



# Biodiversity

Impact, Assessment, and Solutions

2024

# REPORT

The Royal School of Needlework

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## Executive Summary

This report provides a comprehensive overview of the main issues impacting global biodiversity, with a particular focus on the UK, and explores their implications on human populations, ecosystems, and economies. It aims to synthesise current information, foster understanding, and contribute to the ongoing discourse in conservation, offering evidence-based insights and actionable recommendations.

Biodiversity decline is driven by factors such as habitat loss, climate change, overexploitation of natural resources, pollution, and spread of invasive species and poses a significant threat to ecological stability and human well-being. In the UK, these challenges are exacerbated by land-use changes, intensive agriculture and urbanisation, leading to substantial biodiversity losses that have cascading effects on ecosystem services, food security, economic health, and cultural values.

Nature-based solutions can help address these challenges and are important to provide essential tools to combat biodiversity loss. These solutions include ecosystem restoration, sustainable agriculture and forestry, urban greening, establishing protected areas, community-based conservation, and the application of innovative technologies. The report highlights some successful case studies from both global and UK contexts, demonstrating the potential of these approaches to halt and reverse biodiversity decline and build resilience.

This document seeks to stimulate engagement, enhance understanding, and provide a strategic platform for the RSN to advocate for effective biodiversity conservation strategies and integrating nature-based solutions into broader conservation efforts.

# Key Facts and Figures

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## Global perspective

- Approximately 1 million species are at risk of extinction, many within decades, largely due to human activities (IPBES, 2019).
- Global wildlife populations have plummeted by 69% on average since 1970 (WWF, 2022a).
- Food production has caused 70% of biodiversity loss on land and 50% in fresh water. It is also responsible for around 30% of all greenhouse gas emissions (WWF, 2022a).
- The global economy could lose \$479 billion annually by 2050 due to ecosystem degradation (Johnson et al., 2020)
- Tropical regions, which account for 95% of global deforestation, are critically affected by activities like cattle ranching, soy production, and illegal logging, which are primary drivers of biodiversity loss (WWF, 2022a)
- An estimated 8 million tons of plastic enters the oceans each year, causing harm to marine species through ingestion, entanglement, and habitat degradation (WWF, 2022b)

## UK-Specific insights

- In the UK, biodiversity has declined by an average of 19% since the 1970s (State of Nature Partnership, 2023).
- The UK natural capital was estimated at £1.2 trillion in 2019 (Office for National Statistics, 2021).
- In 2021, the total annual value of ecosystem services in the UK was £47 billion (Office for National Statistics, 2021).
- Since the 1970s, 37% of species in the UK have experienced population decline (State of Nature Partnership, 2023).
- Invasive species cost the UK economy an estimated £4 billion a year (CABI, 2023).
- Insect pollination services are worth £690 million annually to UK agriculture (Breeze et al., 2020).
- The UK has lost 97% of its wildflower meadows since the 1930s, significantly affecting pollinator populations, which are vital for agriculture (CBD, 2020).
- Green space in urban areas of England has decreased from 63% in 2001 to 55% in 2018, reducing the availability of natural habitats and essential ecosystem services like air purification (Environment Agency, 2021).
- The Atlantic puffin population is declining due to rising ocean temperatures, which affect their food sources and breeding sites (Marine Scotland, 2023).

## Glossary of key terms

**Biodiversity Intactness Index (BII):** A measure that estimates how much of the natural biodiversity in an area remains compared to a pre-human impact baseline. It is often used to assess the impact of human activities on ecosystems.

**Biodiversity:** The variety of life forms within a given ecosystem, region, or the entire planet.

**Carbon Sequestration:** The process by which carbon dioxide is captured and stored in natural reservoirs such as forests, soil, and oceans, helping to mitigate climate change.

**Ecosystem Connectivity:** The degree to which different ecosystems are linked to each other through natural corridors (like rivers, forests, etc.), allowing species to move between habitats.

**Ecosystem Services:** Benefits provided by ecosystems to humans, such as clean water, air, and pollination.

**Eutrophication:** The process where water bodies receive excess nutrients, primarily nitrogen and phosphorus, leading to dense plant growth and the subsequent depletion of oxygen, which can harm aquatic life.

**Habitat Restoration:** The process of returning a degraded habitat to a healthy, functioning state.

**Invasive Species:** Non-native species that are introduced to an area, where they cause harm to the environment, economy, or human health. They often outcompete, prey on, or bring diseases to native species.

**Monocultures:** Agricultural practice where a single crop species is grown over a large area, often leading to reduced biodiversity and increased vulnerability to pests and diseases.

**Nature-Based Solutions:** Strategies that use natural processes and ecosystems to address environmental challenges.

**Phenology:** The study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life. For example, the timing of flowering or migration in response to changing seasons.

**Rewilding:** Restoring ecosystems to their natural state by reintroducing native species and allowing natural processes to occur.

# 1 Introduction

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## 1.1 Purpose and Scope of the Document

This report aims to provide a comprehensive overview to understand the critical issues affecting biodiversity on a global scale and within the UK. The report seeks to identify the main drivers of biodiversity loss, assess their impacts on ecosystems and human societies, and showcase how nature-based solutions have been used to address these challenges. It is designed to serve as a valuable resource for community partners, cultural and heritage organisations, commercial partners and funders. The ultimate goal is to stimulate impact-driven engagement, foster understanding, and contribute to the development of effective conservation strategies.

## 1.2 Global and UK Context

Globally, biodiversity is facing unprecedented declines, with human activities driving habitat destruction, climate change, and overexploitation of natural resources. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) reported that up to 1 million species are at risk of extinction, posing a severe threat to ecosystem stability and the services they provide to society (IPBES, 2019). In response, the Convention on Biological Diversity (CBD) has established international frameworks such as the Kunming-Montreal Global Biodiversity Framework to guide conservation efforts (CBD, 2022).

In the UK, the situation is similar, with the 2023 State of Nature report revealing that 37% of species have experienced population declines over the past 50 years, with habitats such as wetlands, grasslands, and woodlands under significant pressure (State of Nature Partnership, 2023). The UK also has one of the lowest levels of biodiversity intactness in Europe, retaining only 50.3% of its original biodiversity (Natural History Museum, 2020). The UK government has implemented several policies to address these issues, including the Environment Act 2021, which sets legally binding targets to halt species decline by 2030 and increase populations by 10% by 2042 (DEFRA, 2022). The UK has also committed to protecting 30% of its land and sea by 2030, amongst other targets described in the Environmental Improvement Plan 2023 (DEFRA, 2023a).

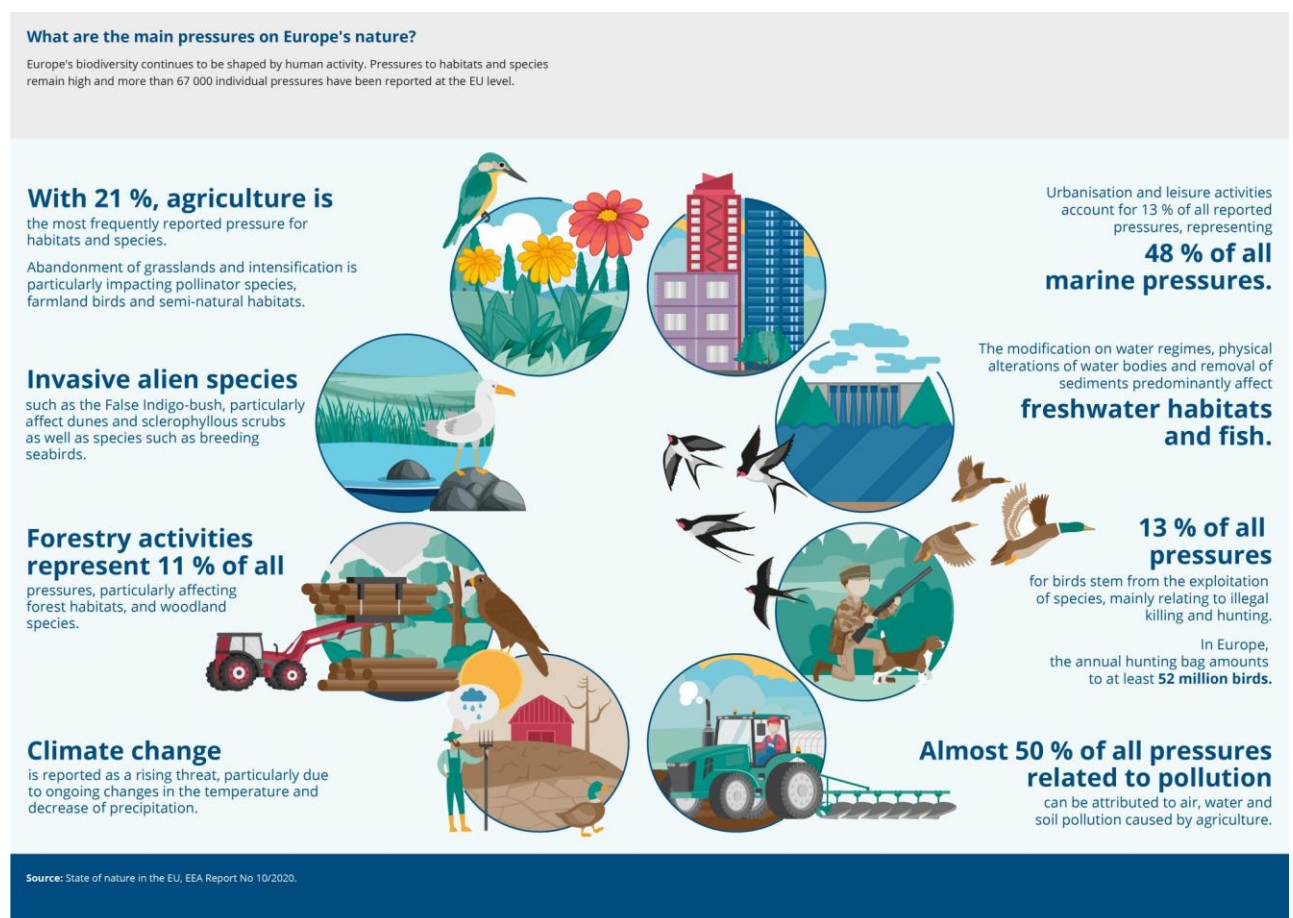
## 1.3 Importance of Biodiversity

Biodiversity is fundamental to the health of ecosystems, economies, and human societies. It supports ecosystem services such as pollination, water purification, climate regulation, and soil fertility, which are essential for food production, clean water, and overall human well-being (IPBES, 2019). These services underpin food security, economic stability, and public health by providing resources like food, medicine, and clean water (IPBES, 2019). Ecosystems such as forests and wetlands are vital for water purification and regulation. The loss of biodiversity in these systems can lead to decreased water quality and availability, affecting both human consumption and agricultural

use (Cardinale et al., 2012). Biodiversity also ensures the availability of a wide range of genetic resources necessary for agriculture, which helps in developing crops that are resilient to pests, diseases, and changing climatic conditions (FAO, 2019). The decline in pollinator species, for example, directly threatens global food production, as many crops depend on these species for pollination (Potts et al., 2016).

Biodiversity not only supports these ecosystem services but also contributes to cultural identity and offers recreational and educational opportunities, enhancing societal well-being (Sandifer, et al., 2015; WWF, 2022a). The loss of biodiversity threatens these services, with significant implications for human health (IPBES, 2019). Public health is closely linked to biodiversity, as many medicines are derived from natural compounds found in diverse species (WHO & CBD, 2015). The loss of species could mean losing potential sources of new drugs and treatments. Additionally, healthy ecosystems play a crucial role in regulating diseases by maintaining balanced interactions among species, which can help control pathogen populations (WHO & CBD, 2015).

Economically, biodiversity contributes to sectors such as agriculture, fisheries, and tourism, and its loss can lead to significant financial costs. The degradation of ecosystems like coral reefs and mangroves, which provide habitat for fish, can severely impact fisheries and the livelihoods that depend on them (Barbier et al., 2011). The World Wildlife Fund (2022a) reported significant declines in wildlife populations, which can have cascading effects on ecosystem services and economic sectors reliant on these resources. Preserving biodiversity is not only crucial for maintaining ecological balance but also for ensuring sustainable development and ensuring a resilient future.



## 2 Main Issues Affecting Biodiversity

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### 2.1 Habitat Loss and Degradation

Habitat loss and fragmentation are the leading causes of biodiversity decline worldwide (WWF 2022a). The conversion of natural habitats into agricultural land, urban areas, and infrastructure development has resulted in the fragmentation and destruction of ecosystems, leaving many species without the necessary resources to survive (Lawton et al., 2010). According to the Global Biodiversity Outlook 5 report (CBD, 2020), nearly 75% of the land based environment and 66% marine have been significantly altered by human activities, resulting in the loss of natural habitats. In the UK, intensive agriculture and urbanisation are the primary drivers of habitat loss, with 97% of wildflower meadows lost since the 1930s, leading to significant declines in pollinator populations (POST, 2022). This loss has had profound impacts on species that depend on these habitats. For example, farmland bird populations in the UK have declined by 60% since 1970 (DEFRA, 2023b).

Forests, which are home to most of Earth's terrestrial biodiversity, have been particularly affected by land-use change, with alarmingly high deforestation in tropical regions, where 95% of global deforestation occurs (WWF, 2022a). In the Amazon rainforest, while recent efforts have shown some success in reducing deforestation rates, it remains a significant threat, driven by the expansion of cattle ranching, soy production, and illegal logging. This ongoing deforestation threatens countless species and contributes to climate change through the release of stored carbon (WWF, 2023). Similarly, marine ecosystems are being degraded by activities such as bottom trawling, which destroys seabed habitats, and coastal development, which leads to the loss of mangroves and coral reefs, crucial habitats for marine biodiversity (IPBES, 2022).

### 2.2 Climate Change

Climate change is a significant threat to biodiversity, altering the distribution and behaviour of species, disrupting ecosystems, and exacerbating other threats such as habitat loss and invasive species. Rising temperatures, changing precipitation patterns, and increased frequency of extreme weather events are impacting species' ability to survive and adapt (IPCC, 2023). For instance, the distribution ranges of many species are shifting poleward or to higher altitudes as they seek suitable habitats, leading to changes in community compositions and ecosystem functions (Hastings, et al., 2020; IPCC, 2023).

In the UK, climate change is affecting species such as the Atlantic puffin (*Fratercula arctica*), which is struggling to adapt as ocean temperatures rise. This is impacting their food sources and breeding sites, leading to significant population declines (Marine Scotland, 2023). Additionally, warmer winters and changes in seasonal patterns are disrupting the phenology of species, causing mismatches between predators and prey, and affecting the timing of flowering and migration (IPBES, 2021; Kharouba et al., 2023). The impacts of climate change on biodiversity are also evident in marine ecosystems, where ocean acidification, caused by increased CO<sub>2</sub> absorption, is harming coral

reefs and shellfish populations, with cascading effects on marine food webs (JNCC, 2023a; Allemand et al., 2019).

## 2.3 Overexploitation of Natural Resources

Overexploitation of natural resources, including overfishing, logging, and hunting, is another significant driver of biodiversity loss (WWF, 2022a). Unsustainable practices have led to the depletion of many species, pushing them towards extinction and disrupting ecosystems. The overharvesting of fish stocks is a prime example, with an estimated 35% of global fish stocks overfished, threatening marine biodiversity and the livelihoods of communities that depend on fisheries (FAO, 2022). In the UK, the North Sea cod population has declined significantly since 1970 due to overfishing (ICES, 2019). While management measures have led to some recovery, many fish stocks remain below sustainable levels.

In terrestrial ecosystems, the illegal wildlife trade is driving the decline of numerous species, including elephants, rhinos, and pangolins, with poaching fuelled by demand for ivory, rhino horn, and bushmeat. Logging, particularly illegal and unsustainable logging, is also contributing to the loss of biodiversity, with tropical forests in Southeast Asia, Central Africa, and the Amazon under severe threat (UNODC, 2024). The depletion of these resources not only leads to the loss of species but also disrupts ecosystem services such as carbon sequestration, water regulation, and soil stability, with long-term consequences for human populations (WWF, 2022a).

## 2.4 Pollution

Pollution, particularly from agricultural runoff, industrial waste, and plastic, is a pervasive threat to biodiversity. Nutrient pollution, primarily from the use of fertilisers and pesticides, leads to eutrophication of water bodies, causing algal blooms that deplete oxygen levels and create dead zones where few species can survive (USGS, 2023). In the UK, agricultural runoff has been linked to the degradation of rivers and lakes, with significant impacts on freshwater biodiversity, including declines in fish populations and aquatic invertebrates (Environment Agency, 2022a). A report by the Environment Agency (2022b) found that only 14% of rivers in England were in good ecological condition, with pollution from agriculture and sewage being major contributors.

Air pollution also poses a significant threat to biodiversity. In the UK, nitrogen deposition from air pollution affects 85.9% of sensitive habitats, leading to changes in plant communities and declines in sensitive species (JNCC, 2023c).

Chemical pollution, including heavy metals and persistent organic pollutants, can have toxic effects on wildlife, affecting reproduction, growth, and survival. Marine ecosystems are particularly vulnerable to plastic pollution, with an estimated 8 million tons of plastic entering the oceans each year, causing harm to marine species through ingestion, entanglement, and habitat degradation (WWF, 2022b). Microplastics have been found in a wide range of marine organisms, from plankton to whales, raising concerns about the long-term impacts on marine food webs and human health.

## 2.5 Invasive Species

Invasive species are non-native species that have been introduced, either intentionally or accidentally, to new environments where they outcompete, prey on, or bring diseases to native species. The spread of invasive species is a major driver of biodiversity loss globally, particularly on islands and in isolated ecosystems where native species have evolved without the presence of these competitors and has been the driver in 16% of animal and plant extinctions (IPBES, 2023). Invasive species can disrupt ecosystems, alter habitat structures, and lead to the decline or extinction of native species (CABI, 2023).

In the UK, invasive species such as the grey squirrel, which competes with the native red squirrel, and Japanese knotweed, which outcompetes native plant species and damages infrastructure, are causing significant ecological and economic harm (DEFRA, 2023c). Aquatic ecosystems are also affected by invasive species, with signal crayfish altering freshwater habitats and threatening native biodiversity (CABI, 2023). Managing invasive species is challenging and costly, requiring coordinated efforts at local, national, and international levels. The economic cost of invasive species to the UK economy is estimated at £4 billion annually (CABI, et al., 2023).

## 2.6 Specific UK Challenges

The UK faces unique challenges in biodiversity conservation, driven by its high population density, intensive land use, and historical changes to its landscapes. The latest State of Nature report shows a 19% decline in the average abundance of UK species since 1970, with one in six species at risk of extinction (State of Nature Partnership, 2023). Agricultural practices, particularly the use of monocultures and chemical inputs, have led to the loss of semi-natural habitats and a decline in farmland biodiversity. The UK's fragmented landscapes, with small and isolated patches of natural habitats, make it difficult for species to move and adapt to changing conditions, exacerbating the impacts of habitat loss and climate change (State of Nature Partnership, 2023).

Urbanisation is another significant challenge, with the expansion of cities and infrastructure leading to the loss of green spaces and increased pollution. The proportion of England's urban areas made up of green space has declined from 63% in 2001 to 55% in 2018 (Environment Agency, 2021). This loss of green space not only impacts biodiversity but also reduces the natural capital of urban areas, which provides crucial ecosystem services such as air pollution removal, flood risk reduction, and

climate regulation. The decline of pollinators, including bees and butterflies, has been linked to the loss of wildflower-rich habitats and the use of pesticides, raising concerns about food security and ecosystem health (Powney, et al., 2019). Additionally, the UK's marine ecosystems are under pressure from overfishing, pollution, and climate change, with species such as the Atlantic cod and seabirds like the kittiwake facing significant declines (DEFRA, 2022).

## Key Challenges in Biodiversity Conservation

### CONFLICTING LAND USES

One of the significant challenges in biodiversity conservation is the conflict between land uses, particularly between agricultural expansion and the need for conservation. As global populations grow, the demand for agricultural land increases, often leading to habitat loss and fragmentation. Balancing the needs for food production with the preservation of natural habitats is critical but challenging.

### LIMITED FUNDING

Effective conservation efforts require substantial financial resources. However, funding for biodiversity projects is often limited, and securing long-term investment can be difficult. Conservation initiatives frequently compete with other urgent societal needs, making it challenging to allocate adequate resources for biodiversity preservation.

### POLITICAL WILL

The success of biodiversity conservation efforts largely depends on political will. Governments must prioritise environmental policies and ensure they are implemented effectively. However, short-term political and economic interests can sometimes undermine long-term conservation goals. Strong leadership and commitment at both national and international levels are essential to drive meaningful change.

## 3 Impact of Biodiversity Decline

### 3.1 Ecological Impacts

#### 3.1.1 Ecosystem Services

Biodiversity is integral to the functioning of ecosystems and the provision of ecosystem services that are essential for human survival and well-being. These services include pollination of crops, water purification, carbon sequestration, soil formation, and nutrient cycling. The decline in biodiversity undermines these services, leading to reduced agricultural productivity, increased vulnerability to natural disasters, and diminished resilience to climate change. For example, freshwater ecosystems, which are rich in biodiversity, provide critical indirect benefits, including natural filtration processes that purify water, filtering pollutants and maintaining water quality. The economic value of these services is estimated at \$50 trillion annually, underscoring their vital importance to human well-being and the high costs associated with their degradation (WWF, 2021).

Forests, which are home to a vast array of species, play a crucial role in carbon sequestration, helping to mitigate climate change. However, human activities have modified 77% of land leading to the dramatic loss of wildlife (IPBES-IPCC, 2021). The destruction of forests, particularly in tropical regions, not only results in the loss of biodiversity but also contributes to climate change by releasing stored carbon into the atmosphere, which could be between 7.44 to 145.95 billion tonnes of carbon released (Mori et al., 2024). Wetlands, another biodiverse ecosystem, provide important services such as flood protection, water purification, and habitat for wildlife. However, the drainage and conversion of wetlands for agriculture and development have led to significant declines in these ecosystems, with long-term consequences for biodiversity and human populations, putting 100-300 million people at increased risk of floods (IPBES 2019).

#### Case study 1: Flooding in the Somerset Levels Due to Habitat Loss

**Context:** The Somerset Levels, a low-lying area in southwest England, are prone to flooding, particularly during the winter months. Historically, this region was managed with natural floodplains and wetlands that helped absorb excess water. However, land-use changes, including the drainage of wetlands for agriculture and urban development, have reduced the area's capacity to manage floods naturally.

**Impact on Human Communities:** In 2014, the Somerset Levels experienced severe flooding that displaced hundreds of residents, destroyed homes, and caused extensive damage to farmland and infrastructure. The loss of natural habitats, such as wetlands that once served as a buffer against flooding, has been identified as a significant factor exacerbating the flood's severity.

The economic impact on local farmers was substantial, with many losing entire crops and facing long-term financial hardship. The community also faced social disruption, as prolonged displacement and the damage to homes created mental health challenges and strained local services.

**Source:** [Environment Agency Report on Somerset Floods](#)

## Case study 2: Decline of Atlantic Salmon in Scottish Rivers

**Context:** Atlantic salmon have historically been a vital species in Scottish rivers, supporting local economies through fishing and tourism. However, recent years have seen a significant decline in salmon populations due to factors such as habitat degradation, overfishing, pollution, and climate change.

**Impact on Human Communities:** The decline in salmon populations has had a profound impact on local communities, particularly those in rural areas that depend on salmon fishing as a source of income. For example, in the River Tweed catchment, reduced salmon numbers have led to a decrease in fishing tourism, which is a crucial economic driver for the region.

Local businesses, including fishing guides, hotels, and restaurants, have suffered as a result. Additionally, the cultural heritage associated with salmon fishing, which has been a part of Scottish tradition for centuries, is at risk of being lost.

**Source:** [Scottish Government Report on Wild Salmon Strategy](#)

## 3.2 Socioeconomic Impacts

### 3.2.1 Food Security

Biodiversity underpins global food security by ensuring the resilience of agricultural systems, providing genetic diversity for crop and livestock breeding, and supporting ecosystem services such as pollination, pest control, and soil fertility (IPBES, 2019). The loss of biodiversity poses a significant threat to food production, particularly in the context of a growing global population and the increasing impacts of climate change. The decline of pollinators, for example, could lead to substantial reductions in crop yields. Recent research indicates that in the absence of animal pollination, global fruit, vegetable, and nut production would decrease by 12%, 16%, and 22% respectively (Reilly et al., 2020). This could significantly affect the availability and affordability of nutritious foods, potentially impacting human health on a global scale (FAO, 2019).

Genetic diversity is also critical for the development of resilient crop varieties that can withstand pests, diseases, and changing environmental conditions. The erosion of this diversity, driven by the spread of monocultures and the loss of wild relatives of crops, limits the ability of agricultural systems to adapt to new challenges (IPES, 2019). Additionally, the overexploitation of fisheries and the degradation of marine ecosystems threaten the livelihoods of millions of people who depend on fish as a primary source of protein and income (WWF, 2022a).

### 3.2.2 Economic Impacts

The economic impacts of biodiversity loss are profound, affecting a wide range of sectors, including agriculture, forestry, fisheries, tourism, and healthcare. The degradation of ecosystems and the loss of species lead to a decline in the services they provide, resulting in significant economic costs (IPBES, 2019). For example, the loss of pollination services due to the decline of bees and other pollinators could cost the global economy between \$235 billion and \$577 billion annually (IPBES, 2021). Similarly, the destruction of coral reefs, which provide coastal protection, tourism opportunities, and fish habitat,

could result in economic losses of \$375 billion per year (WWF, 2022). The degradation of natural resources leads to reduced productivity and increased costs for restoration and management (Dasgupta, 2021).

In the UK, the economic impacts of biodiversity loss are evident in sectors such as agriculture, where the decline of pollinators and soil health is affecting crop yields and profitability. The economic value of pollination services in the UK is estimated to be around £690 million annually, underscoring the critical role that pollinators play in supporting agricultural productivity (DEFRA, 2023f). The loss of natural habitats and green spaces in urban areas also has economic implications, reducing the attractiveness of cities and the quality of life for residents. Research indicates that urban green spaces provide essential ecosystem services valued at approximately £34 billion annually in the UK, including benefits related to air quality, flood mitigation, and public health (Natural England, 2023).

### 3.2.3 Health Implications

Biodiversity plays a crucial role in maintaining human health by supporting ecosystem services that provide clean air, water, and food, and by contributing to the development of medicines and regulating disease vectors. The loss of biodiversity can increase the risk of zoonotic diseases and reduce the availability of natural remedies (WHO, 2021). The decline of biodiversity and the degradation of ecosystems can have direct and indirect impacts on human health, increasing the risk of disease outbreaks, reducing access to clean water and nutritious food, and contributing to mental health issues associated with the loss of natural environments. A study by White et al., (2019) found that spending at least 120 minutes a week in nature is associated with good health and wellbeing. The loss of biodiverse natural spaces could therefore have significant public health implications

The emergence of zoonotic diseases, such as COVID-19, has highlighted the links between biodiversity loss and human health. The destruction of natural habitats and the exploitation of wildlife increase the likelihood of pathogens spilling over from animals to humans, leading to the emergence of new infectious diseases (WHO, 2021). Additionally, the loss of medicinal plants and the decline of species that are sources of pharmaceuticals could limit the development of new treatments for diseases (IPBES, 2019).

### Case study 3: Air Quality and Respiratory Health in Urban Areas

**Context:** Urban green spaces such as parks and tree-lined streets play a critical role in filtering air pollutants and improving air quality in cities. However, the decline of urban trees due to disease, development, and lack of maintenance has resulted in poorer air quality in many UK cities.

**Impact on Human Communities:** In London, the reduction in tree cover has led to increased levels of air pollution, with significantly higher concentrations of harmful pollutants like nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>2.5</sub>). These are major contributors to respiratory illnesses, such as asthma, particularly among children and the elderly.

In London, long-term exposure is estimated to cause between 4000 – 9000 premature deaths annually. The economic cost of air pollution in the UK from healthcare costs and lost productivity is estimated at £5.3-8.7 billion a year.

The loss of these green spaces exacerbates air pollution, which poses significant health risks to urban populations.

**Source:** [UKHSA Report 2023 - Chapter 4: Impacts of climate change on air pollution and human health](#)

### Case Study 4: Loss of Traditional Orchard Practices in England

#### Context:

Traditional orchards are a historic and culturally significant feature of the English landscape. These orchards, often characterised by ancient fruit trees and species-rich grasslands, have been integral to local traditions, including cider-making, community harvest festivals, and the use of orchard wood for crafts.

#### Impact on Cultural Practices:

The decline of traditional orchards driven by agricultural intensification, land development, and neglect, has led to the loss of both biodiversity and cultural practices. 90% of traditional orchards have been lost since 1950. This decline has resulted in the loss of habitats for species like the noble chafer beetle and mistletoe, which are associated with these orchards. Additionally, the reduction in orchard areas has impacted traditional cider production and related community activities, leading to a weakening of cultural heritage linked to these landscapes.

Sources: [PTES Traditional Orchard Project](#)

## 3.3 Cultural and Social Consequences

Biodiversity is deeply intertwined with cultural and social values, providing a sense of identity, inspiration, and connection to nature. The loss of biodiversity can lead to the erosion of cultural heritage, particularly for indigenous and local communities who rely on biodiversity for their livelihoods, traditions, and spiritual practices (CDB, 2020). The decline of species and ecosystems affects the availability of natural resources that are important for cultural practices, such as traditional medicines, foods, and materials for crafts (IPBES, 2019).

In the UK, the loss of biodiversity is affecting cultural landscapes, such as wildflower meadows, ancient woodlands, and heathlands, which are valued for their beauty, biodiversity, and historical significance (State of Nature Partnership, 2023). The decline of iconic species, such as the hedgehog, barn owl, and red squirrel is not only a loss of biodiversity but also a loss of cultural heritage that is deeply embedded in British identity and folklore (State of Nature Partnership, 2023). The degradation of natural environments also has social consequences, reducing opportunities for recreation, education, and community engagement with nature (White et al., 2019).

## 3.4 UK-specific Impacts

The impacts of biodiversity decline in the UK are particularly acute, given the country's long history of land use and habitat modification. The loss of semi-natural habitats, such as hedgerows, meadows, and woodlands, has led to declines in farmland birds, pollinators, and other wildlife, affecting the delivery of ecosystem services and the resilience of agricultural systems (State of Nature Partnership, 2023). The decline of coastal and marine biodiversity, driven by overfishing, pollution, and climate change, is affecting the productivity of fisheries and the health of marine ecosystems, with implications for food security and coastal communities (FAO, 2022).

The fragmentation of habitats in the UK is a significant challenge for biodiversity conservation, as small and isolated patches of habitat are less able to support viable populations of species and are more vulnerable to the impacts of climate change (Lawton et al., 2010). The decline of pollinators and other beneficial insects is affecting crop yields and food production, raising concerns about the sustainability of UK agriculture (Dicks et al., 2021). Additionally, the loss of biodiversity in urban areas, where green spaces are increasingly under pressure from development, is reducing the quality of life for residents and limiting opportunities for people to connect with nature (Wild et al., 2022).

## KEY POINTS FROM IMPACT ASSESSMENT

- **Biodiversity loss directly affects human livelihoods**

Communities that depend on natural resources, such as fishing and agriculture, are particularly vulnerable to the impacts of biodiversity decline, leading to economic hardship and food insecurity.

- **Ecosystem services are being severely disrupted**

The degradation of ecosystems results in the loss of vital services like water purification, flood regulation, and pollination, which are essential for human survival and well-being.

- **Cultural Heritage and Traditional Knowledge Are at Risk**

The erosion of biodiversity threatens the cultural identity and traditional practices of indigenous and local communities, undermining their connection to the land and their historical knowledge.

- **Socio-economic inequality is exacerbated**

Biodiversity loss disproportionately affects marginalised and low-income communities, widening socio-economic gaps and limiting access to natural resources and economic opportunities.

- **Urgent Action Is Needed to Mitigate Long-Term Consequences**

Without immediate and coordinated conservation efforts, the continued decline in biodiversity will have increasingly severe consequences for ecosystems and human societies globally.

## 4 Nature-Based Solutions to Address Biodiversity Challenges

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### 4.1 Ecosystem Restoration

Ecosystem restoration is a key nature-based solution to address biodiversity loss and enhance the resilience of ecosystems to climate change. It involves the recovery of degraded, damaged, or destroyed ecosystems to their natural state, reintroduction of native species, and enhancing habitat connectivity to support biodiversity and enhance their ability to provide essential ecosystem services (EEA, 2023). The UN Decade on Ecosystem Restoration (2021–2030) highlights the global commitment to restore 350 million hectares of degraded ecosystems by 2030, which could generate \$9 trillion in ecosystem services and remove up to 26 gigatons of greenhouse gases from the atmosphere (UNEP, 2021). A recent study by Edwards, et al., (2021) highlighted the positive impacts of large-scale reforestation projects in the tropics, showing significant improvements in biodiversity and carbon storage.

In the UK, large-scale restoration projects such as rewilding initiatives, wetland restoration, and peatland conservation are being implemented to restore habitats and support biodiversity. Restoring peatlands has been found to lead to significant reductions in greenhouse gas emissions, alongside biodiversity benefits (Evans et al. 2021). Rewilding, which involves the reintroduction of native species and the restoration of natural processes, is gaining momentum as a conservation approach. Projects such as the Knepp Estate in West Sussex have demonstrated the potential for biodiversity recovery and the restoration of ecosystem services through rewilding practices (Bateman et al., 2023; Littlewood et al., 2022; Murphy, 2022).

In the UK, there are several large-scale restoration projects:

- **[The Great North Bog](#)**: This project aims to restore over 7,000 square kilometres of upland peat in the North of England. Peatlands are crucial carbon sinks and support unique biodiversity. The project is expected to store 400 million tonnes of carbon dioxide equivalent and provide natural flood management benefits.
- **[Cairngorms Connect](#)**: This is the UK's biggest habitat restoration project, covering over 600 square kilometres in the Scottish Highlands. It aims to restore native woodlands, wetlands, and moorlands, benefiting species such as capercaillie, wildcats, and ospreys.
- **[Wicken Fen Vision](#)**: This National Trust project in Cambridgeshire aims to create a diverse landscape of wetlands, grassland, and woodland over 53 square kilometres. Since its inception in 1999, the project has already seen the return of rare species such as bitterns and water voles.

These projects demonstrate the potential for ecosystem restoration to enhance biodiversity, remove carbon, and provide other ecosystem services such as flood protection and recreational opportunities.

## 4.2 Sustainable Agriculture and Forestry

Sustainable agriculture and forestry practices are essential for reducing the impacts of food and timber production on biodiversity. These practices include agroecology, organic farming, agroforestry, and the adoption of sustainable forest management practices that protect biodiversity while providing food, timber, and other resources (FAO, 2018). Sustainable agriculture focuses on reducing chemical inputs, enhancing soil health, and promoting biodiversity on farms, while sustainable forestry aims to balance timber production with the conservation of forest ecosystems.

In the UK, initiatives such as the Environmental Land Management scheme (ELMS), part of the Agriculture Act 2020, incentivise farmers to adopt sustainable practices that enhance biodiversity, such as planting hedgerows, creating wildflower margins, and restoring wetlands (DEFRA, 2023d). These practices have been shown to increase populations of pollinators and farmland birds in a study by the UK Centre for Ecology & Hydrology (UKCEH) (Redhead et al., 2022).

The UK Forestry Standard promotes sustainable forest management practices that benefit biodiversity. These include maintaining a diversity of tree species and ages, retaining deadwood for wildlife, and protecting sensitive habitats within forest areas (Forestry Commission, 2023). Agroforestry, which integrates trees into agricultural landscapes, can increase biodiversity, improve soil health, and enhance the resilience of farming systems to climate change (Quandt et al., 2023). Sustainable forest management practices, such as selective logging, the retention of deadwood, and the protection of ancient woodlands can also help conserve forest biodiversity and support the long-term sustainability of the forestry sector (Forestry Commission, 2023). These practices have been shown to support a wide range of species, including fungi, invertebrates, and birds, and contribute to long-term forest sustainability (Oettel & Lapin, 2021).

## 4.3 Urban Greening and Green Infrastructure

Urban greening and the development of green infrastructure are important for enhancing biodiversity in cities, improving the quality of life for urban residents and mitigating the impacts of climate change. Green infrastructure includes parks, gardens, green roofs, street trees, and green corridors that provide habitats for wildlife, improve air quality, and create opportunities for people to connect with nature (DEFRA, 2023e). Urban green spaces can significantly enhance urban biodiversity, particularly for pollinators and birds, while also contributing to climate adaptation, air quality improvement, and mental health benefits (Zhao et al., 2022; Silva et al., 2021).

In the UK, cities such as London, Manchester, and Glasgow are implementing urban greening strategies to increase green space, improve air quality, enhance biodiversity, and improve resilience to climate change. The [Glasgow Avenues project](#) is transforming the city centre by creating green corridors with rain gardens, trees, and cycling infrastructure. Whilst, [Manchester's City of Trees](#) initiative aims to plant three million trees within a generation, one for every person in Greater Manchester to help reduce flood risk. The importance of urban greening is further supported by [London's Urban Greening Factor \(UGF\)](#) policy, which requires new developments to include green infrastructure such as green roofs, street trees and rain gardens, with the aim to increase green cover in London by 2050. These initiatives demonstrate how urban areas can contribute significantly to biodiversity conservation while also improving quality of life for residents.

## 4.4 Protected Areas and Habitat Connectivity

The establishment of protected areas and the enhancement of habitat connectivity are essential for conserving biodiversity and supporting the resilience of ecosystems to climate change (Pulido-Chadid et al., 2023). Protected areas provide safe havens for species, protect critical habitats, and support the recovery of endangered species. The UK's 15 National Parks cover 9.3% of England, 19.9% of Wales, and 7.2% of Scotland (British Ecological Society, 2022). These areas are crucial for biodiversity conservation and provide significant recreational and cultural benefits. Habitat connectivity, which involves creating corridors and stepping stones that link fragmented habitats, is also important for enabling species to move and adapt to changing environmental conditions, which was highlighted in the Lawton et al., (2010) report. Initiatives such as the [B-Lines project](#) by Buglife aim to create a network of wildflower-rich habitat corridors across the UK to support pollinators and other invertebrates.

In the UK, efforts are being made to expand and enhance the network of protected areas, with a focus on creating nature recovery networks that connect fragmented habitats and support species movement, which are key components of the government's 25-Year Environment Plan (DEFRA 2018). The Environment Act 2021 included provisions for the creation of Local Nature Recovery Strategies, which aim to increase the extent and connectivity of protected areas and enhance biodiversity across the country (DEFRA, 2024). The UK government has also committed to protecting 30% of UK land by 2030 as part of the global "30 by 30" target. This includes plans to designate and protect 4,000 square kilometres of new land in England (DEFRA, 2023a).

Additionally, the UK has designated 372 Marine Protected Areas (MPAs) covering 38% of UK waters, to conserve marine biodiversity and support the recovery of fish stocks and other marine species (JNCC, 2023b). The UK's [Blue Belt programme](#), which aims to protect over 4 million square kilometres of marine environment, has been shown to significantly benefit fish populations and marine ecosystems. Well-managed MPAs can also lead to the recovery of fish stocks and the protection of critical marine habitats (Cheung, Palacios-Abrantes & Roberts, 2024).

## 4.5 Community-Based Conservation

Community-based conservation (CBC) approaches involve engaging local communities in the management and protection of natural resources, recognising the important role that communities play in biodiversity conservation. These approaches empower communities to take ownership of conservation efforts, build local capacity, and integrate traditional knowledge and practices into biodiversity management (Armitage et al., 2020). Community-based conservation can lead to more sustainable and equitable outcomes, as it ensures that conservation efforts are aligned with the needs and priorities of local people. A review by Brooks et al., (2013) found that CBC initiatives are more likely to succeed when they provide tangible benefits to local communities, such as improved livelihoods, enhanced social capital, and empowerment.

In the UK, community-based conservation initiatives are being implemented to engage local communities in biodiversity conservation and enhance the resilience of ecosystems. For example, the [Nature Recovery Networks](#) initiative involves working with communities to restore and connect

habitats, create new wildlife-friendly spaces, and enhance biodiversity across landscapes. Similarly, the [Community Forests initiative](#) is supporting the creation of new woodlands and green spaces, with a focus on involving local people in the planning and management of these areas. Also, the [Big Garden Birdwatch](#) by the RSPB engage thousands of people in monitoring biodiversity, raising awareness and providing valuable data for conservation. These initiatives demonstrate the potential of community-based conservation to deliver positive outcomes for biodiversity and people.

## 4.6 Innovative Technologies for Biodiversity Monitoring and Conservation

Innovative technologies are playing an increasingly important role in biodiversity monitoring and conservation, providing advanced tools and methods to address biodiversity challenges. Technologies such as remote sensing, environmental DNA (eDNA), artificial intelligence (AI) and others are being used to monitor species populations, assess habitat conditions, and track changes in biodiversity over time. These technologies provide valuable data that inform conservation strategies, identify priority areas for protection, and evaluate the effectiveness of conservation interventions.

Satellite imagery has become a key tool for monitoring large-scale environmental changes such as deforestation, habitat fragmentation and climate change impacts on biodiversity (Pettorelli et al. 2024). For example, identifying illegal deforestation in the Amazon (Hansen et al., 2013) and monitoring changes in UK peatlands to inform restoration (JNCC, 2020).

[Camera traps](#), [drones](#), and [acoustic monitoring](#) are being used to monitor wildlife populations and assess habitat conditions in remote and difficult-to-access areas. These tools are effective for studying elusive or nocturnal species, providing data that would be difficult to obtain. AI and machine learning is automating data analysis and analysing vast amounts of camera trap images (Fennell, Beirne & Burton, 2022) and acoustic recordings (Sharma, Sato & Gautam, 2023), to improve identification and monitoring of species. Drones are also increasingly used for habitat mapping and population surveys, as they provide high resolution images that can cover large areas quickly. Drones have been used in the UK to monitor seabird colonies on remote islands, providing data on population trends and informing conservation strategies (Hodgson et al., 2018).

eDNA technology involves analysing DNA from environmental samples such as water, soil, and air to detect the presence of a species and monitor changes in biodiversity. This non-invasive method is valuable for monitoring aquatic ecosystems. In the UK, eDNA has been used to detect the presence of [great crested newts](#), a protected species, and to detect invasive species in freshwater ecosystems (Deiner et al. 2021). These technologies are helping to improve the accuracy and efficiency of biodiversity monitoring and support evidence-based conservation decision-making.

## 4.7 Summary of biodiversity challenges and solutions

BIODIVERSITY CHALLENGE	SOLUTIONS/STRATEGIES
<b>Habitat Loss and Fragmentation</b>	<ul style="list-style-type: none"> <li>- Implement reforestation and afforestation projects.</li> <li>- Create and expand protected areas.</li> <li>- Promote sustainable land-use planning that integrates conservation.</li> </ul>
<b>Climate Change</b>	<ul style="list-style-type: none"> <li>- Develop and implement nature-based solutions like coastal wetland restoration and urban green spaces.</li> <li>- Promote carbon sequestration through reforestation and soil management.</li> <li>- Enhance ecosystem resilience through biodiversity corridors.</li> </ul>
<b>Pollution (e.g., plastic, chemical runoff)</b>	<ul style="list-style-type: none"> <li>- Enforce stricter regulations on industrial pollution and agricultural runoff.</li> <li>- Promote the adoption of circular economy practices to reduce waste.</li> <li>- Implement large-scale clean-up initiatives and campaigns.</li> </ul>
<b>Invasive Species</b>	<ul style="list-style-type: none"> <li>- Develop and enforce biosecurity measures to prevent the introduction of invasive species.</li> <li>- Conduct targeted removal and control programs.</li> <li>- Restore native species and habitats to outcompete invasives.</li> </ul>
<b>Overexploitation of Resources</b>	<ul style="list-style-type: none"> <li>- Promote sustainable harvesting practices and certifications (e.g., FSC, MSC).</li> <li>- Enforce quotas and protected areas to allow for population recovery.</li> <li>- Support community-based management of natural resources.</li> </ul>
<b>Lack of Funding and Resources</b>	<ul style="list-style-type: none"> <li>- Foster public-private partnerships to fund conservation initiatives.</li> <li>- Encourage conservation finance mechanisms such as biodiversity credits.</li> <li>- Increase public awareness and involvement through citizen science and volunteer programs.</li> </ul>
<b>Political and Institutional Challenges</b>	<ul style="list-style-type: none"> <li>- Advocate for stronger international agreements and national policies that prioritise biodiversity.</li> <li>- Strengthen governance frameworks at all levels to ensure effective implementation.</li> <li>- Promote stakeholder engagement and participatory decision-making processes.</li> </ul>
<b>Loss of Traditional Knowledge and Cultural Heritage</b>	<ul style="list-style-type: none"> <li>- Support indigenous and local community-led conservation efforts.</li> <li>- Document and integrate traditional ecological knowledge into conservation strategies.</li> <li>- Foster cultural preservation programs that link biodiversity with heritage.</li> </ul>

## 5 Case Studies and Success Stories

### 5.1 Global Case Studies

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#### 5.1.1 Costa Rica – Payment for Ecosystem Services

**Type:** Forest conservation and restoration

**Overview:** Costa Rica’s Payment for Ecosystem Services (PES) program is a pioneering initiative that provides financial compensation to landowners for conserving and restoring forests for the ecosystem services they provide, such as carbon sequestration, water regulation, and biodiversity conservation.

**Key features:**

- Financial compensation for landowners
- Focuses on carbon sequestration, water regulation, and biodiversity conservation

**Outcomes:**

- Over 1 million hectares of forest restored
- Increased biodiversity, forest cover and carbon sequestration (Arriagada et al., 2015)

**Success Factors:**

- Alignment of economic incentives with conservation goals
- Wide range of engagement with stakeholders, including smallholders and indigenous communities.

#### 5.1.2 Australia – Great Barrier Reef Marine Park

**Type:** Marine protected area

**Overview:** The Great Barrier Reef Marine Park in Australia is one of the world’s largest and most successful marine protected areas, covering over 344,000 square kilometres. The park is managed through a combination of zoning, which restricts activities such as fishing and tourism in sensitive areas, and active restoration efforts.

**Key features:**

- Zoning of activities
- Active restoration (coral planting and invasive species control)

**Outcomes:**

- Protected reef biodiversity,
- Supported endangered species recovery
- Sustained economic benefits of tourism and fisheries (Prazeres et al., 2023)

**Key insight:** Importance of adaptive management in responding to threats such as coral bleaching and climate change.

### 5.1.3 Namibia – Community-Based Natural Resource Management

**Type:** Community-led conservation

**Overview:** Namibia's Community-Based Natural Resource Management (CBNRM) program is a successful example of community-led conservation, where local communities are empowered to manage and benefit from the sustainable use of natural resources.

**Key features:**

- Over 80 conservancies established
- Covers more than 20% of the country's land area

**Outcomes:**

- Wildlife population recovery
- Ecosystem restoration
- Enhanced local livelihoods through eco-tourism and sustainable resource use (Störmer, et al., 2019).

**Success factors:**

- Strong community governance structures
- Integration of traditional knowledge
- Provision of economic benefits for local communities

### 5.1.4 Coral Reef Restoration in Indonesia

**Type:** Coral Reef Restoration

**Overview:** The Mars Coral Reef Restoration Project has developed innovative techniques for coral reef restoration, using "spider" structures to support coral fragments.

**Key features:**

- Use of "spider" structures to support coral fragments

**Outcomes:**

- Over 185,000 coral fragments have been planted since 2011
- Increased coral cover and fish abundance (Watt-Pringle, et al., 2024).

**Success factors:**

- MARRS methods provides a low cost solution to facilitate rapid coral growth
- Engagement with local communities

### 5.1.5 Mangrove Restoration in Vietnam

**Type:** Mangrove restoration

**Overview:** Thailand and Vietnam have lost half their mangroves due to clearing of shrimp ponds, which results in less protection against tidal waves and storm surges and loss of fish nursery grounds. The Mangroves and Markets project combines mangrove restoration with sustainable aquaculture to help restore the mangroves and provide jobs for local people.

**Key features:**

- Promoted ecosystem-based adaptation by providing incentives for mangrove conservation

**Outcomes:**

- Over 7,000 hectares of mangroves have been restored
- Enhanced coastal protection
- Improved livelihoods through sustainable shrimp farming
- Carbon sequestration

**Success factors:**

- Supported the creation of a national policy to provide mangrove Payment for Ecosystem system

### 5.1.6 Urban Greening in Singapore

**Type:** Urban Greening

**Overview:** Singapore's "City in Nature" vision integrates nature throughout the urban landscape. They have 5 key strategies to expand the nature park network, intensify nature in gardens and parks, restore nature into the urban landscape, strengthen connectivity between green spaces and enhance animal management.

**Key features:**

- Aims to have 200 hectares of nature parks by 2030

**Outcomes:**

- Created extensive skyrise greenery
- Created park connectors

**Success factors:**

- Increased urban biodiversity
- Improved quality of life for residents
- One of the greenest cities in the world

## 5.2 UK Case Studies

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### 5.2.1 [\*Knepp Estate Rewilding Project\*](#)

**Type:** Rewilding

**Overview:** The Knepp Estate in West Sussex is one of the most well-known rewilding projects in the UK, transforming 3,500 acres of intensively farmed land. They replaced traditional farming practices with a hands-off approach that allowed natural processes to shape the landscape and introduced free roaming herbivores to drive habitat creation.

**Key features:**

- Natural processes shaping the landscape
- Introduction of free-roaming herbivores

**Outcomes:**

- Recovery of rare and threatened species (e.g., purple emperor butterfly, nightingale)
- Nightingale pairs increased from 2 to 34 by 2019
- 13 out of 17 UK bat species recorded on site
- Soil carbon increased by 51% in 20 years

**Success factors:**

- Restored biodiversity
- Enhanced ecosystem services
- Created new opportunities for eco-tourism

### 5.2.2 [\*The Great Fen Project\*](#)

**Type:** Wetland habitat restoration

**Overview:** The Great Fen Project is a large-scale habitat restoration initiative in Cambridgeshire that aims to restore 3,700 hectares of degraded farmland to a mosaic of wetland habitats.

**Key features:**

- Collaboration between conservation organisations, local communities, and government agencies

**Outcomes:**

- Created habitat for over 5,000 species (inc. bittern, water vole, and marsh harrier)
- Water vole population increased by 250% between 2005 – 2015
- Bittern are now breeding regularly
- Estimated 325,000 tonnes of CO<sub>2</sub> captured annually

**Success factors:**

- Enhanced biodiversity
- Provided flood protection
- Carbon sequestration
- Recreation and education opportunities

### 5.2.3 London National Park City

**Type:** Urban greening

**Overview:** London's designation as a National Park City is a unique initiative that aims to make the city greener, healthier, and wilder by promoting urban greening, enhancing biodiversity, and connecting people with nature.

**Key features:**

- Creation of new green spaces
- Restoration of existing habitats
- Development of green infrastructure, such as green roofs and walls

**Outcomes:**

- Enhanced urban biodiversity
- Improved quality of life for residents
- Community engagement in conservation

**Success factors:**

- Collaboration with local communities, businesses, and government agencies

### 5.2.4 The Community Forests Initiative

**Type:** Urban and peri-urban forest creation and management

**Overview:** The Community Forests initiative is a network of urban and peri-urban forests that are being created and managed in partnership with local communities to enhance biodiversity, improve public health, and provide opportunities for recreation and education.

**Key features:**

- Creation of new woodlands
- Restoration of degraded habitats

**Outcomes:**

- 15 Community Forests across England
- Delivered 35% of all Government-supported woodland creation in England
- Enhanced biodiversity
- Habitat management
- Opportunities for leisure, recreation and cultural activities

**Success factors:**

- Demonstrates how community-led conservation can deliver positive outcomes for both people and nature.

### 5.2.5 [The Flow Country Peatland Restoration](#)

**Type:** Blanket bog restoration

**Overview:** The Flow Country in northern Scotland is one of the largest and most important areas of blanket bog in the world, providing critical habitats for species such as the golden plover and the hen harrier, and storing vast amounts of carbon. It holds over 10% of the UK's blanket bog and almost 5% of the world's resource covering 400,000 ha.

**Key features:**

- Re-wetting degraded peatlands (18,000 dams installed)
- Removing invasive species
- Restoring natural hydrology

**Outcomes:**

- Raised water tables allowing bog mosses to recover and prevent carbon loss
- Support for local livelihoods through eco-tourism
- Sustainable land management
- Over 2,600 hectares of inappropriate plantation forest removed
- Restored bog habitat has attracted wading birds such as golden plovers
- Recognised as a UNESCO World Heritage Site in July 2024

**Success factors:**

- Enhanced biodiversity
- Carbon sequestration
- Wide partnership collaboration

### 5.2.6 [Pumlumon Project, Wales](#)

**Type:** Upland habitat management

**Overview:** A landscape-scale approach to upland management in the Cambrian Mountains, focusing on ecosystem services covering 40,000 hectares of upland habitat.

**Key features:**

- Landscape-scale approach to upland management

**Outcomes:**

- Restored over 500 hectares of blanket bog
- Increased carbon storage by an estimated 1,700 tonnes annually
- Reduced flood risk
- Created 5km of new native woodland
- Stabilised populations of upland bird species, including curlew

**Success factors:**

- Supported local communities by creating new income streams through sustainable land management and ecotourism.

### 5.2.7 [The Avalon Marshes](#)

**Type:** Wetland restoration

**Overview:** The Avalon Marshes in Somerset are an example of successful wetland restoration that has led to significant biodiversity gains. It is one of the largest lowland wetlands in Britain and internationally important for wildlife especially migrating birds.

**Key features:**

- Nature Recovery Network

**Outcomes:**

- Recovery of key species, such as the bittern and the otter
- Improved water quality
- Enhanced flood resilience

**Success factors:**

- Demonstrates the importance of partnership working, involving conservation organisations, local authorities, and communities.
- Improved ecosystem services

### 5.2.8 [Wallasea Island Wild Coast Project](#)

**Type:** Coastal wetland creation

**Overview:** An RSPB project in Essex creating a coastal wetland from farmland using 3 million tonnes of excavated material from London's Crossrail project.

**Key features:**

- Creation of intertidal habitat

**Outcomes:**

- Created 670 hectares of intertidal habitat
- Provides critical habitat for 20,000 overwintering waterbirds
- Avocet breeding pairs have increased from 0 to over 100 by 2020
- Estimated to sequester 2,500 tonnes of CO<sub>2</sub> annually

**Success factors:**

- Flood protection
- Recreational opportunities
- Enhanced biodiversity

### 5.2.9 [Beaver reintroduction](#)

**Type:** Species reintroduction

**Overview:** The reintroduction of beavers to the River Otter in Devon after a 400-year absence has demonstrated significant benefits for biodiversity, water quality, and flood management (Brazier et al. 2021).

**Key features:**

- Reintroduction of beavers

**Outcomes:**

- Beaver population grew from 2 to 15 family groups by 2020
- Created 28 acres of new wetland habitat
- Reduced peak flows during flood events by up to 30%.

**Success factors:**

- Following the successful five-year trial, beavers are now legally protected in England, and it has demonstrated the potential of beavers to create dynamic and diverse wetland habitats, benefiting a wide range of species.

### 5.2.10 [Scottish Wildcat Conservation](#)

**Type:** Species conservation and reintroduction

**Overview:** The Saving Wildcats project is a conservation initiative aimed at protecting and restoring the critically endangered Scottish wildcat population. By reintroducing wildcats into the Cairngorms National Park, the project seeks to preserve this unique species and maintain ecological balance in Scotland's ecosystems.

**Key features:**

- Reintroduction of wildcats
- Addressing threats to habitat loss and interbreeding with domestic cats

**Outcomes:**

- Successfully begun releasing wildcats
- Raised public awareness and gaining support

**Success factors:**

- Saving Wildcats is making significant strides in ensuring the survival of this iconic species and enhancing biodiversity in Scotland.

These case studies demonstrate the potential of nature-based solutions to address multiple challenges simultaneously, including biodiversity loss, climate change, and flood risk, while also providing economic benefits to local communities. They showcase successful approaches to habitat restoration and species recovery across a range of UK ecosystems, from coastal wetlands to upland bogs.

## 6 Conclusion

Biodiversity is vital for supporting the functioning of ecosystems and the provision of essential services that underpin human well-being. The decline of biodiversity poses significant risks to global food security, economic stability, human health, and cultural heritage, and requires urgent action to address. Nature-based solutions, such as ecosystem restoration, sustainable agriculture, urban greening, and community-based conservation, offer powerful tools for halting biodiversity loss and enhancing the resilience of ecosystems to climate change. By integrating biodiversity conservation into all aspects of policy and practice, engaging local communities, and fostering innovation and collaboration, we can secure a sustainable future for both people and nature.

## 7 Recommendations for Integration and Implementation

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To effectively address biodiversity loss and enhance the resilience of ecosystems, the following recommendations are proposed:

1. **Research and Innovation:** Continued investment in research and innovation is needed to develop new tools, technologies, and approaches for biodiversity conservation. This includes the use of advanced monitoring technologies, the development of nature-based solutions, and the exploration of new financial mechanisms for conservation.
2. **Monitoring and Evaluation:** Effective monitoring and evaluation are necessary to assess the progress of biodiversity conservation efforts and adapt strategies as needed. Robust monitoring systems should be established to track changes in biodiversity, assess the effectiveness of conservation interventions, and inform decision-making.
3. **Partnerships and Collaboration:** Partnerships between governments, conservation organisations, businesses, and local communities are critical for delivering successful conservation outcomes. Collaborative approaches should be promoted, with a focus on sharing knowledge, resources, and best practices.
4. **Community Engagement:** Engaging local communities in biodiversity conservation is essential for achieving sustainable outcomes. Community-based approaches should be supported and scaled up, with a focus on building local capacity and integrating traditional knowledge and practices into conservation efforts.
5. **Policy Integration:** Biodiversity conservation should be integrated into all relevant policies, including agriculture, forestry, urban planning, and climate change adaptation, to ensure that biodiversity considerations are mainstreamed across sectors. As well as integrated at local, regional and national levels to help align efforts and ensure local initiatives are supported by broader policy frameworks and vice versa.
6. **Education and Awareness:** Raising awareness of the importance of biodiversity and the impacts of its loss is essential for building public support for conservation efforts. Education and outreach programmes should be developed to engage people of all ages and backgrounds in biodiversity conservation.
7. **Financial Incentives:** Financial incentives, such as payments for ecosystem services, subsidies for sustainable practices, and support for conservation-oriented businesses, should be provided to encourage the adoption of biodiversity-friendly practices and support the restoration of ecosystems.

## 8 Recommendations for RSN: Integrating Biodiversity into Creative Narratives

### 1. Develop thematic collections inspired by biodiversity

- Create a series of designs that reflect different aspects of biodiversity, such as a collection focused on marine life, forests, or pollinators that highlight endangered species, threatened habitats, or ecosystems in crisis that raise awareness and funds for biodiversity conservation.
- Explore the impact of climate change on natural materials used in textiles.
- Use textile art to depict the fragility of marine ecosystems. This could involve partnerships with ocean conservation NGOs, creating art that tells the story of marine life at risk from pollution, overfishing, and climate change.

### 2. Launch awareness campaigns centred around key biodiversity issues

- Develop social media campaigns, exhibitions, and workshops that tell the stories of communities affected by biodiversity decline. Incorporate interactive elements, such as live demonstrations or participatory embroidery projects, to engage audiences.

### 3. Host exhibitions that pair art with conservation

- Partner with museums, galleries, and conservation groups to curate exhibitions that display RSN's work alongside information that raises awareness of biodiversity loss.

### 4. Engage in cross-disciplinary collaborations

- Host joint workshops with environmental scientists, conservationists, and cultural historians or seminars where experts share insights on biodiversity, helping RSN artists incorporate scientific and cultural knowledge into their work.

### 5. Create educational materials and workshops

- Develop educational materials and offer workshops that combine hands-on embroidery skills with lessons on biodiversity conservation. Develop kits that include educational booklets, patterns inspired by endangered species, and materials that support conservation efforts.

## 9 Suggestions for infographic interpretation

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**Biodiversity decline in the UK:** Visual representation of key species in decline and effects on ecosystems and human life.

**Ecosystem services:** Infographic showing the various services provided by ecosystems such as clean air, water, pollination and carbon removal and how their degradation affects human health and economies.

**Habitat loss in the UK:** Map or timeline showing the loss of key habitats over time.

**Climate change impacts on UK biodiversity:** Visual representation of range shifts and phenological changes.

**Nature-based solutions:** Diagram illustrating how different types of nature-based solutions, such as reforestation, wetland restoration and urban greening can help climate change, support biodiversity and enhance human well-being.

**Urban biodiversity:** Infographic showing potential for biodiversity in urban environments.

**Economic impacts of biodiversity loss:** Visual representation of costs to different sectors of the UK economy.

**Pollinator decline and food security:** Infographic linking pollinator decline to potential impacts on crop yields.

**Invasive species in the UK:** Map showing distribution of key invasive species and their impacts.

**Plastic pollution:** Tracing the lifecycle of plastic waste from production to its final impact on marine ecosystems, highlighting the role of individuals and industries in reducing plastic pollution.

## 10 Recommendations of key actors & spokespersons

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Beccy Speight - Chief Executive, RSPB

Matt Shardlow - Chief Executive, Buglife

Chris Packham CBE - Naturalist, television presenter, and campaigner for wildlife conservation

Dr Craig Bennett - Chief Executive, The Wildlife Trusts

Dr Mark Avery - Environmental campaigner, writer, and former Conservation Director, RSPB

Dr Richard Benwell - CEO, Wildlife and Countryside Link

George Monbiot - Environmental activist, writer, and columnist, The Guardian

Hilary McGrady - Director-General, National Trust

Isabella Tree - Author and co-owner, Knepp Estate rewilding project

Professor Jane Memmott - President, British Ecological Society

Professor Nathalie Seddon - Director, Nature-based Solutions Initiative, University of Oxford

Tony Juniper CBE - Chair, Natural England

Steve Micklewright - Chief Executive, Trees for Life

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## 12 Suggestions for further reading

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