SEI Stockholm Environment Institute

Applying the Unlocking a Better Future framework for a just transition in Scotland

Opportunities for the Scottish Government to promote socio-economic transformations needed to help tackle the climate and nature emergencies

SEI report
February 2025

Fiona Lambe
Nina Weitz
Annika Hilgert
Eric Kemp-Benedict
Henrik Carlsen

Published by

Stockholm Environment Institute
Linnégatan 87D 115 23 Stockholm, Sweden
Tel: +46 8 30 80 44
www.sei.org

Author contact

Fiona Lambe
fiona.lambe@sei.org

Editing

Naomi Lubick

Layout

Richard Clay

Graphics

Mia Shu

Media contact

Ulrike Lamberth
ulrike.lamberth@sei.org

Cover photo

Remote Scottish beach in winter © RJW / Getty

DOI: https://doi.org/10.51414/sei2025.007

Acknowledgements

This project was funded jointly by the Scottish Government's Just Transition Policy Unit (Energy and Climate Change Directorate) and the Environment Strategy Team (Environment and Forestry Directorate). We would like to thank the Scottish Government policy team for their engagement and constructive feedback throughout the research project. We are grateful to the participants of the SDG Synergies workshop on 15 March 2024 and the stakeholder consultation workshop on 17 September 2024, who contributed their time and knowledge to enhance the report's recommendations. Special thanks go to Valerie Nelson for contributing to helpful discussions on transformative change for sustainable development. We also thank Biljana Macura for her support with the systematic evidence review.

The content of this report does not reflect the official opinion of the Scottish Government. Responsibility for the information and views expressed therein lies entirely with the authors. The information in this report was up to date as of 31 January 2025, except where indicated in the text.

Contents

Abbreviations

AI	Artificial intelligence
CARES	Community and Renewable Energy Scheme
CCC	Climate Change Committee
CPO	Compulsary Purchase Order
DEEP	Dornoch Environmental Enhancement Project
EDF	Electricité de France
EPC	Energy Performance Certificate
EPR	Extended Producer Responsibility
ESG	Environmental, Social and Governance
ESH	Environmental Statistics Hub
ESMF	Environment Strategy Monitoring Framework
GFN	Global Footprint Network
IBioIC	Industrial Biotechnology Innovation Centre
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
JNCC	Joint Nature Conservation Committee
LBTT	Land and Buildings Transactions Tax
MaaS	Mobility as a Service
NEF	New Economics Foundation
NHS	National Health Service
NIS	National Innovation Strategy
NMIS	National Manufacturing Institute Scotland
NPF	National Performance Framework
NS	NatureScot
SAIC	Sustainable Aquaculture Innovation Centre
SDIL	Soft Drinks Industry Levy
STEM	Science, Engineering, Technology and Mathematics
UBF	Unlocking a Better Future
VDLIP	Vacant and Derelict Land Investment Programme

Summary

The world is facing the urgent and intertwined crises of global warming, accelerated biodiversity loss and extreme inequality among people and societies. It is widely acknowledged that the climate and nature emergencies are of such a scale that they require transformative change of our societies and economies – that is, fundamental, system-wide change that spans technological, economic and social dimensions, encompassing shifts in paradigms, goals and values.

To be truly transformative, policy measures need to take a whole-of-government approach and, in a coherent manner, set the trajectory towards deep transformation of the society and economy. Around the world, governments are grappling with how to bring about such deep and structural changes and avoid exacerbating existing inequalities or creating new ones.

As part of the process of developing its new Environment Strategy, the government of Scotland has identified the need for transformative economic and societal changes, in order for Scotland to play its role in tackling the climate and nature emergencies locally and globally. The research project reported here was commissioned by the Scottish Government to guide the development of a pathway toward one of the key goals of Scotland's Environment Strategy: driving the societal changes required for Scotland to fulfil its role in addressing the climate and nature crises and achieve a "net-zero, nature-positive society".

To this end, the project research team developed a set of evidence-based recommendations for how the Scottish Government can most effectively promote necessary transformations. The recommendations are summarized below.

As well as describing the research process underpinning the recommendations, this report provides evidence on their associated synergies, trade-offs and co-benefits. Evidence-based recommendations also are presented for public engagement around the implementation of the framework developed as part of this project.

This research is part of a set of projects commissioned to support the development of outcome pathways for Scotland's Environment Strategy. Other projects, led by the New Economics Foundation (NEF) and Global Footprint Network (GFN), focused on economic and global footprint outcomes, respectively (Kiberd, 2024; Lin et al., 2024). Using an integrated, systems-based approach, the SEI team assembled appropriate recommendations from all three reports, resulting in the holistic framework presented here. Indicators are proposed for tracking progress on implementing the recommendations and the holistic framework.

The recommendations for societal transformation and the holistic framework were informed by findings from the scientific report *Stockholm +50: Unlocking a Better Future*, developed by SEI and the Council on Energy, Environment and Water. The "Unlocking a Better Future" (UBF) framework was applied to analyse gaps in Scotland's current policy levers and identify opportunities for societal and economic transformation by building on existing policies and initiatives.

The opportunities and recommendations outlined in this report, if implemented, could significantly close gaps in Scotland's current policy landscape and accelerate efforts to tackle the climate and nature emergencies. With the holistic framework as a guide for developing transformative policies now and in the future, we encourage the Scottish Government to engage with the public to bring these opportunities to life.

Recommendations for societal and economic transformation

Recommendations to support the society outcome	
Strengthening human-nature connectedness	
1.1	As per Scotland's second National Human Rights Action Plan carry out a human rights review of collated baseline data on air, land and water pollution impacts and severe weather events.
1.2	Expand and enforce national accessibility standards of natural outdoor green and blue spaces, with a particular focus on people with disabilities and in low-income communities,
1.3.	Encouraging engagement with nature and increasing the number of nature experiences for people outside of school age through: a. increased funding for local community-led nature projects b. initiatives co-designed by local authorities and communities to increase the use of public natural outdoor green/blue spaces for social and cultural events. c. making protected nature areas more accessible, through investing in accessible and reliable public transport to reach protected areas, ensuring the maintenance of park and nature reserve infrastructure.
1.4	Explore labour needs and employment opportunities related to nature accessibility activities, such as rewilding, nature stewardship and maintaining urban green space.
1.5	Shifting the composition and valuation of green and blue space, especially in urban areas. This could include: a. Increasing the naturalness, biodiversity range and "wildness" of green and blue outdoor spaces through for example rewilding initiatives and regulations around monoculture lawns in public areas. b. shifting the valuation of green and blue spaces from economic factors like growth and development to societal and environmental benefits.
1.6	increasing awareness of the value and benefits of nature beyond financial and profit-maximizing narratives, including linked to food and goods consumption and production.
1.7	Strengthening links between engagement with nature and health and wellbeing benefits to enable systemic change, including through: a. re-launch and expand this Natural Health Service to cover more areas and expand the use of nature-based solutions in health practice b. exploring options for the continued use and scaling up of "green prescribing" for health, wellbeing and to encourage pro-environmental behaviour change.
Nature-based education	
2.1	Implement a nature literacy training program for local authorities in Scotland, modelled after the UK's Carbon Literacy project.
2.2	Ensuring a stronger focus on not just ecological knowledge/knowledge about sustainability but also including practical skills, learning about local environmental issues and taking ownership through hands-on engagement in community projects.
2.3	Promoting the development of more diverse educational materials, drawing more on local knowledge and traditional local forms of environmental education and relationships to nature.
2.4	Strengthened funding for initiatives that increase access to nature spaces and regular engagement with and exposure to nature for school-aged children, with a new focus on schools in low-income areas.

Recommendations to support the society outcome	
2.5	Prioritizing and expanding the workstream on outdoor learning that is part of the "Learning for Sustainability" Action Plan to include: a. A "nature guarantee" for every child that they have access to nature and learning about sustainability as part of the curriculum. b. Develop programs for teachers on nature literacy and outdoor learning. c. A broadened focus on engagement in areas other than woodlands/in green and blue spaces. d. A strengthened focus on ensuring that outdoor learning and nature experiences benefit students from marginalized backgrounds. e. Ensure better application of the Going Out There Guidance, led by the Scottish Government and SAPOE. f. Conduct a nationwide assessment of school grounds and infrastructure for opportunities for outdoor engagement and nature experiences. g. Based on the outcome of (f), develop a set of enforceable standards for outdoor activity minimums for all ages.
Rights of Nature	
3.1	Strengthening and expanding comprehensive stakeholder engagement run by the Scottish Government on the views on and implications of accounting for the intrinsic value of nature, including the possibility of establishing Rights of Nature. a. These activities should include a clear pathway for how input from consultations will be taken into account for decision-making. b. These consultations should include but not be limited to relevant legislative and judicial bodies, the Scottish Environment Protection Agency, Environmental Standards Scotland, the Crown Office and Procurator Fiscal Service, stakeholders from businesses, and citizens.
3.2	Conduct a feasibility study for implementing Rights of Nature in Scotland.
Animal welfare	
4.1	Use animal welfare impact assessments when developing policies, such as informational, financial and regulatory measures.
4.2	Redirect public subsidies for animal and agricultural products towards "humane, healthy and sustainable alternatives" which encourage higher animal welfare and less but better consumption of animal products.
4.3	Support (UK Government) proposals on a compulsory animal welfare labelling system for food and encourage voluntary action on the disclosure of animal welfare, health and environmental risks by food companies to investors to improve information and transparency.
4.4	Invest to strengthen engagement and increase awareness about animal welfare for ethical, moral, environmental and human wellbeing outcomes.
4.5	Ensure meaningful, inclusive participation of different stakeholders in policy development, to not exacerbate existing inequalities or create new ones. a. This should include long-term two-way engagement with stakeholders, such as partnerships and capacity-building, co-design and co-creation processes. b. To mitigate potential negative consequences, consider measures such as compensation for lost incomes, regional- and community-level investments, education and retraining, and strengthening social safety nets.
Nature in urban areas	
5.1	Promote the use of biophilic design principles in development proposals for new and retrofitted urban architecture and housing policy.
5.2	Development proposals should include evaluations of principles and options for greening urban infrastructure, by learning from e.g. biomimicry and greening community practices for urban planning.
5.3	Aligning and expanding existing policies focused on access to nature and community empowerment through national accessibility standards and higher economic valuation of green spaces.
5.4	Strengthen incentives, engagement and awareness among commissioners of developments, including client bodies, private developers and large institutional land/asset owners, to incorporate green and blue infrastructures as part of their delivery.

Recommendations to support the society outcome	
Sustainable lifestyles	
6.1	Building on the Scottish Government's existing policy focus on supporting net-zero behaviours, develop a stronger evidence base and policy response on lifestyle and behaviour changes needed to achieve goals for: a. Circular economy – pay particular attention to the social and behavioural aspects of transition to a circular economy in Scotland. b. Biodiversity – draw on resources such as the GFN analysis and biodiversity risk analyses to identify where current lifestyles have negative impacts on natural systems.
6.2	Adopt a systems approach to key impact areas, expanding planning beyond single-sector concerns. For instance, the 20-minute neighbourhood concept and the Transport Just Transition Plan illustrate this by integrating factors like energy, digital connectivity, and public health into broader strategies.
Recommendations to support the economy outcome	
National accounting beyond GDP	
7.1	Adopt other means of monitoring and measuring economic wellbeing instead of GDP, such as the Scottish Wellbeing Economy Monitor (https://www.gov.scot/publications/wellbeing-economy-monitor/) and the supplementary guidance to HM Treasury's *The Green Book*. a. The Scottish Government could also expand the use of multi-criteria analysis beyond the limited role assigned to it in *The Green Book* supplementary guidance.
Innovation systems	
8.1	Align the National Innovation Strategy to sustainability goals in a coherent manner.
8.2	Use a mission-driven strategy to complement the current opportunistic bottom-up approach in identifying priority areas to explicitly target ambitious innovation for sustainability.
8.3	Apply a sustainability filter across the National Innovation Strategy to ensure that unsustainable activities do not receive explicit government support.
8.4	Shift the focus from growth promotion to more directly target explicit policy goals, such as full and good employment, balancing support across regions, meeting fiscal requirements and supporting initiatives with strong cross-sectoral linkages.
Supply chain governance	
9.1	Mainstreaming application of the Scottish Government's Sustainable Procurement Tools (https://sustainableprocurementtools.scot/)
9.2	Follow the advice and guidance in the note "Public procurement – taking account of climate and circular economy considerations: SPPN 3/2022" and new procurement guidance on biodiversity.
9.3	Where possible, argue for strengthened action at UK level, e.g. to go beyond the UN Global Compact.

1. Introduction and background to the project

The Scottish Government's Environment Strategy sets out a 2045 vision for restoring Scotland's natural environment and for playing Scotland's full role in tackling the global climate and nature emergencies. By doing so, it states, "our country is transformed for the better – helping to secure the wellbeing of our people and planet for generations to come."

To support this vision, the Scottish Government has identified six outcomes to help guide action. Three outcomes describe ambitions for restoring nature, tackling climate change and using resources sustainably. The other three outcomes focus on the wider transformations needed in the country, with global implications: transformative changes would be needed in Scotland's national economy and society, while also ensuring that Scotland has a sustainable overseas environmental footprint – all three of which would help tackle the climate and nature emergencies locally and globally.

Achieving the long-term vision of the Environment Strategy for Scotland will require transformation across all sectors of the economy and society; to do so, the Scottish Government has developed a National Just Transition Planning Framework. The framework is broad and ambitious, not only aiming to guide fair and just transitions in sectors that have high greenhouse gas emissions, but in all the sectors that will have an important role to play in a transformed, net-zero economy.

The SEI research project reported here was commissioned by the Scottish Government's Just Transition Policy Unit and the Environment Strategy Team, hereafter referred to as the Scottish Government policy team. The work conducted by SEI supports the evidence base needed to inform the development of a pathway for one of the outcomes of Scotland's Environment Strategy: the transformations in Scottish society needed to fulfil Scotland's role in tackling the climate and nature emergencies, that is, becoming a "net-zero, nature-positive society".

Achieving this transformation will require changes in people's lifestyles and behaviours, as well as in the design of a wide range of social policies, in key systems such as food, housing, transport, energy, health and education. The SEI research project aimed to identify evidence-based opportunities for how the Scottish Government can use the available policy levers most effectively to promote these societal transformations.

This research project is one of a set commissioned to help inform the development of Environment Strategy outcome pathways. Research projects by the New Economics Foundation (NEF) and Global Footprint Network (GFN) focused on the economy and global footprint outcomes, respectively, supported by additional projects by the James Hutton Institute. A research project on transformative change by Valerie Nelson (professor of sustainability and political ecology, the University of Greenwich Natural Resources Institute) reviewed emerging international thinking on transformative changes for sustainability. The NEF, GFN and transformative change projects have recently been completed, resulting in published reports with sets of recommendations for each (Kiberd, 2024; Lin et al., 2024).

A further objective of the SEI research project was to draw together recommendations for the Scottish Government's Environment Strategy outcomes for economy, society and global footprint – not only from this project but from the NEF and GFN projects – into a holistic framework, using an integrated, systems-based approach. Given the complex and important interactions across these outcomes, the Scottish Government policy team requested that the work be guided by the framework set out in the report *Stockholm+50: Unlocking a Better Future*. Referred to here as the UBF framework, it was developed by SEI and the Council on Energy, Environment and Water to provide recommendations for promoting the socio-economic transformations needed to tackle the global climate and nature emergencies (SEI & CEEW, 2022). In this project, the UBF framework was used to conduct a gap analysis of current policy levers in Scotland to identify opportunities for societal and economic transformation, building on existing policies and measures. A final step in the project was to suggest indicators that could be used to track progress towards achieving transformative change in Scotland, needed to address the nature and climate emergencies.

The report is structured as follows: the remainder of this section provides an overview of the current state of the environment in Scotland and introduces the UBF framework. Section 2 describes how the framework was applied to review current policy levers in Scotland, presents the recommendations for societal and economic transformation based on this analysis, and incudes a discussion of synergies, trade-offs and co-benefits associated with the recommendations. The holistic framework is also presented in Section 2. Section 3 presents findings from a systematic literature review on the use of public participation to support a just transition; based on this, a set of recommendations for Scotland is provided. Section 4 introduces indicators for tracking transformation now and in the future, and Section 5 provides final reflections on the findings of this project, as well as thoughts on next steps towards operationalizing the recommendations and the holistic framework.

1.1 The current state of the environment in Scotland

This section provides an overview of biodiversity, climate change, air quality, water and other aspects of Scotland's environment. In addition, this section presents an overview of the economic conditions that impact Scotland's environment, such as nationwide progress on becoming a circular economy and the current state of existing inequalities in Scotland, beyond only environmental inequalities.

Scotland experiences ongoing biodiversity loss, with 11% of species threatened with extinction as of 2023 (Burns et al., 2023). As of March 2024, 75.6% of designated natural features on protected nature sites were assessed as being in "favourable" condition, compared to about 78% in 2019 and 76.0% in 2007 (Scottish Government, 2024). Scotland's biodiversity intactness is among the bottom 25% globally, with half of its historic land-based biodiversity lost (Walton et al., 2019). Species abundance has declined, particularly for terrestrial and freshwater species, down 15% from 1994 to 2020 (Phillips et al., 2021). While there have been modest improvements in some areas, key drivers of biodiversity loss persist. Invasive species is the single biggest negative pressure on the condition of designated natural features on protected nature sites, accounting for 21%

of all negative pressures followed by overgrazing which accounts for almost 18% of all negative pressures (NatureScot, 2023).

The ambition is relatively high for cutting emissions across a range of sectors devolved to the Scottish Government.

Regarding climate change, net greenhouse gas emissions decreased by 49% between 1990 and 2021, with carbon dioxide (CO_2) comprising 70% of emissions on a carbon-equivalent (CO_2e) basis in 2019 (Scottish Government, 2021d). Scotland's progress towards a net-zero economy presents a mixed picture. The net-zero economy is relatively strong in Scotland in comparison to other UK regions and nations, but the country faces challenges (Office for National Statistics, 2023). The ambition is relatively high for cutting emissions across a range of sectors devolved to the Scottish Government, including domestic heating, transport, land use and agriculture; however, the country remains off track from meeting targets for the short and medium term, indicating issues with policy delivery (Climate Change Committee, 2022). Progress is most notable in the energy sector, but further improvements are needed in peatland restoration, agriculture, transport decarbonization and industry emissions.

Air quality in Scotland has improved considerably over the past few decades. Emissions of nine air pollutants were lower in 2021 than in 2005. The greatest rate of decline was in sulphur dioxide (SO_2) emissions, principally due to the reduction of coal use within the economy. Nevertheless, air quality remains an area of concern, as there are still up to 2700 deaths per year in Scotland attributable to air pollution (UK Health Security Agency, 2022).

Scotland's water environment is significantly impacted by climate change, with rising temperatures leading to drier summers, deteriorating water quality, and increased winter rainfall (Scottish Government, 2023b). Sea levels are rising, threatening infrastructure on or near the coastline (Scottish Government, 2023b). High river runoff has increased by 20%, with winter runoff up nearly 45% over the past four decades (Hannaford, 2015). The predicted increase in extreme rainfall increases the risk of loss of soil nutrients, as they are washed from agricultural land into surface waters, where they affect water quality (Committee on Climate Change, 2017). In 2020, 64% of rivers and lochs were in good condition, a slight improvement since 2015 (The Scottish Environment Protection Agency, 2022). Key pressures on freshwater bodies include rural diffuse pollution, human-made barriers to fish migration, and physical modifications, with agricultural practices being a major source of nutrient pollution (Environmental Standards Scotland, 2022).

According to recent estimates, Scotland's economy is only 1.3% circular, meaning that just over 1% of the resources used in Scotland are circulated back into the economy after use for reuse or recycling, and that the economy relies heavily on virgin materials (Conde et al., 2022). For reference, the global economy is 8.6% circular and the Netherlands' economy is 24.5% circular (Conde et al., 2022). The government is underperforming on waste management targets, including missing the 2020 household recycling goal (Kiberd, 2024). Scotland's large material footprint is in part due to high waste generation, reliance on fossil fuels, and inefficient use of materials – Scotland's low population density means that materials needed for infrastructure, amenities and services are used less efficiently (Kiberd, 2024). A significant portion of Scotland's material consumption and carbon footprint comes from imported materials and

products, with consumption-based emissions exceeding territorial emissions by 42% (Kiberd, 2024).

Inequalities in Scotland

The Scottish Index of Multiple Deprivation ranks areas in Scotland from "most deprived" to "least deprived" based on income, employment, health, education, housing, access and crime (Scottish Government, 2020e). In 2020, 14 areas were consistently among the most deprived, primarily in Glasgow (Scottish Government, 2020e). Deprivation affects both rural and urban areas, with one in eight residents in income poverty in rural areas and one in five in urban areas (Scottish Government, 2020e). Vulnerable groups often rely on low-paying, unstable local work. Rural areas have less broadband coverage (Think Broadband, 2017), higher fuel costs due to limited gas grid access, and a higher rate of fuel poverty (Scottish Government, 2021c). Energy use disparities exist, with the wealthiest using significantly more fossil fuels for international flights (Scottish Government, 2023a).

In terms of access to transportation, people in rural areas are more likely to drive frequently due to limited public transport access, with 84% of rural areas having poor bus service coverage (Scottish Government, 2020c). Rural transport costs are up to £40 higher per week than urban areas. Car access is lower among women, older people, disabled individuals, and people who live in low-income households (Scottish Government, 2020c).

Access to nature and exposure to risks associated with the declining natural environment

Regarding access to natural areas, 66% of people in remote rural areas and 63% in accessible rural areas visit the outdoors weekly, compared to 54% elsewhere (Scottish Government, 2020c). Three-quarters of residents in accessible rural areas live within five minutes of "green" or "blue" spaces, such as forests and fields or coastlines and lochs, with similar proximity in remote rural areas and in the rest of Scotland (Scottish Government, 2020c). During the pandemic, over 75% visited greenspaces weekly, but inequalities in accessing greenspace worsened (Public Health Scotland, 2022). In 2018, 45% of adults in deprived areas visited the outdoors weekly, compared to 68% in the least deprived areas (Scottish Government, 2020b). People who infrequently visit nature are more likely to be female, older, in poor health, of lower socio-economic status, or from ethnic minorities (Boyd et al., 2018; Scottish Government, 2020b; Stewart & Eccleston, 2020).

Ethnic minority communities in the UK are disproportionately impacted by the declining natural environment due to societal inequities, according to a report by the Race Equality Foundation and New Philanthropy Capital (Gadd et al., 2023). For example, intensive farming and industrial practices are contributing to a decline in food security and quality. Individuals from ethnic minority communities with lower incomes are especially susceptible to rising prices of nutritious, low-toxicity foods such as

organic produce. They also face higher risks from zoonotic diseases such as COVID-19 and have limited access to high-quality green spaces. Barriers include financial, cultural and practical factors, alongside experiences of racism (Gadd et al., 2023).

Exposure to adverse impacts of climate change

In 2018, around 284 000 properties in Scotland were at risk of flooding, more than double the number in 2015 (Environmental Standards Scotland, 2022). This increase is due to improved risk identification rather than a physical risk change (Environmental Standards Scotland, 2022). About 90% of flood risk is in 235 Potentially Vulnerable Areas (Scottish Environmental Protection Agency, 2018). Extreme flood disadvantage affects 100 000 people, primarily in urban areas, with remote areas facing social and mobility challenges (Kazmierczak et al., 2015).

Climate change and air pollution disproportionately impact those with pre-existing vulnerabilities, especially socio-economic inequalities. Ethnic minority communities, particularly in poorer economic brackets, face specific challenges: they often live in areas with poor-quality housing that is susceptible to heat during heatwaves, damp during heavy rain, and flooding, which might lead to economic losses if in uninsured rentals, and with high air pollution. This exposure contributes to poorer health outcomes, including higher risks of preterm birth, stillbirth and low birth weight, often linked to socio-economic disparities and racial discrimination (Gadd et al., 2023). Overall, these factors contribute to significantly worse health and economic impacts for ethnic minority communities.

Air quality impacts children and young people more than adults, leading to higher hospital admissions for conditions like asthma (Fitton et al., 2023). The very young, elderly and those with pre-existing health issues are also vulnerable to daily air pollution changes, which can adversely affect their health (Scottish Government, 2020a).

1.2 Perspective on transformation

The Scottish Government has identified the need for transformative change across society and the economy, to achieve its vision and to reflect international evidence and advice from the Intergovernmental Panel on Climate Change (IPCC) and Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). In this report, transformative change is understood as a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values (IPBES, 2019; IPCC, 2022). The systemic nature of transformative change implies changing the parameters within which people operate, to support changes in behaviour and lifestyle.

Although transformative change is difficult to anticipate and govern, scientific evidence points to actions that can be taken to trigger necessary systemic changes. To identify such actions for Scotland, we have applied the framework and proposed actions of the *Stockholm+50: Unlocking a Better Future* report. Published in 2022 by Stockholm Environment Institute and the Council on Energy, Environment and Water, that report was commissioned by the Swedish Government to provide a scientific basis for a

landmark UN international meeting, “Stockholm+50: a healthy planet for the prosperity of all – our responsibility, our opportunity”, marking the 50th anniversary of the UN Conference on the Human Environment. The report was based on a synthesis of scientific evidence about actions that can be taken to promote the socio-economic transformations needed to tackle the global climate and nature emergencies, with the resulting UBF framework that we use here.

Socio-economic transformation is a grand term for a process that has occurred multiple times in every country and region, including Scotland, throughout history. Economic activity is made possible by dominant technologies, and different periods are characterized by different dominant technologies. Each dominant technology is accompanied by legal and regulatory structures, educational systems and social norms. For example, the rules for public roads shifted substantially with the arrival of motor cars (Thorsheim, 2018).

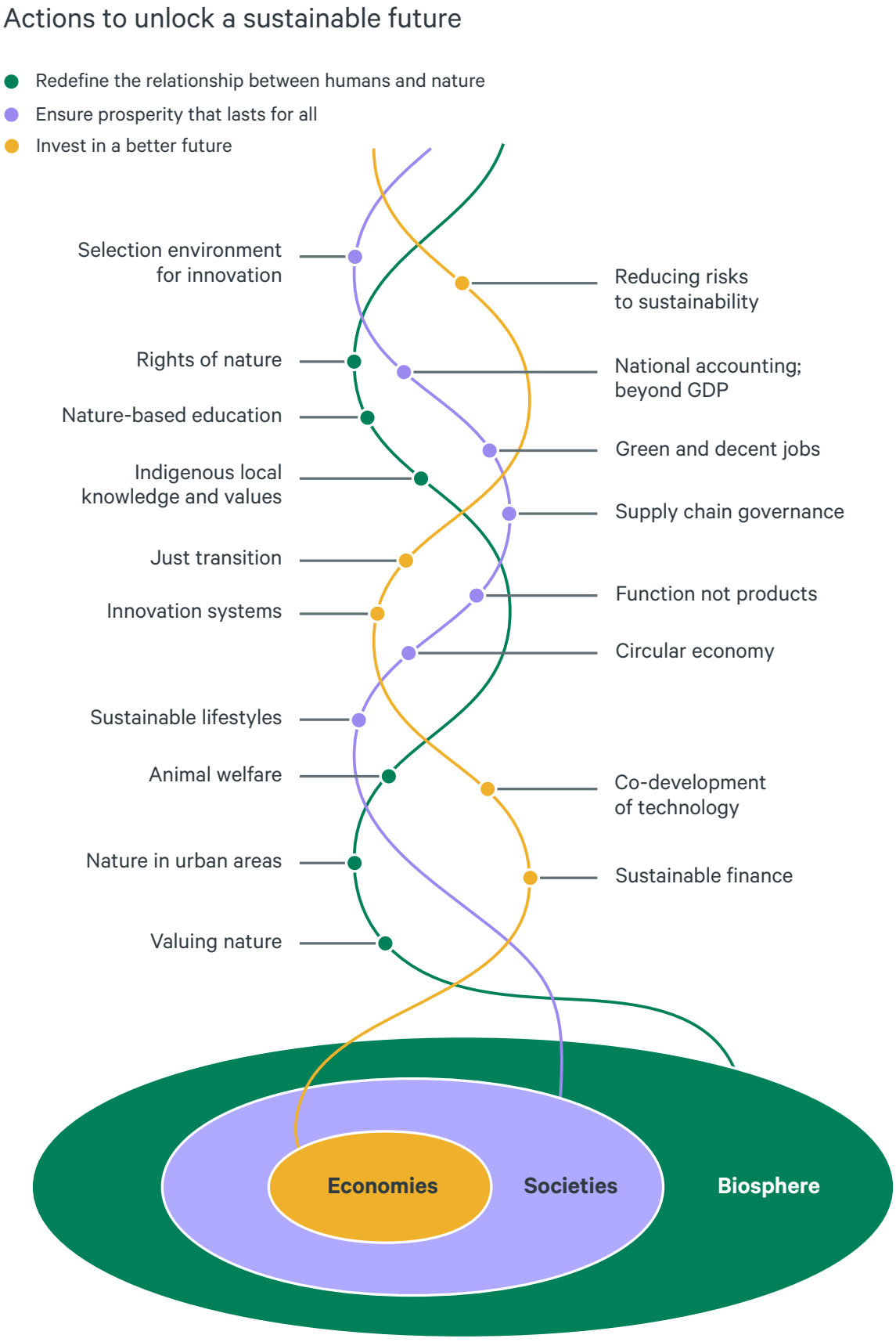
Transformations of a similar scale are likely to be required for a transition to a sustainable future. One way to imagine the possibilities is to look at current infrastructure, practices, laws and educational programs and ask which of those might appear quaint or odd from the perspective of a future sustainable society. Examples could include petrol stations, frequent air travel, inexpensive exotic foods, disconnection from nature, and educational courses on construction and operation of coal-fired power plants (Van Notten et al., 2005).

The UBF framework recognizes as a starting point that societies are embedded within the biosphere, and that our national (and global) economies represent just a fraction of all social interactions (Folke et al., 2016; SEI & CEEW, 2022). After all, without societies, economies would not exist, and societies rest on the largely unseen support of a healthy and resilient biosphere (Folke et al., 2011). The framework is focused on three key shifts: redefine the relationship between humans and nature, ensure prosperity that lasts for all, and invest in a better future; it also outlines a set of actions under each shift. According to the UBF framework, if achieved, these shifts and actions imply systemic change and hold large potential for improving sustainability (see section below for a description of the three shifts).

Key actions to unlock a sustainable future proposed under the UBF framework include the following:

- Rights of Nature
- Indigenous local knowledge and values
- animal welfare
- nature in urban areas
- nature-based education
- change the selection environment for innovation
- national accounting beyond GDP
- supply chain governance
- sustainable lifestyles
- green and decent jobs
- function not products
- circular economy
- reducing risks to sustainability
- just transition
- innovation systems
- co-development of technology
- sustainable finance.

Figure 1. Key action areas outlined in the report Stockholm+50: *Unlocking a Better Future*



Source: SEI & CEEW (2022)

See Figure 1 for how these action areas map to the three interacting shifts and Annex 1 for more details on how these action areas are defined.

The three shifts

The Stockholm+50: Unlocking a Better Future report presented a framework focused on actions to make progress on key shifts needed for a sustainable future. It was written 50 years after the UN Conference on the Human Environment in 1972, in the current context where entwined planetary and human crises persist, despite our having access to the knowledge and means of solving our problems. The report stressed the need for bold and science-based decision-making to accelerate the pace of change. Based on a synthesis of scientific research, it pointed to three broad shifts that require immediate actions, to seed transformative change for the longer term. These shifts are crucial for transformative change but will not be sufficient.

Redefine the relationship between humans and nature

The huge losses and degradation of nature globally in the past half-century has been driven by a perspective in many societies that nature is an instrument, something to be used for resources. An instrumental valuation of nature often underpins policies and economic structures that in turn shape unsustainable behaviours and social norms at the individual level (Folke et al., 2011; Pascual et al., 2017; Richardson et al., 2020). Repairing the relationship between people and nature – shifting from one of extraction to one of care – will require moving away from valuing nature instrumentally, to placing more emphasis on the intrinsic and relational value of nature than is currently the case (Diver et al, 2019). Such a shift would imply transformative changes across societies, economies and communities, how we live in our cities, how we produce food, how and what we learn, and the knowledge and rights that inform our choices. Human – nature connectedness should be strengthened in our social norms and value systems, and in how we live our everyday lives, by integrating nature in our cities; protecting animal welfare and shifting to more plant-based diets; increasing nature-based education for children and youth; and recognizing and drawing on Indigenous local knowledge.

Ensure prosperity that lasts for all

The volume of natural resources extracted by humans globally each year has tripled since 1970. High-income countries have consumed most of these resources. Ensuring lasting prosperity for all and bringing emission and resource footprints within ecological limits requires a complete rethinking of our ways of living, and a shift in social norms and values that drive human behaviour (Hoekstra & Wiedmann, 2014; UNEP, 2017). Achieving such outcomes requires redefining prosperity at all levels in society and economy, creating enabling infrastructures and inspiring new supportive social norms. Making sustainable lifestyles the overwhelmingly preferred choice; scaling business models that focus on services delivered, not on products made; making supply chains better for both humans and the environment; aligning national statistics with sustainability goals; and shaping our innovation system after sustainability criteria can unlock transformative change.

Invest in a better future

To ensure prosperity for all and redefine our relationship with nature, investing in a better future is necessary. Today, a massive amount of capital is ready for sustainability investments, yet we see persistent funding gaps, especially in low-income countries. Action is needed not only to mobilize capital for sustainability, but to ensure sufficient levels at lower costs, supporting allocation to places and sectors in need, and transitioning out of unsustainable practices and capital goods. To invest in a better future, we must recognize and enhance governments' foundational role in innovation; incentivize private finance to bring innovation to the market and raise it to the needed scale; and reduce the risks to sustainability while also raising the costs of unsustainability.

Taking action within the framework

Actions proposed under each shift can be taken now, are known to be important for sustainability in the longer term and can promote systemic change. Moreover, given the UBF framework, the focus is on areas that are less evident in the current policy debate and that are not necessarily part of existing policy agendas within international processes (e.g. climate, biodiversity, chemicals) and sectoral domains (e.g. energy system, food system). The recommendations we can derive from applying the UBF framework to Scotland are thus focused on policy levers that complement the many ongoing or emerging sectoral policy initiatives, already in play in the country.

To take an example, the long-term goal for the economy in the UBF report is that people, simply living their lives, follow a sustainable path. As Park et al. (2023) argued, the biggest sustainability impacts will be achieved by addressing the major cost, convenience and desirability barriers to changing behaviour and that there is a need for interventions that "operate at the 'midstream' (changing proximate choice environments to make green options easy, appealing, affordable, salient and normal) and 'upstream' (leveraging commercial incentives, institutional leadership and regulation in ways which ultimately create those choice environments at scale)".

It should be noted that the UBF framework is one of many perspectives on transformative change for sustainable development. For a comprehensive overview of the academic literature and recent global policy and science-policy discourse on transformative change, see Nelson (2024, forthcoming).

2. Opportunities for socio-economic transformations in Scotland

In this section, we introduce the opportunities for societal and economic transformation in Scotland and describe the methodology we used to identify them. We then situate the opportunities within a holistic framework that includes the recommendations for economic transformation and Scotland's overseas environmental footprint developed under the NEF and GFN reports.

2.1 Methodology

Following a protocol developed in consultation with the Scottish Government policy team, we conducted a review and mapping of current societal policy levers, to identify gaps and opportunities. The work was guided by the question, "How can the available policy levers in Scotland be effectively used to promote the societal transformations needed to tackle the climate and nature emergencies?" The review focused on current Scottish policy levers related to food, housing, transport, energy, the consumption of goods, health and education – i.e. those deemed most relevant for a "societal transformation".

To start, current policy levers in Scotland were systematically mapped based on available Scottish-specific evidence (including data from key Scottish Government monitoring frameworks, including the Environment Strategy Initial Monitoring Framework, Wellbeing Economy Monitor and National Performance Framework), as well as the recommendations proposed in the two other commissioned reports – *Scotland's International Environmental Impact: Evidence Base and Policy Levers*, by GFN, and *Delivering the Environment Strategy Outcome from Scotland's Economy: Evidence Base and Policy Levers*, by NEF – to capture any gaps or opportunities that were already addressed by their recommendations.

The mapping was done manually by searching each website/document using a list of keywords associated with four categories of policy lever: economic, regulatory, infrastructure-based and information-based. These categories of levers are based on definitions provided in a report by the Joint Nature Conservation Committee (JNCC) on policy interventions to encourage sustainable consumption (Harris, 2023), which were also used to analyse policy levers in the NEF and GFN reports. Available policy levers were systematically screened in two stages, irrelevant policy levers excluded, and relevant data coded in a spreadsheet (see Annex 1 for details on the kinds of documents consulted, keywords, exclusion criteria, and screening process).

The existing policy levers where then mapped against the UBF framework, taking the thematic areas as they appear in the framework diagram (see Figure 1).[1] We

1 One thematic area – Rights of Nature – was initially not included as it was deemed more relevant in an international context. However, it was later included based on feedback from the Scottish Government policy team that this was a relevant area to include and one that is not addressed through existing policy levers.

operationalized these areas by extracting explanatory text for these from the report to ensure that we are capturing the original meaning when reviewing the Scottish Government policies. These are listed in Annex 1. For each UBF framework thematic area, we asked whether the policy lever in question addresses this area or not. We then calibrated these assessments in group discussions within the SEI research team, sense-checking difficult or ambiguous cases. We aggregated across all answers per thematic area (how many policy levers scored "yes" per UBF framework area) to identify areas where gaps and opportunities remained. This was accompanied by a short narrative description on gaps and opportunities, noting any ideas for possible recommendations that surfaced.

In total, we mapped 117 policy levers against 18 of the thematic areas of the UBF framework. See Annex 1 for further details on the methodology for the review, and Table 1 for an overview of how the policies reviewed mapped against the UBF framework thematic areas.

Table 1. Overview of mapping of NEF, GFN and Scottish Government policy documents against UBF thematic areas

Name of thematic area	Scottish Government policy documents	Scotland's international environmental impact (GFN)	Delivering the Environment Strategy outcome on Scotland's economy (NEF)
Changing the selection environment for innovation	36	8	27
National accounting beyond GDP	0	4	5
Supply chain governance	15	2	4
Green and decent jobs	34	4	16
Function, not product	9	0	5
Circular economy	29	11	35
Sustainable lifestyles	85	10	23
Indigenous local knowledge and values[1]	Not applicable	Not applicable	Not applicable
Animal welfare	1	3	5
Nature in urban areas	17	1	5
Valuing nature	18	2	9
Nature-based education	9	1	1
Reducing risks to sustainability	8	2	16
Just transition	57	2	21
Innovation system	16	7	25
Co-development of technology[2]	Not applicable	Not applicable	Not applicable
Sustainable finance	4	0	11
Rights of Nature	0	0	0
Total number of policy levers mapped	**117**	**25**	**77**

1 After consultation with the Scottish Government policy team, this thematic area was excluded because it is less relevant in the Scottish context.

2 After consultation with the Scottish Government policy team, this thematic area was excluded, as it is more relevant to the global context, referring to the need to move away from technology transfer from high- to low-income countries.

BOX 1. WELLBEING ECONOMY

The concept of a "wellbeing economy" is defined by the Wellbeing Economy Alliance as "an economy that is designed with the purpose of serving the wellbeing of people and the planet first and foremost; in doing so, it delivers social justice on a healthy planet".[1] The Scottish Government has endorsed the pursuit of a wellbeing economy and was a founding member of the Wellbeing Economy Governments (WEGo) group.[2] Scotland has taken practical steps by initiating a series of "policy labs" aimed at testing ideas.

As per the Wellbeing Economy Alliance, a wellbeing economy supports human needs for dignity; nature; connection; fairness; and participation. These needs are addressed within the Scottish context through the just transition principles and the government's adoption of the "Place Principle", which recognizes the importance of places as the context for connection, which also shapes how resources are directed and used (see Box 2).

As stated in the Wellbeing Economy Policy Design Guide,[3] suitable policy "begins with priority wellbeing goals and identifies changes in the economy required to achieve goals". Viewing the economy as embedded in society, which in turn is embedded within ecosystems, the process starts with the high-level goals and then, through participatory and context-specific proposals, engages in multiple experiments to build an evidence base on which to evaluate alternative policies. The Wellbeing Economy approach is contrasted with "Old Economic Policy", which "begins with the identification of economic challenges or 'market failures' where government intervention is needed".

1 https://www.weallscotland.org/policy-design-guide
2 https://www.gov.scot/groups/wellbeing-economy-governments-wego/
3 https://regionaleconomicdevelopment.scot/our_work/wellbeing-economy-policy-design-guide/

Based on the mapping above, we identified the nine thematic areas below as areas with remaining opportunities for action based on the UBF framework:

- Valuing nature[2]
- Nature-based education
- Rights of Nature
- Animal welfare
- Nature in urban areas
- Sustainable lifestyles
- National accounting beyond GDP
- Innovation systems
- Supply chain governance

We refer to these nine areas as thematic areas for the remainder of the report, since specific recommendations were developed under each one. Note that the three listed last are focused on the economy specifically.

The perspective on transformation represented by the original *Stockholm+50: Unlocking a Better Future* report and the scope of this project align well with two initiatives underway in Scotland – the Wellbeing Economy and the Place Principle (See boxes 1 and 2). As work in these areas has been in progress but not reflected in our initial review, we have linked, as appropriate, our proposed recommendations to the concept of the Wellbeing Economy and to the Place Principle (see definition of Wellbeing Economy in Box 1 and definition of Place Principle in 2).

The final set of recommendations presented in the following section has been informed by feedback from the Scottish Government policy team and relevant policy leads.[3] The recommendations have also benefited from inputs at two workshops involving government and civil society stakeholders.

The first workshop presented insights to better ground recommendations in the Scottish context, and additional feedback and reflections from participants were shared with the research team during and after the workshop. Results from the workshop were used to inform and guide further development of recommendations, ensuring the recommendations make tangible hooks for action in Scotland, use appropriate definitions and precision, and have a strengthened focus on communities to support a just transition.

During this workshop the SDG Synergies approach and tool[4] were used to bring to the surface potential synergies and trade-offs between recommendations at an early stage (Weitz et al., 2018). See Section 2.4 on "Synergies, trade-offs and co-benefits of recommendations" for key findings of the SDG Synergies exercise and Annex 1 for additional material.

2 Following consultation with the Scottish Government policy team, it was agreed to re-label "Valuing Nature" as "Strengthening Human-Nature Connectedness" to better reflect the specific measures proposed under this thematic area.
3 For example, the thematic area "Function, not product" was removed following feedback from stakeholders that they viewed this as one approach among many within a broader circular economy strategy.
4 SDG Synergies

BOX 2. PLACE PRINCIPLE

Together with COSLA, the national membership organization for local government (councils) in Scotland, the Scottish Government has adopted the "Place Principle". Developed by external partners, this principle aims to encourage and enable the ability of local actors within Scotland to identify issues and to respond to them in a manner appropriate to their local situation.

The Place Principle states:[1]

We recognise that:

- *Place is where people, location and resources combine to create a sense of identity and purpose, and is at the heart of addressing the needs and realizing the full potential of communities. Places are shaped by the way resources, services and assets are directed and used by the people who live in and invest in them*
- *A more joined-up, collaborative, and participative approach to services, land and buildings, across all sectors within a place, enables better outcomes for everyone and increased opportunities for people and communities to shape their own lives.*

The principle requests that:

- *all those responsible for providing services and looking after assets in a place need to work and plan together, and with local communities, to improve the lives of people, support inclusive and sustainable economic growth and create more successful places.*

We commit to taking:

- *a collaborative, place-based approach with a shared purpose to support a clear way forward for all services, assets and investments which will maximise the impact of their combined resources.*

1 https://www.gov.scot/publications/place-principle-introduction/

A final round of feedback on the recommendations was gathered during a second online workshop with a similar group of government and civil society stakeholders, towards the end of the project. Similarly, participants had the opportunity to submit further feedback to the research team after the workshop.

2.2 Recommendations for a societal transformation

Below are our recommendations across nine thematic areas that hold potential for transformation in Scotland, by closing gaps vis-à-vis the UBF framework and complementing ongoing initiatives. We first present six recommendations focused on society, followed by three that focus on economic transformation.

Thematic area 1: strengthening human-nature connectedness

The relationship between humans and nature is central to the meaning of sustainability. Human-nature connectedness refers to an individual's subjective sense of their relationship with the natural world and can be enhanced by simple interventions involving contact with nature (Barragan-Jason et al., 2022). A growing body of research indicates that higher levels of nature connectedness are positively associated with improved health and wellbeing (Capaldi et al., 2014; Pritchard et al., 2020).

Such connectedness is also associated with more pro-environmental behaviours. Empirical evidence of this association for a range of pro-environmental behaviours includes using public transportation (Hunecke et al., 2001), mindful use of energy (Black et al., 1985), recycling (Guagnano et al., 1995), environmentally friendly purchasing behaviours (Thøgersen, 2005; Thøgersen & Ölander, 2002), acceptance of climate change policies (Nilsson et al., 2004), acceptance of energy policies (Abrahamse & Steg, 2011), everyday pro-environmental habits (Thøgersen & Ölander, 2002), limited car use (Jakovcevic & Steg, 2013), water conservation (Barrera-Hernández et al., 2020), and donating money to environmental causes (de Groot & Steg, 2008).

We posit that a renewed policy and social focus on human-nature connectedness can help to shift societal norms and individual behaviours related to nature, including action related to climate adaptation and increased resilience to enable systemic change. It can directly or indirectly benefit many other societal goals, such as health, wellbeing and employment, and broaden the lens from the climate crisis to an improved relationship with nature overall and the human right to a clean, healthy and sustainable environment.

Based on our review we found that a modest number of existing policy levers (18) in Scotland address this area, mainly clustered around planning, housing, transport, and food and diets. These include initiatives to encourage communities to grow local food (e.g. the Community Empowerment Act and funding for the "Grow Your Own" initiatives), support for community engagement with woodland areas (e.g. through funding for Community Woodlands Association and initiatives like "Branching Out") and green spaces (e.g. through regional land-use partnerships), and providing guidance for children's engagement with nature through guidance related to outdoor play (e.g.

as part of the National Planning Framework), and the "Learning for Sustainability" framework. Policy levers that seem to address human-nature connectedness are broadly focused on infrastructure-related issues rather than targeting individual behaviour change. Similarly, recommendations from GFN and NEF reports (eight) address human-nature connectedness (Kiberd, 2023; Lin et al., 2023).

We suggest that there is opportunity in Scotland to elevate the importance of human-nature connectedness to create meaningful relationships with nature and decentre extractive, economic and monetized views of nature. Seven specific recommendations for achieving this are:

Recommendation 1.1. As per Scotland's second National Human Rights Action Plan (2023–2030) (Scottish Human Rights Commission, 2023), carry out a human rights review of collated baseline data on air, land and water pollution impacts and severe weather events. To address the disproportionate impact of environmental harms on marginalized places and people whose rights are most at risk, prioritize focus on (a) areas of highest deprivation and/or at higher risk; (b) the impact of environmental hazards on health outcomes; and (c) the extent to which mitigation and adaptation measures are prioritized for areas of highest deprivation. Use findings to inform national decision-making to help better realize the right to a healthy environment.

Recommendation 1.2. Expand and enforce national accessibility standards of natural outdoor green and blue spaces, with a particular focus on people with disabilities and in low-income communities, ensuring that everyone has access to natural outdoor green and blue spaces, within 15 minutes' walk or equivalent from their homes. This should be supported with sufficient funding for local authorities to incorporate nature accessibility measures in local development plans.

Recommendation 1.3. Encouraging engagement with nature and increasing the number of nature experiences for people outside of school age, for example:

1.3a. Through increased funding for local community-led nature projects (e.g. rewilding, urban gardening, stewardship of local nature areas) particularly in disadvantaged communities and where appropriate, expanding the accessibility of green spaces in schools to the local community.

1.3b. Through initiatives co-designed by local authorities and communities (including Greenspace teams), increase the use of public natural outdoor green and blue spaces for social and cultural events.

1.3c. Through making protected nature areas (such as National Parks, National Scenic Areas, and National Nature Reserves) more accessible, through investing in accessible and reliable public transport to reach protected areas, ensuring the maintenance of park and nature reserve infrastructure, and providing accessible guidance on how to engage with and in these spaces. This links to funding (e.g. through the Community Bus Fund or the Active Travel Transformation Fund) and to the Mobility as a Service (MaaS) Investment Fund.

Recommendation 1.4. Through exploring labour needs and employment opportunities related to nature accessibility activities, such as rewilding, nature stewardship and maintaining urban green space. These should be mainstreamed through guidance, funding and tools related to green skills, such as the Scottish Funding Council Upskilling Fund, the green jobs fund, the climate emergency skills action plan, and the Green job workforce academy; as well as educational programs in line with the "Learning for Sustainability" Action Plan.

Recommendation 1.5. Shifting the composition and valuation of green and blue space, especially in urban areas. This could include:

1.5a. Increasing the naturalness, biodiversity range and "wildness" of green and blue outdoor spaces, aligned with efforts to increase climate adaptation and resilience to extreme weather events, for example aligned with the Scottish National Adaptation Plan or the Flood Resilience Strategy, through for example rewilding initiatives and regulations around monoculture lawns in public areas.

1.5b. Shifting the valuation of green and blue spaces from economic factors like growth and development to societal and environmental benefits, through reflecting the inherent (non-economic) value and benefits of green and blue spaces in relevant guidance for land use, housing and planning, to affect decision-making and policies in these areas. Relevant guidance might include the national planning framework guidance "local place plans", national land-use strategies, the Climate Ready School Grounds work and the social housing net-zero standard.

Recommendation 1.6. Increasing awareness of the value and benefits of nature beyond financial and profit-maximizing narratives, including linked to food and goods consumption and production. This could include education and awareness-raising campaigns, as well as informative labels on relevant food and beverage products and consumer goods.

Recommendation 1.7. Strengthening links between engagement with nature and health and wellbeing benefits to enable systemic change, including through:

1.7a. Building on the success of the piloting of Green Health Partnerships led by NatureScot as part of its Our Natural Health Service partnership, to re-launch and expand this complement to the Natural Health Service (NHS) to cover more areas and expand the use of nature-based solutions in health practice, including increased use of the natural environment for physical activity, for physical and mental health benefits. This could include practical guidance on how and where to engage with nature in a safe way (e.g. on forest bathing) and ensuring that all citizens can access these benefits. This should align with the *NHS Scotland climate emergency and sustainability strategy: 2022-2026* where relevant.

1.7b. By exploring options for the continued use and scaling up of "green prescribing" for health, wellbeing, and to encourage pro-environmental behaviour change, for example through the NHS, building on the cross-government Green Social Prescribing Programme.

Thematic area 2: nature-based education

A stronger focus on nature-based education, emphasizing the benefits of outdoor learning and in-depth engagement with environmental issues in local communities, will help build human-nature connectedness and reduce nature-deficit disorder in children. It can directly or indirectly benefit many other societal goals such as health and wellbeing, valuing nature, and a just transition to net zero, as well as the human right to a clean, healthy and sustainable environment.

Research has shown that the most effective programs in environmental education are characterized by occurring over an extended period of time, by learning about existing, local and immediate environmental issues, by directly practising action skills, by experiencing and taking ownership of environmental problems, and by participating together with role models and mentors (Chawla & Cushing, 2007). This is also known as "authentic education" and its meaningful effect on shaping people's connectedness to nature has been recognized (Barthel et al., 2018).

Our review of policy levers in Scotland finds that a limited number of policy levers (eight) currently focus on nature-based education. Policies that do address nature-based education are mainly clustered around just transition, transport, education, food and diets. We found that the GFN and NEF reports each have one recommendation addressing nature-based education. There are opportunities for recommendations in this area, and for aligning these with the ongoing implementation of the "Learning for Sustainability" Action Plan and the ongoing School Grounds Collaborative work. There is opportunity in Scotland to expand the scope of nature-based education and promote a shift to more authentic, outdoor education for school-aged children. Beyond school age, there is also an opportunity to improve nature-literacy in professional contexts. The first of the following specific recommendations for achieving this refers to local authorities, and the other four to schools:

Recommendation 2.1. At the level of local authorities in Scotland implement a nature literacy training program, modelled after the UK's Carbon Literacy project, to enhance understanding of biodiversity, ecosystem services and sustainable land management.

Recommendation 2.2. In schools, ensure a stronger focus on not only ecological knowledge/knowledge about sustainability but also including practical skills, learning about local environmental issues and taking ownership through hands-on engagement in community projects throughout educational settings, for example related to "growing your own food" initiatives. This should be reflected in quality standards and assessments for outdoor learning, and aligned with the vision set out in the Learning for Sustainability Action Plan.

Recommendation 2.3. Promote the development of more diverse educational materials, drawing more on local knowledge and traditional local forms of environmental education and relationships to nature, and weaving them throughout educational materials and national curricula. This should be aligned with the vision set out in the Learning for Sustainability Action Plan.

Recommendation 2.4. Strengthen funding for initiatives that increase access to nature spaces and regular engagement with and exposure to nature for school-aged children, with a new focus on schools in low-income areas, such as the Eco-Schools Scotland program, the outdoor woodland learning association, and visits to farms through the Royal Highland Education Trust.

Recommendation 2.5. Prioritize and expand the workstream on outdoor learning that is part of the "Learning for Sustainability" Action Plan to include:

2.5a. Introduce a "nature guarantee" for every child that they have access to nature and learning about sustainability as part of the curriculum.

2.5b. Develop programs for teachers on nature literacy and outdoor learning.

2.5c. A broadened focus on engagement in areas other than woodlands/in green and blue spaces more generally.

2.5d. A strengthened focus on ensuring that outdoor learning and nature experiences benefit students from marginalized backgrounds.

2.5e. Ensure better application of the *Going Out There Guidance*, led by the Scottish Government and SAPOE.

2.5f. Conduct a nationwide assessment of school grounds and infrastructure for opportunities for outdoor engagement and nature experiences (e.g. greenhouses, gardens, etc.). Identify opportunities for school-led nature engagement projects such as urban gardening, rewilding of green areas, or bee-keeping. These could be linked to existing community-level initiatives. Action plans should be developed based on these assessments, including funding for these activities.

2.5g. Based on the outcome of (f), develop a set of enforceable standards for outdoor activity minimums for all ages, and an associated monitoring system for the quality and quantity of outdoor learning.

Thematic area 3: Rights of Nature

Rights of Nature is a legal instrument that enables nature, such as ecosystems or species, to have inherent rights and legally be entitled to the same protection as individuals and corporations (Lavides, 2018). The human right to a clean, healthy and sustainable environment is based on an anthropocentric view of nature where the primary concern is maximizing natural resources and protecting humans from environmental pollution (Jain, 2021). Rights of Nature could be viewed as the final step in this progression where the focus shifts from the interests of humans to the interests of nature, of which humans are a part (Jain, 2021).

Exploring opportunities for assigning legal rights to nature could contribute to reducing the unsustainable extraction of resources from nature in the short term and recognizing nature's intrinsic value in the longer term, which would represent a

paradigmatic shift in societal values. It can directly or indirectly benefit many other societal goals such as health and wellbeing, changing behaviours related to nature, and providing citizens with a way to contribute publicly to protecting the environment (Giusti et al., 2022). Our review of current policy levers in Scotland finds that there are currently no societal policy levers addressing Rights of Nature as framed above. There is opportunity in Scotland to expand the scope of engagement with the Rights of Nature concept. Two specific recommendations for achieving this are:

Recommendation 3.1. Strengthen and expand comprehensive stakeholder engagement conducted by the Scottish Government on the views on and implications of accounting for the intrinsic value of nature, including the possibility of establishing Rights of Nature. Policy considerations should include both the use of a Rights of Nature framework in policymaking and the practicalities of assigning legal rights to different parts of nature.

3.1a. These activities should include a clear pathway for how input from consultations will be taken into account for decision-making, ensuring that adequate weight is attributed to them, as well as engagement activities beyond consultations for shared learning, exploring and co-design.

3.1b. These consultations should include but not be limited to relevant legislative and judicial bodies, the Scottish Environment Protection Agency, Environmental Standards Scotland, the Crown Office and Procurator Fiscal Service, stakeholders from businesses, and citizens.

Recommendation 3.2. Conduct a feasibility study for implementing Rights of Nature in Scotland. Such a study is the next step in the context of the UN "right to a healthy environment", the proposed EU Directive on Environmental Crime, and building on existing attempts to institutionalize Rights of Nature, such as recently approved ecocide legislation in Belgium. This should include an analysis of what capacities and resources would be needed for effective enforcement and for making use of the Rights of Nature for legal challenges within Scotland, as well as a review of international experiences of institutionalizing Rights of Nature. This could include using Rights of Nature as a way to increase institutional representation for animals.

Thematic area 4: animal welfare

Stronger protection of animal welfare can help build human-nature connectedness and can directly or indirectly benefit many other societal goals, including reduced greenhouse gas emissions and disease prevention (Verkuijl et al., 2022). A livestock industry that ensures humane, healthy and sustainable production, and healthier diets with more plant-based options can reduce environmental impact and enhance wellbeing.

Our review found one policy lever currently in place that addresses animal welfare, and few new proposals in the GFN and NEF reports (6). These mainly focus on food, education and procurement. With strong links to the "valuing nature" and "sustainable lifestyles" areas, our review suggests that there is an opportunity in Scotland to

elevate the importance of animal welfare for sustainable development. Five specific recommendations for achieving this are:

Recommendation 4.1. Use animal welfare impact assessments, for example as part of the Environmental Impact Assessments or Habitats Regulations Appraisal for relevant development and design plans, when developing policies, such as informational, financial and regulatory measures, to ensure that policies benefit humans and non-human animals alike. The Scottish Animal Welfare Commission could recommend formal animal welfare impact assessments and use a definition of animal welfare aligned with their five domains (nutrition, environment, health, behaviour and mental state).

Recommendation 4.2. Redirect public subsidies for animal and agricultural products towards "humane, healthy and sustainable alternatives" which encourage higher animal welfare and less but better consumption of animal products, in a way that rewards sustainable and regenerative agricultural practice and avoids regressive effects on low-income households. Strengthen and expand existing guidance for the share of local and plant-based foods in public sector and healthcare settings, including the NHS, aligned with the Good Food Nation Act, the Better Eating, Better Learning guidance, and the Scottish Government's Sustainable Procurement toolkit.

Recommendation 4.3. Support (UK Government) proposals on a compulsory animal welfare labelling system for food and encourage voluntary action on the disclosure of animal welfare, health and environmental risks by food companies to investors to improve information and transparency, for example by building on current reporting practices related to Environmental, Social and Governance (ESG) and disclosure requirements related to Strategic Environmental Assessments. Relevant measures could include product labelling and certification, for example in cooperation with Food Standards Scotland and Local Authority Environmental Health Departments to help consumers, investors and other stakeholders to make informed choices.

Recommendation 4.4. Invest to strengthen engagement and increase awareness about animal welfare for ethical, moral, environmental and human wellbeing outcomes. Draw on the five domains and One Health approach to strengthen connection between human, animal and environmental health and welfare; and recognize the impacts that our current and potential future policies and practices have on humans and animals.

Recommendation 4.5. Ensure meaningful, inclusive participation of different stakeholders (e.g. workers, consumers, companies, especially affected communities, and organizations representing the interests of animals) in policy development, to not exacerbate existing inequalities or create new ones, for instance by amplifying food or income insecurity for marginalized communities or those with food intolerances or allergies.

4.5a. Include long-term two-way engagement with stakeholders, such as partnerships and capacity building, co-design and co-creation processes, with clear pathways for people's input to affect decision-making.

4.5b. To mitigate potential negative consequences, consider measures such as compensation for lost incomes, regional- and community-level investments, education and retraining, and strengthening social safety nets.

Thematic area 5: nature in urban areas

Green architecture, infrastructure and better access to nature, are ways of integrating nature in the towns and cities where most people live and work – to promote human-nature connectedness and for providing immediate climate, biodiversity and health benefits. Increasing the role and space of nature in urban areas can provide richer, healthier and more resilient environments for people to live in, strengthening the human right to a clean, healthy and sustainable environment.

Our review found that some policy levers (17) address nature in urban areas. Current policy levers are mainly clustered around transport and some related to food and housing. In terms of outcome, they are focused on impacts on air quality and access to green spaces. Several recommendations from the GFN and NEF reports (five) address nature in urban areas. "Biophilic" design principles in architecture include efforts to bring nature indoors, through for example green or living walls, rooftop gardens (Heerwagen et al., 2013); the practice is increasingly used in urban development around the world to make cities more liveable, by reducing heat islands and air pollution (Andreucci et al., 2021).

There is opportunity for the Scottish Government to implement policies aimed at bio-based and biophilic design and infrastructure and related to connecting with nature more generally. Local governments also have the opportunity to strengthen integration of nature in urban areas as a lever for more broadly seeding transformative change through shaping values that strengthen human-nature connectedness. Four specific recommendations for achieving this are:

Recommendation 5.1. Promote the use of biophilic design principles in development proposals for new and retrofitted urban architecture and housing policy by local governments and architects, starting with public spaces for children and young adults.

Recommendation 5.2. Include in all development proposals the evaluation of principles and options for greening urban infrastructure, by learning from, for example, biomimicry and greening community practices for urban planning.

Recommendation 5.3. Align and expand existing policies focused on access to nature and community empowerment, such as the Vacant and Derelict Land Investment Programme (VDLIP), the Place-Based Investment Programme, and the Community Empowerment Act, through national accessibility standards and higher economic valuation of green spaces, to strengthen access to nature in urban areas.

Recommendation 5.4. Strengthen incentives, engagement and awareness among commissioners of developments, including client bodies, private developers and large institutional land or asset owners, to incorporate green and blue infrastructures as part of their delivery.

Thematic area 6: sustainable lifestyles

The *Stockholm+50: Unlocking a Better Future* report emphasized the need for wide-ranging structural transformation to support sustainable ways of living. This focus is compatible with that of the GFN and NEF reports on Scotland's international environmental impact and delivering the Environment Strategy outcome on Scotland's economy. In particular, the GFN report notes that the goal is that "impacts have become systemic".

The GFN and NEF reports offer concrete policy recommendations, among them ones that support sustainable lifestyles. These include, for example, shifting to healthy diets that rely on locally sourced food (GFN) and prioritizing public transport (NEF). Moreover, a range of Scottish Government policies support initiatives to improve wellbeing while reducing impact. The strong overlap is reflected in the large proportion of the Scottish Government policies included in this review that map to this area (85, or 73% of the total), as well as the substantial proportions of GFN and NEF recommendations (10 and 23, respectively, or 40% and 30%).

There is always a danger, when providing targeted recommendations, that they distract attention from the larger need for a systemic transition. Targets also can invite criticism that they are too incremental and will not drive change at the needed scale. This is inevitable – large-scale change is required but cannot be achieved by "flipping a switch". Concrete actions on a transformative path look incremental, even if they support large-scale transformation. Given the substantial number of existing Scottish Government initiatives and the NEF and GFN recommendations that support a shift to sustainable lifestyles, this report emphasizes the need for a structural transformation, through the two recommendations provided below.

The *Stockholm+50: Unlocking a Better Future* report identified as a long-run goal an economy in which sustainable lifestyles are the overwhelmingly easy choice. In contrast, today, the overwhelmingly easy choice is to be unsustainable. The report argued that transformation is necessary for ensuring lasting prosperity and substantially reducing footprints of high-income people and nations. It requires enabling infrastructures, policy guidance and strengthened social norms around sufficiency. There is an opportunity to further elevate and enable sustainable lifestyles in Scotland. Two specific recommendations for achieving this are:

Recommendation 6.1. Building on the Scottish Government's existing policy focus on supporting net-zero behaviours, develop a stronger evidence base and policy response on lifestyle and behaviour changes needed to achieve goals for:

6.1a. Circular economy – pay particular attention to the social and behavioural aspects of transition to a circular economy in Scotland.

6.1b. Biodiversity – draw on resources such as the GFN analysis and biodiversity risk analyses to identify where current lifestyles have negative impacts on natural systems, with a goal of ensuring robust ecosystem function and biodiversity preservation.

Recommendation 6.2. Take a systems approach to key impact areas, expanding the plan beyond single-sector or single-issue concerns. This could build on current measures at both detailed and broad levels. For example, the motivation for 20-minute neighbourhoods is inherently systemic – such planning can help to address a range of challenges at once, while having knock-on effects that must be addressed. At a broader level, the Transport Just Transition Plan exhibits a systems approach by going beyond transport to encompass energy, digital connectivity, planning, tourism, public health, etc.

2.3 Recommendations focused on the economy

The mapping of current policy levers against the UBF framework described above (and further in Annex 1) also highlights some gaps and synergies in areas more closely related to the economy. To address these gaps, this section emphasizes recommendations from the *Stockholm+50: Unlocking a Better Future* report that are complementary to existing policies of the Scottish Government and recommendations in the NEF and GFN reports.

Thematic area 7: national accounting beyond GDP

National accounts are economic accounts prepared by governments. They follow international standards set by the UN (https://unstats.un.org/unsd/nationalaccount/sna.asp) but can be extended using a range of more and less standardized extensions. Arguably the most familiar indicator from the national accounts is gross domestic product, or GDP. GDP is popular because it can be presented in at least three useful ways: as total money income; as total value of production net of purchases between firms; and as the value of consumption net of trade.

However, its popularity has led to GDP being applied outside its proper sphere as a measure of national economic health: a growing GDP is good, a shrinking GDP is bad, and the faster it goes up the better. This is problematic because it is too blunt. What about the distribution of income? The nature of work? The social and ecological impacts of production and trade? For this reason, it is important to expand the widely disseminated economic metrics beyond GDP.

The Scottish Government's National Performance Framework, described as Scotland's "wellbeing framework", measures national success against a wide range of wellbeing outcomes. However, that framework is not tied to national accounts. Furthermore, it overlapped with only five of the NEF report's 77 recommendations. However, we did find significant overlap with the GFN report, where 4 of 25 recommendations supported this goal.

We argue that when measuring progress against economic strategies, the Scottish Government can incorporate wider measures of environmental and social wellbeing within the national accounts. Depending on the scope and scale of the strategy being considered, measures could include:

Recommendation 7.1. Adopt other means of monitoring and measuring economic wellbeing instead of GDP, such as the Scottish Wellbeing Economy Monitor (https://www.gov.scot/publications/wellbeing-economy-monitor/)and the supplementary guidance to HM Treasury's *The Green Book*, including:

> Wellbeing (https://www.gov.uk/government/publications/green-book-supplementary-guidance-wellbeing)
>
> Climate change and environmental valuation (https://www.gov.uk/government/publications/green-book-supplementary-guidance-environment)
>
> Declining discounting rates over long time horizons following the discounting guidance (https://www.gov.uk/government/publications/green-book-supplementary-guidance-discounting)

7.1a. Expand the use of multi-criteria analysis, beyond the limited role assigned to it in the *Green Book* supplementary guidance (https://assets.publishing.service.gov.uk/media/5a7a17fde5274a34770e434d/Mult-crisis_analysis_a_manual.pdf).

Thematic area 8: innovation systems

The UBF framework separates two closely related topics: the selection environment for innovation and innovation systems. The first, which is well-covered by Scottish Government policies (36 of 117 policies reviewed and recommendations from the NEF and GFN reports), refers to regulations, subsidies and fees that make green innovation more cost-effective and conventional innovation less cost-effective than at present.

The second, innovation systems, gets less coverage (16 of 117 policies reviewed and recommendations from the NEF and GFN reports). It refers to coordinated action, both public and private, to foster production of new knowledge and facilitate its uptake. At present, measures are somewhat piecemeal and do not represent a coherent missions-based approach to structural transformation through which sustainability becomes the overwhelmingly easy choice.

The National Innovation Strategy 2023–2033 (NIS) includes actions that are neutral towards or run counter to sustainability goals. These include support for sectors with high growth potential regardless of sustainability goals and support for the highly energy-intensive artificial intelligence (AI) sector. Nevertheless, the strategy evidences a marked slant towards sustainable enterprise.

Several existing measures provide important support. They include targets in the National Innovation Strategy[5] (NIS), particularly under NIS Theme 1: Energy Transition. Also, within the NIS, several of the government-supported innovation centres include a sustainability focus: BE–ST (Built Environment – Smarter Transformation), Sustainable Aquaculture Innovation Centre (SAIC), Net Zero Technology Centre, Industrial Biotechnology Innovation Centre (IBioIC), and the and Lightweight Manufacturing

5 https://www.gov.scot/publications/scotlands-national-innovation-strategy/

Centre, both under the National Manufacturing Institute Scotland (NMIS). Finally, the government supports innovation through procurement[6] and conformity to the sustainable procurement duty.[7]

Specific recommendations that go beyond existing measures include:

Recommendation 8.1. Align the National Innovation Strategy to sustainability goals in a coherent manner.

Recommendation 8.2. Use a mission-driven strategy to complement the current opportunistic bottom-up approach in identifying priority areas to explicitly target ambitious innovation for sustainability.

Recommendation 8.3. Apply a sustainability filter across the National Innovation Strategy to ensure that unsustainable activities do not receive explicit government support.

Recommendation 8.4. Shift the focus from growth promotion, which is at best a strategy to achieve goals rather than a goal in itself, to more directly target explicit policy goals, such as full and good employment, balancing support across regions, meeting fiscal requirements, supporting initiatives with strong cross-sectoral linkages, and so on.

Thematic area 9: supply chain governance

The Scottish Government already pays a great deal of positive attention to the needs of just and environmentally sustainable domestic supply chains. The domestic focus is also true of the NEF and GFN reports. On one hand, the domestic focus makes sense, as international sourcing is addressed through national (i.e. UK Government) policies. Thus, to the extent possible under devolved government, the recommendation is to implement and reinforce supply chain governance measures that actively discourage unsustainable activities, as well as positively reinforcing sustainable activities. Measures can include:

Recommendation 9.1. Make mainstream the application of the Scottish Government's Sustainable Procurement Tools (https://sustainableprocurementtools.scot/).

Recommendation 9.2. Follow the advice and guidance in the note "Public procurement – taking account of climate and circular economy considerations: SPPN 3/2022" and new procurement guidance on biodiversity.[8] Public bodies in Scotland are not subject to the Sustainable Procurement Act, so this will require either: (1) strengthening the capacity of local bodies to satisfy the requirements of the act, or (2) defining an equivalent to the act better suited to the Scottish context.

6 https://www.gov.scot/publications/public-procurement-supporting-innovation-through-procurement-sppn-3-2023/
7 https://www.gov.scot/policies/public-sector-procurement/sustainable-procurement-duty/.
8 https://sustainableprocurementtools.scot/index.cfm/guidance/biodiversity/

Recommendation 9.3. Where possible, argue for strengthened action at the UK level, e.g. to go beyond the UN Global Compact. As noted in the *Stockholm+50: Unlocking a Better Future* report, the compact emphasizes encouragement of sustainable actions, which is good, but not discouragement of unsustainable actions. Such an approach can relegate sustainable initiatives to niches that fail to expand. Scotland could encourage the UK to take positive steps towards disincentivizing unsustainable practices, in addition to incentivizing sustainable ones.

2.4 Synergies, trade-offs and co-benefits of recommendations with wider societal goals

The SDG Synergies exercise focused on the coherence of recommendations across the nine action areas. Participants systematically explored how progress across the nine action areas would influence one another (see Annex 1 for the interactions matrix). For example, would progress towards more sustainable lifestyles restrict or promote progress on animal welfare? Are there some action areas in which progress would promote progress in many other areas too, and are there instances where progress in two areas stand in conflict?

The purpose of the exercise was for participants to engage with the initial set of recommendations and to flag as early as possible in the project any potential synergies and conflicts between the areas in which recommendations were being developed. It also aimed to build capacity with a tool developed for systems analysis and policy coherence analysis.

Results are indicative only but showed that progress across the nine thematic areas is more often promoting than restricting progress in other themes (see Annex 1 for the summary statistics) and that all areas would be supported if progress were made in all other areas. This suggests that the action areas, as defined by the proposed recommendations, are overall coherent – although to a varying degree. For example, Rights of Nature is the least supported by progress on other areas. Progress on sustainable lifestyles, national accounting beyond GDP, supply chain governance, strengthening human-nature connectedness, and nature in urban areas showed strong positive influence on the other areas; these five areas present an opportunity to unlock progress.

Some potential trade-offs or conflicts were highlighted in the discussions, including with Rights of Nature. Participants' reasoning underlined the need for clear definitions of concepts, as these shape the trade-offs and synergies identified. Participants found the theme of innovation systems challenging to score, and the assessment was based on the narrative of current innovation policy, as reflected in the National Innovation Strategy, rather than the narrative of the UBF framework that had shaped the recommendations.

It should be noted that the SDG Synergies exercise looked at synergies at the level of thematic area rather than the level of specific measures. We find that synergies exist between specific measures proposed across thematic areas. In particular, we note a high level of synergy between measures within the following: strengthening human-nature connectedness, nature in urban areas, nature-based education, Rights of Nature

and animal welfare. For example, increased funding for local community-led nature projects (e.g. rewilding, urban gardening, stewardship of local nature areas), particularly in disadvantaged communities and where appropriate, and expanding the accessibility of green spaces in schools to the local community are strongly linked to nature-based education. For strengthening human-nature connectedness, a recommendation (1.5) proposes shifting the composition and valuation of green and blue space, especially in urban areas, which is supportive of the thematic area nature in urban areas.

One focus is on the need to invest to strengthen engagement and increase awareness about animal welfare for ethical, moral, environmental and human wellbeing outcomes. Recommendation 4.4 under the thematic area animal welfare, "Invest to strengthen engagement and increase awareness about animal welfare for ethical, moral, environmental and human wellbeing outcomes," is synergistic with the thematic areas strengthening human-nature connectedness and Rights of Nature (recommendations 1 and 3).

Co-benefits

When looking at the recommendations as a whole, several co-benefits can be identified for people and communities. Of particular note are improved health and wellbeing, as well as new opportunities for creating "good, green jobs" and for tackling inequalities in Scotland as part of a just transition.

Health and wellbeing

Access to natural space is essential for human health and wellbeing, inspiration, relaxation and a sense of belonging (IPBES, 2019; Riechers et al., 2021). A recent study of more than 1000 cities in 31 European countries found that as many as 43 000 premature deaths could be avoided each year if the WHO guidelines regarding residential proximity to green space were adhered to in these cities (Barboza et al., 2021).

Several recommendations under the thematic area strengthening human-nature connectedness have the potential to directly benefit health and wellbeing, in particular those that are focused on nature accessibility standards and measures to incentivize community-level engagement with nature (see for example, recommendations 1.1, 1.2 and 1.3). In addition, recommendations 1.7a and b are focused on incorporating exposure to natural spaces into healthcare through, for example, "green prescribing for health and wellbeing", which is increasingly acknowledged as holding potential for contributing to both reactive (healthcare) and proactive (health promoting) public health solutions, while at the same time enhancing the natural environment (Robinson & Breed, 2019).

Under the thematic area nature in urban areas, we identify potential health co-benefits related to recommendations on the application of biophilic design principles in urban architecture (recommendation 5.1) and the inclusion of green design principles such as biomimicry in urban design proposals (recommendation 5.2). Biophilic design and biomimicry are increasingly used to make cities more liveable by reducing the urban

heat island effect, improving air quality and have been shown to have positive effects on mental health (Ryan & Browning, 2020; Zhong et al., 2022).

The thematic area animal welfare, especially the recommendation on redirecting public subsidies to healthy, sustainable and animal-friendly alternatives (4.2), has the potential to promote improved human health. In high- and middle-income countries such as Scotland, overconsumption of "red" and processed meat is associated with a range of adverse health outcomes, including increased risk of colorectal cancer, cardiovascular disease and type 2 diabetes (Hemler & Hu, 2019; Verkuijl et al., 2022). In 2021, 32% of adults who consume meat in Scotland exceeded the recommended limit of 70 grams per day of red and processed meat (Stewart et al., 2023). Shifting current dietary patterns towards high-quality, plant-based diets could alleviate significant health burdens (Hemler & Hu, 2019).

Recent research suggests that in high-income countries, dietary change interventions that incentivize adoption of healthy and sustainable diets can help consumers in those countries reduce costs while, at the same time, contribute to fulfilling national climate change commitments and reduce public health spending (Springmann et al., 2021). For high-income countries like Scotland, research shows that healthy and sustainable dietary patterns are up to 22–34% lower in cost compared with current dietary trends (Springmann et al., 2021).

Opportunities for good, green jobs

Several of the thematic areas include measures that have the potential to generate good, green jobs. For example, a recommendation under the thematic area strengthening human-nature connectedness (1.4) proposes exploring labour needs and employment opportunities related to nature accessibility activities, such as rewilding, nature stewardship and maintaining urban green space. Under the thematic area animal welfare, potential for new green jobs could be in plant-based food production, provided that care is taken to ensure adequate funding for retraining, to prepare people and communities for work in humane, healthful, sustainable sectors (Sagat et al., 2020; Verkuijl et al., 2022). Under the thematic area innovation systems, a recommendation (8.4) proposes a systemic shift away from growth promotion to more directly target explicit policy goals, such as full and good employment.

Tackling inequalities

As described in Section 1 of this report, disadvantaged populations – including ethnic minority communities and low-income communities – have the least access to nature and the highest exposure to risks associated with the declining natural environment. Several of the recommendations under thematic area strengthening human-nature connectedness have the potential to tackle these inequalities.

For example, the recommendation that proposes a human rights review of environmental baseline data under SNAP 2 (1.1) would address the disproportionate impact of environmental harms on marginalized places and people whose rights are most at risk. People with disabilities and in low-income communities are in focus for another recommendation (1.2), when expanding and enforcing national nature

accessibility standards. And we recommend (1.3c) increased funding for local community-led nature projects (e.g. rewilding, urban gardening, stewardship of local nature areas), particularly in disadvantaged communities.

Children from low-income and ethnic minority communities experience disparities in health, education and access to nature; research suggests that nature contact may reduce these health and educational disparities for urban low-income populations (Sprague et al., 2020). Under the thematic area nature-based education, a recommendation (2.3) proposes strengthened funding for initiatives that increase access to nature spaces and regular engagement with and exposure to nature for school-aged children, with a new focus on schools in low-income areas. Furthermore, a sub-recommendation (2.5a) proposes that a "nature guarantee" for all children be included in Scotland's "Learning for Sustainability" action plan to help ensure outdoor learning for all Scottish children.

2.5 A holistic framework with recommendations for Scotland

We used the UBF framework as an analytical lens to bring together the societal recommendations above with recommendations from the NEF and GFN reports. The result is a holistic framework, the logic of which is explained below, with a short guide to using the framework.

As described in the introduction to this report, the Scottish Government has identified the need for economic and societal transformations to tackle the global (and local) nature and climate emergencies and the goal of ensuring that Scotland's global environmental impact is sustainable. The holistic framework we developed can enable policymakers to identify policy opportunities to support transformative changes to Scotland's society and economy; the assumption we make is that achieving transformation in these two outcome areas will result in Scotland having a sustainable global impact.

As described earlier in this report, the UBF framework, as formulated in the *Stockholm+50: Unlocking a Better Future* report, is underpinned by three key shifts that can lead to transformative change. When applying the UBF framework to Scotland, we sought to align the three key shifts with the Scottish Government's Environment Strategy outcomes for the economy and society. To that end, together with the Scottish Government policy team, we revised the original wording of two of the three key shifts to better align with the Environment Strategy outcomes.

The three key shifts at the core of the holistic framework are:

1. Strengthen people's connection with nature
2. Ensure Scotland thrives within the planet's sustainable limits
3. Invest in a better future

To bring relevant recommendations from the NEF and GFN reports into the holistic framework, recommendations from the NEF and GFN reports were mapped against

the UBF thematic areas, as shown in Table 1. The mapping procedure, which was an essential foundation to the work in this report, is described in the methodology section above (Section 2.1) and further documented in Annex 1. The total number of overlapping recommendations from the NEF and GFN reports is shown against the UBF framework areas in Figure 2 below.

Figure 2. Number of recommendations in the NEF and GFN reports that fit within the UBF categories

46	Circular economy
35	Changing the selection environment for innovation
33	Sustainable lifestyles
32	Innovation systems
23	Just transition
20	Green and decent jobs
18	Reducing risks to sustainability
11	Sustainable finance
11	Valuing Nature
9	National accounting; beyond GDP
8	Animal welfare
6	Supply chain governance
6	Nature in urban areas
5	Function, not product
2	Nature-based education

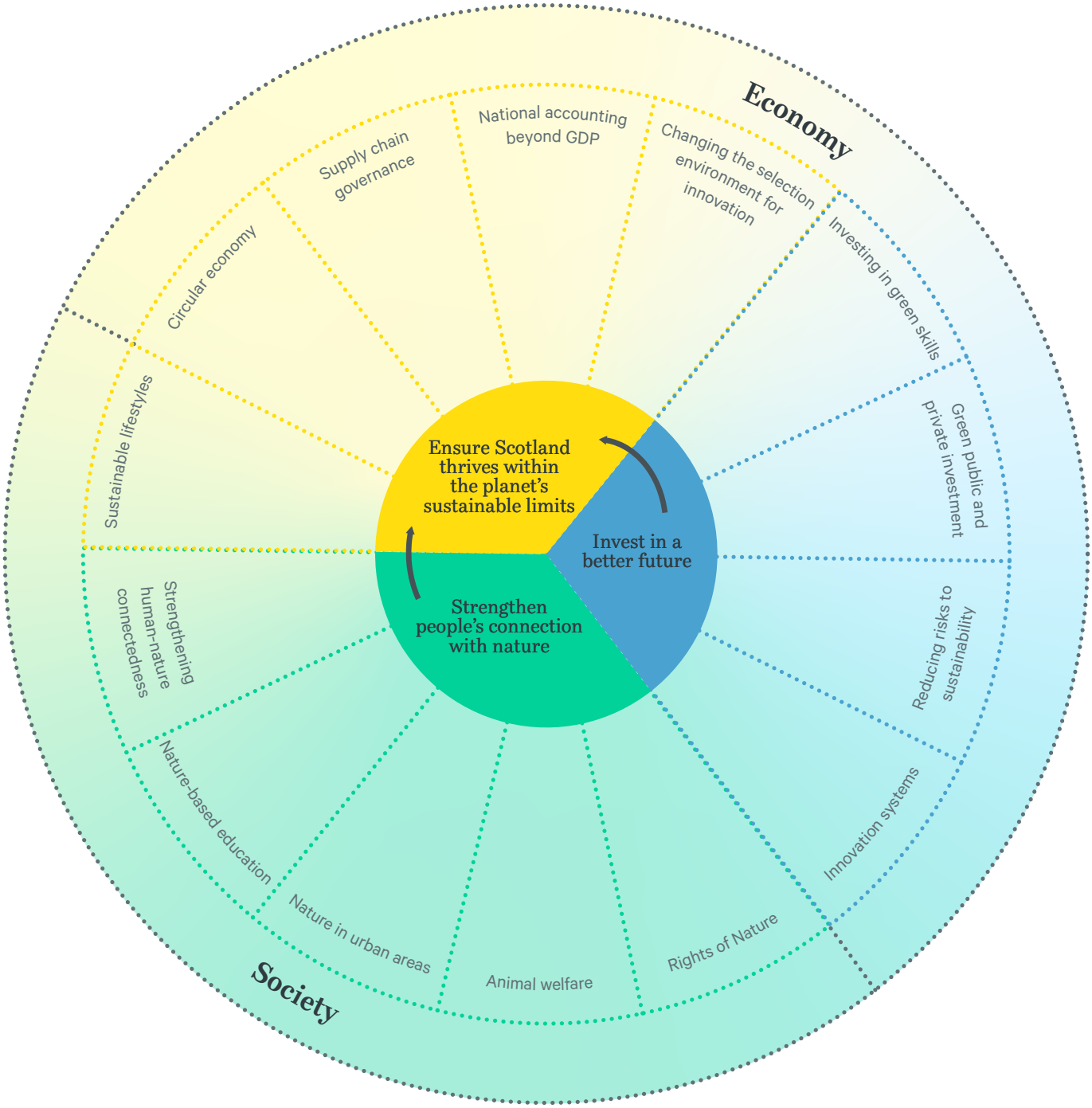
Note: colours scale with the number of recommendations; bolded items are UBF framework areas for which recommendations are developed in this report.

Through this process, three additional thematic areas were identified for inclusion in the holistic framework: circular economy, changing the selection environment for innovation, and reducing risks to sustainability. In a final round of feedback with the Scottish Government policy team to ensure that there were no gaps in the holistic framework, two additional thematic areas were included: green public and private investment and investing in green skills, bringing the total number of thematic areas to 14.

An overview of the holistic framework

We visualize the holistic framework as the 14 thematic areas of action as wedges embedded in the whole of the economy and society together, with the three key shifts at the centre (Figure 3). Each thematic area represents a number of specific policy measures, including measures from the NEF and GFN reports (see tables in Annex 2).

Figure 3. The holistic framework



Source: Authors' own

Using the framework

The holistic framework can be used to:

1. Present an overview of current thematic areas and recommendations for policies and measures considered important for supporting societal and economic transformation in the Scottish context.
2. Identify possible gaps where further policies or measures are needed.
3. Align future policies and measures with common themes and overarching goals.

The holistic framework presents an overview of the thematic areas where recommended policies and measures are deemed to have the potential for impact. Taken together, these measures aim to deliver the societal and economic transformations needed to tackle the climate and nature emergencies in Scotland. As such, it indicates the current thematic areas, policy levers and measures on which to focus to bring about transformative change. The framework could be used to identify possible gaps where additional recommendations for policies and measures are needed under each thematic area, comparing where they overlap and interact.

Our intention was to produce a framework that will have longevity and that can be used by policymakers in Scotland as a guiding logic when developing future policies and measures with transformative potential. Here we see potential to use the framework as a model for aligning future policies and measures in Scotland. Where policies touch on several thematic areas, the framework could be used to articulate and visualize what the policy mix includes and which thematic areas are most prominent in that mix.

The holistic framework assumes an integrated and systemic approach to policymaking, which ensures policy mixes are coherent and consistent towards sustainability goals and increase incentives for action. Taking the recommendations forward, the Scottish Government should use tools for systematically analysing policy interlinkages (synergies and trade-offs), apply wider system boundaries and extended timescales to account for future generations, and use frameworks for sequencing policy interventions to trigger positive tipping points.

Any policies (existing or proposed) that have a bearing on sustainability goals must be assessed for coherence, which would require that they are mapped, analysed and addressed, by many societal actors, to unlock effective action. Here it would make sense for government to also set and enforce higher standards for transparency and public participation in the procedures for policymaking, to enable multiple perspectives on the resolution of goal conflicts and pursuit of synergies.

It is important to highlight that the holistic framework should be seen as a practical tool to support policymaking, rather than a technical model to which policymakers must rigidly adhere. As such, it may be useful to develop a set of companion questions that would be useful for policymakers to consider when formulating new policies and measures in relation to the framework. For example, guiding questions could be included to help policymakers understand what the potential co-benefits and trade-offs of a new policy or measure might be in a certain context. Similarly, guiding questions could be developed to help bring to light policy synergies, and an interactive tool could be linked with existing tools, such as the SEI SDG Synergies tool. Thus, there appears to be potential for further developing the framework into an interactive tool to support decision-making.

3. Unlocking change through public engagement

Across the transformative outcome pathways, the Scottish Government is committed to supporting change in an inclusive way and in line with the National Just Transition Planning Framework principles, for example by working in partnership with communities, encouraging bottom-up approaches, and supporting broad and inclusive public engagement and participation. Thus, this cross-cutting section outlines the insights gathered through a systematic review of the academic literature on how public participation can be used to support a just transition, drawing on best practices and best available techniques from other relevant policy contexts.

Here we focus on issues related to enabling community-led action; encouraging a strong "social mandate" for a transition to net zero and reducing backlash; and ensuring the "just" element of a just transition through public engagement, as per the project specifications. We do not intend to assess the "value" or "appropriateness" of public engagement at large, but rather we identify where and how different public engagement strategies can enable large-scale transformative change to take place in a just and inclusive way.

The section begins with a brief overview of public engagement through or by the Scottish Government in the context of the transition to net zero, then outlines the main insights from the academic literature on how public or citizen engagement can effectively support a just transition (the methodology for this review can be found in Annex 1). It concludes with a series of recommendations to the Scottish Government for effective public engagement in the context of a just transition.

3.1 Public engagement for a just transition driven by the Scottish Government

The Scottish Government has committed to public engagement and community empowerment in the process of a just transition to net zero across a range of scales. The Just Transition strategy commits to involving people "with a stake in the transition" in co-designing how the transition will be managed (Scottish Government, 2021b). Additionally, the Scottish Government has published a climate change public engagement strategy that outlines three objectives: to communicate climate change, to enable participation in policy design and to encourage action (Scottish Government, 2021a), following the five stages of the Spectrum of Public Participation which is a model that describes five general modes of participation that fall on a progressive continuum of increasing public influence over decision-making in a civic-engagement process (Nabatchi, 2012). This strategy sets out a holistic and systematic approach to public engagement, including seven guiding principles and different actions to inform, consult, involve, collaborate and empower communities (Scottish Government, 2021a) (see framework in Figure 4).

The Scottish Government also has committed to building more resilient and healthy communities that can take actions on their own to address climate change. This aligns with the National Just Transition Planning Framework outcome to "support affected regions by empowering and invigorating communities and strengthen local economies" (Scottish Government, 2021b) as well as with the Place Principle. The Scottish Government has outlined policy actions for community-led climate action, such as community climate action hubs, to ensure a strategic regional approach to climate change, and the Climate Action Towns project, which concluded in 2022 and aimed to enable community-led climate action at the local town level (Scottish Government, n.d.). Finally, the Scottish Community Development Centre offers "Building Stronger Communities" training, which builds capacity for climate action at the community level (Scottish Government, n.d.).

We have focused explicitly on the potential of public engagement to ensure the "just" element of a transition, by enabling community-led action and encouraging public support for the transformative change needed. More generally, engagement with the public and communities at large serves a range of purposes and is a key component of legitimate, fair, open, transparent, just and inclusive democratic government in Scotland. Indeed, documented co-benefits of public engagement in the literature include stronger and more resilient local communities, shared identities and solidarity between citizens (Gorman, 2022; Knops & Vrydagh, 2023; Massari et al., 2024; Weller, 2019), an increased place attachment and sense of local pride (Ross et al., 2021), capacity building and skills development related to project management, communications and leadership (Hauenstein et al., 2023; Llewellyn et al., 2017; Snell, 2018; Verfuerth et al., 2023), and more general democratic capacities like deliberation (Berglund et al., 2023; Gooding et al., 2023; Knops & Vrydagh, 2023). While we recognize the larger value and importance of public engagement, as indicated above, this section only summarizes insights from the academic literature on how different forms of public engagement can support a just transition.

3.2 Evidence from a global academic literature review

In the academic literature, public engagement has been linked to increasing the acceptance and legitimacy of decision-making in the context of a transition away from fossil fuels (Brauers et al., 2018; Lamb et al., 2020; Oei et al., 2020; Turnhout et al., 2020), for example in Germany (Gooding et al., 2023; Wagemans et al., 2019) and in Taranaki, New Zealand (Krawchenko & Gordon, 2022). However, some research has found that public engagement, particularly through collaboration, does not increase public acceptance of energy policies (Liu et al., 2021).

Some scholars have highlighted that public engagement strategies in the context of a just transition can fail to reduce backlash to policies when there is existing (political) polarization or strong anti-establishment attitudes, such as in the case of the French Yellow Jackets (Benini et al., 2023; Germann et al., 2024; Johnstone & Buhmann, 2023; Radtke & Ohlhorst, 2021; van Dijk et al., 2023). Similarly, deliberative forums such as citizens' assemblies can improve perceptions of legitimate decision-making among the wider public (Germann et al., 2024), though this effect is not observed among "polarized" citizens with very strong ideological political views (van Dijk et al., 2023).

However, as indicated earlier, this is not to say that public engagement at large is not valuable or does not serve a variety of important purposes. Rather, the academic literature on how public engagement strategies can support a just transition indicates that there is limited evidence that public engagement activities increase public acceptance of net-zero policies.

According to most of the published scientific literature in this area, the aim of public engagement is not to decide *if* a transition to net zero will be implemented, but *how* this will be done (Hauenstein et al., 2023; Kozłowska-Woszczycka & Pactwa, 2022). For example, Olson-Hazboun (2018) highlighted that people who feel "punished" or "attacked" by a transition to net zero often perceive public engagement processes as illegitimate and unlikely to address their concerns. Similarly, Withouck et al. (2023) highlighted that fishers involved in participatory planning on new wind parks in Scotland felt that their interests were not on equal footing with renewable energy development as a "national interest", making them less willing to engage in the participatory processes. In such cases, these stakeholders should be involved, and their perceptions addressed. Otherwise the perceived "inevitability" of low-carbon policies, like mine closures or wind park developments, can lead to resentment, which limits the potential of public engagement processes (Kozłowska-Woszczycka & Pactwa, 2022).

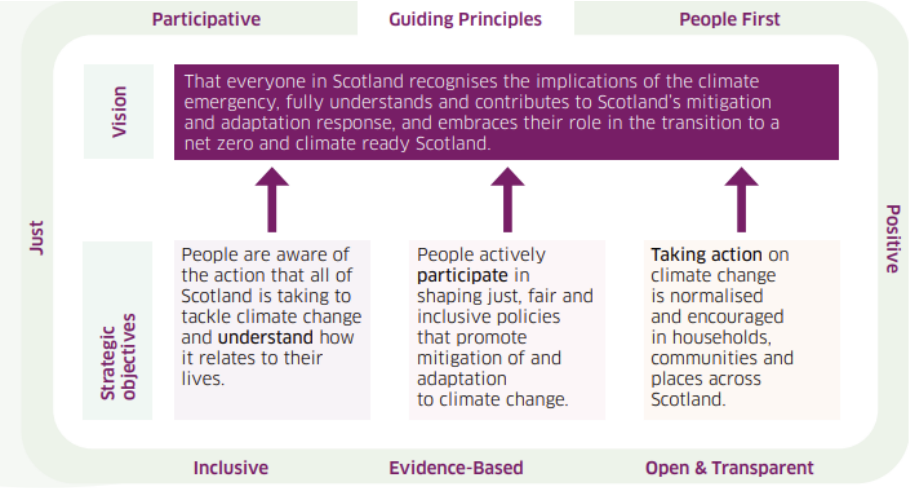
In the case of Scotland, the government has already formally decided to pursue a just transition and public engagement processes form part of the pathway towards this transition (Scottish Government, 2021b). Addressing opposition based on views that a transition away from fossil fuels should not take place, entrenched political polarization, or anti-establishment attitudes can only take place in a limited way through formal public engagement processes. However, Menon et al. (2024) highlighted some public engagement activities to prevent backlash against "green policies", including an in-depth analysis of potential "adversaries" and emphasizing the benefits and opportunities when communicating policies with the public.

Finally, public engagement has been linked to the creation of locally relevant and well-suited policies (King et al., 2021; Measham et al., 2024; Ross et al., 2021; Saarikoski et al., 2023). It also is linked to learning opportunities for participants (Berglund et al., 2023; Gooding et al., 2023; Knops & Vrydagh, 2023), including "social learning" processes that improve participatory mechanisms and strengthen community solidarity (King et al., 2021; Massari et al., 2024).

The potential of bottom-up approaches to public engagement

The vast majority of cases of public engagement in the context of a just transition to net zero focus on top-down engagement, most prominently consultations, community meetings, and citizens' assemblies or juries (Fritz et al., 2024; Khatibi et al., 2021; Puskás et al., 2021). Planned public engagement activities in the Scottish context largely follow this trend, with a strong focus on top-down initiatives like consultations and citizen forums (Scottish Government, 2021a).

Figure 4. Framework for public engagement from the Scottish Government



Source: Scottish Government (2021a)

Some scholars have highlighted the positive impacts of consultations and citizens' assemblies, such as increased knowledge and awareness of the public (Berglund et al., 2023; Gooding et al., 2023), reduced biases in reasoning (Knops & Vrydagh, 2023) and improved community solidarity (Massari et al., 2024; Padmanabhan & Rose, 2021). However, the majority of the literature highlights the shortcomings of contemporary top-down approaches to public engagement (Berglund et al., 2023; Černík et al., 2023; Gorman, 2022; Harrahill & Douglas, 2019; Jeffers, 2020; Measham et al., 2024; Moesker & Pesch, 2022; Slevin et al., 2022; Withouck et al., 2023). Common criticisms include a lack of pathways for direct impact on decision-making (Cooper et al., 2023), that such activities are "placating public relations" rather than meaningful forms of engagement (Cooper et al., 2023; Löhr et al., 2022; Mojanchevska, 2016; Murunga et al., 2024), that they do not build capacities needed to enable transformative communities (Sachs et al., 2019), and that they assume a "deficit" model of public engagement, which dismisses alternative framings, values and struggles (Cook et al., 2022; Revez et al., 2022). Additionally, some scholars have pointed to the potential of top-down participation as "tyrannical", where outcomes of public engagement processes can reinforce the same problem they were intended to solve, now legitimized through a participatory process (Hügel & Davies, 2020; Murunga, 2022; Turnhout et al., 2020).

Further, top-down approaches largely reach "the urban, educated, guilty middle classes" (Patel, 2024; Slevin et al., 2022; Tarhan, 2022) and those who are already engaged and interested in environmental governance processes (Hesketh et al., 2022; Kozłowska-Woszczycka & Pactwa, 2022). "Hard-to-reach" groups, such as people with low incomes, unhoused individuals, or immigrants, are much less likely to take part in formal top-down engagement processes, despite their increased vulnerability (Verfuerth et al., 2023), including in Scotland (Scottish Government, 2021a).

Thus, researchers have emphasized the need to move beyond top-down approaches and call for increased participation of, collaboration with and empowerment of the public (Berglund et al., 2023; Černík et al., 2023; Cook et al., 2022; Johnstone &

Buhmann, 2023; Okpanachi et al., 2022; Restrepo-Mieth et al., 2023; Tops & Lamers, 2024). Public engagement activities that shift more power to the public, allow for public participation and empowerment, and include deliberation about the purpose and values of policies are seen as key to ensuring acceptance and legitimacy of proposed policies (Lamb et al., 2020; Verfuerth et al., 2023). Given the scale of changes necessary for a just transition to net zero, shifting the focus of public engagement from communication and consultation to collaboration and empowerment, including about the framing and purpose of policies, is crucial to reduce distrust among different stakeholder groups and to contribute to policy acceptance and legitimacy. This aligns with the National Just Transition Planning Framework outcome on "citizens, communities and place" to empower and invigorate communities.

Such bottom-up approaches can include, for example, community energy initiatives, participatory green budgeting, co-decision-making processes, community commissions and community steering groups. At the same time, bottom-up and grassroots engagement can also include so-called "uninvited" activities, in the form of protests or boycotts, that do not align well with the collaborative governance framing that underlies the spectrum of public participation (Benini et al., 2023; Djinlev & Pearce, 2024; Fritz et al., 2024; Johnstone & Buhmann, 2023; Radtke & Ohlhorst, 2021; Ross et al., 2021).

The literature contains very limited empirical evidence and theoretical focus on bottom-up approaches, and indeed a knowledge gap has been identified on how governments can support citizen initiatives in the context of climate change (Schreuder & Horlings, 2022; Wu, 2021). Despite this lack of evidence, bottom-up approaches are often posited as solutions to problems faced by top-down approaches, such as enabling more diversity in perspectives and reaching more marginalized communities (Verfuerth et al., 2023). This outcome is not supported by the available literature, which indicates that bottom-up initiatives – and even top-down ones – are skewed towards populations with higher incomes and higher social capital (Mojanchevska, 2016; Radtke & Ohlhorst, 2021; Tarhan, 2022; Thaler & Seebauer, 2019; Verfuerth et al., 2023; Wagemans et al., 2019).

While bottom-up approaches are usually led by communities, scholars highlight the importance of government support in creating enabling environments.

While bottom-up approaches are usually led by communities, scholars highlight the importance of government support in creating enabling environments. This includes the provision of training and capacity-building activities, such as courses in leadership, entrepreneurship, finance and project management (Hauenstein et al., 2023; Llewellyn et al., 2017; Snell, 2018; Verfuerth et al., 2023); funding for communal spaces such as community gardens or shared transport facilities (Schreuder & Horlings, 2022); mentorship or stewardship programs (King et al., 2021; Nautiyal, 2024); strengthening support for community organizations (Nautiyal, 2024); and providing support with bureaucratic and legal issues related to establishing initiatives (Massari et al., 2024; Patel, 2024; Tarhan, 2022; Wagemans et al., 2019). To involve more marginalized parts of a community, supporting initiatives can connect marginalized groups with existing community organizations, for example through funding local community food initiatives for low-income households (Verfuerth et al., 2023). In the context of the Scottish Government, lessons learned from the Climate Action Towns project highlight the importance of building community capacity and collaborative networks between community organizations and local government, for example through the Building

Stronger Communities training delivered by Scottish Community Development Centre, which could be useful to encourage community-led climate action in the context of a just transition (Architecture and Design Scotland, 2023).

Relatively institutionalized forms of community-led activity are captured in the final two stages of the spectrum of public participation; beyond these, there are forms of bottom-up citizen engagement that may not be well-suited to a collaborative governance process. While popular protests, boycotts and other pushback are usually considered forms of bottom-up public engagement (Benini et al., 2023), as noted above, they might not be seen as invited or desirable by policymakers in decision-making processes (Fritz et al., 2024; Gorman, 2022; Mojanchevska, 2016; Ross et al., 2021). These activities play an important role in democracies in general, and in the context of environmental governance, how such bottom-up initiatives – which are "not necessarily invited or welcomed by existing power structures, e.g. 'yellow vests' and Fridays for Future" – are addressed by institutions charged with public engagement processes is a key factor to ensuring their legitimacy (Benini et al., 2023).

Efforts to create enabling environments for community-led and bottom-up action can contribute not only to more resilient, just and adaptable communities, but also encourage more local living and working in line with the 20-minute neighbourhood model and foster efforts to empower communities to engage with and value nature differently. Thus, public engagement activities can contribute to tackling inequalities, improve people's wellbeing and encourage opportunities for local resilience.

In line with this, many of the recommendations above – particularly within the themes strengthening human-nature connectedness, nature-based education, Rights of Nature, and nature in urban areas – focus on a societal transformation related to community activities and empowerment. Following these recommendations can contribute to enabling conditions for community-led processes, in a beneficial feedback loop.

Barriers and enabling conditions for successful public engagement

Among the cross-cutting barriers and enabling conditions for successful public engagement reported in the academic literature, our review found structural design and implementation as barriers and adequate time and funding as enablers. We summarize these and more in this section.

Most commonly, scholars highlight barriers related to design and implementation. These include limited resources and funding for public engagement processes, as well as their short timelines (Berglund et al., 2023; Doyon et al., 2023; Gooding et al., 2023; Withouck et al., 2023) and the limited time and resources of citizens to participate (Schuster et al., 2023; Wagemans et al., 2019). More structurally, perceived low levels of impact of public engagement activities and unclear mechanisms for how public engagement will affect decision-making, particularly for the "consultation" and "collaboration" stages of public engagement, often reduce the willingness of individuals to participate (Černík et al., 2023; Goddard & Farrelly, 2018; Hauenstein et al., 2023; Moesker & Pesch, 2022; Schuster et al., 2023).

Conversely, scholars highlight that long-timeframes for engagement projects, and adequate funding for processes, including compensation for participants, can contribute to successful public engagement processes (Černík et al., 2023; Cook et al., 2022; Hesketh et al., 2022; Hügel & Davies, 2020; Measham et al., 2024). In particular, clear pathways for impact are highlighted across the literature as a key factor for successful public engagement, including for citizens' willingness to engage and to minimize frustration (Coy et al., 2022; Germann et al., 2024; Hesketh et al., 2022; Johnstone & Buhmann, 2023; Knops & Vrydagh, 2023; Kozłowska-Woszczycka & Pactwa, 2022). Allowing for iterative feedback loops and reflexive practices through the process (Doyon et al., 2023; Murunga, 2022), as well as possibilities for learning (Gooding et al., 2023), enables some of the positive benefits of public participation. This resonates with lessons learned from the Climate Action Towns project, recommendations made by the second Just Transition Commission for participation and engagement (Scottish Government, 2022), and aims outlined in the Public Engagement for Climate Change Strategy (Scottish Government, 2021a).

More broadly, both top-down and bottom-up approaches to stakeholder engagement struggle to reach marginalized and disengaged citizens, identified as a barrier to holistic and just public engagement (Berglund et al., 2023; Hauenstein et al., 2023; Kozłowska-Woszczycka & Pactwa, 2022; Slevin et al., 2022). Berglund et al (2023) highlighted that it is often the same well-informed, middle-class citizens who are involved public engagement processes, and who tend to overshadow more marginalized individuals (Roman & Ruiters, 2020). In the context of bottom-up approaches, power differences between different initiatives and organizations have been identified as barriers to inclusive public engagement (Hauenstein et al., 2023; Thaler & Seebauer, 2019). For example, large and international NGOs often have more time and resources available and can initiate processes and define the scope for participation (Turnhout et al., 2020), while smaller community organizations are less able to participate and make their voices heard (Withouck et al., 2023).

At the same time, including "non-relevant" stakeholders has also been identified as a barrier to successful public engagement. The involvement of stakeholders that are not considered relevant – for example, international NGOs or communities in capital areas far removed from where change is happening in rural settings – can be perceived as "unwanted interference" and decisions made with their input seen as illegitimate by local communities or individuals who are most impacted (Johnstone & Buhmann, 2023). Also relevant is how people are divided into relevant "communities" for smaller scale interventions, for example based on their location, vulnerability or socio-economic status (Hesketh et al., 2022); within the same community, some delineations can be a barrier to successful engagement.

Systematically mapping stakeholders and potential impacts of interventions is highlighted as an important preparatory activity for public engagement activities.

Withouck et al. (2023) and Weller (2019) highlighted that defining communities in a way that did not resonate with affected individuals for public engagement activities limited the ability and willingness of relevant stakeholders to participate, as well as the acceptance of outcomes. Considering this, systematically mapping stakeholders and potential impacts of interventions is highlighted as an important preparatory activity for public engagement activities (Boyle et al., 2022; Černík et al., 2023; Envall & Rohracher, 2024).

Our survey of the literature found that a localized approach and focusing on the most heavily affected communities and aspects of communities is emphasized for successful public engagement (King et al., 2021; Norris et al., 2024; Schuster et al., 2023). For example, King et al. (2021) outlined that setting public engagement at a granular scale and in line with a place-based approach allows for conversations to be more relatable and relevant to the communities involved. Others have highlighted making use of and working within existing community structures for public engagement processes, to enable more diverse participation and higher willingness of engagement from community members (Coy et al., 2022; Gorman, 2022; Tarhan, 2022). This includes, for example, consulting communities when and where public engagement activities should take place (Withouck et al., 2023), using existing community organizations as trusted messengers (Gorman, 2022) or holding events at well-frequented venues (Moesker & Pesch, 2022).

Some scholars have noted that community-centred communication is key for successful public engagement, such as "listening engagement", meeting community members where they feel comfortable, and using different channels of communication, such as non-technical summaries of feedback, shared through various channels, such as newsletters, website and local radio (Doyon et al., 2023; King et al., 2021). This focus on local communities and their structures aligns with the place-based principle, as well as with commitments made by the Scottish Government to build strong and resilient community as a way to enable community-led climate action (Architecture and Design Scotland, 2023; Scottish Government, n.d., 2021b, 2021a).

3.3 Recommendations for public engagement in a just transition

Given the findings in the research literature discussed above, we suggest the following could improve public engagement for environmental policies in a just transition, bridging social, economic and sustainability issues in the thematic areas above, while ensuring more equitable outcomes.

- Strengthen measures to ensure that across public engagement activities, it is clearly defined and communicated why and how public engagement is taking place, through
  - planning for and communicating how feedback and input will affect decision-making, and to document this transparently, for example through publishing documentation online;
  - strengthening the preparatory protocol before public engagement activities to establish their scope and purpose, linked to concrete outcomes, to include a mapping of stakeholders to identify relevant ones and potential conflicts between them; and based on that develop plans for involving "hard-to-reach" communities.

- Shift the focus of public engagement activities to the higher end of the Spectrum of Public Participation to collaborate with and empower communities. This involves shifting to longer-term engagement processes with multiple interactions rather than one-off consultations, as well as a transfer of agency and power to

communities, for example, through community steering groups, green participatory budgeting, partnerships or capacity-building activities.

- Strengthen the focus of public engagement interventions on the local and regional scales and make use of existing community structures to engage individuals, in line with the Place Principle (see Box 2, p.20). This involves focusing on tangible and concrete impacts and concerns on a more granular scale and making use of local trusted messengers, as well as delegating these processes alongside resources to local councils.

- Strengthen community initiatives to enable bottom-up approaches, for example through
  - building on the success of existing initiatives to strengthen community capacity, such as the Climate Challenge Fund, community climate action hubs, and Community Energy Scotland, and providing long-term targeted funding for community organizations;
  - providing capacity-building and skills development opportunities through education, training and service centres, including for individuals from marginalized groups. These could include financial and legal skills, project management, and leadership capacities.

- Support initiatives that connect marginalized groups with existing community organizations, for example, through funding local community food initiatives or community transport schemes for low-income households.

4. Tracking transformation

Tracking progress towards and through a major transformation is a challenging task. Pursuing transformation requires adaptive management, which means adjusting strategies and the details of goals as a process unfolds. Moreover, tracking progress can turn into a pursuit of indicators in place of the pursuit of transformative change. Not only is that a problematic – if very common – result of monitoring, but the problems are also amplified by the need to select from indicators that are already being observed. Those indicators might best be seen as indicating the possibility of transformation, rather than the transformation itself. The reason is that transformation involves changes in interconnected structures – economic, legal and social – while available indicators mainly measure isolated actions or trends.

Thus, while effective governance requires monitoring through indicators and other means, it also requires critical evaluation of the results and learning, which may lead to a revision of strategies, detailed goals and associated monitoring activities. With that in mind, we propose an initial set of indicators that fit within the UBF framework of this report, drawn from those already being collected, that at least point in the directions proposed in the preceding sections. The criteria for selecting indicators are the same as those for the Scottish Government's Environment Strategy Initial Monitoring Framework.[9] Namely, indicators must be relevant, valid, distinctive, practical, clear, credible, and of interest to the public.

4.1 Applying existing indicators to the recommendations

The proposed indicators are provided in Table 2. In all cases, the proposed indicators are based on data collected by the Scottish Government or its partners. In only one case is a novel indicator constructed based on that data: the number of innovation centres with a sustainability focus.[10]

While we identified several indicators for the key shift "Strengthen people's connection with nature", they were all for the thematic area strengthening human-nature connectedness. Progress on other strategies – overcoming the instrumental valuation of nature, shifting from extraction to care, and raising the intrinsic and relational value of nature – are not measured by existing indicators for Scotland.

By contrast, under the key shift "Ensure Scotland thrives within the planet's sustainable limits", there were indicators for every strategy except that of taking a structural change perspective. As noted earlier, such monitoring is particularly challenging and not normally available in national statistics. Structural change metrics are proposed in the academic literature, but some effort would be required to construct a suitable

9 See https://www.gov.scot/publications/environment-strategy-scotland-initial-monitoring-framework/pages/3/

10 A further relevant framework is the National Just Transition Monitoring Framework. However, it is still in development: https://www.gov.scot/publications/draft-energy-strategy-transition-plan/pages/15/.

metric for Scotland. Of the indicators proposed, one is new in this report: the number of innovation centres[11] with a sustainability focus. We counted six such centres:

- BE–ST (Built Environment – Smarter Transformation)
- SAIC (Sustainable Aquaculture Innovation Centre)
- Net Zero Technology Centre
- IBioIC (Industrial Biotechnology Innovation Centre)
- NMIS Digital Factory
- NMIS Lightweight Manufacturing Centre.

For the key shift "Invest in a better future", we identified only one indicator, tracking the adoption of renewable energy in the electrical grid. The strategies within that theme in the UBF framework are to direct investment where it is needed; bring innovation to market at needed scale; and reduce risks to sustainability while raising costs of unsustainability. A key example of directing investment where it is needed is the ambitious and successful targeting of renewables. As shown in Figure 5,

Table 2. Proposed indicators

Three key shifts in the holistic framework	Indicator	ESMFa	Sourceb
Strengthen people's connection with nature	Visits to the outdoors	✓	SHS
	Access to green and blue space(s)	✓	SHS
	Active travel	✓	SHS/TS
	Health benefits from recreation		NSc
Ensure Scotland thrives within the planet's sustainable limits	Extent of habitats in Scotland		ONS
	Perceptions of local area		NPF
	Places to interact		NPF
	Attitudes towards taxation, spending and redistribution		SSAS
	Gender equality index		DGS
	Financial vulnerability		DGS
	Views on government priorities, the NHS and the general standard of living		SSAS
	Number of innovation centres with a sustainability focus		NISd
Invest in a better future	Renewables output as % gross electricity consumption		ESH

[a] ESMF: Environment Strategy Monitoring Framework.
[b] Sources: DGS: data.gov.scot; ESH: Scottish Energy Statistics Hub; NIS: National Innovation Strategy; NPF: National Performance Framework; NS: NatureScot; ONS: UK Office of National Statistics; SHS: Scottish Household Survey; SSAS: Scottish Social Attitudes Survey 2023 on tax, spending and redistribution; TS: Transport Scotland.
[c] This indicator appears in numerous monitoring frameworks used by the Scottish Government.
[d] This indicator was calculated by the authors.

11 See https://www.gov.scot/publications/scotlands-national-innovation-strategy/pages/11/.

renewables production accounts for nearly all domestic energy consumption in Scotland (that is, energy production less exports).

The strategy of bringing innovation to market at needed scale refers to the end stage of mission-driven publicly funded innovation, in which the private uptake of potentially profitable but novel innovations are encouraged by government. One key mechanism is procurement, and the Scottish Government's "sustainable procurement duty", outlined in Procurement Reform (Scotland) Act 2014, requires government procurement of services and goods to align with national sustainability goals, including reducing inequality.[12] However, while several performance indicators are tracked that would fit this strategy, there is not a comprehensive measure of adherence to the duty. Neither is there a measure of how well public procurement encourages broader uptake of these practices.

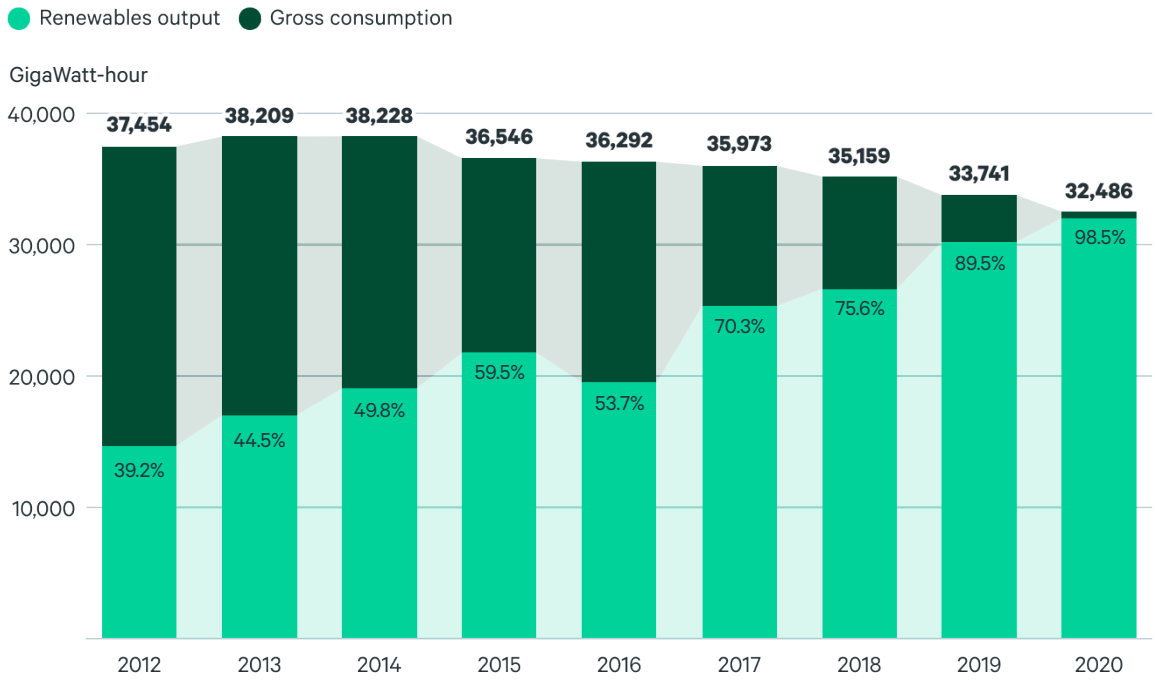
The strategy of reducing the risks of sustainability while increasing costs of unsustainability requires that incentives for sustainable production or purchasing be combined with disincentives for unsustainable production and purchasing. The reason why both are needed is that while incentives open niches to sustainable alternatives, those niches are not likely to expand as long as unsustainable alternatives remain attractive.

Because the disincentives are, by design, unfavourable to incumbent firms and users of prevailing technologies, those firms and users have a strong motivation to resist them. Furthermore, because the imposition of the disincentives raises both cost and perceived risk, policymakers find it difficult to withstand that resistance. This is a mechanism for structural inertia, and as it is widespread, it is not surprising that we could not find clear examples of paired incentives and disincentives for Scotland.

Structural inertia is not inherently bad, as it provides stability and predictability. However, in the present case, it locks in problematic technologies and systems of production and consumption.

12 The sustainable procurement duty, in place since 2014, is a statutory requirement to align government procurement with national strategic goals for sustainability. See: https://www.gov.scot/policies/public-sector-procurement/sustainable-procurement-duty/.

Figure 5. Gross electricity consumption and renewables output as a percentage of gross consumption



Source: Scottish Energy Statistics Hub (Scottish Government, 2020d)

4.1 Looking towards the future: indicators for transformation

Most indicators are for the past and present: they help evaluate how things are, and when they can be viewed over time, they show how things have been changing. However, as has been emphasized throughout this report, a key concern is the potential for a transition towards a more sustainable and just *future*. For this, we need indicators that show the possibility of change.

Nelson (2024, forthcoming) prepared a report for the Scottish Government that explains the need to target "deep leverage points" that enable that change. Indicators for deep leverage points might report on shifts in values and of people's power and agency. They may also include measures of social and economic structure, including the relative importance of economic sectors and the distribution of income and wealth.

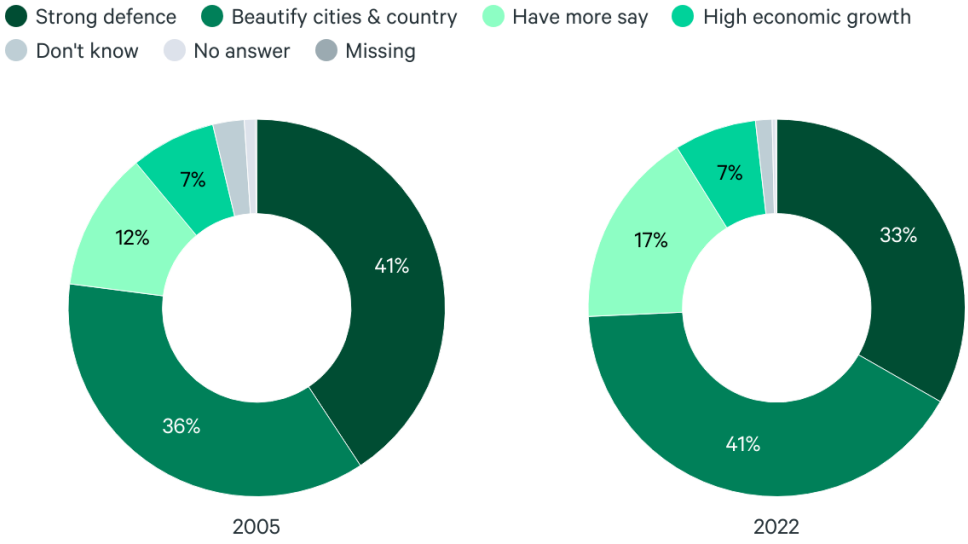
Already existing datasets contain a wealth of indicators that can shed light on some deep leverage points. For example, the World Values Survey contains questions for which UK residents' responses can be enlightening for the purposes of measuring attitudes towards transformation: question E001, for example, asks for respondents' perception of the aims of their country (Figure 6). Between 2005 and 2022, the fraction responding "Strong defence forces" fell noticeably, the fraction answering "People have more say about how things are done" grew strongly, and the fraction answering "Trying to make our cities and countryside more beautiful" rose modestly. While these are for the UK as a whole, responses can be narrowed down to Scotland.

Other World Values Survey questions are specifically more directed towards the future. These include E015, which asks whether "Less importance placed on work" is a good thing, a bad thing or whether the respondent has no opinion. As shown in Figure 7, the responses hardly shifted between 2005 and 2022; this lack of change seems surprising, given that the first wave of the survey preceded the 2007/2008 economic crisis and recession, when expectations for the future seemingly would have been high, and the second wave followed the COVID-19 pandemic lockdowns. The main shift was a declining share of people who said that they did not know how to respond.

Some highly relevant questions were asked in earlier waves of the World Values Survey that were not posed in subsequent waves. These include E014, which asked if, looking towards the future, "Less emphasis on money and material possessions" is good, bad or neutral.

The distribution of wealth is correlated with a variety of factors. These include political influence and power and the ability to shape the future of the economy. Wealth inequality is collected by the World Inequality Database.[13] As an example, again for the UK as a whole, Figure 8 shows the share of wealth held by the top 1% of the population. It fell reasonably steadily from over 70% in the late 19th century to about 16% in 1985. After that it grew to about 20% in recent years.

Figure 6. Responses in the UK to the World Values Survey question E001: aims of country



Source: Responses in the UK to the World Values Survey question E001: aims of country. Figure created by authors using data from the World Values Survey (Inglehart et al., 2014), downloaded from www.worldvaluessurvey.org on 7 October 2024.

Another set of indicators looks at economic structure. Often, studies of economic structure are aimed to inform strategies for supporting growth (e.g. Kelly et al., 2016). However, they can just as well look at transitions towards less growth-oriented and more sustainable modes of living. Studies have also looked at vulnerability to a decarbonization transition (e.g. Cahen-Fourot et al., 2021). A suitable indicator in this

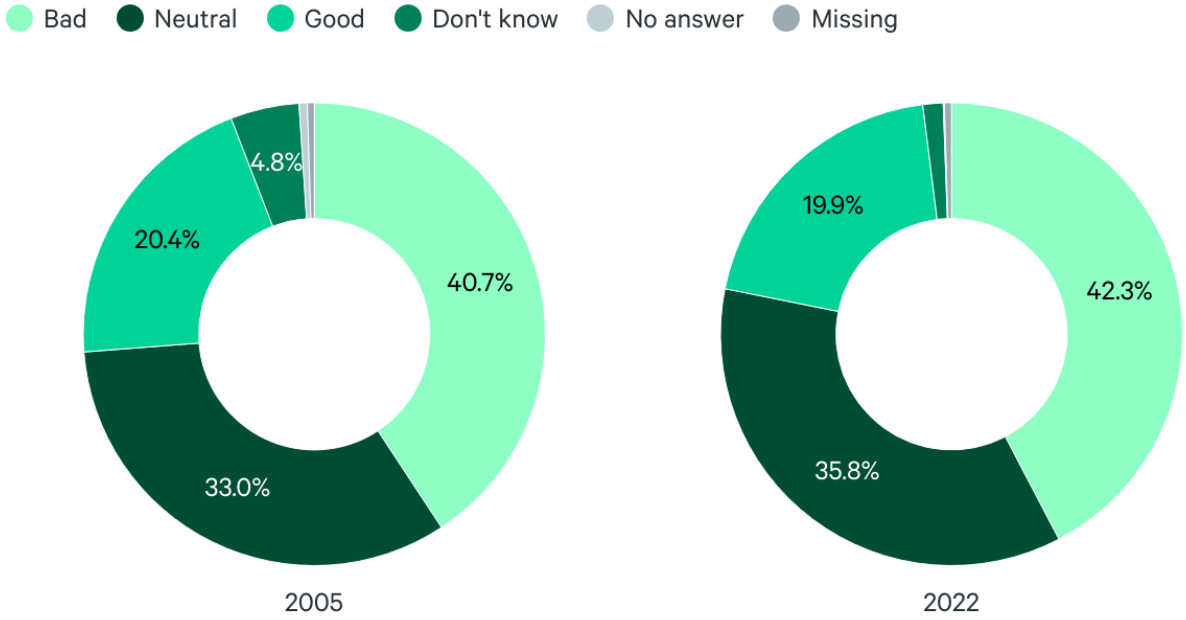
13 See: https://wid.world/.

case could be the “forward linkages” of various sectors, which would demonstrate the extent to which the overall economy depends on the products of those specific sectors.

Other indicators may require novel approaches to measurement and data collection. For example, measures of “conviviality”, or “a society where individuals are free to live meaningful and fulfilling lives, supported by tools, institutions and relations that foster autonomy, creativity, and mutual respect” (Nelson, 2024, forthcoming). It is possible that relevant questions could be added to future World Values Surveys. However, the survey tends to adopt field-tested questions, so some research and, likely, co-development of questionnaires would be required before data could be collected that would fit this indicator.

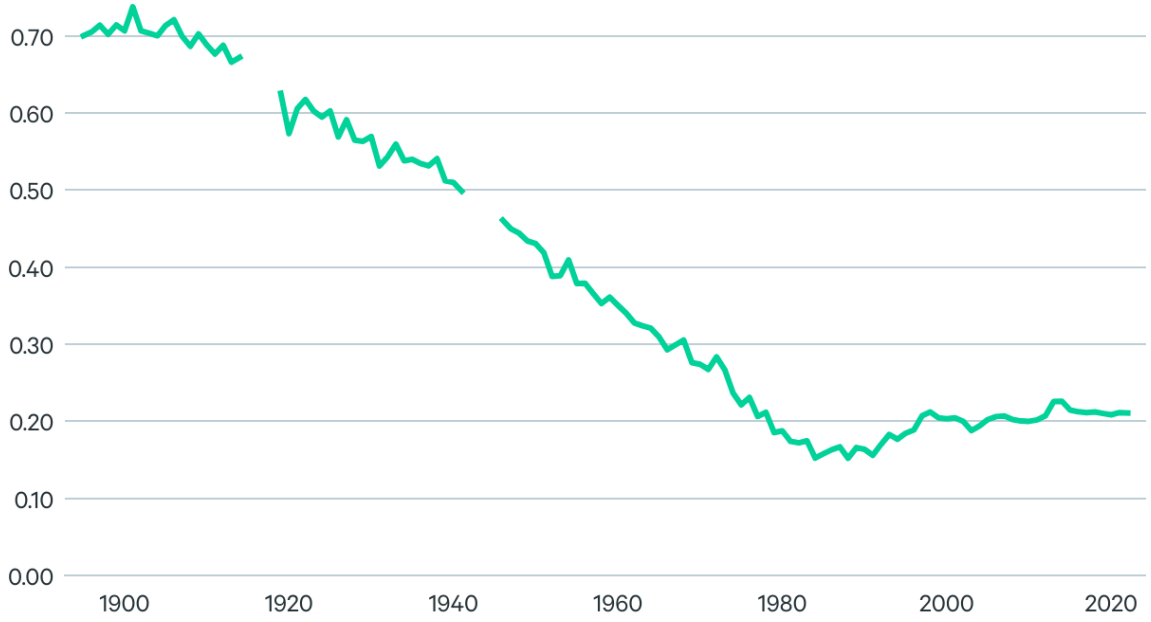
Similarly, tracking the implementation of “Rights of Nature” is fraught. Creating law, either by legislative action or through court decisions, does not ensure protection. Interested actors must be engaged, and vested interests successfully contested, stretching from the scale of the natural feature itself, upward to the national level (Krämer, 2020). This emerging area of work calls for a range of indicators that include declarations of rights, public acceptance of those rights, and the outcomes arising from cases seeking to ensure the rights.

Figure 7. Responses in the UK to the World Values Survey question E015: Future changes: Less importance placed on work



Source: Responses in the UK to the World Values Survey question E015: Future changes: less importance placed on work. Figure created by authors using data from the World Values Survey (Inglehart et al., 2014), downloaded from www.worldvaluessurvey.org on 7 October 2024.

Figure 8. Share of wealth held by the top 1% of the population in the UK, 1895–2022



Source: Figure created by authors using data from the World Inequality Database (World Inequality Database, 2024). Downloaded from wid.world on 7 October 2024

5. Final reflections

This report has presented opportunities for the Scottish Government to achieve its 2045 vision for tackling the global climate and nature emergencies within the country's boundaries and abroad. These are opportunities for promoting just socio-economic transformations, based on a gap analysis vis-à-vis the scientific synthesis and framework presented in the report *Stockholm+50: Unlocking a Better Future* (SEI & CEEW, 2022).

The opportunities rest on scientific syntheses, many are novel and they complement existing policy levers in Scotland. Throughout the project, stakeholder consultations have reinforced the conclusion that the challenge at hand is to turn opportunities into actions that make change happen.

We are confident that the opportunities outlined in this report, if implemented, would go a long way to close gaps in the current policy landscape and that they would support a just transition in Scotland. However, policy is only useful if it works in practice. Policy analysis that assesses the effectiveness, efficiency, equity and feasibility to implement any of these opportunities in Scotland will be a necessary next step to guide the government of Scotland in prioritizing and sequencing policy action.

To unlock change through the opportunities proposed in this report, the Scottish Government may also need to tackle structural barriers. The *Stockholm+50: Unlocking a Better Future* report reminded policymakers and others around the world how our

institutions might very well have created the challenges of today, and how these same institutions also will have to change to facilitate the transformations envisioned. On a national scale, Scotland will need to ensure that its rules, norms and institutional structures cohere, locally and internationally, to provide incentives that align with its vision. It will need to ensure that data and indicators can effectively track progress and ensure accountability.

The analysis of synergies and trade-offs, opportunities for public engagement, and indicators for tracking progress presented in this report would serve this purpose at a national level. In an international context, there are further conditions for change that need strengthening, including to ensure that foreign policy is consistent with national ambitions and that solidarity and trust is rebuilt to foster multilateral cooperation on global challenges that Scotland contributes to and is affected by.

The pace and scale of changes today demand agility and that the whole government is aligned to deliver policies as practical actions. The holistic framework delivered in this report (Section 2.5) gives a heuristic for developing future policies and measures with transformative potential, aligned with common themes and overarching goals. We encourage the Scottish Government to apply it with the full engagement of the public, to further articulate and visualize policy mixes that make the many opportunities identified in this report reality.

References

Abrahamse, W., & Steg, L. (2011). Factors related to household energy use and intention to reduce it: the role of psychological and socio-demographic variables. *Human Ecology Review*, *18*(1), 30–40. JSTOR.

Andreucci, M. B., Loder, A., McGee, B., Brajković, J., & Brown, M. (2021). Exploring regenerative co-benefits of biophilic design for people and the environment. In C. Catalano, M. B. Andreucci, R. Guarino, F. Bretzel, M. Leone, & S. Pasta (Eds.), *Urban Services to Ecosystems: Green Infrastructure Benefits from the Landscape to the Urban Scale* (pp. 391–412). Springer International Publishing. https://doi.org/10.1007/978-3-030-75929-2_21

Architecture and Design Scotland. (2023). *Learning from the Climate Action Towns*. https://www.ads.org.uk/resource/embed-climate-action-your-town

Barboza, E. P., Cirach, M., Khomenko, S., Iungman, T., Mueller, N., Barrera-Gómez, J., Rojas-Rueda, D., Kondo, M., & Nieuwenhuijsen, M. (2021). Green space and mortality in European cities: A health impact assessment study. *The Lancet Planetary Health*, *5*(10), e718–e730. https://doi.org/10.1016/S2542-5196(21)00229-1

Barragan-Jason, G., De Mazancourt, C., Parmesan, C., Singer, M. C., & Loreau, M. (2022). Human–nature connectedness as a pathway to sustainability: A global meta-analysis. *Conservation Letters*, *15*(1), e12852. https://doi.org/10.1111/conl.12852

Barrera-Hernández, L. F., Sotelo-Castillo, M. A., Echeverría-Castro, S. B., & Tapia-Fonllem, C. O. (2020). Connectedness to nature: its impact on sustainable behaviors and happiness in children. *Frontiers in Psychology*, *11*, 276. https://doi.org/10.3389/fpsyg.2020.00276

Barthel, S., Belton, S., Raymond, C. M., & Giusti, M. (2018). Fostering children's connection to nature through authentic situations: the case of saving salamanders at school. *Frontiers in Psychology*, *9*, 928. https://doi.org/10.3389/fpsyg.2018.00928

BBC. (2024). *Children are more vulnerable to poor air quality, says Dundee study* [News]. BBC News. https://www.bbc.com/news/uk-scotland-67934837

Benini, L., Jesus, A., Funtowicz, S., Kovacic, Z., Strand, R., & Völker, T. (2023). *The case for public participation in sustainability transitions*. European Environment Agency. https://www.eea.europa.eu/publications/the-case-for-public-participation/the-case-for-public-participation/download.pdf.static

Berglund, O., Britton, J., Hatzisavvidou, S., Robbins, C., & Shackleton, D. (2023). Just transition in the post-pandemic city. *Local Environment*, *28*(6), 753–767. https://doi.org/10.1080/13549839.2023.2173732

Black, J. S., Stern, P. C., & Elworth, J. T. (1985). Personal and contextual influences on household energy adaptations. *Journal of Applied Psychology*, *70*(1), 3–21. https://doi.org/10.1037/0021-9010.70.1.3

Boyd, F., White, M. P., Bell, S. L., & Burt, J. (2018). Who doesn't visit natural environments for recreation and why: A population representative analysis of spatial, individual and temporal factors among adults in England. *Landscape and Urban Planning*, *175*, 102–113. https://doi.org/10.1016/j.landurbplan.2018.03.016

Boyle, E., Ó Gallachóir, B., & Mullally, G. (2022). Participatory network mapping of an emergent social network for a regional transition to a low-carbon and just society on the Dingle Peninsula. *Local Environment*, *27*(12), 1431–1445. https://doi.org/10.1080/13549839.2021.1936472

Brauers, H., Herpich, P., Von Hirschhausen, C., Jürgens, I., Neuho, K., Oei, P.-Y., & Richstein, J. (2018). *Coal transition in Germany. Learning from past transitions to build phase-out pathways*. IDDRI and Climate Strategies.

Burns, F., Mordue, S., al Fulaji, N., Beorsch-Supan, P., Boswell, J., Boyd, R., Bradfer-Lawrence, T., de Ornellas, P., de Palma, A., de Zylva, P., Dennis, E., Foster, S., Gillbert, G., Halliwell, L., Hawkins, K., Haysom, K., Holland, M., Hughs, J., Jackson, A., … Gregory, R. (2023). *State of Nature 2023*. The State of Nature Partnership. https://stateofnature.org.uk/wp-content/uploads/2023/09/TP25999-State-of-Nature-main-report_2023_FULL-DOC-v12.pdf

Cahen-Fourot, L., Campiglio, E., Godin, A., Kemp-Benedict, E., & Trsek, S. (2021). Capital stranding cascades: The

impact of decarbonisation on productive asset utilisation. *Energy Economics*, *103*, 105581. https://doi.org/10.1016/j.eneco.2021.105581

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: A meta-analysis. *Frontiers in Psychology*, *5*. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2014.00976

Černík, M., Cerny, M., Gažo, P., & Fraňková, E. (2023). Beyond a Czech-the-Box Exercise: proposals for meaningful stakeholder participation in the just transition. *Journal Für Entwicklungspolitik (JEP)*, *39*(3/4), 83–112. https://doi.org/10.20446/JEP-2414-3197-39-3-83

Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research*, *13*(4), 437–452. https://doi.org/10.1080/13504620701581539

Climate Change Committee. (2022). *Progress in reducing emissions in Scotland 2022: Report to Parliament*. Climate Change Committee. https://www.theccc.org.uk/wp-content/uploads/2022/12/Progress-in-reducing-emissions-in-Scotland-2022-Report-to-Parliament.pdf

Committee on Climate Change. (2017). *UK Climate Change Risk Assessment 2017*. https://assets.publishing.service.gov.uk/media/5a7f6e5ae5274a2e8ab4c23d/uk-climate-change-risk-assess-2017.pdf

Conde, A., Birliga Sutherland, A., & Colloricchio, A. (2022). *The Circularity Gap Report Scotland*. Circle Economy. https://cdn.prod.website-files.com/5e185aa4d27bcf348400ed82/6399cc007f63ad41fae0b240_CGR%20Scotland.pdf

Cook, B. R., Cornes, I., Satizábal, P., & de Lourdes Melo Zurita, M. (2022). Experiential learning, practices, and space for change: The institutional preconfiguration of community participation in flood risk reduction. *Journal of Flood Risk Management*, *n/a*(n/a), e12861. https://doi.org/10.1111/jfr3.12861

Cooper, C., Cunningham, N., & Bracken, L. J. (2023). Exploring different framings of nature-based solutions with respect to governance, and citizen participation, beneficiaries, and quality of life outcomes. *Environmental Science & Policy*, *150*, 103592. https://doi.org/10.1016/j.envsci.2023.103592

Coy, D., Malekpour, S., & Saeri, A. K. (2022). From little things, big things grow: Facilitating community empowerment in the energy transformation. *Energy Research & Social Science*, *84*, 102353. https://doi.org/10.1016/j.erss.2021.102353

de Groot, J. I. M., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: how to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, *40*(3), 330–354. https://doi.org/10.1177/0013916506297831

Djinlev, V., & Pearce, B. J. (2024). Collective action lessons for the energy transition: Learning from social movements of the past. *Sustainability Science*, *19*(3), 847–863. https://doi.org/10.1007/s11625-023-01455-5

Doyon, A., O'Donnell, E., Trousdale, W. J., & Pletnikoff, R. G. (2023). Localizing a just transition: A case study of St. George, Alaska. *Ecology and Society*, *28*(4). https://doi.org/10.5751/ES-14311-280424

Envall, F., & Rohracher, H. (2024). Technopolitics of future-making: The ambiguous role of energy communities in shaping energy system change. *Environment and Planning E: Nature and Space*, *7*(2), 765–787. https://doi.org/10.1177/25148486231188263

Environmental Standards Scotland. (2022). *Baseline Evidence Review – Water (Strategy and Analysis)*. Environmental Standards Scotland. https://www.environmentalstandards.scot/wp-content/uploads/2022/09/Baseline-Evidence-Review-Water-2022-09.pdf

Fitton, C. A., Cox, B., Stewart, M., Chalmers, J., & Belch, J. J. F. (2023). Respiratory admissions linked to air pollution in a medium sized city of the UK: a case-crossover study. *Aerosol and Air Quality Research*, *23*(8), 230062. https://doi.org/10.4209/aaqr.230062

Folke, C., Biggs, R., Norström, A. V., Reyers, B., & Rockström, J. (2016). Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society*, *21*(3). JSTOR. http://www.jstor.org/stable/26269981

Folke, C., Jansson, Å., Rockström, J., Olsson, P., Carpenter, S. R., Chapin, F. S., Crépin, A.-S., Daily, G., Danell, K., Ebbesson, J., Elmqvist, T., Galaz, V., Moberg, F., Nilsson, M., Österblom, H., Ostrom, E., Persson, Å., Peterson, G., Polasky, S., … Westley, F. (2011). Reconnecting to the biosphere. *AMBIO*, *40*(7), 719–738. https://doi.org/10.1007/s13280-011-0184-y

Fritz, L., Baum, C. M., Low, S., & Sovacool, B. K. (2024). Public engagement for inclusive and sustainable governance of climate interventions. *Nature Communications*, *15*(1), 4168. https://doi.org/10.1038/s41467-024-48510-y

Gadd, L., Clay, T., Kili, B., Davis, L., & Butt, J. (2023). *How will the climate and nature crises impact people from Black, Asian and Ethnic Minority Communities? A briefing for charities and funders*. Race Equality Foundation and NPC. https://raceequalityfoundation.org.uk/wp-content/uploads/2023/05/How-will-the-climate-and-nature-crises-impact-people-from-Black-Asian-and-Ethnic-Minority-Communities.pdf

Germann, M., Marien, S., & Muradova, L. (2024). Scaling up? Unpacking the effect of deliberative mini-publics on legitimacy perceptions. *Political Studies*, *72*(2), 677–700. https://doi.org/10.1177/00323217221137444

Giusti, M., Dawkins, E., & Lambe, F. (2022). *Valuing Nature as individuals and communities* . Stockholm+50 background paper series. Stockholm Environment Institute. https://www.sei.org/publications/valuing-nature-individuals-communities/

Goddard, G., & Farrelly, M. A. (2018). Just transition management: Balancing just outcomes with just processes in Australian renewable energy transitions. *Applied Energy*, *225*, 110–123. https://doi.org/10.1016/j.apenergy.2018.05.025

Gooding, L., Devine-Wright, P., Rohse, M., Ford, R., Walker, C., Soutar, I., & Devine-Wright, H. (2023). The best-laid plans: Tracing public engagement change in emergent Smart Local Energy Systems. *Energy Research & Social Science*, *101*, 103125. https://doi.org/10.1016/j.erss.2023.103125

Gorman, J. (2022). Rooting and reaching: Insights from Love Leitrim's successful resistance to fracking in Ireland. *Community Development Journal*, *57*(1), 17–39. https://doi.org/10.1093/cdj/bsab049

Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships: a natural experiment with curbside recycling. *Environment and Behavior*, *27*(5), 699–718. https://doi.org/10.1177/0013916595275005

Hannaford, J. (2015). Climate-driven changes in UK river flows: A review of the evidence. *Progress in Physical Geography: Earth and Environment*, *39*(1), 29–48. https://doi.org/10.1177/0309133314536755

Harrahill, K., & Douglas, O. (2019). Framework development for "just transition" in coal producing jurisdictions. *Energy Policy*, *134*, 110990. https://doi.org/10.1016/j.enpol.2019.110990

Harris, M. (2023). *Policy interventions to encourage sustainable consumption*. JNCC Report 747 (Guidance report). Joint Nature Conservation Committee. https://hub.jncc.gov.uk/assets/859c5573-1f84-4122-b509-65d779489757

Hauenstein, C., Braunger, I., Krumm, A., & Oei, P.-Y. (2023). Overcoming political stalemates: The German stakeholder commission on phasing out coal. *Energy Research & Social Science*, *103*, 103203. https://doi.org/10.1016/j.erss.2023.103203

Heerwagen, J., Kellert, S. R., & Mador, M. (2013). *Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life*. Wiley. http://rbdigital.oneclickdigital.com

Hemler, E. C., & Hu, F. B. (2019). Plant-based diets for personal, population, and planetary health. *Advances in Nutrition*, *10*, S275–S283. https://doi.org/10.1093/advances/nmy117

Hesketh, P., Ma, A., Kiviet, E., Tibbett, M., Fourie, A. B., & Boggs, G. (2022). *Initiating a just transition in response to a low-carbon energy transition in coalfield communities, Western Ukraine* (pp. 577–588). Mine Closure 2022: 15th International Conference on Mine Closure, 2022 4-6 October 2022, Brisbane. Australian Centre for Geomechanics. https://doi.org/10.36487/ACG_repo/2215_40

Hoekstra, A. Y., & Wiedmann, T. O. (2014). Humanity's unsustainable environmental footprint. *Science*, *344*(6188), 1114–1117. https://doi.org/10.1126/science.1248365

Hügel, S., & Davies, A. R. (2020). Public participation, engagement, and climate change adaptation: A review of the research literature. *Wiley Interdisciplinary Reviews. Climate Change*, *11*(4), e645. https://doi.org/10.1002/wcc.645

Hunecke, M., Blöbaum, A., Matthies, E., & Höger, R. (2001). Responsibility and environment: ecological norm orientation and external factors in the domain of travel mode choice behavior. *Environment and Behavior*, *33*(6), 830–852. https://doi.org/10.1177/00139160121973269

Inglehart, R., Haerpfer, C., Moreno, A., Welzel, C., Kizilova, K., Diez-Medrano, J., Lagos, M., Norris, P., Ponarin, E., & Puranen, B. (2014). *World Values Survey: Round Six—Country-Pooled Datafile Version* [Dataset]. JD Systems Institute. https://www.worldvaluessurvey.org/WVSDocumentationWV6.jsp

IPBES. (2019). *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (E. S. Brondízio, J. Settele, S. Díaz, & H. T. Ngo, Eds.). Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. https://doi.org/10.5281/zenodo.3831674

IPCC. (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. https://doi.org/10.1017/9781009157926

Jain, P. (2021). Environmental personhood towards a rights based approach for nature and humanity. In *Green Crimes and International Criminal Law*. Vernon Press.

Jakovcevic, A., & Steg, L. (2013). Sustainable transportation in Argentina: Values, beliefs, norms and car use reduction. *Transportation Research Part F: Traffic Psychology and Behaviour*, *20*, 70–79. https://doi.org/10.1016/j.trf.2013.05.005

Jeffers, J. (2020). Barriers to transformation towards participatory adaptation decision-making: Lessons from the Cork flood defences dispute. *Land Use Policy*, *90*, 104333. https://doi.org/10.1016/j.landusepol.2019.104333

Johnstone, R. L., & Buhmann, K. (2023). Megaprojects on ice: Lessons from the Kárahnjúkar hydropower project for a Just Transition. *The Polar Journal*, *13*(2), 240–263. https://doi.org/10.1080/2154896X.2023.2269691

Kazmierczak, A., Cavan, G., Connelly, A., & Lindley, S. (2015). *Mapping Flood Disadvantage in Scotland, 2015: Final report to the Scottish Government*. https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2015/12/mapping-flood-disadvantage-scotland-2015-main-report/documents/00490788-pdf/00490788-pdf/govscot%3Adocument/00490788.pdf

Kelly, S., Tyler, P., & Crawford-Brown, D. (2016). Exploring vulnerability and interdependency of UK infrastructure using key-linkages analysis. *Networks and Spatial Economics*, *16*(3), 865–892. https://doi.org/10.1007/s11067-015-9302-x

Khatibi, F. S., Dedekorkut-Howes, A., Howes, M., & Torabi, E. (2021). Can public awareness, knowledge and engagement improve climate change adaptation policies? *Discover Sustainability*, *2*(1), 18. https://doi.org/10.1007/s43621-021-00024-z

Kiberd, E. (2024). *Delivering the Environment Strategy Outcome on Scotland's Economy: Evidence Base and Policy Levers*. New Economics Foundation. https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2024/01/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers/documents/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers/govscot%3Adocument/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers.pdf

King, M., Padmanabhan, C., & Rose, K. (2021). *Public Engagement for Net-Zero: A Literature review*. Centre for Public Impact (CPI).

Knops, L., & Vrydagh, J. (2023). Between hopes and systemic unsustainability: An analysis of citizens assemblies' potential on climate change. In *16 Between hopes and systemic unsustainability: An analysis of citizens assemblies' potential on climate change* (pp. 211–226). De Gruyter. https://doi.org/10.1515/9783110758269-018

Kozłowska-Woszczycka, A., & Pactwa, K. (2022). Social license for closure—a participatory approach to the management of the mine closure process. *Sustainability*, *14*(11), Article 11. https://doi.org/10.3390/su14116610

Krämer, L. (2020). Rights of Nature and their Implementation. *Journal for European Environmental & Planning Law*, *17*(1), 47–75. https://doi.org/10.1163/18760104-01701005

Krawchenko, T. A., & Gordon, M. (2022). Just transitions for oil and gas regions and the role of regional development policies. *Energies*, *15*(13), Article 13. https://doi.org/10.3390/en15134834

Lamb, W. F., Antal, M., Bohnenberger, K., Brand-Correa, L. I., Müller-Hansen, F., Jakob, M., Minx, J. C., Raiser, K., Williams, L., & Sovacool, B. K. (2020). What are the social outcomes of climate policies? A systematic map and review of the ex-post literature. *Environmental Research Letters*, *15*(11), 113006. https://doi.org/10.1088/1748-9326/abc11f

Lavides, M. N. (2018, January 31). *Rights of Nature (RoN) and Global Sustainability Agenda at National and Local Levels*. IPBES Secretariat. https://ipbes.net/policy-support/case-studies/rights-nature-ron-global-sustainability-agenda-national-local-levels

Lin, D., Wackernagel, M., Horsburgh, N., & Tyler, A. (2024). *The Environment Strategy for Scotland Delivering the Environment Strategy Outcome on Scotland's Global Footprint: Evidence Base and Policy Levers* [Independent report by Global Footprint Network]. https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2024/01/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers/documents/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers/govscot%3Adocument/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers.pdf

Liu, L., Bouman, T., Perlaviciute, G., & Steg, L. (2021). The more public influence, the better? The effects of full versus shared influence on public acceptability of energy projects in the Netherlands and China. *Energy Research & Social Science*, *81*, 102286. https://doi.org/10.1016/j.erss.2021.102286

Llewellyn, D. H., Rohse, M., Day, R., & Fyfe, H. (2017). Evolving energy landscapes in the South Wales Valleys: Exploring community perception and participation. *Energy Policy*, *108*, 818–828. https://doi.org/10.1016/j.enpol.2017.04.028

Löhr, K., Matavel, C. E., Tadesse, S., Yazdanpanah, M., Sieber, S., & Komendantova, N. (2022). Just energy transition: learning from the past for a more just and sustainable hydrogen transition in West Africa. *Land*, *11*(12), Article 12. https://doi.org/10.3390/land11122193

Massari, M., Boulanger, S. O. M., & Longo, D. (2024). Collective energy actions to pursue a just transition.: A Southern European observation. *European Journal of Spatial Development*, *21*(1), Article 1. https://doi.org/10.5281/zenodo.10889481

Measham, T., Walker, J., Haslam McKenzie, F., Kirby, J., Williams, C., D'Urso, J., Littleboy, A., Samper, A., Rey, R., Maybee, B., Brereton, D., & Boggs, G. (2024). Beyond closure: A literature review and research agenda for post-mining transitions. *Resources Policy*, *90*, 104859. https://doi.org/10.1016/j.resourpol.2024.104859

Menon, R., Sevilla Núñez, P., & Jesse, R. (2024). *The Inequalities-Environment Nexus: Tools for Catalyzing a Just Transition*. NYU Center on International Cooperation. https://s42831.pcdn.co/wp-content/uploads/2024/04/The-Inequalities-Environment-Nexus-2024.pdf

Moesker, K., & Pesch, U. (2022). The just transition fund – Did the European Union learn from Europe's past transition experiences? *Energy Research & Social Science*, *91*, 102750. https://doi.org/10.1016/j.erss.2022.102750

Mojanchevska, K. (2016). *Self-Organised Citizens' Groups and Urban Space: Challenges in Planning Paradigm*. Brill. https://doi.org/10.1163/9781848884922_017

Murunga, M. (2022). Public engagement for social transformation: Informing or Empowering? *Environmental Science & Policy*, *132*, 237–246. https://doi.org/10.1016/j.envsci.2022.02.031

Murunga, M., Macleod, C., & Pecl, G. (2024). Assumptions and contradictions shape public engagement on climate change. *Nature Climate Change*, *14*(2), 126–133. https://doi.org/10.1038/s41558-023-01904-0

Nabatchi, T. (2012). Putting the "public" back in public values research: designing participation to identify and respond to values. *Public Administration Review*, *72*(5), 699–708. https://doi.org/10.1111/j.1540-6210.2012.02544.x

NatureScot. (2023). *The Proportion of Scotland's Protected Sites in Favourable Condition 2023* [Dataset]. https://www.nature.scot/doc/proportion-scotlands-protected-sites-favourable-condition-2023

Nautiyal, S. (2024). Building capacities for transformative climate action: Lessons from five fields of practice. *Climatic Change*, *177*(6), 83. https://doi.org/10.1007/s10584-024-03738-x

Nelson, V. (2024). Forthcoming, *Transformative Change for Sustainability in Scotland: A report for the Scottish Government*.

Nilsson, A., Von Borgstede, C., & Biel, A. (2004). Willingness to accept climate change strategies: The effect of values and norms. *Journal of Environmental Psychology*, *24*(3), 267–277. https://doi.org/10.1016/j.jenvp.2004.06.002

Norris, L., Bristow, G., Cotterill, E., Healy, A., & Marshall, A. P. (2024). Decarbonisation, place attachment and agency: Just transition in old industrial regions. *Contemporary Social Science*, *19*(1–3), 283–302. https://doi.org/10.1080/21582041.2024.2323106

Oei, P.-Y., Brauers, H., & Herpich, P. (2020). Lessons from Germany's hard coal mining phase-out: Policies and transition from 1950 to 2018. *Climate Policy*, *20*(8), 963–979. https://doi.org/10.1080/14693062.2019.1688636

Office for National Statistics. (2023). *Low carbon and renewable energy economy, UK, 2021: Estimates of the size of the UK's Low Carbon and Renewable Energy Economy (LCREE), including turnover and employment*. Office for National Statistics (ONS). https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2021

Okpanachi, E., Ambe-Uva, T., & Fassih, A. (2022). Energy regime reconfiguration and just transitions in the Global South: Lessons for West Africa from Morocco's comparative experience. *Futures*, *139*, 102934. https://doi.org/10.1016/j.futures.2022.102934

Olson-Hazboun, S. K. (2018). "Why are we being punished and they are being rewarded?" views on renewable energy in fossil fuels-based communities of the U.S. west. *The Extractive Industries and Society*, *5*(3), 366–374. https://doi.org/10.1016/j.exis.2018.05.001

Padmanabhan, C., & Rose, K. (2021). *Public Engagement on Climate Change: A Case Study Compendium*. Centre for Public Impact (CPI).

Park, T., Londakova, K., Brennan, I., Schein, A., Reynolds, D., Whincup, E., Chan, E., Pelenur, M., & Halpern, D. (2023). *How to build a Net Zero society Using behavioural insights to decarbonise home energy, transport, food, and material consumption: A guide for policymakers and businesses*. The Behavioural Insights Team. https://www.bi.team/wp-content/uploads/2023/01/How-to-build-a-Net-Zero-society_Jan-2023-1.pdf

Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., Watson, R. T., Başak Dessane, E., Islar, M., Kelemen, E., Maris, V., Quaas, M., Subramanian, S. M., Wittmer, H., Adlan, A., Ahn, S., Al-Hafedh, Y. S., Amankwah, E., Asah, S. T., … Yagi, N. (2017). Valuing nature's contributions to people: The IPBES approach. *Current Opinion in Environmental Sustainability*, *26–27*, 7–16. https://doi.org/10.1016/j.cosust.2016.12.006

Patel, N. (2024). Performing energy justice futures: How visions of just futures shape discourses and practices in the United Kingdom's community energy sector. *Energy Research & Social Science*, *111*, 103475. https://doi.org/10.1016/j.erss.2024.103475

Phillips, H., De Palma, A., Gonzalez, R. E., Contu, S., Hill, S. L. L., Baselga, A., Borger, L., & Purvis, A. (2021). *The Biodiversity Intactness Index—Country, region and global-level summaries for the year 1970 to 2050 under various scenarios* (p. 31131 kb) [JSON,CSV]. Natural History Museum. https://doi.org/10.5519/HE1EQMG1

Pritchard, A., Richardson, M., Sheffield, D., & McEwan, K. (2020). The relationship between nature connectedness and eudaimonic well-being: a meta-analysis. *Journal of Happiness Studies*, *21*(3), 1145–1167. https://doi.org/10.1007/s10902-019-00118-6

Public Health Scotland. (2022). *More than three quarters of people visited greenspace at least once a week during the*

pandemic, but inequalities in accessing greenspace also increased. [Public Information]. Public Health Scotland. https://publichealthscotland.scot/news/2022/july/more-than-three-quarters-of-people-visited-greenspace-at-least-once-a-week-during-the-pandemic-but-inequalities-in-accessing-greenspace-also-increased/

Puskás, N., Abunnasr, Y., & Naalbandian, S. (2021). Assessing deeper levels of participation in nature-based solutions in urban landscapes – A literature review of real-world cases. *Landscape and Urban Planning*, *210*, 104065. https://doi.org/10.1016/j.landurbplan.2021.104065

Radtke, J., & Ohlhorst, D. (2021). Community energy in Germany – bowling alone in elite clubs? *Utilities Policy*, *72*, 101269. https://doi.org/10.1016/j.jup.2021.101269

Restrepo-Mieth, A., Perry, J., Garnick, J., & Weisberg, M. (2023). Community-based participatory climate action. *Global Sustainability*, *6*, e14. https://doi.org/10.1017/sus.2023.12

Revez, A., Dunphy, N., Harris, C., Rogan, F., Byrne, E., McGookin, C., Bolger, P., Ó Gallachóir, B., Barry, J., Ellis, G., O'Dwyer, B., Boyle, E., Flood, S., Glynn, J., & Mullally, G. (2022). Mapping emergent public engagement in societal transitions: A scoping review. *Energy, Sustainability and Society*, *12*(1), 2. https://doi.org/10.1186/s13705-021-00330-4

Richardson, M., Dobson, J., Abson, D. J., Lumber, R., Hunt, A., Young, R., & Moorhouse, B. (2020). Applying the pathways to nature connectedness at a societal scale: A leverage points perspective. *Ecosystems and People*, *16*(1), 387–401. https://doi.org/10.1080/26395916.2020.1844296

Riechers, M., Balázsi, Á., Engler, J.-O., Shumi, G., & Fischer, J. (2021). Understanding relational values in cultural landscapes in Romania and Germany. *People and Nature*, *n/a*(n/a). https://doi.org/10.1002/pan3.10246

Robinson, J. M., & Breed, M. F. (2019). Green prescriptions and their co-benefits: integrative strategies for public and environmental health. *Challenges*, *10*(1), 9. https://doi.org/10.3390/challe10010009

Roman, A., & Ruiters, G. (2020). Changing people, changing lives through public participation and social transformation: a South African case study of a rural development programme. *Politikon*, *47*(2), 253–268. https://doi.org/10.1080/02589346.2019.1697533

Ross, A., Van Alstine, J., Cotton, M., & Middlemiss, L. (2021). Deliberative democracy and environmental justice: Evaluating the role of citizens' juries in urban climate governance. *Local Environment*, *26*(12), 1512–1531. https://doi.org/10.1080/13549839.2021.1990235

Ryan, C. O., & Browning, W. D. (2020). Biophilic design. In V. Loftness (Ed.), *Sustainable Built Environments* (pp. 43–85). Springer US. https://doi.org/10.1007/978-1-0716-0684-1_1034

Saarikoski, H., Huttunen, S., & Mela, H. (2023). Deliberating just transition: Lessons from a citizens' jury on carbon-neutral transport. *Sustainability: Science, Practice and Policy*, *19*(1), 2261341. https://doi.org/10.1080/15487733.2023.2261341

Sachs, J. D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N., & Rockström, J. (2019). Six transformations to achieve the Sustainable Development Goals. *Nature Sustainability*, *2*(9), 805–814. https://doi.org/10.1038/s41893-019-0352-9

Sagat, C., Vogt-Schilb, A., & Luu, T. (2020). *Jobs in a Net-Zero Emissions Future in Latin America and the Caribbean*. Inter-American Development Bank and International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/documents/publication/wcms_752069.pdf

Schreuder, W., & Horlings, L. G. (2022). Transforming places together: Transformative community strategies responding to climate change and sustainability challenges. *Climate Action*, *1*(1), 1–15. https://doi.org/10.1007/s44168-022-00024-3

Schuster, A., Zoll, M., Otto, I. M., & Stölzel, F. (2023). The unjust just transition? Exploring different dimensions of justice in the lignite regions of Lusatia, Eastern Greater Poland, and Gorj. *Energy Research & Social Science*, *104*, 103227. https://doi.org/10.1016/j.erss.2023.103227

Scottish Environmental Protection Agency. (2018). *Flood Risk Management in Scotland 2018 Publication of NFRA and PVAs* [FAQ]. Scottish Environmental Protection Agency. https://www.sepa.org.uk/media/399172/nfra-faq.pdf

Scottish Government. (n.d.). *Community-led climate action*. Retrieved September 12, 2024, from https://www.gov.scot/policies/climate-change/community-led-climate-action/

Scottish Government. (2020a). *Air Quality Knowledge Account* [Knowledge Account]. Rural and Environment Science and Analytical Services at the Scottish Government. https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/02/environment-strategy-scotland-vision-outcomes/documents/air-quality-knowledge-account/air-quality-knowledge-account/govscot%3Adocument/air-quality-knowledge-account.pdf

Scottish Government. (2020b). *Quality Greenspace—Knowledge Account* [Knowledge Account]. e Rural and Environment Science and Analytical Services of the Scottish Government. https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2020/02/environment-strategy-scotland-vision-outcomes/documents/quality-greenspace-knowledge-account/quality-greenspace-knowledge-account/govscot%3Adocument/quality-greenspace-knowledge-account.pdf

Scottish Government. (2020c). *Scotland's people annual report: 2019*. https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2020/09/scottish-household-survey-2019-annual-report/documents/scotlands-people-annual-report-2019/scotlands-people-annual-report-2019/govscot%3Adocument/scotlands-people-annual-report-2019.pdf

Scottish Government. (2020d). *Scottish Energy Statistics Hub* [Dataset]. https://scotland.shinyapps.io/Energy/

Scottish Government. (2020e). *The Scottish Index of Multiple Deprivation* [Dataset]. https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/

Scottish Government. (2021a). *Climate change—Net Zero Nation: Public engagement strategy*. https://www.gov.scot/publications/net-zero-nation-public-engagement-strategy-climate-change/

Scottish Government. (2021b). *Just Transition—A Fairer, Greener Scotland: Scottish Government response*. https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/09/transition-fairer-greener-scotland/documents/transition-fairer-greener-scotland/transition-fairer-greener-scotland/govscot%3Adocument/transition-fairer-greener-scotland.pdf

Scottish Government. (2021c). *Scottish Government, Heat in Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings*. Scottish Government. https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2021/10/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/documents/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings/govscot%3Adocument/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings.pdf

Scottish Government. (2021d). *Scottish greenhouse gas emissions 2019*. Scottish Government. https://www.gov.scot/publications/scottish-greenhouse-gas-statistics-1990-2019/documents/

Scottish Government. (2022). *Making the Future: Initial Report of the 2nd Just Transition Commission*. https://www.justtransition.scot/publication/making-the-future-initial-report-of-the-2nd-just-transition-commission/

Scottish Government. (2023a). *Just transition for the transport sector: A discussion paper*. Scottish Government. https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2023/06/transition-transport-sector-discussion-paper/documents/transition-transport/transition-transport/govscot%3Adocument/transition-transport.pdf

Scottish Government. (2023b). *Water, Wastewater and Drainage Policy Consultation*. https://www.gov.scot/binaries/content/documents/govscot/publications/consultation-paper/2023/11/water-wastewater-drainage-policy-consultation/documents/water-wastewater-drainage-policy-consultation/water-wastewater-drainage-policy-consultation/govscot%3Adocument/water-wastewater-drainage-policy-consultation.pdf

Scottish Government. (2024). *Measuring Progress—Environment: National Performance Framework* [Dataset]. https://nationalperformance.gov.scot/national-outcomes/explore-national-outcomes/environment/measuring-progress-environment

Scottish Human Rights Commission. (2023). *SNAP 2: Scotland's second National Human Rights Action Plan (2023-2030)*. Scottish Human Rights Commission. https://

www.scottishhumanrights.com/projects-and-programmes/scotlands-national-action-plan/

SEI & CEEW. (2022). *Stockholm+50: Unlocking a Better Future*. Stockholm Environment Institute. https://doi.org/10.51414/sei2022.011

Slevin, A., Barry, J., Hill, T., Orr, J., O'Flynn, P., Sullivan, L., & McLernon, R. (2022). Local Climate praxis in practice: community climate action in Belfast. In C. Howarth, M. Lane, & A. Slevin (Eds.), *Addressing the Climate Crisis: Local action in theory and practice* (pp. 3–13). Springer International Publishing. https://doi.org/10.1007/978-3-030-79739-3_1

Snell, D. (2018). "Just transition"? Conceptual challenges meet stark reality in a "transitioning" coal region in Australia. *Globalizations*, *15*(4), 550–564. https://doi.org/10.1080/14747731.2018.1454679

Sprague, N., Berrigan, D., & Ekenga, C. C. (2020). An analysis of the educational and health-related benefits of nature-based environmental education in low-income Black and Hispanic Children. *Health Equity*, *4*(1), 198–210. https://doi.org/10.1089/heq.2019.0118

Springmann, M., Clark, M. A., Rayner, M., Scarborough, P., & Webb, P. (2021). The global and regional costs of healthy and sustainable dietary patterns: A modelling study. *The Lancet Planetary Health*, *5*(11), e797–e807. https://doi.org/10.1016/S2542-5196(21)00251-5

Stewart, C., McNeill, G., Runions, R., Comrie, F., McDonald, A., & Jaacks, L. (2023). *Meat and milk product consumption in Scottish adults: Insights from a national survey*. https://doi.org/10.21203/rs.3.rs-3585630/v1

Stewart, D., & Eccleston, J. (2020). *Enjoying the Outdoors: Monitoring the impact of Coronavirus and social distancing* (Research Report 1252). NatureScot. https://www.nature.scot/sites/default/files/2020-08/Publication%202020%20-%20NatureScot%20Research%20Report%201252%20-%20Enjoying%20the%20outdoors%20-%20monitoring%20the%20impact%20of%20Coronavirus%20and%20social%20distancing.pdf

Tarhan, D. (2022). Community renewable energy's problematic relationship with social justice: Insights from Ontario. *Local Environment*, *27*(6), 767–783. https://doi.org/10.1080/13549839.2022.2077713

Thaler, T., & Seebauer, S. (2019). Bottom-up citizen initiatives in natural hazard management: Why they appear and what they can do? *Environmental Science & Policy*, *94*, 101–111. https://doi.org/10.1016/j.envsci.2018.12.012

The Scottish Environment Protection Agency. (2022). *Water Classification Hub* [Dataset]. https://informatics.sepa.org.uk/WaterClassificationHub/

Think Broadband. (2017). *Rural and Urban superfast broadband coverage in Scotland* [Public Information]. Think Broadband. https://www.thinkbroadband.com/news/7892-rural-and-urban-broadband-coverage-in-scotland

Thøgersen, J. (2005). How may consumer policy empower consumers for sustainable lifestyles? *Journal of Consumer Policy*, *28*(2), 143–177. https://doi.org/10.1007/s10603-005-2982-8

Thøgersen, J., & Ölander, F. (2002). Human values and the emergence of a sustainable consumption pattern: A panel study. *Journal of Economic Psychology*, *23*(5), 605–630. https://doi.org/10.1016/S0167-4870(02)00120-4

Thorsheim, P. (2018). *Inventing Pollution: Coal, Smoke, and Culture in Britain since 1800* (1st ed.). Ohio University Press. https://doi.org/10.2307/j.ctv224tx7r

Tops, J., & Lamers, M. (2024). Just tourism transitions? Sustainability policy interventions and implications on Boracay, Philippines. *Tourism Geographies*, *26*(2), 237–254. https://doi.org/10.1080/14616688.2023.2289996

Turnhout, E., Metze, T., Wyborn, C., Klenk, N., & Louder, E. (2020). The politics of co-production: Participation, power, and transformation. *Current Opinion in Environmental Sustainability*, *42*, 15–21. https://doi.org/10.1016/j.cosust.2019.11.009

UK Health Security Agency. (2022). *Chemical Hazards and Poisons Report Issue 28 – June 2022 Reducing health harms associated with air pollution* (28). UK Health Security Agency. https://assets.publishing.service.gov.uk/media/62ab19c4e90e07038e6df074/CHaPR_AQ_Special_Edition_2206116.pdf

UNEP. (2017, September 26). *The Marrakech task Force on sustainable lifestyles*. UNEP - UN Environment Programme. http://www.unep.org/explore-topics/resource-efficiency/what-we-do/one-planet-network/marrakech-task-force-sustainable

van Dijk, L., Turkenburg, E., & Pow, J. (2023). The perceived legitimacy of deliberative minipublics: Taking the perspective of polarized citizens. *European Political Science Review*, *15*(3), 409–426. https://doi.org/10.1017/S1755773922000649

Van Notten, Ph. W. F., Sleegers, A. M., & Van Asselt, M. B. A. (2005). The future shocks: On discontinuity and scenario development. *Technological Forecasting and Social Change*, *72*(2), 175–194. https://doi.org/10.1016/j.techfore.2003.12.003

Verfuerth, C., Demski, C., Capstick, S., Whitmarsh, L., & Poortinga, W. (2023). A people-centred approach is needed to meet net zero goals. *Journal of The British Academy*, *11*(S4), 97–124. https://doi.org/10.5871/jba/011s4.097

Verkuijl, C., Sebo, J., Hötzel, M. J., Visseren-Hamakers, I., Achakulwisut, P., Bastos Lima, M., & Green, J. (2022). *Mainstreaming animal welfare in sustainable development: A policy agenda* (Stockholm+50 Background Paper Series, p. 27). Stockholm Environment Insitute.

Wagemans, D., Scholl, C., & Vasseur, V. (2019). Facilitating the energy transition—the governance role of local renewable energy cooperatives. *Energies*, *12*(21), Article 21. https://doi.org/10.3390/en12214171

Walton, P., Eaton, M., Stanbury, A., Hayhow, D., Brand, A., Brooks, S., Collin, S., Duncan, C., Dundas, C., Foster, S., Hawley, J., Kinninmonth, A., Leatham, S., Nagy-Vizitiu, A., Whyte, A., Williams, S., & Wormald, K. (2019). *The State of Nature Scotland 2019*. The State of Nature Partnership.

Weitz, N., Carlsen, H., Nilsson, M., & Skånberg, K. (2018). Towards systemic and contextual priority setting for implementing the 2030 Agenda. *Sustainability Science*, *13*(2), 531–548. https://doi.org/10.1007/s11625-017-0470-0

Weller, S. A. (2019). Just transition? Strategic framing and the challenges facing coal dependent communities. *Environment and Planning C: Politics and Space*, *37*(2), 298–316. https://doi.org/10.1177/2399654418784304

Withouck, I., Tett, P., Doran, J., Mouat, B., & Shucksmith, R. (2023). Diving into a just transition: How are fisheries considered during the emergence of renewable energy production in Scottish waters? *Energy Research & Social Science*, *101*, 103135. https://doi.org/10.1016/j.erss.2023.103135

World Inequality Database. (2024). *World Inequality Database* [Dataset]. https://wid.world/

Wu, J. (2021). *Planning for Energy Transition: Embracing an Area-Specific Approach in Urban China* [University of Groningen]. https://doi.org/10.33612/diss.177284422

Zhong, W., Schröder, T., & Bekkering, J. (2022). Biophilic design in architecture and its contributions to health, well-being, and sustainability: A critical review. *Frontiers of Architectural Research*, *11*(1), 114–141. https://doi.org/10.1016/j.foar.2021.07.006

Annex 1. Methodology

Review of policy levers

The following research question guided this policy review process:

How can the available policy levers in Scotland be effectively used to promote the societal transformations needed to tackle the climate and nature emergencies in the following sectors: food, housing, transport, energy, the consumption of goods (and services), health and education?

Thus, the review was limited to Scottish policy levers related to food, housing, transport, energy, the consumption of goods, health and education.

The review included a range of document types:

- Policy origin documents
- Scottish Government reports (including progress/monitoring reports)
- Policy briefs (both by the Scottish Government and produced by third parties)
- Third party reports (from civil society organization/think tanks with focus on Scotland)
- Consultation papers
- Strategies
- Discussion papers
- Action plans
- Monitoring frameworks.

The search for relevant literature was conducted across Scottish Government websites, documents provided by the Scottish Government policy team, and other sites/databases recommended by the team and government policy experts.

Each website/document was manually searched using the keywords detailed in Table 1 below. The keywords were defined iteratively where new search terms will be added as the review continues. The initial list is based on definitions and examples provided by the Scottish Government, the Joint Nature Conservation Committee (JNCC) report, the New Economics Foundation (NEF) report, and the Global Footprint Network (GFN) report (Harris, 2023; Kiberd, 2024; Lin et al., 2024).

Table 1. List of keywords for policy review

Economic levers	Regulatory levers	Infrastructure-based levers	Information-based levers
Tax	Standard	Reporting	Consumer information
Charge	Ban	Production requirements	Eco-label
Subsidy	Quota	Partnership	Certificate/Certification
Investment	Framework	Network	Awareness raising
Public procurement	Green skills	Database	Communications campaign
Research & development	Directive	Portal	Education pack/lessons/courses/(integration into/topic in) national curriculum
Fund	Guarantee	Platform	Life-cycle assessment
Fine	Guidance	Measure	Business disclosures
Incentive	Guideline	Infrastructure	Public engagement
Levy	Training	Circular economy	Consultation
Duty	Scheme		
Grant	Strategy		
	Initiative		
	Legislation		
	Principle		

Screening for relevance was conducted in two stages. We first screened titles, followed by full-text retrieval and screening. Relevant metadata (Name of policy; Type of policy, type of document, where found, Type of policy lever; expected outcomes) was coded in a spreadsheet, alongside expected co-benefits.

During the initial screening we excluded the following:

- policies that are “not in the target area” (24): for certain sectors, e.g. forestry; those more focused on industry; those not related to society and or climate.
- areas of intention (99): where it is not clear what the policy lever is and / or when it will be implemented.
- theoretical policy levers (77): policies and measures that have been recommended by third parties.

During the second screening, we then applied a further refined set of exclusion criteria:

1. **Covered by another policy lever (only if same kind of lever and same responsible agency).**
   a) Example: combined three different sub-policies in the national planning framework, all related to supporting local living, into one.

2. **Planned but implementation status unclear – could not verify that the policy is being implemented, policy might be under development.**
    a) Example: the Scottish Government's plans to "Develop certified repair training to encourage repair and re-use" as outlined in the *circular economy strategy from 2016* – could not verify if that is happening or has happened
3. **Draft document: New policy mechanisms discussed within a draft are not yet implemented.**
    a) Example: the Scottish Government's plans to "support projects to promote car-share schemes and platforms at national and regional level through grant funding" as outlined in the *Draft route map to Reducing car use for a healthier, fairer and greener Scotland A route map to achieve a 20 per cent reduction in car kilometres by 2030.*

4. **Consultation document: new policy mechanism discussed within a consultation not yet implemented.**
    a) Example: the prohibition of polluting heating systems after 2045, as outlined in *Delivering Net Zero for Scotland's Buildings: A Consultation on Proposals for a Heat in Buildings Bill*

5. **The identified policy is at consultation stage – policy mechanism not yet implemented.**
    a) Example: consultation on the final route map to achieving a 20% reduction in car kilometres driven in Scotland by 2030 as outlined in the *National Transport Strategy: Third Annual Delivery Plan 2023-24*

6. **Policy mechanism no longer current.**
    a) Example: circular textile fund from the Scottish Government's circular economy strategy from 2016, which is now closed for application

7. **Policy lever not yet active/forthcoming.**
    a) Example: the requirement for all packaging types (except for plastic films and flexibles) to be labelled as "recycle" or "do not recycle", to come into force by 2026, outlined in the *Delivering Scotland's circular economy – Route Map to 2025 and beyond: consultation*

8. **Not an area directly relevant to our focus**: society outcomes (education, housing, planning, green skills, transport, food and diets, energy) in the context of climate change and/or a just transition.
    a) Example: the Land and Buildings Transactions Tax (LBTT) aims to support the delivery of new affordable homes throughout the country, encourage the emergence of the Build to Rent sector and support homeownership outlined in the *Housing to 2040 strategy*.

9. **Not a government-level lever.**
    a) Example: private investment into low-carbon hydrogen production according to the *Just Transition for the Grangemouth industrial cluster: discussion paper*

10. **A UK Government lever – not for the Scottish Government to decide.**
    a) Example: the Soft Drinks Industry Levy (SDIL) mentioned in *A healthier future: Scotland's diet and healthy weight delivery plan*

11. **No specific policy mechanism outlined.**
    a) Example: national development project for the Edinburgh Waterfront to create a high-quality, mixed use, locally liveable place outlined in the *National Planning Framework 4.*

This left us with an overview of all current policy levers related to a societal transformation in the context of the Scottish Government.

Mapping against the UBF framework

We then mapped these policy levers against the 18 headings as they appear in the framework diagram in the *Stockholm+50: Unlocking a Better Future* report. These headings were operationalized using explanatory text for these from the report to ensure that we are capturing the original meaning when reviewing the Scottish Government policies. These are listed in Annex 2. We based the mapping strictly on the information contained in the spreadsheet, i.e., we did not go back into each policy document when assessing against the UBF framework. For each UBF heading, we asked whether the policy lever in question addresses this heading: "yes" or "no".

Using difficult or ambiguous cases, we calibrated and sense-checked our assessments within the research team. We then calculated across all answers per heading, assessing how many policy levers scored "yes" per UBF heading. This allowed us to see which UBF headings are covered well by the policies and where there seem to be gaps (the basis for identifying opportunities). We then looked at the calculations for each UBF heading and produced a narrative based on the key sectors in focus, whether there appear to be gaps, and noting any ideas for possible recommendations that surfaced.

Following the mapping, in consultation with the Scottish Government policy team, it was concluded that two thematic areas were not applicable in the Scottish context: "Indigenous local knowledge and values" due to its lack of relevance – there is no Indigenous local knowledge in the Scottish context; and "Co-Development of Technology" as this area is more relevant to the global context, referring to the need to move away from technology transfer from high- to low-income countries (SEI & CEEW, 2022).

SDG Synergies methodology and workshop

The recommendations that result from this project should help drive a whole-of-government approach and be guided by systems-based approaches. As a step in our methodology to ensure this, the project organized a workshop on 15 March 2024 to reveal potential synergies and trade-offs between drafted recommendations under the nine thematic areas: valuing nature, nature-based education, Rights of Nature, animal

welfare, nature in urban areas, sustainable lifestyles, national accounting beyond GDP, innovation systems and sustainable supply chains.

The SDG Synergies approach and tool, developed by researchers at the Stockholm Environment Institute, was used to facilitate the workshop. The SDG Synergies approach is a form of collaborative analysis that allows for priority-setting based on systems analysis, and assessing alternative development pathways by scoring interactions between different goals. For more information and methods, see tools website https://www.sdgsynergies.org/, fact sheet for overview (Weitz et al., 2019) or original source (Weitz et al., 2018).

The SDG Synergies workshop in this project offered participants a systematic way to discuss and surface potential synergies and trade-offs between recommendations, giving focus and perspective on how the draft recommendations can work together in Scotland. The analysis and discussion during the workshop presented insights to better ground recommendations in the Scottish context, and additional feedback and reflections from participants were shared with the research team during and after the workshops. These were used to inform the refinement of recommendations.

At the workshop, participants were introduced to the SDG Synergies methodology and presented with the draft recommendations. They were then split into break-groups to do an interactions assessments between different thematic areas, aiming to identify trade-offs and synergies. The outcomes and preliminary findings of the exercise were then discussed in plenary and further reflections gathered.

The matrix in Figure 1 and summary statistics in Figure 2 show that progress across the nine thematic areas is **more often promoting than restricting progress** in other themes.

Figure 1. Interaction matrix (first-order): Pairwise scoring across the nine thematic areas, by workshop participants. Interaction matrix: Pairwise scoring across the nine thematic areas, by workshop participants. 1 = Valuing nature. 2 = Nature-based education. 3 = Rights of Nature. 4 = Animal welfare. 5 = Nature in urban areas. 6 = Sustainable lifestyles. 7 = Beyond GDP. 8 = Innovation systems. 9 = Supply chain governance.

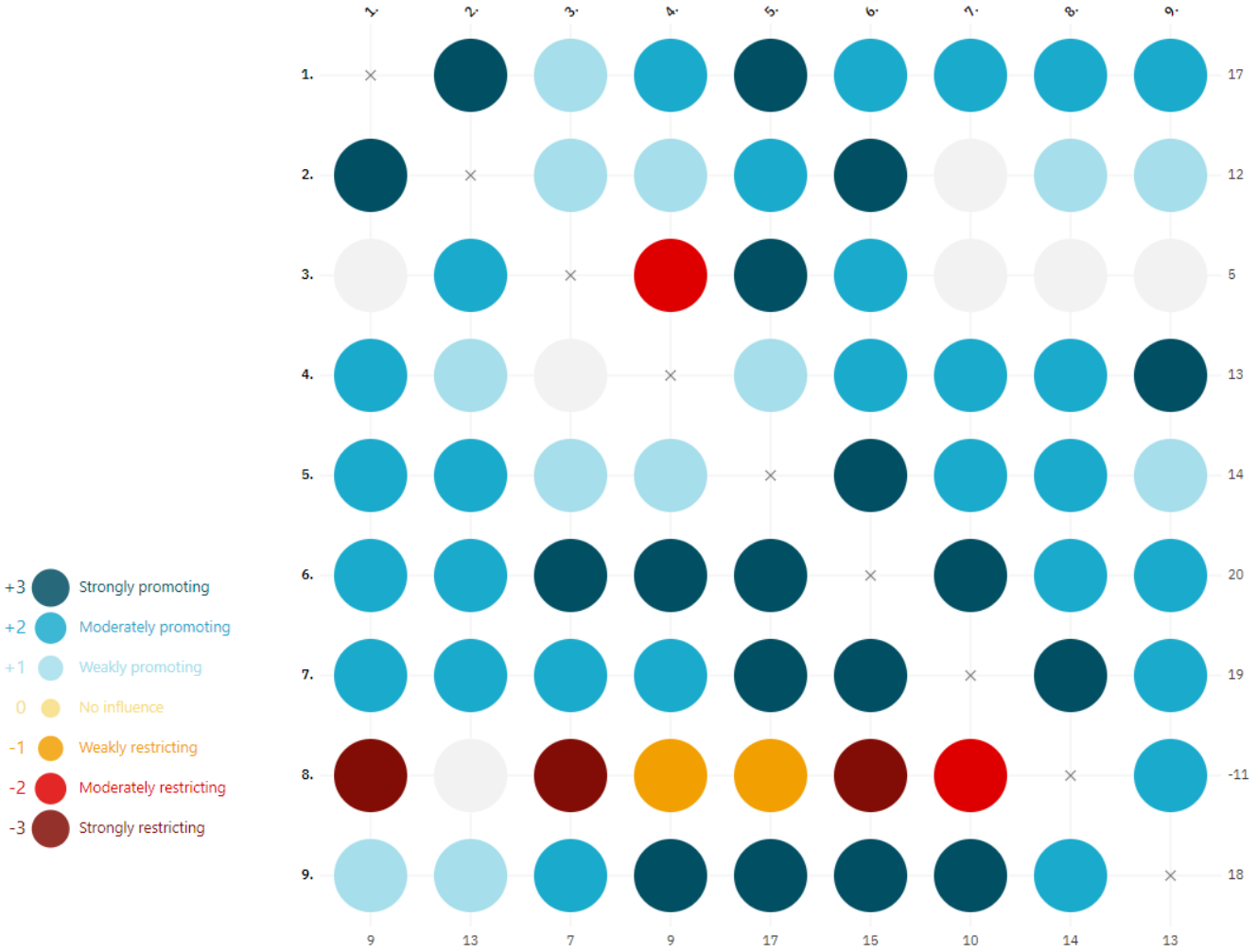


Figure 2. Summary statistics: frequency, mean and median of the total 72 scores.

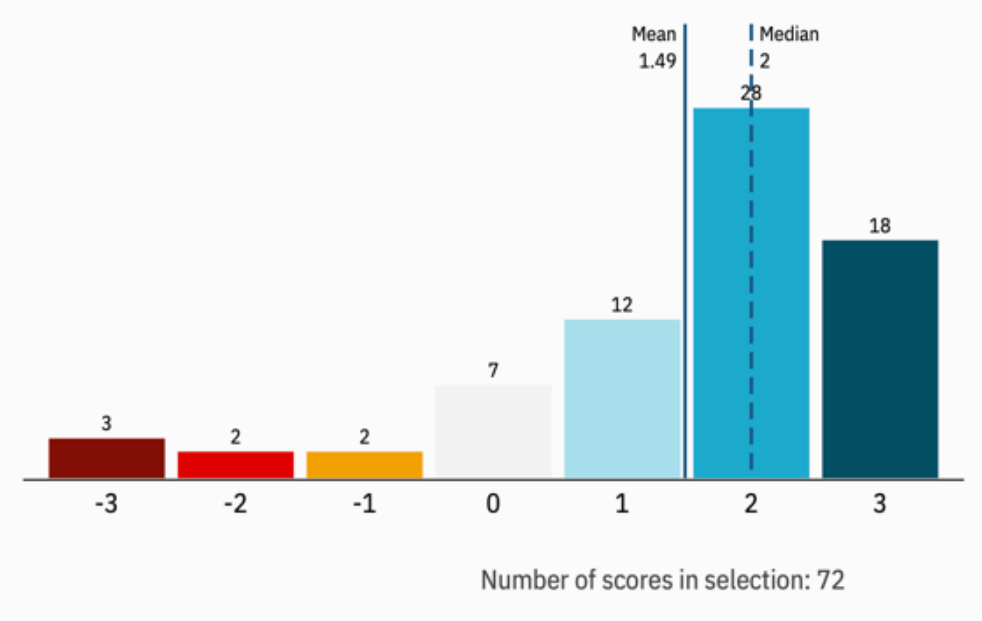


Figure 3. Interaction matrix (second-order): Pairwise scoring across the nine thematic areas. 1 = Valuing nature. 2 = Nature-based education. 3 = Rights of Nature. 4 = Animal welfare. 5 = Nature in urban areas. 6 = Sustainable lifestyles. 7 = Beyond GDP. 8 = Innovation systems. 9 = Supply chain governance.

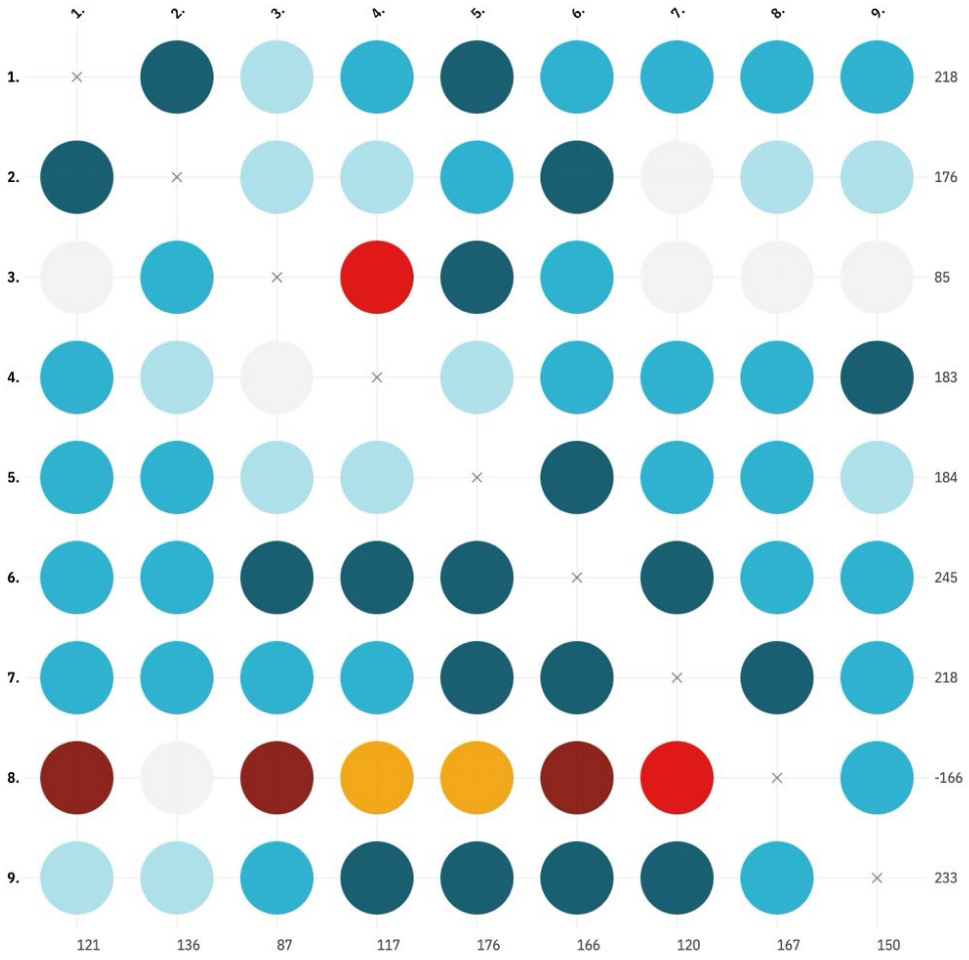


Figure 3 shows the same matrix as presented in Figure 1 but with row- and column sums accounting for second-order interactions. That is, it considers effects two steps away or "neighbour's neighbour" (e.g. one influences three, which each influence five). Taking these effects into account gives a better systems representation and alters the ranking of which themes have most synergistic effect (Table 2). It suggests that **making progress in sustainable lifestyles, supply chain governance, valuing nature, Beyond GDP and Nature in urban areas present opportunity to promoting progress on all themes.**

Table 2. First- vs second-order ranking

First-order most synergistic	Second-order most synergistic
Sustainable lifestyles	Sustainable lifestyles
Beyond GDP	Supply chain governance
Supply chain governance	Valuing nature & Beyond GDP
Valuing nature	Nature in urban areas

Academic review

The academic literature review focuses on how public participation can be used to support a just transition, drawing best practices/best available techniques from other relevant policy contexts. The research question to be answered was "What does the academic literature say about how public/citizen engagement can effectively support a just transition?".

The academic literature review was conducted across three bibliographic sources: Web of Science, Scopus and Google Scholar. After an initial trial with different keywords, a search string was developed in alignment with the scope of the review (see Table 3). Further, Google Scholar was searched for relevant titles with a simplified search string. We will retrieve the first 1000 search results using Publish or Perish software.

Table 3. Search string for academic review

Search string	TITLE-ABS-KEYWORDS ("soc* transform*" OR "just transition*") AND ((engage* NEAR/2 (public OR civic OR communal OR communit*)) OR (particip* NEAR/2 (public OR civic OR communal OR communit* OR citizen*))):

The screening methodology involved a two-step process, including the screening of titles and abstracts followed by a full-text assessment. After title and abstract screening, full texts of records with relevant abstracts were retrieved. Retrieved records were screened at the full-text level. Eligibility (inclusion and exclusion) criteria were defined as outlined in Table 4.

Table 4. Eligibility criteria for academic review

Eligible intervention	Societal transformations or just transitions
Eligible outcome	Public engagement in the process of transformation and related outcomes
Study type	All types of journal articles, including reviews, commentaries, theoretical papers, and empirical qualitative and quantitative research
Language	English language publications only
Time limitation	No restrictions on the publication date

Relevant metadata were coded into an Excel spreadsheet. This included: the actors involved in community engagement or citizen engagement (policymakers, academic actors, civil society, local communities, private actors); modes of public engagement used; implementation contexts (i.e., geographical, such as country or region), socio-economic unit of the target groups (communities), scalar (size and scale, including pilots and scaled-up projects), sector in focus; outcomes of public participation; success factors; barriers; and enabling conditions.

Annex 2. Key actions to unlock a sustainable future proposed under the UBF framework

As indicated in Section 2 of the report, the UBF framework outlined 18 interconnected thematic action areas across economy, society and biosphere, which are used as an analytical framework across this report. This annex outlines a brief description of these areas as well as calls for action related to them, taken from the UBF report.

Change the selection environment for innovation
The upstream selection environment for innovation has a cumulative impact on technological development. Common sustainability standards and principles should be applied to guide innovation, international organizations should work to harmonize these, and publicly funded innovation should adhere to these.

Calls to action:

- Businesses should adopt voluntary sustainability standards and principles so that they become market-leading and influence innovation and product development.
- Governments should develop binding standards and classification schemes when voluntary standards are not aligning with sustainability goals or they are not sufficiently influential.
- International organizations should seek to harmonize standards, with special concern to entry requirements for low- and middle-income countries, so that they can access new markets for sustainable products and align their innovation systems to ambitious selection environments.
- Publicly funded innovation should demand adherence to standards.

National accounting; beyond GDP
Align national statistics with sustainability goals – It is time to move beyond GDP as the single metric and adopt indicators that help measure progress towards the vision of sustainable development, such as indicators on inclusive wealth and indicators recognizing the caring economy. Global governance and convergence on alternative metrics are needed to reduce the risk for “first movers”.

Calls to action:

- Global leaders must collectively recognize the need to redefine prosperity through alternative indicators, to generate buy-in and not deter first movers.
- Governments should mainstream the narrative of redefined prosperity within countries through consultative approaches, including with subnational government.

- National statistics offices should more widely adopt consumption-based accounting and life-cycle accounting, and national governments should set goals and strategies for reducing footprints, with support for low-capacity institutions from relevant UN bodies.

Supply chain governance

Make supply chains better for both humans and the environment and ensure that integrated supply chains bridge the technology and economic gap between developed and developing economies. Existing governance initiatives provide a basis, but there is scope to increase environmental ambition and make frameworks more binding. To date, supply chain governance has mostly been voluntary and targeted at mapping and analysing sustainability impacts along the supply/value chain.

Calls to action:

- The UN Global Compact and its members should consider increasing the level of ambition of the environment-related Ten Principles, to more actively demote unsustainable options and practices.

- National governments and international organizations should consider more binding due diligence requirements and greater harmonization, but with aim of bridging not widening the technology divide.

Green and decent jobs

In the context of the climate transition (SDG13), the potential of new, green jobs has come to the fore, as a co-benefit or even a primary reason to make large public investments in renewable energy, low-carbon mobility, energy efficiency and climate resilience. Sustainable patterns of production should include prospects for new jobs and skills, scope for additional investment, higher interdependency in co-creating and sharing prosperity, social safety nets for the vulnerable, and environmental integrity.

Calls to action:

- Relevant international organizations, supported by member states, business, trade unions and youth organizations, should consider co-developing more knowledge and best practices for maximizing synergies between green jobs, decent work and youth employment.

Function not products

Purchasing functions to fulfil our material needs instead of products would be more resource-efficient; this should be a key element of the reset needed for everything from individual lifestyle choices to business models, to ensure lasting prosperity. Material throughput can be substantially lower if households, businesses and government agencies switch from purchasing products to acquiring functions of products.

Calls to action:

- Businesses should shift to offering functions and services rather than products as much as possible.
- Government should adapt legal frameworks to remove bias against business models that switch from selling products to functions.

Circular economy

Supportive regulatory frameworks and changed social norms on ownership and reuse could have a transformative effect on scaling such business models and reducing material throughput.

Calls to action:

- Governments should help create and expand markets for use- and result-oriented product service systems through public procurement.
- Government and businesses should pioneer more neutral language around consumption and reuse, to enable new social norms to develop around the status of ownership and new products.

Sustainable lifestyles

Make a sustainable lifestyle the easy choice. We are now at a point where efficiency-oriented options and nudging measures for making lifestyles more sustainable are insufficient; systemic and transformative measures are needed. These should actively create enabling infrastructures, reconfigure systems and amplify social norms around sufficiency, as well as new global governance initiatives to address equity in these transitions. In order to change lifestyles, governments must consider alternatives ways to price consumption-related resource footprints.

Calls to action:

- Transformative change requires a long-term vision, but it can be enabled through near-term actions: local and national governments should identify the barriers in infrastructure that prevent individuals from shifting to more sustainable lifestyles and begin to remove them, combined with more effective and ambitious mixes of policies that edit out unsustainable choices, in order to accelerate change.
- The use of local policy labs and learn-by-doing experiments for sustainable lifestyles should be scaled up, where the individual is an active co-creator and network influencer.
- A regular UN forum on sustainable lifestyles should be established, to enable international peer learning and elevate action on SDG12. A collective global

exercise to co-develop pathways for sustainable lifestyles and parameters that can measure progress should be convened.

Rights of Nature

Rights of Nature is a legal instrument that enables nature, such as ecosystems or species, to have inherent rights and legally be entitled to the same protection as individuals and corporations. It follows the rationale used to establish human rights: since human rights are based on the philosophical belief that rights are derived from humanity's own existence, then logically, so do inherent rights of the natural world. Assigning legal rights to nature can be a way of limiting extraction of resources but can also lead to recognition of nature's intrinsic values and changed behaviour over time.

Calls to action:

- National legislative and judicial bodies should consider whether establishing Rights of Nature will help protect nature in specific contexts, based on comprehensive consultation with stakeholders and analysis of what capacities and resources would be needed for effective enforcement.

- The human right to clean, safe and sustainable environment should incorporate a Rights of Nature rationale, whereby human responsibility and interests for the protection of nature as a legal entity with personhood are clearly articulated.

Indigenous local knowledge and values

Greater recognition of Indigenous local knowledge can make nature conservation more effective and support Indigenous rights. Acknowledging Indigenous knowledge and values can lead to more effective, locally owned and equitable conservation and development outcomes.

Calls to action:

- National policies related to nature conservation should more strongly include the role of traditional and Indigenous knowledge, in line with international agreements.

Animal welfare

Protect animal welfare by mainstreaming it in sustainable development governance – Animal welfare matters morally, but many of the ways in which we currently interact with animals also limit our ability to achieve sustainable development goals and impact the environment. Stronger protection of animal welfare will help build human-nature connectedness, and can also directly or indirectly benefit many other societal goals.

Calls to action:

- Governments should elevate the importance of animal welfare for sustainable development, and sustainable development for animal welfare, in international instruments.
- Support policies that benefit humans and non-human animals alike, particularly policies that use informational, financial and regulatory measures to benefit animals more and harm them less. Animal welfare impact assessments can play a valuable role here.
- Governments could phase down public subsidies for animal products and harmful agriculture, and increase support for plant-based food production, in a way that avoids regressive effects on low-income households.
- Governments should require or encourage voluntary action on disclosure of animal welfare, health and environmental risks by food companies to investors.
- Researchers, experts and policymakers should expand the interpretation of the One Health framework to recognize animal health and welfare as an end in itself, and not just instrumental to human health outcomes.

Valuing nature:
Our relationship with nature needs to shift from appropriation and extraction towards protection and care. Human-nature connectedness should be strengthened in social norms and value systems, and in physical terms in how we live our everyday lives.

Nature in urban areas
Integrate nature in cities and urban areas – Local governments can promote human-nature connectedness through green architecture, infrastructure and access to nature in the towns and cities where most people live and work, as a way of both seeding transformative change through shaping values and providing immediate climate, biodiversity and health benefits.

Calls to action:

- Local governments and architects should apply biophilic design principles in new and retrofitted urban architecture and housing policy, to enable human-nature connectedness as well as provide direct climate, biodiversity and health benefits.
- Local planners should “green” urban infrastructure such as water treatment, for example by learning from biomimicry and smallholder practices.
- Access to nature in urban areas should be promoted through empowered local communities and national accessibility standards and higher economic valuation of green space.

Nature-based education

Expand and invest in nature-based education – Through education policy and school curricula that connect children with nature, education authorities and teachers could contribute to a long-term, catalytic effect on repairing our relationship with nature. Inspiration can be taken from Indigenous communities' nature-based education

Calls to action:

- Education authorities and Indigenous communities should collaborate on weaving in Indigenous principles of environmental education into modern educational systems.
- To build a deep relationship with nature, education authorities and teachers should not just focus on ecological knowledge but also include practical skills, learning about local environmental issues and taking ownership, through hands-on engagement in community projects.
- UN organizations, such as UNESCO and UNEP, should start a global campaign to promote development of more diverse educational materials, and include practical skills, drawing more on cases from the Global South.

Reduce the risks to sustainability

Reduce risks to sustainability, enhance risks of unsustainability – One key to increasing the scale of private finance for a sustainability transition is to alter the perceived riskiness of investments. This includes both reducing the perceived risk of sustainable investments and raising the perceived risk of unsustainable investments, for example through allocation mandates on lending portfolios. Many low-income countries cannot de-risk financially underserved sectors and technologies. To overcome this barrier, risks can be pooled across countries and then de-risked through a common fund.

Calls to action:

- Governments should reduce investor risk by providing a stable policy environment with long-term goals set in key areas of sustainability. International agreements are an effective way of setting shared long-term, binding goals.
- Governments and international financial institutions should consider joint de-risking initiatives to meet the sustainability investment needs in low-income countries and emerging markets, where domestic credit to the private sector is insufficient.
- Educate investors on novel and emerging sustainability technologies and solutions, to enable accurate assessments of risk.
- Regulators should consider mandates for minimum allocation of lending portfolios to sustainable assets, in order to enhance the perceived risk of unsustainable investment portfolios.

Just transition
A new pool of labour skills must be available to build and operate new capital equipment in the process of a transition towards sustainability. Also necessary is the will to abandon the old before the end of its useful life, while at the same time ensuring a just transition to support communities dependent on the older assets for their livelihoods. More investment capital alone will not deliver a societal transformation towards sustainable development.

Innovation systems
Recognize and enhance public funding of innovation. Mission-driven public investment can contribute to sustainability-oriented innovation systems.

Calls to action:

- Increase public research and development funding to missions co-defined with stakeholders (industry, civil society, local communities affected, academia) to achieve sustainability goals.

Co-development of technology
To bridge the technology gap between rich and poor countries we need a new paradigm of "co-development of technology", particularly in critical areas of clean energy, health and sustainable agriculture. This requires jointly designed research and development programs, pooling of resources, co-owned and shared intellectual property, local adaptation, and equitable voice in the governance of emerging technologies.

Calls to action:

- Target international finance to low- and middle-income countries to develop and implement green industrial strategies, as well as their co-defined and nationally owned missions and innovation systems, especially countries faced with a phase-down of fossil fuel production.

- Replace ineffective technology transfer mechanisms with a new paradigm of "technology co-development".

Sustainable finance
Incentivize active engagement in private finance. Private finance has a critical role in bringing innovation to market, and investors should engage more actively to ensure sustainable finance becomes the norm. At a global scale, private investors are increasingly interested in monitoring the Environmental, Social and Governance (ESG) performance of their investments, but through shareholder initiatives or direct engagement with the firms in which they invest they have much more power to transform sectors or industries.

Calls to action:

- Financial actors and investors should engage more in active approaches to investing to support rapid action on climate change, especially with high-emitting sectors.

- Governments should provide enabling conditions for viability of sustainable investment at early stages of commercialization or start-up. Raise adequate private finance.

- Multilateral climate finance institutions should substantially enhance grant finance, to support capitalization of catalytic instruments that help make available domestic credit to sustainable investments in developing countries.

- Governments should coordinate to harmonize financial regulation frameworks (e.g. taxonomies, disclosure standards) in developing countries with international frameworks to remove barriers to mobilizing and accessing finance internationally.

Annex 3. Economy and footprint recommendations within the holistic framework

New Economics Foundation (NEF) recommendations

Recommendation	Overlaps with UBF themes
Work with the UK Government and Scotland's industry to maximize the social value from private investment in renewables, including through increased local content (supply chains based in Scotland) and employment – one specific approach could be through the ongoing review of future Contracts for Difference rounds that is considering 'non-price' factors (e.g. local supply chains) in upcoming auction rounds.	7
Franchise public transport and deliver integrated nationwide fare structure ensuring that the cost of public transport is cheaper than the cost of driving – such as Austrian "Klimaticket" with standard local, regional and national multimodal travel rates.	6
Adopt an area-based approach centred on communities and local authorities in order create good, low-carbon jobs, support local supply chains, and ensure that communities benefit from local multiplier effects. The scale of building improvements needed across Scotland presents a unique opportunity to scale up local authority activity in this area.	5
Assess opportunities for local government bodies in Scotland to take a more proactive role in planning and developing places that are compatible with a net-zero, nature-positive and circular economy, drawing on good practice abroad. Some of the levers considered may include: increasing funding to local planning departments to resource them to undertake more proactive planning, rather than reactive, potential uses of Compulsory Purchase Order powers to enable land assembly, models such as development corporations that allow a more proactive approach to planning at a neighbourhood scale, options for how revolving infrastructure funds or lending from the Scottish National Investment Bank can be used to finance the upfront costs of creating these neighbourhoods, legislative changes that would enable the public to capture more land value uplift from development, via approaches such as land readjustment or strategic public land ownership.	5
Develop new contracting guidance for public procurement in sectors such as buildings and transport to secure outcomes relevant to the net-zero, nature-positive and circular economy missions, as well as broader outcomes on job quality, diversity and skills.	5
Expand the opportunities available under the Scottish Government's Community and Renewable Energy Scheme (CARES) to support the development of community energy projects at a larger scale than currently seen in Scotland.	5
Increase investment in nature conservation and restoration, funded by a redirection of existing subsidies and taxation via environmentally linked taxes or in the longer term, via general progressive taxation.	5
Provide fiscal incentives for businesses to invest in improving product and process standards, embedding circular practices from cradle to grave.	5
Undertake a deeper assessment of the impact of existing agricultural production on biodiversity and nature, to understand which activities in the sector need to end to achieve the nature-positive goals, and which parts of the sector can incrementally reduce their impact.	5
Address the existing lack of emphasis on improving energy efficiency and heating in the private rented sector – increase the existing financial support programs and incentives offered to non–fuel-poor households if it is to meet its targets.	4
Advocate to the UK Government for the fast development of a market design for a fully decarbonized, resilient electricity system that is flexible, promotes the participation of smaller players, provides incentives for the development of new renewable energy projects, and ensures that the low cost of renewable energy is passed on to households.	4
Assess the potential to procure from circular economy product service systems across all departments and implement a plan to increase the proportion of circular suppliers to the Scottish Government.	4
Collaborate with Scottish businesses to increase the rate of voluntary measurement and disclosure of nature-related risks and impacts.	4
Explore options for influencing UK-wide financial and companies regulations to require nature-related disclosures by companies and the consideration of nature risks in financial decision-making.	4
Explore specific incentives for consumers and businesses to promote the product-as-a-service model that encourages leasing and sharing of goods. Car-pooling, renting power tools or sharing company printers and copiers are some examples where employee incentives such as successful bike to work schemes could be replicated.	4
Focus greater attention on the compatibility of policies such as the food and drink sector strategy and rural development policies with the nature-positive mission.	4
Increase Scottish Government support to community-led forestry projects.	4

Recommendation	Overlaps with UBF themes
Increase spending on public transport with a focus on the provision of a reliable, affordable and green bus service in Scotland's rural areas, including through publicly owned transport services. Roll-out the committed spending on bus priority measures on roads and motorways.	4
Provide transitional support in the form of grants, subsidies, or low-interest loans ahead of the start of low emission zone enforcement, and consider phased implementation allowing sufficient time for affected individuals and businesses to adjust.	4
Re-prioritize all current and future transport spend to reflect the Scottish Government's commitments to reduce emissions from transport. In particular, the Scottish Government should reconsider spending earmarked for increasing or subsidizing private road travel, and direct it towards public transport, place-based transformation, and decarbonization of shipping.	4
Setting a prioritized framework for institutional R&D: setting a clear framework of principles and priorities for the areas in which higher education and collaborative R&D can have maximum impact in Scotland for both net-zero and nature-positive outcomes. Includes explicit encouragement and support for R&D that has a spatial focus which reflects the different requirements of the significantly diverse geographies of Scotland, is specifically targeted to areas which interact with and support the public investment capabilities of the Scottish Government, focuses on encouraging R&D in the most hard to decarbonize sectors, which are the least attractive to most research because there are less easy-wins or clear next steps for R&D, builds-in consideration of nature-positive outcomes into net-zero R&D and innovation, even if it requires broadening the scope and resource requirement of an R&D project.	4
To contribute to a just transition where the benefits of nature-related investment are broad-based, recalibrate policy measures in the sector to recapture some of the gains accruing to large investors in forestry, potentially using levers such as changes to taxation, reforms to forestry grant design, public interest tests and taxation of carbon units.	4
Understanding and mitigating against path-dependency in private sector R&D.	4
When putting the Vision for Agriculture and the Agricultural Reform Route Map into practice, reform payments to farmers with a heavy emphasis on meeting net-zero and nature-positive goals. This would make subsidies heavily conditional on nature-positive (not just less harmful) activities such as conservation or rewilding. This is likely to be most effective in subsectors that are more reliant on subsidies. This subsidy reform could achieve a fairer outcome for the population as a whole, by investing public money in national natural capital. It could also offer a more inclusive way of restoring nature that involves local residents, relative to the alternative of commercial afforestation.	4
Work with all relevant agencies, including Skills Development Scotland, the Scottish Funding Council, and the Scottish Cities Alliance, to ensure action in the following areas: a better understanding of the principles of a circular economy and the identification of the skills that are required to deliver it, tree planting and peatland restoration skills development programs to scale up the number of entrants into these sector, identification of key skills gaps in the sectors critical to the transition to a nature-based economy and development of training in those occupations, supporting local authorities to remedy the technical and analytical skills gap relating to the decarbonization of buildings, developing workforce skills to build and maintain zero-emission vehicles, encouraging more students into STEM subjects throughout primary and secondary education, developing skills in "green finance" options, and providing careers advice and awareness of the green economy targeted at young people (14 to 19) and adults (25 to 44).	4
Work with Westminster to secure more finance for decarbonizing Scottish industry under the UK Government's cluster approach to decarbonization, and step up funding available for private firms to alter their internal production services and product design.	4
Advocate to the UK Government for a publicly owned clean energy generation company that would ensure that Scotland's communities reap the benefits of local natural resources rather than foreign investors – similar to EDF in France, EnBW in Baden-Württemberg (Germany), or Vattenfall in Sweden.	3
Conduct a bottom-up multi-criteria assessment of required nature investments that assesses where private investment is more or less suitable and considers alternative public funding options, to generate a clearer picture of the finance gap for nature investment.	3
Consider options for food labelling schemes to clearly show the emissions and nature impact of different foods to consumers at the point of purchase.	3
Consider options for funding nature-positive investment through progressive taxation powers that are currently available, such as the top rate of income tax.	3
Direct funding towards lower-impact forms of aquaculture, such as shellfish aquaculture and seaweed farming. Consider options for incubating local start-ups in these forms of sustainable aquaculture. There is also potential to apply stricter conditions to the Marine Fund Scotland grants, requiring that all projects address biodiversity outcomes, which would favour the aforementioned forms of aquaculture.	3
Explore how Extended Producer Responsibility (EPR), which exists in sectors such as plastic packaging, could be extended to the textile sector, with the aim of reducing the volume of textile related products consumed per capita and cutting down the waste associated with textile production.	3
Focus on imminently reducing the carbon footprint of energy-intensive industries through technologies currently available at commercial scale, including improving energy and resource efficiency, fuel switching via electrification and the use of sustainable biomass, and accelerating the substitution of carbon-intensive materials with alternatives (e.g. in construction).	3

Recommendation	Overlaps with UBF themes
Fully assess the potential for using conservation burdens to secure long-term biodiversity improvements on privately-owned land and scale up their use where possible.	3
Include a more deliberate emphasis on creating a nature-positive economy in the missions of the Scottish National Investment Bank.	3
Invest in decarbonization of the maritime sector in line with UK Climate Change Committee (CCC) recommendations, including zero-carbon fuels, vessel technologies shore power and electric recharging infrastructure at all of Scotland's major ports.	3
Invest to replicate successful models of inclusive rewilding across Scotland, building on existing good practice.	3
Setting a clear target for reduction of per capita material use and intensity. We recommend the Government adopt a similar governance approach to meeting its circular economy outcomes as it does on carbon targets. This could be done by requiring and tracking contributions towards circular economy goals from different Government portfolios, as is currently done for statutory climate targets.	3
Undertake an assessment of national land use in light of the nature-positive and net-zero missions and goals for sustainable food production, exploring the balance of different forms of farming, areas of conservation, forestry, industry and urban development to meet these missions.	3
Work with Westminster to secure powers for broader forms of taxation such as land tax, wealth tax or corporation tax, and an increase to borrowing limits and capital grants where the relevant investment is required by the net-zero and nature-positive missions.	3
Adopt a 2030 aviation demand reduction target in line with the CCC's pathways to net zero. To meet the targets set out in the updated Climate Change Plan which exceed in ambition CCC's Balanced Pathway, the Scottish Government needs to aim for a 13% reduction in aviation demand on 2019 levels as set out in CCC's Tailwinds scenario.	2
Allocate funds that are commensurable with Scotland's ambitious targets to decarbonize the building stock.	2
Assess the potential for certain nature investments to be funded through green bonds and the options for green bond issuance.	2
Cap the amount a single landowner can receive under the Scottish Forestry Grant Scheme to ensure that the funding is distributed in a way that is more compatible with a just transition.	2
Collect evidence on labour conditions in the sector, act on existing evidence through stricter enforcement and remove loopholes that exclude migrant fisheries workers from UK employment standards, so that the Fair Work First standards are implemented for all workers in Scottish fisheries.	2
Consider ways to recalibrate regulation of the sector to maximize the combined economic, social and environmental net benefit, such as redistributing a greater proportion of the fishing quota towards small-scale fishers.	2
Consult, finalize and table legislation in line with Scotland's Heat in Buildings Strategy, alongside delivery plans including adequate public investment allocation and funding for local authorities.	2
Ensure that any private investment in nature-positive projects is governed by binding criteria for social and environmental benefit such as those expressed in the Interim Principles for Responsible Investment in Natural Capital, and that the details of blended finance arrangements are subject to sufficient public scrutiny in line with the recommendations of Audit Scotland on Private Finance Initiative approaches.	2
Explore longer-term options for vesting the ownership of biological carbon in Crown Estate Scotland.	2
Fully assess the potential for using climate change burdens to secure reductions in emissions from privately-owned land and buildings and should scale up their use where possible.	2
Implement whole life carbon policies through building regulation, planning policy and infrastructure planning to encourage use of renewable construction materials and drive decarbonization of Scottish construction industry.	2
Increase funding to Forest and Land Scotland to accelerate the rate of land acquisition for afforestation and to support its other activities in nature restoration.	2
Prioritize environmental outcomes in the upcoming sectoral vision, with an outlook that frames the economic sector as existing within Scotland's ecosystems, rather than a focus on mitigating the damage from the sector or framing environmental outcomes as an added bonus to economic growth.	2
Progress with Energy Performance Certificate (EPC) reform, building on the ongoing consultation on EPC reform.	2
Provide sufficient funding to local authorities and build planning and enforcement capacity locally. This is necessary to help close the existing performance gap between predicted and actual performance of buildings. Without adequate funding at a local level, other key levers including building and heating regulation, local planning, and enforcement will fail.	2
Set resource efficiency targets for key energy-intensive and high emission industries and improve data collection to enable better monitoring of progress. Implement resource efficiency regulation in devolved areas of industry.	2

Recommendation	Overlaps with UBF themes
Switch food procurement to vegetarian food across all Scottish Government catering and explore a switch to vegan food as standard.	2
Using powers under the planned Air Departure Tax, develop and introduce a tax measure that is progressively structured to reduce unnecessary air travel in a just way. This could potentially take the form of a frequent flyer levy (if administrative and legislative circumstances allow for this) or first-flight discounts.	2
We recommend Scotland follow the example of Sweden and strongly consider consumption-based emissions in its climate change and circular economy plans. This could begin with using public money, through local and national procurement, to identify and drive down consumption emissions, subsequently expanding it to private investment.	2
Accelerate the introduction of road user demand management schemes (before 2025) to achieve the required reduction in vehicle kilometres travelled by car, and work with local councils to maximize the use of road user charging, parking permits, charges and workplace levies to disincentivize unnecessary car journeys.	1
Apply green budgeting to quantify the public spending contributing to improved biodiversity in each year's budget, with an aim to increase this as a proportion of total Scottish Government spending.	1
Continue to develop the Natural Capital Asset Index to improve its coverage of marine habitats and other important outcomes raised in assessments.	1
Continue to invest in building the scientific evidence base as a foundation for how the sector is regulated.	1
Continue working with sectoral organizations to improve consistency of practice and labelling on shelf-life.	1
Fully integrating Scotland's climate change plans with any upcoming circular economy strategy will be critical in ensuring targets, policies, their governance and delivery are aligned.	1
In addition to developing a pipeline of skilled personnel newly entering the workforce, place an equal focus on ensuring that the current workforce has the necessary skills to contribute to the net-zero, nature-positive and circular economy.	1
Incorporate the nature-positive mission into all future Scottish Government policies and strategies (starting with the targets from the forthcoming Natural Environment Bill) and assess ways to monitor this mainstreaming of biodiversity (e.g. regular reviews to check progress) and potential to set up new inter-departmental groups to improve coordination on the nature-positive mission.	1
Produce a clear timeline for the development of skilled workers, setting out the actions that are needed to deliver the necessary skills over the next 10 years.	1
Raise the level of the Land & Buildings Transactions Tax (LBTT) for agricultural and forestry land on par with the rate for residential land, and consider options for an LBTT surcharge to larger landholdings or multiple plots of land with the same owner.	1
Remove the exemption from business rates for timber companies and finfish aquaculture firms.	1
Restore and maximize use of Compulsary Purchase Order (CPO) powers to bring land into public ownership for nature restoration and restore CPO powers to Forestry and Land Scotland.	1

Global Footprint Network (GFN) recommendations

Recommendation	Overlaps with UBF themes
Implement the approach outlined in the Environment Strategy Vision and Outcomes, and the forthcoming "outcome pathways": "The Environment Strategy for Scotland's vision and supporting outcomes describe our guiding ambitions for restoring Scotland's natural environment and playing our full role in tackling the global climate and nature crises. In turn, this will help to build a stronger, more resilient economy and improve the health and wellbeing of Scotland's people. It will help to ensure we live within the planet's sustainable limits as responsible global citizens."	6
Developing skills and supply chains in Scotland: A project to examine, say, the top 10 imported inputs to Scotland as measured by value or volume to see if joint work can take place with the overseas sellers to reduce the Footprint of these inputs.	4
Education and awareness-raising campaigns to encourage behaviour change related to meal planning to combat food waste, food products' carbon footprints (e.g. seasonal and local versus imported; whole food versus processed; meats versus pulses), practical meal preparation with environmentally lighter ingredients with a focus on plant-based alternatives to meat and freshly prepared, and fast fashion – impacts, alternatives, career opportunities.	4
Opportunities for the Scottish Government's purchasing policy be adapted to give extra points to any product or service provider that includes demonstrable ways of reducing overseas footprint.	4

Encouraging increased consumption of venison as a local, low-carbon meat alternative to other red meat, aligned with existing landscape-scale ecosystem restoration projects (e.g. Cairngorms Connect, which is aiming to control excessive deer numbers that are preventing woodland regeneration) as part of a drive towards more flexitarian, sustainable diets.	3
Expand the range of indicators with those that can reveal more about the state and progress of Scotland's resource security. This could potentially be facilitated by: Verifying whether regeneration is the materially limiting factor for economies, and if so, developing robust accounts that track demand on and availability of regeneration to understand Scotland's situation in detail; and producing such accounts within Scotland or join international efforts to produce them collectively (which may be more robust and cost-effective).	3
Recommended that Scotland increases the breadth and depth of actions to tackle food waste, and sets more ambitious food reduction targets.	3
Supporting new industries with a reduced ecological footprint, for example through a project to identify, say, the next 10 new "low ecological impact industries of tomorrow" that will have much lower ecological impact, and whether there is any existing or future potential to develop any of these industries partly or fully in Scotland? The commitment in the 2023 Programme for Government to develop a Green Industrial Strategy provides an excellent opportunity for exploring this.	3
Accelerate circular economy strategies, including replacing resources with waste inputs through for example the new Scottish farming funding program that will replace the EU CAP support mechanism, and the Scottish Enterprise and Zero Waste Scotland grants programs could be targeted at supporting such innovation.	2
Could existing grants programmes run by Scottish Enterprise and Zero Waste Scotland be adjusted, in general, to provide extra incentives to grant recipients to reduce overseas ecological impact? For example, a project could get extra funding (e.g. a 10% top-up) or points awarded in project evaluation for any grant application that can demonstrate any significant type of reduction in overseas ecological impact?	2
Developing skills and supply chains in Scotland: essential that school curriculum adequately incorporates the sustainability transformation in its topics.	2
Implement eco-design and sustainable production requirements.	2
Increased use of disincentives like taxation of virgin materials and regulation of production, and financial levers such as incentivizing sustainable purchasing.	2
Investment in infrastructure for rentals, repair and recycling.	2
Investment in short supply chain, circular infrastructure, like vending machines for local produce, presents another opportunity to reduce food miles, in conjunction with more local and seasonal offerings by supermarkets.	2
Strengthening policy and funding support to the emerging vertical farming sector, including to generating alternative feedstocks.	2
The CCC has recommended a 20% reduction in the consumption of high-carbon meat and dairy products by 2030.	2
Waste management could be redesigned to benefit from maximum, and most energy efficient, repurposing of wasted materials. Circularity could be optimized by creating maximum overshoot reduction per effort. This would require improving current metrics for circularity to go beyond kilograms of material, in order to capture both the biocapacity effects of circular practices and the Ecological Footprint savings.	2
Incentivize sustainable purchasing through discounts.	1
Increased regulatory and economic levers to target the larger food value chain, for example at the packaging, distribution and supermarket levels, and to reduce the overconsumption of food.	1
Promoting localization at a higher "systems" level: implementing policy levers encouraging local consumption by households, in particular financial incentives that are known to have a strong influence on consumer choices.	1
Pursue information-based levers like ecolabelling to empower consumers to make more environmentally friendly purchasing decisions.	1
Support and promotion of vertical farming.	1
Taking models such as the Dornoch Environmental Enhancement Project (DEEP) which we understand is a partnership involving industry, NGOs and government agencies and extending them in other areas. For example, could projects such as these lead to the replacement of oyster importing, thereby reducing overseas ecological impact? Could this partnership model be applied to other impact reduction challenges?	1
The forest industry could be invited to develop a longer-term perspective on how it could serve Scottish industrial needs, including for construction materials.	1

References

Harris, M. (2023). *Policy interventions to encourage sustainable consumption* (JNCC Report 747 (Guidance report). Joint Nature Conservation Committee. https://hub.jncc.gov.uk/assets/859c5573-1f84-4122-b509-65d779489757

Kiberd, E. (2024). *Delivering the Environment Strategy Outcome on Scotland's Economy: Evidence Base and Policy Levers*. New Economics Foundation. https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2024/01/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers/documents/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers/govscot%3Adocument/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-economy-evidence-base-policy-levers.pdf

Lin, D., Wackernagel, M., Horsburgh, N., & Tyler, A. (2024). *The Environment Strategy for Scotland Delivering the Environment Strategy Outcome on Scotland's Global Footprint: Evidence Base and Policy Levers* [Independent report by Global Footprint Network]. https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2024/01/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers/documents/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers/govscot%3Adocument/environment-strategy-scotland-delivering-environment-strategy-outcome-scotlands-global-footprint-evidence-base-policy-levers.pdf

SEI & CEEW. (2022). *Stockholm+50: Unlocking a Better Future*. Stockholm Environment Institute. https://doi.org/10.51414/sei2022.011

Weitz, N., Carlsen, H., Nilsson, M., & Skånberg, K. (2018). Towards systemic and contextual priority setting for implementing the 2030 Agenda. *Sustainability Science*, *13*(2), 531–548. https://doi.org/10.1007/s11625-017-0470-0

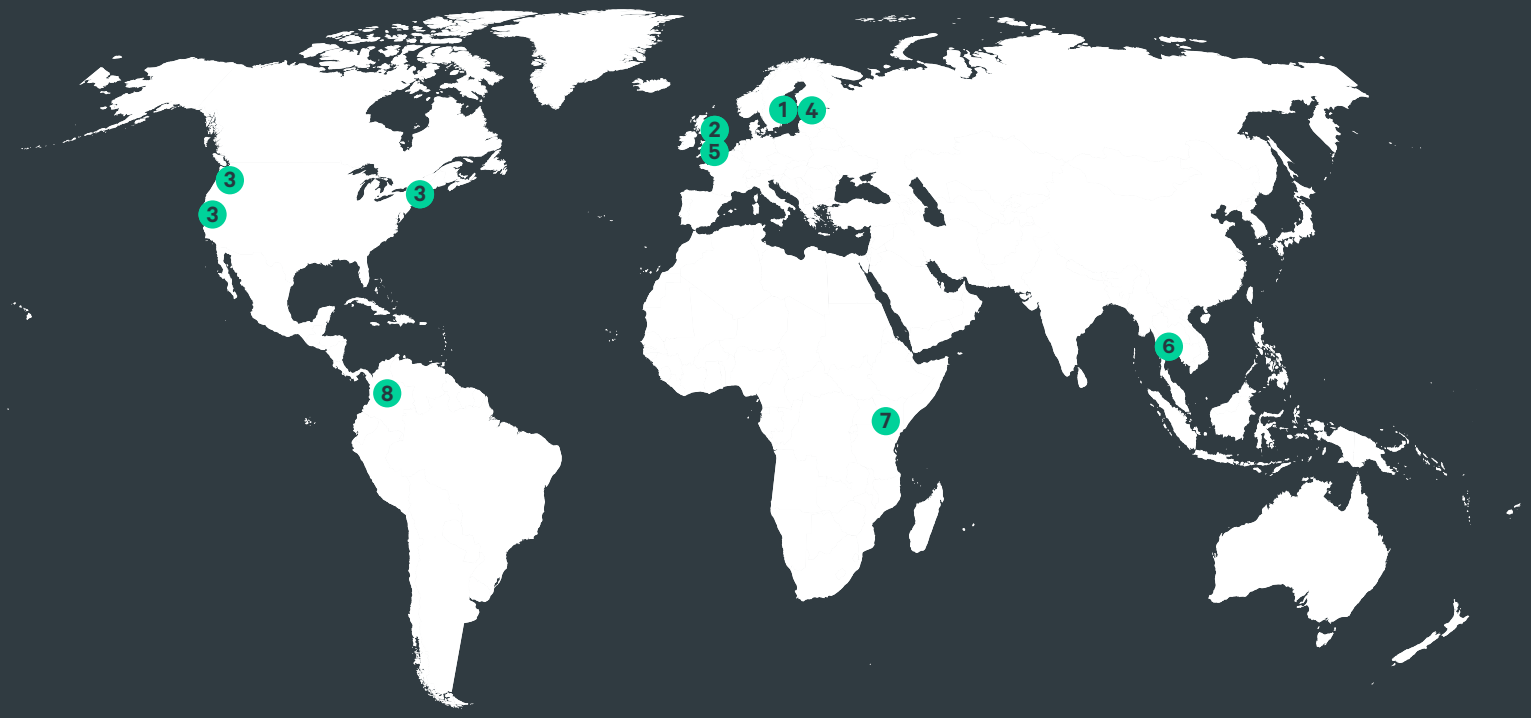
Weitz, N., Carlsen, H., & Trimmer, C. (2019). *SDG Synergies: An approach for coherent 2030 Agenda implementation* (SEI brief). Stockholm Environment Institute. https://www.sei.org/publications/sdg-synergies-factsheet/

Stockholm Environment Institute is an international non-profit research institute that tackles environment and sustainable development challenges.

We empower partners to meet these challenges through cutting-edge research, knowledge, tools and capacity building. Through SEI's HQ and seven centres around the world, we engage with policy, practice and development action for a sustainable, prosperous future for all.

Visit us at

1 SEI Headquarters 2 SEI York 3 SEI US 4 SEI Tallinn 5 SEI Oxford 6 SEI Asia 7 SEI Africa 8 SEI Latin America



SEI Stockholm Environment Institute

sei.org/contact