State of Natural Capital Report for England 2024

Risks to nature and why it matters

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State of Natural Capital Report for England 2024: Risks to nature and why it matters

Natural England Research Report NERR137

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About Natural England

Natural England is here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

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Foreword by Tony Juniper CBE, Chair of Natural England

Fixing our relationship with nature is one of the most urgent challenges of our age. Climate change may grab more headlines, but the depletion of the natural world is an equally severe emergency and one very much fuels the other.

Nature has historically been regarded as largely expendable in the pursuit of economic advances, but there is a growing understanding that we can no longer afford to treat it in such a careless way. Our economy and our society depend on complex ecosystems from mountain-tops to seabeds for food, clean water and air, our ability to cope with climate change impacts, and places that foster health and wellbeing. Viewing nature as natural capital clearly encapsulates our fundamental reliance on this stock of national wealth. The idea of natural capital thereby also supports our ongoing efforts to preserve, monitor and manage our natural resources so that they continue to meet our needs long into the future.

Until now, though, there has been a missing piece in the natural capital jigsaw. We lacked a clear picture that systematically brought together the best evidence about the state of our ecosystems and which comprehensively demonstrated what this meant for the benefits provided. This report does just that, in a way which is accessible and interprets the evidence so that people beyond the environmental sector can use it to take action. I hope it will enable the full range of values we derive from nature to be put at the heart of decisions affecting its future – and the future of people who rely on it. Expressing nature in practical economic terms makes it easier for decision-makers to incorporate it into their plans, while offering reassurance that putting money into nature is a sound investment.

The momentum behind such moves to recover and protect nature is gathering pace, both globally and domestically. At Biodiversity COP 15 in Montreal almost 200 nations, including the UK, pledged to reverse biodiversity loss and protect 30% of land and seas by 2030. The new Government has recognised the scale of the challenge and is reviewing and refreshing the way we bring about this recovery in this decade and beyond. The private sector, increasingly mindful of its dependence on our fragile natural world, is using its financial and innovation expertise to drive nature recovery. For example, the Taskforce for Nature-related Financial Disclosures enables businesses to assess and improve their relationships with nature, while green finance mechanisms such as Projects for Nature link businesses with nature recovery efforts on the ground.

Tackling the nature crisis will require action across all sectors to reduce risks to society. This report is your guide to action. I encourage you to read it, use it, and secure the benefits nature provides into the future, not just for yourself but for society as a whole and the natural world which sustains us.


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Executive Summary

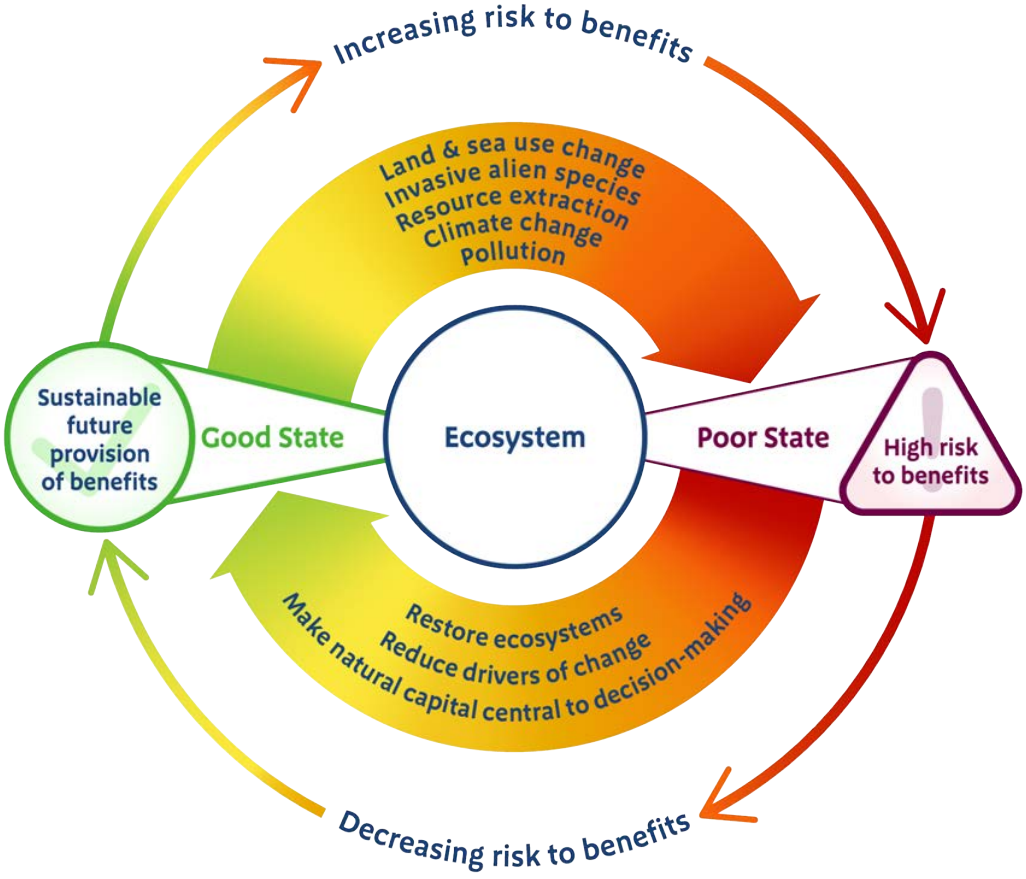
Natural capital is the parts of nature that provide benefits to people. We depend on it for the air we breathe, the water we drink and the food we eat. It boosts our health and wellbeing. It captures and stores carbon and has a vital role to play in helping us adapt to the impacts of climate change. Natural capital is also an economic concept. It considers nature as a stock of assets, which we have to invest in. Ecosystem assets need to be in a healthy state to support the benefits society relies on.

The State of Natural Capital Report provides evidence for decision makers in one place:

- **Comprehensive assessment of the state of ecosystem assets** – why they are important and what is impacting on them.
- **Risk register** – why nature is at risk and what this means for the benefits from nature we rely on.
- **Risk consequences for policy areas** – how risks to the benefits from nature affect: economic resilience, Net Zero, climate adaptation, food security, health and wellbeing, water security.
- **Indicator and data appendix** – collating the best currently available indicators and data on the state of ecosystem assets.

Key messages

- **Due to the state of England's natural capital, society and the economy face substantial risks.** Nature is at risk. This puts the benefits it provides at risk. For example, degraded peatlands and damaged seabeds can release huge carbon stores. Declines in nature make the impacts of climate change worse, including flooding and soaring urban temperatures. Loss of pollinators is a threat to the crops which depend on them.
- **These risks need to be tackled head-on by decision makers.** Society has taken nature and its benefits for granted. This results in decisions that cause damage to nature and increases risks for the economy and society. Many seemingly unrelated decisions impact on nature. We need to make natural capital central to decision making. Even where the decisions aren't specifically about natural capital.
- **We need to invest in natural capital now, to reduce risks and reap rewards.** Acting quickly to prevent and address the degradation of nature makes economic sense. It secures and enhances the benefits we depend on, now and for the future, meaning it will be cheaper and more effective in the long run. The image below shows how loss and decline of nature puts the benefits we rely on at risk. Investing in nature reduces these risks.



Key findings

- **Because our ecosystem assets are degraded, they are less able to cope with the impact of future change.** Our assets are already very highly impacted by land and sea-use change, pollution, natural resource use and exploitation and climate change. There is currently a very rapid increase in the severity of impacts of climate change, associated invasive species (including pests and diseases) and land and sea-use change. This puts the assets and benefits we rely on at risk.

- **All of our ecosystem assets, and almost all the benefits they provide, are at high or medium-high risk:**
  - Assets at high risk: marine; coastal margins; freshwaters and wetlands; mountains moorlands and heaths; woodlands.
  - Assets at medium-high risk: semi-natural grasslands; enclosed farmland; urban.
  - Benefits at high risk: timber and other wood products; produce from the sea; plentiful water; reared animals and their outputs; clean water; erosion control; flood protection; thriving plants and wildlife; cultural benefits.
  - Benefits at medium-high risk: cultivated crops; clean air; urban cooling; noise regulation; pollination; pest and disease control.

Priority actions and opportunities

There are three main ways to reduce risk to natural capital:

- Restore ecosystems.
- Reduce impacts of drivers of change.
- Make natural capital central to decision-making.

Priority actions: the image below shows priority actions to tackle risk to natural capital, through restoring ecosystems and reducing impacts of drivers. The report identifies priority actions for policy areas and ecosystem assets.

Priority opportunities to bring natural capital into decision-making:

Nature, and the benefits it provides, are frequently ignored in decision-making. The following decision-making opportunities can profoundly affect the future of our natural capital:

- Embed priority actions in emerging policy development.
- Apply Nature-related Financial Disclosure in companies' and financial institutions' risk management.
- Promote private and public investment in large-scale ecosystem creation and restoration.
- Put natural capital at the heart of land- and sea-use planning.
- Avoid sectoral financial support which drives risk to ecosystem assets.
- Fill evidence and data gaps and make information available to inform decision making.
- Invest in regular and ongoing monitoring of indicators for assessing change.
- Continue the development and implementation of natural capital accounts.
- Go beyond GDP and include assessment of natural capital, as one of the stocks in an assessment of national wealth.

We need to act now - asset restoration becomes more challenging over time and may not be achievable. The costs of acting later are substantially greater than the costs of acting now. The State of Natural Capital Report for England 2024 sets out why nature is at risk, why this matters for society, and what we can do about it.

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1. Introduction

Society and the economy face significant risks because of the state of England's natural capital.

Natural capital is the parts of nature that provide benefits to people. It provides us with the air we breathe, the water we drink, the food we eat. It boosts our health and wellbeing; it captures and stores carbon; and has a vital role to play in helping us adapt to the impacts of climate change.

Natural capital is also an economic concept that considers nature as a stock of assets that provide benefits to people. These benefits are wide-ranging and essential for a thriving society and economy. As with any other asset, nature needs to be in good working order to sustainably supply these benefits into the future.

It is widely acknowledged that England's natural environment has been heavily modified by human activity and continues to be degraded. England is ranked as one of the most nature depleted countries in the world in terms of how well it has retained natural animals and plants[1].

This poses significant risks to society and the economy because both are intimately dependent upon nature's ability to provide the things we need. Natural systems that are damaged cannot do this well and continued degradation increases the risks for the future.

Because we don't know when natural systems will be unable to provide the benefits society depends on, we need to act now and take account of the state of nature in decision making. Particularly where the outcomes are dependent on the benefits we get.

But how do decision-makers know what to focus on, where it is critical and what they have to do?

This State of Natural Capital Report provides the first evidence-based and systematic answer to these questions, showing which natural systems and which benefits are most at risk and what we can do about it. We do this by focussing on key economic and societal policy areas that are dependent on natural capital and look at the current risks that these sectors are carrying. We show that if natural capital is in a good state, then it reduces the risks to these areas. If it is in a poor state, then it increases the risks.

1.1 Report Orientation

- Section 2 summarises the rationale and key terms used throughout this report.
- Section 3 shows which aspects of natural capital are currently at highest risk. We identify the consequences of that risk to different areas of policy delivery. We highlight key actions that help reduce this risk. In this report we focus on those policy areas that are most dependent on the benefits natural capital provides:
  - Economic resilience
  - Net Zero
  - Climate adaptation
  - Food security
  - Health and wellbeing
  - Water security
- Section 4 summarises the state of our natural capital assets in terms of their risk.
- Section 5 identifies specific ways decision-makers across policy areas can use this report and analysis to reduce the risk to their areas of delivery by investing in natural capital now.

2 Understanding the State of Natural Capital

Cat Bells, Lake District

2.1 Nature and the Economy

The Dasgupta Review[2], commissioned by the UK's Chancellor, describes how the economy is embedded in nature and is not external to it (Figure 1). This means our economy is limited by the state of nature and nature's ability to provide the benefits we rely on. Our economy relies on natural resources and a whole range of benefits that nature supplies such as improvement in water quality, flood alleviation or pollination. Society has taken nature and its benefits for granted which means they are not costed in the economy and are underrepresented in decision making. This results in decisions that cause damage to nature and increases risks for the economy and society into the future.

Figure 1 The economy and biosphere The economy is embedded in the biosphere and is not external to it[2].

Natural capital provides us with a way of understanding, measuring and valuing nature's contribution to people through the benefits it provides. For this to continue we must take care of and invest in our stock of natural capital just as we would any other portfolio of assets.

Currently we are using up our stocks faster than they can regenerate and we have been doing this for many years. This is clearly unsustainable. The decisions we make, for people's health, wellbeing, and the economy, need to take account of our stock of assets and our dependence on the associated benefits.

Many seemingly unrelated decisions impact on our assets, and we therefore need to be careful to include natural capital into a wide range of decision-making frameworks.

Investment in the protection and recovery of nature is an investment in England's natural capital. As with any other capital asset, acting quickly to prevent and address the degradation of our natural capital assets makes economic sense. It secures and enhances the benefits that society and the economy depend on, now and for the future, meaning it will be cheaper and more effective in the long run[2,3].

Box 1 Natural Capital in the UK Economy

Natural capital contributes to all sectors of the UK economy. The most recent ONS natural capital accounts estimated the current value of the UK's natural wealth to be £1.5 trillion in 2021[4], and this is likely to be an underestimate because we know it is a partial assessment. For example, the avoided health outcomes provided by the removal of air pollution by natural capital in 2021 is estimated to have an annual value of around £2.5 billion[4]. Annual expenditure on tourism and recreation in the natural environment is estimated at £10.6 billion for 2022, and the associated annual health benefits have been valued at around £7 billion[4].

2.2 Applying Natural Capital

Although natural capital can be varied and complex in its application, we are making it easy to interpret in this report. Figure 2 illustrates how, in natural capital logic, a stock of ecosystem assets underpins the provision of a suite benefits from nature, that in turn contribute to the economy.

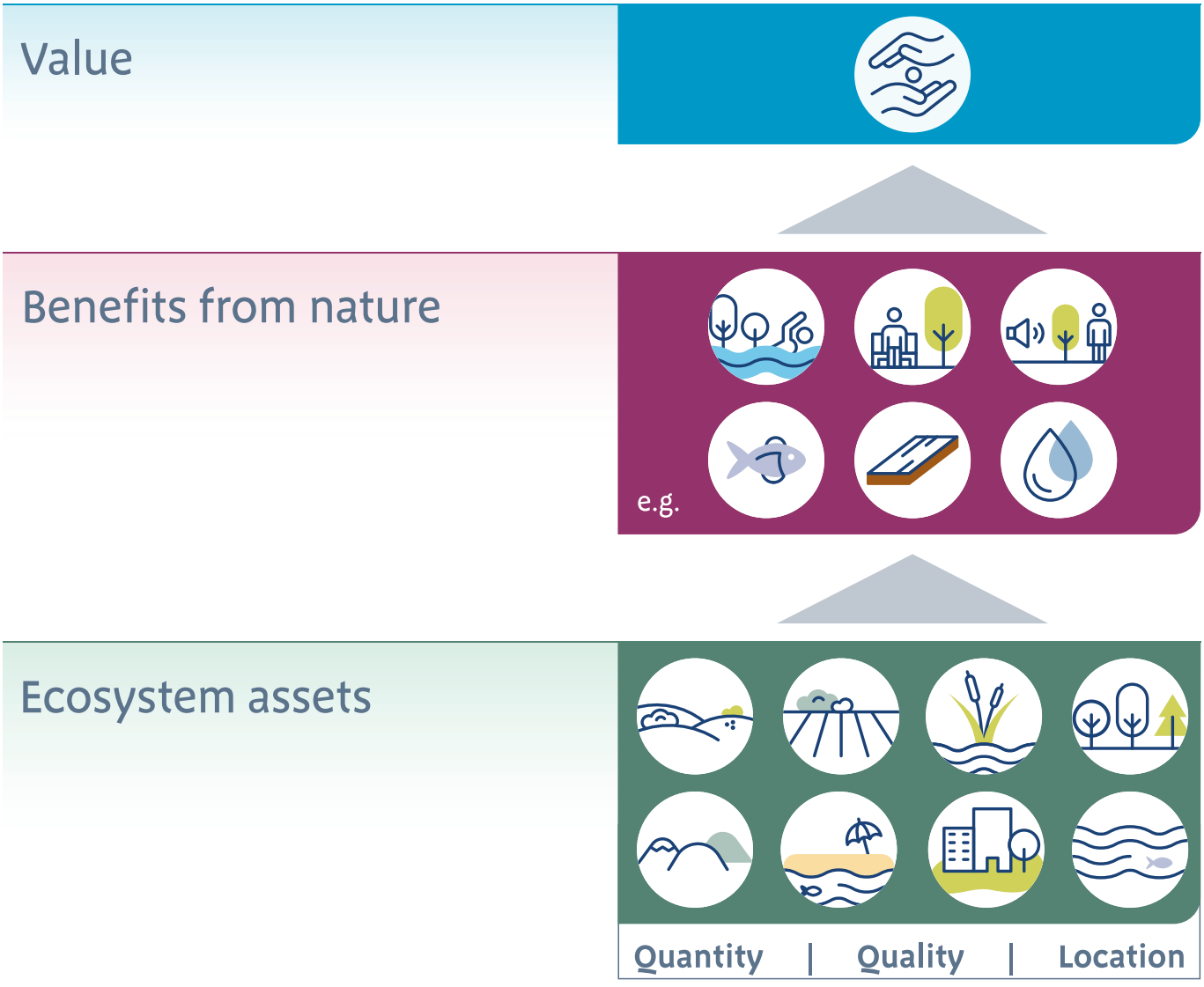


Figure 2 Natural capital logic chain. Ecosystems are the natural capital **assets** that underpin **the benefits on which society depends.** How much we have (quantity), what condition it is in (quality), and where it is (location), determine the benefits the asset provides. This figure shows example benefits from nature contributing value to people and society.

Box 2 Important Terms and Concepts

Natural Capital: In a natural capital framework, nature is treated as a stock of assets that provide benefits to people. These benefits are wide-ranging and essential for a thriving society and economy. When we talk about England's natural capital, we mean the stock of nature that provides these essential benefits.

Ecosystem Assets: Natural capital assets are the parts of nature we want to protect and grow. In this report we focus on ecosystems as our assets because this is where the living and non-living parts of nature interact as a system. In order for natural capital to provide the benefits society depends on, ecosystems need to be in good working order.

Benefits: Our stock of assets, in good condition, provide multiple benefits to society and individuals. They are essential and include things such as food, clean air and water, the reduction of flood risk, and our mental and physical health.

Biodiversity: Biodiversity is short for biological diversity. It is the variety of life in all its forms, and at all levels including genes, species, and ecosystems. Different species combine into communities that interact with the physical world to create ecosystems. The diversity of species within ecosystems enables them to be more productive, resilient, and adaptable.

2.3 Natural Capital and Ecosystems

The way that nature underpins society and economy is through the living (e.g. plants, animals, bacteria) and non-living (e.g. soil, climate, water) components all interacting as a system, or ecosystem. Ecosystems provide and sustain the benefits society and the economy depend on. They work best when they have a full complement of species and aren't degraded[2].

In the same way a sports team always needs depth on the reserves bench to be able to overcome injury setbacks and support key players, ecosystems need a full complement of species to give resilience to different environmental stresses. The reserves are essential to the workings of the team. When ecosystems are intact with a full complement of species, they are more resilient to change, are adaptable and more productive. This is both in terms of their own regenerative properties and the benefits they provide to people. As with a financial portfolio, breadth and diversity ensures resilience and reduces risk. Figure 3 shows how increasing biodiversity reduces risk and increases resilience in the provision of benefits from nature.

Figure 3 Increased biodiversity and reduced risk. Increasing biodiversity in our extensive seas and on land reduces risks and increases resilience in the provision of benefits to people from ecosystems[2].

Our economy and society completely rely on this foundation of healthy, biodiverse ecosystems. It is ecosystems that are responsible for fundamental processes such as soil formation, the water cycle, and the flow of energy and nutrients through food webs. These are functions that cannot be substituted with other solutions such as technology. They are irreplaceable.

Loss of species reduces the ability of ecosystems to carry out their functions and increases the chance of exceeding tipping points. This is where ecosystems move from good working systems to poorer, less productive ones. Once tipping points have been exceeded it is extremely difficult to recover them, and the consequences for society and the economy are considerable. It puts the benefits we rely on at risk. We do not know where many of these tipping points are, and many of our ecosystems are decreasing in area, degraded or declining[5]. Because of this, a focus on ecosystems as our natural capital assets is essential and urgent.

2.4 Understanding the state of our ecosystem assets

The state of ecosystem assets affects how well they work and whether they provide benefits to society and the economy, or not (Figure 2). How much we have (quantity), what condition it is in (quality), and where it is (location), determine the benefits the asset provides. These three aspects together determine the state of England's natural capital.

Natural England has systematically evidenced which attributes of quantity, quality and location underpin the provision of the benefits we analyse in this report[6]. Indicators we can use to measure change in these attributes were also identified. It is this evidence framework that has enabled the interpretation we offer in this State of Natural Capital Report.

The methods and evidence we have used for the interpretation are detailed in the Natural Capital Risk Register (the Risk Register)[7] and State of the Assets Technical Report[8].

Table 1 identifies the way we define and refer to England's ecosystems and the icons we use to represent them.

The full range of benefits that we consider in this report and the icons we use to represent them are described in Table 2. The benefits are based on a simplified and plain English version of the Common International Classification of Ecosystem Services (CICES)[9]. The relationship between the benefits below and CICES 5.2 classes are set out in Appendix 2[10].

Table 1 Descriptions of assets

Icon	Asset	Description
	Marine	English marine areas extend 200 nautical miles from the coast and cover nearly twice the land area. They range from kelp forests, seagrass beds and rocky reefs, to vast sediment plains and deep cold-water coral reefs.
	Coastal margins	Coastal margins include estuaries, mudflats, saltmarsh, shingle, rocky shores, sand dunes and sea cliffs.
	Freshwaters and Wetlands	Freshwaters and wetlands include rivers, ponds, lakes, streams, canals and reservoirs, as well as wetlands such as fens, marshes and swamps, and groundwater.
	Woodlands	Woodlands include coniferous, broadleaved, mixed and yew woodland and scrub.
	Mountains, Moorlands and Heaths	Mountains, moorlands and heaths include upland and lowland heath, bog and bracken.
	Semi-Natural Grasslands	Semi-natural grasslands range from traditional hay meadows and rolling chalk downs to extensive, more species-poor, upland grasslands.
	Enclosed Farmland	Enclosed farmland includes arable, horticulture and improved grassland, as well as small patches of scrub, woodland and semi-natural grassland in field margins and boundaries.
	Urban	Urban green and blue space includes parks, playing fields, sports pitches and allotments as well as areas of all the other ecosystems (found within the Office for National Statistics built-up areas boundary[11]).

Table 2 Descriptions of benefits from nature

Icon	Benefit	Description
	Timber and other wood products	Timber, paper and other products from wood.
	Produce from the sea	Products from the sea e.g. fish, shellfish and seaweed for food, fertiliser, angling bait, medicines.
	Plant based energy	Energy from wood, energy crops and other land plants.
	Aquaculture	Products from aquaculture e.g. fish, shellfish and seaweed for food, fertiliser, angling bait, medicines.
	Cultivated crops	Food from crops e.g. cereals, vegetables, fruit.
	Plentiful water	Water supplies for e.g. drinking, irrigation, livestock, industrial use including cooling, energy production, wildlife.
	Reared animals and outputs	Products from animals e.g. meat, dairy products, honey.
	Clean water	Clean water through the natural dilution, degradation, and decomposition of pollutants, including by plants and animals.
	Clean air	Clean air through the uptake, deposition, and interception of air pollution by plants.
	Noise regulation	Lowering of urban noise levels due to buffering by plants.
	Urban cooling	Cooling provided by urban green and blue spaces, through shading and lower absorption and retention of heat than built surfaces.
	Erosion control	Slowing of the erosion of land, soil and coastal areas e.g. vegetation preventing soil erosion, salt marshes protecting sea walls.
	Flood protection	Reduced flood risk due to ecosystems e.g. slowing flows, increasing water infiltration, sand dunes as barriers to coastal flooding.

Icon	Benefit	Description
	Pollination	Pollination, supporting crops dependent on insect pollination e.g. field beans, apples, plums, pears, cucumbers, plums, strawberries, oilseed rape.
	Thriving plants and wildlife	Biodiversity, in its own right, and underpinning all other benefits.
	Pest and disease control	Natural control of agricultural pest species and diseases.
	Climate regulation	Natural carbon stores and sinks contributing to reducing greenhouse gas emissions.
	Cultural benefits	The many ways our interactions with the natural environment enrich our lives e.g. through outdoor activities, creativity, learning, or just our personal connection with the places we frequent.

3 Natural Capital Risk

© Alisdair Hickson

Drought in Greenwich Park, London

3.1 Risks to society from risks to natural capital

We are in a triple nature, climate and pollution crisis[12, 13], around the world and at home. When nature is in crisis, the benefits we get from it are at risk. Degraded peatlands emit greenhouse gases, while damage to the seabed from fishing and dredging churns up sediment, potentially releasing huge carbon stores. Declines in nature make the impacts of climate change worse, with poorly managed catchments increasing the risk of flooding. Loss of pollinators is a threat to the crops which depend on them. Air pollution and extreme urban heat put the health of our population at increased risk. These are just a few examples. To understand the risks to a wide range of benefits, we need to know the state of our ecosystems and how they are changing.

3.1.1 Our approach

In this section we summarise which assets and benefits are at the highest risk and why. We then look at the consequences for important policy areas most dependent on natural capital.

To build a full picture of the risk to natural capital, we combine existing evidence and expert opinion. Here we briefly outline the approach we have taken. The Risk Register[7] provides the full method. In Section 4 we look further at the state of our assets and why they, and the benefits they provide, are at risk.

3.1.2 The state of ecosystems and risks to benefits

How resilient to change our ecosystem assets are, depends on how good they are to start with. An ecosystem needs to be in "good working order", in the same way a machine needs to be, before increasing the demands put on it. Losses in animals, plants and other life mean that nature is trying to cope with change from a difficult starting point. Figure 4 shows how impacts degrade ecosystem assets and put the benefits from nature at risk. It also shows how restoring assets decreases the risk to benefits.

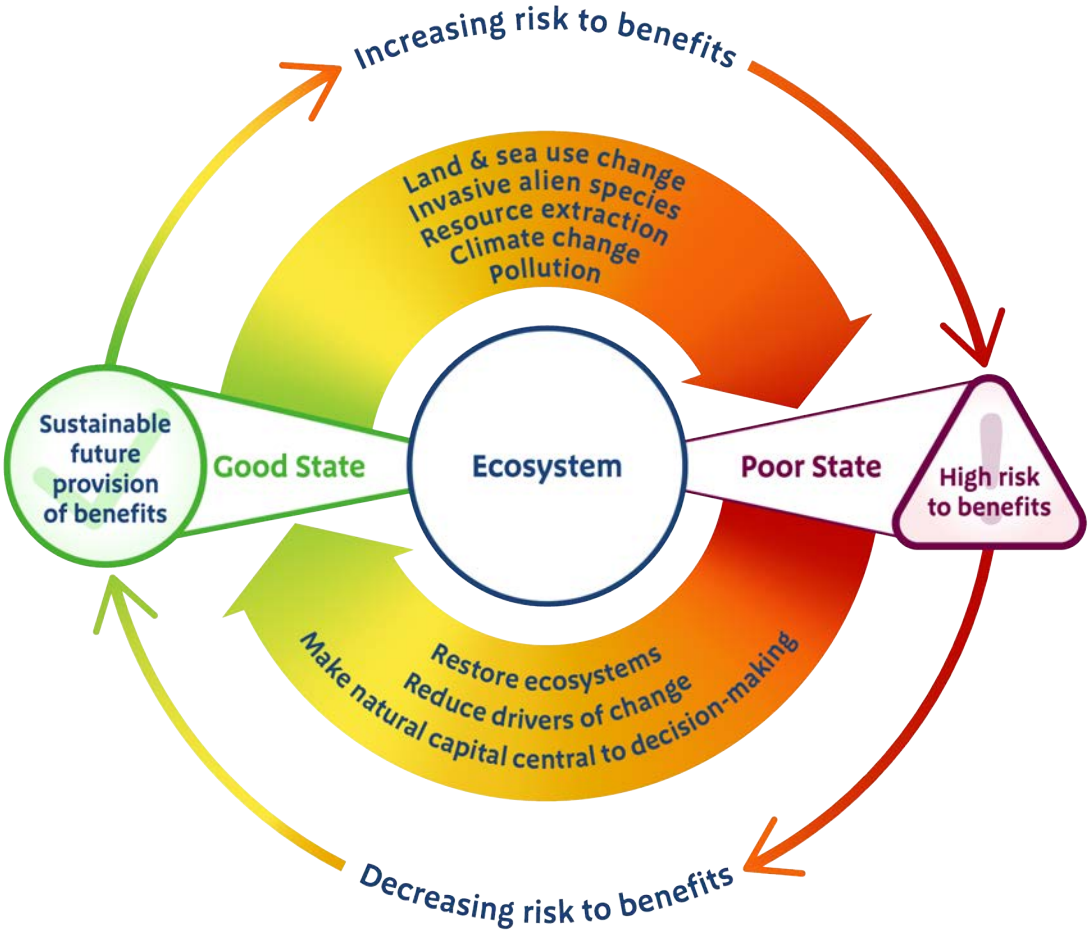


Figure 4 State of ecosystems and risks to benefits

3.1.3 Which benefits are at the highest risk?

Table 3 shows the ecosystem assets and benefits which we assess as being at high and medium-high risk. The Risk Register[7] shows the full range of risks.

Table 3 Summary of ecosystems and benefits at the highest risk. Key: Red = high risk; orange = medium-high risk.

Ecosystem	Benefits at risk			
Marine	Produce from the sea	Thriving plants and wildlife	Climate regulation	Cultural benefits
Coastal margins	Produce from the sea	Clean water	Erosion control	Flood protection
	Thriving plants and wildlife	Climate regulation	Cultural benefits	
Freshwaters and wetlands	Plentiful water	Clean water	Erosion control	Flood protection
	Thriving plants and wildlife	Climate regulation	Cultural benefits	
Woodlands	Timber and other wood products	Thriving plants and wildlife		
	Erosion control	Flood protection	Climate regulation	Cultural benefits
Mountains, moorlands and heaths	Plentiful water	Reared animals and outputs	Clean water	Erosion control
	Flood protection	Thriving plants and wildlife	Climate regulation	Cultural benefits

Ecosystem	Benefits at risk			
 Semi-natural grasslands	 Plentiful water	 Clean water	 Flood protection	 Pollination
	 Thriving plants and wildlife	 Climate regulation	 Cultural benefits	
 Enclosed farmland	 Cultivated crops	 Plentiful water	 Clean water	 Erosion control
	 Flood protection	 Pollination	 Thriving plants and wildlife	
	 Pest and disease control	 Climate regulation	 Cultural benefits	
 Urban	 Plentiful water	 Clean water	 Clean air	
	 Noise regulation	 Urban cooling	 Flood protection	
	 Thriving plants and wildlife	 Climate regulation	 Cultural benefits	

3.2 What are the consequences of risks to natural capital?

The risks to our natural capital and the benefits it provides have wide-reaching consequences. In the following sections we look at the consequences of risk to natural capital for six policy areas, which are dependent on the benefits provided by nature.

We reviewed government policy areas to identify where they most rely on benefits from nature. We then identified the benefits they depend on, and which of these benefits we assess as being at high or medium-high risk (Table 4). Thriving plants and wildlife, climate regulation and plentiful water contribute to all policy areas, as they underpin the provision of all the other benefits. The policy area of economic resilience is dependent on all the benefits.

Each policy area is covered in turn, setting out why it is dependent on the benefits from nature. We also explore the consequences of losing the benefits rated at high or medium-high risk for each area, and the priority actions to take to reduce this risk.

Table 4 Policy areas dependent on benefits from nature that are at highest risk. Key: red = high risk; orange = medium-high risk. Only benefits at high or medium-high risk are shown. Where benefits have different risk ratings across ecosystems, the highest risk rating is given. This follows The Orange Book principle[14], of "When assigning a consequence rating to a risk, the rating for the highest, most credible worst-case scenario should be assigned". See the Risk Register[7] for further detail.

	Economic resilience	Net Zero	Climate adaptation	Food security	Health & wellbeing	Water security
Timber and other wood products	■					
Produce from the sea	■			■		
Cultivated crops	■			■		
Plentiful water	■	■	■	■	■	■
Reared animals and outputs	■			■		
Clean water	■			■	■	■
Clean air	■				■	
Noise regulation	■				■	
Urban cooling	■		■		■	
Erosion control	■		■	■		■
Flood protection	■		■	■	■	■
Pollination	■			■		
Thriving plants and wildlife	■	■	■	■	■	■
Pest and disease control	■		■	■		
Climate regulation	■	■	■	■	■	■
Cultural benefits	■				■	

3.2.1 Priorities for action in the next five years

We identify priority actions for these six policy areas. These are a priority for action in the next five years and are based on:

- the benefits at highest risk on which each sector depends.
- the ecosystems where these benefits are at highest risk.
- the drivers of change which are causing the highest risk.

With a changing climate and other increasing drivers, this urgent action is needed to maintain the benefits from nature we rely on. It protects us from approaching unknown thresholds of irreversible damage to ecosystems. It also avoids further escalation of the risks and costs of restoration. The Dasgupta report[2] highlighted that the longer we allow ecosystems to deteriorate, the higher the economic cost of restoration will be. It is twice as expensive to delay conservation and restoration action by 10 years as it is to do something now[15].

3.3 Economic Resilience

Economic resilience refers to the strength and stability of our society and economy when exposed to shocks and pressures. Risks to the delivery of benefits from nature are a fundamental risk to economic resilience.

Benefits from nature which are at high and medium-high risk are shown in Table 5. This includes produce from the sea, timber and reared animals, as well as pollination and pest and disease control, which are vital for crops. These benefits contribute to industries, such as farming, forestry, fisheries and aquaculture, agri-food and construction, which supported 1.3 million jobs in England in 2022[16]. Benefits from nature help to reduce these impacts on economic resilience.

Flood protection, erosion control, and clean and plentiful water are all at high risk, which increases the risk of water-related hazards. In urban areas, blue and green spaces help reduce these hazards, while also reducing air pollution, noise and extreme temperatures.

Thriving plants and wildlife and climate regulation underpin all the other benefits from nature. The Dasgupta Report[2] and Stern Review[3], respectively, conclude that early action to tackle biodiversity loss and climate change far outweighs the cost of not acting.

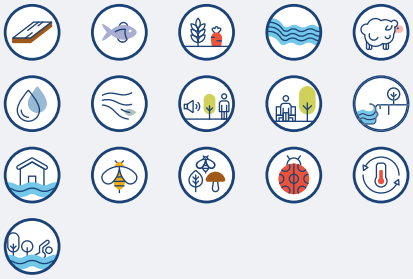
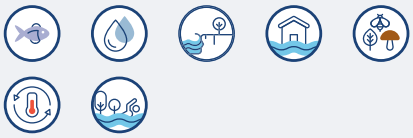
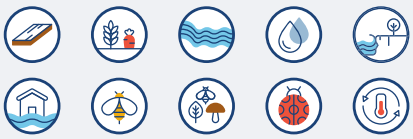
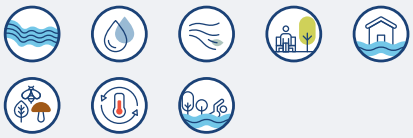
Table 5 Consequences for economic resilience when high (red) and medium-high (orange) risk benefits are lost

Benefits at high or medium-high risk		Risk consequences for economic resilience
	Timber and other wood products	Impacts across construction, biomass energy, clothing fibre, and bio-based plastics sectors[17]. The total volume of timber in England in 2022 was over 1.9 million cubic meters, valued at £2.8 billion[18].
	Produce from the sea	Losses across the fishing industry, from produce, employment, and trade. In 2022 the UK exported 330 thousand tonnes of fish, with a value of £1.7 billion[19].
	Plentiful water	Electricity generation uses over half of our abstracted water each year, based on the average use between 2000-2018[20]. Reduced supply puts pressure on the energy, agriculture and industry sectors, which could make water, and products that rely on it, more expensive.
	Reared animals and outputs	Decline of available grazing due to increased drought and flooding. Mutton and lamb products, which are more likely to graze on at-risk mountains, moorlands and heaths, accounted for £1.6 billion in England in 2022[21].
	Clean water	Deteriorating water quality requiring costly clean up, loss of water-based recreation economy, and knock-on impacts across the food and health sectors.
	Erosion control	Catastrophic erosion: up to 82,000 homes and 754 hectares of good quality agricultural land in England at risk from erosion by 2080 due to climate change[22].

Flood protection	Increasing economic losses due to damages from flooding. Winter flooding in 2019-20 caused an estimated economic loss of £333 million[23]. Network Rail reported £190 million in delay payments to passengers from flooding between 2006-2021[24]. By 2080, 650km of coastal railway lines will be at greater flood risk due to climate change[22].
Thriving plants and wildlife	Loss of biodiverse, healthy, functioning ecosystems underpinning all the other benefits. The Dasgupta review[2] concluded that the economic benefits of strong and early action to reduce biodiversity loss far outweigh the economic costs of not acting.
Climate regulation	Losing natural carbon sinks and increasing emissions from existing stores, such as peatlands. The Stern Review on The Economics of Climate Change concluded that the benefits of strong, early action outweigh the economic costs of not acting[3]. The economic benefit of reduced carbon emissions from restoring all peatlands in the UK is between 5 and 10 times the cost[25].
Cultural benefits	Loss of highly valued benefits of nature-related tourism and recreation, valued at £7.9 billion in 2022[18].
Cultivated crops	Loss of crops that we eat, and the fodder eaten by farmed animals. The annual value of wheat production in the UK in 2021 was £4.1 billion, vegetable production was £1.8 billion and fruit just over £1 billion (in 2022 prices)[21].
Clean air	More people exposed to air pollution, which accounts for over 6 million sick days every year, leading to loss of productivity and estimated social cost of £22.6 billion per year in the UK[26].
Noise regulation	Loss of noise reduction due to loss of trees and other vegetation in urban areas[27], increasing impacts on mental health, healthcare costs and workforce productivity.
Urban cooling	High summer temperatures reduce people's ability to work, increase air conditioning costs and ultimately increase fatalities. In the summer of 2022, a record-breaking series of heat waves caused 2,985 excess deaths in the UK[28]. Cooling provided by urban trees in central London is estimated to save up to £22 million a year from a 13% reduction in energy usage[29].
Pollination	Losing yields of pollinator-dependent crops such as oilseed rape, strawberries and apples, which covered 20% of the UK's cropped area in 2007[30]. Pollination represents approximately £500 million in benefits[31] in the agricultural industry and its loss would have cross-sector knock-on impacts.
Pest and disease control	Loss of crops, livestock and timber products due to agricultural and forestry pests and diseases, which are increasing with climate change. The spread of invasive and non-native species could cost the UK economy £1.8 billion each year[32].

3.3.1 Priority Actions for Economic Resilience

Listed below are 11 priority actions to reduce risk to economic resilience, with the benefits from nature supported by each action represented by icons.

1. Use sea and land-use planning measures to ensure the protection and enhancement of ecosystem assets	
2. Minimise damage to the seabed through good fishery management	
3. Ensure space and sediment supply for saltmarshes and sand-dunes with sea level rise	
4. Sustainably manage soils and river catchments, slowing flows and encouraging infiltration of rainwater	
5. Create large-scale, wilder nature networks planned and located to provide multiple benefits	
6. Maintain and enhance nature-rich areas through sustainable farming and forestry	
7. Create multi-functional networks of accessible, wildlife-rich green and blue urban space	
8. Create, protect and conserve natural carbon sinks and stores on land and at sea	
9. Identify, report, prevent and minimise the introduction, spread and impact of invasive species including freshwater species and tree pests and diseases	
10. Reduce pollution from all sources	
11. Reduce water demand and waste, from all uses	

3.4 Net Zero

Net Zero refers to the balance between release and capture of carbon dioxide. When the amount of carbon dioxide released is the same as is being absorbed, within a certain amount of time, Net Zero is achieved. In the UK, we have committed to achieving Net Zero by 2050[33] as a legally binding target, as well as to reducing greenhouse gas emissions by at least 68% by 2030, compared to 1990 levels[33]. Our ecosystems play an essential role in Net Zero by absorbing and storing carbon in plants, animals, soils and oceans. Carbon builds up in ecosystems over time, when thriving plants and animals live, die and interact.

Table 6 shows some of the consequences for achieving Net Zero if we lose the benefits provided by nature. Achieving Net Zero is most at risk from land- and sea-use change and climate change. Damaging our ecosystem carbon stores through draining peatlands and marshes, trawling ocean floors, and losing woodlands and grasslands to development will increase carbon release. Climate change alone could reduce the area of land suitable for peat-forming bog by up to 65% by 2050[34].

Table 6 Consequences for Net Zero when high (red) risk benefits are lost

Benefits at high risk		Risk consequences for achieving Net Zero
	Plentiful water	Transition toward green energy and hydrogen fuel sources puts further pressure on water supplies. Drying of peatland and wetland carbon stores results in release of carbon dioxide, as well as other greenhouse gases into the atmosphere.
	Thriving plants and wildlife	Nature will not be able to remove the 50 mega tonnes of CO_2 per year up to 2050 that we are relying on to meet Net Zero[34].
	Climate regulation	We lose carbon from England's largest carbon sinks, in marine and coastal margins. An estimate of between 10.5 and 60.1 million tonnes of carbon dioxide equivalent were sequestrated in UK waters in 2018 by saltmarsh and subtidal sand and mud with an estimated value of between £742 million and £4,259 million (in 2019 prices)[35]. We lose carbon from our largest land-based carbon stores in the English uplands[36]. Degraded peatlands continue, and potentially increase, their emissions of greenhouse gases. Peatlands are estimated to emit 23 megatons of CO_2 per year[37], which equates to approximately 6% of the annual UK CO_2 emissions for 2023[38]. Degradation of soils leads to decreases in their carbon stores, estimated as being equivalent to 36% of global annual carbon emissions from fossil fuels[39]. Peatlands drained for agriculture would continue to have the highest greenhouse gas emissions per hectare of any UK land use[36]. Loss of carbon from important stores in heathlands and semi-natural grasslands, which store more carbon than modern agricultural landscapes, but less carbon than peatlands, saltmarsh and established woodlands[36].

3.4.1 Priority Actions for Net Zero

Listed below are 11 priority actions to reduce risk to Net Zero, with the benefits from nature supported by each action represented by icons.

1. Use marine spatial planning and blue carbon mapping to minimise the impact of development on seabed carbon stores/ sinks, including saltmarsh, seagrass, seafloor and kelp beds	
2. Adopt fishing practices and management which minimise damage to seabed carbon stores/sinks	
3. Ensure space and natural sediment supply for saltmarsh systems, as part of shoreline management planning	
4. Re-wet bogs and restore peat formation to shift them from carbon sources to sinks	
5. Manage cultivated peat soils to reduce carbon emissions and retain their carbon stores	
6. Create and restore large naturally-functioning and diverse wetland complexes	
7. Restore naturally-functioning river systems and floodplains to shift them from carbon sources to carbon sinks	
8. Sustainably manage semi-natural grasslands, mountains, moorlands and heaths to act as carbon sinks	
9. Create new woodland through a "right tree in the right place" approach, which avoids damage to existing nature or carbon-rich areas	
10. Use strategic land-use planning to protect natural carbon stores from loss and damage from development	
11. Cease extraction and use of peat	

3.5 Climate Adaptation

Developing a society that can cope with the stresses and shocks of a changing climate is vital for prosperity, our economy and wellbeing. Climate adaptation describes the changes we make to reduce the impact of extreme weather, such as flooding, drought, storms and heatwaves. Extremes of weather are already being recorded in the UK and will become more likely in the future[40]. Natural capital assets play an important role in supporting our resilience to the impacts of these extreme weather events.

Ecosystems are vital in slowing water flows, increasing infiltration, and providing space for flood waters. Low-density broadleaved woodland, heath and semi-natural grassland can tip the balance in favour of water infiltration and replenishment of freshwater aquifers[41]. Dunes and saltmarsh provide natural flood defences and reduce wave energy. Urban green spaces decrease surface water run-off and urban temperatures, as vegetation absorbs and retains less heat than built surfaces. Species diversity, including in the soil, is vital for supporting the natural control of agricultural and forestry pests and diseases, which are likely to increase with climate change. Thriving plants and wildlife underpin all the benefits.

Climate and land- and sea-use change further increase the burden on our already degraded assets. These put our natural carbon stores and sinks at high risk. Table 7 shows some of the consequences of risk to natural capital benefits for climate change adaptation.

Table 7 Consequences for climate adaptation when high (red) and medium-high (orange) risk benefits are lost

Benefits at high or medium-high risk		Risk consequences for climate adaptation
	Plentiful water	Pressure on water supplies, vulnerability to droughts causing loss of crops and livestock, and risk of damaging wildfires. Climate change will increase the demand on public water supplies by up to 400 million litres per day by 2050[42].
	Erosion control	Catastrophic, irreversible erosion, especially at the coast, affecting housing, businesses, and infrastructure, including transport routes and power supplies. Across England and Wales, soil degradation, erosion, and compaction causes losses of £1.2 billion each year[43].
	Flood protection	Long-term impacts on health and damage to infrastructure including transport routes, power and water supplies. Over 5.2 million homes and properties[44], 23% of Listed Buildings and 18% of Scheduled Monuments[34] are at risk from flooding and coastal erosion.
	Thriving plants and wildlife	Loss of healthy, functioning ecosystems which help us to adapt to climate change.
	Climate regulation	Nature will not be able to remove the 50 mega tonnes of CO2 per year up to 2050 that we are relying on to meet Net Zero[34].

	Urban cooling	High summer temperatures reduce people's ability to work, increase air conditioning costs and ultimately increase fatalities. In the summer of 2022, a record-breaking series of heat waves caused 2,985 excess deaths in the UK[28]. Cooling provided by urban trees in central London is estimated to save £22 million in annual energy consumption[29].
	Pest and disease control	Loss of crops, livestock and timber products due to agricultural and forestry pests and diseases, which are increasing with climate change. Globally, 20-40% of food is lost each year due to pests and diseases[43].

3.5.1 Priority Actions for Climate Adaptation

Listed below are 11 priority actions to reduce risk to climate adaptation with the benefits from nature supported by each action represented by icons.

1. Create and restore large naturally-functioning and diverse wetland complexes, including as part of flood management schemes	
2. Restore naturally-functioning river systems and re-connect rivers to flood plains, increasing resilience to climate change	
3. Create structurally diverse, naturally-functioning upland mosaics	
4. Develop fire prevention, management and contingency plans for mountains, moorlands and heaths	
5. Create large-scale wilder nature networks planned and located to slow flows and encourage water infiltration	
6. Improve the infiltration of rainwater to groundwater, by restoring soil organic matter levels and avoiding soil compaction	
7. Ensure space and natural sediment supply for saltmarshes and sand dunes with sea level rise, including through shoreline management planning	
8. Reduce pressures on marine ecosystems, including through marine planning and sustainable fishing practices, to enhance ecosystem resilience to climate change	
9. Create species-rich nature networks within enclosed farmland of field margins, boundary features and larger areas	
10. Use land use planning measures to reduce water use, surface run-off and flood-risk, enhancing resilience to climate change	
11. Incorporate multi-functional blue and greenspace in urban developments for urban cooling and flood risk management	

3.6 Food Security

Food security is defined in the National Food Strategy[45] as being able to feed the population at a reasonable cost, even in the face of future shocks. We are dependent on our natural capital assets to provide our food, through produce from the sea, cultivated crops and reared animals. Clean and plentiful water, pollination and natural control of pests and diseases support the growth of food species. Ecosystems play a vital role in reducing the impacts of climate change on food production, through slowing water flows, increasing infiltration and storage, and reducing soil erosion.

Table 8 shows some of the consequences for food production of losing these benefits from nature. Technology has developed to increase food production, through fertilisers, pesticides, improved machinery, fish detection and selective breeding. However, increased food production has also led to over-extraction of resources and damage to assets vital for food security. Bottom trawling, over-fishing, marine infrastructure and pollution put produce from the sea at high risk. Intensive agricultural activity puts soils at risk from degradation, with 3.9 million hectares at risk of soil compaction in England and Wales[46]. Natural capital assets supporting agriculture are most at risk from land use change, intensive farming practices and climate change. We rely on 20 species to provide 90% of the world's food[45]. Being dependent on so few species put us all at risk.

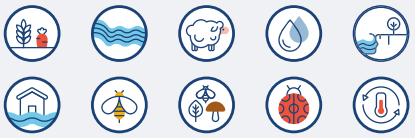
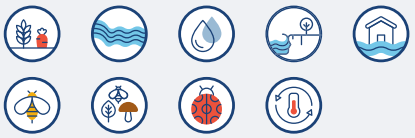
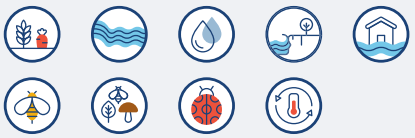
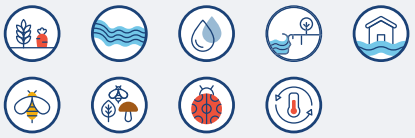
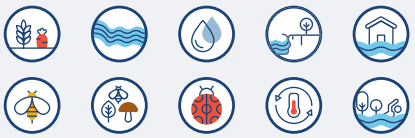
Table 8 Consequences for food security when high (red) and medium-high (orange) risk benefits are lost

Benefits at high or medium-high risk		Risk consequences for food security
	Produce from the sea	Loss of wild populations of fish and shellfish in our food supply, impacting our fishing industry. Over 1/3 of UK fish stocks are overfished, and 1/4 of populations are in a critically low state[47].
	Plentiful water	Decline of crop and livestock production due to seasonal changes in rainfall, exacerbated by loss of water infiltration, storage and increased run-off. Drought conditions are more likely in April-October, the months of the UK's crop growing season[43].
	Reared animals	Loss of grazing land and livestock, with increasing frequency of droughts and flooding, exacerbated by loss of water infiltration, storage and increased run-off.
	Clean water	Populations of fish and shellfish growing in polluted water and absorbing heavy metals which can be transferred to humans through eating. There have been increasing concentrations of lead in fish and shellfish each year of between 2.5-3.5%[48].
	Erosion control	Loss of soil and organic matter that supports the growth of crops and livestock. Across England and Wales, soil degradation, erosion, and compaction causes losses of £1.2 billion each year[43].
	Flood protection	Increased risk of flooding, putting crops and livestock at risk. 71% of land at high risk of flooding is agricultural land in England[49].

	Thriving plants and wildlife	Loss of ecosystems and species diversity supporting produce from the sea, pollination and natural pest and disease control. Loss of soil and sediment life, vital for food production. Potential loss of future food species.
	Climate regulation	Natural carbon stores and sinks are lost, which prevents us from reaching Net Zero, and puts food production at risk from the impacts of climate change, including flooding and drought.
	Cultivated crops	Reduced capacity to produce food domestically. The UK is largely self-sufficient in grain production, but without this we will become more reliant on imports, and have to secure our food supply against international environmental, economic, or political changes[43].
	Pollination	Crops, fruit, vegetables and livestock feed dependent on animal pollination more likely to fail, reducing yields and threatening the agricultural industry. Pollinator-dependent crops such as oilseed rape, strawberries, apples and pears, covered 20% of the cropped area of the UK in 2007[30].
	Pest and disease control	Loss of crops and livestock due to agricultural pests and diseases, which are increasing with climate change. Globally, 20-40% of food is lost each year due to pests and diseases[43].

3.6.1 Priority Actions for Food Security

Listed below are 9 priority actions to reduce risk to food security with the benefits from nature supported by each action represented by icons.

1. Minimise damage to the seabed through good fishery management	
2. Use marine spatial planning and mapping to minimise the impact of development on seabed ecosystems and seek restoration of damaged areas	
3. Take account of fish (and other sea food) nursery and breeding grounds in shoreline management planning, including ensuring space and natural sediment supply for the landward migration of saltmarshes	
4. Reduce water pollution from all sources, including to improve water quality in coastal waters	
5. Sustainably manage soils and river catchments, slowing flows and encouraging infiltration of rainwater	
6. Create species-rich nature networks within enclosed farmland of field margins, boundary features and larger areas	
7. Maintain and enhance nature-rich areas through sustainable farming practices	
8. Increase the carbon and biodiversity of all cultivated soils	
9. Reduce water consumption and waste, adopting water conservation measures	

3.7 Health and Wellbeing

Benefits from nature, such as clean air and water, noise regulation and reducing the impacts of climate change, are fundamental to physical and mental health[50]. Experiences of nature-rich places are important for our wellbeing. Land- and sea-use change, climate change and pollution are impacting how ecosystems can provide these public health benefits.

Table 9 shows some of the consequences of risk to benefits from nature for our health and wellbeing. Public Health England[51] identifies poor air quality as the greatest environmental risk to public health, with 40,000 people dying early due to air pollution each year in the UK[26].

Loss of urban green and blue space results in a reduction in air and water quality, flood protection, noise regulation, urban cooling, and the mental health benefits these spaces provide.

Data from 2018 show 17.7% of the UK population suffering from mental health issues[52], yet there is evidence that spending time in nature improves our physical and mental health and wellbeing[50]. Impacts on our ecosystem assets beyond our urban areas also put flood protection and clean and plentiful water at high risk, with negative consequences to our health and wellbeing.

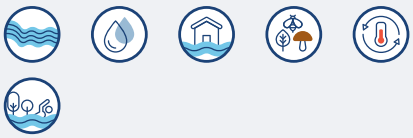
Table 9 Consequences for health and wellbeing when high (red) and medium-high (orange) risk benefits are lost

Benefits at high or medium-high risk		Risk consequences for health and wellbeing
	Plentiful water	Increasing pressure on water supplies to meet demand. To make supplies resilient to drought in England, an additional 1,150 million litres of water per day is needed for public water supply up to 2050[42].
	Clean water	Increasing pressure on existing infrastructure to deliver a secure, safe supply of water that we require for everyday uses like drinking, hygiene, sanitation and water-based recreation.
	Flood protection	An increase in the proportion of people under threat of flooding, who are 50% more likely to experience poorer mental health than other residents in England[44].
	Thriving plants and wildlife	Loss of biodiverse, healthy, functioning ecosystems underpinning the health and wellbeing benefits we rely on.
	Climate regulation	Loss of natural carbon stores and sinks prevents us from meeting Net Zero, resulting in an increase in frequency of extreme weather events, which impact on human health and wellbeing.
	Cultural benefits	Loss of access to natural spaces for relaxation and recreation. 69% of adults reported visiting green and natural spaces at least once a week between April 2022 and March 2023[53] and 88% of children aged 8-15 agreed that being in nature made them very happy[54].
	Clean air	Increasing respiratory illnesses (such as asthma), psychological impacts, cancer[50], plus negative impacts on the growth and development of children[50]. In 2020, vegetation in England removed 10.6 thousand tonnes of fine air pollution particles produced by industry and transport[55].

	Noise regulation	Worsening impact of road traffic noise on our mental health, leading to more cases of depression and anxiety[56]. Noise reduction from trees has been estimated to have a total annual value of £16.6 million in 2021[57], in avoided loss of quality adjusted life years.
	Urban cooling	Risking the health and lives of people during record-breaking heat waves. In the summer of 2022, a record-breaking series of heat waves caused 2,985 excess deaths in the UK[28].

3.7.1 Priority Actions for Health and Wellbeing

Listed below are 6 priority actions to reduce risk to health and wellbeing with the benefits from nature supported by each action represented by icons.

1. Create multi-functional networks of accessible, wildlife-rich green and blue urban space	
2. Use land-use planning measures to embed climate adaption in new developments including reducing water use, surface run-off and flood-risk, as well as vegetation for urban cooling	
3. Create large-scale wilder nature networks, planned and located to provide multiple benefits and achieve standards for access to natural greenspace	
4. Work with natural processes in headwaters and catchments to slow water flows, encourage infiltration and reduce soil erosion	
5. Ensure space and natural sediment supply for saltmarshes and sand dunes with sea level rise, including through shoreline management planning	
6. Reduce water pollution from all sources	

3.8 Water Security

Water makes life possible; it is essential for every living thing. Water security enables a population to have access to clean and sustainable water sources, as well as resilience to water-related hazards, such as droughts and floods. Ecosystems are vital for supplying plentiful clean water and contributing to flood protection. However, ongoing impacts of climate change, land- and sea-use change, and pollution, put water security at risk.

Our ecosystem assets play a vital role in water security. Most of our drinking water comes from upland water bodies and 30% comes from groundwater aquifers[58]. Assets such as low-density woodland and semi-natural grasslands can help to slow flows, increase rainwater infiltration and replenish aquifers. Storing water on floodplains and in wetlands can decrease downstream flood risk, while sand dunes and saltmarshes can act as natural flood defences. Urban green spaces reduce surface water run-off and water pollution. Ecosystem processes help to dilute, degrade, and decompose pollutants.

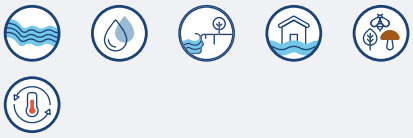
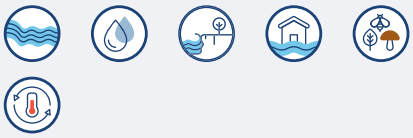
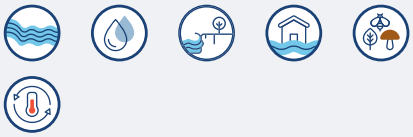
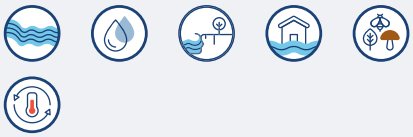
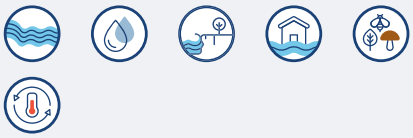
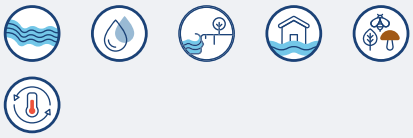
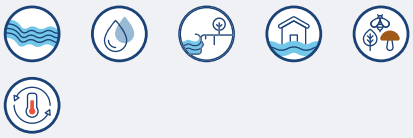
Natural capital risks to water security increase risks across multiple sectors, such as food, drinking water, energy production, water-based recreation and produce from the sea. Some of the consequences for water security of risk to natural capital benefits are shown in Table 10.

Table 10 Consequences for water security when high (red) risk benefits are lost

Benefits at high risk	Risk consequences for water security
Plentiful water	We risk water demand for drinking water, energy production, agriculture and other industries outstripping supply during future periods of drought. To make water supplies resilient to drought in England, an additional 1,150 million litres of water per day is needed up to 2050[42].
Clean water	More resources, energy and money will be needed to purify and clean water, increasing bills and pressure on our water infrastructure. Poor water quality will increase the health risks of water-based recreation; in 2022 all designated bathing water rivers in England were classified as 'Poor'[59].
Erosion control	Sediments will be transported into our rivers, lakes, and seas, further increasing the risk of flooding.
Flood protection	People, livelihoods, houses, and other vital infrastructure is put at increased risk. Over 5.2 million homes and businesses[44], 23% of Listed Buildings and 18% of Scheduled Monuments[34] are at risk from flooding and coastal erosion.
Thriving plants and wildlife	Loss of healthy, functioning biodiverse freshwater and wetland ecosystems, supporting the water security benefits we depend on.
Climate regulation	Loss of natural carbon stores and sinks prevents us from meeting Net Zero, resulting in an increase in frequency of droughts, flooding and associated water quality issues.

3.8.1 Priority Actions for Water Security

Listed below are 10 priority actions to reduce risk to water security with the benefits from nature supported by each action represented by icons.

1. Reduce water pollution from all sources	
2. Reduce water demand and waste, from all uses	
3. Work with natural processes in headwaters and catchments to slow flows, encourage infiltration and reduce soil erosion	
4. Create and restore large naturally-functioning and diverse wetland complexes, including as part of flood management **schemes**	
5. Restore naturally-functioning river systems and re-connect rivers to flood plains, increasing resilience to climate change	
6. Restore hydrology and peat formation in mountains, moorlands and heaths	
7. Create large-scale wilder nature networks, planned and located to provide multiple benefits	
8. Ensure space and natural sediment supply for saltmarshes and sand dunes with sea level rise, including through shoreline management planning	
9. Use land use planning measures to reduce water use, pollution, surface run-off and flood-risk, enhancing resilience to climate change	
10. Improve the infiltration of rainwater to groundwater, by restoring soil organic matter levels and avoiding soil compaction	

3.9 Assessing risk based on the impact of drivers of change

The Intergovernmental Panel on Biodiversity and Ecosystem Services[60] identifies five main drivers of nature loss (Table 11). These five drivers, working alone and in-combination, directly cause a decline in our ecosystem assets. This puts the benefits we receive from nature at risk. While these are the main direct drivers of change, they are in turn impacted by economic growth, and demographic, technological and other changes.

Table 11 Five main drivers of change for natural capital

Icon	Driver	Description
	Land- and Sea-use Change	Changes in the cover and management of ecosystems for uses including forestry, agriculture, fisheries, aquaculture, mineral extraction, urbanisation, energy production, tourism, housing, and other infrastructure development.
	Pollution	Release of chemicals and nutrients such as nitrogen, phosphorus, sulphur, ozone, dissolved metals, macro- and microplastics, and particulate matter, from sources including agriculture, combustion and energy production, road transport, urban sewage, and industry and contaminated land.
	Natural Resource Use and Exploitation	Consumption and exploitation of terrestrial, marine, and freshwater resources, including wildlife, commercial fish stocks, timber, livestock and wild herbivore grazing, and freshwater abstraction.
	Climate Change	Changes linked to unprecedented rises in anthropogenic greenhouse gas emissions, including changes in temperature, changes in precipitation levels, more frequent and severe extreme weather events, sea level rises, ocean acidification, species extinctions, changes to the timing of reproduction and migration events, and increased frequency in outbreaks of pests and disease.
	Invasive Species	Invasive species can include non-native species that displace and/or out-compete native species for food and resources, or native species that become too dominant after habitat or climate changes.

We apply a transparent, evidence-based approach to assessing risk, which allows us to be clear about what is driving it. Our assessment of risk is based on how impacted our ecosystems are already from all five main drivers of change, and the severity of these drivers now and going forward. For the ecosystems, it doesn't matter if the drivers were different in the past, than now and in the future. What matters is that deterioration means they are less able to cope with future change.

Where drivers have had a low level of impact to date, and the current and ongoing trend shows improvement, then the risk is low. This is because the ecosystems are in relatively good working order and are therefore better able to cope with change. If the impact to date is high or very high, and the ongoing trend shows a very rapid increase of the impact, then the risk to ecosystems is high too. Where ecosystems are already impacted by change, they are less able to cope with additional current and future impacts. This risks pushing them towards thresholds, beyond which they cannot recover.

Our Risk Register[7] shows that our assets are already very highly impacted by land- and sea-use change, pollution, natural resource use and exploitation, and climate change. There is currently a very rapid increase in the severity of impacts of climate change, associated invasive species (including pests and diseases), and land- and sea-use change. The full risk results are provided in the Risk Register[7]. Further detail on the impacts of drivers and the resulting risk scores for different ecosystem assets is provided in Section 4.

As well as impacting directly on the provision of benefits (e.g. pollution impacting produce from the sea), a driver can also increase the demand for a benefit. Climate change increases the likelihood of extreme weather events including droughts, flooding, and heat waves. This increases the burden on our ecosystems in the provision of clean and plentiful water, flood protection, erosion control and urban cooling, putting these benefits at risk.

Not all of the benefits are negatively affected by all of the drivers. For example, pollution impacts on the provision of clean water but not on the role ecosystems play in flood protection. This means that the impact of pollution (to date, and ongoing) is not a driver of change for flood protection.

Box 3 summarises how we have assessed risk. The full risk method is provided in the Risk Register[7].

Box 3 How have we assessed risk to natural capital?

We have assigned risk by assessing the severity of impacts to date, and current/ongoing impacts of drivers of change. This is based on an updated version of the UK National Ecosystem Assessment 2011 matrix of the impact of drivers on ecosystems[5]. We have updated this using indicator trends and progress to targets, other evidence sources and the expert opinion of Natural England specialists. We reviewed the natural capital risk register developed by the Natural Capital Committee[61] and incorporated their progress against targets method into our updating of the matrix. Our approach builds on this to give a fuller picture of risk (beyond those indicators with targets) and clearly identifies what is driving the risk.

Box 3 continues on the following page.

Table 12 Impact and trend of direct drivers on eight ecosystem assets

Ecosystem	Direct driver of change				
	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Marine	↑	→	↗	↑	↑
Coastal margins	↗	→	↘	↑	↗
Freshwaters and wetlands	→	→	↗	↑	↗
Woodlands	↗	↗	↘	↗	↑
Mountains, moorlands and heaths	↗	→	↗	↑	→
Semi-natural grasslands	↗	↗	→	↗	→
Enclosed farmland	↗	→	→	↗	↗
Urban	↗	→	↗	↗	↗

Key to Table 12:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

Box 3 continues on the following page.

We have then assigned a risk rating to the impacts of drivers of change, as follows:

Table 13 Assignment of risk ratings to impacts of drivers of change

		Driver's current and ongoing trend (since the UKNEA[a])			
Driver's impact on extent and condition of ecosystem assets (1940-present)		↘ Decreasing Impact	→ Continuing Impact	↗ Increasing Impact	↑ Very Rapid Increase of Impact
	Very High	M	M	M-H	H
	High	L	M	M-H	H
	Moderate	L	M	M	M-H
	Low	L	L	M	M

Note: Colour indicates the level of risk: red = high; orange = medium-high; yellow = medium; lemon = low.

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

We have applied this approach first to the ecosystem assets and then to the benefits they provide. For the benefit risk ratings, we also take into account whether a driver impacts on a particular benefit or not. For a risk to be rated as high, the ecosystem must already be highly or very highly impacted and at least one of the drivers having a very rapid increase of impact. In other words, urgent action is required. If a driver is not having a very rapid increase of impact, the risk will not be rated high.

4 State of the Ecosystem Assets

Heather/polypody sward

Our assets can only keep on giving if they are properly maintained. In the previous section we identify assets and benefits at risk from drivers of change. We set out the potential consequences of this risk for six different sectors. Here, we show how this hinges on the state of our ecosystems and the benefits they provide, exploring further why they are at risk due to drivers of change. A summary is provided here, with a fuller account in the State of The Assets Technical Report[8]. Indicators for measuring change in asset state, and the data used to do this, are given in the Indicators and Data Appendix (Appendix 1)[62]. These indicators fundamentally underpin our assessment of both asset state and risk.

Our method for assessing risk is summarised in Box 3, with further detail provided in the Risk Register[7]. We report on the state of eight broad ecosystems, collectively covering the whole of England:

- Marine and Coastal Margins (reported together as an interconnected system)
- Freshwaters and Wetlands
- Woodlands
- Mountains, Moorlands and Heaths
- Semi-Natural Grasslands
- Enclosed Farmland
- Urban

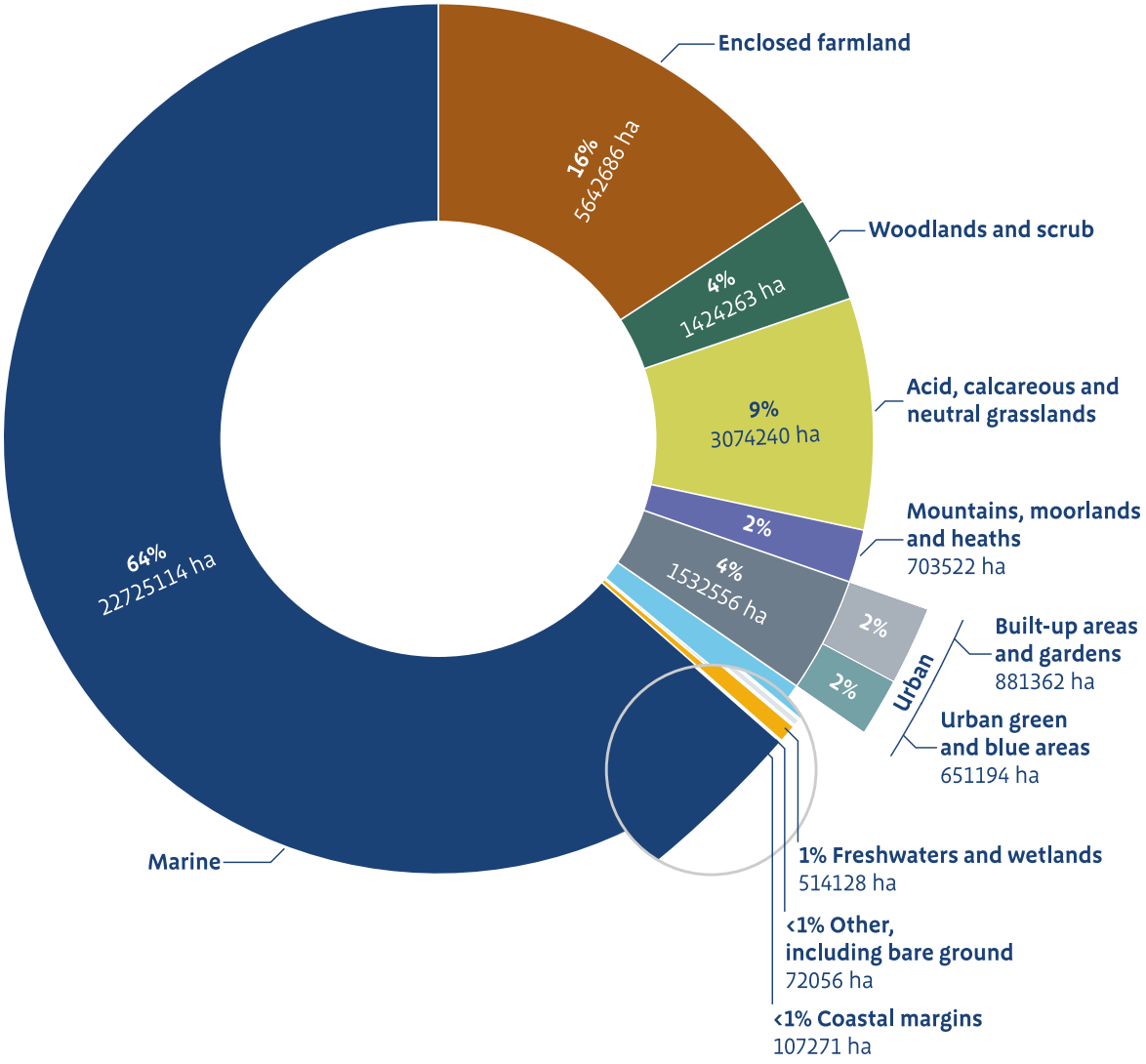


Figure 5 The extent of broad ecosystems in England. Predicted extents are measured using the Living England Phase IV dataset, which uses a satellite-based habitat classification model. Please note that the extent of acid, calcareous and neutral grassland includes both semi-natural and some improved grassland.

Thrift (*Armeria maritima*) on serpentine rocks, Caethillian Cove, The Lizard

4.1 Marine and Coastal Margins

Box 4 Risk to marine and coastal margin ecosystem assets from main drivers of change

Our research has assessed how at-risk marine and coastal margin ecosystem assets are in England, and is summarised below.

	Marine ecosystems are at high risk due to:	
	Impact to date	Very high impact to date of **resource exploitation (fishing)** and **climate change** High impact to date of **land- and sea-use change**
	Trend – current and ongoing	Very rapid increase of impact from **climate change**, **land- and sea-use change**, and **invasive species** Increasing impact from **resource exploitation**

These drivers put the following benefits at risk (key: red = high risk, yellow = medium risk):

Produce from the sea	Aquaculture	Clean water	Thriving plants and wildlife	Climate regulation	Cultural benefits

	Coastal margins are at high risk due to:	
	Impact to date	Very high impact to date of **land- and sea-use change**, **pollution and climate change**
	Trend – current and ongoing	Very rapid increase of impact from **climate change** Increasing impact from **land- and sea-use change**, and **invasive species**

These drivers put the following benefits at risk (key: red = high risk, yellow = medium risk):

Produce from the sea	Aquaculture	Clean water	Erosion control
Flood protection	Thriving plants and wildlife	Climate regulation	Cultural benefits

With the UK Continental Shelf extending 200 nautical miles from the coast, English coastal and marine ecosystems cover nearly twice the area of our terrestrial and freshwater ecosystems. The coast and sea function together as a system driven by natural processes; tides, currents, climate and weather. As such, it is hard to draw a boundary between coastal and marine ecosystems. We are therefore considering them together in this section.

Sand dunes, saltmarshes, estuaries, beaches and cliffs are found along our coastal margins. The intertidal zone is covered and revealed by the tides. Seagrass beds are found in the intertidal and shallow sub-tidal areas, as are reefs created by mussels and worms. In the deeper subtidal zone, soft bottom habitats, such as mud, sand, mixed and coarser sediments, cover almost all of England's continental shelf.

4.1.1 Impacts on marine and coastal margins

This report has identified the level and trend of impacts of the five main drivers of change on marine and coastal margins in England, as summarised in Table 14.

Table 14 Impacts of drivers of change on marine and coastal margins

	Land-/sea-use changes	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Marine	↑	→	↗	↑	↑
Coastal margins	↗	→	↘	↑	↗

Key to Table 14:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

Historically there have been huge losses in coastal habitats. This is due to land reclamation for farming, construction of harbours and coastal defences, and the development of coastal towns. Further out to sea, trawl fishing, dredging and industrial infrastructure have damaged the seabed. 75% of the English Channel and South Celtic Seabed are affected by high levels of disturbance from fishing[63].

80% of marine pollution comes from land-based sources, including agriculture, storm overflows, wastewater treatment and industrial discharges[64, 65]. Pollution includes pharmaceuticals, heavy metals, pesticides, microplastics and sewage.

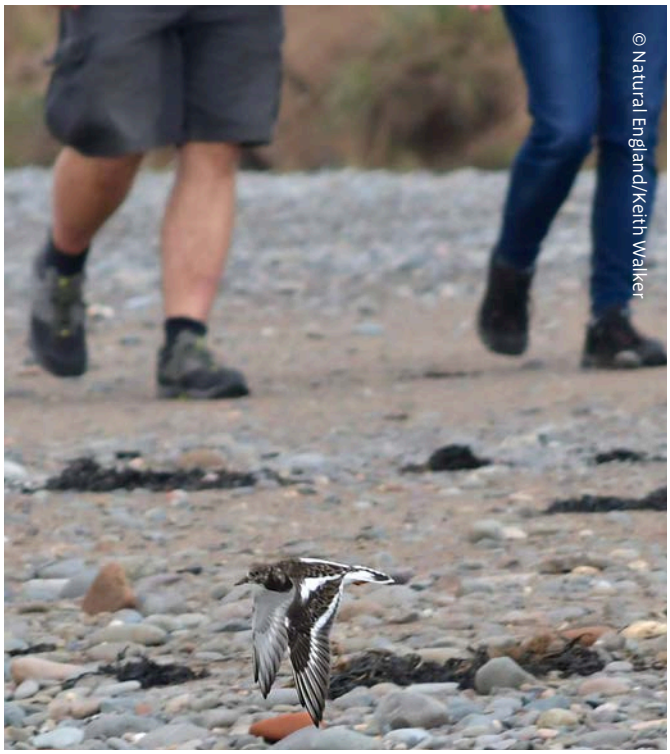
Climate change is impacting on our thin strip of coastal ecosystems through increased storminess, sea level rise, increased saline intrusion, coastal erosion and accretion[66]. Increases in seawater temperatures and associated acidification[64] have knock-on effects on marine ecosystems. Changes in the distribution and seasonality of plankton blooms can mean that they are out of sync with organisms higher up the food chain, such as breeding birds[67].

Fish in seas across Europe are estimated to be just 5% of the total mass present before commercial exploitation[68]. Since UK bottom trawling records began in the 1880s, fish numbers have decreased so steeply that 17 times the fishing effort is now required to catch the same number of fish[69]. The number of marine invasive non-native species established across 10% or more of the coastline has increased from two species in the 1960s to 29 in 2020[70]. The current and future rapid increase in offshore wind farm and other development impacts on the seabed and provides habitat for invasive species to spread on the pilings.

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put the provision of produce from the sea, thriving plants and wildlife, climate regulation and cultural benefits from marine and coastal margins at high risk. Coastal clean water, flood protection and erosion control are also at high risk (see Box 4 for full list of benefits at risk).

Snakelocks anemone amongst kelp fronds

Allonby Bay



European Otter

4.2 Freshwaters and Wetlands

Box 5 Risk to freshwater and wetland ecosystem assets from main drivers of change

Our research has assessed how at-risk freshwater and wetland ecosystem assets are in England, and is summarised below.

	Freshwaters and wetlands are at high risk due to:	
	Impact to date	Very high impact to date of **land-use change**, **pollution**, **and climate change** High impact to date of **resource exploitation** and **invasive species**
	Trend – current and ongoing	Very rapid increase of impact from **climate change** Increasing impact from **resource exploitation** and **invasive species**

These drivers put the following benefits at risk (key: red = high risk):

Plentiful water	Clean water	Erosion control	Flood protection	Thriving plants and wildlife	Climate regulation	Cultural benefits

Freshwaters and wetlands are some of our most naturally diverse ecosystems. This reflects their dynamic and varied nature. Standing water bodies range in size from species-rich ponds to our largest lakes in the Lake District, as well as constructed canals, reservoirs and gravel pits. Wetlands include reedbeds, fens, swamps, grazing marshes and extensive floodplains. Groundwaters emerge at the surface as headwater springs, feeding streams which flow into rivers and ultimately meet the sea at our estuaries.

4.2.1 Impacts on freshwaters and wetlands

This report has identified the level and trend of impacts of the five main drivers of change on freshwaters and wetlands in England, as summarised in Table 15.

Table 15 Impacts of drivers of change on freshwaters and wetlands

	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Freshwaters and wetlands	→	→	↗	↑	↗

Key to Table 15:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

Over millennia, as the human population and food production increased, freshwaters and wetlands have been polluted, drained, fragmented and physically altered, including through the building of flood defences. The extent of UK wetlands has decreased by 90% since Roman times[71]. This has continued into the present day with over 1000 ha of wetland lost between 2006-2012[72]. 75% of ponds were lost between the late 19th century and 1980s, although the number of ponds in England increased by 18% between 1998-2007[73]. There are no pristine freshwaters remaining in England[71].

The intimate links between freshwater and land, mean that changes in catchments affect water levels and quality of nearby wetlands and water bodies. Point source and diffuse pollution enter freshwaters and wetlands from sources including agricultural practices, storm overflows, waste-water treatment, industrial discharges, and road run-off. Water quality has improved markedly in rivers in recent decades but these improvements have not continued in recent years[74].

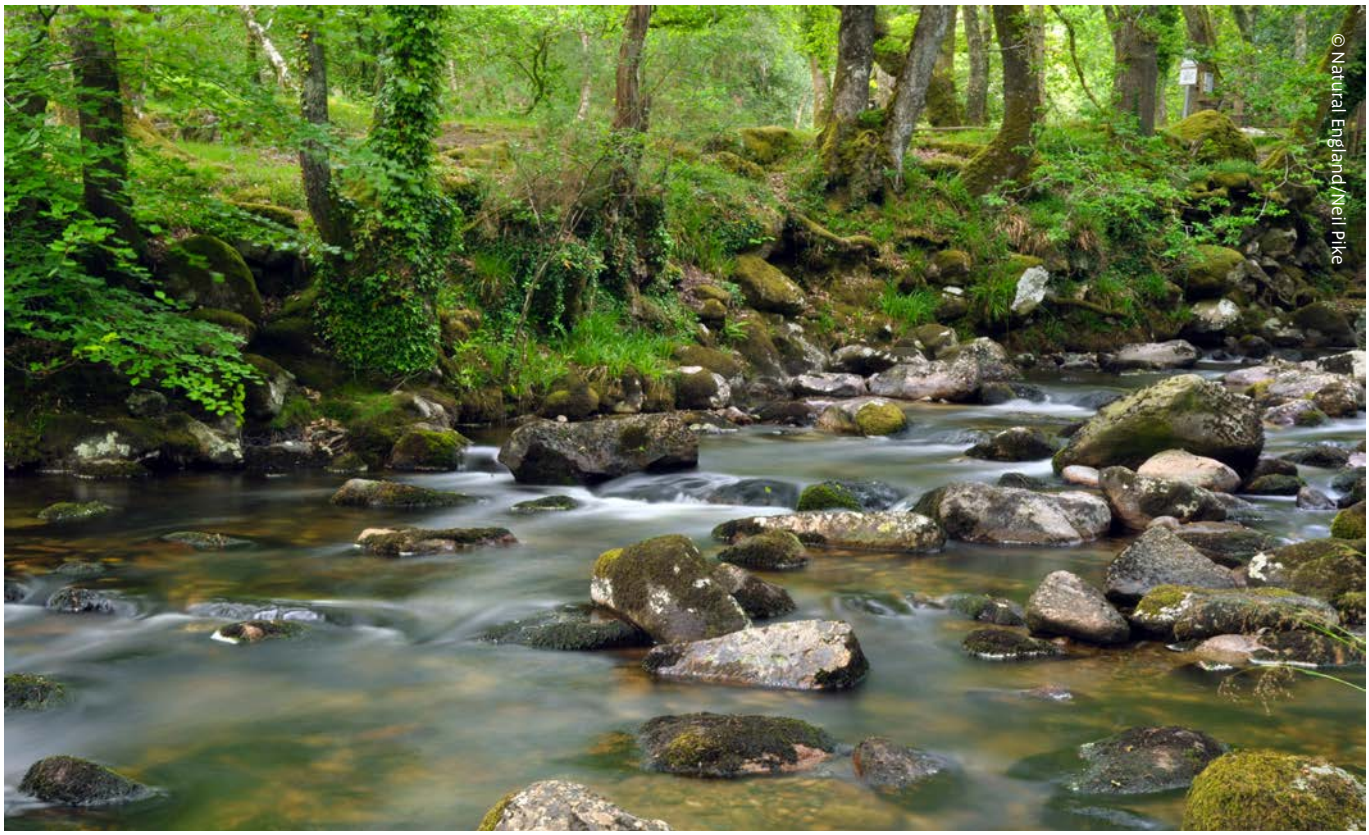
Population growth and climate change impact further on water quality and resources. Droughts will add to the pressure on surface and groundwaters. Our freshwaters and wetlands are among the most sensitive of our ecosystems to climate change[75], affecting water levels and temperature, which exacerbate pollution and algal blooms.

Invasive species, such as signal crayfish, Himalayan balsam, Japanese knotweed and Australian stonecrop have been introduced by humans and spread further by the flow of water.

All these impacts affect the wildlife of wetlands and freshwaters. There have been declines in the past decade in the ecological status of rivers and lakes[76], as well as wetland birds[77].

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put the benefits from freshwater at high risk (see Box 5). The impacts of land use change to date, coupled with climate change, put plentiful water, clean water, erosion control, flood protection, thriving plants and wildlife, climate regulation and cultural benefits at high risk. Hotter, drier summers and droughts also put plentiful water and our wetland carbon stores at risk of drying out. Pollution levels have an additional impact on clean water, cultural benefits, and thriving plants and wildlife.

River Plym



Dendles Wood, Dartmoor

4.3 Woodlands

Box 6 Risk to woodland ecosystem assets from main drivers of change

Our research has assessed how at-risk woodland ecosystem assets are in England, and is summarised below.

	Woodlands are at high risk due to:	
	Impact to date	Very high impact to date of **resource exploitation** High impact to date of **invasive species**
	Trend – current and ongoing	Very rapid increase of impact from **invasive species (pests and diseases)** Increasing impact from **land-use change**, **pollution**, and **climate change**

These drivers put the following benefits at risk (key: red = high risk; orange = medium-high risk; yellow = medium risk):

Timber and other wood products	Plentiful water	Clean water	Clean air	Erosion control
Flood protection	Thriving plants and wildlife	Climate regulation	Cultural benefits	

Covering 11% of England's land[78], woodlands and scrub constitute a highly distinctive, much-loved and spectacularly wildlife-rich component of our landscapes. They are very diverse and vary with climate, geology, soils, and management, past and present.

They support large numbers of rare and often specialist species of plants, invertebrates, fungi, and birds, and are home to many of our most cherished mammals such as red squirrels, pine martens and dormice.

4.3.1 Impacts on woodlands

This report has identified the level and trend of impacts of the five main drivers of change on woodlands in England, as summarised in Table 16.

Table 16 Impacts of drivers of change on woodlands

	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Woodlands	↗	↗	↘	↗	↑

Key to Table 16:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

The high demand for timber has doubled England's woodland cover since 1945, however this has been particularly coniferous species and often on heathlands and bogs[79]. More recently broadleaved tree planting has been driven by efforts to combat the biodiversity and climate crises[80].

Woodland condition and structural diversity have declined: traditional practices such as coppicing and other management have been abandoned. Overgrazing by deer has prevented natural regeneration[81]. Invasive species, pests and diseases pose a constant threat. Air pollution is also an issue, with atmospheric nitrogen deposition affecting all nutrient sensitive broadleaved woodlands in England[82]. Consequently, despite the growth in total woodland area, many woodland species are in decline.

Climate change is likely to result in further impacts on woodland from pests and diseases, drought and winter waterlogging of roots[83]. While warmer temperatures and levels of carbon dioxide may increase tree growth rates, this is variable with not all species benefiting[83].

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put woodland thriving plants and wildlife at high risk (see Box 6). Timber and wood products are also at high risk due to invasive pest and disease species.

Valley of the Rocks – West Exmoor Coast

4.4 Mountains, Moorlands and Heaths

Box 7 Risk to mountains, moorlands and heath ecosystem assets from main drivers of change

Our research has assessed how at-risk mountains, moorlands and heath ecosystem assets are in England, and is summarised below.

	Mountains, moorlands and heaths are at high risk due to:	
	Impact to date	Very high impact to date of **land-use change**, **pollution**, and **climate change**
	Trend – current and ongoing	Very rapid increase of impact from **climate change** Increasing impact from **land-use change** and **resource exploitation**

These drivers put the following benefits at risk (key: red = high risk):

Plentiful water	Reared animals and outputs	Clean water	Erosion control
Flood protection	Thriving plants and wildlife	Climate regulation	Cultural benefits

Mountain, moorland and heath ecosystems are remote, evocative, 'wild' landscapes. In the harsher climatic conditions of the uplands, bog, heath, bracken and rocky habitats are found in a mosaic with flushes, semi-natural grasslands and woodlands.

The English uplands form the largest unfragmented expanses of semi-natural habitats in England. They contain 1.5% of the world's blanket bog[84] and represent England's largest land-based carbon stores[36]. Raised bogs and heaths are also found in the lowlands. Whilst lowland heaths are more fragmented, they tend to be more biodiverse than their upland counterparts, supporting species such as silver studded blue butterfly, nightjar, sand lizards and Dartford warbler.

4.4.1 Impacts on mountains, moorlands and heaths

This report has identified the level and trend of impacts of the five main drivers of change on mountains, moorlands and heaths in England, as summarised in Table 17.

Table 17 Impacts of drivers of change on mountains, moorlands and heaths

	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Mountains, moorlands and heaths	↗	→	↗	↑	→

Key to Table 17:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

Dramatic changes have occurred in the uplands since the Second World War. A shift to more intensive grazing, commercial forestry and game management has led to a significant reduction in the extent of peatlands and heaths. Their condition, along with lowland peatlands, has also deteriorated due to drainage, grazing, burning and peat extraction[85]. Lowland heathlands have declined in extent and condition over the last century with only about 20% remaining of what was present in the 19th Century[85]. Urban development, agricultural intensification, abandonment of traditional practices, and afforestation[85], has resulted in lowland heathland becoming a rare and highly fragmented habitat. Air pollution and wildfires have also contributed to declining condition. Virtually all bog, heath and montane habitats are subject to damaging levels of nitrogen deposition[82].

Mountains, moorlands and heaths are among the most sensitive ecosystems to climate change[75]. Degraded bogs are the most sensitive[75], especially to drying with hotter and drier summers. Along with wildfire, this puts these major carbon stores at further risk. Intense

periods of rainfall impact on degraded peatland. The subsequent run-off results in carbon losses and potentially impacts water quality. Climate change also puts further pressure on thriving wildlife and the provision of plentiful water, flood protection and erosion control.

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put the benefits from mountains, moorlands and heaths at high risk (see Box 7).

Sphagnum moss

Chalk downland flora and wild mignonette, Hampshire

4.5 Semi-Natural Grasslands

Box 8 Risk to semi-natural grassland ecosystem assets from main drivers of change

Our research has assessed how at-risk semi-natural grassland ecosystem assets are in England, and is summarised below.

	Semi-natural grasslands are at medium-high risk due to:	
	Impact to date	Very high impact to date of **land-use change** and **pollution** High impact to date of **resource exploitation**
	Trend – current and ongoing	Increasing impact from **climate change**, **pollution** and **land-use change**

These drivers put the following benefits at risk (key: orange = medium-high risk; yellow = medium risk):

Plentiful water	Reared animals and outputs	Clean water	Flood protection
Pollination	Thriving plants and wildlife	Climate regulation	Cultural benefits

Semi-natural grasslands, created through traditional farming practices, are a product of thousands of years of interactions between humans and nature. These remnants of traditional livestock farming practices are rich in plant, invertebrate, mammal and bird life.

Semi-natural grasslands vary with geology, soil, climate and management. In the lowlands they are often fragmented, although large swathes remain in places like Salisbury Plain. Extensive areas are also found in our uplands. These are more species-poor, and often the result of degraded heath and bog.

4.5.1 Impacts on semi-natural grasslands

This report has identified the level and trend of impacts of the five main drivers of change on semi-natural grassland in England, as summarised in Table 18.

Table 18 Impacts of drivers of change on semi-natural grasslands

	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Semi-natural grasslands	↗	↗	→	↗	→

Key to Table 18:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

97% of lowland semi-natural grasslands in England and Wales were lost between the 1930s and 1984[86]. This trend has continued, with a decrease in extent of nearly half between 1960 and 2013[87]. Changing farming practices including ploughing, drainage and applications of fertiliser and herbicide resulted in conversion to arable, horticulture and improved grasslands. Post-war losses are also due to forestry, urbanisation, and road building.

Changing farming practices have also affected the quality of the remaining areas. Under-grazing can be an issue for lowland semi-natural grassland sites, while over-grazing has impacted on upland areas[88]. Nutrient enrichment from fertilisers, slurry and air pollution causes losses in plant and invertebrate diversity[88]. These combined changes affect other species too. A major decline in the distribution of breeding and wintering grassland birds occurred in the second half of the 20th century[89]. The decline in bumblebees since the 1960s has been linked to the decline in semi-natural grassland[90].

The impacts of climate change are likely to change both the species composition of semi-natural grasslands, as well as the way in which they are managed. The fragmented nature of lowland grasslands leaves them vulnerable, as species distributions change with the climate[88].

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put the benefits provided by semi-natural grasslands at medium-high risk (see Box 8). This includes risks to clean and plentiful water and flood protection, affected by pollution, lower rainfall infiltration and storage, and the increased severity of droughts and floods. Loss of species and their abundance impacts on thriving plants and wildlife, pollination, and natural pest control. With intensification of management, there's a risk of losing carbon from these important carbon stores.

Pasqueflower

Gulls following plough

4.6 Enclosed Farmland

Box 9 Risk to enclosed farmland ecosystem assets from main drivers of change

Our research has assessed how at-risk enclosed farmland ecosystem assets are in England, and is summarised below.

	Enclosed farmland is at medium-high risk due to:	
	Impact to date	Very high impact to date of **land-use change** and **pollution**
	Trend – current and ongoing	Increasing impact from **climate change**, **invasive species** and **land-use change**

These drivers put the following benefits at risk (key: orange = medium-high risk; yellow = medium risk):

Cultivated crops	Plentiful water	Reared animals and outputs	Clean water
Erosion control	Flood protection	Pollination	Thriving plants and wildlife
Pest and disease control	Climate regulation	Cultural benefits	

43% of the land in England is enclosed farmland[78] and managed primarily for food production. Arable and horticultural land is mainly in the drier east, with improved grassland for animal production in the wetter and milder west. The farmed landscape includes a patchwork of field margins, hedges, banks of trees and scrub, walls, and ditches. Along with small woodlands and ponds, this array of features is vital for supporting farmland wildlife. Our farmed landscapes are vital for our health and wellbeing, especially as places to visit close to where we live.

4.6.1 Impacts on enclosed farmland

This report has identified the level and trend of impacts of the five main drivers of change on enclosed farmland in England, as summarised in Table 19 .

Table 19 Impacts of drivers of change on enclosed farmland

	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Enclosed farmland	↗	→	→	↗	↗

Key to Table 19:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

Agricultural productivity increased four-fold after the Second World War[21]. Yields increased with the introduction of mechanisation, pesticides, fertilisers, and new varieties and breeds. At the same time, there has been a loss of mixed farming systems. Smaller fields have been merged, losing margins and boundary feature habitats, impacting on wildlife. Included in the recorded declines are iconic farmland birds such as skylarks, yellowhammers and lapwings, and butterflies[81]. Urbanisation, roads, and infrastructure have eaten into farmland in many areas.

Pollinator-dependent crops covered a fifth of the UK in 2007[30]. Hedgerows, banks of trees, scrub and other wilder areas are needed to support the pollinators. This pollination has been estimated to be worth £500 million annually in the UK[31]. Greater species diversity, supported by boundary and other field margins and soil biodiversity, helps to control agricultural pests and diseases. Pests and diseases account for between 20% and 40% of global food production losses each year[43].

Soil health and soil life are vital for farming. Healthy soils can store water, cycle nutrients, buffer chemical pollutants and reduce soil erosion. Production losses due to soil erosion have been estimated to be at around £40 million per year in England and Wales[91]. Bare soil increases water run-off, which impacts

on aquifer replenishment and flood risk. Soil is a critical carbon store, but it can also be a carbon source, for example peatlands drained for agriculture have the highest greenhouse gas emissions per hectare of any UK land use[36]. Freshwater and wetlands are affected by diffuse pollution from agricultural practices. Atmospheric pollution from farming affects sensitive habitats too.

Climate change impacts on enclosed farmland through increased summer temperatures and changes in rainfall patterns, including drought and storms. These will also impact negatively on species diversity, including pollinators. Dried out or waterlogged soils will affect pollution and clean water. In addition to changes in weather patterns, crops and reared animals are at risk from climate-driven increases in pests and diseases.

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put most of the benefits from enclosed farmland at medium-high risk (see Box 9).

Brown hares

4.7 Urban

Box 10 Risk to urban ecosystem assets from main drivers of change

Our research has assessed how at-risk urban ecosystem assets are in England, and is summarised below.

	Urban ecosystems are at medium-high risk due to:	
	Impact to date	Very high impact to date of **land-use change** and **pollution**
	Trend – current and ongoing	Increasing impact from **climate change**, **resource exploitation**, **invasive species** and **land-use change**

These drivers put the following benefits at risk (key: orange = medium-high risk):

Plentiful water	Clean water	Clean air	Noise regulation	Urban cooling
Flood protection	Thriving plants and wildlife	Climate regulation	Cultural benefits	

Situated in the heart of our towns and cities, urban green and blue spaces support wildlife such as birds, bees, and butterflies. The list is extensive: parks, sports pitches, and amenity areas; gardens, allotments, and cemeteries; ponds, rivers, and canals; brownfield sites and green corridors. More nature-rich, semi-natural places such as woods, grassland and wetlands can also be found. Consisting of small oases through to large open spaces, they make up to 43% of the urban area[78]. However, access to urban green and blue spaces varies considerably across England, with the most densely populated areas having the least green space[92].

4.7.1 Impacts on urban ecosystems

This report has identified the level and trend of impacts of the five main drivers of change on urban ecosystems in England, as summarised in Table 20.

Table 20 Impacts of drivers of change on urban ecosystems

	Land- and sea-use change	Pollution	Natural resource use and exploitation	Climate change	Invasive species
Urban	↗	→	↗	↗	↗

Key to Table 20:

Driver's impact on extent and condition of ecosystem assets

- Low
- Moderate
- High
- Very High

Driver's current (since the UKNEA[a]) and ongoing trend

- ↘ Decreasing impact
- → Continuing impact
- ↗ Increasing impact
- ↑ Very rapid increase of impact

[a]Exact timeframe over which trends were assessed differed across indicators depending on dataset availability.

Providing places for people to relax, unwind, and interact with wildlife, urban ecosystems play a vital role in supporting our physical and mental wellbeing and healthy child development[93]. This includes reducing the prevalence of depression and anxiety[94]. Social, demographic, and economic change has, and continues to, impact on urban green and blue spaces, and we are now substantially below Government target levels of greenspace on our doorsteps, locally and in the wider neighbourhood[95].

Many urban green spaces (particularly brownfield sites) have been lost to housing, transport and other infrastructure[93]. Vegetation has been replaced by concrete, tarmac, and other non-permeable surfaces, including paving of front gardens over the last 50 years[96]. Yet urban greenspace plays a vital role by allowing rainwater to get into the soil, reducing pollution, surface water and flooding. Vegetation also helps to buffer noise, with soft lawns decreasing noise more than paving[97]. In our more coastal towns and cities, sand dunes and salt marshes can provide flood protection, reduce wave energy, and protect seawall infrastructure.

Climate change means we will place additional demands on our urban ecosystems. As summer temperatures increase, so does the need for

green and blue spaces, and trees for urban cooling. Trees provide shade and reduce temperatures through evaporation. Vegetation absorbs and retains less heat than built infrastructure. We need the benefits from our urban blue and green spaces more than ever.

Our Risk Register[7] scoring is based on the combination of these past, present and future impacts. These impacts put the benefits from our urban green and blue spaces at medium-high risk (see Box 10).

Allotments

5 Priority Opportunities

Saltmarsh and intertidal mud at Titchwell Marsh RSPB Reserve, North Norfolk Coast

5.1. Priority actions

So, what can we do to reduce the risks to our ecosystem assets? How can we ensure the future sustainable provision of the benefits we rely on? As our approach to risk is based on assessing the drivers of change affecting different ecosystems, we can identify the priority actions we need to take. These priority actions are targeted at the benefits which are at high or medium-high risk.

There are three main ways in which we can reduce the risk to our assets:

- Achieving large-scale targeted restoration of ecosystems.
- Reducing the drivers of change causing nature loss.
- Making natural capital central to decision-making.

Figure 6 summarises the actions which co-deliver for multiple policy areas.

Figure 6 Summary of priority actions contributing to multiple policy areas. In Section 3 we identify bespoke priority actions for each policy area, for both reduction of drivers and restoration of ecosystems. A number of these bespoke actions are a priority for multiple areas.

The recovery of nature is vital to ensure healthy, functioning ecosystems which are resilient to change. This means resilience to climate change, and other drivers where there is a very rapid increase in the severity of impacts. It also means ensuring that where our ecosystems have been highly impacted to date, increasing pressures don't push them towards tipping points from which they won't recover. We need this, if we want to continue to receive the benefits from nature we depend on.

We identify the creation of large scale, wilder nature networks as a priority action for a number of the policy areas. In the State of the Assets Technical Report[8], we identify more specific priority actions for each of the assets. These are summarised in Figure 7.

Newcastle

Reducing risks to natural capital through nature recovery

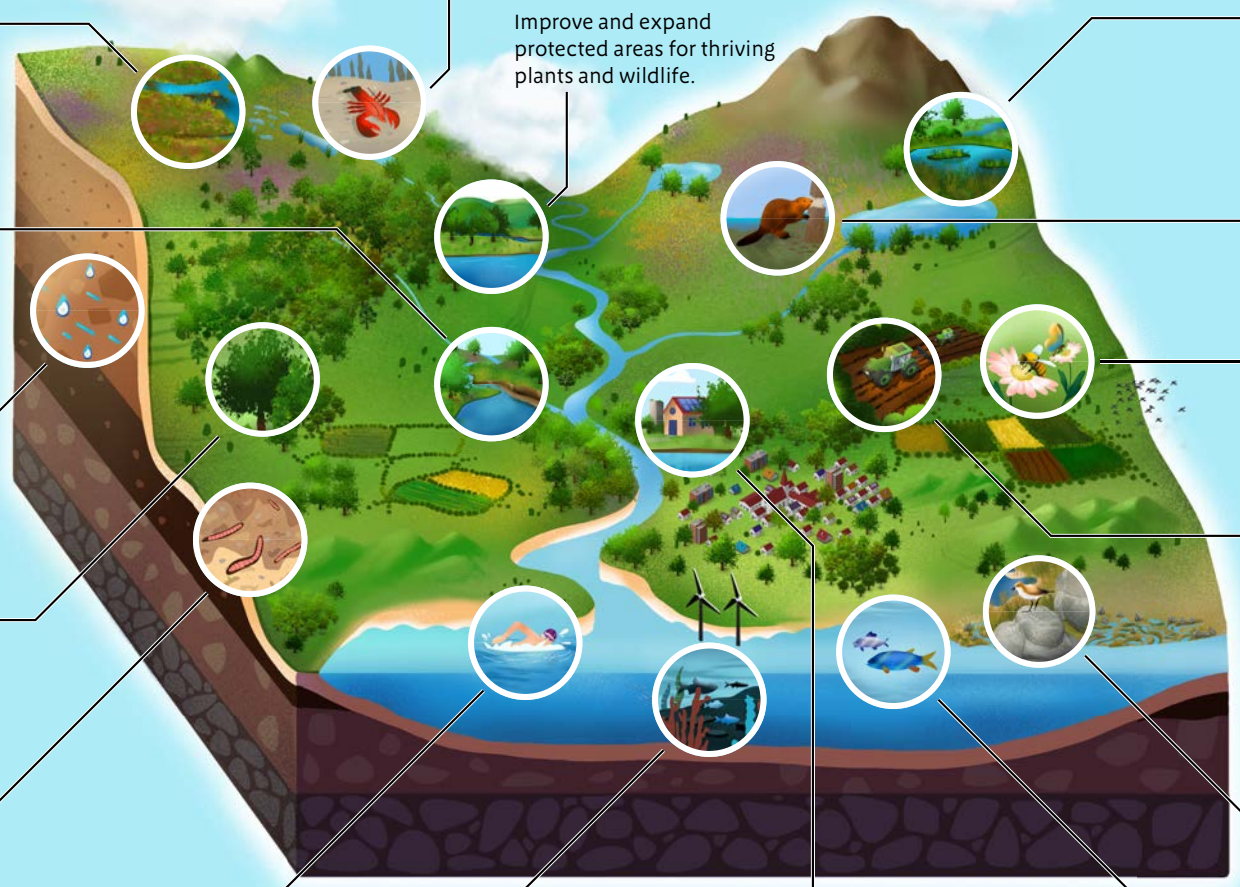


Figure 7 Summary of priority actions for restoration of ecosystem assets

5.2 Bringing natural capital into decision-making

Nature and the benefits it provides are frequently ignored in decision-making. If we don't want to lose these benefits, we need to take all opportunities to put natural capital into the heart of decision-making.

The information in this report can help to inform key decisions to both reduce risks to natural capital and enhance it for the sustainable provision of benefits. The following decision-making mechanisms present opportunities to profoundly affect the future of our natural capital - we signpost the sections of the State of Natural Capital Report which can be used to inform each priority opportunity:

1. Embed priority actions in emerging policy development - take all opportunities of emerging policy development, to embed priority actions for natural capital restoration and reduce the risks to ecosystem assets.

- Figure 6 and Section 3 of this report identify the priority actions that can be incorporated into policy development to reduce the risk to Economic Resilience, Net Zero, Climate Adaptation, Food Security, Health and Wellbeing and Water Security.
- The State of the Assets Technical Report[8] identifies priority actions for each broad ecosystem we report on that will reduce the risk to the asset and benefits it provides.

2. Apply Nature-related Financial Disclosure[98] in companies' and financial institutions' risk management to identify, assess, manage and, where appropriate, disclose nature-related issues.

- Section 3 of this report identifies those ecosystems and benefits that are at high and medium-high risk (Table 3).
- Section 4 of this report provides the risk rating for each ecosystem asset and summarises specific drivers of change.
- The State of the Assets Technical Report[8] explores how these drivers contribute to ecosystem asset risk.
- The Indicators and Data Appendix[62] identifies indicators that can be used to measure change in the state of these assets over time.
- The Risk Register[7] provides a method of assessing natural capital risk.

3. Promote private and public investment in large-scale ecosystem creation and restoration.

- Section 3 of this report identifies priority actions for ecosystem creation and restoration that reduce the risk to economic resilience, Net Zero, climate adaptation, food security, health and wellbeing and water security.
- Figure 7 identifies key actions for large-scale nature recovery that reduces the risks to our natural capital.
- The State of the Assets Technical Report[8] identifies priority ecosystem creation and restoration actions for each broad ecosystem we report on.

4. Put natural capital at the heart of land- and sea-use planning - including spatial planning, to ensure the protection, large-scale restoration and enhancement of ecosystem assets for the provision of multiple benefits.

- Section 5 of this report identifies priority actions, for ecosystem creation, restoration and reduction of drivers, to deliver multiple benefits.
- The State of the Assets Technical Report[8] identifies priority ecosystem creation and restoration actions for each broad ecosystem we report on.

5. Assess and avoid sectoral financial support which drives risk to ecosystem assets.

- Section 4 of this report provides the risk rating for each ecosystem asset and summarises specific drivers of change.
- The State of the Assets Technical Report[8] identifies those drivers that contribute to ecosystem asset risk.

6. Fill evidence and data gaps and make information available to inform decision making.

- The Risk Register[7] identifies data and knowledge gaps in our ability to assess risk to our natural capital assets through impacts and trends in direct drivers of change.
- The Indicators and Data Appendix[62] identifies existing data gaps in our ability to measure change in our ecosystem assets.
- Section 4 identifies which assets and benefits are at the highest risk due to which drivers.
- The State of the Assets Technical Report[8] identifies priority actions, for each ecosystem, that will reduce the risk to the asset and the benefits it provides.
- Figure 6 and Figure 7 identify over-arching priority actions for enhancing multiple benefits and policy areas.

7. Invest in regular and ongoing monitoring of indicators for assessing change - including the Natural Capital and Ecosystem Assessment and all other sources of monitoring, which enable future assessments of the state of our ecosystem assets.

- The Indicators and Data Appendix[62] identifies existing data gaps in our ability to measure change in ecosystem assets.

8. Continue the development and implementation of natural capital accounts - including the Office for National Statistics shadow accounts, to promote the contribution and risk of natural capital to the economy.

- The State of the Assets Technical Report[8] and Indicators and Data Appendix[62] identify the key attributes of natural capital we need to include in the assessment of the contribution and risk of natural capital to the economy.

9. Include changes to natural capital in assessment of national wealth – to go beyond GDP (a measure of national income) and include assessment of natural capital as one of the stocks in an assessment of national wealth*.

- The State of the Assets Technical Report[8] and Indicators and Data Appendix[62] identify the key attributes of natural capital we need to include in the assessment of the contribution and risk of natural capital to the economy.

*GDP is a measure of national income, but governments also need to manage national wealth to check whether we are getting wealthier or poorer over time. There is no single quantitative indicator of national wealth. Natural capital, along with human, social and manufactured capital, is one of the stocks of national wealth which need to be assessed.

6 What now?

We can't take our natural capital for granted. It is at risk, posing a fundamental risk to the benefits we depend on.

We need to manage our natural capital as critical natural assets. For this, we need an explicit and integrated system of tracking its state and managing it. This management includes both investment in the assets and reduction in the drivers of change.

To track the state of our natural assets requires a regularly published evidence-based assessment of the state of natural capital in England. This is our first report. We want to review and repeat it every 5-6 years. Future reports will use the best available data at that time, including the Natural Capital and Ecosystem Assessment evidence base.

To progress from tracking our natural capital to managing it, we need you. This State of Natural Capital Report shows how risks to nature mean risks to society and the economy. We are asking you to use this report, to tackle those risks head-on. Boosting nature helps to secure your goals, now and into the future. We want to work with you to turn this vision into a reality.

Great Spotted Woodpecker and lichen

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