



Department
for Environment
Food & Rural Affairs

Summary of evidence and approach

Date: 06 May 2022

We are the Department for Environment, Food and Rural Affairs. We're responsible for improving and protecting the environment, growing the green economy, sustaining thriving rural communities and supporting our world-class food, farming and fishing industries.

We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.



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Evidenced approach to target development

Background

The Environment Act 2021 (referred to as the Act hereafter) target provisions bring about an important opportunity to deliver the vision set out in the 25 Year Environment Plan and leave the environment in a better state than we found it.

The Act requires government to set at least one target in four priority areas: air quality, biodiversity, water, and resource efficiency and waste reduction, as well as a target for fine particulate matter (PM2.5) and species abundance. These targets need to be laid as draft Statutory Instruments by 31 October 2022 and will come into force once approved by Parliament. There are several requirements within the Act that must be considered before targets are set (see box one below)¹. Importantly, targets must be **objectively measurable, achievable, and collectively deliver significant environmental improvement**.

We identified key parameters that have helped inform our approach to developing targets. **These are not weighted or order their importance in decision-making** however some relate to the Act requirements.

Targets should be sufficiently **ambitious** taking account of;

1. **Delivery of environmental outcomes**
2. Ability to achieved **required results**

It is an Act requirement that targets should be **achievable**, we interpret this to include;

4. **Feasibility** (external pressures)
5. **Viability** (internal pressures)

We have included key areas of best practice within our parameters, and want targets to;

5. Deliver **Value for Money**
6. Be **resilient and ‘future proof’**
7. Take account of **systems interactions**

¹ This is also included in the Annex to the Target Consultation, <https://www.gov.uk/government/consultations/environment-act-2021-environmental-targets>

All targets, both long-term and interim, must meet certain requirements that are set out in the Environment Act 2021. These requirements alongside best practice principles are reflected in the box below

BOX 1. New legal requirements for targets:

- long-term targets can be set in respect of matters that relate to the natural environment or people's enjoyment of it;
- at least one long-term target must be set in each of the four priority areas (air quality, biodiversity, water, and resource efficiency and waste reduction).
- a target for fine particulate matter (PM_{2.5}) and for species abundance must also be set;
- more than one target could be set within a given priority area;
- a long-term target must be at least 15 years or longer;
- targets must have a clearly defined level or quality standard to be achieved, which can be objectively measured. The method for objective measurement should be clear and repeatable, to allow results to be reproducible within reason;
- a specific date must be identified for achieving each target. This ensures targets are time-bound and there is a clear deadline to focus policy action;
- when developing targets we must make sure that they are achievable.
- independent expert advice needs to be sought by government when developing long-term targets. A range of experts will play a role in informing the development of targets including academics, scientists or expert practitioners; and
- targets should be developed in a way that is consistent with the requirements of the policy statement on environmental principles, established under the Environment Act.

Best practice principles in developing proposed targets:

- Help meet the key goals and outcomes in the 25 Year Environment Plan.
- Where possible, based on environmental outcomes or intended benefits to the environment.
- Use a system-based approach to the natural environment to collectively understand interdependencies and with the wider environment.
- Consider how proposed targets will inform the Significant Improvement Test.
- Consider relevant international best practice and commitments and their relevance to our domestic environmental agenda.
- Consider whether they offer value for money to society and offer the best balance of costs, benefits, risks, taking into account factors which cannot easily be costed.
- Make sure they are resilient and 'future proofed' as far as possible.

Working in a complex system

Environmental targets under consideration and wider Defra priorities represent a broad category of topics that may work together or against each other depending on approaches taken. To aid development of a suite of complementary targets, we used joined-up processes to propose targets that function in the same system and that do not conflict or compete against each other as a whole.

Approach

To achieve this goal, a systems approach was taken to identify and analyse interactions between targets. Policy makers were able to use this information to tailor target proposals to acknowledge trade-offs, reduce negative outcomes, and maximise benefits.

Defra's Chief Scientific Adviser's Office and policy teams developed a matrix to assess the strength and type of interactions between proposed targets. The interactions were either identified as positive (co-benefits or synergies) or negative (trade-offs). Where trade-offs were found, options to soften the trade-off or provide compromise were suggested. The resulting matrix of interactions was used by policy teams to adjust targets, where possible, to help develop more robust proposals.

A systems analysis approach helps develop a realistic baseline that considers the outcomes of other targets within a trajectory. Applying this approach will be crucial when developing logic models and delivery plans for targets and interim targets.

Crucially, the systems analysis has supported development of a more accurate cost-benefit-analysis. Double counting of costs (inputs) has been understood and the realisation of co-benefits (outputs) appreciated. Not only does this allow a more robust analytical process, but it can also identify where duplication of efforts might introduce inefficiencies.

Results

The possible interactions were rated as strong/ weak and negative/ positive. Some interactions were deemed neutral where the outcome is dependent on decisions taken within the delivery plans. Out of all the strong interactions-

- **Over 68% of target interactions were positive** and would deliver co-benefits if implemented as a suite. As a result, achievability and efficiency of each target would increase when implemented together.
- **Approximately 12% of interactions were neutral** and could be developed to deliver further co-benefits through decision-making processes.
- **Less than 20% of targets required the consideration of trade-offs** and allowed teams to make informed decisions to avoid negative outcomes.

Resilient targets

As we are proposing long-term ambitious targets, it is crucial they stand the test of time. Defra Chief Scientific Adviser Office Futures Team provide on-going support to help understand potential future threats. This informs our risk assessment to be taken into account for delivery of targets.

1. Air quality targets

Summary of evidence

Target metrics and measurability, including information on target indicators and limitations

The air quality targets are focused on reducing concentrations of fine particulate matter (PM_{2.5}) as this is the air pollutant which causes the most harm to human health. The targets will be based on measurements of PM_{2.5} mass as it remains the best indicator of health damage and it can be robustly and routinely measured.

The targets will focus on long-term exposure to PM_{2.5} as it is the accumulative effect over many years which causes the most damage for the majority of people. There will be an annual mean concentration target which sets a maximum concentration level that cannot be exceeded (by the target date) and a population exposure reduction target which sets a reduction in average exposure. The targets will work in tandem to drive action across the country.

Assessment of both targets will be based on fixed monitoring undertaken through Defra's Automatic Urban and Rural Network. Modelling will be used to provide supporting information and indicators of progress.

Target ambition

Government proposes that the annual mean concentration target is set at a level of 10 µg m⁻³ and the population exposure reduction target is 35% compared to a 2018 baseline, both to be met by 2040. Interim targets will be used to ensure sustained, timely progress is made towards both targets from now until the target date.

A wide range of evidence and expert advice has informed the proposed target levels and dates. A key part of this was the modelling of different future scenarios to estimate the possible concentration reductions achievable under different levels of emissions reduction.

The evidence demonstrates that these targets are challenging but achievable requiring widespread action by government, business, and individuals.

Summary of desirability, feasibility, and viability

All reductions in PM_{2.5} exposure are beneficial to health, but greater reductions demand more action and will entail greater cost and/or scale of change for businesses and individuals.

These targets reflect the current evidence and the uncertainty in the analysis, balancing the desirability of achieving lower levels sooner - and associated health benefits - against the impacts on society and the costs and impacts of measures required to achieve them. Many interventions require significant financial investment by individuals, small businesses, industry and government; as well as time to implement.

Expert input/ advice

The Air Quality Expert Group (AQEG) and the Committee on the Medical Effects of Air Pollutants (COMEAP) have been engaged throughout the evidence development and target setting process. Experts have provided specific advice and recommendations to help shape and inform the development of targets as well as providing oversight as the evidence was developed. Formal advice and recommendations have been published on our website².

Policy scenarios and options

Whilst a range of emissions reduction scenarios have been assessed to determine target achievability, detailed policy pathways to delivery have not yet been developed. Action will be required across all sectors of society including transport, manufacturing, construction, agriculture and energy, and to be taken by government, industry and individuals. The same measures will contribute to both targets, but urban measures will have greatest impact on delivery of the concentration targets.

Two areas where further action may be needed are domestic burning and road transport. For instance, changing to cleaner stoves and cleaner and more efficient fuels in domestic burning. The use of electric vehicles will eliminate tailpipe emissions but there is some debate about the magnitude of emissions from non-exhaust sources (brakes, tyres and road wear – as well as resuspension of road dusts from vehicle movements) compared to traditionally powered vehicles. Further assessment is needed to determine the impacts of increased electric vehicle use (e.g., from regenerative braking) and research into innovative abatement technologies is already underway and will need to continue to inform our approach.

² <https://uk-air.defra.gov.uk/library/air-quality-targets>

As policy pathways for achievement of the targets are developed, there will be further opportunities for consultation on specific measures that are tailored to local areas and their sources.

How they offer value for money

Exposure to PM_{2.5} is the most significant air pollutant in terms of impacts on health and reductions in exposure to PM_{2.5} deliver significant health benefits. The dual target approach reduces the impacts on the most vulnerable – where elevated levels can be most harmful – whilst also reducing long term exposure for everyone, reducing the significant burden on health across the country.

Although scenario measures have not been optimised for cost-effectiveness, all packages are cost beneficial and have significant co-benefits, particularly with net zero policy. Future work will develop cost-effective pathways for meeting the targets.

Where the systems interactions exist

The most significant area of interaction with air quality policy is net zero where there are both significant benefits and potential pressures/challenges. Key positives for air quality targets will come from progress towards decarbonisation of industry, energy, and transport – reducing the reliance on fossil fuel-based combustion. However, a key challenge will come from a need to ensure energy from biomass, a potentially important tool in reaching net zero, does not reduce or indeed reverse any such potential air quality benefits. Importantly, although helpful in reducing exhaust emissions, electric vehicles do not eliminate road transport PM_{2.5} emissions, as brake, tyre and road wear are an important source.

Reductions in precursor emissions of ammonia that are required to meet the PM_{2.5} targets will ensure reductions in nitrogen deposition, which is important for supporting progress to halting biodiversity decline.

How they are resilient to change and will last the test of time and potential future opportunities and risks

Key challenges may come from a range of areas such as better evidence about key sources of PM_{2.5} or new and emerging sources increasing emissions in future years.

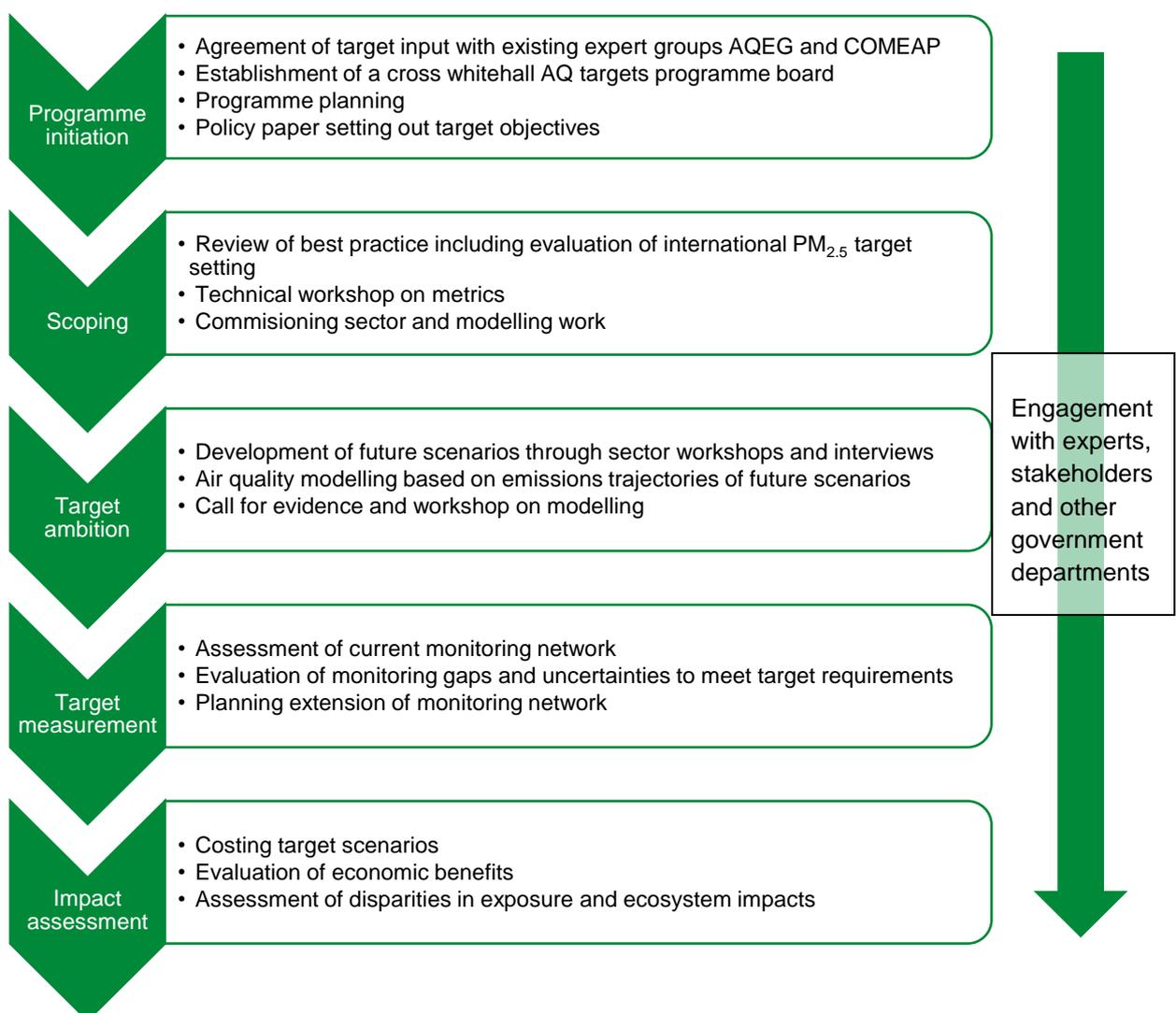
Evidence will continue to accumulate about the toxicity mechanisms and health impacts of PM_{2.5} and its component parts. In the future this may allow for supplementary targets to be developed for specific types of particulates. Experts advise that PM_{2.5} mass will likely continue to be the most important metric for health over the lifetime of these targets.

Alternative targets discussed but not progressed and rationale

These targets focus on reducing long term exposure to PM_{2.5}, which will have a beneficial impact on public health. Whilst it is highly likely that constituent components of the overall mass of PM_{2.5} in an air space will have differential toxicity, expert advice was very clear that targets should focus on the total mass of PM_{2.5}.

As evidence is still developing it is not appropriate to attempt to take forward bespoke targets for component parts of PM_{2.5} or for specific sources of PM_{2.5}. We are looking at opportunities to improve both our modelling and our monitoring network to understand how it is possible to monitor different components of PM_{2.5} to improve the evidence in this area.

Figure 1: Overview of air quality target development evidence process



2. Biodiversity terrestrial and freshwater targets

Summary of Evidence

Species abundance targets (2030 and 2042)

Target metrics and measurability

Species abundance is an established metric, this indicator will track changes in relative abundance of widespread species characteristic of different broad habitats in England. The indicator covers 1,071 species for which we have sufficiently robust data, including birds, bats, butterflies, moths, freshwater invertebrates and plants, providing a wide range of ecosystem services including pollination. The indicator is based on best available data however, there are gaps in coverage at present, such as other fresh-water species, fungi and bees. Biases in the indicator have been thoroughly reviewed, described and options for minimising the impact considered, such as weighting the index.

Target ambition

- To halt the decline in species abundance by 2030 (Environment Act commitment).
- To reverse the ongoing decline in species abundance, increasing by 10% on the 2030 baseline, by 2042

Summary of desirability, feasibility, and viability

Feasibility of targets were initially determined with a questionnaire and at a workshop in March 2021³. Feasibility was then further refined through modelling and analysis using existing data. Assessment of viability was supported by cost benefit analysis of the proposed target (see the biodiversity targets Environment Act Impact Assessment (IA)). The workshop was held before the inclusion of the target to halt decline by 2030 in the Environment Act, and before the 2042 timeline had been set, hence references to a 2037 timeline.

³ Note, this was before the 2030 statutory target was agreed and so participants were working to a 2037 cut-off date

Desirability

A target to increase species abundance is desirable as it will drive wide-ranging actions to deliver nature recovery. Species abundance is a good proxy for wider ecosystem health and this target will only be achieved by restoring a range of habitats and reducing pressures. Most participants wanted an ambitious target that saw increases in species abundance.

Feasibility

Halt decline by 2030: Three quarters of those contributing to the questionnaire had medium to full confidence that halting decline by 2037 was achievable whilst stretching and ambitious. Modelling was not carried out on this target as timeframes were too short to achieve accurate results with available data.

Reverse ongoing decline by 2042: Experts had limited confidence that a significant increase in species abundance was possible within this timeframe⁴. Those who were not confident suggested that an additional 10-20 years would be required.

Modelling the change in species abundance in different scenarios was challenging due to data limitations. The modelling that was produced, indicated that achieving the 2042 target is highly ambitious and will require strong action including more habitat creation and alleviation of pressures.

Viability

See section value for money below.

Expert advice

Modelling for the species abundance targets was developed by UKCEH, with guidance from Defra and Natural England. The independent Biodiversity Targets Advisory Group has been involved in discussions and workshops throughout, minutes to these meeting can be found alongside other consultation documentation⁵.

Illustrative policy roadmap

Potential policy pathways were developed as part of the workshops and questionnaires. The actions required were similar across all proposed targets. Improving the condition of protected sites alongside the restoration and creation of wildlife-rich habitats and agri-environment schemes were consistently seen as essential for delivery of the targets. All require significant increases in scale of implementation to be sufficient, except agri-environment schemes which required

⁴ This is likely to be explained by the tension of defining feasibility by what is ecologically feasible versus realistically feasible considering likely political, social, environmental, and economic constraints and experience.

⁵ <https://consult.defra.gov.uk/natural-environment-policy/consultation-on-environmental-targets>

modest improvement. Offsite remedial actions such as tackling diffuse pollution and reductions in nitrogen deposition were also raised as priorities. Increased importance of biodiversity in land-use decisions including development and tree planting were highlighted, alongside spatial planning, improved partnership working and advice to landowners, as well as improvements to monitoring and evaluation. Improving water quality was seen as critical to all targets.

How they offer value for money⁶

The estimated additional average annual cost (2022-2042) of meeting the species abundance and species extinction risk targets is £206.6m. The estimated total cost (present value, 2022-2100) of meeting the species targets is around £2,098m.

The estimated total benefit (present value 2022-2100) of the species target is £7,275m.

The impact of some of the wider pressures on biodiversity such as climate change have not been fully taken into account due to current evidence gaps that we are working to fill. It is likely that climate change will negatively affect the ability of species and habitats to recover. This may mean that actions additional to those as identified as required may be needed to meet the biodiversity targets. This could potentially significantly increase the costs of meeting the targets.

Where the systems interactions exist

Halting and reversing species decline is related and dependent on other statutory targets being met improving air and water quality; increasing available habitat and improving its condition. Achieving the aims of the 25 YEP will also contribute to meeting this target.

Potential future opportunities and risks

There is some flexibility in the way the target could be met, making it more robust to future policy uncertainty. Climate change will result in both wins and losses for many species across different taxa, for example range expansions and contractions will have positive and negative implications on abundance, respectively. While other pressures e.g. habitat loss, will only result in species abundance declines. This indicator currently combines data across six taxa, based on their meeting strict criteria for inclusion. With improvements to monitoring and statistical analysis of abundance it is possible that additional species and/or taxa could be represented within this indicator. The addition of new species to the indicator could improve the indicator's representativeness of England's biodiversity. A societal level change in

⁶ For more information about the cost benefit analysis please refer to the accompanying biodiversity targets Environment Act Impact Assessment (IA).

perception and importance of biodiversity is required to enable positive behaviour changes so that this target can be met and sustained past 2042.

Long-term Species Extinction Risk target (2042)

Target metrics and measurability

We propose using Great Britain (GB) level data to create a new England Red List Index to use as our target indicator. This draft England-level Red List Index, with data for over 7,000 species, includes birds, mammals, reptiles, amphibians, some invertebrates, vascular plants, bryophytes, lichens and some fungi. Only extant, native English species with 20% or more of their GB range in England will be included in the indicator to make it more representative of England. The assessment and analysis are not yet complete, therefore figures may change.

We expect little change in the indicator in the short-term as there is a lag between the implementation of policies and subsequent changes to biodiversity, which need to be significant enough to warrant a change in IUCN Red List category.

Target ambition

To see an improvement in the Red List Index of species extinction risk by 2042 compared to the 2022 baseline.

Summary of desirability, feasibility, and viability

Methodology as for species abundance targets

Feasibility

Participants did not have a consistent view on the feasibility of achieving any level of ambition². Natural England assessed recovery potential of a subsample of species under different scenarios. Under the most ambitious scenario, over 60% of threatened species were considered likely to improve in extinction risk status by 2040. This is akin to a very small increase in the overall index. Experts raised that extinction debt (species that are not yet extinct but are unrecoverable) could present a real risk to delivery of this target.

Desirability

A target to improve the Red List Index of species extinction risk is desirable because it will drive action to prevent the loss of the rarest or fast declining species, while at the same time preventing species at a lesser threat risk from further decline. Participants indicated that the ambition should be a percentage decrease in threatened species, not just halting decline.

Viability

See Species Abundance target section.

Expert advice

The modelling for the species extinction risk target was developed by Natural England, with guidance from Defra and UKCEH. The independent Biodiversity Target Advisory Group has been involved in discussions and workshops throughout.

Illustrative policy roadmap

See Illustrative Policy roadmap of Species Abundance targets. Targeted action for species were considered especially important for this target, which will require improvements in status of some of our most threatened and rare species.

How they offer value for money

See Species Abundance target section.

Where the systems interactions exist

See Species Abundance targets section.

Potential future opportunities and risks

Looking to the future, it is expected that additional data will be collected for more species, through often novel and improved technologies. Therefore, some species that are currently data deficient will then contribute to the England Red List Index. The impact of this on meeting the target will depend on the species additions. Climate change will continue to put pressure on species, however some species, for example those that thrive in warmer conditions, may experience positive impacts on their England range, this again will feed into any changes of this indicator. While it is unknown how these previously data deficient species will impact the England Red List Index, the collection of data and continued monitoring of species will ensure that actions taken can be adaptive based upon the data, thereby improving our ability to reach this target. A societal level change in perception and importance of biodiversity is required to enable positive behaviour changes so that this target can be met and sustained past 2042.

Long-term Wider Habitats (2042)

Target metrics and measurability

The indicator will show the number of hectares where management has been implemented to create or restore diverse wildlife-rich habitat through a range of measures, see section 5 below.

Target ambition

To create or restore in excess of 500,000 hectares of a range of wildlife-rich habitat outside protected sites by 2042, compared to the 2022 baseline.

Summary of desirability, feasibility, and viability

Methodology as for species abundance targets (section 3).

Feasibility

Around 48% of participants were medium, high or fully confident that creating or restoring 500,000 hectares was achievable².

Trajectory work completed by Natural England indicated that the target ambition is feasible given the current and planned future initiatives – such as biodiversity net gain and agri-environment schemes - contributing to habitat creation and restoration.

Desirability

A target to create or restore in excess of 500,000 hectares of wildlife-rich habitat outside protected sites is desirable because new or improved habitat is critical for the restoration of ecosystems and the recovery of biodiversity. This in turn is essential for achieving our species targets. A habitats target will ensure the resilience and adaptability of species to future change and drive wider environmental improvements. Experts were keen to have as high a level of ambition possible in light of achievability.

Viability

See Section value for money below.

Expert advice

The modelling for the trajectory of the wider habitats target was developed by Natural England, with guidance from Defra and UKCEH. The independent Biodiversity Target Advisory Group has been involved in discussions and workshops throughout.

Illustrative policy roadmap

See Species Abundance target section

How they offer value for money

It is estimated that the average annual cost (2022-2042) of meeting the wider habitats target is £53.8 million. The total cost (present value, 2022-2100) of the wider habitats target is estimated to be around £1,133m. To avoid double counting, this does not include woodland creation, the cost for which are captured in the woodland cover target Impact Assessment.

The estimated total benefit (present value 2022-2100) of the wider habitats target is around £7,848m indicating that the benefits of a wider habitats target far outweigh the costs. See section 6 of Species Abundance for considerations of the impacts of wider pressures.

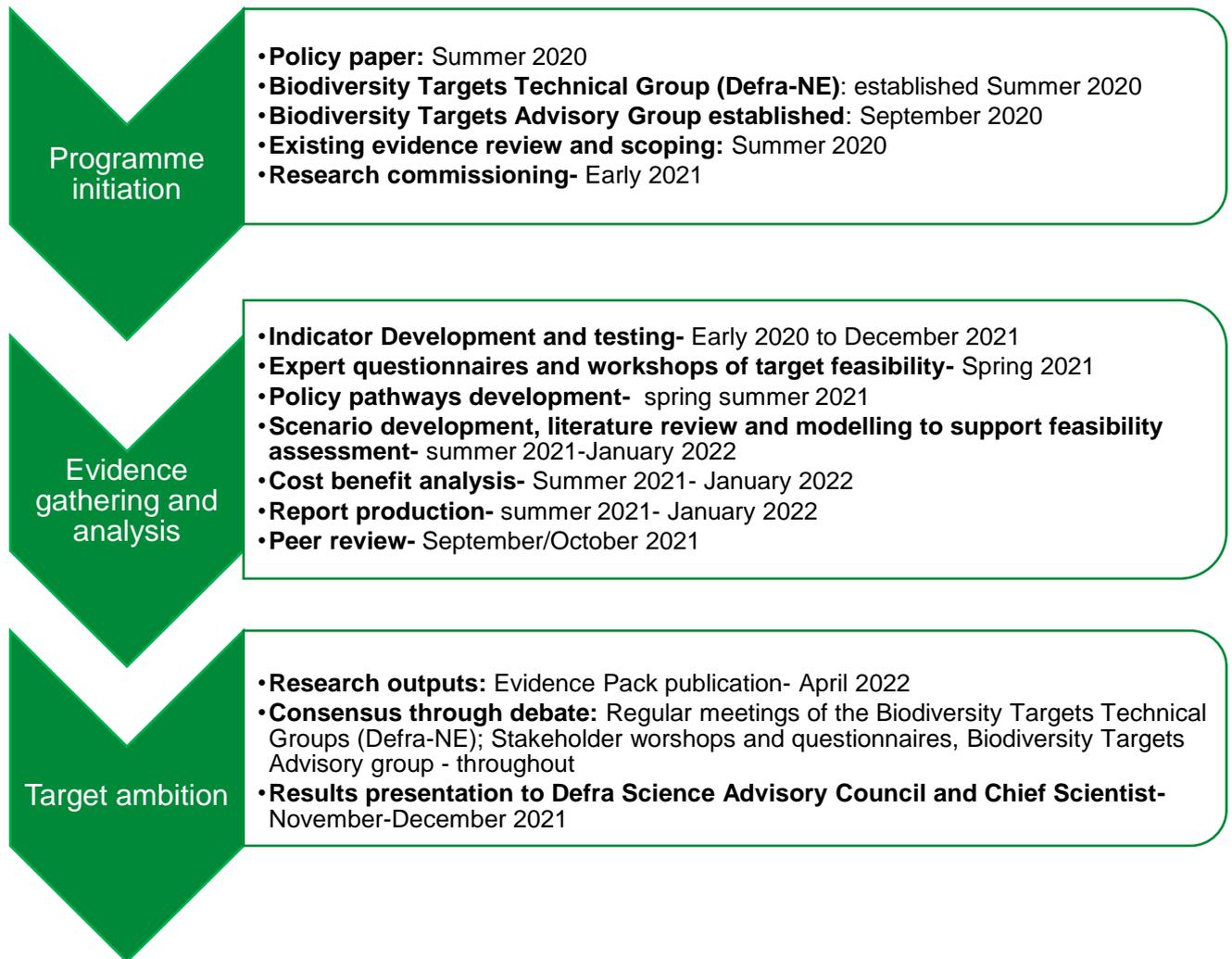
Where the systems interactions exist

See Species Abundance target section

Potential future opportunities and risks

The delivery of many actions required to achieve this target will be through government funded or supported schemes and, as such, much of the data collection will be through regular reporting. There is also a role for private finance to contribute to achieving the delivery of actions at the scale and pace that is required and to provide additional resilience over long time periods. Climate change will impact habitats in numerous ways, for example increasing the likelihood of pest and disease outbreaks and will interact with other pressures. A societal level change in perception and importance of biodiversity is required to enable positive behaviour changes so that this target can be met and sustained past 2042.

Figure 2: Overview of biodiversity terrestrial and freshwater target development evidence process



3. Biodiversity marine target

Summary of evidence

There are multiple marine targets that aim to improve the marine environment through reaching ‘Good Environmental Status’ as set out in the 2019 update to UK Marine Strategy part one⁷. However, there are no time bound targets for Marine Protected Areas (MPAs) to be restored to favourable condition⁸.

A legally binding target for MPAs could complement and bolster on-going work to protect the marine environment and existing legal obligations, by providing a clear deadline for recovery of the MPA network. The network is crucial for the recovery of the wider marine environment as an ecologically coherent and representative sample of crucial habitats.

Target metrics and measurability, including information on target indicators and limitations

The proposed Environment Act MPA target is: 70% of the designated features in the MPA network to be in favourable condition by 2042, with the remainder in recovering condition, and additional reporting on changes in individual feature condition.

“MPA network” refers to Marine Conservation Zones (MCZs) designated under the Marine and Coastal Access Act 2009 (MCAA), Special Areas of Conservation (SACs) and to Special Protection Areas (SPAs) designated under the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Habitats Regulations).

MPAs are designated to protect representative examples of the UK’s marine biodiversity and geomorphology by protecting specific features listed at the time of designation. These features can be habitats (e.g., seagrass beds, coral gardens) or species (e.g., harbour porpoise, native oyster). The objective for all MPAs is for their designated features to be in favourable condition. A metric using favourable condition of features across the MPA network is therefore an evidence-based way to assess features within protected sites and ties with existing MPA conservation objectives. Interim targets will also be developed to help assess progress towards the overarching target.

Condition assessments allow the Statutory Nature Conservation Bodies (SNCBs), Natural England and Joint Nature Conservation Committee (JNCC), to judge if a

⁷ <https://www.gov.uk/government/publications/marine-strategy-part-one-uk-updated-assessment-and-good-environmental-status>

⁸ Favourable condition means that protected features are in a healthy state and are being conserved by appropriate management.

designated feature is in favourable condition. Each feature has a number of defined attributes, which are used to determine the health of that feature. Evidence for these condition assessments is collected either through survey data or a vulnerability assessment (which uses a combination of feature sensitivity and exposure to human pressures). The long-term aim is to increase the proportion of assessments done based on survey data, and to use data collected for similar MPAs/ features to improve vulnerability assessments.

Using favourable condition would tie the target in with existing MPA conservation objectives. The government and regulating bodies will be required to determine whether the MPAs in the network are reaching their conservation objectives or not. While individual features in each site would have a yes/ no assessment of whether they are in favourable condition, the percentage of all features across the network in favourable condition can be calculated to determine progress towards the Environment Act MPA target. Over time, the trend towards achieving the target by 2042 can be shown and progress will be assessed against interim targets. Additional reporting on interim targets will provide more detail using feature attributes (such as extent, distribution, structure, function and supporting processes, e.g., water quality) to show change to individual feature condition. For example, more feature attributes in a good healthy state would show progress towards overall favourable condition for that feature.

MPA condition is directly affected by the sensitivity of the designated features to the pressures to which they are exposed. A sensitivity assessment categorises habitats or species based on their resistance (ability to withstand) and resilience (ability to recover after) to pressures caused by human activities. The resilience category gives a timeframe (varying from within 2 years to over 25 years) in which recovery is expected after the pressure is removed. Management of those damaging human activities will therefore be required to remove the pressures. The target metric assumes that management measures to remove pressures on designated features will be in place by 2024.

Target ambition

The MPA target requires all designated features in the MPA network to be on a path to recovery, however it also considers that recovery timescales will vary by feature and geographic location.

The proposed percentage is based on the best available evidence on recoverability information for habitats and species from the SNCBs, taking a high scientific certainty scenario (i.e., recovery rates are unlikely to be overestimated). Recoverability is determined using feature sensitivity and current condition assessments. Although slow recovering species and habitats could recover quicker than estimated, setting the target at this level also allows for any challenges in implementing entirely effective management measures across all our MPAs.

A bespoke monitoring programme to review progress towards achieving the proposed MPA target is being developed.

Summary of desirability, feasibility, and viability

Desirability: A legally binding target for MPAs would provide a clear trajectory for the recovery of the MPA network features. This will support wider nature recovery in the marine environment.

Viability: SNCBs are responsible for assessing the condition of designated features (carried out through monitoring), to inform regulators on whether conservation objectives of the MPAs are being met and to advise regulators on management measures for MPAs. The success or otherwise of the target will be assessed through monitoring systems that are being developed.

Feasibility: In order to achieve the target condition, management of the human activities will be required to remove or limit the pressures on features. The target metric assumes that management measures will be in place by 2024. The percentage level in the target reflects understanding based on the best-available evidence on the rates of recoverability of the marine environment (utilising the slower recovery rate estimates) and that implementing effective MPA management requires that we need to work with sea-users to ensure measures are developed that will be successful.

Expert input/ advice

SNCBs have been commissioned by the Department for Environment, Food & Rural Affairs (Defra) to deliver the evidence to support the proposed MPA Target due to their experience and statutory duties in advising on MPAs within territorial waters (within 12 nautical miles from the coast for Natural England) and offshore (beyond 12 nautical miles from the coast to the extent of the UK Continental Shelf for JNCC). SNCBs have provided recoverability information (based upon scientific evidence) and used current condition assessments to identify which MPA features are likely to recover within the timescale of the 25 Year Environment Plan (i.e., by 2042).

Additionally, the Biodiversity Targets Advisory Group was set up to provide expert advice to Defra specialists developing the evidence base for legally binding biodiversity targets, including the marine target for the MPA features.

Policy scenarios and options

The proposed MPA target complements the existing marine and fisheries policies and objectives. Achieving and sustaining favourable condition of MPA features will also support the wider objectives of the UK Marine Strategy. We have been working to ensure that management measures to remove pressures on designated features will be in place by 2024. No new/additional policy measures are required.

How they offer value for money

MPAs aid in creating a biologically diverse and thriving marine environment that is of high value to society. Public authorities with functions in the marine area are already subject to requirements, under MCAA and the Habitats Regulations, to manage the impact of marine activities on protected features (e.g., fishing) so as to achieve or not hinder the MPA conservation objectives. The proposed MPA target can therefore be implemented at no additional cost as legal provision for management measures is already in place.

The implementation of a target itself should not have any direct impact on costs, other than holding the government of the day to account because the costs and benefits are already accounted for in the designation and management impact assessments for the MPA network.

Assessments

In order to assess progress towards the Environment Act target, MPA condition assessments will be required. There are three key components to undertaking condition assessments:

1. Monitoring MPAs to collect data over time;
2. Use of indicators/metrics to enable the consistent application of monitoring data to draw conclusions around condition;
3. Overall assessment approach for undertaking MPA condition assessments.

Options for monitoring will be confirmed following discussion with Defra, JNCC and Natural England.

Research and development undertaken over the lifetime of the target will lead to technological innovation which will enable more effective future monitoring and management of MPAs.

Where the systems interactions exist

There are interactions with other sea users including fisheries and the delivery of offshore wind farms to meet the net zero target. All MPAs are protected through the planning and licensing regimes that cover activities such as dredging for aggregates and constructing offshore wind farms. In addition, 98 sites in our waters now have management measures in place to protect sensitive features from bottom towed fishing gears.

Defra will work with regulators to ensure activities are not damaging MPA features including working with BEIS to enable offshore wind expansion without damage to the MPA network.

How they are resilient to change and will last the test of time and potential future opportunities and risks

As part of the proposed target, a supporting monitoring programme will be developed to gather information that aims to improve the marine environment. We do not expect much change over the life of the target but if the evidence shows a need, then we will adapt the network based on the evidence.

If further MPAs are designated in the future, we propose to consider at the time whether they should be included in the target.

4. Woodland cover target

Summary of evidence

Metric

The proposed metric comprises an aggregate measure of woodland cover and tree canopy cover outside of woodland. Woodland cover is reported through the National Forest Inventory (NFI), based on analysis of aerial photography and administrative records for recently established woodland. The NFI defines woodland as a group of trees of at least 0.5 hectares in area with a minimum of 20% canopy cover and width of at least 20 meters and have the potential to reach 5 meters in height. Canopy cover of trees outside woodland includes small woods (less than 0.5 ha in area), groups of trees and individual trees (including urban trees). For trees outside woodlands, canopy cover is measured by remote sensing and the findings published as a National Forest Inventory report: tree cover outside woodlands in GB. A key limitation of the data-sources is remote sensing under-reporting tree cover in urban areas, and areas subject to natural colonisation. For urban areas, the risk of under-reporting is mitigated by applying a statistical correction factor (established through analysis of ground-truthed aerial photography) to the remote sensing data. For natural colonisation a new methodology is being developed which will be supported by field survey.

Target Ambition

Tree and woodland cover in England is currently 14.5% of total land area. We are proposing to set a legal target for tree and woodland cover to increase to 17.5% of total land area in England by 2050. The level of ambition for the increase has been guided by an analysis of the level of woodland creation needed to support net zero ambitions as well as what would be practically achievable and affordable.

Summary of Desirability, Feasibility, and Viability

Our 2020 consultation on the England Tree Strategy revealed high public interest in tree planting at both national and local level. Adopting a broad scope for the metric ensures that a wide variety of measures to establish new trees and woodlands will be considered as a means of meeting the proposed target.

Expert Input and Advice

Progress in developing the proposed target has been discussed at regular meetings with the Tree and Woodland Scientific Advisory Group, made up of independent experts from a range of tree and woodland research backgrounds, who have

provided advice on potential approaches. This has been taken into consideration alongside internal analysis and wider stakeholder engagement.

Policy scenarios and options

The policy options considered are the following;

- **Option 0 Business as Usual (Baseline):** Tree planting rates will approximately treble to 7,500 hectares (ha) per year by the end of this Parliament. In the absence of any further policy intervention, planting rates will likely fall back to current levels of approximately 2,100 ha per year after 2025.
- **Option 1 17.5% Woodland Cover Target By 2050:** this option will require planting levels of 7,500 – 10,000 ha per year by 2025 rising to 16,700 ha per year of woodland creation by 2035 and maintained to 2050; in addition, new planting of small woods and trees outside woodland will be required to achieve a net gain in tree canopy cover outside woodland.

Short term assumptions (up to 2025)

In both options it has been assumed that the forestry sector has the capability to meet the 2025 level of ambition.

Long term assumptions 2025 – 2050

For both options, we have assumed a level of deforestation and loss of canopy cover from trees outside of woodlands based on recent trends and future policy interpretation.

Assumptions have been made about the proportion of new woodland and tree canopy cover outside woodland established as agroforestry systems.

Option 1 includes assumptions over the balance of woodland types established and their likely contribution to meeting net zero.

Policies that would support the delivery of the target include the Nature for Climate Fund (NCF) which has committed £720 million to woodland creation, tree planting and peat restoration. Funding through environmental land management schemes will help to deliver the required planting rates from 2025 onwards, with increasing levels of private finance, particularly through carbon markets, anticipated to reduce reliance on the public purse.

Value for Money

Rural woodland, agroforestry and trees outside of woodlands offer a range of benefits. All types of tree planting provide substantial carbon sequestration. Other non-market benefits include improvements to air quality, water quality, biodiversity and landscape. Trees can also provide flood regulation services, recreation benefits

and amenity value, when planted in appropriate locations. Tree planting and woodland creation also has noteworthy planting, management, and maintenance costs. These costs will be met by a blend of government funding and private finance; we anticipate that the contribution from private finance to woodland creation will increase over time. Our Impact Assessment (IA) shows that by 2100 the net present value of having met the proposed tree and woodland target will be in the range of £10.17 billion to £22.34 billion (with a central estimate of £16.42 billion) suggesting that the lifetime carbon sequestration and environmental benefits considerably outweigh the overall costs of delivering the proposed target. We estimate that for every pound spent on woodland creation there are approximately £3.50 worth of social benefits.

Systems Interactions

A statutory tree and woodland target will build on a series of existing commitments to increase tree planting and woodland cover, including those set out in: the 25 Year Environment Plan which aspires to increase woodland coverage of England to 12% by 2060; the England Trees Action Plan 2021-24 which has committed Government to at least treble woodland creation rates by the end of this parliament; and Government's commitment to reach net zero greenhouse gas emissions by 2050. The Use of Environmental Impact Assessment (Forestry) and the UK Forestry Standard will help to ensure the right tree is in the right place, supporting the delivery of other Environment Act targets, including; improvements to air quality as trees can offer small highly localised improvements to air quality through the removal of particular matter, water quality improvements through intercepting sediment and nitrate run off and biodiversity through the creation of habitats and the improvement in species numbers.

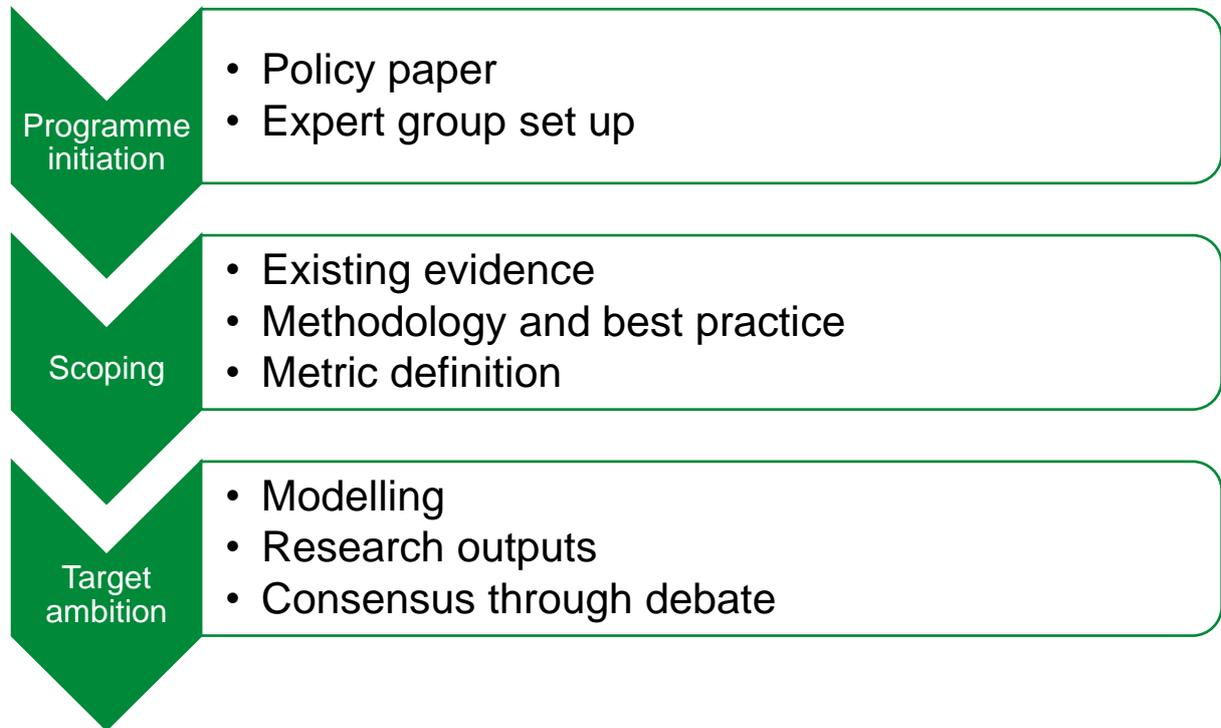
The proposed ambition level would require 3% of land to be changed to woodland and modelling has identified 3.2 million hectares of land potentially suitable for planting, excluding best and most versatile agricultural land, designated landscapes (all National Parks and Areas of Outstanding Natural Beauty) and a range of other sensitivities; planting may also be appropriate outside these low-risk areas for woodland creation. Environmental Impact Assessment (Forestry), use of the UK Forestry Standard and, in visually sensitive areas, use of a Landscape and Visual Impact Assessment (LVIA) will help to mitigate the risk of the proposed target driving undesirable land outcomes.

Potential Future Opportunities and Risks

The proposed woodland target is designed to be robust to future policy uncertainty. Having a broad scope, including different trees beyond conventional woodland, gives the target flexibility in the way that it is met. By allowing for multiple pathways, the

target has increased potential to mitigate future risks and to take advantage of future opportunities.

Figure 3: Overview of woodland cover target development evidence process



5. Resource efficiency and waste reduction targets

Summary of evidence

Target metrics and measurability, including information on target indicators and limitations

Waste not reused or recycled, including material that is too degraded or contaminated for these purposes, is termed 'residual' waste. Residual waste can originate from a range of sectors, including households (as "black bag waste"), commercial and industrial, and construction, demolition, and excavation sources. It is usually sent for incineration at an energy recovery plant or for disposal at landfill. Some is also sent overseas as refuse derived fuel (RDF) or may be used in energy recovery for transport fuel. We are proposing a target scope of all residual waste excluding major mineral wastes, i.e., excluding the predominant, and largely inert, waste categories from construction and demolition, such as concrete, bricks and sand, as well as soils and other mineral wastes from excavation and mining activities. We are proposing a treatment-based definition of residual waste, with a metric that includes waste that is sent to landfill and put through incineration (including incineration with energy recovery), sent overseas for energy recovery, or used in energy recovery for transport fuel. The target metric will not include other end of life treatment options such as waste sent for anaerobic digestion (AD), but we will continue to review which treatments it is appropriate to capture in the metric as new technologies and treatment options emerge.

Target ambition

The ambition level was determined using several different modelling approaches to sense check our outputs and align with complementary departmental strategies and commitments. This has involved modelling the collective impacts of the planned Collection and Packaging Reforms (CPR) on residual waste, as well as illustrative potential future policy pathways that include possible additional policies to divert household waste from residual waste and a collection of possible policies to divert waste from landfill and incineration. We have also considered what trajectories to meet the 65% municipal recycling rate by 2035 and zero avoidable waste by 2050 commitments may look like. We are proposing a target ambition of a 50% reduction in residual waste (excluding major mineral wastes) by 2042 from 2019 levels. We propose a kg per capita metric. This would mean a reduction in residual waste (excluding major mineral waste) in kg per capita from 560 kg per capita in 2019 to 280 kg per capita in 2042.

Summary of desirability, feasibility, and viability

The proposed target fits well with long-term strategic ambitions and commitments set out in the Resources & Waste Strategy (RWS) e.g., to work towards zero avoidable waste by 2050. The potential policy pathways towards achieving the target are viable in the sense that they are driven by action to prevent waste and increase recycling, though some may have wider economy implications that increase complexity of delivery. The target metric is relatively robust, accounting for demographic change through the per capita metric, and is not expected to clash with emerging future trends such as increased digitisation/ servitisation of products (fewer individually owned cars, for example, and more car sharing services), which will support a reduction in waste through reduced material-based consumption. Improvements in sorting and reprocessing technologies would also increase recycling and reduce residual waste. However, it is important to note that residual waste arisings are historically linked to economic growth and can be affected by economic shocks.

Expert input/ advice

The Resources and Waste Target Expert Group⁹ (RWTEG) was formed in November 2020, with meetings taking place approximately monthly thereafter. The experts have provided guidance and scrutiny on target scope, indicator measurement, baseline development and modelling, and assessment of policy pathways.

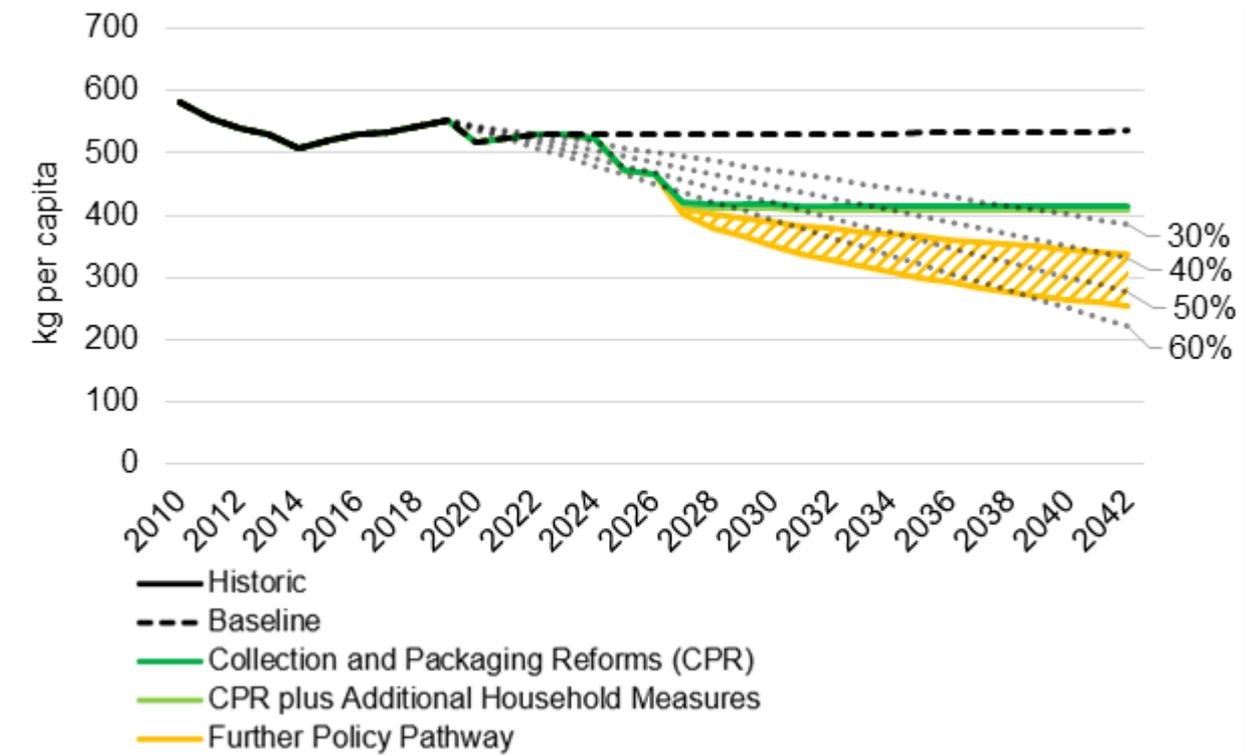
Policy scenarios and options

In the shorter term, where we have policies identified, the Collection and Packaging Reforms (CPR) outlined in the Resources and Waste Strategy are expected to provide a significant contribution to progress against the target (i.e., half the way towards the target, see Figure 4). These reforms comprise the introduction of consistency of recycling collections from households and commercial businesses, a deposit return scheme for drinks containers and extended producer responsibility for packaging materials. Government commitments to achieve a 65% municipal recycling rate by 2035 and zero avoidable waste by 2050 will also drive progress against the target. Additional policies and measures that could be considered to further progress include price-based levers to make it more expensive to dispose of waste through waste management options typically associated with residual waste, specification of producer responsibility across a range of different products and materials, or regulatory levers to maximise municipal recycling rates beyond CPR (including an expanded kerbside waste collection service and policies to divert organics from residual waste; see Figure 4).

⁹ <https://www.gov.uk/government/groups/resources-and-waste-targets-expert-group>

The government believes it is important that local authorities continue to support comprehensive and frequent rubbish and recycling collections to households. The government’s consistent collection proposals have included consulting on expanding food waste collections, supporting garden waste collections, and introducing a minimum collective frequency for residual waste. Such reforms would help ensure households continue to have access to a comprehensive and frequent service, whilst improving environmental outcomes.

Figure 4: Residual waste excluding major mineral waste after potential future policies, up to 2042



How they offer value for money

Residual waste monitoring data has been reported at the end-point of waste management under existing frameworks for over 20 years and will be captured within existing plans for data improvements via Smart Waste Tracking. Beyond CPR, costs and benefits will depend on the future policies implemented, as discussed further within the Impact Assessment. The illustrative future policy pathway, which shows one way the target could potentially be met, has a benefit-cost ratio of 1.79:1.

Where the systems interactions exist

There are potential trade-offs and synergies with several policy areas including air quality, water quality, and terrestrial and marine biodiversity, as well as synergies with net zero and soil health, amongst others.

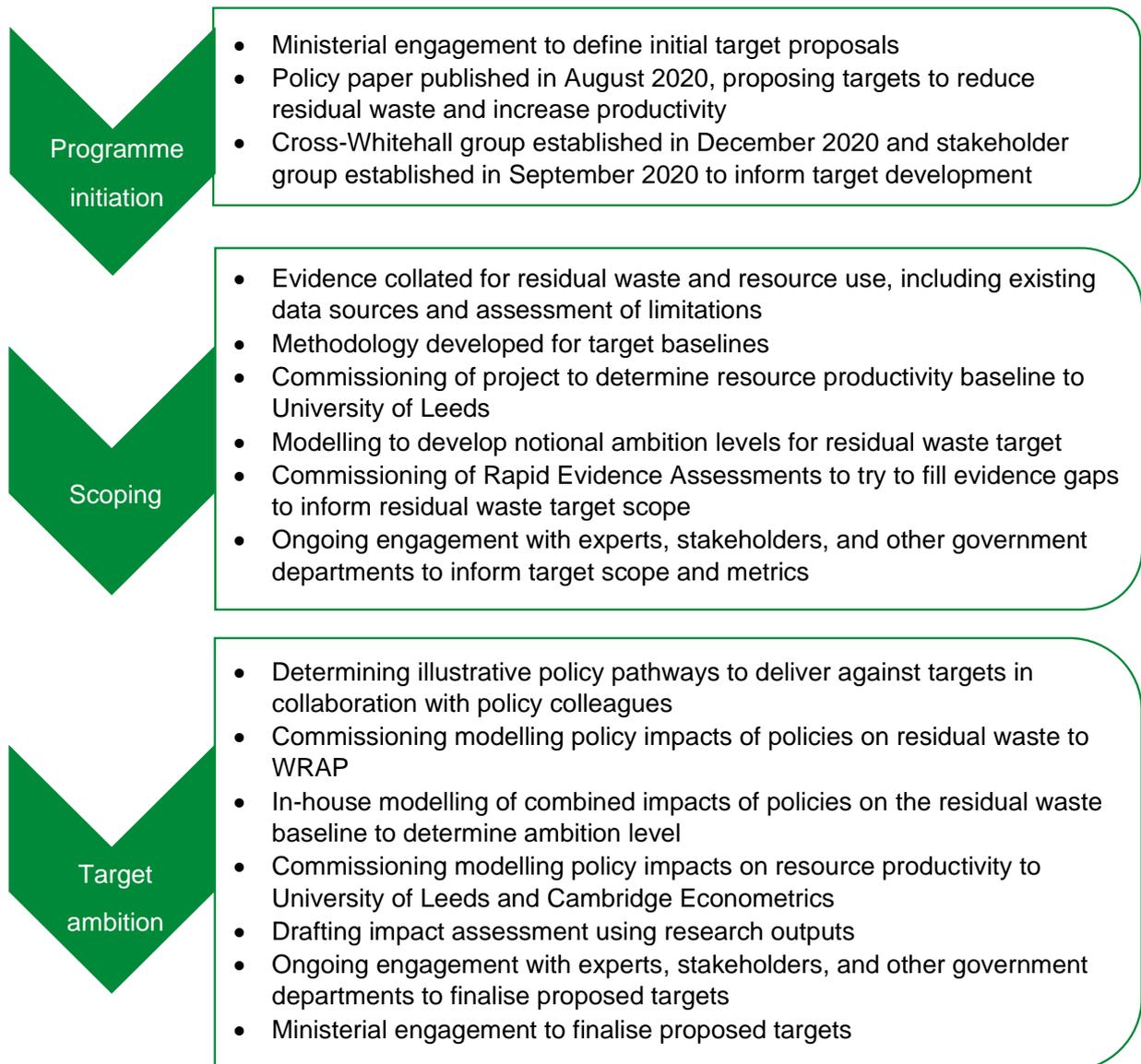
How they are resilient to change and will last the test of time and potential future opportunities and risks

The proposed target is resilient to change. Key threats identified include population change, economic growth, and shifting baseline syndrome, in which positive behavioural or societal change doesn't occur because society as a whole becomes habituated to the environment as-is, for example, increased littering or fly-tipping. Population change is accounted for by the *per capita* metric, policy interventions could drive an absolute decoupling of waste arisings from economic growth, and attitudes and behaviours could be addressed by potential policy levers such as information and media campaigns.

Alternative targets discussed but not progressed and rationale

An additional target discussed but not progressed was 'Resource productivity', measured in terms of GDP divided by Raw Material Consumption. Due to the large sectoral coverage, cross-government remit and complexity in calculating the target itself, it was decided not to set a target in October 2022, but still gather evidence on it to obtain views on how to best to develop it as a potential future target.

Figure 5: Overview of resource efficiency and waste reduction target development evidence process



6. Water targets

Abandoned metal mines target

Target metrics and measurability, including information on target indicators and limitations

We are proposing a target which is based on the length of rivers polluted by six substances: cadmium, nickel, lead, copper, zinc, arsenic (Cd, Ni, Pb, Cu, Zn, As) discharged from abandoned metal mines. Monitoring of river pollution is carried out through water sampling and lab analysis of metal concentrations, and the results are combined with geospatial data to calculate the lengths of rivers which are polluted (in kilometres). As responsible authority, the Environment Agency (EA) has determined where the observed pollution is caused by abandoned metal mines rather than other sources. The EA will continue to monitor metal concentrations in polluted rivers so that progress towards the target can be assessed after implementation of remedial measures.

Target ambition

We propose an ambition of reducing by 50% the length of rivers and estuaries polluted by target substances (Cd, Ni, Pb, Cu, Zn, As) from abandoned metal mines by 2037. This equates to roughly 750km of rivers which will be improved.

Summary of desirability, feasibility, and viability

The target is desirable as abandoned metal mines are the most significant source of metal pollution in the water environment, causing environmental harm and in some cases, threatening economic activity. This is also a government liability since the former mine operators cannot be held liable for water pollution from mines abandoned before 2000. Funding to remediate the abandoned metal mines is primarily from government, and the metal mines target is viable based on the funding through the 2021 spending review. The target is feasible as the technologies to achieve the target are known.

Expert input/ advice

We set up a Water Expert Advisory Group (WEAG) consisting of independent academic and industry experts to advise and help us in development of the targets. The WEAG have met to have focussed discussions on each target including on our suggested metric or indicator and our approach to the cost benefit analysis for each target.

Policy scenarios and options

The existing Water and Abandoned Metal Mines (WAMM) Programme would be the primary mechanism to achieve the target. This is a partnership between Defra, the EA, and the Coal Authority. A robust governance system defines the roles and responsibilities, funding principles and prioritisation criteria for including projects in the WAMM programme. If the target is adopted, these would be updated to reflect this. The existing modest programme of interventions would be significantly accelerated by implementing the target, delivering a step-change in environmental and economic benefits. The target would lead to the construction of mine water treatment schemes and other remedial interventions which directly limit the inputs of metals that pollute rivers.

How they offer value for money

This target has been assessed to be cost-beneficial. The main source of funding would be through government spending decisions, used to fund existing and new projects.

Where the systems interactions exist

Healthy water bodies are an essential ecosystem for thriving biodiversity. Metal pollution can cause severe harm to fish and river flies, impacting biodiversity and the resilience of aquatic ecosystems.

Elevated metal concentrations in mine wastes and soils enable priority habitats such as metal tolerant calaminarian plants to flourish, but these contaminated soils also contribute to metal pollution in rivers. Some remedial interventions include planting calaminarian vegetation which limits the mobilisation of metals, increases biodiversity, and captures carbon in soils.

Rivers act as conduits for plastics as well as nutrients, sediments, and a wide range of other persistent and emerging contaminants to coastal waters and the ocean. Up to half the metals entering rivers are discharged by abandoned mines and so by taking action to achieve the abandoned metal mines target, we will reduce pollutant loads flowing into marine waters and accumulating in estuarine and marine sediments. In some estuaries, significant economic activity (fisheries and shipping) is threatened due to difficulties in managing metal-contaminated sediments and so this target supports the levelling up agenda.

Taking action to address pollution from abandoned metal mines will have positive benefits for the local aquatic ecology and support the delivery of biodiversity targets. In addition to water quality benefits, many interventions include carbon sequestration in soils, enhance priority plant habitats and tree planting, delivering wider

environmental benefits with nature-based solutions. It could also have positive downstream effects on marine ecology.

How they are resilient to change and will last the test of time and potential future opportunities and risks

The current WAMM programme already has robust governance, with sites in operation from 2014 that have improved ~100km of rivers and prevents 140 tonnes of the target substances entering rivers each year. Future implementation would be periodically reviewed, allowing future opportunities (e.g., technology improvements) to be incorporated, as well as alterations in response to emerging risks (e.g., climate change effects).

Nutrient target: from agriculture

Target metrics and measurability, including information on target indicators and limitations

We will assess progress against this target through modelling (with input variables of land use and livestock data, farm nutrient management practices and uptake of regulatory and voluntary land management measures to reduce nutrient and sediment loss) which will then be verified by targeted water quality monitoring to measure the agricultural load of nitrogen, phosphorus, and sediment to rivers.

Target ambition

The proposed target is to reduce the loads of nitrogen, phosphorus, and sediment pollution from agriculture to the water environment by 40% by 2037. Modelling undertaken for us by ADAS in 2019¹⁰ suggested that between 25 and 30% reductions in nitrate and phosphorus pollution were possible through 85% minimum uptake of a range of mitigation measures in the FARMSCOPER model coupled with some targeted land use changes that converted some potentially higher risk land areas (e.g., slopes adjacent to watercourses) to lower risk uses. The 40% ambition will be achieved by going further, for example through further targeted habitat creation, coupled with developments in agri-technology.

Summary of desirability, feasibility, and viability

This target is desirable as pollution from agriculture and rural areas is responsible for approximately 40% of Reasons for Not Achieving Good Status (RNAG) failures

¹⁰<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=20001&FromSearch=Y&Publisher=1&SearchText=WT1594&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>

under the Water Environment Regulations¹¹. The inclusion of sediments alongside nitrogen and phosphorus is important as it is a widespread source and conveyor of pollutants.

Expert input/ advice

We set up a Water Expert Advisory Group (WEAG) consisting of independent academic and industry experts to advise and help us in development of the targets. The WEAG have had focussed discussions on each target including on our suggested metric or indicator and our approach to the cost benefit analysis for each target.

Policy scenarios and options

Delivering the target will use and build on existing policies and initiatives. Defra's policy approach for tackling water pollution from agriculture relies on a mix of regulatory, advice and incentive-based actions. Alongside this, a number of industry initiatives, often working in partnership with government schemes, support farmers and others to reduce water pollution.

Existing regulations are a combination of: baseline regulations that apply to all farms (e.g. The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018, known as the Farming Rules for Water); spatially targeted regulation (e.g. Nitrates Action Programme); and sector targeted (e.g. The Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010). Improving compliance with these regulations will be needed to achieve our targets, through clear advice, monitoring and enforcement.

The Catchment Sensitive Farming Partnership between Natural England and the EA delivers targeted advice and help to farmers to apply to Countrywide Stewardship and scheme applications to implement better practices. Since 2006, CSF has worked with around 20,000 farms and helped farmers achieve reductions in agricultural pollutants - with nitrogen levels down by 4%, phosphorus levels down by 8% and a 12.3% reduction in sediment.

We are currently rolling out our new environmental land management schemes (including the Sustainable Farming Incentive, Local Nature Recovery and Landscape Recovery), which will support the delivery of this target by rewarding farmers for actions to help sustainably manage their nutrients and create new habitat. Schemes will be open to all and will be kept flexible so that farmers can choose the actions that will best deliver environmental benefits on their land.

¹¹ The Water Framework Directive was transposed into domestic legislation under The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, referred to in this document as the Water Environment Regulations. Available at: <https://www.legislation.gov.uk/ukxi/2017/407/contents/made>.

How they offer value for money

Grants and incentives through the three new environmental land management schemes (Sustainable Farming Incentive, Local Nature Recovery and Landscape Recovery) will provide financial support for habitat creation and pollution mitigation measures. The target should drive improved nutrient use efficiency and a focus on a circular nutrient economy which will help reduce input costs and encourage uptake of cost-effective solutions such as better utilisation of manures and less reliance on artificial fertilisers.

The environmental benefits arise from the reduction of pollutant emissions to water, and therefore the improvement to water quality, as well as wider environmental benefits to soil health, biodiversity and air quality from the establishment of new habitats and improved connectivity between them. The benefits of the environmental improvements outweigh the costs, and this increases over time, as described in the impact assessment for these targets.

Where the systems interactions exist:

Rivers act as conduits for plastics as well as nutrients, sediments, and a wide range of other persistent and emerging contaminants to coastal waters and the ocean. By taking action to achieve our water targets and reduce the presence of pollutants in inland waters, we will reduce pollutant loads flowing into marine waters.

Healthy water bodies are an essential ecosystem for thriving biodiversity. The water targets will improve these habitats and play a vital role in progressing towards our ambitions for biodiversity. There are also opportunities to use methods for restoring water bodies that will provide benefits for nature and biodiversity through their implementation, such as by increasing the amount and connectivity of habitats.

There could also be significant co-benefits to both air quality and reducing greenhouse gas emissions from agriculture as increased nutrient use efficiency, reduced losses of nitrogen fertilisers and better slurry and manure management could all lead to reductions in ammonia and nitrous oxide emissions.

Many of the measures farmers can take to reduce nutrient pollution will also have significant positive impacts on soil health and may help store more carbon in agricultural soils.

How they are resilient to change and will last the test of time and potential future opportunities and risks

There are a variety of different policies which could contribute to the delivery of the target, alongside improvements the industry itself is likely to make to practices that reduce pollution, such as by improving nutrient use efficiency and retaining soil and

water in fields. There are also a range of factors that will make delivering the target more challenging, including climate change and population growth.

It will be crucial to assess uptake of these initiatives over time to ensure progress and a focused effort on addressing nutrient and sediment pollution and respond to changes over time.

Nutrient target: from wastewater

Target metrics and measurability, including information on target indicators and limitations

We have proposed a target for a reduction in phosphorus loads from wastewater treatment. Progress against the target will be measured through industry reported data which will be published by the Environment Agency (EA). We will also be able to evaluate the combined impact of our agriculture and wastewater targets by monitoring the long-term trends in phosphorus and nitrogen concentrations in water bodies.

Target ambition

The proposed phosphorus target sets an ambition of reducing phosphorus from water company wastewater treatment by 80% by 2037 against a 2020 baseline.

Summary of desirability, feasibility, and viability

A phosphorus reduction target for the water industry is desirable as phosphorus is the most common reason a water body fails to achieve good status and the water industry is the biggest source of phosphorus pollution in the water environment, negatively impact the water environment (e.g. through eutrophication). The phosphorus target is deemed to be feasible and viable based on existing technologies and water companies' current planned phosphorus reduction programmes.

Expert input/ advice

We set up a Water Expert Advisory Group (WEAG) consisting of independent academic and industry experts to advise and help us in development of the targets. The WEAG have met to have focussed discussions on each target including on our suggested metric or indicator and our approach to the cost benefit analysis for each target.

Policy scenarios and options

Water companies have committed to reducing phosphorus loads from wastewater treatment by 50% by 2027 against a 2020 baseline. We are creating a more ambitious, long-term target for water companies to reduce phosphorus by 80% by 2037. Beyond 2027, we are assuming that a number of wastewater treatment works serving a population greater than 2,000 will have phosphorus reduction to current Technically Acceptable Limit (TAL) of 0.25 mg/l. This is tightest limit that the EA currently permit at if they are not already at TAL. The EA will manage and monitor water company permits to enforce these phosphorus levels.

How they offer value for money

The wastewater targets would largely be delivered through water company investment, funded through consumer bills. Through the five yearly price review process Ofwat ensures that investment is efficient and supported by customers. Initial estimates for the phosphorus target show it is cost-beneficial, however we will keep this under review as the delivery pathway is clarified.

Where the systems interactions exist

Healthy water bodies are an essential ecosystem for thriving biodiversity. Treated wastewater is the largest source of phosphorus in the water environment. Reducing phosphorus from wastewater treatment will help to improve water quality and contribute to restoration of habitats affected by eutrophication, providing a link with the proposed wider habitats target. There are also opportunities to use methods for restoring water bodies that will provide additional benefits for nature and biodiversity through their implementation.

Rivers act as conduits for plastics as well as nutrients, sediments, and a wide range of other persistent and emerging contaminants to coastal waters and the ocean. By taking action to achieve our water targets and reduce the presence of pollutants in inland waters, we will reduce pollutant loads flowing into marine waters.

There are links between this target and our net zero goals. Reducing phosphorus concentrations further could increase the carbon intensity of certain wastewater treatment processes, and nature-based solutions may sequester carbon in wetlands but create new methane sources, so the overall impact is uncertain.

How they are resilient to change and will last the test of time and potential future opportunities and risks

The phosphorus target level of ambition has accounted for population growth and future development. The target may drive innovation of new technologies for wastewater treatment, that enable phosphorus recovery. Currently these processes

are significantly more expensive than chemical treatment. There is a risk of increased carbon emissions from the wastewater treatment process as water companies have to increase the amount of treatment to remove phosphorus.

Water demand target

Target metrics and measurability, including information on target indicators and limitations

Progress against the water demand target will be measured through Distribution Input over population (DI/Pop). Distribution Input (DI) is an industry reported and published measure of the number of megalitres per day of water delivered into the public supply by water companies. This includes household and non-household consumption and all leakage.

We then divide the DI by population to measure input against the pressures of population change. This enables comparison between the progress over years to achieve a reduction in water demand and allows comparisons to be made regionally.

Target ambition

We propose a target of reducing the distribution input/population in England by 20% against the 2019/2020 reporting round figures, by the reporting period 2037/38.

Summary of desirability, feasibility, and viability

This target is desirable as sufficient surface and ground water in the environment is essential for protecting and improving biodiversity water quality and wetland habitat. We also need to ensure a sustainable and resilient supply of water in the face of climate change and population growth. It is feasible as government has committed to policies to reduce water demand and achieve this level of ambition in the Written Ministerial Statement on Reducing Demand for Water published in July 2021.

Expert input/ advice

We set up a Water Expert Advisory Group (WEAG) consisting of independent academic and industry experts to advise and help us in development of the targets. The WEAG have met to have focussed discussions on each target including on our suggested metric or indicator and our approach to the cost benefit analysis for each target.

Policy scenarios and options

In July 2021 the government published the Written Ministerial Statement on Reducing Demand for Water. This includes the policies required to achieve the stated level of ambition for the water demand target. The policies include: water companies taking a consistent approach to leakage on customers' own pipes; introduction of a mandatory water efficiency label; more widespread adoption of the optional minimum building standard of 110 litres per person per day (l/p/d); a roadmap to greater water efficiency in new developments and retrofits. The target holds government to account for delivering the policies by 2037.

How they offer value for money

The costs of actions to reduce leakage and consumption are modest compared to the avoided costs of the investments otherwise needed to supply projected increases in demand due to population growth, lifestyle trends and climate change. The proposed target involves additional commitments by including (in the DI/population measure) non-household consumption of public water supply. We have limited information at present about the cost of that to water companies or their non-household customers, but we believe it is likely to be low and, in most cases, to involve customer bill savings through efficiency measures including energy costs.

Where the systems interactions exist

Reducing water demand will help reduce greenhouse gas emissions, e.g. via reduced household energy usage (a significant proportion of which is used to heat water), reduced abstraction, treatment and pumping costs.

This target will also lead to improvements in national resilience to climate change, both societal and environmental. Reduced water demand will reduce the need for abstraction leading to more water remaining in the environment during dry conditions, and adoption of efficient household and non-household water practices will reduce the impact of future droughts.

How they are resilient to change and will last the test of time and potential future opportunities and risks

The proposed metric of DI/pop will take into account population growth projections from the Office for National Statistics. Sustainable water consumption is essential for adapting to the impacts of climate change.

Figure 6: Overview of resource efficiency and waste reduction target development evidence process

