LSE

Grantham Research Institute on Climate Change and the Environment

Submission to the UK Ministry of Housing, Communities and Local Government

Response to open consultation on proposed reforms to the National Planning Policy Framework and other changes to the planning system

Grantham Research Institute on Climate Change and the Environment

October 2024

Grantham Foundation for the Protection of the Environment

The Grantham Research Institute on Climate Change and the Environment was established in 2008 at the London School of Economics and Political Science. The Institute brings together international expertise on economics, finance, geography, the environment, international development and political economy to establish a world-leading centre for policy-relevant research, teaching and training in climate change and the environment. It is funded by the Grantham Foundation for the Protection of the Environment, which also funds the Grantham Institute – Climate Change and the Environment at Imperial College London.
www.lse.ac.uk/granthaminstitute

About this submission

This report consists of a submission by the Grantham Research Institute on Climate Change and the Environment made in response to the open consultation by the UK Ministry of Housing, Communities and Local Government on proposed reforms to the National Planning Policy Framework and other changes to the planning system.

See details of the consultation here: www.gov.uk/government/consultations/proposed-reforms-to-the-national-planning-policy-framework-and-other-changes-to-the-planning-system

This submission draws on research and insights from across the Grantham Research Institute on Climate Change and the Environment. The response to the consultation was submitted on 24 September 2024. This version of the submission was edited by Georgina Kyriacou and Sam Kumari.

About the authors

All authors are affiliated with the Grantham Research Institute on Climate Change and the Environment. Tiffanie Chan led the preparation and consolidation of inputs for this Submission, with review from Catherine Higham and Josh Burke. Contributions are listed below according to the chapter or sub-chapter of the consultation to which they relate.

Building a modern economy: Esin Serin (Policy Fellow)

Promoting healthy communities: Lei Bian (Policy Fellow), Shouro Dasgupta (Visiting Senior Fellow), and Elizabeth Robinson (Director)

Bringing onshore wind back into the nationally significant infrastructure projects (NSIP) regime and supporting renewable deployment: Leo Mercer (Policy Analyst), Esin Serin and Josh Burke (Senior Policy Fellow)

Tackling climate change: Catherine Higham (Policy Fellow), Tiffanie Chan (Policy Analyst), Sara Mehryar (Research Fellow) and Candice Howarth (Distinguished Policy Fellow)

Availability of agricultural land for food production: Leo Mercer, with inputs from Elizabeth Robinson and Lei Bian

This submission was first published in October 2024 by the Grantham Research Institute on Climate Change and the Environment.

Suggested citation: Grantham Research Institute on Climate Change and the Environment (2024) *Submission to the UK Ministry of Housing, Communities and Local Government on the National Planning Policy Framework*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science.

Contents

Key messages

This report represents a response submitted to an open consultation that ran from 30 July to 24 September 2024 by the UK Ministry of Housing, Communities and Local Government on proposed reforms to the National Planning Policy Framework (NPPF) and other changes to the planning system.

The submission answers **questions 62–63**, **70–74**, **78** and **80–83** of the consultation. Our responses are primarily relevant to Chapters 6 (*Building a strong, competitive economy*); 8 (*Promoting healthy and safe communities*); 9 (*Promoting sustainable transport*); 14 (*Meeting the challenge of climate change, flooding and coastal challenge*); 15 (*Conserving and enhancing the natural environment*); and 17 (*Facilitating the sustainable use of minerals*).

It addresses the following issues in the consultation draft of the NPPF (the '**draft NPPF**'):

- **Building a modern economy means building a decarbonised economy. Economic policy is inseparable from environmental policy, and the NPPF should clearly reflect this principle.**
  - The proposed changes to the NPPF reflect a high-level acknowledgement of the diverse needs of a modern economy. However, the proposed changes do not sufficiently emphasise that the UK can only be a strong and competitive economy if it is a decarbonised and climate-resilient economy. The NPPF should explicitly recognise that addressing climate change presents significant economic opportunities.
  - The connection between economic policy and environmental policy should be made more explicit, as should the anticipated impacts on a wide range of sectors. For example, it could be stated upfront that the objective under Chapter 6 is heavily dependent on the UK making progress on meeting the challenge of climate change.
  - Sectors that may need particular support will depend on the forthcoming Industrial Strategy and the draft NPPF should prepare decision-makers for the implications of this strategy. Priority sectors under the strategy could include carbon capture, usage and storage (CCUS), floating offshore wind and tidal stream energy, in which the UK has particular strengths over other countries.
- **Promoting healthy communities means tackling climate change effectively. The NPPF could better support local authorities in promoting healthy communities and tackling childhood obesity by increasing its recognition of the interlinked challenges of climate change and health.**
  - Integrated action on climate change mitigation, adaptation and resilience could enable the UK to reap significant health and economic co-benefits of net zero transition in four critical areas: reduced air pollution, active travel, healthier low-carbon diets and urban greening.
  - To support such integrated action on climate change and health, the draft NPPF should prioritise: nature-based solutions, climate resilience, and building resilient domestic food systems that emphasise affordable healthy diets.
  - Encouraging healthier behaviours and physical activity through spatial planning could improve resilience to climate change impacts on older people and younger children at the community level. This could make more resources available for health and social spending to be used for investments in building climate-resilient, safe and age-friendly communities.
- **The NPPF should support actions that would enable large onshore wind projects to be brought online as quickly as possible, as long as they are sited in appropriate locations following consideration of their wider environmental impacts (including on biodiversity and land use).**

  - The reintegration of onshore wind into the nationally significant infrastructure projects (NSIP) regime is only desirable if it leads to faster approvals. This could be facilitated by the selection of a proper threshold for defining large projects and by adequate staffing to facilitate the NSIP regime.
  - The proposed changes to give greater support to renewable and low-carbon energy are welcome. However, expansion of renewables must occur alongside the acceleration of the development and approval of complementary infrastructure, including transmission, distribution, flexible demand systems and storage. This could be acknowledged by adding a consideration of the need for such infrastructure to paragraph 164 of the draft NPPF.
  - There could be benefits to specifying that planners should explicitly consider the impacts on biodiversity and carbon sequestration capacity when identifying suitable sites for renewable and low-carbon energy sources.

- **Climate change considerations need to be more strongly integrated within the NPPF, with tests and guidance emphasising the need for consistency between planning policy and obligations under the Climate Change Act 2008 (CCA). This includes:**
  - Requiring plans to be developed in a manner consistent with climate mitigation and adaptation policies and programmes developed under the CCA, and providing more detailed guidance on how to do so either in the NPPF or in subsequent documentation.
  - Ensuring that planning authorities consider climate change mitigation and adaptation holistically and in an integrated way where relevant, to avoid the potential for maladaptation and malmitigation.
  - Expanding the level of detail on the need to address heat risk.
  - Improving the approach to addressing flood risk, such as through stronger integration of climate change projections in planning decisions, tighter controls on development in flood-prone areas, mandatory sustainable drainage systems in all new (particularly urban) developments, and strengthening cross-boundary flood risk management.
- **For the NPPF to effectively contribute to the achievement of sustainable development, it should enable planning decisions to prioritise climate mitigation, adaptation and resilience outcomes. This could include:**
  - Explicitly referring to enabling climate-smart agriculture and investments in agrivoltaics in paragraph 86(b) of the draft NPPF.
  - Expressly recognising that a 'vision-led' approach to promoting sustainable transport modes (as proposed) prioritises promoting cycling infrastructure.
  - Revising the sections on coal, oil and gas in Chapter 17 to better reflect climate change pathways and priorities, and the need for a just transition.
  - Clarifying that the mandate for minerals authorities to encourage CCUS should differentiate between the different types of CCUS and its use for different purposes.
- **Land use will increasingly need to be multifunctional to address climate change:**
  - The supply of land devoted to conventional agriculture will change over the medium term in the UK. How the NPPF treats development on agricultural land should take account of incidental benefits, whether in terms of agricultural emissions abatement or provision of clean electricity.
  - Chapter 15 of the draft NPPF could incorporate the principle that wherever possible, rural land use development should be multifunctional to support both environmental and food security objectives.

Building a modern economy

Question 62: Do you agree with the changes proposed to paragraphs 86(b) and 87 of the existing NPPF?

Economic policy is inseparable from environmental policy, and the planning framework should clearly reflect this principle. Language should be included to show that the list of priority facilities mentioned in the draft NPPF is non-exhaustive, and that there are other facilities that will also be required to build a competitive, decarbonised, modern economy.

The proposed changes to the NPPF promise greater alignment between the Government's growth objectives and the operation of the planning system, which is to be welcomed. The additions reflect a high-level acknowledgement of the diverse needs of a modern economy. However, the proposed changes do not sufficiently emphasise that the UK can only be a strong and competitive economy if it is a decarbonised and climate-resilient economy. This would be helped by an upfront statement in the draft Chapter 6 clarifying that its objective of "building a strong, competitive economy" is heavily dependent on the UK making progress on its parallel objective of "meeting the challenge of climate change, flooding and coastal change" under Chapter 14. It should also recognise that addressing climate change presents significant economic opportunities.

The draft text of Chapter 6 currently includes only a few references to the need to decarbonise the economy to modernise it. For example, it states that planning policies should identify strategic sites for gigafactories (i.e. battery cell manufacturing plants) to meet the needs of a modern economy. It also mentions grid connections as a type of infrastructure that will be needed to support the growth of knowledge and data-driven, creative and high-tech industries. It recognises the specific locational requirements of activities relating to transport innovation and decarbonisation. However, decarbonisation is essential not just for transport but for all sectors of the economy. While improving grid connections is a prerequisite for decarbonising sectors where electrification is the primary solution, other sectors, such as heavy industry and heavy goods transport, will require access to different types of infrastructure, such as CO_2 transport pipelines and hydrogen fuelling stations, respectively.

Although the draft NPPF is not wrong to highlight the types of facilities it does as key elements of a modern economy, providing a narrow list of examples may hinder future efforts to operationalise the UK's new industrial strategy and support the country's sustainable economic growth more broadly. The NPPF cannot be reasonably expected to list all types of infrastructure that may be relevant to these objectives, but it could better emphasise that the examples provided under the proposed amendments are not intended as an exhaustive list, and that a broader view will be required to support a clean, strong and competitive UK economy.

Overall, the infrastructure and facilities necessary to enable the UK economy to decarbonise and capture industrial opportunities should be given more explicit recognition in the NPPF. This should be accompanied by an acknowledgment of the diverse forms that such infrastructure and facilities may need to take in different sectors. This will help ensure that the Government can fully capitalise on the synergies between its economic growth and clean energy missions. It will also minimise the possibility of the planning system acting as a barrier to decarbonisation.

The following summary of evidence on the interrelationships between the UK's economic and environmental objectives is provided to support the recommendations above:

With timely investment and the right set of coordinated policies in place, the UK can achieve economic growth while also delivering a clean energy system and environment. These goals are complementary (Zenghelis et al., 2024; Serin et al., 2022). Delaying the investment for the clean transition will undermine the economy's productivity, resilience and competitiveness, and risk the loss of UK jobs and access to fast-growing global markets (Zenghelis, 2024). Analysis by the Climate Change Committee (CCC) has estimated that the actions required to meet the Sixth Carbon Budget could deliver a boost to GDP of around 2% by 2030, alongside a 1% increase in employment (CCC, 2020).

This growth opportunity can be characterised by the following factors:

- **Switch from high- to low-carbon technologies**. Many low-carbon technologies are more efficient and thus cheaper to run than their fossil fuel counterparts. For example, electric vehicle drive systems have 15–20% energy loss, compared with 64–75% for petrol cars. Furthermore, certain clean technologies have become significantly cheaper in recent decades, while the real price of fossil fuels has remained roughly constant for more than a century (Way et al., 2022). Widespread use of clean technology will also shield the UK from the volatility of global fossil fuel markets. In contrast, if the UK continues its dependence on gas at the current level, recurring gas price spikes could add around 13% of GDP to public debt by 2050, according to the Office for Budget Responsibility (2023).
- **Health co-benefits.** The transition to clean technologies (in particular, the adoption of public and electrified transport powered by renewable energy) is in line with objectives to reduce traffic congestion and air pollution. These problems present a threat to people's wellbeing and limit productivity, with air pollution costing the National Health Service and businesses more than £20 billion each year (Royal College of Physicians, 2018).
- **Innovation and industrial opportunities.** The UK is well placed to tap into growing global demand for clean products and services. It is a hub for finance and services, including consultancy, engineering and design, which are central to delivering decarbonisation projects, and boasts an innovative economy with technological specialisms in many areas that are seeing rapid growth globally, such as offshore wind and carbon capture, usage and storage (CCUS) (Curran et al., 2022). Further investment in these innovative technologies can unlock export opportunities along with productivity-enhancing spillover effects into other sectors. Ramping up net zero capabilities across the UK could enable growth and the creation of good jobs at the national level, and also help address regional economic disparities. This conclusion is supported by various datasets analysed by the Centre for Economic Performance and the Grantham Research Institute at LSE (Curran et al., 2022).

Question 63: Are there other sectors you think need particular support via these changes? What are they and why?

Yes, the sectors that may need particular support will depend on the forthcoming Industrial Strategy and the draft NPPF should prepare decision-makers for the implications of this strategy.

There may well be other sectors that should receive particular support via these changes in line with the UK's forthcoming new Industrial Strategy. For example, our research has demonstrated significant UK strengths over other countries in clean technologies like CCUS, floating offshore wind and tidal stream energy, which could be prioritised under this new Strategy (Serin and Andres, 2024).

Introducing a new Industrial Strategy was among the Government's manifesto pledges to support its mission to kickstart economic growth (Labour Party, 2024). The commitment to introduce a new strategy, to be supported by the establishment of an Industrial Strategy Council, has since been reiterated by the Prime Minister in the briefing documents of the King's Speech which sets out the legislative priorities of the Government (Prime Minister's Office, 2024).[1] Indeed, as we have also previously argued, a clearly-signalled Industrial Strategy should be developed and operationalised as soon as possible to ensure the UK is able to capture economic opportunities from the growing domestic and international demand for the technologies and services of the 21st century (Brandmayr et al., 2024). The planning system should enable the rapid and effective implementation of this strategy. The draft NPPF should therefore explicitly refer to the

[1] Since this submission was made, the Government has published its green paper on a new Industrial Strategy for the UK, and formally committed to publishing the final Industrial Strategy in spring 2025. For further information, see 'Invest 2035: the UK's modern industrial strategy' (Department for Business and Trade, 2024).

forthcoming strategy and prepare decision-makers throughout the planning system for the likely implications it will have on their thinking and processes.

The sectors mentioned above (i.e. CCUS, floating offshore wind and tidal stream energy) could be priority sectors in a new Industrial Strategy, with the Government's clean energy mission at its core. Realising the economic opportunities presented by these sectors will come down to the availability of a range of enabling infrastructure. For example, the successful demonstration and operation of CCUS technologies depends on CO_2 transport and storage infrastructure, while the development of floating offshore wind and tidal stream energy will require access to suitable ports and offshore testing facilities. Decision-makers throughout the planning system should be open-minded to supporting such diverse kinds of infrastructure where these demonstrate potential to support the UK's economic objectives.

Just transition principles also need to be embedded at the centre of the Industrial Strategy and mainstreamed through the NPPF. Delivering a fair and orderly transition away from fossil fuels to these priority sectors requires proactive planning to anticipate the implications of a new Industrial Strategy and carefully manage the economic transformation in a way that maximises the opportunities and minimises the risks for workers and communities, including through dialogue with affected stakeholders (Selvaraju and Robins, 2024).

Promoting healthy communities

Question 70: How could national planning policy better support local authorities in (a) promoting healthy communities and (b) tackling childhood obesity?

The draft NPPF could better support local authorities in promoting healthy communities and tackling childhood obesity by increasing its recognition of the interlinked challenges of climate change and health. Increased priority should be given to nature-based solutions, climate resilience, and building resilient domestic food systems that emphasise affordable healthy diets.

Tackling climate change has been described as the greatest opportunity for the health of both people and the planet in the 21st century. Air pollution, unhealthy diets and physical inactivity are all drivers of climate change, as well as major risk factors for non-communicable diseases (NCDs), such as cardiovascular and respiratory diseases. Climate change and air pollution are also both drivers of biodiversity loss that worsen physical and mental health, including through reduced access to green spaces. Integrated action on climate change mitigation, adaptation and resilience could enable countries to reap significant health and economic co-benefits of the transition to net zero in four critical areas: reduced air pollution, active travel, healthier low-carbon diets, and urban greening (Robinson, 2023). These interventions can take pressure off national health services from the growing incidence of NCDs, contributing to improved health and population resilience to climate change, while accelerating net zero goals.

To support integrated action on climate change and health, the draft NPPF should prioritise:

1. Nature-based solutions. The role of nature-based solutions is critical in tackling climate change that brings significant health co-benefits. For example, urban green spaces can provide cooling and mental wellbeing benefits and contribute to carbon sequestration (ibid.). The Environment, Food and Rural Affairs (EFRA) Committee has called on local authorities to urgently invest in urban green spaces (UK Parliament, 2024). Evidence suggests that £5.5 billion per year of investments in urban green spaces could yield significant health co-benefits worth £200 billion for nearly one-third of the UK population, through reduced pressure on local health services and improved quality of life (National Trust, 2020).

   However, funding has been identified by the EFRA Committee as a significant challenge in the UK, particularly given that local councils are primarily responsible for allocating budget

and funding to their statutory responsibilities. An improved understanding of human and ecological health benefits of urban green spaces has the potential to contribute both to addressing funding shortfalls in green infrastructure and taking a more integrated approach to climate change mitigation and adaptation. For example, increased investments in high-quality parks and urban green spaces could alleviate impacts of heat stress and air pollution on vulnerable populations, reducing health and social inequalities (Romanello et al., 2023); improve mental health and wellbeing through encouraging physical activity and recreational activities; enhance biodiversity and contribute to sustainable tourism (Parks Management, 2023); and increase opportunities for carbon sequestration. It is particularly important that planning authorities know how to assess these benefits in a holistic way, to support more comprehensive decision-making on spatial planning that might contribute to a reallocation of resources into nature-based infrastructure investments.

2. Climate resilience. Increasing resilience to climate change impacts such as heatwaves should be a priority for planning policy, to support the objective of promoting healthy communities. About 3 million of the UK's elderly people living in older buildings are at the greatest health risk from extreme heat (Centre for Ageing Better, 2024). Interventions in adapting the design of buildings, with an increased focus on residential care homes and other social services homes, combined with adaptation investments in early warning systems, can reduce heat-related mortality in older people. Additional short-term climate mitigation measures that improve air quality during periods of extreme heat can also improve the health of the labour force and support productivity. (See further discussion on addressing heat risk in the NPPF in the answer to Question 78 below.)

3. Improving food security and nutrition in a changing climate. Food security in the UK is already threatened by the increasing severity and frequency of heatwaves and extremes of precipitation due to climate change, which are impacting domestic and overseas food production and prices, and thus labour supply, productivity and health (Dasgupta and Robinson, 2022; Robinson et al., 2023). Increased food prices due to climate shocks disproportionately affect lower-income households in the UK, reducing their ability to afford fresh fruit and vegetables and encouraging the purchase and consumption of foods that are cheaper with lower nutritional value, which will put more children at risk of malnutrition and undernourishment (Royal College of Paediatrics and Child Health, 2023). Unhealthy diet is among the major risk factors for worsening child health outcomes through an increase in the prevalence of obesity (ibid.). Nearly a quarter of primary school children in England are living with obesity, which imposes a considerable fiscal burden on the health and care system (Department of Health and Social Care, 2023). Given that 46% of food in the UK is imported, our research demonstrates the importance of factoring climate risks into building domestic resilient food production and supply chains, with a key focus on increased affordability and access to fresh fruit and vegetables (Robinson et al., 2023). Spatial planning through the NPPF should reflect this priority.

Question 71: Do you have any other suggestions relating to the proposals in this chapter?

Our research has stressed the importance of promoting healthy ageing across the life course as an important climate adaptation and resilience strategy (Bian and Robinson, 2023). For example, emerging evidence shows that the combined impacts of extreme heat and air pollution disproportionately increase the number of deaths in older people. Moreover, less healthy people are less resilient to extreme heat. Encouraging healthier behaviours, such as physical activity, walking and cycling, and healthy eating, through spatial planning could potentially improve the UK population's resilience to climate change impacts in older people and younger children at the community level. This could make more resources available for investments in building climate-resilient, safe and age-friendly communities. Opportunities to further mainstream climate change considerations into the sustainable transport section of the NPPF are discussed further in the response below to Question 81.

Onshore wind and supporting renewable deployment

Question 72: Do you agree that large onshore wind projects should be reintegrated into the NSIP regime?

The reintegration of onshore wind into the Nationally Significant Infrastructure Projects (NSIP) regime is only desirable if it leads to faster approvals. This could be facilitated by the selection of a proper threshold for defining large projects and by adequate staffing to facilitate the NSIP regime.

We support actions that would enable large onshore wind projects to be brought online as quickly as possible, as long as they are sited in appropriate locations following consideration of their wider environmental impacts (including on biodiversity and land use). Onshore wind is one of the cheapest forms of electricity generation in the UK (DESNZ, 2023). The Government has committed to doubling onshore wind capacity by 2030 (from around 15 GW today) (Ministry of Housing, Communities & Local Government et al., 2024). This is in line with the advice of the CCC in its 2024 *Progress Report to Parliament*, which also included a recommendation for planning barriers on onshore wind development to be removed (CCC, 2024). Increasing the share of onshore wind in the UK's energy mix is in line with the objectives of reducing energy bills, enhancing energy security, reducing dependence on gas imports and working towards net zero emissions by 2050. These provide the grounds for large onshore wind projects to be considered within the scope of nationally significant infrastructure.

However, the reintegration of onshore wind into the NSIP regime cannot be viewed as an end in itself: what matters is whether this leads to faster approvals for projects. Even though implementing this change would reduce the likelihood that applications are refused, reported experience suggests that the NSIP process takes considerably longer than planning decisions delivered at the local level (Murray, 2024). In fact, an operational review of the NSIP regime in 2021 highlighted that the time for a decision to be made on an NSIP had increased from 2.6 years in 2012 to 4.2 years in 2021 (Pincher, 2021). Several reforms have since been made to accelerate the process, which have been largely welcomed by developers of relevant infrastructure, but further action is likely necessary, as recommended by the National Infrastructure Commission (Rankl, 2024). Therefore, while the reintegration of onshore wind into the NSIP regime appears desirable in theory, it will only deliver the faster approvals intended if it is accompanied by the selection of a proper threshold (determined through consideration of industry input collected in the current consultation) and further measures (including sufficient staffing and resourcing) to accelerate the NSIP process itself.

Public support for onshore wind in the UK is high, as demonstrated by the DESNZ Public Attitudes Tracker of spring 2024 (DESNZ, 2024a). However, people appear more supportive of the development of onshore wind in principle than they are of the idea of hosting it in their immediate vicinity. In the survey, 77% of respondents expressed support, in general terms, for the use of onshore wind. This compares with 43% who stated that they would be happy for an onshore wind farm to be built in their local area (with 13% stating they would not be happy and 28% stating no preference either way). Accordingly, in order to ensure continued public support, planning decisions should be made with an acknowledgment that the development of large-scale onshore wind will bring significant benefits at the national level but may cause some level of disruption for residents at the local level. Effort should be made to minimise any disruption and complementary measures such as discounts on energy bills and provision of local facilities like libraries and community halls should be considered to compensate affected residents.

Question 73: Do you agree with the proposed changes to the NPPF to give greater support to renewable and low carbon energy?

We welcome the current changes to the draft requiring local authorities to support applications for renewable energy projects.

The Government has set ambitious targets for renewable energy development by 2030. These include targets to increase onshore wind generation to 35GW from a base of 15GW and to increase offshore wind generation to 55GW from a base of 14.7GW (Renewable UK, 2024). For solar PV generation, the target is 50 GW from a baseline of 16.9 GW (DESNZ, 2024b). Meeting these targets will be challenging and relies upon successfully reducing the time it takes projects to receive planning approval, complete construction and connect to the grid. Recent estimates indicate projects wait an average of five years to connect to the grid in addition to there being multi-year delays to planning approval (DESNZ, 2024c). We believe that the removal of footnotes 58 and 59 in addition to the added text in paragraph 164 will support the achievement of the ambitious targets highlighted.

The UK's heavy dependence on natural gas and inefficient housing made it particularly vulnerable to the surge in energy prices after Russia's invasion of Ukraine. This led to severe impacts on household budgets and a 66% rise in the average fuel poverty gap from 2020 to 2023, worsening conditions for those already in fuel poverty (DESNZ, 2024d). Transitioning the energy mix away from fossil fuels, electrifying end uses and improving efficiency will boost resilience and allow the UK to more easily seize growth opportunities afforded by the net zero transition (Zenghelis et al., 2024). On the other hand, delaying the transition will extend the UK's exposure to volatile oil and gas markets and potential future price shocks; risk the loss of UK jobs and access to rapidly growing clean technology markets; and lead to higher costs and disruption further down the line, given the necessity to deliver net zero emissions by 2050 (Valero, 2024). It is important that in supporting renewable energy, the NPPF also encourages a just and orderly transition. This requires an approach that accounts for the employment and social impacts on workers and communities currently dependent on the oil and gas industry, but also anticipates and proactively plans for potential economic opportunities (Chan et al., 2024).

For these reasons, we are supportive of facilitating approvals for established renewable and low-carbon energy sources such as solar PV, onshore wind and offshore wind along with newer technologies such as floating offshore and tidal stream energy. However, expansion of these renewables must occur in tandem with the acceleration of the development and consent processes for complementary infrastructure, including transmission, distribution, flexible demand systems and storage sites. This could be acknowledged by adding a consideration of the need for such infrastructure to paragraph 164 of the draft NPPF.

Question 74: Some habitats, such as those containing peat soils, might be considered unsuitable for renewable energy development due to their role in carbon sequestration. Should there be additional protections for such habitats and/or compensatory mechanisms put in place?

We believe there are benefits to specifying in the draft NPPF that when identifying suitable sites for renewable and low-carbon energy sources, planners should explicitly consider impacts on biodiversity and carbon sequestration capacity.

In principle, peatland soils should not be encroached upon. Degraded peatland contributes around 3–4% of the UK's total annual emissions (Evans et al., 2017). There is a critical need to protect existing intact peat and begin a national restoration process in line with targets, e.g. those in the Environmental Improvement Plan (EIP). In England, there is a target to increase the peatland restoration rate to 32,000 ha per year by 2026. The rate increased to 12,700 ha in 2023 but is evidently far off the Government's target and the CCC's balanced pathway target of restoring more than 50,000 ha/annum (CCC, 2024).

We support the strengthening of paragraph 161 that states a requirement for plans to identify sites for renewable energy. However, to address the challenge highlighted above, this section could benefit from noting that decision-makers should make efforts to select sites where negative impacts on biodiversity and carbon sequestration capacity can be avoided or minimised. More explicit cross-referencing to Chapter 15 may also be desirable, along with noting that any impacts on resilience to climate change should also be considered (see further discussion in response to Question 78).

Tackling climate change

Question 78: In what specific, deliverable ways could national planning policy do more to address climate change mitigation and adaptation?

The language of the NPPF can be tightened to require plans to be consistent not only with the broad objectives of the Climate Change Act (CCA) but also with the mitigation policies and adaptation programmes developed to meet the requirements of the CCA.

Reform of national planning policy to ensure consistency with the UK's climate commitments has repeatedly been one of the Climate Change Committee's priority recommendations (see 2023 and 2024 Progress Reports). Specifically, the CCC has recommended the Government review and update the NPPF to "ensure that Net Zero outcomes are consistently prioritised throughout the planning system, making clear that these should work in conjunction with, rather than being over-ridden by, other outcomes such as development viability" (Recommendation 2023-155). In July 2024's *Progress Report*, the Committee scored "no progress" against this recommendation.

We recommend that the draft NPPF explicitly recognise the need for public authorities, including the relevant Secretary of State, Planning Inspectorate and local planning authorities, to align planning decisions with targets and carbon budgets set, and climate policies and adaptation programmes produced, under the CCA.

The current NPPF states that plans should take a "proactive approach" to mitigating and adapting to climate change, in line with the "objectives and provisions of the Climate Change Act 2008" (in a footnote to paragraph 159 of the draft NPPF). Section 19(1A) of the Planning and Compulsory Purchase Act 2004 currently also requires development plans, developed by local authorities, to include policies designed to "secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change". The NPPF must be taken into account in preparing development plans.

Explicitly recognising a requirement for local planning authorities to align decisions with policies prepared under Section 13 of the CCA, and the need to contribute to the delivery of short- and long-term emission reduction targets and climate adaptation programmes, would help clarify the application of paragraph 159. This would support local authorities to fulfil legal obligations under the Planning and Compulsory Purchase Act 2004.

Our research suggests that giving public bodies, including planning authorities, a mandate to operate in a way that is aligned not only with climate goals but also with climate plans and policies can have significant positive benefits for climate action (Averchenkova et al., 2024a; 2024b). In particular, our study of Ireland's regulatory framework found that strong legally binding language requiring decisions by public bodies to be "consistent with" the climate action plan was associated with impacts on strengthening accountability and engagement from key sectors (Averchenkova et al., 2024a). The current NPPF does not explicitly recognise that to be "in line with the objectives and provisions" of the CCA; planning policies and decisions must also be **consistent with** climate policies and adaptation programmes.

To further inform local planning authorities, either in the NPPF or subsequent planning practice guidance, additional clarification on how to align plans with the CCA could include:

- **Explicitly providing for a strong presumption in favour of repurpose and reuse of buildings.** This 'retrofit first' approach to interpreting and applying paragraph 159 has been highlighted in previous planning decisions (see Dehon and Clapp, 2023). Paragraph 158 of the draft NPPF only states that the planning system, among other climate objectives, "should help to... encourage the reuse of existing resources, including the conversion of existing buildings".
- **Setting out clear guidelines on how applicants may need to describe the significance of the proposed development on mitigation and adaptation to climate change.** Paragraph 160 of the draft NPPF provides little detail on how planning authorities should take climate change into account to achieve adaptation and mitigation objectives. By contrast, paragraph 200 provides detail on information required to assess the significance of any heritage assets affected by development plans. Research by the Centre for Sustainable Energy and Town and Country Planning Association (2023) has previously suggested that the lack of clarity (in comparison to other priority areas like housing) has posed barriers to prioritising climate in local plans (CCC, 2023).

The NPPF's contribution to the UK's climate change response could be strengthened by ensuring that adaptation and mitigation are not treated in silos.

Mitigation and adaptation strategies have historically been developed separately, and this continues today. The climate is already changing and integration of adaptation and mitigation in policy and practice is now urgently needed. The design and implementation of adaptation and mitigation in isolation is not cost-effective, does not reflect their multidimensionality and complexity, can lead to a range of social barriers, and can even result in maladaptation and unintended consequences (Howarth and Robinson, 2024; Howarth, 2024). This could contribute to a range of inefficiencies occurring alongside policy incoherence. For example, rapid investment in solar or onshore wind could result in habitat disruption and reduce ecosystem resilience if sites are not carefully selected.

Some options for tackling climate change already integrate adaptation and mitigation and offer co-benefits. For instance, investment in urban green spaces (e.g. green roofs, urban trees) offers the potential triple dividend of carbon sequestration, cooling and improved biodiversity. Similarly, adopting more balanced low-carbon diets combined with climate-smart agriculture (such as climate-resilient crop varieties, agroforestry, and reduced-methane livestock farming) could not only decrease emissions from food systems but also increase the climate resilience of food production and security.

Integration of adaptation and mitigation actions also helps mitigate potential conflicts between the two. For example, as discussed further below, heat risk and overheating is a growing issue globally, with a range of countries, including the UK, unprepared for projected future increases in temperature extremes. To adapt to the ambient temperature, many countries have utilised energy-intensive cooling technologies (such as air conditioning), but these technologies can lead to increased emissions and increase local ambient heat, further increasing overheating. Policies have traditionally focused on insulating buildings to keep them warm in the winter while reducing electricity demand; if these measures are installed properly, with adequate ventilation, they can also help to reduce the risk of overheating while simultaneously reducing energy costs.

To better reflect this need to consider adaptation and mitigation together, the draft NPPF could be strengthened by including a reference to the need to consider synergies and trade-offs between climate mitigation and adaptation measures: in paragraph 20 on the development of strategic policies, and in paragraph 160, where adaptation and mitigation are currently treated as distinct. Approaches that incorporate both mitigation and adaptation co-benefits should be prioritised in plans and by planning authorities.

The NPPF should explicitly include reference to the need for new developments to be resilient to heat risk. Although heat risk is mentioned in paragraph 159, this reference is currently insufficient given the magnitude of the challenge.

2022 was the warmest year on record in the UK, and 2023 the second warmest. On 19 July 2022, the UK experienced temperatures over 40°C for the first time, and there were five heat periods that summer leading to almost 3,000 heat-related deaths in England, the highest number since the introduction of the Heatwave Plan for England in 2004. Without adaptation, and under a high emissions scenario, UK heat-related deaths are estimated to increase by almost 166% (4,266 total deaths per year) in the 2030s, 580% in the 2050s (10,889 total deaths per year), and 1,244% (21,545 total deaths per year) in the 2070s, above a 2007–2018 baseline (Howarth et al., 2024).

Historically, the UK has not experienced extreme high temperatures like those seen in 2022 and it is not prepared for such hazards. Over half of the building stock is already at high risk of overheating, even outside heatwave periods, and is not equipped to withstand the impacts of extreme heat (Howarth et al., under review). Moreover, efforts to keep buildings and homes warm in the winter can lead to unintended overheating impacts outside the winter months. Heat also affects productivity and educational attainment; the current costs of heat exposure to the UK economy are estimated at £260–300 million per year, projected to increase to up to £950 million per year by 2050 (ibid).

Policies directly and indirectly related to the UK's response to heat are fragmented and do not adequately address the severity and urgency of this risk, particularly when temperatures exceed those experienced in summer 2022. There is a governance gap on managing the risk of extreme heat, with no clear coordination between policies or across government departments, at local, regional and national scales. While implementing an integrated response is challenging, it is vital that this is prioritised by government, and those driving responses, given the urgency of preparing for heat risk. There are significant economic benefits to accelerating adaptation and value for money to be gained from many early adaptation investments, such as heat alerts and heatwave planning, capacity-building and making new infrastructure resilient (Howarth et al., under review).

Question 80: Are any changes needed to policy for managing flood risk to improve its effectiveness?

There are five key ways in which the section of the NPPF on managing flood risk could be improved. These include:

1. **Stronger integration of climate change projections.** The NPPF could incorporate more robust requirements for local planning authorities to account for the long-term impacts of climate change, particularly sea level rise, extreme weather events, and changes in rainfall patterns. This would involve requiring the use of up-to-date climate projections in planning decisions and mandating adaptive measures in all flood-prone areas. Rözer and Surminski (2021) analysed the changes in flood risk exposure of recently built homes under different future climate scenarios. They found that a disproportionately higher number of homes built in poorer areas of England and Wales between 2008 and 2018 are expected to end up in high flood-risk areas over their lifetime due to climate change. This highlights the crucial role of spatial planning that accounts for climate change scenarios and impacts in managing and adapting to current and future flood risks.
2. **Tighter controls on development in flood-prone areas.** While the NPPF restricts inappropriate development in flood zones (e.g. paragraph 173), the lack of clarity in exceptions has allowed building in areas at significant risk. Between 2001 and 2014, 12% of new residential developments were on floodplains, with 25% of these located in medium- or high-risk areas (CCC, 2015). Additionally, 120,000 new homes built between 2008 and 2018 are in high-risk flood zones in England and Wales, including areas prone to surface water flooding, as well as flooding from rivers and the sea (Rözer and Surminski, 2021). Moreover, the annual rate of development in high-risk floodplain areas is higher than the national average (Surminski et al., 2020; Crick et al., 2018). These findings indicate that, despite current restrictions under the NPPF, development on floodplains continues at a significant rate. Introducing more strict and rigorous exceptions and reassessing the

application of the 'Sequential Test' (which directs development away from high-risk areas) could limit construction in flood zones unless essential.

Currently, the NPPF allows certain 'essential' developments to be built in flood-prone areas if there are no feasible alternatives. However, this definition of 'essential' can be too broad, leading to potentially risky developments in high-risk flood zones. Stricter criteria should be applied to define 'essential' developments, ensuring only critical infrastructure is built in high-risk areas, and only with strong flood mitigation measures in place. Housing developments in flood zones should be particularly avoided unless no alternatives exist, and robust flood defences should be mandatory if building in such areas. The current policy permits development in areas at risk of flooding, provided mitigation measures are incorporated; however, evidence suggests this does not occur for all developments (CCC, 2021).

In addition, the Exception Test within the NPPF allows development in flood zones if the benefits (such as economic or social gains) outweigh the risks. While this flexibility can promote necessary developments, it sometimes leads to excessive risk-taking. Reassessing how and when the Exception Test is applied is needed. Developers should also be required to thoroughly evaluate alternative sites and consider the cumulative impact of multiple developments on flood risks. Additionally, incorporating natural flood management strategies, such as wetlands and green infrastructure, should be mandatory for any development in flood-prone areas to enhance resilience.

3. **Enforcement of protecting natural floodplains.** The draft NPPF should prioritise the protection and restoration of natural floodplains, which act as natural flood defences. Strengthening the requirement for developments to avoid floodplains or mitigate impacts (such as requiring compensatory flood storage) would help reduce flood risk downstream. A 'no net loss' policy, aiming to balance or outweigh the negative impacts on biodiversity from a development project, could limit development in high-risk areas while encouraging natural flood management techniques. Such natural solutions offer a flood management approach with several co-benefits beyond the reduction of risks (Molnar-Tanaka and Surminski, 2024).
4. **Mandatory green infrastructure and sustainable drainage systems (SuDS).** Although SuDS are encouraged for major developments (e.g. paragraph 175), the NPPF could make them mandatory in all new developments, particularly in urban areas. Currently, SuDS are only required for developments of 10 homes or more and planning authorities must ensure that arrangements are made for future maintenance of SuDS over the lifetime of a development (Surminski et al., 2020). The new policy could specifically mandate SuDS in urban areas, where the risk of surface water flooding is greatest, and not only for large developments. It could also specify that SuDS must provide co-benefits (water management, ecological and recreational). Another enforcement option could be to extend the role of SuDS Approval Bodies (SABs) – currently required only in Wales (Natural Resources Wales, 2022) – across the UK. SABs ensure that SuDS proposals meet certain standards and are properly maintained. Making this process a legal requirement for all developments would further ensure compliance. The Government announced that this would become mandatory for most developments in England from 2024, yet it is not reflected in the draft NPPF. Additionally, in England, the long-term maintenance of SuDS is less clearly defined, often leaving it up to developers, local authorities or property owners to manage. This lack of clarity can result in poorly maintained systems that may fail to function as intended.
5. **Strengthening cross-boundary flood risk management.** Flood risk management often spans across local authority boundaries. The draft NPPF could be updated to require better coordination between authorities, agencies (like the Environment Agency), and stakeholders for managing flood risk across regions. Strengthening this cooperation, especially in areas with multiple jurisdictions, could prevent fragmented flood management strategies.

Question 81: Do you have any other comments on actions that can be taken through planning to address climate change?

Climate change considerations should be mainstreamed into the definition of sustainable development in the NPPF and across related chapters. The sections on coal, oil and gas in Chapter 17 in particular should be revised to better reflect climate change pathways and priorities, and the need for a just transition.

Paragraph 7 of the NPPF articulates clearly that the purpose of the planning system is to contribute to the achievement of sustainable development. This objective of sustainable development is then defined with reference to the principle of intergenerational justice, i.e. "meeting the needs of the present without compromising the ability of future generations to meet their own needs". Addressing climate change is central to securing intergenerational justice (Wang and Chan, 2023).

For the NPPF to effectively contribute to the achievement of sustainable development, it should enable planning decisions to prioritise climate mitigation, adaptation and resilience outcomes. However, the current and proposed NPPF primarily keeps climate considerations to Chapter 14. Analysis from the CCC (2023) and the Centre for Sustainable Energy and Town and Country Planning Association (2023) has stated that the NPPF results in climate considerations competing with other areas (e.g. housing needs), about which more detail is included in the framework and which are more clearly measurable. This increases the risk of climate considerations being set aside by local plans and planning decisions.

To increase clarity and better align national planning policy with net zero and the UK's climate commitments, the NPPF and updated planning practice guidance should ensure climate change is mainstreamed across the other policy areas and chapters. Examples of potential mainstreaming opportunities include:

- Chapter 6 (*Building a strong, competitive economy*) – as set out in detail in our responses to Questions 62 and 63, this chapter should emphasise that the UK can only be a strong and competitive economy if it is a decarbonised and climate-resilient economy. There are tremendous employment and growth opportunities, but particular consideration should also be given to the employment implications of transitioning away from domestic production and consumption of oil and gas.
  - For example, although paragraph 86(b) of the draft NPPF refers to enabling the "diversification of agricultural and other land-based rural businesses", this could refer expressly to climate-smart agriculture and investments in agrivoltaics. Climate-smart agriculture approaches can play a vital role in building resilient food supplies, helping to tackle the issue of food availability, while also contributing to carbon sequestration (O'Leary et al., 2024).
- Chapter 9 (*Promoting sustainable transport*) – there should be express recognition that a "vision led" approach to promoting sustainable transport modes (as proposed) prioritises promoting cycling infrastructure.
  - Active travel plays a crucial role in decarbonising transport and reducing pollution, while at the same time providing a range of benefits for public health and the economy (Heckwolf et al., 2024). To incentivise this, planning policies and development need to ensure the safety of cyclists and pedestrians. Developing specialised urban infrastructure, promoted by the NPPF and local plans, that protects cycle lanes using physical borders is one important solution.
  - In 2023, two members of staff from the London School of Economics and Political Science died while cycling in or near London. Kerb-separated cycle infrastructure and stepped tracks (a cycleway built higher than the carriageway but lower than the footway) have been found to reduce the odds of injury for cyclists by 40% and 65% respectively compared with the absence of any infrastructure, whereas so-called 'advisory' lanes, which vehicles are legally allowed to use, actually increase the chances of injury by 30% (Adams et al., 2020).

- Chapter 17 (*Facilitating the sustainable use of minerals*) – the CCC has recommended that there should be a "strong presumption" against new consents for coal production in national planning frameworks. It has also stated that there should be "tighter limits" on oil and gas production, including a presumption against new exploration, and that "tests for allowing any further oil and gas exploration and extraction should be strengthened and clarified" (CCC, 2023). Research has also shown that "existing fossil fuel capital stock is sufficient to meet energy demands implied by representative 1.5°C scenarios" (Green et al., 2024). Given this, we recommend strengthening the existing presumption against coal in paragraph 233 of the NPPF, and introducing a presumption against new oil and gas developments within the NPPF.
  - **To strengthen the presumption against new coal developments** in paragraph 223, the current exceptions in sub-paragraphs a) and b) should be omitted. If any exception to the presumption against new coal is retained, then this should include an explicit reference to the CCC's recommendation that only coal produced in a way that includes at least 95% carbon capture and storage should be permitted (CCC, 2023), and stringent criteria should be applied for assessing the technical and economic viability of relevant carbon capture and storage plans. As in the case of oil and gas (discussed below), no new permission for coal production should be granted without an environmental impact assessment that includes both the upstream emissions from production and downstream emissions from the combustion of coal generated, and consideration of these impacts on both the UK's carbon budgets and emissions reduction targets and the overall goal of limiting warming to 1.5°C. Clearer guidance on assessing such impacts would also be in line with the recent High Court decision in the case of *R (Friends of the Earth and others) v. Secretary of State for Levelling Up* [2024] EWHC 2349 (Admin). In that case, the decision-makers erred in law by accepting arguments that the purchase of international offsets enabled a coal mine to be compliant with the UK's territorial net zero obligation. Clarification on this and other matters raised in the case within the NPPF would help decision-makers to avoid such errors in future.
  - **A presumption against new oil and gas projects** should be introduced in this section. If any exceptions to the presumption are included in the NPPF, they should take into account the following:
    - In June 2024, the Supreme Court confirmed that the granting of planning permission for oil production requires an environmental impact assessment that includes analysis of the downstream (scope 3) greenhouse gas emissions that arise from the combustion of fuel, following refinement of crude oil (see *R (on the application of Finch on behalf of the Weald Action Group) v. Surrey County Council and others* [2024] UKSC 20). This decision interprets the Town and Country Planning (Environmental Impact Assessment) Regulations 2017. The NPPF should be updated to align with this, and to require an assessment of the impact of both upstream and downstream greenhouse gas emissions on both UK and international climate goals.
    - If it is deemed necessary to include an exception to the presumption against new oil and gas developments where such development may include "national, local or community benefits" (as in paragraph 223), then further detail on how such benefits should be assessed and defined should be included in the NPPF. Among the necessary considerations should be an assessment of the extent to which oil and gas produced would support domestic energy needs or would be sold on international markets, as well as the potential distributional implications from the perspective of a just transition.

- **It should be clear that the mandate for minerals authorities to encourage CCUS should differentiate between different types of CCUS, and its use for different purposes:** Paragraph 221(b) of the NPPF states that mineral planning authorities should "encourage underground gas and carbon storage and associated infrastructure if local geological circumstances indicate its feasibility". CCUS is expected to play a strategic role in meeting both national and global climate targets given its potential contribution to decarbonisation in various different sectors (Serin, 2023a).
  - Securing the intended contribution of CCUS towards the UK's decarbonisation efforts will require the alignment of local-level planning decisions with national-level oversight of the technology's development. For example, CO_2 transport and storage infrastructure may need to be built with a larger capacity than would be required by an initial set of carbon capture projects connecting to it, with a view that additional emitters may need to access it in the future (which may be outside local boundaries, given options explored to transport CO_2 by road, train and shipping in the future). Site selection and sizing decisions should reflect such considerations from the start.
  - Furthermore, authorities should act with an understanding that not all CCUS applications are created equally. Emissions savings associated with applications will vary based on the nature of the operation and supply chain, and may be especially limited when the application involves the use of natural gas, such as in the case of 'blue hydrogen' production (Carbon Tracker Initiative, 2024). Given these risks, project approvals and wider planning decisions should reflect an overall policy framework for CCUS designed to ensure the technology makes a genuine contribution to the UK's mitigation efforts (Serin, 2023b).

Availability of agricultural land for food production

Question 82: Do you agree with removal of this text from the footnote?

The NPPF should recognise that the supply of land devoted to conventional agriculture will change over the medium term, which requires a change in the balancing of priorities in the way that plans treat development on agricultural land.

We are supportive of the removal of this section of the footnote. The *UK Food Security Report 2021* identified climate change as the biggest strategic threat to UK food supply (Defra, 2021). This threat implies a need to contribute to global efforts to reach net zero by reducing domestic emissions rapidly. Giving effect to this imperative at regional and sub-regional scales presents challenges for any planning authority, which must balance pressures across food production, infrastructure development and siting new sources of renewable energy.

Naturally, the best and most versatile agricultural soils should be protected from ill-conceived development such as low-density urban sprawl. It then follows that other options like utility-scale solar farm developments should be located on lower quality agricultural land, avoiding the most productive and versatile soils. Utilising roofs and farm buildings for solar should also be incentivised as this delivers a sustainable method of energy production while avoiding potential land use conflicts.

Emissions from agriculture, land use and peatlands were around 58Mt of CO_2 equivalent or around 12% of UK territorial emissions in 2021 (Defra, 2024). Necessarily, land use planning must take into account firstly the net-zero target and secondly the growing share of emissions from agriculture and LULUCF (land use, land use change and forestry). The CCC's Balanced Pathway for the Sixth Carbon Budget projects that agriculture will be responsible for 13% of the UK's net emissions in 2030 and 20% by 2035 as other economic sectors achieve faster decarbonisation (CCC, 2020). How the NPPF treats agricultural land should be joined up with other

recommendations, for example the CCC's Sixth Carbon Budget recommendations for the agriculture and land use sectors.

In total, the CCC's Sixth Carbon Budget Balanced Pathway sees 20% of the UK's land area being reforested or used for agro-forestry and energy crop production (including reduced food wastage and meat consumption) by 2050 – compared with around 15% today. The supply of land devoted to conventional agriculture will change over the medium term as the UK's administrations grapple with achieving the CCC's recommendations and roll out post-Common Agricultural Policy agri-environmental subsidy schemes that incentivise the supply of environmental goods.

Thus, how the NPPF treats development on agricultural land should take account of incidental benefits, whether in terms of agricultural emissions abatement or provision of clean electricity.

Question 83: Are there other ways in which we can ensure that development supports and does not compromise food production?

The NPPF could incorporate the principle that wherever possible, rural land use development should be multifunctional in order to support both environmental and food security objectives.

Public discourse frequently assumes that food security and energy security are mutually exclusive. In some cases this may be the case, but in practice there are many opportunities to integrate food production with other environmental objectives. Multifunctionality should become, wherever possible, a key principle guiding land use planning. The imperative to meet net zero emissions by 2050, while also producing food for a growing UK population through increasingly unpredictable climatic conditions, naturally demands more from land than has been historically the case. It is worth highlighting evidence collated by CarbonBrief (2022) that solar PV deployment in line with the net zero target would occupy only 0.3% of the UK's landmass: whereas 0.6% is taken up by golf courses.

Where possible, farmers should be incentivised (whether through Environmental Land Management [ELM] schemes or private leasing arrangements) to supply multiple goods from the same land holding. This could involve agroforestry/silvopasture or onshore wind/solar PV with grazing or cropping where this makes sense for a farmer. Building multifunctionality into land management supports environmental and food security objectives. Traditionally, planning policy, environmental restoration policy and agricultural support policy have been siloed and have not worked to achieve mutual objectives (Carvalho et al., 2024).

There is increasing evidence that agrivoltaics, the co-location of solar photovoltaic (PV) and crop or livestock production, has the potential to enhance farm income and domestic energy security, which in turn can contribute to increased food security, while providing climate and biodiversity benefits (Barron-Gafford et al., 2019; Chatzipanagi et al., 2023). Zimmermann PV-Agri, for instance, has integrated solar panels into a variety of horticultural operations. One such project in Babberich, Eastern Netherlands, has covered a 3.3 hectare raspberry crop (raspberries being shade-tolerant and needing shelter) with 10,250 specially designed wide-spaced solar panels to generate 2.67MW – enough energy to power up to 1,250 households. No decrease in yield or quality of berry has been recorded, and electricity is sold back to the grid.

In the UK, there is guidance that grazing can be integrated with solar power generation at similar stocking densities to conventional farming (BRE, 2014). Other widely cited evidence, from the University of Oregon (Andrew et al., 2021), exploring lamb growth and pasture production on agri-PV and control paddocks found little change in lamb weight gain and a slight reduction in the quantity of forage, which is offset by improvements in quality of forage. Other benefits for livestock include provision of shade and shelter. Blaydes et al. (2021) find that ground-mounted solar-PV can support invertebrates with food and nesting resources, better integrating fragmented habitats and bolstering pollination on natural and managed landscapes alike.

References

Adams T and Aldred R (2020) Cycling Injury Risk in London: Impacts of Road Characteristics and Infrastructure. *Findings*, December. https://doi.org/10.32866/001c.18226

Andrew AC, Higgins CW, Smallman MA, Graham M and Ates S (2021) Herbage yield, lamb growth and foraging behavior in agrivoltaic production system. *Frontiers in Sustainable Food Systems*, *5*, p.659175. https://doi.org/10.3389/fsufs.2021.659175

Averchenkova A, Higham C, Chan T and Keuschnigg I (2024a) *Impacts of Climate Framework Laws: lessons from Germany, Ireland and New Zealand*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/wp-content/uploads/2024/03/Impacts-of-climate-framework-laws.pdf

Averchenkova A, Higham C, Chan T and Keuschnigg I (2024b) *Supplemental evidence on the impacts of climate framework laws*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/wp-content/uploads/2024/03/Supplemental-evidence-on-the-impact-of-climate-framework-laws_Technical-Annex.pdf

Barron-Gafford G et al. (2019) Agrivoltaics provide mutual benefits across the food-energy-water nexus in drylands. *Nature Sustainability*. https://doi.org/10.1038/s41893-019-0364-5

Bian L and Robinson E (2023) *Promoting healthy ageing in Asia-Pacific through action on climate and air pollution*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/publication/promoting-healthy-ageing-in-asia-pacific-through-action-on-climate-and-air-pollution/

Blaydes H, Potts SG, Whyatt JD and Armstrong A (2021) Opportunities to enhance pollinator biodiversity in solar parks. *Renewable and Sustainable Energy Reviews*, *145*, p.111065. https://doi.org/10.1016/j.rser.2021.111065

Brandmayr C, Bird J, Jennings N, Gilbert A, Ward B et al. (2024) *General Election 2024: Climate change priorities for the next UK Government*. London: Grantham Institute – Climate Change and the Environment (Imperial College London) and Grantham Research Institute on Climate Change and the Environment (London School of Economics and Political Science). www.lse.ac.uk/granthaminstitute/publication/general-election-2024-climate-change-priorities-for-the-next-uk-government/

BRE (2014) *Agricultural Good Practice Guidance for Solar Farms*. https://files.bregroup.com/solar/NSC_-Guid_Agricultural-good-practice-for-SFs_0914.pdf

Carbon Tracker Initiative (2024) *Kind of Blue*. https://carbontracker.org/reports/kind-of-blue/

CarbonBrief (2022) *Factcheck: Is solar power a 'threat' to UK farmland?* www.carbonbrief.org/factcheck-is-solar-power-a-threat-to-uk-farmland/

Carvalho F, Lee HK, Blaydes H, Treasure L, Harrison LJ et al. (2024) Integrated policymaking is needed to deliver climate and ecological benefits from solar farms. *Journal of Applied Ecology*. https://doi.org/10.1111/1365-2664.14745

Centre for Ageing Better (2024) Summer heatwaves threatening health of up to 3 million older people. Blog post, 4 September. https://ageing-better.org.uk/news/summer-heatwaves-threatening-health-3-million

Centre for Sustainable Energy [CSE] and Town and Country Planning Association (2023) Spatial Planning for Climate Resilience and Net Zero. *Barriers & opportunities for delivering net zero and climate resilience through the local planning system*. A report for the Climate Change Committee. www.theccc.org.uk/publication/spatial-planning-for-climate-resilience-and-net-zero-cse-tcpa/

Chan T, Wang J and Higham C (2024) *Mapping justice in national climate action: a global overview of just transition policies*. London: Grantham Research Institute on Climate Change and the Environment. London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/publication/mapping-justice-in-national-climate-action-a-global-overview-of-just-transition-policies/

Chatzipanagi A, Taylor N and Jaeger-Waldau A (2023) Overview of the potential and challenges for Agri-Photovoltaics in the European Union. *JRC Science for Policy Report*. Publications Office of the European Union. https://publications.jrc.ec.europa.eu/repository/handle/JRC132879

Climate Change Committee [CCC] (2015) *Progress in preparing for climate change. 2015 Report to Parliament*. www.theccc.org.uk/wp-content/uploads/2015/06/6.736_CCC_ASC_Adaptation-Progress-Report_2015_FINAL_WEB_250615_RFS.pdf

Climate Change Committee [CCC] (2020) *The Sixth Carbon Budget: The UK's path to Net Zero*. www.theccc.org.uk/publication/sixth-carbon-budget/

Climate Change Committee [CCC] (2021) *Independent Assessment of UK Climate Risk Advice to Government For the UK's third Climate Change Risk Assessment (CCRA3)*. www.theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf

Climate Change Committee [CCC] (2023) *Progress in reducing emissions, 2023 Report to Parliament*. www.theccc.org.uk/publication/2023-progress-report-to-parliament/

Climate Change Committee [CCC] (2024) *Progress in reducing emissions, 2024 Report to Parliament*. www.theccc.org.uk/publication/progress-in-reducing-emissions-2024-report-to-parliament/

Crick F, Jenkins K and Surminski S (2018) Strengthening insurance partnerships in the face of climate change–insights from an agent-based model of flood insurance in the UK. *Science of the total environment*, 636, pp.192-204.

Curran B, Martin R, Muller S, Nguyen-Tien V, Oliveira-Cunha J et al. (2022) *Growing Clean: Identifying and investing in sustainable growth opportunities across the UK*. London: Resolution Foundation and London School of Economics and Political Science. https://economy2030.resolutionfoundation.org/reports/growingclean/

Dasgupta S, and Robinson EJZ (2022) Attributing changes in food insecurity to a changing climate. *Scientific Reports*, 12, 4709. https://doi.org/10.1038/s41598-022-08696-x

Dehon E and Clapp R (2023) *Deep Dive: Retrofit, embodied carbon and the M&S Decision – refusal and recrimination on Oxford Street*, Blog post, 9 August. https://cornerstonebarristers.com/deep-dive-retrofit-embodied-carbon-and-the-ms-decision-refusal-and-recrimination-on-oxford-street/

Department for Energy Security and Net Zero [DESNZ] (2023) *Electricity generation costs 2023*. www.gov.uk/government/publications/electricity-generation-costs-2023

Department for Energy Security & Net Zero [DESNZ] (2024a) DESNZ Public Attitudes Tracker: Renewable energy, Spring 2024, UK. www.gov.uk/government/statistics/desnz-public-attitudes-tracker-spring-2024/desnz-public-attitudes-tracker-renewable-energy-spring-2024-uk

Department for Energy Security and Net Zero [DESNZ] (2024b) *Accredited official statistics. Solar photovoltaics deployment. Monthly deployment of all solar photovoltaic capacity in the United Kingdom*. www.gov.uk/government/statistics/solar-photovoltaics-deployment

Department for Energy Security and Net Zero [DESNZ] (2024c) *Connections Action Plan. Speeding up connections to the electricity network across Great Britain*. https://assets.publishing.service.gov.uk/media/6581730523b70a000d234bb0/connections-action-plan-desnz-ofgem.pdf

Department for Energy Security and Net Zero [DESNZ] (2024d) *Annual Fuel Poverty Statistics in England, 2024* (2023 data). https://assets.publishing.service.gov.uk/media/65ccecba1d939500129466a9/annual-fuel-poverty-statistics-report-2024.pdf

Department for Environment, Food & Rural Affairs [DEFRA] (2021) *United Kingdom Food Security Report 2021: Theme 2: UK Food Supply Sources*. https://www.gov.uk/government/statistics/united-kingdom-food-security-report-2021/united-kingdom-food-security-report-2021-theme-2-uk-food-supply-sources#united-kingdom-food-security-report-2021-theme2-indicator-2-3-3

Department for Environment, Food & Rural Affairs [DEFRA] (2024) *Official Statistics: Agri-climate report 2023*. www.gov.uk/government/statistics/agri-climate-report-2023/agri-climate-report-2023

Department for Levelling Up, Housing & Communities [DLUHC] (2024) *Changes to various permitted development rights: consultation*. www.gov.uk/government/consultations/changes-to-various-permitted-development-rights-consultation/changes-to-various-permitted-development-rights-consultation

Department of Health and Social Care (2023) *Government plans to tackle obesity in England*. Blog post, 7 June. https://healthmedia.blog.gov.uk/2023/06/07/government-plans-to-tackle-obesity-in-england/

Evans C, Artz R, Moxley J, Smyth MA, Taylor E et al. (2017) *Implementation of an emissions inventory for UK peatlands*. Centre for Ecology and Hydrology.

Green F, Bois von Kursk O, Muttitt G and Pye S (2024) No new fossil fuel projects: The norm we need. *Science*, *384*(6699), pp.954-957.

Heckwolf A, Scheer A and Wyckoff P (2024) *Promoting active travel in London – benefits and barriers*. Blog post, 12 March. www.lse.ac.uk/granthaminstitute/news/promoting-active-travel-in-london-benefits-and-barriers/

Howarth C (2024) Preparing for heat risk is complex: aligning adaptation and mitigation is essential, *PLOS Climate*. https://doi.org/10.1371/journal.pclm.0000371

Howarth C and Robinson E (2024) Effective climate action must integrate climate adaptation and mitigation, *Nature Climate Change*. https://doi.org/10.1038/s41558-024-01963-x

Howarth C et al. (2024) *Turning up the heat: Learning from the summer 2022 heatwaves in England to inform UK policy on extreme heat*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science.

Howarth C, McLoughlin N, Kythreotis A, Murtagh E (under review) "Climate resilient net zero" preparedness to heat risk in the UK: A new framework for integrating climate mitigation and adaptation. Submission to *Global Environmental Change*.

Howarth C, McLoughlin N, Mehryar S, Murtagh E, Armstrong A and Porter J (under review) A culture of heat: is the UK ready for more heatwaves? Submission to *Nature Climate Change*.

Labour Party (2024) *Labour Party Manifesto 2024*. https://labour.org.uk/change/

Ministry of Housing, Communities & Local Government [MHCLG] (2024) *Policy statement on onshore wind*. www.gov.uk/government/publications/policy-statement-on-onshore-wind/policy-statement-on-onshore-wind

Molnar-Tanaka K and Surminski S (2024) *Nature-based solutions for flood management in Asia and the Pacific*. OECD Development Centre Working Paper. www.oecd-ilibrary.org/development/nature-based-solutions-for-flood-management-in-asia-and-the-pacific_f4c7bcbe-en

Murray J (2024) How Labour's planning reforms aim to unlock 'a net zero future'. *Business Green*, 5 August. www.businessgreen.com/news-analysis/4343323/labours-planning-reforms-aim-unlock-net-zero-future

National Trust (2020) *Levelling up and building back better through urban green infrastructure: an investment options appraisal*. https://nt.global.ssl.fastly.net/binaries/content/assets/website/national/pdf/urbangreen-infrastructure-investment-appraisal-2020-report.pdf

Natural Resources Wales (2022) *How to comply with Sustainable Drainage Systems (SuDS) standards*. https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/how-to-comply-with-sustainable-drainage-systems-standards/?lang=en

O'Leary L, Dasgupta S and Robinson E (2024) *Tackling the impacts of climate change on food security in Bangladesh*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/publication/tackling-the-impacts-of-climate-change-on-food-security-in-bangladesh/

Office for Budget Responsibility [OBR] (2023) *Fiscal risks and sustainability report – July 2023*. https://obr.uk/frs/fiscal-risks-and-sustainability-july-2023/

Parks Management (2023) *DEFRA Inquiry into urban green spaces*. www.parksmanagement.org.uk/news/defra-inquiry-into-urban-green-spaces/

Pincher C (2021) *Letter from Christopher Pincher MP to the National Infrastructure Planning Association*. www.gov.uk/government/publications/nationally-significant-infrastructure-projects-regime-operational-review

Prime Minister's Office (2024) *King's Speech 2024: background briefing notes*. www.gov.uk/government/publications/kings-speech-2024-background-briefing-notes

Rankl F (2024) *Planning for nationally significant infrastructure projects (NSIPs)*. House of Commons Library. https://commonslibrary.parliament.uk/research-briefings/sn06881/

Renewable UK (2024) *UK wind energy database. Live facts and figures, powered by EnergyPulse*. www.renewableuk.com/energypulse/ukwed/

Robinson E (2023) Climate friendly public health policies make economic case. *BMJ*. https://doi.org/10.1136/bmj.p2236

Robinson E, Dasgupta S and Bian L (2023) *Submission to the UK Environmental Audit Committee's Inquiry on Environmental Change and Food Security*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/03/Submission-to-UK-Environmental-Audit-Committee-Inquiry-on-Food-Security-1.pdf

Romanello M et al. (2023) The 2023 report of the Lancet Countdown on health and climate change: the imperative for a health-centred response in a world facing irreversible harms. *The Lancet*. https://doi.org/10.1016/S0140-6736(23)01859-7

Royal College of Paediatrics and Child Health (2023) *Child health inequalities and climate change in the UK – position statement*. www.rcpch.ac.uk/resources/child-health-inequalities-climate-change-uk-position-statement

Royal College of Physicians (2018) *Every breath we take: the lifelong impact of air pollution*. www.rcp.ac.uk/improving-care/resources/every-breath-we-take-the-lifelong-impact-of-air-pollution/

Rözer V and Surminski S (2021) Current and future flood risk of new build homes across different socio-economic neighbourhoods in England and Wales. *Environmental Research Letters*, *16*(5): 054021. https://iopscience.iop.org/article/10.1088/1748-9326/abec04

Selvaraju S and Robins N (2024) *Negotiating the social contract for net zero: Port Talbot and a just transition for UK steel*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/publication/negotiating-the-social-contract-for-net-zero-port-talbot-steel-and-the-just-transition/

Serin E (2023a) *What is carbon capture, usage and storage (CCUS) and what role can it play in tackling climate change?* Grantham Research Institute on Climate Change and the Environment. Blog post, 13 March. www.lse.ac.uk/granthaminstitute/explainers/what-is-carbon-capture-and-storage-and-what-role-can-it-play-in-tackling-climate-change/

Serin E (2023b) *UK policy on carbon capture usage and storage needs a course correction*. Grantham Research Institute on Climate Change and the Environment. Blog post, 12 September. www.lse.ac.uk/granthaminstitute/news/uk-policy-on-carbon-capture-usage-and-storage-needs-a-course-correction/

Serin E and Andres P (2024) *Harnessing the UK's strengths for green growth*. Grantham Research Institute on Climate Change and the Environment. Blog post, 14 August. www.lse.ac.uk/granthaminstitute/news/harnessing-the-uks-strengths-for-green-growth/

Serin E, Valero A, Curran B and Subramoni A (2022) *Submission to the independent review of the UK Government's approach to net zero*. London: Grantham Research Institute on Climate Change and the Environment et al., London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/publication/submission-to-the-uk-government-review-of-net-zero-call-for-evidence/

Surminski S, Mehryar S and Golnaraghi M (2020) *Flood Risk Management in England. Building flood resilience in a changing climate*. The Geneva Association. www.genevaassociation.org/sites/default/files/flood-risk-management-england.pdf

UK Parliament (2024) *Invest in our green spaces, say MPs*. Environment, Food and Rural Affairs Committee. News, 14 March. https://committees.parliament.uk/work/7932/urban-green-spaces/news/200407/invest-in-our-green-spaces-say-mps/

US Department of Energy [US DoE] (n.d.) *Where the Energy Goes: Electric Cars*. www.fueleconomy.gov/feg/atv-ev.shtml

Valero A (2024) *What do times of economic hardship mean for the UK's transition to net zero?* Grantham Research Institute on Climate Change and the Environment. Explainer, 28 March. www.lse.ac.uk/granthaminstitute/explainers/what-do-times-of-economic-hardship-mean-for-the-uks-transition-to-net-zero/

Wang J and Chan T (2023) *What is meant by intergenerational climate justice?* Blog post, 7 December. www.lse.ac.uk/granthaminstitute/explainers/what-is-meant-by-intergenerational-climate-justice/

Way R, Ives M C, Mealy P, Farmer J D (2022) Empirically grounded technology forecasts and the energy transition. *Joule,* 6(9): 2057–2082. https://doi.org/10.1016/j.joule.2022.08.009

Zenghelis D (2024) *How will the transition to net zero affect the UK economy*? Grantham Research Institute on Climate Change and the Environment. Explainer, 23 April. www.lse.ac.uk/granthaminstitute/explainers/how-will-the-transition-to-net-zero-affect-the-uk-economy/

Zenghelis D et al. (2024) *Boosting growth and productivity in the United Kingdom through investments in the sustainable economy*. London: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science. www.lse.ac.uk/granthaminstitute/publication/boosting-growth-and-productivity-in-the-united-kingdom-through-investments-in-the-sustainable-economy/