

Natural Capital Committee

State of Natural Capital Annual Report 2019

Sixth Report to the Economic Affairs Committee of the Cabinet

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Chair's message

Eight years ago the government published the White Paper, **The Natural Choice**, committing to the objective “*to be the first generation to leave the natural environment of England in a better state than it inherited*”, and it established the Natural Capital Committee (NCC) to advise on how best to achieve it. The NCC advised that there needed to be a 25 Year Environment Plan (25 YEP), and this was supported by all the main political parties in their 2015 General Election manifestos. In 2018, the Plan was finally published.

The NCC continues to advise on how best to turn the objective and the Plan into solid results. As we report on the ten goals set out in the 25 YEP, the absence of progress since 2011 is more notable than the successes. Broadly the natural environment has been deteriorating. To turn this around is a huge undertaking, and requires a radical change of direction across all the departments of government.

Fortunately the policy pace picked up in 2018. In addition to the publication of the 25 YEP, a new Agricultural Bill is being progressed through Parliament, including at its heart the principle of public goods for public money. The government has published a draft Environment Bill.

There is much work to do to turn good intentions into definite results. The NCC is critical of the substance of both the metrics and the net gain proposals as they stand. Getting the metrics right will determine whether the government pursues the most efficient ways of meeting its objective. Taking the environment seriously in planning and development will determine whether aggregate natural capital is maintained and enhanced.

Of prime importance is to ensure that the 25 YEP and its goals are given a meaningful statutory footing, and that the environmental institutions are aligned to ensure that the 25 YEP's objective is met. Without this, there is a very real danger that the 2011 White Paper and the 25 YEP go the way of so many bold initiatives that have punctuated the decline of England's natural environment over the previous generations. To allow this to happen would not only undermine confidence in environmental policy generally, but condemn the next generation to a poorer economy and environment. We can be green and prosperous, but it will not happen by default.

Let me conclude by paying thanks to the members of the NCC, who put in time and effort far beyond what is required of them, and to the Secretariat that so ably assists us.

Professor Dieter Helm, Chairman

Executive summary

In January, 2018 the government published its 25 Year Environment Plan (25 YEP) setting out how it will deliver on its pledge to leave the environment in a better state for the next generation; a pledge was first made in the 2011 white paper, *The Natural Choice*. Then followed: the Agriculture Bill, embedding the public money for public goods principle; the draft Environment Bill; and consultations on indicators and metrics, and net gain. In addition, the Fisheries Bill aims to implement an ecosystem-based approach to fisheries management to ensure that negative impacts of fishing activities on the marine ecosystem are minimised, and to avoid degradation of the marine environment.

Despite some successes, overall progress since the 2011 white paper has not been good. Based on the partial assessment of available data, it appears that only moderate / limited progress has been made towards some of the 25 YEP ten goals. Notable improvements include the quality of bathing waters and reductions in the emissions of sulphur oxides, mercury and lead into the atmosphere. In addition, the number of marine protected areas and number of heritage sites has increased since 2011.

Areas where progress has been much slower or declining include a decrease of just over 35% in the percentage of surface water bodies in England that have been assessed as attaining high or good ecological status, with only 14% of rivers in England meeting these standards. Wildlife including bees, butterflies, farmland birds and bats have either continued to decline or stagnate in number. Only half of priority habitats are meeting the favourable status target of 80%. In addition, greenhouse gas (GHG) emissions from the transport sector have increased by 3%.

The gap between the ambition and the outcomes remains considerable and in order to meet the 2011 objective to be the first generation to improve the environment, substantive action is now very urgent. **Business as usual is going to lead to failure.**

Key points

1. The NCC welcomes the 25 YEP and has provided advice on how best to meet its ten goals. Our single most **important recommendation is that the 25 year plan must be placed on a meaningful statutory basis in the forthcoming Environment Bill promised for this year.** Without a credible statutory underpinning, the 25 YEP may end up as yet another interesting document on the shelf. The Plan as it currently stands has no official status – it is neither ‘Green nor White’. Having raised expectations, the government’s environmental credibility is on the line.
2. The environmental policy and regulatory landscape is occupied by multiple agencies, regulatory and advisory bodies and other institutions. None is currently charged with

delivering the 25 YEP. This needs to change: **a lead body should be designated, and given responsibility for overseeing the delivery of the Plan and its ten goals.** The current crowded landscape of often overlapping bodies needs to be urgently reviewed.

3. In developing the policies to implement the 25 YEP, overarching principles should be set, and enshrined in legislation. The temptation, reflected in the draft Environment Bill, to set out a long list should be resisted: they inevitably overlap, weakening the force of them. **Three principles should drive the implementation of the 25 YEP: 1. public money for public goods; 2. the polluter pays; and 3. net environmental gain.**
4. **All government departments should be required to adhere to these three principles in the development and implementation of any policy relating to use of or impact on natural capital.**
5. To assess progress in delivering the overarching objective and the ten goals, **detailed and enforceable milestones need to be established for the 25 YEP.**
6. In assessing progress, a baseline needs to be set, and metrics and natural capital accounts developed to record progress so that the government can be held to account. **Proposals in the current metrics consultation fall short of what is required, with insufficient emphasis on the role of natural capital assets in achieving the ten goals in the 25 YEP.** There is the danger therefore that the proposed metrics will not achieve the intended outcome.
7. Tracking progress is made more difficult by the ambiguity and lack of precision in defining the ten goals. In particular the goal of *‘Thriving plants and wildlife’* is open to a wide variety of interpretations, making it hard to hold government to account. **There needs to be greater alignment between the ten goals and the indicator framework** so that progress towards the goals can be assessed transparently. Potential trade-offs between the goals need to be recognised, particularly with respect to *‘Using resources from nature more sustainably and efficiently’*, agricultural productivity and the other nine goals.
8. The absence of data on the state of natural capital is worrying. This needs a radical upgrade, and **the NCC proposes that there be a five yearly environment census.** Defra should be tasked with delivering an environmental census to establish a robust baseline against which to measure progress towards the 25 YEP goals. The census should have clearly defined leadership and governance, and should be as inclusive as possible, carried out within one calendar year, securing widespread NGO and public engagement in the process.

9. The NCC is tasked with advising the National Infrastructure Commission (NIC). The *National Infrastructure Assessment*, published in July 2018, fails to address adequately the opportunities green infrastructure provides, and fails to take full account of the environmental impacts of its specific infrastructure proposals. **Future assessments should rectify this.**
10. Taking natural capital seriously, to ensure the economic and environmental benefits are grasped, requires that the environment is incorporated into the heart of the economy, and this means it must be integrated fully into national and corporate accounts. Natural capital is at least as important as physical and human capital in producing economic outputs and hence economic well-being. The NCC continues to advise the Office for National Statistics (ONS) and Defra on natural capital accounts. It is now time to **make the use of the corporate accounting template the NCC previously developed, including a set of corporate accounting standards, a formal audit requirement.** The NCC is concerned that the plethora of initiatives and different 'natural capital accounting' approaches may lead to greenwashing.
11. **These metrics and accounting approaches should form the basis not only of the assessment of progress of the overall 25 YEP objective and the ten goals, but also for the assessment of developments, the calculation of net environmental harms, and the location and form of compensation payments.**
12. The NCC has shown in several previous reports that **investment in environmental improvement and natural capital enhancement** can yield rates of return which readily outstrip those afforded by public spending elsewhere. In line with new H.M. Treasury 'Green Book' guidance, scientifically robust assessments of the wider effects of environmental change should be combined with cost-benefit analyses to identify priority investments. The government needs to ensure that decision makers can undertake high quality analyses by having access to **reliable information on the value of benefits and costs arising from environmental improvements and change.** These valuations should be sensitive to both the magnitude and location of change, as both affect values.
13. **The net gain consultation published by the government in December last year falls short of what is required to ensure that development does not lead to a net environmental loss.** The proposals are not comprehensive, and focus almost exclusively on biodiversity. This risks overlooking significant natural capital costs and benefits, which are typically highly spatially dependent and context specific. Even in this narrow biodiversity domain, the alternative uses of land are not considered fully, but rather the choice is relegated to a binary one between the state of land now and the development. Not only will this exclude considerable environmental and economic

opportunities, but it could even result in perverse incentives. Spatial factors are an integral consideration.

14. **The net environmental gain principle should be extended to cover development and activities in the marine environment.** The government should work towards an innovative sea management system, akin to and working with land use planning and management systems. This should extend beyond licensing activities in the marine environment and redirect the use of public money and other incentives to enable users of the sea to become better stewards of it.
15. To turn the declines in natural capital around, and to grasp the full economic and environmental opportunities, the 25 YEP needs to be not only placed upon a meaningful statutory basis, but also sufficiently resourced. The wide range of environmental public goods, from health, education and recreation, to soils, fish, carbon sequestration and recreation, will not arise spontaneously. The close direction of agricultural subsidies to public benefits, the resourcing of the delivery bodies and the application of rigorous benefit assessments should be taken fully into account in the forthcoming Spending Review. **It is not enough to will the ends: the means have to be provided to achieve them.**

1. Progress in implementing the 25 YEP

Government progress in implementing the 25 YEP

Eight years ago, the government launched its Natural Environment White Paper, *The Natural Choice*¹. This important document set out an ambition to halt decades of environmental degradation and to begin rebuilding England's natural capital. The government committed to being the first generation to reverse environmental decline; pledging to leave the environment in a better state for the next generation. It recognised that natural capital is often considered as an afterthought, omitted from decision making. It aimed to place the environment at the heart of economic considerations.

The White Paper committed to establishing a Committee to advise government on what was happening to the environment, whether this mattered and what needed to be done to reverse declines. The Natural Capital Committee (NCC) was duly established and recommended in 2015 that the government needed to urgently develop a 25 year plan to improve the environment.

In January 2018, the Prime Minister launched the government's 25 Year Environment Plan (25 YEP)². This was a very welcome step forward and the NCC congratulates the government on its publication. Natural capital is at the heart of the 25 YEP and it explicitly recognises the important contribution to human well-being and the significant economic benefits investment in natural capital can yield.

Publishing the 25 YEP is however only a first step. The policy intents within it need to be translated into agreed, resourced action plans with clear success measures, outcomes and milestones. Clear accountabilities and responsibilities are also essential. Actions need to be taken at all spatial scales from local to national and to be clearly articulated, with a mechanism put in place to ensure that they will result in the 25 YEP ambitions being achieved.

The Plan outlines ten goals that are based on the natural capital framework developed largely through the NCC's earlier work, in particular its 2015 State of Natural Capital

¹ Defra, *The Natural Choice: Securing the Value of Nature* (2011):
<https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature>

² Defra, *A Green Future: Our 25 Year Plan to Improve the Environment* (2018):
<https://www.gov.uk/government/publications/25-year-environment-plan>

Report³. The Plan also contains over 200 actions that it claims will put the environment on track to improve over the life of the 25 YEP.

The government's acceptance that the 25 YEP will need to be refreshed periodically to ensure that it continues to target the right improvements and make a real difference, is welcome. But time is running out. The commitment to improve the environment within a generation was first made in 2011, yet over the past eight years there has been limited progress.

Since the 25 YEP was published a year ago, several developments have occurred namely:

- A number of consultations on various components of the 25 YEP, including:
 - I. The draft Environment (Principles and Governance) Bill, to determine what institutional arrangements should take effect to hold government to account on environmental standards once we have left the European Union (EU)⁴.
 - II. The future of farm support and fishing policy outside of the EU, with subsequent Agriculture and Fisheries Bills laid in Parliament⁵.
 - III. A Clean Air Strategy setting out proposed measures to reduce air pollution from a wide range of sources⁶.
 - IV. The third tranche of Marine Conservation Zones (MCZ) in waters around the UK, covering an additional 41 proposed sites.
 - V. Proposals to reform the Planning System to mandate biodiversity net gain in developments.
- An Ivory Bill which will prohibit the import and re-export of ivory for commercial purposes, to and from the UK;
- A Resources and Waste Strategy aiming to double resource productivity and eliminate avoidable waste of all kinds (including plastic waste) by 2050⁷;

³ See the NCC's 3rd State of Natural Capital Report, (2015):

<https://www.gov.uk/government/publications/natural-capital-committees-third-state-of-natural-capital-report-government-response>

⁴ Defra, *Draft Environment (Principles and Governance) Bill* (2018):

<https://www.gov.uk/government/publications/draft-environment-principles-and-governance-bill-2018>

⁵ Parliament, *Fisheries Bill 2017-19* (2018): <https://services.parliament.uk/bills/2017-19/fisheries.html> and Parliament, *Agriculture Bill 2017-19* (2018): <https://services.parliament.uk/bills/2017-19/agriculture.html>

⁶ Defra, *Clean Air Strategy 2019* (2019): <https://www.gov.uk/government/publications/clean-air-strategy-2019>

⁷ Defra, *Resources and Waste Strategy for England* (2018):

<https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>

- A call for evidence on how charges could reduce the amount of single use plastics waste followed by a Budget 2018 commitment to introduce a new tax on non-recycled plastic materials;
- A review of National Parks and Areas of Outstanding Natural Beauty (AONB), and whether there is scope for expansion as well as opportunities to enhance natural capital in existing designations;
- A ban on the manufacture and sale of products containing plastic microbeads⁸.
- A new report by the Committee on Climate Change (CCC)⁹ setting out the need for fundamental land use and management reform to better contribute to mitigating and adapting to climate change.

As welcome as these developments are, they will not in and of themselves reverse the decline in natural capital assets. More ambition and action is needed and quickly.

In particular, the NCC advises that government prioritises:

1. Getting the legislative underpinnings right for the 25 YEP through the Environment Bill, which should include enshrining the ten goals in legislation.
2. Establishing the right institutional framework to implement the 25 YEP. It is highly unlikely that the current delivery landscape is close to optimal. The right leadership, responsibilities and accountabilities are essential.
3. Developing a clear set of principles to inform future policy development. The three critical ones are 1) public money for public goods; 2) polluter pays; and 3) net environment gain.
4. Embedding the natural capital approach into all decision making, particularly public sector and major infrastructure decisions.

Detailed recommendations on all of these are provided below.

25 YEP Pioneer projects

Following advice from the NCC, Defra created four Pioneer projects to inform the development and implementation of the 25 YEP. Each pioneer is located in a different area of England. There is a Cumbria Catchment Pioneer, a North Devon Landscape Pioneer, a Greater Manchester Urban Pioneer and a Marine Pioneer. The locations were chosen by

⁸ Defra, *World leading microbeads ban comes into force* (2018): <https://www.gov.uk/government/news/world-leading-microbeads-ban-comes-into-force>

⁹ Committee on Climate Change, *Land use: Reducing emissions and preparing for climate change* (2018): <https://www.theccc.org.uk/publication/land-use-reducing-emissions-and-preparing-for-climate-change/>

government to offer a range of environmental challenges and circumstances against which to test implementation of aspects of the Plan.

Defra tasked the Pioneers with exploring four broad objectives:

- Applying a natural capital approach to decision making;
- Developing innovative funding opportunities;
- Demonstrate integrated approaches to planning and delivery;
- Building our understanding of 'what works' in practice.

Over the past year, the Committee has continued to engage with the Pioneer projects on a one-to-one basis and through group meetings involving all of the Pioneers. There has been some welcome progress. The length of time it takes to establish functioning projects involving a wide range of stakeholders should not be underestimated. There is now greater clarity on leadership.

Governance of the Pioneers needs to operate at two levels; practitioner groups to carry out the work and oversight groups that provide the resources, higher level steer and the political and organisational buy-in to the work. As there is no additional funding for the Pioneers, a willingness to pool existing resources and funding in new ways and to modify prior plans, including through more integrated approaches, continues to be a vital aspect to determining the success or otherwise of these projects.

Just as with the 25 YEP, clear outcomes and objectives are needed at the individual Pioneer level to describe what success looks like. These need to be evidence based; which in turn will assist with the task of determining priority actions and 'investments' for each of the project areas.

The Committee also advises that locally and nationally significant natural capital assets need to be identified with a view to compiling: a natural capital asset register; an associated risk register for those assets; and a natural capital account for each of the projects. In the first instance, this can be a simple balance sheet of assets and liabilities, the capital maintenance required to maintain the assets and the dependencies between the various natural assets.

There also needs to be a clearer formalised reporting mechanism to the Committee on progress, including how lessons identified from the Pioneers can support implementation and delivery of the 25 YEP. The Pioneers could also be used, along with other locations, to test out developing policy thinking and implementation. This would require clear tasking, success measures and reporting back mechanisms.

Recommendations:

- **Based on the learning to date, clear objectives should be agreed with each of the Pioneers that will guide their work programmes for the remainder of their terms, to understand better what works in practice. These objectives could include aspects that test developing policy thinking and implementation.**
- **Routine reports on progress against these objectives should be sent to the NCC.**

Progress on developing national natural capital accounts

In 2011 the government committed to working with the Office for National statistics (ONS) and Defra to incorporate natural capital into the UK Environmental Accounts by 2020. The 25 YEP reiterated this commitment, and the ONS recently published an updated road map to 2020¹⁰. To date, natural capital accounts for several broad habitats, as well as for aggregate UK-wide accounts, have been published and are being regularly updated. The updated road map aims both to improve existing statistics and to develop accounts for the whole suite of broad habitats. The UK is at the forefront internationally of national accounting for natural capital and will be well placed to influence the next update of the System of National Accounts. It is important to maintain this momentum.

There will be two further updates to the UK aggregate accounts before 2020. The next aggregate accounts will distinguish between volume and price changes in order to throw more light on reasons for changes in values. Woodland, farmland and fresh water accounts will also be updated. Development work will continue so that by 2020 accounts for all eight broad habitats - woodland, farmland, marine, freshwater, urban areas, semi-natural grassland, coastal margins, and mountains, moorland and heath - will have been compiled. Work on refining the accounts, especially on extending the range of ecosystem services covered, is expected to continue beyond 2020. In particular it is likely that the revision of the United Nations (UN) guidance on ecosystem accounting, due to be published in 2020, may show up areas where the approaches taken in the UK accounts will need to be revised. More work is also needed to improve the accounts of the condition of ecosystem assets, in line with the development of indicators to support the 25 YEP, and the availability of more up-to-date Land Cover Maps will lead to revisions in the accounts of the extent of ecosystems in the UK.

Recent publications include initial accounts of urban green spaces across the UK, including first estimates for related services including noise and temperature regulation. These have been informed by new geospatial data, including for example maps showing access points

¹⁰ ONS, *UK Natural Capital: interim review and revised 2020 roadmap* (2018): <https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/methodologies/uknaturalcapitalinterimreviewandrevised2020roadmap>

and proximity of areas of population to urban green space, and estimating the valuation of a bundle of ecosystem services inherent in property prices.

Work is in progress to develop restoration cost accounts. In particular initial restoration cost accounts will be published for mountain, moorland and heath habitats and peatland. Work is also in progress on country specific accounts for Wales and Scotland. A project is in hand to link the natural capital accounts to the Sustainable Development Goals (SDG) indicators more systematically.

Geographically disaggregated (NUTS3)¹¹ pollution removal estimates were published in July 2018 and can be used to support compilation of accounts at sub-national scales. Together with better documentation of existing and proposed methodologies, tailored advice and support for local applications are on-going roles for Defra and ONS, and in due course it may be possible to establish a Centre of Excellence to put this support onto a formal footing.

In previous annual reports, the NCC has described how it has developed and piloted a system of Corporate Natural Capital Accounting (CNCA). It was shown to be of considerable value as both a management accounting system and a form of corporate natural capital reporting. It should now be developed into a corporate accounting standard and be made a formal audit requirement on companies.

Recommendations:

- **Government invests sufficient resources to deliver on its commitment to produce a comprehensive set of national natural capital accounts by 2020.**
- **The Treasury should work with the ONS and Defra to develop natural capital updates based on the accounts to accompany annual budget statements.**
- **The NCC corporate accounting template should be developed into a corporate accounting standard and made a formal audit requirement.**

¹¹ The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU - <https://ec.europa.eu/eurostat/web/nuts/background>

2. Progress towards the ten goals in the 25 YEP

The committee has undertaken a high level of review of environmental trends, as defined by the ten goals in the 25 YEP. This can be found in Annex 1.

A wide range of data has been examined, including government official statistics and the ONS experimental natural capital accounts¹². Based on this partial assessment of available data, it appears that only moderate / limited progress has been made towards some the 25 YEP goals. Notable improvements include the quality of bathing waters and reductions in the emissions of sulphur oxides, mercury and lead into the atmosphere. In addition, the number of marine protected areas and number of designated heritage sites has increased since 2011. Notable areas where progress has been much slower or declining include the ecological status of surface water bodies, priority habitats meeting target condition and greenhouse gas (GHG) emissions from the transport sector.

For government to deliver on its commitment to leave the environment in a better state than was inherited, immediate additional action is required. Further policies need to be developed to address areas where change has been stagnating or declining and in many cases where some progress has been made.

Important lessons from this assessment concern the lack of a consistent set of robust data on all elements of the environment and the lack of a good baseline against which to assess trends in environmental change. Furthermore, several goals in the 25 YEP are not well defined, notably “Thriving plants and wildlife” and “Using resources from nature more sustainably and efficiently”. This needs to be addressed through the production of a robust set of indicators and metrics for the 25 YEP that allows progress against the ten goals to be clearly and transparently measured.

In December 2018, government published the consultation paper “*Measuring environmental change – draft indicators framework for the 25 Year Environment Plan: Draft for discussion*”¹³. The framework is to be used to help measure the government’s progress in achieving the ten goals in the 25 YEP. Whilst the Committee appreciates that a lot of work has gone into bringing together the indicators in this document, and it represents a draft for discussion, there are some serious errors in the approach and the indicators being proposed. The danger is that these proposed indicators will not achieve the intended

¹² ONS, *UK natural capital accounts (2017)*: <https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/methodologies/naturalcapital>

¹³ Defra, *Measuring environmental change – draft indicators framework for the 25 Year Environment Plan: Draft for discussion (2018)*: <https://www.gov.uk/government/consultations/25-year-environment-plan-measuring-progress>

outcome, which is to measure progress or help achieve the ten goals set out in the 25 YEP. Four general points should be given consideration.

1. **Framing:** The indicators framework is missing some important elements. It proposes indicators to measure environmental outcomes with little knowledge of whether the method to achieve the outcomes could result in further degradation of the environment in other areas. An example is the 25 YEP goal '*Use resources from nature more sustainably and efficiently*'. Here indicators focus on the measurement of 'increased farming productivity'. It is difficult to see how measuring farming productivity will ultimately lead to using resources from nature more sustainably. Wider damage to water / the environment from increased use of fertilisers and herbicides and cutting down of hedgerows, in order to use larger machinery to increase productivity are potentially missed.
2. **Type of natural capital assets to be measured:** This is closely linked with the issue of framing above. The majority of the proposed indicators are either focused on outcomes (e.g. water quality, air quality) or the quality / quantity of one asset, namely wildlife (e.g. numbers of International Union for Conservation of Nature (IUCN) Red-listed species / marine species diversity). Very few of the indicators focus on natural capital assets that underpin the essential flows (thus the ecosystem services) and those that do, are insufficient. For example, the proposed indicator to measure 'changes in nature on land and water that affect our lives and livelihood' proposes to measure functional species including pollinators and invertebrates. Measuring the number of pollinators and invertebrates will provide only a very small snapshot of the service flows from natural capital assets that affect our lives and livelihoods. Indicators to capture these flows need to measure those natural capital assets that provide arguably the most important service flows (e.g. carbon sequestration, soil erosion protection, water filtration, flood risk protection, cultural services). Indicators are needed for all of these.
3. **Scale:** Most of the proposed indicators lack scale and are considered as a stand-alone 'unit' of measurement. Greater appreciation needs to be given to the fact that many natural capital assets work as a system and that one asset can provide multiple benefits. For example, if an indicator was included to measure the extent of habitats that are known to be important for sequestering carbon (e.g. peatlands, forests, saltmarsh, seagrasses, and kelp forests - contributing to 25 YEP goal 'Mitigating and adapting to climate change'), this could also provide a good measure for wildlife (25 YEP goal 'Thriving plants and wildlife') and cultural services (25 YEP goal 'Enhanced beauty, heritage and engagement with the natural environment'), and many other benefits associated with these habitats. In contrast, the current framework appears to take a linear approach, where progress towards

each goal is measured independently using a set of indicators or drawing links between them.

4. **Business as usual:** Most of the proposed indicators in the framework draw on existing monitoring data, resulting in a strong sense of 'business as usual'. Developing the framework through the lens of what is currently measured, rather than what should ideally be measured is limiting and may impact on future ambition. This applies equally to Overseas Territories which appear to have a different set of proposed indicators.

Recommendations:

- **Defra should be tasked with delivering an environmental census to establish a robust baseline against which to measure progress towards the 25 YEP goals. The census should have clearly defined leadership and governance but should be as inclusive as possible, carried out within one calendar year, securing widespread NGO and public engagement in the process.**
- **The census should aim to capture a detailed picture of the health of terrestrial and marine environments and related assets, including a broad spectrum of information on biodiversity.**
- **Census data should align with indicators and metrics already routinely monitored by government agencies, local authorities and NGOs (e.g. Royal Society for the Protection of Birds (RSPB) 'State of the UK's birds' report). It should also allow for new data-capture resulting from the use of emerging technologies (e.g. Sentinel satellites and Landsat imagery, smart phone apps) and encourage as wide a participation as possible in collecting this data, including citizen scientists, individual landowners and school children.**
- **The measurement process should aim to become a global exemplar for citizen engagement in the environment. The Committee proposes that the Environmental Census is led by an independent body which will coordinate partners and the collection of data.**
- **All information should be captured in a centralised, open-source database and web-portal. The output should be an accessible web-based report detailing the main findings plus a summary for policy makers. Data should be sufficient to support economic and other analyses of the effect of investments in maintaining and enhancing natural capital.**
- **Government agencies should be co-ordinated in such a way that each takes the lead / responsibility for a different environmental asset to be measured, and for the associated metrics and activities. Duplication between different agencies**

should be avoided at all costs.

- **As part of the environmental census, a national soils survey should be undertaken to determine the state of soils in England, with periodic updates every five years. A comprehensive suite of policies and funded actions to ensure soils are managed sustainably by 2030, as outlined in the 25 YEP, should be developed following the survey.**

3. Embedding the natural capital approach

The natural capital approach at the heart of the government's 25 YEP is fundamentally about incorporating the often hidden benefits of the environment into decision making. Natural capital provides many societal benefits, positive externalities and public goods. These are all too often ignored in decision making and consequently the decisions taken are inefficient, resulting in natural capital being over-consumed and under invested in. This means that economic growth, measured properly, is lower than it should be, and our prosperity and that of future generations is reduced.

The Committee has shown in numerous previous reports that such investment can yield rates of return which readily outstrip those afforded by spending elsewhere.

To improve decision making and meaningful implementation of the 25 YEP, the Committee recommends action on multiple fronts to embed the natural capital approach.

- The government should establish strong statutory underpinnings for the 25 YEP through the Environment Bill, which should include enshrining the ten goals in legislation.
- The government needs to establish a robust and credible institutional framework to ensure clear roles and responsibilities with respect to delivery of the 25 YEP, and to ensure that government itself can be held to account.
- A set of principles needs to be applied to the decisions we all take. The NCC recommends the adoption of three core principles to guide policy and implementation of the 25 YEP: public money for public goods; the polluter pays; and net environmental gain. All other principles are subsidiary to these.
- The natural capital approach, including the three principles, needs to be more strongly embedded in public sector and major infrastructure decisions.

Each of these are set out in more detail below.

Getting the right legislative framework in place

The Prime Minister announced the Environment Bill in July 2018 by saying “... *the Government will bring forward the first Environment Bill in over 20 years. This builds on our 25 Year Environment Plan, setting out what we are doing to improve the environment for the next generation.*”

The importance of the Environment Bill in laying the foundations for implementing the 25 YEP should not be underestimated. To be effective, long-term certainty is needed across multiple fronts. The current content of the Draft Environment Bill sets out the process for

reporting and refreshing the Plan, but the final Bill needs to go further to include targets based on the 25 YEP goals, milestones and a robust set of indicators and metrics. Reporting on progress needs to go beyond a summary of what actions have been undertaken over a particular period and focus on progress towards the goals and targets. As it stands, the statutory basis of the 25 YEP needs to be stronger with a requirement for the ten goals to be met.

Recommendations:

The NCC welcomes the draft Environment bill but it does not go far enough to secure the improved environment to which the government is committed. The Committee recommends that the final Environment Bill should include:

- **Placing the 25 YEP on a statutory footing. In order to drive progress, quantified targets should be established for the various aspects of the 25 YEP goals. Targets will need to be set against an agreed baseline, and progress measured using standardised methodologies which account for variations in scale, setting (i.e. local and national, urban and rural) and location.**
- **Requirements for the Office for Environmental Protection (OEP) to be able to: hold government, and all others that fall within the remit of environmental legislation, to account for the proper implementation and delivery of the stated requirements; have appropriate enforcement and sanctioning powers; and oversee the delivery of the 25 YEP.**
- **A requirement for the government to report annually to be expanded to include progress against the milestones for each of the main targets.**
- **A requirement for a comprehensive review of progress against the 25 YEP goals to be undertaken on five yearly basis. The full assessment should be supplemented by annual monitoring, assessment and reporting on the state of the environment.**

Getting the right institutional framework in place

The Pioneers have revealed the challenges of what happens when no single organisation is in charge, and hence has the lead responsibility and is accountable for identifying, agreeing and then delivering the outcomes.

The 25 YEP covers a wide range of environmental issues including: water quality, water resources, air quality, plants and wildlife, hazards, waste and resources, beauty, heritage, climate change, chemicals and biosecurity. This scope encompasses the roles and responsibilities of national and local delivery bodies, agencies and regulators, including the Environment Agency (EA), Natural England (NE), Forestry Commission (FC), Animal and Plant Health Agency (APHA), Rural Payment Agency (RPA), Drinking Water Inspectorate (DWI),

Marine Management Organisation (MMO), local authorities, English Heritage, National Parks.

It would be surprising if a bold and innovative plan like the 25 YEP can be realised in an efficient and effective manner by the existing bodies with their existing remits. Under an 'organisations-as-usual' approach, each will continue to focus on their existing remits as they are bound by statute and their tasking by government to do. No one will own the overall delivery of the plan. The NCC do not consider this to be a credible position.

In order to ensure an effective institutional framework, a number of issues have to be addressed:

- The role of the OEP has to be refined. It has been conceived as a way to replace the oversight currently provided by the European Commission and the European Court of Justice (ECJ). The 25 YEP is both different in essence and more ambitious than existing EU directives requirements. The OEP as currently proposed will cover some of the goals of the 25 YEP, for example water quality and air quality. However, its focus will be on government actions (as is the ECJ) and not the organisations that are tasked with implementing and complying with environmental legislation. It thus only deals with some aspects of environmental protection, but not all.
- There is a case to be made for incorporating all aspects of environmental protection at a national level within one body. This would entail substantial changes to the existing bodies.
- There needs to be a body with a statutory duty to meet the overall objectives of the 25 YEP, and in particular the five year milestones the NCC proposes. It would also have a role in advising what these milestones should be.
- There is an obvious temptation to simply add this responsibility onto an existing body. The NCC does not think this is appropriate. Existing organisations were designed, tasked and are staffed to deliver something different. The 25 YEP is not a marginal change from what has gone before: it is a comprehensive and decisive step change that encompasses all ten goals and goes beyond the specific remits existing organisations have been designed to address.
- In order for the new organisation to fulfil its statutory duty, appropriate governance arrangements will be required with regards to national and local delivery bodies. This is more than "having regard to", and requires a remaking of the existing roles, duties and functions of the other bodies.
- There is considerable scope to simplify and streamline the current institutional landscape resulting in substantial savings through the simplification of the associated administrative arrangements.

- The new institutional landscape needs to be resourced properly. There should be a comprehensive review not only of the existing institutions, but also of the income streams, other revenues and public expenditures.

Recommendations:

- **The proposed OEP needs to be able to: hold government, and all others that fall within the remit of environmental legislation, to account for the proper implementation and delivery of the stated requirements; have appropriate enforcement and sanctioning powers; and to oversee the delivery of the 25 YEP.**
- **Defra should review the roles and remit of the existing environmental delivery bodies, including the EA, NE, the MMO and Local Authorities to clearly identify responsibilities for delivery of the many actions in the 25 YEP.**

Embedding environmental principles

Public money for public goods

The concept of public goods is fundamental to natural capital policy and decision making. While there are numerous types of public good, many of which concern the natural environment (e.g. air quality and public health), the concept is perhaps most easily related to public funding in respect of land use policy. Here the principle of public money for public goods is central to the government's 25 YEP and its 2018 consultation on the future for food, farming and the environment in the run up to publication of the Agriculture Bill. It was also endorsed by both the Secretary of State for Environment, Food and Rural Affairs (House of Commons, 2016; Q280) and the Prime Minister (2018)¹⁴. Given this centrality it is useful to clearly define the concept of a public good.

A public good is both non-excludable (i.e. non-paying consumers cannot be prevented from accessing it) and non-rivalrous (i.e. use by one individual does not reduce availability to others), an environmental example being the air we breathe. At the other extreme food is a "private good" as it is both excludable (i.e. consumers have to pay to access it) and rivalrous (i.e. use by one individual precludes its use by another).

Agriculture is a private enterprise and food is sold in markets, directly to consumers, and is therefore by definition (and according to official government guidance) a private, rather

¹⁴ House of Commons, *The Work of Defra, Questions 94–289, Oral Evidence from the Rt. Hon. Michael Gove MP, Secretary of State for Environment, Food and Rural Affairs, Environment, Food and Rural Affairs Committee, HC 321*, The Stationery Office Limited, London (2016).

than a public, good¹⁵. Public subsidy of private production is extremely unusual (especially at the rates of up to 50% which pertain in UK agriculture) and runs the risk of consumers paying twice, once as purchasers of food and again as taxpayers.

Just because food is a private good, this does not mean that farms cannot also produce public goods. Indeed, as noted by the House of Commons (2007, p.3)¹⁶ the “only long-term justification for future expenditure in the agricultural sector is the provision of public benefits”, a position accepted, and indeed supported, by many land owners and increasingly by farmers (e.g. CLA, 2018)¹⁷. The main public good highlighted in the government’s farming consultation document is environmental improvement. Environmentally related public benefits which can be produced by farming include under the ten goals, but are not limited to:

- Improved soil health;
- Water quality improvement;
- Water quantity regulation;
- Flood risk reduction;
- Climate change mitigation through the reduction and storage of greenhouse gas emissions;
- Other air quality improvements such as reducing ammonia emissions;
- Conservation and enhancement of biodiversity;
- The provision of amenity views;
- Recreational access;
- Improvements to physical and mental health;
- Supporting provision of the above environmental public goods through diversification into other production with high public good characteristics (e.g. woodland) and / or compensation for environmental damage elsewhere in the economy (e.g. delivering net environmental gains from housing developments).

Agriculture is very far from the sole provider of public goods. For example both urban and marine environments have the potential to deliver massive improvements in the wellbeing associated with access to high quality natural capital. Similarly, targeting public interventions in transportation so that they both boost the economy and reduce air

¹⁵ H.M. Treasury, *The Green Book: Central Government Guidance on Appraisal and Evaluation* (2018): <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

¹⁶ House of Commons, *The UK Government’s Vision for the Common Agricultural Policy*, House of Commons Environment, Food and Rural Affairs Committee, Fourth Report of Session 2006–07, vol. I, The Stationery Office Limited, London (2007) HC 546-I: <https://publications.parliament.uk/pa/cm200607/cmselect/cmenvfru/546/546i.pdf>

¹⁷ Country Land and Business Association, *The Land Management Contract* (2018): <https://www.cla.org.uk/Land-Management-Contract#>

pollution would be highly cost-beneficial. Options should be explored to adapt coastal developments and maritime activities (such as fishing or renewable energy development) to improve public goods that restore natural capital stocks and enhance human wellbeing. The principle of public money being focused upon the provision of public goods should hold throughout.

Recommendations:

- **There should be a clear focus on identifying priority investments for enhancing natural capital. Tools such as cost benefit analysis need to take account of the wider effects of environmental change and the integrated nature of environmental systems and the goods and services they provide.**
- **Public funding for agriculture should be focused on the delivery of environmental public goods. There should be no presumption that historic levels of funding or the current distribution of these are correct; in some cases they might rise, in others fall.**
- **Appraisal of the potential benefits of investing in natural capital and environmental improvement should be undertaken. The Committee has shown in numerous previous reports that such investment can yield rates of return which readily outstrip those afforded by spending elsewhere.**
- **In order to guide investment in the provision of environmental public goods, the government should ensure that decision makers have access to robust evidence on environment change and associated economic values. This valuation evidence should be sensitive to both the magnitude and location of change. Developing this evidence base requires strong partnerships between academia and government and adequate research investment to provide robust and usable information.**
- **Alternative options for investment should routinely be considered to ensure that the best ones are chosen.**

Polluter pays principle

An economically efficient market is one in which all the costs (and benefits) are included so that the price sends the right signal to allocate resources. Environmental externalities are examples of where these costs are not included, and hence the prices are too low, and pollution as a result is excessive. Making the polluter pay improves market efficiency and hence increases properly measured economic growth.

It is sometimes objected that whilst the costs need to be reflected in markets, it might not matter whether the polluter or the polluted parties pay. For example, farming lobbies have argued that farmers should be subsidised if they are to reduce pollution (a recent example is

ammonia emissions). Making the polluted pay with no compensating reduction in over-production is neither economically efficient nor fair.

The net environmental gain principle (see below) incorporates the polluter pays principle: developers are required to compensate for the environmental damage caused by their projects. Fines for pollution are also examples of the polluter pays principle. As with net gain, fines need to be at least equal to the damage caused.

The 25 YEP rightly incorporated the polluter pays principle, and this has been carried over to the consultation document for the Agriculture Bill: *'Health and Harmony: the future for food, farming and the environment in a Green Brexit'*¹⁸ but not the Bill itself.

Net environmental gain

The government's proposal within the 25 YEP to introduce a net environmental gain requirement for new development offers a potential source of long-term investment in the delivery of an improved natural environment. However, to gain the greatest benefits, this approach must be applied in a considered way, addressing the following questions

- What should be compensated for? Compensation should consider losses of all the benefits provided by the natural environment. Simple definitions of environmental loss as being just the impact upon wild species or biodiversity are inadequate. Development can generate multiple impacts either directly on environmental assets or mediated through environmental impacts: wild species; recreation and related physical and mental health benefits; water quality, quantity and flooding; air pollution emissions and GHG, etc. It is the losses of benefit value generated by development which should be compensated for.
- Who should pay? Those whose activities give rise to the environmental damage should pay the associated costs of compensation. This scheme should be compulsory rather than voluntary.
- Where compensation should be targeted? Net environmental gain proposals associated with development should adopt an avoid, minimise, remediate, compensate hierarchy. For net environmental gain to be a reality, the compensation needs to include a distinct investment component that delivers a gain over and above the starting baseline. Sufficient funding is also required to maintain the new assets that have been created. There are various approaches that can be applied to where remediation and compensation projects are targeted. Changes in the location of projects will alter the consequences and benefits they deliver. Choice of location

¹⁸ Defra, *Health and Harmony: the future for food, farming and the environment in a Green Brexit* (2018): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/684003/future-farming-environment-consult-document.pdf

should include considerations such as: maximising ecological gains; promoting a coherent network of habitats across the country; providing benefit to those people who currently experience the lowest quality environments; proximity and providing benefits as close as possible to where the impact occurs. Consideration needs to be given to the principles underpinning the objectives and hence rules for locating compensation projects. It may be that that different rules are applicable to the remediation and compensation aspects of net environmental gain.

- What is the baseline for assessing compensation? The net environmental gain principle tends to be considered as a binary comparison between the existing use and the proposed new use. For example, land in the Green Belt might currently be of little environmental value because it has been degraded. But it might be capable of being of high environmental value if properly managed. Net gain needs to take account of all options, and not just the narrow one of comparing current use with housing or infrastructure. If land is in a poor environmental condition and landowners have no reason to improve it, a net environmental gain approach that is based simply on the comparison of the existing state and the proposed new use can create an incentive for landowners to allow the condition of their land to deteriorate prior to development so as to reduce compensation requirements.

Serious and urgent consideration should be given to answering all of the above questions to ensure that the net environmental gain principle is implemented both rapidly and effectively. The NCC will consider net gain further and produce a detailed and considered piece of advice in March 2019.

Embedding natural capital into public spending decisions.

The government has made significant strides towards the improved incorporation of natural capital within economic analyses of public spending. Recent changes require that appraisals of alternative options for public spending:

- Understand the implications of public spending options for natural capital stocks and flows;
- Value the costs and benefits of the various consequences of each option.

A major contribution to these improvements is delivered through the new edition of the H.M. Treasury “Central Government Guidance on Appraisal and Evaluation”, more generally referred to as “The Green Book”¹⁹. This revision, the first of its kind for 15 years, reflects long term and positive collaboration between H.M. Treasury and the NCC through which the natural capital approach has been brought into government appraisal of spending options.

¹⁹ H.M. Treasury, *The Green Book: Central Government Guidance on Appraisal and Evaluation* (2018): <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

The Green Book notes the significant strides which the NCC and colleagues have delivered in terms of improving access to non-market valuations of environmental costs and benefits and natural capital decision support tools more generally. These include both the development of support designed for specific applications (such as the searchable Woodland Valuation Tool; p.63)²⁰ and more generic tools such as the Outdoor Recreation Valuation (ORVal) Tool (p.64)²¹. This latter tool has recently been extended through the Defra funded Natural Environment Valuation Online (NEVO) tool which allows non-expert decision and policy makers to understand the value of environmental benefits and costs arising from a wide variety of user-defined public spending options.

Recommendations:

- **The recently updated Green Book should be implemented robustly across all government department to fully take account of natural capital in policy design and publicly funded projects and programmes.**
- **As part of implementing the Green Book, policy decision makers need access to robust values for changes in the services provided by natural capital which will require adequate resourcing.**

Embedding natural capital within infrastructure decisions

The NCC's terms of reference require the Committee to advise the NIC to ensure that 'green and blue infrastructure' is appropriately considered within wider infrastructure discussions. The Committee has been pleased to provide some advice on the NIC's first National Infrastructure Assessment but consider that there is further to go in ensuring the NIC does appropriately incorporate natural capital considerations in all of its work. For example, there was scant mention of natural capital or the 25 YEP goals and green infrastructure was not considered as part of the assessment.

In future, it will be important to fully align the implementation of the 25 YEP, with both the ongoing work of the NIC and also the work of the new Industrial Strategy Council. All three strategic frameworks for the economy are establishing sets of metrics to inform future policies, and all have the common aim of improving the well-being of people around the country. If these considerable efforts are conducted in isolation from each other, there may be a missed opportunity to create a genuinely strategic and consistent framework for the economy. The NCC will continue to explore how we can best embed natural capital in these

²⁰ University of Exeter, *Woodland Valuation Tool* (2017): <https://www.forestry.gov.uk/forestry/bee-h-as4j2w>

²¹ LEEP at The University of Exeter, *Outdoor Recreation Valuation Tool*: <https://www.leep.exeter.ac.uk/orval/>

overlapping areas of policy, including incorporating appropriate natural capital metrics in infrastructure assessment frameworks.

Recommendations:

- **The NIC should ensure that all major infrastructure recommendations incorporate the need for full natural capital baseline assessments.**
- **In addition to properly reflecting the impacts on natural capital assets when making infrastructure decisions, natural capital should be considered as infrastructure in its own right.**
- **All publically funded infrastructure projects and programmes, infrastructure providers and public bodies should be required to analyse their impacts on and have regard to all the 25 YEP goals. Where negative impacts are likely, net environmental gain compensation should be required.**

4. Natural Capital Committee recommendations summary

Headline recommendations

The NCC recommendations for the Draft Environment Bill

The Committee welcomes the draft Environment Bill but it does not go far enough to secure the improved environment to which the government is committed. The final Environment Bill should include:

- Placing the 25 YEP on a meaningful statutory footing. This needs to go further than the current text and include the ten goals set out in the Plan with associated clear targets, five year milestones, robust indicators and metrics.
- A requirement for the government to report annually to be expanded to include performance against the milestones for each of the core targets.
- Requirements for the OEP to be able to: hold government, and all others that fall within the remit of environmental legislation, to account for the proper implementation and delivery of the stated requirements; have appropriate enforcement and sanctioning powers; and oversee the delivery of the 25 YEP.
- Defra should review the roles and remit of the existing environmental delivery bodies, including the EA, NE, the MMO and Local Authorities to clearly identify responsibilities for delivery of the many actions in the 25 YEP.
- Three core principles to drive policy and implementation: 1) public money for public goods; 2) the polluter pays; and 3) net environmental gain. All government departments, with minimal exemptions, should be required to apply these to policy development and implementation where it relates to use of, or impact on Natural Capital.

The NCC recommendations to Defra

- Defra should be tasked with delivering an environmental census to establish a robust baseline against which to measure progress towards the 25 YEP goals. The census should have clearly defined leadership and governance but should be as inclusive as possible, carried out within one calendar year, securing widespread NGO and public engagement in the process.
- Fisheries policy, including setting fishing catch targets, should be implemented in a manner that is consistent with the Plan, including improving the whole marine environment and taking into account that fish are one element of a complex and highly integrated marine system delivering multiple services.

- Agricultural policy and subsidies should be developed so as to support the 25 YEP.

The NCC's recommendations to Treasury and other economic departments

- Sufficient resources must be provided to implement the 25 YEP fully and properly in order to achieve the goals.
- In implementing the Green Book, policy decision makers need access to robust values for changes in the services provided by natural capital requiring strong partnership with Defra and adequate resourcing.
- All publicly funded infrastructure projects and programmes, infrastructure providers, public property (including the sea bed) and public bodies should be required to analyse their impacts on and have regard to all the 25 YEP goals. Where negative impacts are likely, net environmental gain compensation should be required.
- The Treasury should work with the ONS to develop natural capital updates to accompany annual budget statements.
- Department for Business, Energy and Industrial Strategy (BEIS) should take action to encourage private sector production of corporate natural capital accounting, notably by engaging with the accounting bodies to consider future revisions to accounting standards to include natural capital.
- The NIC should ensure that all major infrastructure recommendations incorporate the need for full natural capital baseline assessments.
- Natural capital assets should be viewed as infrastructure in their own right in national infrastructure assessments and government should expand the remit of the NIC to enable this.

The NCC's recommendations to Ministry of Housing, Communities and Local Government (MHCLG)

- The National Planning Policy Framework (NPPF) should explicitly include net environment gain provisions.
- Net environment gain should be a requirement for all new housing development.

Targets, baselines and reporting for the 25 YEP

- In order to drive progress, quantified targets should be established for the various aspects of the 25 YEP goals in the Environment Bill. Targets will need to be set against an agreed baseline, and progress measured using standardised methodologies which account for variations in scale, setting (i.e. local and national, urban and rural) and location.
- A comprehensive review of progress against the 25 YEP goals should be undertaken on a five yearly basis. The full assessment should be supplemented by annual monitoring, assessment and reporting on the state of the environment.

Implementing the natural capital approach at a local level

- Building on lessons learned through the Pioneers and other exemplars, a local natural capital baseline assessment methodology should be developed. This guidance should clearly set out how to undertake a baseline natural capital assessment for specific geographies such as a major river catchment, a city or town, a national park, a coastal stretch or a marine area.
- The maps and data sets that would enable a baseline natural capital assessment to be carried out for England should be specified and collated centrally by government. This guidance sets should be made freely and widely available. It is recognised that there may currently be intellectual or commercial property issues associated with this but ways of overcoming these need to be found as a matter of urgency.
- Some natural capital evaluations will require assessments to be carried out at higher resolutions and for a wider range of parameters than those contained within the baseline methodology outlined above, but this should not detract from the priority of agreeing a local natural capital baseline assessment methodology.
- The approach taken to local level natural capital assessments should be based on the NCC's 'How to do it Workbook' of which the government now needs to take ownership of and develop. This includes the following process and steps:
 - Establishing a baseline for both the overall state of the environment and particular asset types.
 - Defining the geographic area for the assessment.
 - Compiling an asset register on a prioritised basis in terms of quantity, condition and location including international, national and locally important natural capital assets.

- Identifying the main goods, services and benefits the assets provide and their value.
- Compiling an asset risk register noting if the assets are renewable or non-renewable; which are at risk and from what; whether the extent and condition of the assets is increasing or decreasing; the proximity of the asset extent and condition to any tipping points, connectivity with other assets.
- Identifying how much it will cost to prevent further deterioration, restore the assets to a resilient function, capacity and capability and then maintain them including assessing if the proposed actions are technically feasible and the costs proportionate.
- The amount of time taken to establish new capital assets.
- Compiling a natural capital balance sheet.
- Follow H.M. Treasury Green Book guidelines on the valuation of costs and benefits arising from changes in natural capital assets.

Environmental census

- Government needs to commission and resource a new environmental census to help establish a robust baseline against which progress towards the 25 YEP goals can be measured.
- The first Environmental Census should be undertaken in 2020 to follow the government's "Year of Green Action" in 2019 and the transfer of EU environment legislation to UK legislation. The census should aim to capture a detailed picture of the health of terrestrial and marine environments and related assets, including a broad spectrum of information on biodiversity.
- Census data should align with indicators and metrics already routinely monitored by government agencies (e.g. EA; water and air quality), local authorities and NGOs (e.g. RSPB's 'State of the UK's birds' report) and with the metrics being developed to support the 25YEP. It should also allow for new data-capture resulting from the use of emerging technologies (e.g. Sentinel satellites and Landsat imagery, smart phone apps) and encourage as wide a participation as possible in collecting this data, including citizen scientists, individual landowners and school children.
- The measurement process should aim to become a global exemplar for citizen engagement in the environment. We propose that the environmental census therefore is led by an independent body which will coordinate the partners and collection of the data.
- We recommend that different government agencies are co-ordinated in such a way that each takes the lead / responsibility for a different environmental asset to be

measured, and for the associated metrics and activities. Duplication between different agencies should be avoided at all costs.

Public money for public goods and funding

- System analysis and cost-benefit analysis should be used to identify priority investments for enhancing natural capital. Such analyses need to take account of the wider effects of environmental change.
- Public funding for agriculture should be focussed on the delivery of environmental public goods. There should be no presumption that historic levels of funding or the current distribution of these are correct; in some cases they might rise, in others fall.
- Appraisal of the potential benefits of investing in natural capital and environmental improvement should be undertaken. The Committee has shown in numerous previous reports that such investment can yield rates of return which readily outstrip those afforded by spending elsewhere.
- In order to guide investment in the provision of environmental public goods, the government should ensure that decision makers have access to robust information on the value of benefits and costs arising from environmental improvements and change. Those valuations should be sensitive to both the magnitude and location of change as both affect values. Ideally the people affected by natural capital changes should also be considered. This requires strong partnership with Defra and adequate resourcing to provide such robust and informative values.
- Alternative options for investment should routinely be considered to ensure that the best alternatives are chosen.

Application examples of the NCC recommendations

Green Belt

- The Green Belt should be reviewed to identify the potential contribution it can make to the goals and objectives of the 25 YEP.
- The spatial planning system should take account of all the potential natural capital assets and resulting societal benefits, including mental and physical health-benefits of the Green Belt and not only its current uses, which may be sub-optimal.
- Incremental developments should be assessed in terms of the Green Belt and neighbouring urban areas as a whole and not only the land directly affected.
- Support should also be given to the creation of green spaces elsewhere in urban areas, such as green corridors and inner-city green spaces, widening access to natural capital more broadly beyond those currently able to live in or near the green

belt and enhancing natural capital in line with the aims of the 25 YEP.

Marine

- Government should undertake marine natural capital assessments and accounting in order to increase understanding and evidence of the extent of assets, services and benefits from the sea, coastal waters and estuaries, particularly the physical and psychological health and wellbeing benefits (as well as social and economic benefits) of recreation and leisure activities in blue spaces and the assets that underpin them.
- Marine natural capital plans should be developed that work with, and integrate with land-based natural capital plans. Catchment and land management approaches and any associated public payments or incentive schemes for investments should take full account of their impact on estuaries, coastal waters and the sea and the need to protect and enhance these and associated regional coastal and marine economies e.g. by promoting aquaculture and shellfisheries.
- Government should critically review the network of marine protected areas (currently designated to protect target features) and their use in the 25 YEP by re-orientating their protection towards natural capital assets and flows of ecosystem services more generally, including their recovery and resilience.
- Government should work towards an innovative sea management system, akin to and working with the land management system. This includes use of public money or other incentives to empower and enable users of the sea to become the stewards of the marine environment and its biodiversity as public goods for all users.

Soils

- Government should give soils equivalent focus and attention to air and water and this should be reflected in the 25 YEP indicators being developed, such that soil health is one of the headline indicators. To underpin this investment in developing soil indicators should go well beyond the £200,000 specified in the 25 YEP and reflect the cost of ongoing degradation which is estimated at £3.21 billion just for the loss of soil carbon across the UK.
- A national survey should be undertaken as part of the environmental census to determine the state of soils in England, with periodic updates every five years to ensure our soils are being restored. A comprehensive suite of policies and funded actions to ensure soils are managed sustainably by 2030, as outlined in the 25 YEP, should be developed following the survey. These will need to align with post Brexit agricultural payments for public goods.
- In addition to a comprehensive national survey, an assessment of sites where soils have been sealed by development (e.g. in urban environments) should be

undertaken and government should commit to not increase the level of soil sealing in line with environmental net gain principles and ensuring sustainable soil management.

Annex 1: Progress against the ten goals

This annex highlights the long term trend for each of the 25 YEP goals and where data exists, as assessment of what has happened since the government adopted its commitment to improve the environment within a generation, in 2011. The evidence presented here is only a partial assessment. The data in the sections below are for England, unless otherwise stated, given the limited availability of England only data in some cases.

Clean air

Poor air quality has serious health and environmental impacts. Concentrations of particulate matter in the UK have been reducing since measurement began in the early 1990s, although the rate of decline (and hence rate at which air quality is improving) has slowed over the last decade. The same pattern is observed for nitrogen oxides (NOx)²² concentrations.

In contrast, ozone concentrations have risen slightly over the last three decades. As the population grows and society becomes more urbanised, exposure to air pollution increases, offsetting some of the gains from reduced emissions. Insufficient progress has been made towards improving the air quality in some areas of England (e.g. London) which has resulted in the EU Commission taking action against the UK for failing to meet the required air quality standards.

Progress towards the goal

Between 1990 and 2011, UK estimated emissions of NOx (expressed as NO₂) and particulate matter (PM₁₀)²³ have reduced by 63% and 55% respectively. Since 2011, emissions have fallen by 57% for sulphur oxides, 22% for NOx (expressed as NO₂), 8% for non-methane volatile organic compounds (NMVOC) and 2% for particulate matter (PM_{2.5})²⁴. However, there has been a marginal increase of under 1% in emissions PM₁₀²⁵.

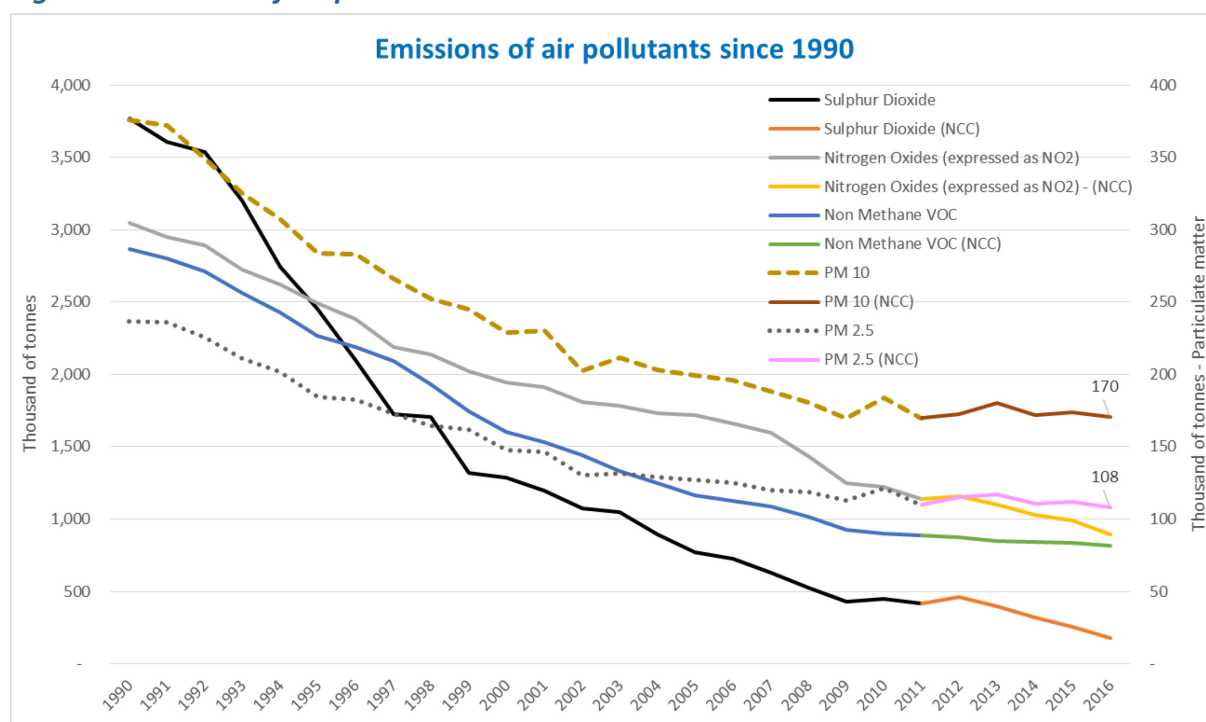
²² NOx are emitted during fuel combustion, such as from road transport and industrial facility activities.

²³ PM10 refers to particles with a diameter smaller than 10µm. They may be produced directly from a source such as an engine (primary PM) or formed from reactions between other pollutants (e.g. NO₂, SO₂, and NH₃) in the air (secondary PM). The NAEI only considers the emissions of primary PM.

²⁴ PM2.5 refers to particles with a diameter smaller than 2.5µm. They may be produced directly from a source such as an engine (primary PM) or formed from reactions between other pollutants (e.g. NO₂, SO₂, and NH₃) in the air (secondary PM). The NAEI only considers the emissions of primary PM.

²⁵ National Atmospheric Emissions Inventory, UK emissions data selector: <http://naei.beis.gov.uk/data/data-selector>

Figure 1 Emissions of air pollutants since 1990



Source: National Atmospheric Emissions Inventory

Even though there has been a reduction in the overall concentrations of air pollutants, latest data for 2017 on clean air compliance shows that the UK had two (Greater London and South Wales) out of 43²⁶ zones that were not compliant for nitrogen dioxide one hour limit value of ($200 \mu\text{g m}^{-3}$). In addition annual mean compliance was low, only six of the 43 zones had met the annual mean limit. While the remaining 37 zones had locations with measured or modelled annual mean NO₂ concentrations higher than the annual mean limit value ($40 \mu\text{g m}^{-3}$)²⁷.

Clean and plentiful water

Water is one of the most important natural capital assets; it is essential for human life, the environment and wildlife. Over the years, progress has been made in improving England's water quality through the reduction of high levels of pollution but there is still much to do. Flooding can have a devastating impact on people and a significant impact on the local and national economy.

²⁶ The UK is divided into 43 zones for air quality assessment. There are 28 agglomeration zones (large urban areas) and 15 non-agglomeration zones.

²⁷ Defra, *Air Pollution in the UK 2017* (2017): <https://uk-air.defra.gov.uk/library/annualreport/>

Evidence from the 2015 update to the River Basin Management Plans in England show that water is under a number pressures including physical modifications affecting 39% of water bodies in England. Over time many modifications have been made to rivers, lakes and estuaries, including flood defences and weirs, and changes to the size and shape of natural river channels for land drainage and navigation. These modifications alter natural flow levels, cause excessive build-up of sediment in surface water bodies and the loss of habitats and recreational uses.²⁸

Table 1 Water management pressures scoped in the River Basin Management Plan in 2015

Water management issue/pressure:	Water bodies in England
Physical modifications	affecting 39%
Pollution from waste water	affecting 35%
Pollution from rural areas	affecting 35%
Pollution from towns, cities and transport	affecting 11%
Changes to the natural flow and level of water -	affecting 6%
Pollution from abandoned mines -	affecting 3%
Negative effects of non-native invasive species	affecting 2%

Source: Defra, *update to the river basin management plans in England: National Evidence and Data Report*

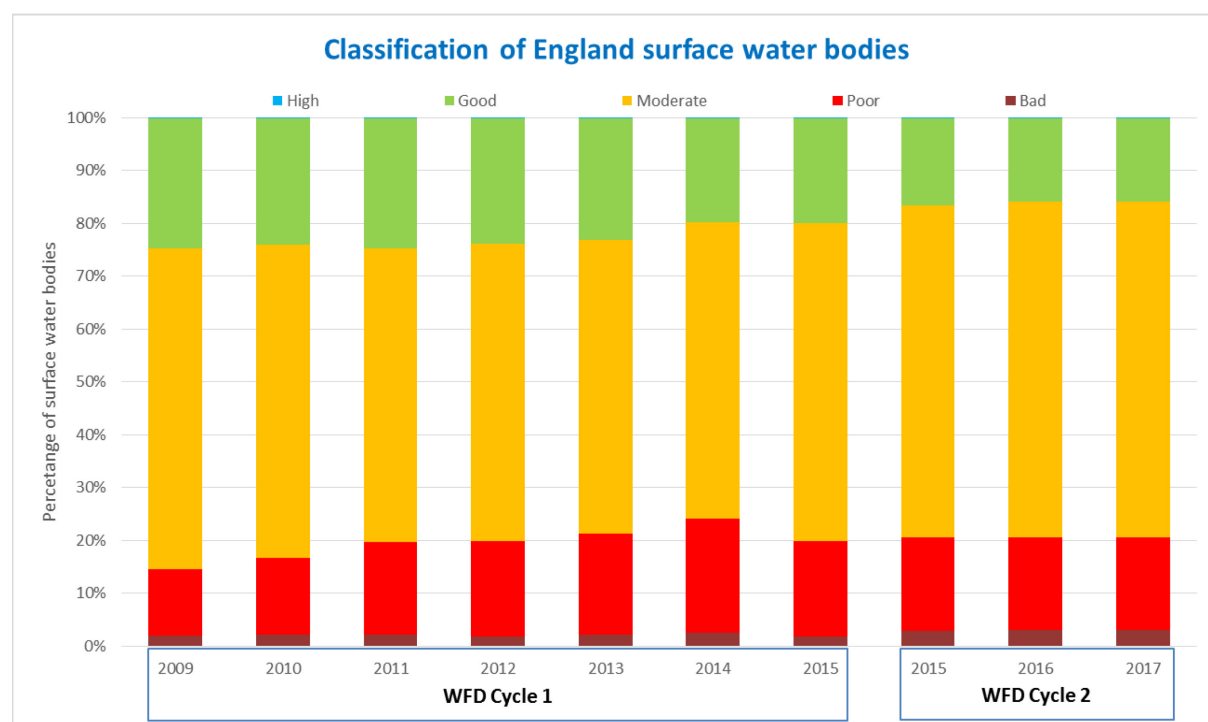
Progress towards the goal

Data on the percentage of water bodies at good or better ecological status in 2016 for England show that only 14% of rivers, 16% of lakes, 20% of estuaries and 45% of coasts are meeting this status²⁹. There has been a decrease of just over 35% in the percentage of surface water bodies in England awarded high or good ecological status between 2011 and 2017. Some of this reduction can be attributed to a change in the classification process - see figure 2 below.

²⁸ Environment Agency, *Update to the river basin management plans in England: National Evidence and Data Report* (2018):
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/514944/National_evidence_and_data_report.pdf

²⁹ Defra, *The state of the environment: water quality* (2018):
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/709493/State_of_the_environment_water_quality_report.pdf

Figure 2 Classification of England surface water bodies based on Water Framework Directive



Source: Environmental Agency³⁰

Bathing water quality improved steadily between 1988 and 2014, largely as a result of improvements to the sewerage system by water companies. Data after 2014 is based on the

³⁰ Notes:

1. Based on the numbers of surface water bodies classified under the Water Framework Directive (WFD) in England. These include rivers, canals, lakes, estuaries and coastal water bodies, but exclude SSSI ditches and surface water transfers.
2. A water body is a management unit, as defined by the relevant authorities.
3. Water bodies that are heavily modified or artificial (HMAWBs) are included in this indicator alongside natural water bodies. HMAWBs are classified as good, moderate, poor or bad 'ecological potential'. Results have been combined; for example, the number of water bodies with a good status class has been added to the number of HMAWBs with good ecological potential.
4. The results published each year relate to data reported in that year under the Water Framework Directive (WFD); data reported in a given year relate to data collected over the previous year. In 2016, the Environment Agency moved to a triennial reporting system and will report next in 2019. As classifications are valid until they are next assessed, the latest available data from 2016 have been carried forward.
5. The percentage of water bodies in each status class has been calculated based on the total number of water bodies assessed in each year.
6. The total number of assessments varies slightly from year to year: in 2009, 5,805 water bodies were assessed; in 2010, 5,739 were assessed; in 2011, 5,760; in 2012, 5,692; in 2013, 5,735; in 2014, 5,769; in 2015, 5,738 under cycle 1 and 4,656 under cycle 2; and in both 2016 and 2017, 4,656 water bodies were assessed.
7. The relatively large reduction in the number of assessments in 2015 was due to England adopting the monitoring and classification standards laid down in cycle 2 of the WFD. This means that data from 2015 onwards are not directly comparable to those in earlier years.

2006 Bathing Water Directive (BWD) replacing the 1976 Directive with an update of the standards, based on recommendations from the World Health Organisation (WHO)³¹.

In 2018 around 411 (97.9%) bathing areas met at least the minimum standard (sufficient) of the European Bathing Water Directive in the UK. There has been an increase in the number of bathing water classified as excellent when compared to 2015 of 18 (6.8%) areas.

However, the highest level of excellent (and lowest of poor) are found in 2016, where 287 bathing areas were classified as excellent and six as poor³². See table 2 below for change over time on the quality of bathing water.

Table 2 Bathing water quality data since 2015

Bathing water classification for England ^{33, 34}	2015	2016	2017	2018
Excellent (blue)	264 (63.6%)	287 (69.5%)	271 (65.6%)	282 (67.1%)
Good (green)	110 (26.5%)	98 (23.7%)	109 (26.4%)	106 (25.2%)
Sufficient (amber)	29 (7.0%)	22 (5.3%)	26 (6.3%)	23 (5.5%)
Poor (red)	12 (2.9%)	6 (1.5%)	7 (1.7%)	9 (2.1%)
Total	415	413	413	420

Source: Defra, ENV 17 – Bathing water quality: additional datasets (2015-2018)

From the most recent data on water abstractions, the number of licences in force continues to reduce reaching an all-time low of 19,073 licences. The biggest reduction in the number of licences since 2000 has been to the south west 8,214 (77%). Since 2011 the number of licences has been reduced by 679 (3%). There has also been a reduction in the amount of water abstracted of 3,672 (19%) million cubic metres over the same period. Data for 2016 show an increase compared to 2015 of 905 million cubic litres³⁵. See figure 3 for change over time on the water abstraction and number of licences.

³¹ Defra, Statistics on bathing waters in England (2015-2018):

<https://www.gov.uk/government/statistics/bathing-water-quality-statistics>

³² Defra, ENV 17 – Bathing water quality: additional datasets (2015-2018):

<https://www.gov.uk/government/statistical-data-sets/env17-bathing-water-quality-additional-datasets>

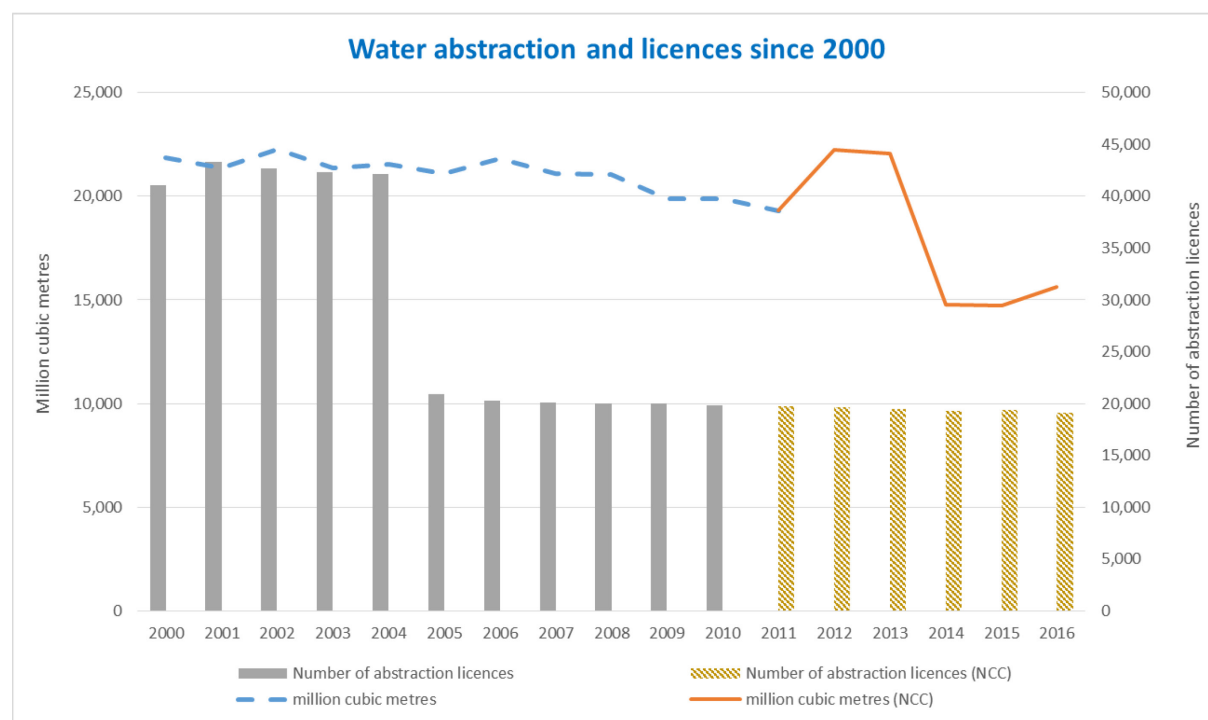
³³ Water bathing classification description: **Excellent** (the highest, cleanest class), **Good** (generally good water quality), **Sufficient** – the water quality meets the minimum standard; and **Poor** – the water quality has not met the minimum standard.

³⁴ Percentage figures may not add up to 100% due to rounding.

³⁵ Defra, ENV15 - Water abstraction tables for England (2018): <https://www.gov.uk/government/statistical-data-sets/env15-water-abstraction-tables>

Evidence published by the Environment Agency in *Water abstraction plan: Environment*, show that 8% of surface water bodies and 28% of groundwater bodies are being abstracted unsustainably and a further 10% were identified as being subject to potentially unsustainable abstractions. The Environment Agency has also estimated that 5% of surface water bodies and 15% of groundwater bodies are at risk from increasing water use by current licence holders that could damage the environment³⁶.

Figure 3 Water abstraction data since 2000



Source: Defra, ENV15 - Water abstraction tables for England (2018)

Thriving plants and wildlife

Thriving plants and wildlife is a broad goal that requires multiples approaches in order to assess progress.

Plants and wildlife are vital and valuable natural capital assets that that may provide food, water, carbon sequestration, soil erosion control, shelter and other functions to other wildlife and humans. Plants are incredibly important in providing habitat for a number of species, such as fungi, insects, food for birds and mammals (including humans). While

³⁶ Defra, *Water abstraction plan* (2018): <https://www.gov.uk/government/publications/water-abstraction-plan-2017/water-abstraction-plan>

wildlife support a range of ecosystem and are important part of the food chain, for example bees are responsible for pollinating plants and are used to produce honey. It has been estimated that 70 of the 100 crop species that provide 90% of food worldwide are pollinated by bees³⁷.

There has been an increase in designation of marine protected areas (MPAs) with approximately 24% of UK waters currently designated. There has been little progress on systematic monitoring or on implementing management measures and actions to ensure that they are effective in achieving the goal.

Government should critically review the network of marine protected areas (currently designated to protect target features) and their use in the 25 YEP by re-orientating their protection towards natural capital assets and flows of ecosystem services more generally including their recovery and resilience. This includes considering further protections to extend and expand MPAs where fishing and other disruptive activities are banned in order to allow greater recovery of fish stocks and other natural capital.

Progress towards the goal

There has been a decline on the number of bees and pollinators in England, but also in the status of plants and wildlife, especially priority species³⁸. Defra has estimated that between 2010 and 2015 the index in the abundance of species has declined by 18% relative to its value in 2010, again showing a statistically significant decrease. The index for distribution of species was 3% higher in 2016 when compared to 2011³⁹.

Farmland birds and butterfly species have also declined between 2010 and 2015. The breeding birds' index has fallen by 8% over the same period. Since 1990 the index for butterflies on farmland has fallen by 27%, while for bats on farmland, the index between 2011 and 2016 has not changed significantly.

³⁷ Defra. *Bees' Needs: Food and a home* - <https://www.gov.uk/government/news/bees-needs-food-and-a-home>

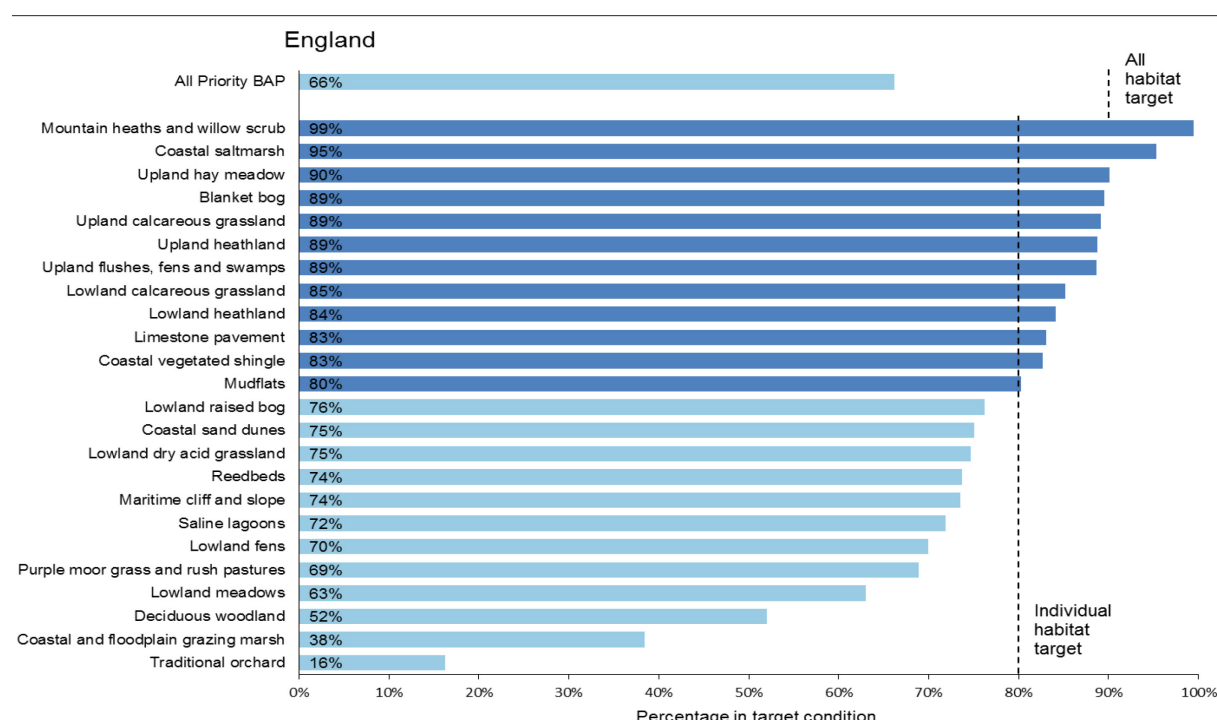
³⁸ **Priority species** Priority species are defined as those on one or more of the biodiversity lists of each UK country (Natural Environmental and Rural Communities Act 2006 - Section 41 (England), Environment (Wales) Act 2016 section 7, Northern Ireland Priority Species List, and Scottish Biodiversity List). The combined list contains 2,890 species in total. The priority species were highlighted as being of conservation concern for a variety of reasons, including rapid decline in some of their populations.

³⁹ Defra. *Biodiversity 2020: A strategy for England's wildlife and ecosystem services: Indicators* - <https://www.gov.uk/government/statistics/england-biodiversity-indicators>

Progress towards meeting the biodiversity 2020 target of 90% of priority habitats in favourable⁴⁰ or recovering condition and at least 50% of Sites of Special Scientific Interest (SSSIs) in favourable condition, while maintaining at least 95% in favourable or recovering condition by 2020 has been limited⁴¹.

Data compiled by Natural England as of March 2018 show that only 66% of priority sites have met favourable condition status. With respect to individual habitats, only half meet the target of 80%, with coastal and flood plain grazing marsh and traditional orchard reaching 38% and 16% respectively. See figure 4 below.

Figure 4 Percentage of individual priority habitats in target condition, England March 2018



Source: Natural England

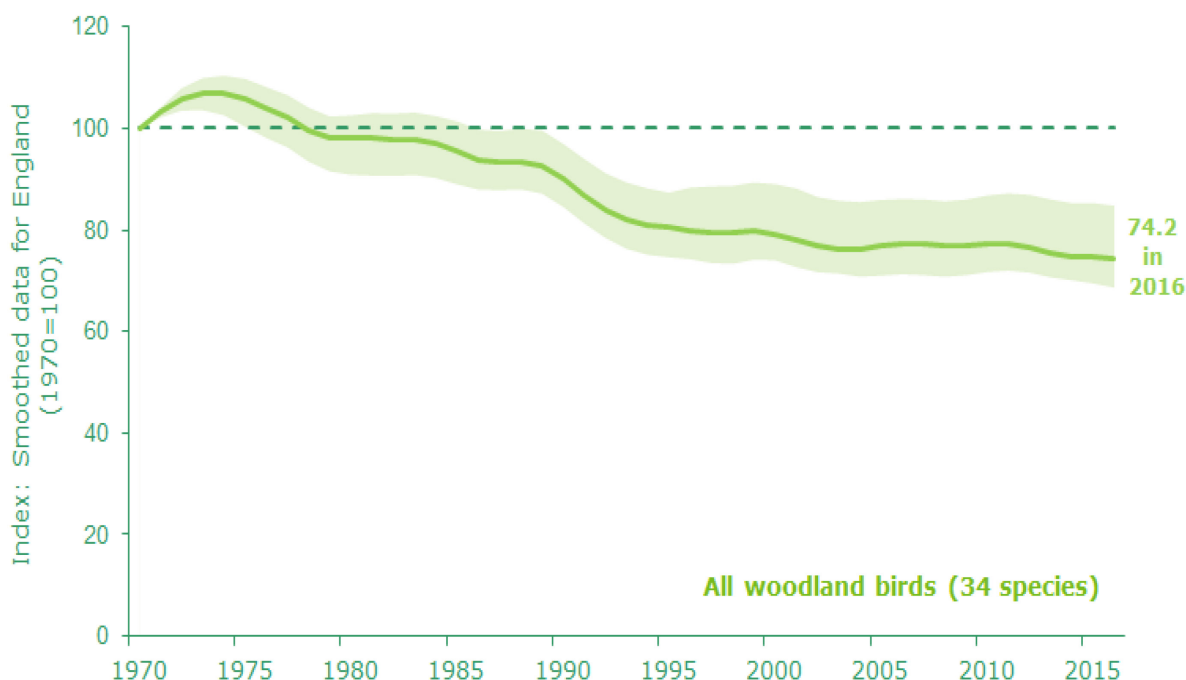
In 2016 the woodland bird index for England was 26% lower than in 1970 (smoothed data - unstandardised woodland bird index and its 95% confidence interval). The greatest decline occurred between the early 1980s and the mid-1990s. Since then the index has been more

⁴⁰ 'Favourable' condition status indicates that a particular site meets agreed standards for the priority habitat of interest. 'Recovering' condition status indicates that the site fails to meet the standards, but has appropriate management in place that will achieve those standards, sites with inappropriate or no suitable management are 'unfavourable'.

⁴¹ Defra, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services* (2011): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726851/England_biodiversity_indicators_2018_final.pdf

stable. Over the past ten years the woodland bird index has fluctuated but showed no significant change overall.⁴²

Figure 5 Measure of what is happening to the number and variety of species that live in woodland; using Woodland Birds data



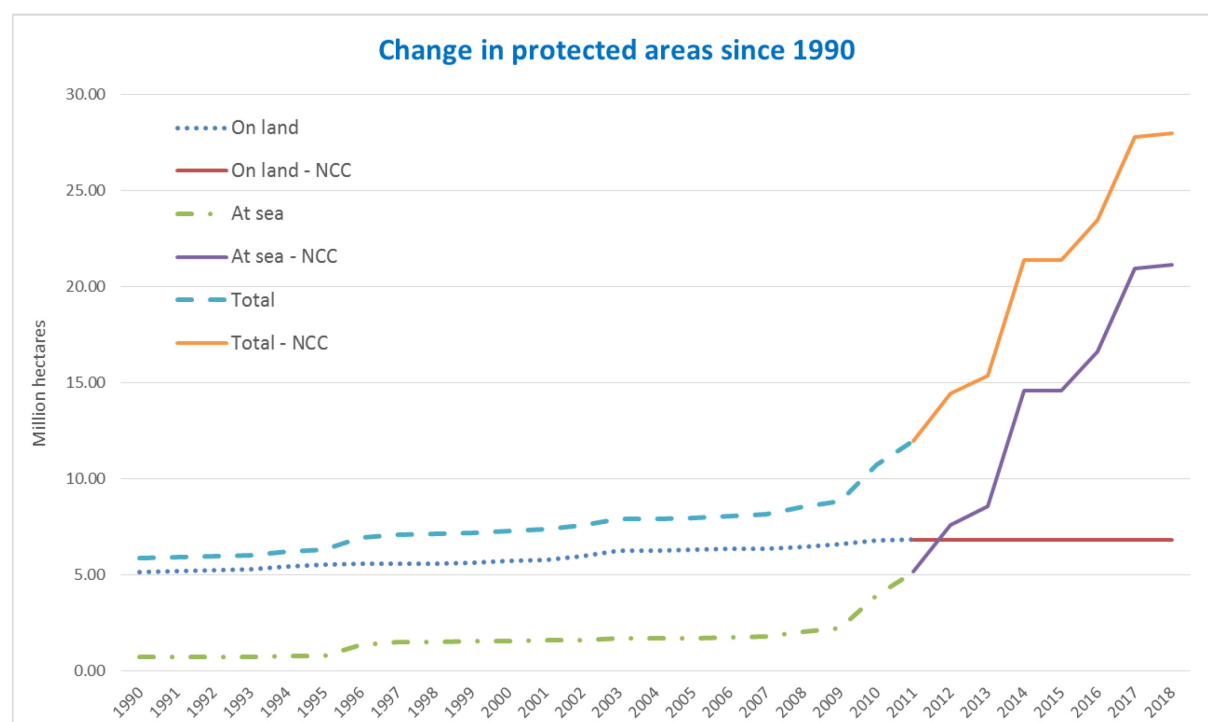
Source: Forestry Commission, *Corporate Plan Performance Indicators* (2018)

There has been increase in the extent of designations of UK land and marine protected areas. Data from the Joint Nature Conservation Committee (JNCC) shows that the majority of the increase in domestic and international protected areas has come from designations at sea. Between 2011 and 2018 there was an increase of 16 million hectares (309%). Over the same period, for land the change in the extent of protected areas has been minimal at 0.02 million hectares.⁴³

⁴² Forestry Commission, *Corporate Plan Performance Indicators* (2018): [https://www.forestry.gov.uk/pdf/FC-England-Indicators-Report-2018.pdf/\\$FILE/FC-England-Indicators-Report-2018.pdf](https://www.forestry.gov.uk/pdf/FC-England-Indicators-Report-2018.pdf/$FILE/FC-England-Indicators-Report-2018.pdf)

⁴³ Joint Nature Conservation Committee, *UK Biodiversity Indicators: C1 Protected areas* (2108): <http://jncc.defra.gov.uk/page-4241>

Figure 6 Total extent of land and sea protected in the UK through national and international protected areas



Source: Joint Nature Conservation Committee, *UK Biodiversity Indicators: C1 Protected areas (2018)*

Reducing the risks of harm from environmental hazards

Flooding is one of the major threats to the economy and wellbeing of over five million business and homes in England. In recent times, England has experienced a number of extreme flooding events such as the 2007 summer flood, where around 45,000 homes and 8,000 businesses properties flooded⁴⁴. Over 200 people were evacuated from flood waters in Sheffield, 20 were airlifted from Lower Don Valley and 13 people lost their lives.⁴⁵

The winter of 2013-2014 was the wettest winter on record for the UK and England since 1910⁴⁶. While the winter of 2015 to 2016 brought widespread flooding to 17,000 properties

⁴⁴ Defra, *Delivering benefits through evidence: The costs of the summer 2007 floods in England* (2010): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291190/scho1109brja-e-e.pdf

⁴⁵ Defra, *Ten years on from the summer floods of 2007* (2017): <https://environmentagency.blog.gov.uk/2017/07/31/ten-years-on-from-the-summer-floods-of-2007/>

⁴⁶ Met Office, *Winter 2013/14*: <https://www.metoffice.gov.uk/climate/uk/summaries/2014/winter>

across the north of England, with named storms Desmond, Eva and Frank causing December 2015 to be the wettest month ever recorded. The Environment Agency warns that floods are likely to be more frequent and intense in the future⁴⁷.

Progress towards the goal

Since 2011 the government has invested £2.2bn of capital on flood and coastal erosion risk management in England. However, there are still 5.2 million business and homes in the England at risk of flooding⁴⁸. Latest estimates from the Environment Agency are around one in six homes is under the risk of flooding in England⁴⁹.

Between 2012 and 2017 there has been an increase in the number of properties identified as being at risk of flooding from rivers and the sea by around 200,000 (2.5 to 2.7 million). However, the number of properties identified as being at risk from flooding from surface water has reduced by around 600,000 (3.8 to 3.2 million). These changes have been driven mainly by a better understanding of risk as the EA's model and data improve.⁵⁰

Since the start of the of the Environment Agency six year capital plan in April 2015, 142,850 properties are better protected from flooding risk. The EA expects to achieve their target of achieving 300,000 by March 2021, in line with their six year planning⁵¹.

Using resources from nature more sustainably and efficiently

⁴⁷ Environmental Agency, *Climate change means more frequent flooding, warns Environment Agency* (2018) <https://www.gov.uk/government/news/climate-change-means-more-frequent-flooding-warns-environment-agency>

⁴⁸ Defra, *Managing flood and coastal erosion risks in England: 1 April 2011 to 31 March 2017* (2018): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694808/1_April_2011_to_31_March_2017_managing_FCERM.pdf

⁴⁹ Defra, *Flooding in England: A National Assessment of Flood Risk* (2009): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/292928/geho0609bqds-e-e.pdf

⁵⁰ Defra, *Managing flood and coastal erosion risks in England: 1 April 2011 to 31 March 2017* (2018): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694808/1_April_2011_to_31_March_2017_managing_FCERM.pdf

⁵¹ Environment Agency, *Annual report and accounts for the financial year 2017 to 2018* (2018): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/725117/Environment_Agency_annual_report_and_accounts_2017_to_2018.pdf

As with Thriving plants and wildlife, *Using resources from nature more sustainably and efficiently* is a broad goal that needs to be assessed in a range of ways. The evidence below reflects our best effort to estimate progress based on the limited data available.

To conserve natural resources for future generations, they need to be managed and used in a sustainable manner. Managing resources more efficiently can also minimise England's resource security pressures, price volatilities and dependency on resources from unstable regions.

Increasing competition for resources is also leading to additional pressures on the environment. Where resources have already been exploited, opening up new sources of supply often involves more energy intensive mining and refining, with higher GHG emissions and increased demands on water supplies and other natural systems.⁵²

There is a need to reduce the environmental impacts from the extraction, use and disposal of renewable and non-renewable resources. There should also be a commitment to only use renewable resources that have proper sustainability metrics (e.g. FSC). From an economics perspective, there is a clear market failure where some environmental costs associated with these resources are not priced in. There needs to be a better balance between extraction and consumption, and the full price of resources needs to be reflected in lifecycles, from extraction to end-of-life.

Fisheries are managed using a Total Allowable Catch or TAC (corresponding to a particular harvesting rate), and technical measures (mainly mesh sizes and minimum landing sizes, which determine the smallest fish that can be caught and landed, but sometimes closed areas) based on scientific advice.

Information from selected key stocks that is collected as part of international data suggests that several stocks are recovering to levels at which they can be fished to their maximum sustainable yield, but there are still important stocks that are suffering reduced reproductive capacity and cannot be fished sustainably. Furthermore, the data does not permit evaluation of sustainability of high value inshore stocks such as shellfish, bass and monkfish⁵³.

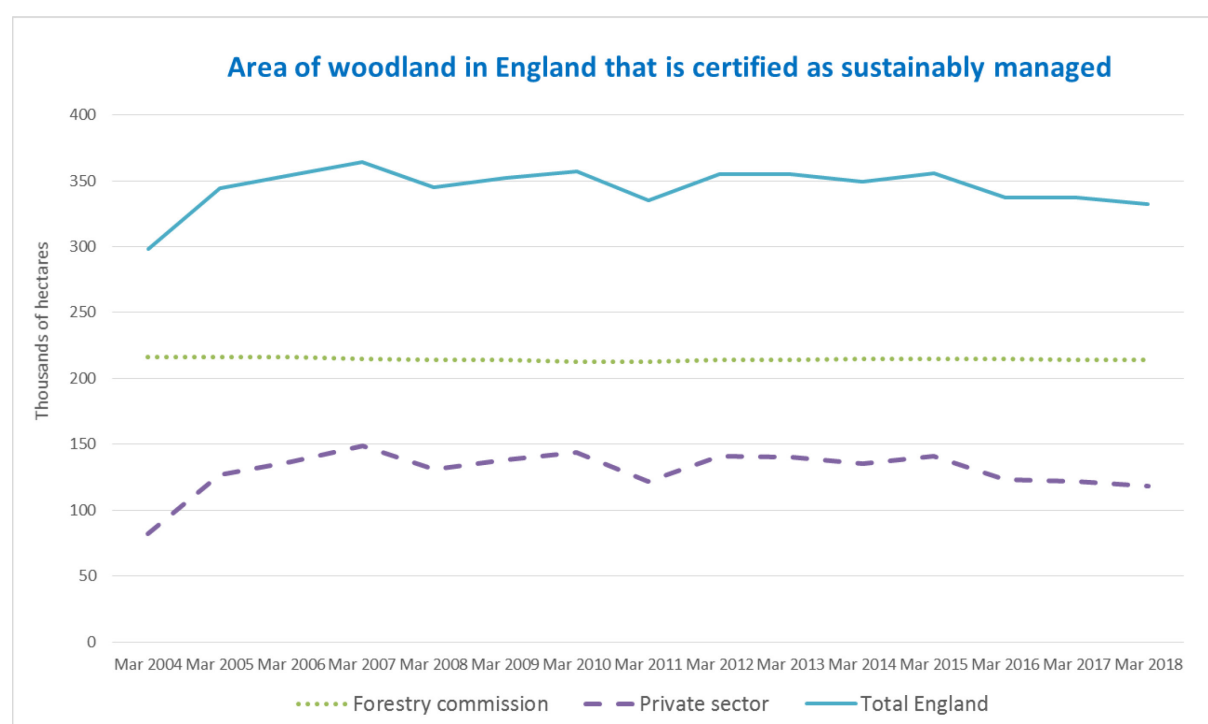
⁵² Defra, *Resource Security Action Plan: Making the most of valuable materials* (2012): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69511/pb13719-resource-security-action-plan.pdf

⁵³ Marine Management Organisation, *UK Sea Fisheries Statistics 2017* (2018): <https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2017>

Progress towards the goal

Data from the Forestry Commission shows a decline in the area of woodland that is sustainably managed in England. Between March 2011 and March 2018 there was a decline of 3,000 hectares (3%) managed in England. The decline was due to the reduction from the private sector of 4,000 hectares. The area managed by the Forestry Commission has been flat since 2004 ranging between 213-216 hectares.⁵⁴ See figure 7 for area of woodland in England that is certified as sustainably managed since March 2004.

Figure 7 Area of woodland in England that is certified as sustainably managed



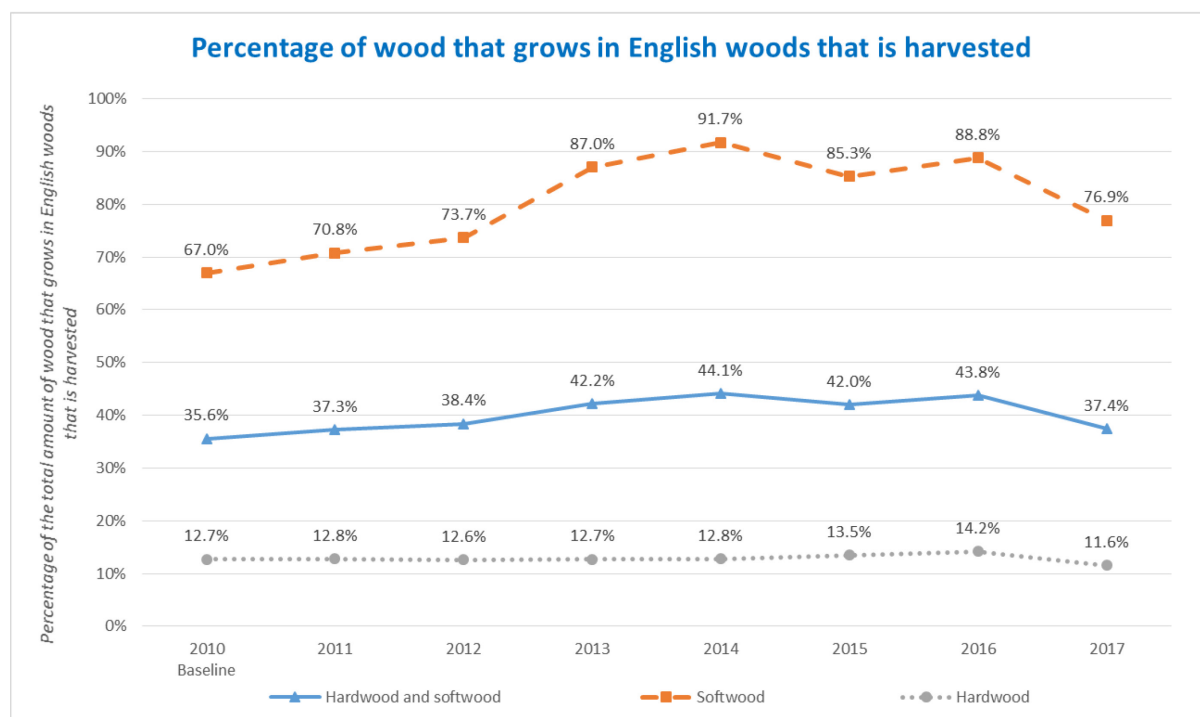
Source: Forest Research

Estimates from the Forestry Commission show little or no change between 2011 and 2017 in wood that is harvested that grows in English woods. There was a significant increase in the level of soft wood that is harvested in 2014 reaching 91.7% of softwood being harvested.

⁵⁴ Forest Research, *Forestry Commission Excel tables from Forestry Statistics 2018* (2018): <https://www.forestresearch.gov.uk/tools-and-resources/statistics/data-downloads/>

While for hardwood there has been a decline when comparing to 2011.⁵⁵ See figure 8 for change in harvested wood since 2010.

Figure 8 Percentage of the amount of wood that grows in English woods that is harvested



Source: Forestry Commission

There is limited data available of the health of soils. Evidence from Defra's Cost of soil degradation in England and Wales from 2011 estimated that the total economic cost of soil degradation in England and Wales was around £1.2 billion per annum with 80% caused by compaction and loss of soil organic matter⁵⁶. A UK estimate of £3.2 billion for soil carbon loss based on a social cost of carbon (SSC) of £173 per tonne of CO₂⁵⁷. Soils are being eroded with losses of 2.2 million tonnes of arable topsoil being lost annually in the UK due to erosion by water. This is 20 fold greater than the formation rate.⁵⁸

⁵⁵ Forest Research, *Forestry Commission Excel tables from Forestry Statistics 2018* (2018): <https://www.forestresearch.gov.uk/tools-and-resources/statistics/data-downloads/>

⁵⁶ Defra, *Cost of Soil Degradation final draft* (2011): <http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=16992>

⁵⁷ The Sustainable Food Trust, *The Hidden Cost of Food* (2018): <http://sustainablefoodtrust.org/wp-content/uploads/2013/04/HCOF-Report-online-version-1.pdf>

⁵⁸ Posthumus, H., Deeks, L. K., Rickson, R. J. and Quinton, J. N., *Costs and benefits of erosion control measures in the UK* (2015). *Soil Use Manage*, 31: 16-33. <https://onlinelibrary.wiley.com/doi/abs/10.1111/sum.12057>

Data from the International Council for the Exploration of the Sea (ICES) published in the Defra UK Sea Fisheries Statistics⁵⁹ shows that some progress has been made to fish stocks sustainably being harvested. As per table 3 a selection of key UK fishery stocks has seen an improvement in North Sea and Irish Sea Cod, and North East Atlantic Mackerel, which in 2017 were at full reproductive capacity and being harvested sustainably. However, further progress is needed to improve the sustainability of West of Scotland and Celtic Cod, and Irish Sea and Eastern Channel Sole.

Table 3 International Council for the Exploration of the Sea assessment code table

Code	Description
Red (R)	Indicates stocks which are suffering reduced reproductive capacity
Amber (A)	Indicates stocks which are at risk of suffering reduced reproductive capacity
Green (G)	Indicates stocks which are at full reproductive capacity but are either at risk of being harvested unsustainably or are being harvested unsustainably
Blue (B)	Indicates stocks which are at full reproductive capacity and are being harvested sustainably
Grey (GR)	Indicates stocks where the current stock status is unknown

Table 4 International Council for the Exploration of the Sea stock assessment data

ICES stock assessment	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
North Sea Cod	R	R	R	R	R	R	R	R	A	A	B
West of Scotland Cod	R	R	R	R	R	R	R	R	R	R	R
Irish Sea Cod	R	R	R	R	R	R	R	R	R	R	B
Celtic Sea Cod	R	A	GR	GR	B	GR	GR	GR	A	A	R
North Sea, Skagerrak and West of Scotland Haddock	GR	GR	GR	GR	GR	GR	GR	B	B	A	B
North Sea Plaice	A	B	B	B	B	B	B	B	B	B	B
Irish Sea Plaice	B	B	B	GR	GR	GR	GR	GR	GR	GR	B
North Sea Sole	R	R	B	A	B	B	B	B	B	B	B
Irish Sea Sole	R	R	R	R	R	R	R	R	R	R	R

⁵⁹ Marine Management Organisation, *UK Sea Fisheries Statistics* (2018): <https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2017>

Eastern Channel Sole	B	G	G	G	G	G	G	G	G	A	A
Western Channel Sole	A	A	GR	GR	GR	GR	GR	GR	B	B	B
North Sea Herring	A	A	A	A	B	B	B	B	B	B	B
North East Atlantic Mackerel	G	G	G	G	G	G	B	B	B	G	B

Source: ICES fish stock assessment are based on data from UK Sea Fisheries Statistics, which in turn are derived from annual Advisory Committee (ACOM) categorized according to the ICES' definition of the state of the stock.

Another threat to the environment concerns aquaculture⁶⁰, which can have a negative impact on the seabed and the environment. These impacts range from untreated fish waste, overuse of antibiotics and endangerment of marine life. There is also the threat of pests from aquaculture such as lice and the associated pesticides used to treat them.⁶¹

Enhancing beauty, heritage and engagement with the natural environment

Enhancing beauty, heritage and engagement with the natural environment is a particularly difficult goal to measure. The evidence below reflects our best effort to estimate progress based on the limited data and indicators available.

Much of Great Britain was originally covered in native woodland. Large scale conversion to other land-uses (e.g. agriculture and settlements) over the centuries have reduced the land area occupied by ancient semi-natural woodland (ASNW) to only around 1-2%. A number of restoration programmes since the 1980's are underway. In most cases the aim of the restoration process is to create the conditions needed to promote the development of native woodland over the longer term. The contribution that ASNW makes to our natural and cultural heritage has been increasingly recognised.⁶²

⁶⁰ **Aquaculture** is the farming of underwater organisms such mollusks, crustaceans, and fish. There are many types of aquaculture that occur around the world in ponds, rivers, oceans, estuaries, land-based facilities.

⁶¹ Friend of the earth, *The Dangers of Industrial Ocean Fish Farming*: https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/2018/02/Aquaculture-Report_Feb14_FullSpread.pdf

⁶² Forestry Commission, *Restoration of Native Woodland on Ancient Woodland Sites* (2003): <https://www.forestry.gov.uk/website/publications.nsf/WebpubsbyISBN/0855385790>

In addition to natural heritage, Great Britain has human-made heritage sites of outstanding beauty. These are all around us in town and cities, villages and rural places. These include UNESCO World Heritage Site such as Stonehenge, historic buildings, places of worship, parks, gardens and landscapes, ancient monuments, archaeological sites, war memorials, places of worship and maritime wrecks.

In 2017, heritage is estimated to have generated a Gross Value Added (GVA) of just under £1.2 billion⁶³. Data from Historic England indicates that heritage employs (direct and indirect) 349,000 people in England⁶⁴. There is a strong economic rationale for investment in heritage assets, which results in increased employment, tourism and human wellbeing.

Progress towards the goal

There was not a clear definition for the word “beauty” in the 25 YEP goal. Without a clear definition of what “beauty” means in an environmental context no evidence was found to estimate the progress in this area.

There is limited data on the trends in heritage sites in the England. Data from Historic England provides a partial assessment of improvement to parks and gardens, historical sites and conservation areas. Data compiled from Historic England Heritage at Risk reports⁶⁵ shows a decline in the overall number of sites that are on the register⁶⁶ since 2011.

The largest number of sites that Historic England covers concerns scheduled monuments⁶⁷. Data since 2009 shows there has been a decline of these monuments in the register and an increase in the total number to 19,852. Between 2011 and 2018, there has

⁶³ DCMS, *Sectors Economic Estimates 2017: GVA subsectors (2017)*:

<https://www.gov.uk/government/statistics/dcms-sectors-economic-estimates-2017-gva>

⁶⁴ Historic England, *Heritage and the Economy 2018 (2018)*: <https://historicengland.org.uk/content/heritage-counts/pub/2018/heritage-and-the-economy-2018/>

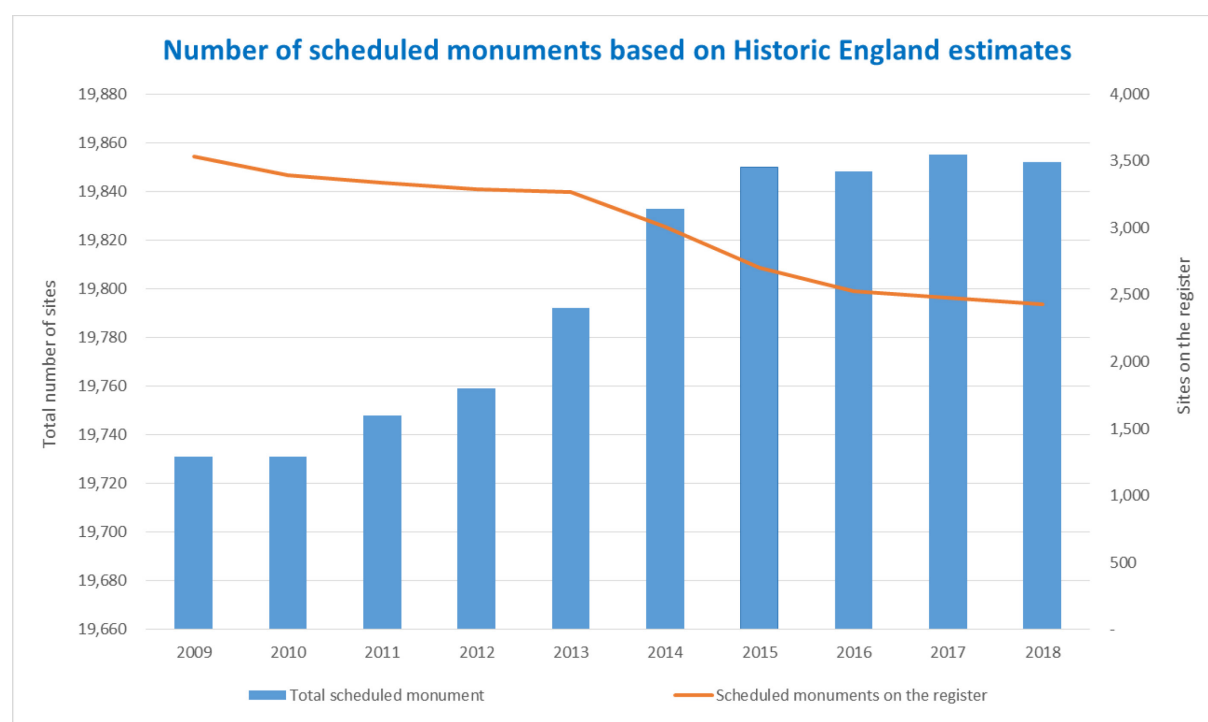
⁶⁵ Historical England, *Heritage at Risk Register reports (2009-2018)*: <https://historicengland.org.uk/images-books/publications/?searchType=Publication&search=heritage+at+risk>

⁶⁶ Sites included in the register are sites that are at risk. Heritage assets included on the Register are risk assessed according to the nature of the site rather than the type of listing. Sites have their own assessments because they each have their own particular characteristics and factors that may put them at risk. Sites are removed from the register once a range (e.g.: appropriate management and monitoring regime) of steps have been taken to address issues.

⁶⁷ **Scheduled monuments** include single archaeological sites and complex archaeological landscapes. Nearly 20,000 examples have been listed because of their national importance. Scheduled monuments are not graded. They cover human activity from the Paleolithic era, such as cave sites, to 20th century military and industrial remains.

been a reduction of 908 site from the register and an increase in the total sites under scope by 104. See figure 9 for the change in the number scheduled monuments since 2009.

Figure 9 Change in the number of scheduled monuments on the register since 2009 – England

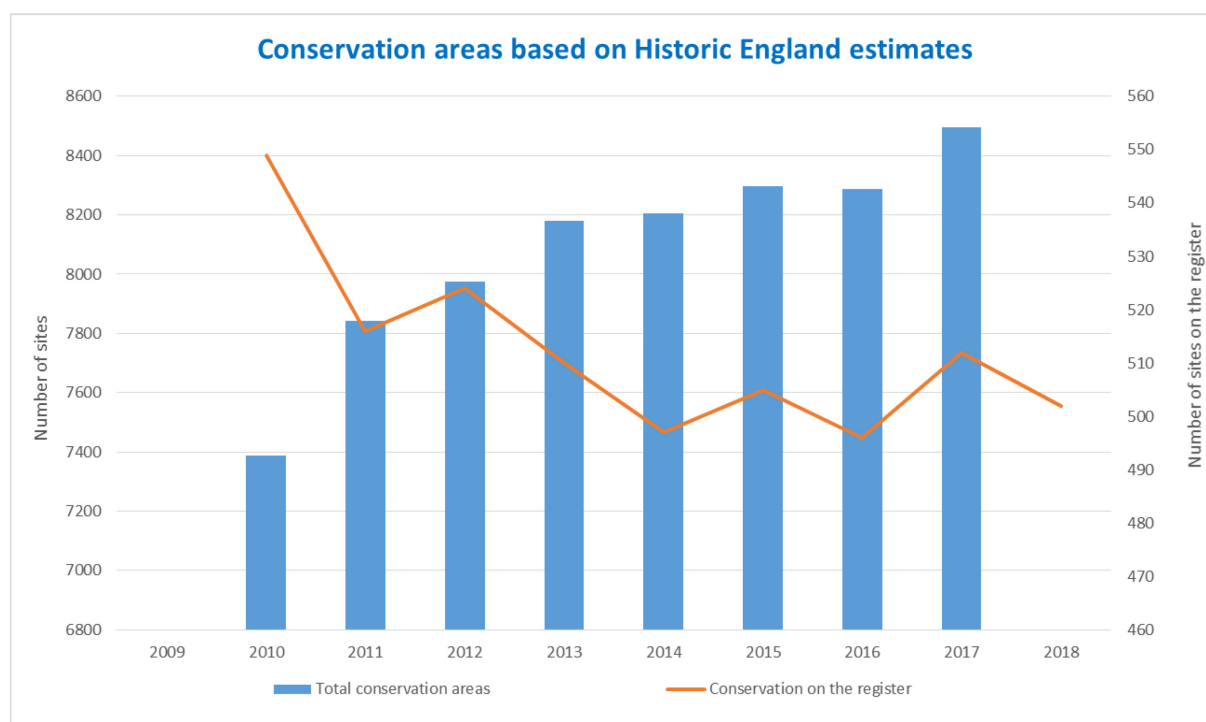


Source: Historic England

Based on the 2018 Heritage at Risk report, data for 2018 was not made available on the number of conservation areas⁶⁸ that have been surveyed by local authorities. However it is expected that these have remained stable in line with the historical trend. Data on the total number of sites in 2017 shows that there were 8,494 sites while in 2011 there were 7,841, an increase of 8.3%. Data is available on the number of sites included in the register, between 2011 and 2018, there was a decline in the number of sites 516 to 502. See figure 10 below for progress overtime.

⁶⁸ **Conservation areas** are listed by local authorities and are areas of particular architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance

Figure 10 Change in the number of conservation areas on the register since 2009 – England

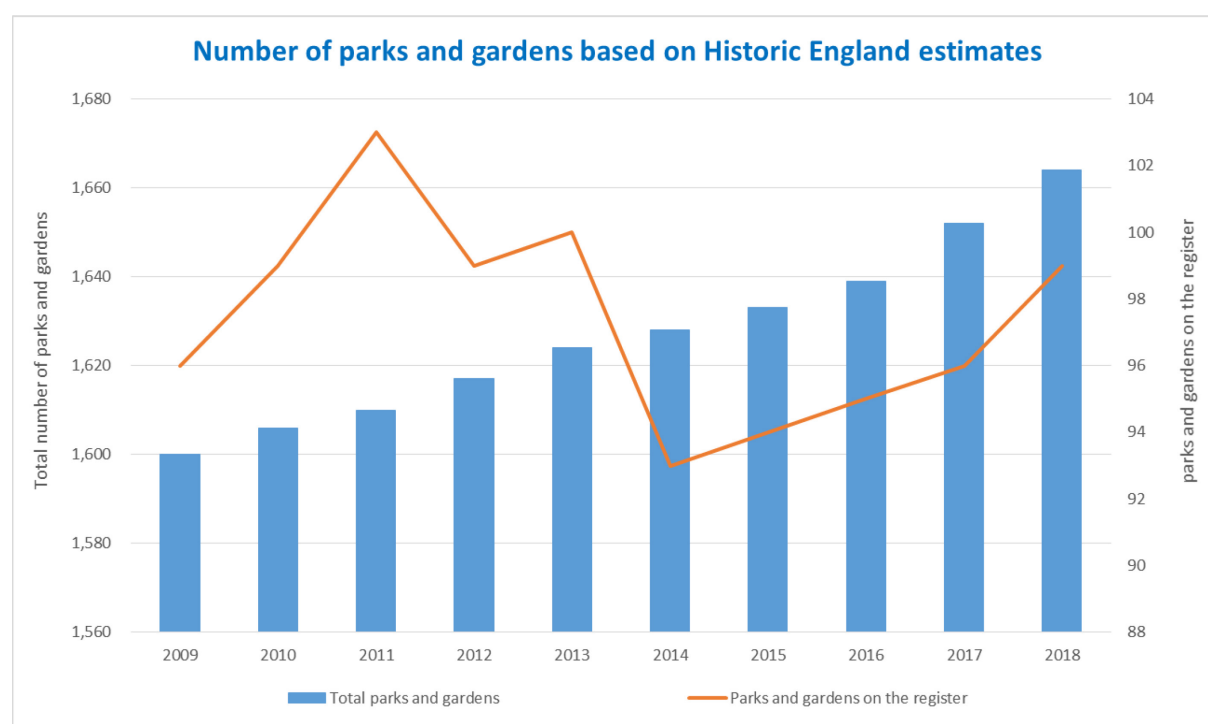


Source: Historic England

There was also an increase in the total number of parks and gardens of special historic interest (PGSHI)⁶⁹ between 2011 and 2018. There were 1,610 sites, by 2018 this figure has increased by 54 to a total of 1664. The number of PGSHI on the register has been stable over the same period, with a small decline in 2018 of four sites, from 103 to 99. See figure 11 below for progress since 2009.

⁶⁹ **Historic Parks and Gardens** of Special Historic Interest. These registered landscapes are graded I, II* or II, and include private gardens, public parks and cemeteries, rural parkland and other green spaces. They are valued for their design and cultural importance, and are distinct from natural heritage designations.

Figure 11 Change in the number of parks and gardens on the register since 2009 – England



Source: Historic England

There is limited data on the accessibility of woodlands⁷⁰ in England. The Woodland Trust has published the *Space for People Targeting action for woodland access* on how accessible⁷¹ woodland areas are. Table 5 below presents the change over the years on how accessible woodlands have become. There has been an increase in the area size of accessible woodland of around 15,000 ha between 2012 and 2017. Around 68% of England's

⁷⁰ **Woodland** is defined in UK forestry statistics as land under stands of trees with a canopy cover of at least 20% (25% in Northern Ireland), or having the potential to achieve this. Based on the Forestry Commission definition found here: <https://www.forestryresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2017/woodland-areas-and-planting/woodland-area/>

⁷¹ **Accessible woodland** is defined as "any site that is permissively accessible to the general public for recreational purposes". Based on the Woodland's Trust definition found here: <https://www.woodlandtrust.org.uk/mediafile/100083906/space-for-people.pdf>

population has access to woodlands of 20ha+ within 4km of their homes. This is an increase of around two percentage points compared to 2012.^{72, 73 and 74}

Table 5 Area of accessible, inaccessible and creations woodland

		2004	2009	2012	2016
Area of accessible woodland	(ha)	n/a	398,523	382,407	397,149
Accessible woods	% of population with access to a 2ha+ wood within 500m	10.2%	14.5%	16.8%	18.0%
	% of population with access to a 20ha+ wood within 4km	55.2%	63.0%	65.8%	67.9%
Inaccessible woods	% extra population with access to a 2ha+ wood within 500m if existing woods opened	26.1%	23.2%	34.3%	33.6%
	% extra population with access to a 20ha+ wood within 4km if existing woods opened	26.7%	20.6%	22.2%	20.3%
Woodland creation	% population requiring new woodland to be able to access a 2ha+ wood within 500m	63.7%	62.3%	48.8%	48.3%
	% population requiring new woodland to be able to access a 20ha+ wood within 4km	18.1%	16.4%	11.9%	11.8%

Source: *Space for People: Targeting action for woodland access*, Woodland Trust (2010, 2015, 2017)⁷⁵.

⁷² Woodland Trust, *Space for People Targeting action for woodland access*:
<https://www.woodlandtrust.org.uk/mediafile/100083906/space-for-people.pdf>

⁷³ Woodland Trust, *Space for People Targeting action for woodland access (2015)*:
<http://www.woodlandtrust.org.uk/mediafile/100523450/pp-wt-130315-space-for-people.pdf?cb=f6abf2f03f1d461a91cfbf2f41ff2d9e>

⁷⁴ Woodland Trust, *Space for People Targeting action for woodland access (2017)*:
<https://www.woodlandtrust.org.uk/mediafile/100818946/pp-wt-010617-space-for-people-2017.pdf?cb=cfeb28f142034f8c94754cfdd1c1b71c>

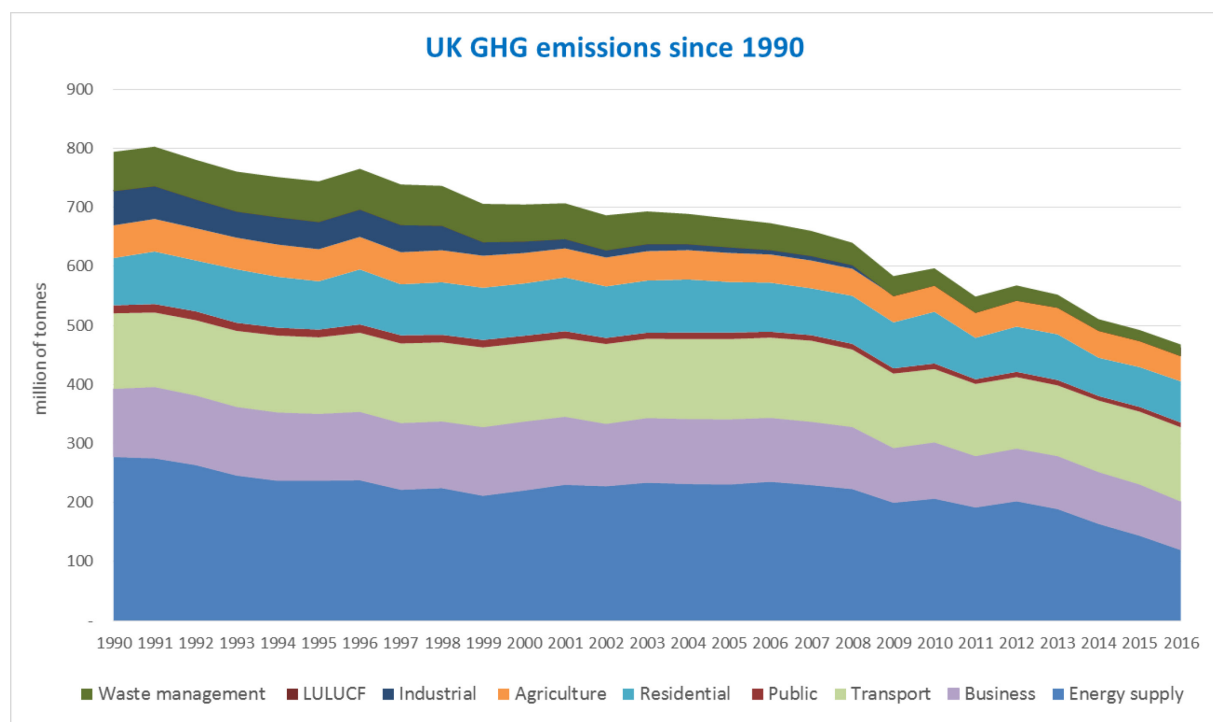
⁷⁵ Caution is advised when comparing between years. Versions of Space for People in 2004 and 2009 that used different woodland data and census data are less comparable with 2017 report than the 2015 edition.

Mitigating and adapting to climate change

Climate change poses serious threats to the environment and humanity. The UK has made significant progress towards limiting the increase in GHG since the Climate Change Act in 2008. Progress on how the UK is mitigating and adapting the climate change is reported on by the CCC.

Overall GHG emissions have been falling since 1990 and the UK is on track to meet the first three carbon budgets (2008-2022). However, it is not on target to meet the fourth carbon budget. Based on CCC analysis, the UK will need to reduce emissions by at least 3% per year between now and 2050⁷⁶. Figure 12 below shows the change in GHG emissions since 1990.

Figure 12 Greenhouse gases emissions by sector since 1990



Source: BEIS Final UK greenhouse gas emissions national statistics

Environmental improvements under the 25 YEP are likely to improve England's national contribution to reducing global GHG emissions by increasing carbon sequestration in natural environments including in our seas, coastal wetlands, forests and soils.

⁷⁶ Committee on Climate Change, *Carbon budgets: how we monitor emissions targets* (2018): <https://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets/>

Progress towards the goal

Even though GHG emissions have been falling, not all sectors have achieved the same level of reduction. Progress since 2011 has been limited to a few sectors such as energy, waste management and business. The public, residential, industrial and agriculture sector have all see marginal decreases in emissions. The transport sector however has seen an increase of just under 3.5 million tonnes (3%) over the same period⁷⁷. See table 6 for the change in emissions between 1990, 2011 and 2016.

Latest GHG emissions data for 2016 shows that the transport sector is now the largest emitting sector in the UK with just over 120 MtCO₂ in 2016. See figure 13 for 2016 GHG emissions data. Limited progress has been made since 1990 and 2011. The transport sector is one of the most challenging sectors to achieve decarbonisation, not least because the number of vehicles on the road in Great Britain has increased year on year since 1994. Between 2011 and 2018 there was an increase of 10%, from 34.2 to 37.7 million vehicles⁷⁸.

Table 6 Greenhouse gases emissions by sectors for 1990, 2011 and 2016

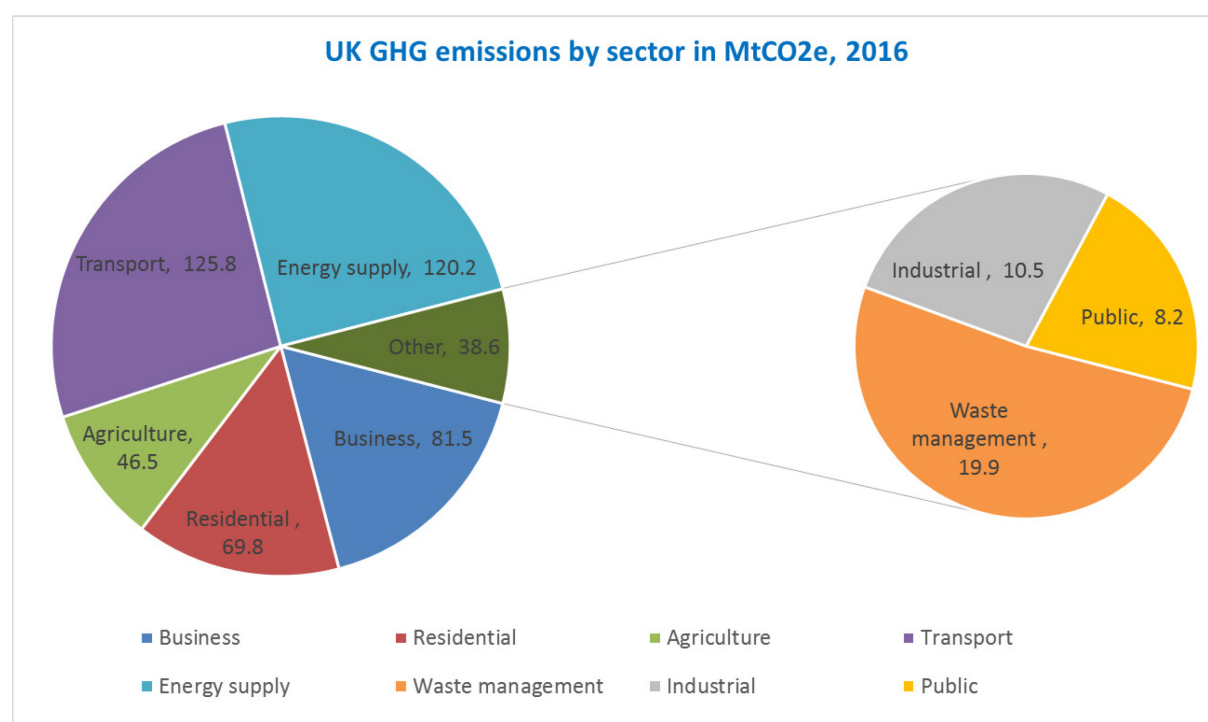
GHG emissions by sector	1990	2011	2016	% change between 1990 and 2016	% change between 2011 and 2016
Energy supply	277.9	192.4	120.2	-57%	-38%
Business	114.7	86.4	81.5	-29%	-6%
Transport	128.1	122.3	125.8	-2%	3%
Public	13.5	8.0	8.2	-39%	2%
Residential	80.2	70.1	69.8	-13%	0%
Agriculture	55.3	46.0	46.5	-16%	1%
Industrial	59.9	11.3	10.5	-82%	-7%
LULUCF	-2.1	-15.0	-14.6	590%	-3%
Waste management	66.7	27.7	19.9	-70%	-28%
Total	794.2	549.1	467.9	-41%	-15%

Source: BEIS Final UK greenhouse gas emissions national statistics

⁷⁷ BEIS, *Final UK greenhouse gas emissions national statistics (1990-2016)*: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2016>

⁷⁸ Department for Transport, & DVLA, *VEH0102: Licensed vehicles by body type (annual): Great Britain and United Kingdom (2018)* <https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>

Figure 13 UK GHG emissions by sector in MtCO₂e in 2016



Source: BEIS Final UK greenhouse gas emissions national statistics

Minimising waste

Waste and its disposal can cause a number of environmental issues such as leachate from landfills. In addition, badly managed waste management sites can attract vermin and cause litter and odour problems. The disposal of waste also contributes to climate change, such as through the methane released from landfill sites and the burning of petroleum derived products (e.g.: plastics). There is also the issue of resource utilisation, materials that are incinerated are lost eliminating the possibility of these being recycled or reused.

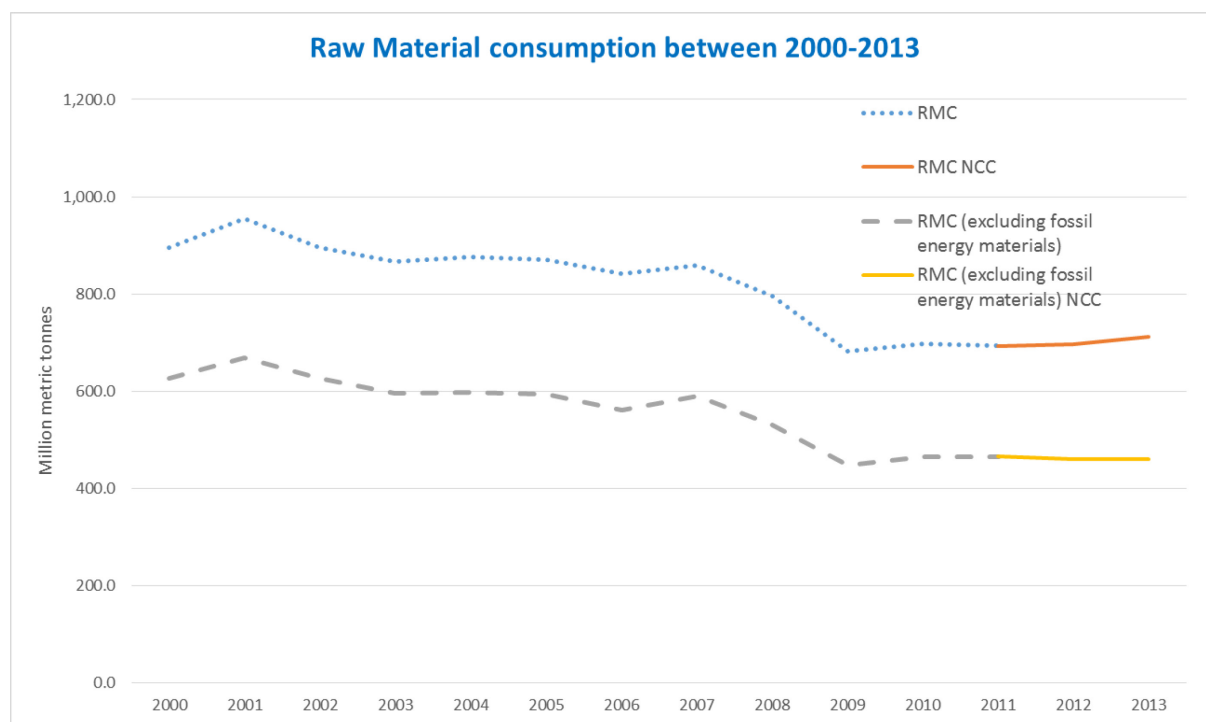
Increasing public awareness of the need to reduce single use plastics has led to widespread acceptance of the introduction of the plastic bag tax, support for the ban on the sale of products containing microbeads and willingness to increase and improve plastic recycling. However the environmental effects of these have yet to be determined.

Progress towards the goal

There is limited data for Raw Material Consumption (RMC) produced by the ONS. The latest UK data available covers the period up to 2013. RMC is composed of the sum of domestic

raw material consumption and imports of raw material equivalents (RME)⁷⁹, minus the exports of RME. Since 2011 the data shows an increase in the in the amount of RMC from 693 to 712 million metric tonnes (2.8%)⁸⁰. See figure 14 for data on RMC.

Figure 14 Raw material consumption data from the ONS



Source: ONS

The Landfill Directive⁸¹, set restrictions on what can be sent to landfill and together with the domestic landfill tax, have been key drivers in the reduction of waste being sent to landfill. However, in recent years this progress has plateaued. Latest data for 2017 shows that waste being sent to landfill has increased by just under 2% when compared to 2011, from 44.7 Mt to 45.4 Mt. There has been a significant increase in waste sent for incineration (including

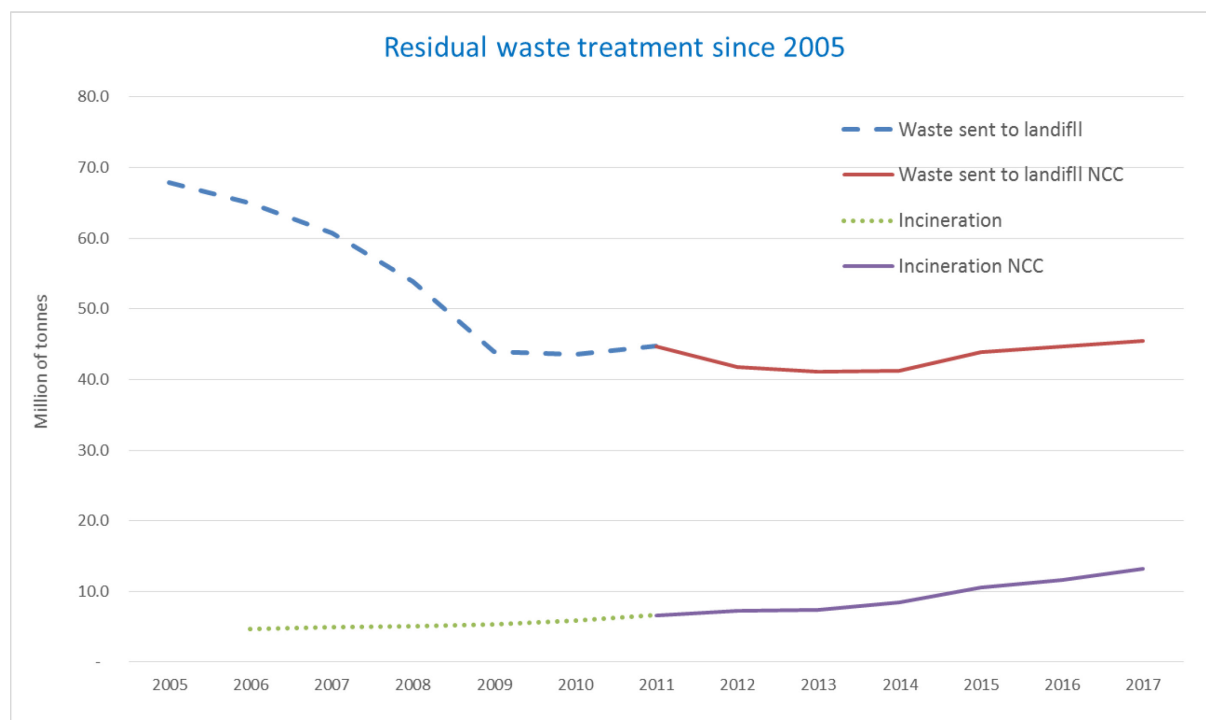
⁷⁹ Raw Material Equivalent (REM) is a material flow indicator

⁸⁰ ONS, *UK Environmental Accounts: How much material is the UK consuming?* (2016): <https://www.ons.gov.uk/economy/environmentalaccounts/articles/ukenvironmentalaccountshowmuchmaterialistheukconsuming/ukenvironmentalaccountshowmuchmaterialistheukconsuming>

⁸¹ European Commission, *Landfill directive*: http://ec.europa.eu/environment/waste/landfill_index.htm

EFW plants) between 2011 and 2017 of 6.6 Mt (100%)^{82,83}. See figure 15 for residual waste treatment in England since 2005.

Figure 15 Residual waste treatment data for England since 2005



Source: Environmental Agency

Managing exposure to chemicals

The 25 YEP has clear commitments to reduce land-based emissions from mercury and to eliminate the use polychlorinated biphenyls (PCBs). The plan also makes commitments to reduce the environmental impact of pesticides and fertilisers. Excess heavy metals⁸⁴ such as arsenic, cadmium, lead and mercury in soils can impair plant metabolism and decrease crop

⁸² Environment Agency, *Waste management for England 2016* (2017): <https://www.gov.uk/government/publications/waste-management-for-england-2016>

⁸³ Environment Agency, *Waste Data Interrogator 2017* (2018): <https://data.gov.uk/dataset/dd8629ad-bd32-4db3-a07a-879737964f23/waste-data-interrogator-2017>

⁸⁴ **Heavy metals** is the generic term for metallic elements having an atomic weight higher than 40.04 (the atomic mass of Ca). Metals that generally have a high density, atomic weights or atomic numbers.

productivity, ultimately putting pressure on arable land. When they enter the food chain, these pollutants also pose risks to food security and water resources.⁸⁵

Progress towards the goal

Emissions of heavy metals to the environment have significantly reduced since 1990. With mercury and lead reducing by 90% (34 tonnes) and 98% (2,845 tonnes) respectively between 1990 and 2016. There was a limited reduction between 2011 and 2016. For example, emissions of arsenic between 2011 and 2015 increased, only falling below 2011 levels in 2016. While cadmium, chromium and lead had some years over the same period that emissions were higher. See figure 16 for heavy metal emissions since 1990.⁸⁶

Latest data for emissions of Persistent Organic Pollutants (POPs) demonstrate a reduction in the levels of dioxins (PCDD/F)⁸⁷, hexachlorobenzene and PCBs since 1990. However, this trend has not continued between 2011 and 2016 for hexachlorobenzene, which has seen an increase of 26% from 24kg to 31kg. While emissions of dioxins (PCDD/F) and PCBs have reduced by 13% and 27% respectively. See figure 17 for emissions of POPs since 2000.⁸⁸

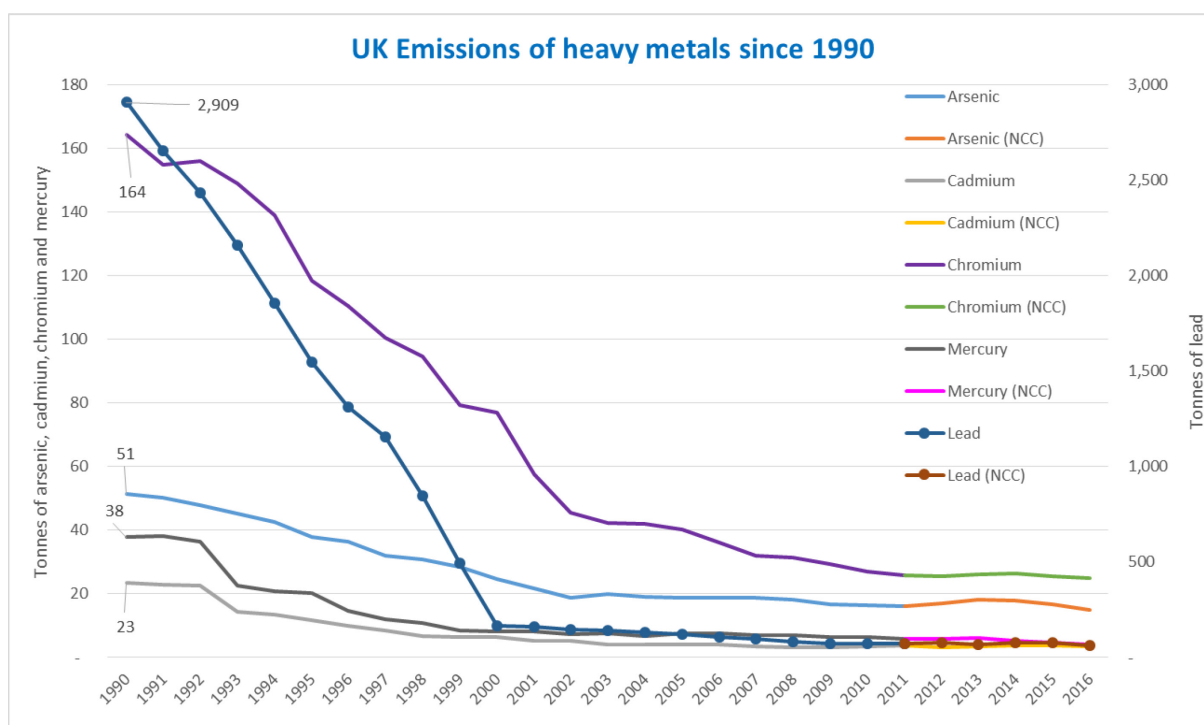
⁸⁵ Food and Agriculture Organisation (FAO) of the United Nations, *Soil Pollution a Hidden Reality* (2018): <http://www.fao.org/3/I9183EN/i9183en.pdf>

⁸⁶ National Atmospheric Emissions Inventory, UK emissions data selector: <http://naei.beis.gov.uk/data/data-selector>

⁸⁷ **Dioxins (PCDD/F)** are a group of polychlorobenzodioxins (PCDDs) and polychlorodibenzofurans (PCDFs).

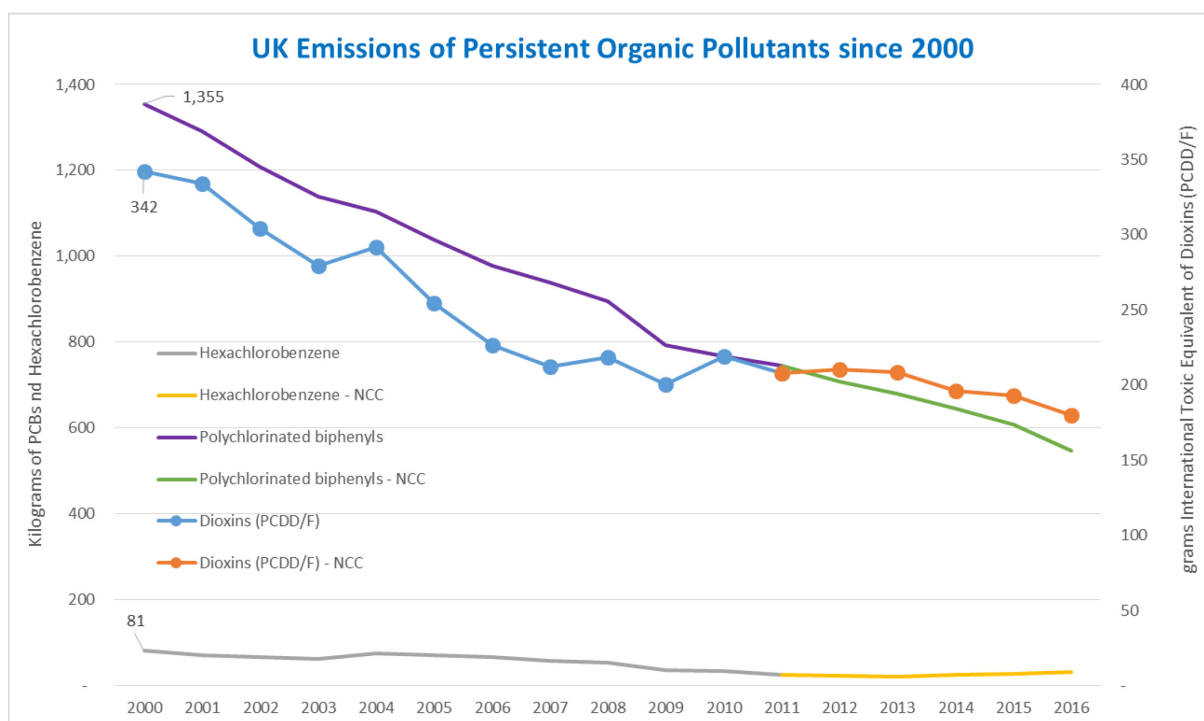
⁸⁸ National Atmospheric Emissions Inventory, UK emissions data selector: <http://naei.beis.gov.uk/data/data-selector>

Figure 16 UK emissions of heavy metals since 1990



Source: National Atmospheric Emissions Inventory

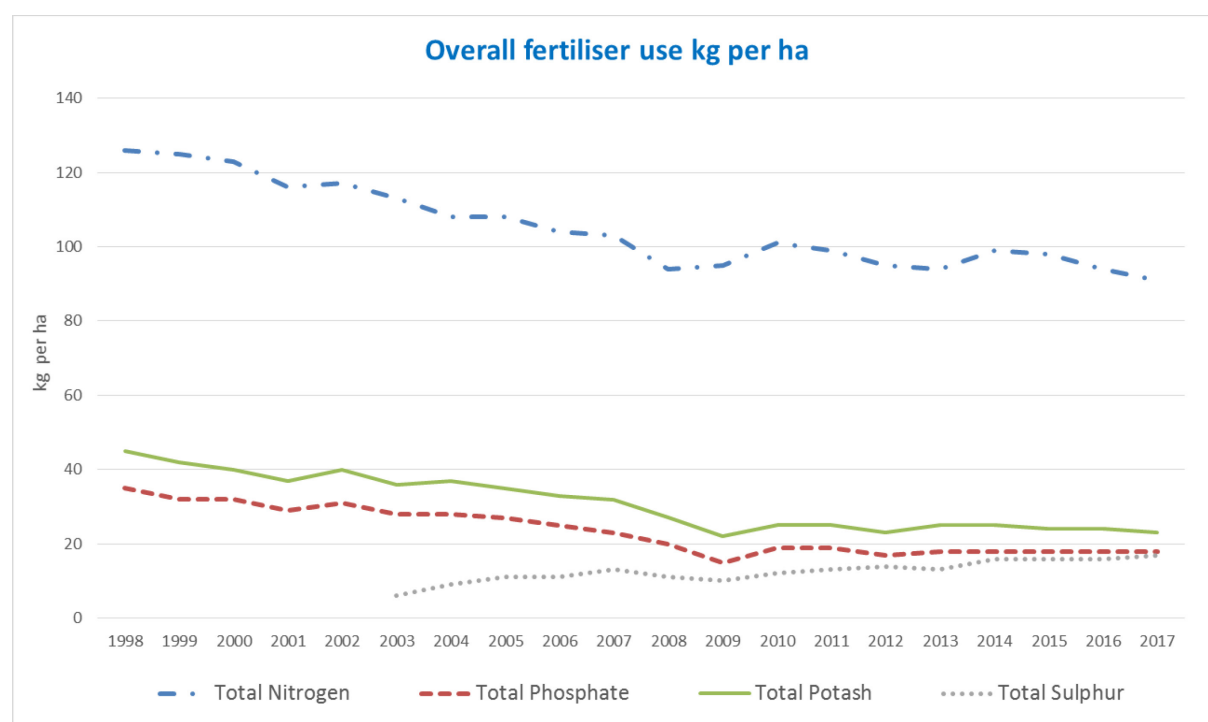
Figure 17 UK emissions of Persistent Organic Pollutants since 2000



Source: National Atmospheric Emissions Inventory

Fertiliser estimates are based on British Survey of Fertiliser Practice data. Overall there has been a decrease in the amount of nitrogen, phosphate and potash fertilisers being applied to crops and grass. However, there has been an increase of sulphur of 31% between 2011 and 2017, from 13kg to 17kg per ha.⁸⁹

Figure 18 Overall fertiliser use (kg/ha) on all crops and grass, Great Britain 1983 – 2017



Source: Defra British survey of fertiliser practice dataset

Enhancing biosecurity

The impact of invasive non-native Species (INNS) can be significant, ranging from loss of crops, damaged buildings, and additional production costs, to the loss of livelihoods and ecosystem services. There are nearly 2,000 non-native species established in Great Britain; 1,800 in the terrestrial environment and around 80 in marine and freshwater environments respectively. It is estimated that the number of new INNS is increasing by around 10-12 every year⁹⁰.

⁸⁹ Defra, *British survey of fertiliser practice dataset* (2013-2018): <https://www.gov.uk/government/statistical-data-sets/british-survey-of-fertiliser-practice-dataset>

⁹⁰ Defra, *The Great Britain Invasive Non-native Species Strategy* (2015): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/455526/gb-non-native-species-strategy-pb14324.pdf

The impact of INNS on the environment can be significant. Around 10-15% of non-native species established in Great Britain cause significant adverse impacts through the disruption of habitats and ecosystems, preying on or out-competing native species, spreading disease, and interfering with the genetic integrity of native species.

There is also the economic impact from decreased yield and productivity, prevention and control and eradication. In 2010 the cost was estimated to be around £1.3 billion for England⁹¹. Much of this cost is borne by the agriculture and horticulture sector, but many other sectors, including transport, construction, aquaculture, recreation and utilities, are also affected.

Progress towards the goal

There is limited data on INNS, and the best estimates comes from an indicator containing 190 non-native species that are considered to be having a negative impact on native biodiversity (46 freshwater species, 36 marine species and 108 terrestrial species). The data shows an increase in the number of invasive species between 1960 and 2017 and between 2010 and 2017. The majority of invasive species are terrestrial with just 120, with just over 50 in freshwater and just under 40 in the marine environment.⁹²

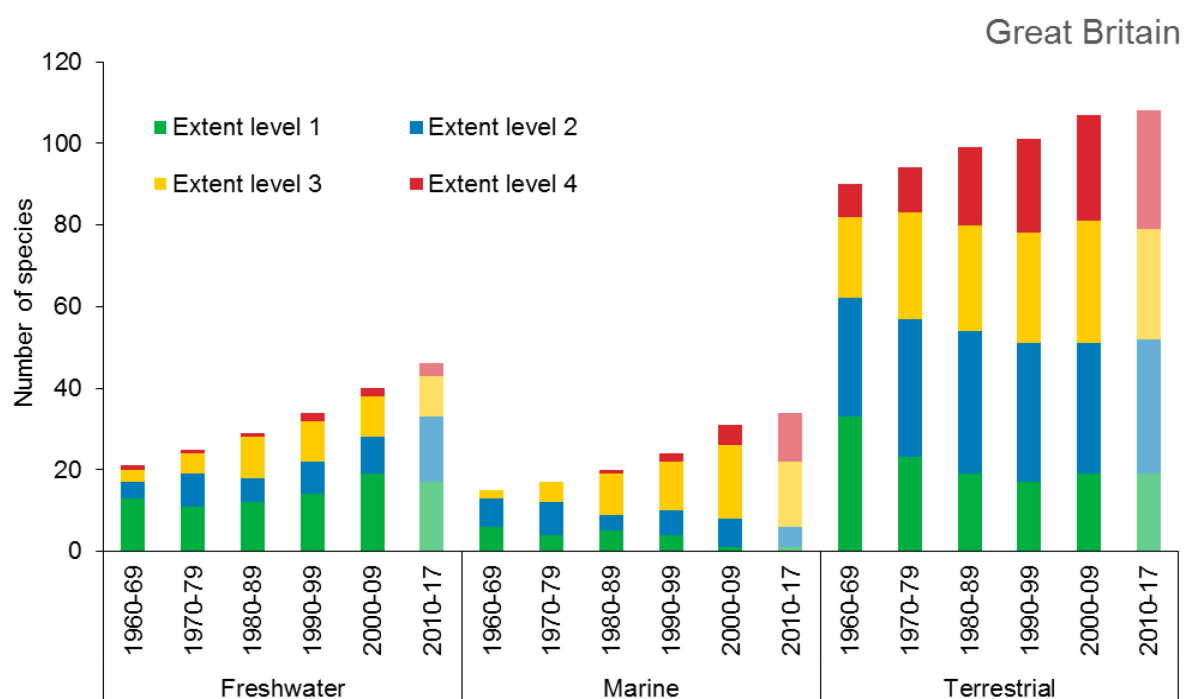
Table 7 Invasion extent of non-native species in Great Britain

Definition	Interpretation	Extent
Not present in territory	Absent	0
Present in territory and either not established or with established populations that have not spread more than 10 km from their source	Not or scarcely established	1
Established populations represent less than 10% of territory, with some having arrived from further than 10 km from their source; or if more widespread then populations scattered and sparse	Established but still generally absent or at most occasional	2
Established populations present in 10% to 50% of the territory	Established and frequent in part of the territory	3
Established in more than 50% of the territory	Widespread	4

⁹¹ CABI, *The Economic Cost of Invasive Non-Native Species on Great Britain* (2010): <https://www.cabi.org/isc/FullTextPDF/2012/20127200446.pdf>

⁹² Defra, *Biodiversity 2020: A strategy for England's wildlife and ecosystem services* (2011): <https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services>

Figure 19 Changes in the extent of invasive non-native species in marine (coastal), freshwater and terrestrial environments, 1960 – 2017



Source: Biodiversity 2020: A strategy for England's wildlife and ecosystem services: Indicators based on data from the: Botanical Society of Britain and Ireland, British Trust for Ornithology, Centre for Ecology & Hydrology, Marine Biological Association, National Biodiversity Network

Annex 2: Background to the Natural Capital Committee

The government's Environment White Paper: The Natural Choice was published in 2011. In this report, government committed to 'establishing an independent Natural Capital Committee (NCC) reporting to the Economic Affairs Cabinet Committee...The Committee's remit was to advise the government on the state of English natural capital' and what needed to be done about it. The NCC was established in 2012 as an independent committee chaired by Professor Dieter Helm.

Since then, the NCC has published plethora of advice on the sustainable use of natural capital in England and most notably a recommendation to the government to create a 25 Year Environment Plan. The government accepted this recommendation, developed it and it was launched by the Prime Minister, Theresa May in January 2018.

The Committee entered its 2nd term in January 2016, with the key focus being advising the government on the implementation of the 25 YEP; including the development of suitable metrics to be used to track progress against the Plan's objectives.

The Secretary of State has appointed two new members, Professors Melanie Austen and Christopher Collins, to the Natural Capital Committee. They join five of the six members who were appointed on 25 February 2016 and the Chair, Professor Dieter Helm, who was reappointed in December 2015.

Dame Georgina Mace has left the Natural Capital Committee to take up a position on the Adaptation Sub Committee of the Committee on Climate Change.

Chairman Professor Dieter Helm, CBE

Dieter is a Professor of Economic Policy at the University of Oxford and a Fellow of New College, Oxford. He is author of *Natural Capital - how to value the planet* (Yale University Press) and his latest book *Green and Prosperous Land* will be published in March 2019 (William Collins).

Members

Professor Chris Collins

Chris is Chair of Environmental Chemistry at the University of Reading. He is the Natural Environment Research Council Soils Coordinator and chairs Defra's Hazardous Substances Advisory Committee providing expert advice to the UK government on how to protect the environment, and human health via the environment from chemicals. His research focuses on determining the factors controlling exposure of biota to environmental pollution and the role of soil organic carbon in modifying pollutant exposure and the parallels between pollutant and carbon cycling in soils.

Professor Colin Mayer, CBE

Colin is Professor of Management Studies, Saïd Business School at the University of Oxford. He is an expert on all aspects of corporate finance, governance and taxation, the regulation of financial institutions and the role of the corporation in contemporary society.

Professor Diane Coyle, CBE

Diane is Bennett Professor of Public Policy at the University of Cambridge. She has held a number of public service roles including Vice Chair of the BBC Trust (2006-2014), member of the Competition Commission (2001-2009), and member of the Migration Advisory Committee (2009-2014). Diane is an expert adviser to the National Infrastructure Commission and a member of the Council of Economic Advisers. She was awarded a CBE for her contribution to the public understanding of economics in the 2018 New Year Honours.

Professor Ian Bateman, OBE

Ian is Professor of Environmental Economics and a Director of the Land, Environment, Economics and Policy Institute (LEEP) at the University of Exeter. His research interests focus on ensuring sustainable wellbeing through the integration of natural and social science knowledge within decision-making and policy. Particular interests lie in the fields of quantitative analysis, integrated modelling and the valuation of non-market benefits and costs.

Professor Kathy Willis, CBE

Kathy is a Professor of Biodiversity and Head of the Long-term Ecology laboratory at the University of Oxford. She is also the Principal of St Edmund Hall, one of the Colleges that makeup the University of Oxford. Until recently she was the Director of Science at the Royal Botanic Gardens, Kew. She has over 30 years of research experience focusing on modelling and remotely determining important landscapes for biodiversity and ecosystem services across the world. Most recently she has been leading a research team to develop new and emerging models and technologies to assist land managers in decision-making to ensure the best outcomes for business and biodiversity.

Professor Melanie Austen

Melanie is a marine ecologist and interdisciplinary marine researcher who is Head of Science for the Sea and Society group at Plymouth Marine Laboratory. She has recently been appointed as an independent member of the Joint Nature Conservation Committee (JNCC), completed a 3 year term as the Chief Scientific Advisor to the UK's Marine Management Organisation (MMO) and for the last twenty years she has been developing and leading UK and EU funded collaborative marine research projects. She has been an Honorary Professor

at the University of Exeter medical school since 2014, a member of other Expert Advisory Groups, and has chaired an EU Marine Board expert group on marine ecosystem valuation.

Professor Paul Leinster, CBE

Paul is Professor of Environmental Assessment at Cranfield University and was formerly Chief Executive of the Environment Agency. He has worked at BP International and Schering Agrochemicals, led an environmental consultancy and was Director of Corporate Environmental Services at SmithKline Beecham. He also holds a BSc in chemistry, a PhD in environmental engineering and an MBA from the Cranfield School of Management.

The Committee is supported by a secretariat based in the Department for Environment, Food and Rural Affairs.

Annex 3: Terms of reference for the Natural Capital Committee

Background

The government is establishing the Natural Capital Committee (NCC) for the duration of this Parliament (through to September 2020), to provide it with independent advice on protecting and improving natural capital. The government's ambition is to improve the environment within a generation, so that England has the best environment and is one of the most beautiful places in the world to live, to work and to bring up a family.

The NCC are working with the government to develop a 25 YEP to deliver this vision; to empower people, businesses and the third sector to protect and improve the environment; taking into account the use of data, tools, new technologies and techniques. The government has a large number of environmental data sets which others could utilise to achieve positive environmental outcomes.

The initial phase of the NCC concluded on 30th September 2015 and the Committee successfully met its Terms of Reference in full. It provided advice to the government on three main issues:

1. The unsustainable use of natural assets;
2. How action to protect and improve natural capital should be prioritised;
3. Research priorities.

Terms of reference

Over this Parliament, the government requires advice from the NCC on the development and implementation of the 25 Year Environment Plan, which the NCC itself recommended. The Committee, therefore, will move into a new phase of work to help inform the plan's development.

The new NCC will be vital in driving forward the next stage of natural capital work in England. This will include playing a key role in advising the government on environmental assets at risk and ways of identifying priorities for improvement where the benefits are greatest, building on its work of the last three years. To do this, the Committee will need to make use of appropriate knowledge, tools and techniques to ensure natural capital can be properly and consistently assessed, valued and accounted for in decision-making and economic planning. There should be a strong focus on embedding the use of open data, tools and techniques to facilitate positive action on the environment across the country, and consideration of national (England wide) and local delivery.

The Committee will advise on the importance of natural capital to sustainable economic growth, health and wellbeing and identify potential actions that could be taken to boost these.

The Committee will continue working with the government and the Office for National Statistics to develop national natural capital accounts and work with businesses to develop and apply

corporate natural capital accounts, recognising that much of our natural capital is privately owned. It will consider the international dimensions of natural capital in formulating its advice where appropriate. The Committee will also advise the National Infrastructure Commission to ensure that 'green and blue infrastructure' is appropriately considered within wider infrastructure discussions.

The NCC will continue to report to the Economic Affairs Committee of the Cabinet.

Specifically, the Committee will advise government and its delivery bodies on the development and implementation of an integrated 25 Year Environment Plan to protect and improve our natural capital; making use of appropriate knowledge and tools to identify priority assets for protection and improvement.

In doing so, it should have particular regard to:

- Advising the government on how national environmental priorities could be delivered in partnership with the private, public and third sectors, including local community endeavours;
- Providing practical advice to the government on how people and businesses can reconnect with nature;
- The development of suitable metrics to be used to track progress against the Plan's objectives and benchmarking the English environment with the rest of the world;
- Advising government on progress against the Plan.

The Committee may:

- Produce and publish occasional reports to the Economic Affairs Committee;
- Provide responsive, ad-hoc advice if requested by the Secretary of State for the Environment on behalf of the Economic Affairs Committee;
- Provide advice to Ministers in confidence.

The Committee may not:

- Perform a watchdog or advocacy role with respect to government policy;
- Be policy prescriptive in its advice or publicly comment on specific projects, unless requested by the Secretary of State for the Environment (or by the Economic Affairs Committee via the Secretary of State);
- Make decisions on classifications or statistical standards.

Committee set-up and structure

The Committee will be set up as an ad-hoc independent advisory body to the government, comprising a Chair and members with expertise in the fields of economics, natural and social

sciences, accounting, statistics, data, technical and both local and national delivery. Members of the Committee will be widely recognised as leading experts in their respective fields and have been appointed and perform on the basis of their professional background as opposed to representing any stakeholder interests. Members are expected to act in accord with the principles of public life.

The Committee will be supported in its work by a secretariat based in Defra. It may also set up expert working groups or rely on existing groups to take forward its work.

Any enquiries regarding this publication should be sent to us

at: NaturalCapitalCommittee@defra.gov.uk