Green Finance Institute

Framework to develop a UK Green Taxonomy for adaptation and resilience

Developed by the Land, Nature and Adapted Systems Advisory Group

Preface

The independent Land, Nature and Adapted Systems (LNAS) Advisory Group has today released its second and final report, outlining a practical framework to support the mobilisation of finance into resilience and adaptation-focused investment.

Even if global temperature rise is limited to 1.5°C above pre-industrial levels, the UK and other nations must contend with more frequent and extreme acute weather events as well as chronic risks from rising sea levels. In the UK, the past year has seen record-breaking weather-related property insurance claims and recent storms have led to multiple deaths, extensive damage to homes, power outages and at times forced the suspension of much of the Great Western Railway network. Overseas, the picture is equally stark. Canada and the U.S. have endured unprecedented wildfire seasons and catastrophic rainfall and flash floods in Spain have claimed hundreds of lives and likely inflicted damage costing billions. The message is clear: no region is immune to climate change and adaptation is essential.

LNAS, spun off from the Green Technical Advisory Group (GTAG), was tasked with advising HM Government on how to develop adaptation and resilience within a UK Green Taxonomy. In its report, LNAS proposes a five-step framework to identify adaptation investments and develop criteria which define their effectiveness in delivering adaptation and resilience outcomes.

In the absence of quantified national adaptation goals, a well-defined, government-backed adaptation taxonomy can help identify and scale effective resilience building solutions. Such a taxonomy can guide financial institutions to better understand physical climate risks and help real economy firms and investors identify and deploy opportunities in adaptation-enabling technologies and solutions—from advanced forecasting tools and water efficient irrigation systems to nature-based solutions. Promisingly, research has shown that the total return from a broad definition of adaptation solutions was 16.3% higher than the market.

Adaptation is a necessity. By clarifying what qualifies as an adaptation and resilience-enabling investment, a UK Green Taxonomy can give financial institutions the confidence and guidance they need to invest at the scale and speed these challenges demand.

To date no country has yet developed an adaptation taxonomy that starts with the outcome we need to see – which is a real economy adapted to the climate change that is already here and yet to come. The first principles-based approach described in this paper aims to do just that, providing a framework to support the mobilisation of finance into resilience and adaptation-focused investment.

Dr Robert Bradburne
Chair, LNAS Advisory Group and Chief Scientist, Environment Agency

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Glossary

Adaptation	In human systems, adaptation is the process of adjusting to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, adaptation is the process of adjusting to the actual climate and its effects; human intervention may facilitate adjustment to the expected climate and its effects (IPPC, AR6).
Adaptation and resilience goal	An adaptation and resilience (A&R) goal provides a headline ambition, analogous to net zero by 2050. A headline goal related to adaptation could be that "the UK will be a climate-resilient society, fully adapted to the unavoidable impacts of climate change by 2050."
Adaptation and resilience target	Adaptation and resilience (A&R) targets are specific, measurable objectives to achieve an A&R goal. These targets are designed to guide actions and track progress toward delivering the A&R goal. For example "by 2030, 100% of new builds will be designed to withstand expected and projected flooding through to at least 2050" or "by 2030, transmission and distribution grids' resilience to extreme events is increased and flexibility is enhanced to accommodate varying daily, seasonal, and interannual patterns of demand."
Adaptation and resilience metric	Adaptation and resilience (A&R) metrics measure the effectiveness of action taken to achieve the target. An example A&R metric could be "the number of new buildings designed to be resilient to a 1 in 200 flood event."
Adapted activities	Activities that are adapted through adaptation measures, actions or solutions that minimise the direct impact of hazards and physical climate risks to the asset or activity by directly responding to the climate change impacts (e.g. renovating existing buildings to the risk of occupants overheating). In this situation, adaptation is not the primary objective of the economic activity. There could be another primary objective, and adaptation is mainstreamed or adaptation could be one of several objectives.
Adaptation measures	An adapting measure is a measure that makes the activity in which it is implemented more climate resilient, such as the use of heat-resistant materials in buildings.
Climate Bonds Initiative (CBI)	Climate Bonds Initiative is an international organisation working to mobilise global capital for climate action, through the development of the Climate Bonds Standard and Certification Scheme, policy engagement and market intelligence work.
Climate Change Committee (CCC)	The Climate Change Committee (CCC) is an independent, statutory body established under the Climate Change Act 2008. They advise the UK and devolved governments on emissions targets and adapting to climate change. This includes reports to Parliament on progress made in reducing greenhouse gas emissions and preparing for and adapting to the impacts of climate change.
Climate Financial Risk Forum (CFRF) Adaptation Working Group	The Climate Financial Risk Forum (CFRF) is an industry forum jointly convened by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA). Established in 2019, the CFRF aims to build capacity and share best practices across the financial sector to address the financial risks posed by climate change. The CFRF includes several working groups, one of which is the Adaptation Working Group.

Climate impacts	The consequences of realised risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services) and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial (IPPC, AR6).
Climate risk	The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species. The equation for calculating climate risk is given by the IPCC as: Climate Risk = Hazard x Vulnerability x Exposure (IPPC, AR6).
Climate risk and vulnerability assessment	Climate risk and vulnerability assessments are tools used to evaluate the potential impacts of climate change on systems, resources and economic activities. Climate risk assessment often includes hazard identification, exposure analysis and impact assessments. Vulnerability assessments can include sensitivity analysis and analysis of adaptive capacity.
Economic activities	An economic activity refers to the actions and processes involved in producing, buying and selling goods and services. An adaptation-focused economic activity would be the installation and maintenance of green roofs on buildings.
Enabling adaptation activities	Activities that have a substantial potential to reduce climate change impacts or increase the resilience to climate change of other economic activities, people, nature and assets. In this situation, adaptation is the primary objective of the activity.
Enabling Type 1: Dedicated adaptation activities	Activities that directly reduce material physical climate risks or their associated adverse impacts on other people, nature, physical assets, or other economic activities (e.g. constructing coastal defences to protect communities, businesses, and infrastructure from increasing flood risk and the manufacturing and/or installation of adaptation measures e.g. drip irrigation equipment).
Enabling Type 2: Addressing systemic barriers to adaptation	Activities that address barriers to adaptation. This includes activities that remove information, technological, capacity and/or financial barriers to adaptation by others (e.g. high-resolution weather and seasonal forecasting models for crop growing).
Environmental Change Institute (ECI)	The Environmental Change Institute (ECI) is part of the University of Oxford and has been active since 1991. It focuses on interdisciplinary research to understand and respond to global environmental changes. Their work spans various areas, including climate, ecosystems, energy, food, water, and health.
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected (IPPC, AR6).

Global Goal on Adaptation (GGA)	The Global Goal on Adaptation (GGA), established in 2015 and operationalised under the UAE Framework for Global Climate Resilience in 2023, is a collective commitment under Article 7.1 of the Paris Agreement aimed at "enhancing [the world's] adaptive capacity, strengthening resilience and reducing vulnerability to climate change."
Green taxonomy	A green taxonomy is a classification system, that defines which economic activities and assets as environmentally sustainable. It can provide clarity for companies, capital markets and policymakers and can serve as a screening tool to support investment flows into those activities.
Greenwashing	Greenwashing refers to the practice of making misleading or deceptive claims about the environmental benefits of a product, service, or company's practices.
Green Technical Advisory Group (GTAG)	The Green Technical Advisory Group (GTAG) was an expert group, chaired by the GFI, made up of key financial market stakeholders and subject matter experts. Its advice is considered as an input to the UK Government's taxonomy development process. The role of the GTAG was to provide non-binding advice to HM Treasury.
Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPPC, AR6).
Maladaptive actions (Maladaptation)	Actions that may lead to an increased risk of adverse climate-related outcomes, including increased greenhouse gas (GHG) emissions, increased vulnerability to climate change, or diminished welfare, now or in the future. Maladaptation is usually an unintended consequence (IPPC, AR6).
Met Office UK Climate Projections (UKCP)	The UK Climate Projections (UKCP), developed by the Met Office, provides detailed information on how the UK's climate may change in the future. The UKCP offers probabilistic estimates of different future climate outcomes. Their projections cover a range of climate variables, including temperature, precipitation and sea-level rise and include data at various resolutions, from local (2.2 km) to global (60 km), allowing for detailed regional analysis.
Resilience	The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding to or reorganising in ways that maintain their essential function, identity, and structure. Resilience is a positive attribute when it maintains the capacity for adaptation, learning and/or transformation (IPPC, AR6). In the context of the taxonomy, resilience refers to the ability of economic activities to adapt to and recover from environmental and climate-related stresses and shocks.
Smith School of Enterprise and the Environment (SSEE)	The Smith School of Enterprise and the Environment (SSEE) is part of the University of Oxford. It focuses on addressing climate change and promoting environmental sustainability through research, teaching, and partnerships with businesses and enterprises.
Sovereign bonds	A sovereign bond is a debt security issued by a national government to raise money for its operations, pay down old debt, pay interest on current debt, and for any other government spending needs.

Shared Socioeconomic Pathways (SSPs)	Shared Socioeconomic Pathways (SSPs) are a set of five alternative socio-economic futures, which factor in education, population, technology etc. in the absence of climate policy intervention. SSPs comprise sustainable development (SSP1), middle-of-the-road development (SSP2) regional rivalry (SSP3), inequality (SSP4) and fossil-fuelled development (SSP5). The combination of SSP-based socio-economic scenarios and Representative Concentration Pathway (RCP)-based climate projections provides an integrative frame for climate impact and policy analysis.
Technical screening criteria (TSC)	The technical screening criteria are a set of quantitative and qualitative metrics and thresholds used to evaluate whether an economic activity can be considered environmentally sustainable under the UK Green Taxonomy.
Tailwind Taxonomy for Adaptation and Resilience Investments	This framework is designed to help investors identify and support projects and companies focused on climate adaptation and resilience. Their taxonomy categorises over 400 examples of investable solutions, financial instruments and philanthropic interventions across 8 themes.
UK Standard Industrial Classification (SIC) codes	Standard Industrial Classification (SIC) codes are used to classify the business activity of companies in the UK. The current UK SIC system consists of 5 digits, categorising companies into 21 sections (A to U). The classification is hierarchical, breaking down into divisions, groups, classes, and subclasses.
UK Climate Change Risk Assessment (CCRA)	Independent assessment of UK Climate Risk which set out the priority climate change risks and opportunities for the UK, and the proposals and policies for adapting to climate change. CCRA3 (2021) outlines the latest understanding of current and future climate change in the UK and an assessment of 61 risks and opportunities grouped into 5 categories: natural environment and assets, infrastructure, health, communities and the built environment, business and industry, and international dimensions. The CCRA4, due to be published in 2026, will comprise a technical report which builds on the foundations of the CCRA3.
UK Infrastructure Bank (UKIB)	The UK Infrastructure Bank (UKIB) is a state-owned development bank in the UK, established to support the government's goals of achieving net-zero carbon emissions by 2050 and promoting regional and local economic growth.
UK National Adaptation Programme (NAP)	The UK's National Adaptation Programmes (NAPs) set the actions that the government authorities will take to adapt to the impacts of climate change in the UK. The latest National Adaptation Programme (NAP3) sets out the key actions for 2023 to 2028. This report forms part of the 5-yearly cycle of requirements under the Climate Change Act 2008.
UK National Infrastructure Assessment	a National Infrastructure Assessment which analyses the UK's long term economic infrastructure needs. The second National Infrastructure Assessment (NIA2), published in 2023, provides the latest assessment for delivering resilience for the UK's economic infrastructure based on a 30-year time horizon.
UNDRR-Climate Bonds Initiative Climate Resilience Classification Framework	The United Nations Office for Disaster Risk Reduction (UNDRR), together with the Climate Bonds Initiative (CBI), has produced a blueprint for the development of a climate resilience classification framework. They developed the "Resilience Taxonomy White Paper" to guide the creation of a taxonomy for adaptation and resilience finance investments.

Executive Summary

As climate change impacts intensify, the UK faces escalating risks across all sectors of its economy.[1] While building a net zero economy remains crucial, adaptation and resilience must be elevated to be parallel priority. Yet, adaptation investment continues to lag and current financial frameworks are not mobilising capital at the scale needed.[2]

Green taxonomies have become useful tools for directing capital towards environmentally sustainable economic activities.[3] However, their primary focus on mitigation to date has left the adaptation opportunity underdeveloped.[4] In its 2021 Greening Finance Roadmap, His Majesty's Government (HMG) outlined that the UK Green Taxonomy will follow the same high-level design features employed in the EU Green Taxonomy – including all six environmental objectives.[5] While the EU Taxonomy provides a robust foundation for mitigation, the Green Technical Advisory Group (GTAG) identified key gaps in its adaptation approach, including a process-over-outcomes approach in terms of delivering resilience investment and the omission of important sectors crucial for adaptation, such as agriculture.[6] Without a robust and dedicated emphasis on adaptation, the UK Green Taxonomy risks not catalysing adaptation and resilience-focused investment at the pace and scale the UK needs.

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[1] CCC (2023) Progress Report to Parliament
[2] Globally this now stands at 187 – 359 billion USD per year (UNEP, 2024).
[3] As of June 2024, EU companies already reported €249bn in taxonomy-aligned activities, significantly higher than all of 2023. EC (2024) The EU Taxonomy's uptake on the ground.
[4] In the absence of government backed adaptation focused taxonomies, others including academia, non-proft organisations and the private sector have developed different adaptation taxonomies for a variety of purposes.
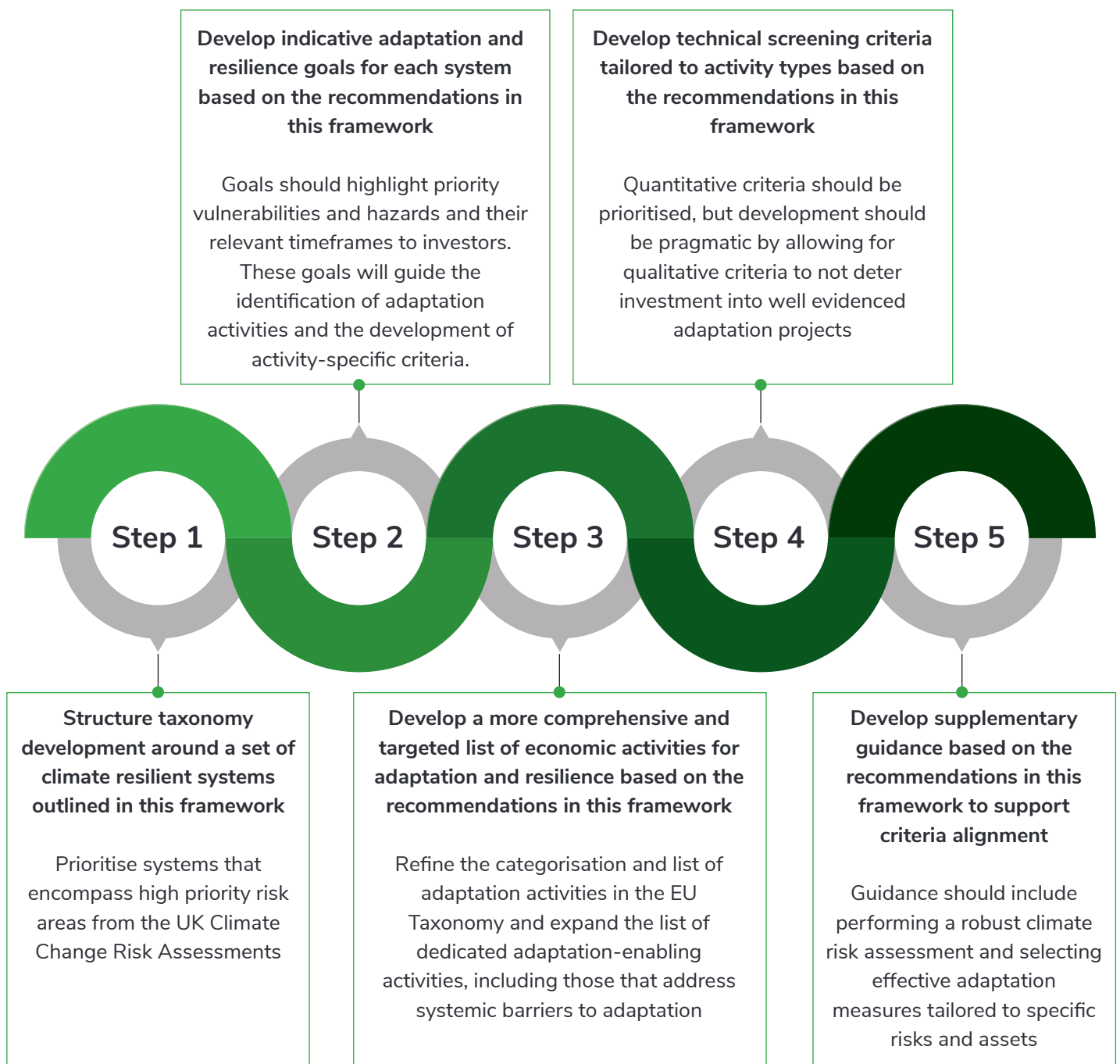[5] HMG (2021) Greening Finance Roadmap
[6] GTAG (2022) Advice on the development of a UK Green Taxonomy

The Land Nature and Adapted Systems (LNAS) Advisory Group has developed a practical framework for HMG to develop an adaptation focused taxonomy, supported by real-world use cases that demonstrate its potential. A government-backed adaptation taxonomy can provide clarity on climate risks, guide capital toward resilience-focused activities and improve investor confidence to support the delivery of a resilient UK economy.

A five-step framework for an adaptation-focused UK Green Taxonomy

LNAS proposes a five-step framework for HMG to define and expand adaptation and resilience activities and to develop useful adaptation descriptors and metrics to guide investment into impactful adaptation projects.

Figure 1: Overview of LNAS framework

Develop indicative adaptation and resilience goals for each system based on the recommendations in this framework

Goals should highlight priority vulnerabilities and hazards and their relevant timeframes to investors. These goals will guide the identification of adaptation activities and the development of activity-specific criteria.

Develop technical screening criteria tailored to activity types based on the recommendations in this framework

Quantitative criteria should be prioritised, but development should be pragmatic by allowing for qualitative criteria to not deter investment into well evidenced adaptation projects

Step 1 Step 2 Step 3 Step 4 Step 5

Structure taxonomy development around a set of climate resilient systems outlined in this framework

Prioritise systems that encompass high priority risk areas from the UK Climate Change Risk Assessments

Develop a more comprehensive and targeted list of economic activities for adaptation and resilience based on the recommendations in this framework

Refine the categorisation and list of adaptation activities in the EU Taxonomy and expand the list of dedicated adaptation-enabling activities, including those that address systemic barriers to adaptation

Develop supplementary guidance based on the recommendations in this framework to support criteria alignment

Guidance should include performing a robust climate risk assessment and selecting effective adaptation measures tailored to specific risks and assets

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Cities and settlements: a worked example

To illustrate the framework in action, this report includes a worked example focusing on "cities and settlements." This example highlights how the framework can be applied to address critical risks such as heat stress and flooding, providing a practical template for taxonomy development across other systems.

Categories of adaptation activities

Recognising that different types of finance will flow to different types of adaptation, the framework identifies three broad categories of adaptation activities, each with specific criteria options to define effective adaptation:

1. **Adapted Activities:** Activities which integrate adaptation measures, actions or solutions that minimise the direct impact of hazards and physical climate risks to the asset or activity. Criteria should focus on delivering measurable resilience outcomes for priority hazards (e.g. rails are designed to a stress free temperature of 27°C) and be supported by risk assessments and guidance for implementing adaptation measures tailored to specific risks and assets.

2. **Enabling Activities (Type 1):** Activities focused on directly reducing material physical climate risks or their impacts on people, nature, physical assets, or economic activities (e.g. flood defences, urban wetlands, manufacturing of adaptation measures). Criteria should take a pragmatic approach, which demonstrates evidence of their resilience benefits over an appropriate time frame, using either quantitative or qualitative metrics depending on the activity.

3. **Enabling Activities (Type 2):** Activities that address systemic barriers to adaptation, such as improving access to climate data, technologies, or financial and governance resources (e.g. high-resolution weather forecasting models, parametric insurance, citizen engagement). The resilience benefits of these activities are inherently recognised by their inclusion in the taxonomy. Criteria should focus on following best practices, aligning with scientific guidelines and ensuring transparency of any data and modelling used.

Recommended next steps for HMG

To advance this work, LNAS recommends that HMG should:

- Secure the capacity to work with sectoral experts to develop detailed criteria and guidance in line with the five-step framework outlined by LNAS. This task will be easier if undertaken alongside the development of sector-specific adaptation and resilience objectives, targets, and metrics.
- Prioritise the roll out based on the urgency approach employed in the UK Climate Change Risk Assessment and the Committee on Climate Change (CCC) progress reports. This would entail addressing health and productivity risks from increased heat exposure in cities and settlements and tackling risks to agriculture and forestry production from multiple climate hazards.
- Advocate for strengthened development of adaptation in other taxonomies as part of the UK's leadership on green finance and adaptation.

Acknowledgements

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Introduction

This report sets out a framework developed by the Land, Nature and Adapted Systems Advisory Group (LNAS) for His Majesty's Government (HMG) to develop adaptation in a UK Green Taxonomy to support the delivery of a resilient UK economy. The report includes a worked example of the development process to guide HMG in this endeavour.

- This responds to Defra's request for technical guidance on adaptation during the development of a UK Green Taxonomy.
- It is based on the knowledge that there is an adaptation finance gap.
- It builds on the understanding that integration of climate adaptation into green taxonomies is technically complex and that guidance is needed.
- LNAS recognises the value of an adaptation-focused green taxonomy and sees scope to build upon the EU Green Taxonomy, to strengthen adaptation in a UK Green Taxonomy.

The report reflects the consensus view of LNAS and input from Defra throughout the process. The Green Finance Institute (GFI) provided the Secretariat for LNAS, building upon its role as the Secretariat for the Green Technical Advisory Group (GTAG),[7] which first recommended the creation of LNAS.

LNAS was launched in April 2023[8] to provide independent advice to the Department for Environment, Food and Rural Affairs (Defra) on defining environmentally sustainable land use and nature-related economic activities for the UK Green Taxonomy and how to further develop adaption in a UK Green Taxonomy to support the delivery of a resilient UK economy. LNAS was funded to provide expert independent advice to Defra and was first announced in the 2023 Green Finance Strategy.[9]

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[7] GFI, UK Green Taxonomy
[8] GFI (2023) New independent group to advise government on accelerating investment into sustainable UK agriculture and fisheries
[9] HM Government (2023) Green finance strategy.

LNAS included a rotating membership, structured into sector-specific working groups over its 16-month mandate. During Phase 1, the group focused on developing technical screening criteria (TSC) for sustainable agriculture and commercial wild capture fisheries, while Phase 2 focused on developing aquaculture TSC and climate change adaptation.

This report complements LNAS's independent advice to the Defra on developing TSC for sustainable agriculture, commercial wild capture fisheries and fed-based and non-fed aquaculture. The full report and technical annexes are available to download from the GFI.[10]

The need for adaptation and resilience in the UK

The impacts of climate change are becoming increasingly evident in the UK. Recent extreme weather events, such as the 2022 heatwave that saw temperatures breach 40°C for the first time, resulted in nearly 3,000 excess deaths and significant disruptions, from school closures to disrupted healthcare systems.[11] These events, alongside the ongoing risks of flooding, droughts and other hazards, underscore the urgent need for the UK to not only mitigate emissions but also adapt to the inevitable effects of climate change. Even in a scenario where global warming is limited to 1.5°C, adaptation is needed. The UK's third Climate Change Risk Assessment (CCRA3) clearly concluded that action is required across all sectors: agriculture, the natural environment, infrastructure, health, supply chains, water, buildings and small and medium-sized enterprises (SMEs).[12]

Without action, climate-related risks could cost the UK economy billions annually. Flooding already incurs costs of £1.3bn each year to the UK economy[13] and, under current policies, the total cost of climate change damages to the UK are projected to increase from 1.1% of GDP at present to 3.3% by 2050.[14] Beyond avoided losses, adaptation can also present economic benefits; on average, every dollar spent on adaptation this decade could generate 12-dollars in economic returns.[15]

Despite the growing urgency and potential economic gains from early action, there remains a substantial gap in the financing deployed for climate adaptation. While estimates vary, the UK faces an adaptation financing requirement of £5-10 billion annually, from both the public and private sectors.[16] The private sector currently contributes just a small fraction of the needed finance.[17] Several barriers hinder adaptation investment, including a lack of targeted policy, the lack of a standardised classification framework for adaptation investments and activities, perception that adaptation is a lower priority compared to mitigation, limited clarity on revenue streams and benefits - and therefore on returns of investment – for adaptation projects.[18]

A UK Green Taxonomy can prove a useful tool to address some of these barriers and the CCC and others have recommended the need for an effective adaptation-focused taxonomy in the UK (see box 1: Calls for a UK Adaptation-focused taxonomy - expert and advisory body recommendations)[19][20][21]

[10] GFI (n.d.) LNAS Advisory Group
[11] SSEE, ECI, GFI (2023) Mission Climate Ready: Unleashing finance and investment for a prosperous Climate Ready Economy
[12] CCC (2022) UK Climate Risk Independent Assessment (CCRA3)
[13] Environment Agency (2018) The costs of the winter 2015 to 2016 floods. Bristol: UK Government Environment Agency.
[14] Rising et al. (2022) What will climate change cost the UK? A study of climate risks, impacts and mitigation for the net-zero transition
[15] Standard Chartered (2023) The case for early action on climate adaptation
[16] SSEE, ECI, GFI (2023) Mission Climate Ready: Unleashing finance and investment for a prosperous Climate Ready Economy
[17] BCG, GRP, USAID (2023) From Risk to Reward: The Business Imperative to Finance Climate Adaptation and Resilience
[18] It's important to note that while private sector investment is essential, it cannot fully address public adaptation needs and should not be seen as a replacement for the government's societal adaptation gap, but as complementary.
[19] CCC (2023) Investment for a well-adapted UK
[20] SSEE, ECI, GFI (2033) Mission Climate Ready: Unleashing finance and investment for a prosperous Climate Ready Economy
[21] FCA, CFRF (2024) Mobilising adaptation finance to build resilience

Box 1: Calls for a UK Adaptation-focused taxonomy – expert and advisory body recommendations

"The UK government should set out steps to ensure that the Green Taxonomy is effective in improving our understanding of adaptation investment needs, directing finance towards adaptation and ensuring that regulators and auditors have the necessary expertise to monitor the quality of reporting and provide incentives for organisations to report on their adaptation actions."
Climate Change Committee (CCC), 'Investment for a well-adapted UK' (2023)

"The Green Technical Advisory Group (GTAG) highlighted that the EU green taxonomy did not sufficiently focus on describing how to make infrastructure assets resilient to a changing climate. It also missed important sectors crucial for adaptation, such as agriculture. [...] The UK government should continue the work started by the Land Use Nature and Adapted Systems (LNAS) Advisory Group to develop a UK adaptation-focused taxonomy"
Climate Financial Risk Forum Adaptation Working Group (CFRF AWG), 'Mobilising adaptation finance to build resilience' (2024)

"Adaptation should be fully integrated within the UK Green Taxonomy, drawing upon the work of the Green Technical Advisory Group (GTAG), the LNAS Advisory Group and the transition plan taskforce (TPT)."
Smith School of Enterprise and the Environment, University of Oxford, 'Mission Climate-Ready: Unleashing finance and investment' (2023)

How can an adaptation taxonomy support the delivery of adaptation and resilience in the UK

The value of adaptation in a UK Green Taxonomy

The below provides LNAS's views on how a government-backed adaptation taxonomy can prove a useful tool in mobilising capital towards adaptation and resilience in the UK. A taxonomy can help achieve this by creating transparency on climate risks to assets and activities and by guiding investments towards economic activities that deliver adaptation and resilience.

1. **Provide a government-backed standardised framework for the market:** A government-backed adaptation taxonomy can offer a standardised classification framework for the market amongst the varied interpretations of adaptation and resilience taxonomies developed by non-state actors, which often lack activity-specific criteria. This standardisation can reduce market fragmentation and foster market confidence to reduce greenwashing and guide sustainable finance towards credible adaptation activities.

2. **Encourage adaptation considerations alongside mitigation:** Historically financial institutions, corporates and government have prioritised mitigation over adaptation. Introducing the adaptation taxonomy alongside mitigation actively encourages these actors to integrate adaptation considerations into their decision-making processes and to consider the adaptation side of a specific sector on an equal footing. If the UK government introduces mandatory adoption of the taxonomy,[22] this can support mainstreaming climate adaptation into investment decisions.

3. **Provide a more comprehensive list of adaptation activities and investments:** By building a rich and well-defined list of eligible adaptation activities and investments, the UK Green Taxonomy can signal to the market that a wide range of investments and activities can contribute to UK adaptation and resilience (A&R). This includes both climate proofing existing and new assets and economic activities which enable wider adaptation and resilience.

4. **Defining good adaptation at an asset level within a systems-wide context:** The taxonomy can provide criteria for what constitutes good adaptation at the asset level, providing financial institutions with guidance to make informed investment decisions. By developing these asset-level definitions within broader systems (e.g. cities and settlements, infrastructure), the taxonomy can support individual asset adaptations that contribute to resilience at the system-wide level.

5. **Facilitate investment into public goods:** Public goods, including primary adaptation solutions like flood defences and those where adaptation is a secondary benefit, such as wetland restoration, often face underinvestment due to revenue streams and benefits - and therefore returns of investment - being unclear. By identifying and defining these activities within the taxonomy, with a focus on their high value for climate adaptation and resilience, the taxonomy can support public sector entities and public-private initiatives to identify projects suitable for green financing instruments (green gilts, green bonds, blended finance solutions etc.).

Ultimately a standardised classification framework for A&R economic activities defined through robust and evidence-based criteria and backed by government can foster market confidence and encourage greater investment in activities that support the UK's transition to a resilient economy.

Use cases for a UK Adaptation Taxonomy

Adaptation taxonomies can offer different applications, as outlined in Martín et al.'s (2024) analysis of existing adaptation taxonomies.[23] For firms and investors, they are used to guide them on what type of activities can be considered adaptation-aligned for reporting, corporate strategy and investment decisions. On the governmental and regulatory front, adaptation taxonomies can support the issuance of sovereign bonds, enable tracking of adaptation finance and contribute to improved standards for disclosure and reporting.

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[22] In its 2023 Green Finance Strategy, the UK government committed to at least a two-year voluntary period for companies before exploring mandatory disclosures: HM Government (2023) Mobilising Green Investment

[23] Martín et al. (2024) The (in)coherence of adaptation taxonomies

Building on GTAG's advice on the application of a UK Green Taxonomy[24] and its value case in supporting wider policy areas,[25] the following use cases illustrate practical applications across different actors—from private sector investments and company reporting to public sector initiatives and financial tracking.

- **Guiding sustainable finance in the private sector:** The finance sector typically draws on taxonomies when creating sustainable finance frameworks, or similar tools. These are used to classify where financing should be classed as sustainable, which in turn is often used to underpin targets for reaching higher levels of sustainable financing and/or determining what activities attract preferential borrowing terms, including discounted rates. Effective inclusion of adaptation activities in the UK taxonomy means these activities are more likely to benefit from preferential rates and terms, in line with mitigation and other sustainable activities. Success in this use case requires sufficient clarity, simplicity and a low administrative burden to confidently demonstrate compliance.

- **Tracking adaptation finance flows:** A well-defined adaptation taxonomy can help improve the tracking of public and private sector flows of adaptation finance. By providing clear definitions and classifications of adaptation activities, the taxonomy can enable more accurate monitoring of where and how funds are allocated. This improved tracking can help identify gaps between current financing and the UK's adaptation needs, informing policy and investment decisions.

- **Guiding the issuance of a UK adaptation bond:** Building on the success of UK green gilts and following recommendations from the GTAG, HM Treasury and the Debt Management Office can use the UK Green Taxonomy as a framework for issuing the UK's first dedicated adaptation bond:
  - GTAG recommended that the UK Green Taxonomy should guide the use of proceeds for green gilts, with a phased approach until all environmental objectives have been addressed.[26] HMT endorsed this approach in its 2021 Green Finance Framework (GFF), aiming to align green gilt use of proceeds with the UK Green Taxonomy and the GFF already includes flood defences and climate monitoring solutions as examples of eligible green expenditures.[27]
  - The 2023 "Mission Climate Ready" report by the Smith School of Enterprise and the Environment (SSEE), the Green Finance Institute (GFI) and the Environmental Change Institute (ECI) recommended that the UK should issue the world's first dedicated adaptation bond for a G7 country to mobilise resources for government funding and financing from the private sector.[28]
  - The adaptation bond's use of proceeds can be guided by a UK Green Adaptation Taxonomy, which should include and define activity types needed for supporting UK resilience, to ensure that funded projects align with the relevant taxonomy TSC for the eligible activities.

Learning from the EU Green Taxonomy

The EU Green Taxonomy has set a foundational framework for green taxonomies globally. GFI research indicates that approximately 75% of country-led green taxonomies are similar to or based on the EU framework.[29] As set out in GTAG's advice promoting the international interoperability of a UK Green Taxonomy, GTAG recommended the adoption of the same broad concepts, methodologies and metrics as the EU taxonomy where possible, to support the international interoperability of green taxonomies.[30] As such, the EU Green Taxonomy serves as a starting point for developing this framework, where relevant the framework also incorporates elements from additional non-state adaptation taxonomies, such as those developed by the Climate Bonds Initiative (CBI)[31] and Tailwind.[32]

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[24] GFI, GTAG (2023) Advice on the development of a UK Green Taxonomy
[25] GFI, GTAG (2023) Applying the UK Green Taxonomy to wider policies: the value case and options
[26] (ibid)
[27] HM Treasury, UK DMO (2021) UK Government Green Financing Framework
[28] SSEE, ECI, GFI (2033) Mission Climate Ready: Unleashing finance and investment for a prosperous Climate Ready Economy
[29] If removing taxonomies which are in their early stage and/or in discussion.
[30] GFI, GTAG (2023) Promoting the international interoperability of a UK Green Taxonomy
[31] CBI and UNDRR (2023) Designing a climate resilience classification framework to facilitate investment in climate resilience through capital markets
[32] Tailwind (2024) Taxonomy for Adaptation and Resilience Investments

Identified gaps in the EU Green Taxonomy

The EU Green Taxonomy initially focused on identifying activities that substantially contribute to climate change mitigation, with technical screening criteria (TSC) to substantially contribute to climate change adaptation developed for these same activities. As a result, the EU Adaptation Taxonomy in its current form is largely an "adaptation of mitigation activities," in that it primarily focuses on high-carbon sectors such as manufacturing and energy (see Figure 3). While this can encourage adaptation considerations alongside mitigation, this focus has left gaps in addressing vulnerable sectors where adaptation is needed, such as agriculture, as well as economic activities that are primarily focused on adaptation, such as dedicated blue/green infrastructure and financial instruments for adaptation. GFI research indicates that currently, 86% of the EU's Green Taxonomy activities that substantially contribute to adaptation are those identified for mitigation, categorised as "adapted" activities within the EU Green Taxonomy (see Figure 2).

Figure 2: EU economic activities which substantially contribute to climate change adaptation

- ■ Mitigation activities
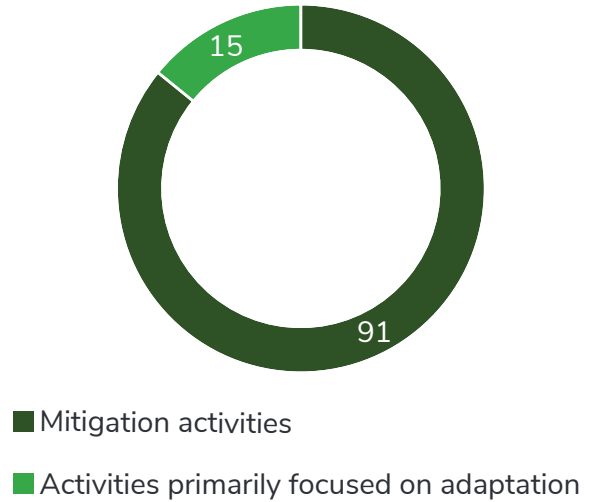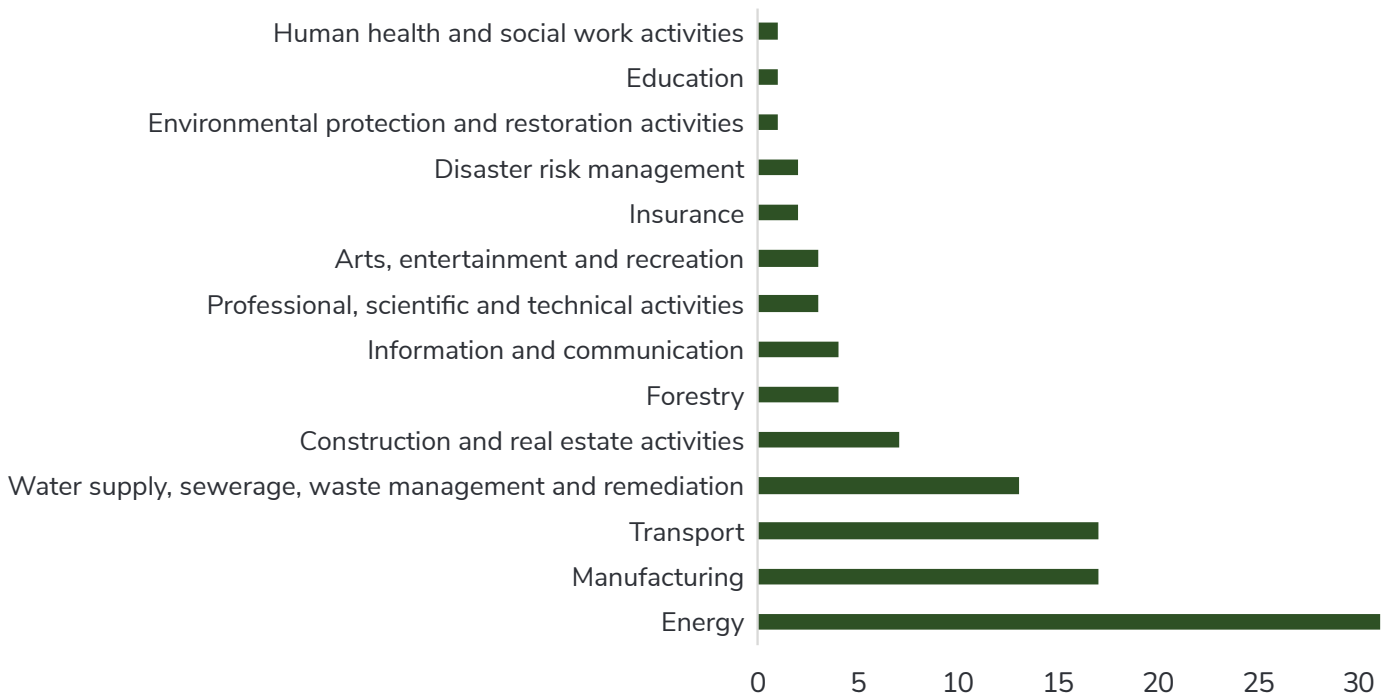- ■ Activities primarily focused on adaptation

Figure 3: Number of EUs substantial contribution to adaptation activities by sector

The TSC developed for these activities primarily rely on process-based requirements that apply generically across sectors. These processes include conducting robust climate risk and vulnerability assessments, implementing adaptation measures that align with key principles, and monitoring effectiveness against "pre-defined indicators." However, without specific thresholds or performance indicators for what constitutes successful adaptation, such criteria can be open to interpretation.

For example, while activities such as the "construction of new buildings" have detailed criteria for climate change mitigation (e.g. threshold to reduce primary energy demand) and for the circular economy (e.g. thresholds for the maximum use of primary raw materials), the adaptation criteria lack specificity in defining what a well-adapted building is.[33] This ambiguity can create challenges in understanding the requirements for alignment with the adaptation objective, potentially leading to underreporting and misinterpretation. This has also led to EU member states and civil society organisations developing their own guidance to support alignment.[34][35] Although the EU's advisory group has highlighted the need to develop more specific criteria to demonstrate resilience benefits, this work has yet to be advanced.[36] To categorise adaptation activities, the EU Taxonomy defines three types, each with its own set of generic criteria. The definitions of the activity types are taken from the EU's platform on sustainable finance (PSF).[37]

1. **"Adapted" activities** – activities, which become adapted to climate change risks in own operations and substantially increase their own resilience to current and projected climate-related disruptions by assessing climate change-related risks to their successful operation and by implementing adaptation actions addressing those risks (see, for example, activity Electricity generation from hydropower).[38] The criteria for adapted activities require:
   a. Conducting a robust climate risk and vulnerability assessment to identify material physical climate risks.
   b. Implementing physical and non-physical adaptation solutions that substantially reduce these identified risks.
   c. Ensuring that adaptation solutions do not adversely affect the resilience of other people, nature, or assets and align with local, regional, or national adaptation plans.
   d. Monitoring the solutions against predefined indicators.

2. **Adaptation "enabling" activities** – activities, which have a significant potential to increase the resilience to climate change of other economic activities, of people, nature and assets. (e.g. activity "Consultancy for physical climate risk management and adaptation).[39] The criteria for enabling activities involve:
   a. Demonstrating, through a climate risk assessment, that the activity provides a service, product, or practice that supports the adaptation of other entities.
   b. Using best practices and state-of-the-art science for vulnerability and risk analysis, aligned with standards such as EN ISO 14090:2019 and ISO 14091:2021.
   c. Ensuring that the activity does not negatively impact the resilience of other people, nature, or assets and is consistent with relevant adaptation strategies.
   d. Monitoring the activity against predefined indicators.

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33 European Commission (2021) Construction of new buildings
34 German Environment Agency (2022) How to perform a robust climate risk and vulnerability assessment for EU taxonomy reporting?
35 Dutch Green Building Council (n.d.) Framework Climate Adaptive Buildings
36 EU Technical Expert Group on Sustainable Finance (2020) p.30 Taxonomy: Final report of the Technical Expert Group on Sustainable Finance
37 EU Platform on Sustainable Finance (2022) p41-42. PSG Supplementary: Methodology and Technical Screening Criteria
38 European Commission (2021) Electricity generation from hydropower
39 European Commission (2021) Consultancy for physical climate risk management and adaptation

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3. **"Adapted-enabling" activities** – activities, which have significant enabling potential, but also need to be adapted to climate risks themselves first and foremost to be able to provide the enabling effect e.g. activity "Afforestation"[40] and "Emergency Services"[41]. The criteria for adapted-enabling activities require:
   a. The same requirements as "Adapted" activities, such as conducting a climate risk and vulnerability assessment and implementing adaptation solutions.
   b. The activity must also demonstrate its enabling benefit, showing how it increases the resilience of other entities or systems. However, the criteria do not specify how this enabling benefit should be measured or evidenced.

All economic activities within the EU Green Taxonomy, which are not substantially contributing to climate change adaptation, must prove that they do no significant harm (DNSH) to climate change adaptation for taxonomy alignment. The DNSH to adaptation criteria applies generically to all activities, which require:

a. Conducting a robust climate risk and vulnerability assessment to identify material physical climate risks.
b. Implementing physical and non-physical adaptation solutions within 5 years, that reduce these risks.
c. An adaptation plan for the implementation of those solutions.

Learnings and opportunities for the UK Green Taxonomy

Based on the gaps identified by the GFI and GTAG in the EU Green Taxonomy, there are opportunities for the UK to improve the adaptation elements in a UK Green taxonomy to better mobilise capital towards adaptation and resilience.

1. **Broaden the scope of adaptation activities made eligible in a UK Green Taxonomy to those where adaptation is most needed.**

Given that the physical effects of climate change are likely to affect the entire scope of the UK economy in one way or another, the UK Green Taxonomy should over time expand beyond the activities primarily mapped to climate change mitigation, to include agriculture, wider UK infrastructure, including, for example, IT, telecoms and adaptation-based retrofitting activities, as well as nature-based solutions and green infrastructure. This will be a significant undertaking but it could align with the general approach employed in the UK Climate Change Risk Assessment (CCRA),[42] prioritising sectors based on urgency and where adaptation could deliver the greatest economic benefits in the near term.

2. **Develop adaptation descriptors and metrics that enable the taxonomy to provide decision-useful data.**

The UK Green Taxonomy could improve upon the EU's process-based approach by developing specific, outcome-focused descriptors and metrics for adaptation activities, as well as providing guidance for conducting robust climate risk and vulnerability assessments. Metrics could be closely tied to organisational and UK climate risk assessments, and the four National Adaptation Programmes by setting measurable adaptation outcomes for identified risks and outlining specific adaptation measures needed for different climate-related risks.

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[40] European Commission (2021) Afforestation
[41] European Commission (2021) Emergency Services
[42] The CCRAs assess the urgency of adapting to UK climate risks and opportunities, considering both the current climate and projected future climates: CCC (2021) Independent Assessment of UK Climate Risk

Land Nature and Adapted Systems (LNAS) Adaptation Working Group

The LNAS Adaptation Working Group ran from February to August 2024 and was composed of experts across the fields of academia, policy, financial services and taxonomy users.

Objectives of the adaptation working group

1. Develop overarching adaptation and resilience goals for priority systems to provide a focal point for investment in climate adaptation.
2. Building on the EU's Green Taxonomy, provide a methodology to broaden the scope of economic activities made eligible under the adaptation substantial contribution objective.
3. Develop principles and options to design adaptation descriptors and metrics that enable the taxonomy to provide decision-useful data.

Guiding principles and general approach

As set out in GTAG's advice on the development of a UK Green Taxonomy, the framework was guided by three core principles, as outlined within the UK Government's Greening Finance: A Roadmap to Sustainable Investing[43] where it states the UK Green Taxonomy should be:

1. **Robust and evidence-based.**
2. **Accessible**
3. **Built for the UK to support a global transition.**

These principles were developed following recommendations from GTAG provided to HM Treasury in 2021, published in the GTAG October 2022 paper.[44]

In addition to the above principles, **fostering international interoperability** was prioritised as an additional principle in the LNAS Advisory Group's framework development process, in recognition of the global activity of UK companies and to support global taxonomy harmonisation efforts. GTAG has published its advice on international interoperability.[45] The development of the adaptation taxonomy should therefore align, where possible, with existing adaptation taxonomies to prevent market fragmentation.

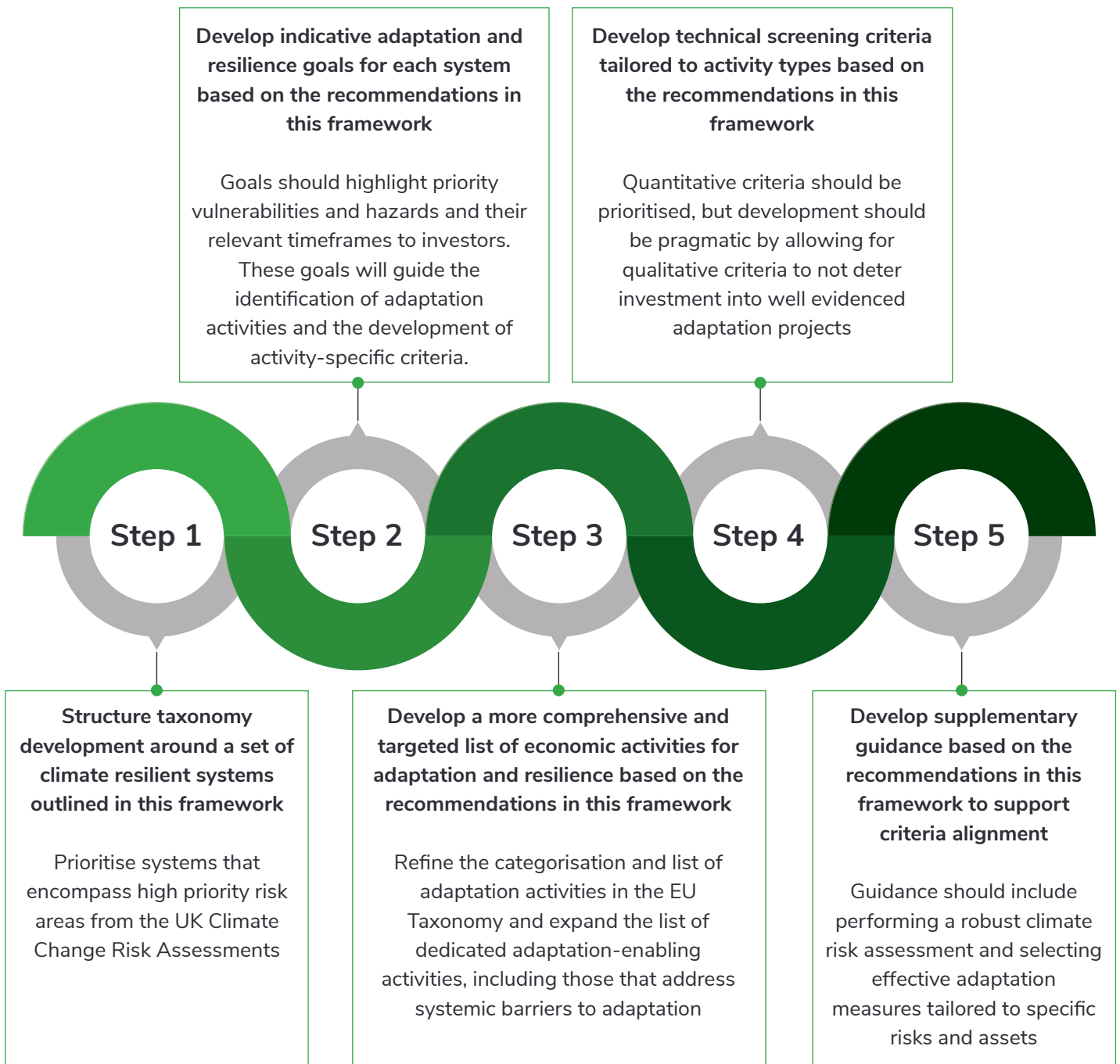
[43] HM Treasury (2021) Greening Finance: A Roadmap to Sustainable Investing
[44] GFI, GTAG (2022) GTAG: Advice on the development of a UK Green Taxonomy
[45] GFI, GTAG (2023) Promoting the international interoperability of a UK Green Taxonomy

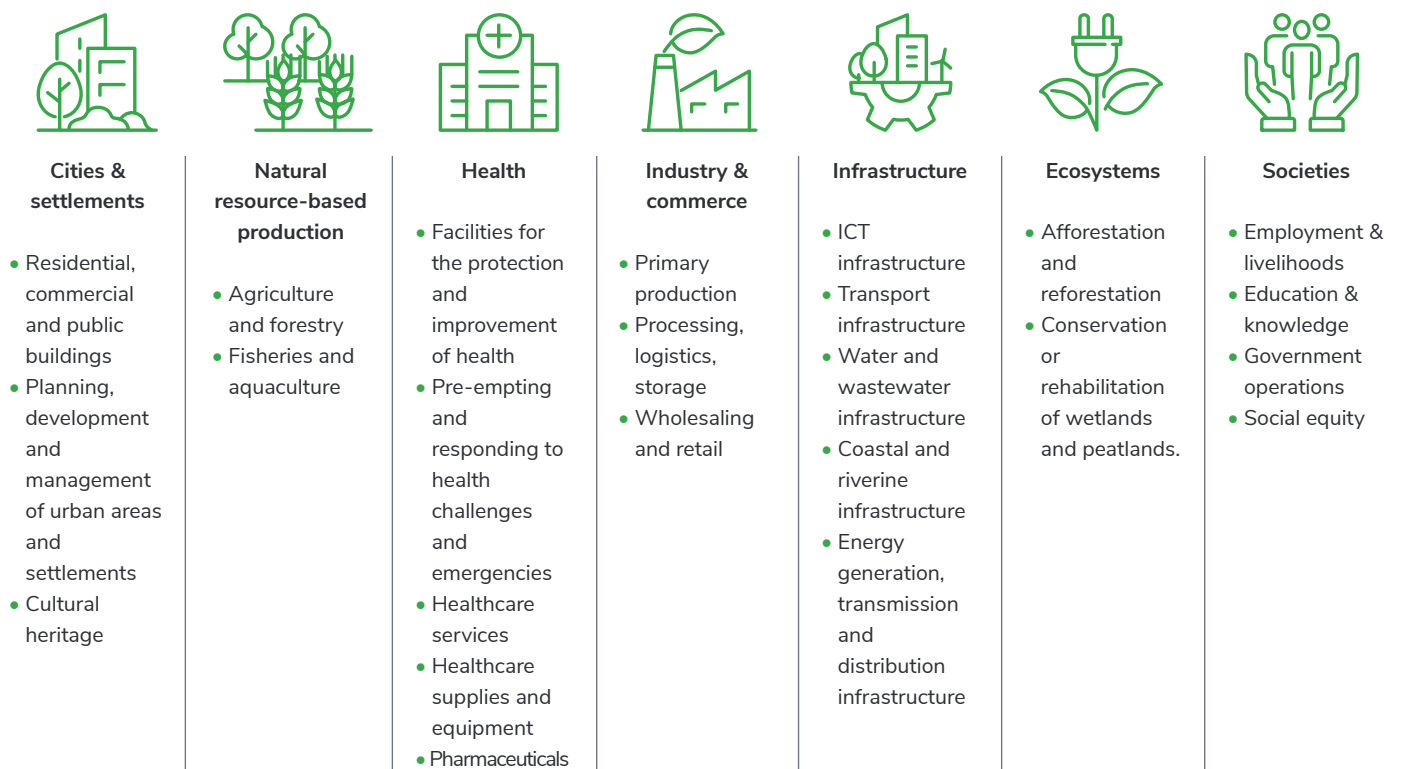# Framework to develop a UK Green Taxonomy for adaptation and resilience

Figure 4: Overview of the LNAS framework

Develop indicative adaptation and resilience goals for each system based on the recommendations in this framework

Goals should highlight priority vulnerabilities and hazards and their relevant timeframes to investors. These goals will guide the identification of adaptation activities and the development of activity-specific criteria.

Develop technical screening criteria tailored to activity types based on the recommendations in this framework

Quantitative criteria should be prioritised, but development should be pragmatic by allowing for qualitative criteria to not deter investment into well evidenced adaptation projects

Step 1   Step 2   Step 3   Step 4   Step 5

Structure taxonomy development around a set of climate resilient systems outlined in this framework

Prioritise systems that encompass high priority risk areas from the UK Climate Change Risk Assessments

Develop a more comprehensive and targeted list of economic activities for adaptation and resilience based on the recommendations in this framework

Refine the categorisation and list of adaptation activities in the EU Taxonomy and expand the list of dedicated adaptation-enabling activities, including those that address systemic barriers to adaptation

Develop supplementary guidance based on the recommendations in this framework to support criteria alignment

Guidance should include performing a robust climate risk assessment and selecting effective adaptation measures tailored to specific risks and assets

1. Structure taxonomy development around a set of climate resilient systems

LNAS recommends that HMG develops the UK adaptation taxonomy around a set of climate resilient systems rather than activities (as for the mitigation taxonomy), with defined sectors and sub-sectors, where investments in climate adaptation and resilience are most needed. To maximise short-term economic benefits and growth, the roll out should draw on the broad urgency approach employed in the UK Climate Change Risk Assessment. This system-level structure should build on existing taxonomies and divide the framework into distinct systems to support resilience across multiple sectors and UK SIC codes.

Figure 5: LNAS recommended framework structure for taxonomy development

Cities & settlements	Natural resource-based production	Health	Industry & commerce	Infrastructure	Ecosystems	Societies
• Residential, commercial and public buildings • Planning, development and management of urban areas and settlements • Cultural heritage	• Agriculture and forestry • Fisheries and aquaculture	• Facilities for the protection and improvement of health • Pre-empting and responding to health challenges and emergencies • Healthcare services • Healthcare supplies and equipment • Pharmaceuticals	• Primary production • Processing, logistics, storage • Wholesaling and retail	• ICT infrastructure • Transport infrastructure • Water and wastewater infrastructure • Coastal and riverine infrastructure • Energy generation, transmission and distribution infrastructure	• Afforestation and reforestation • Conservation or rehabilitation of wetlands and peatlands.	• Employment & livelihoods • Education & knowledge • Government operations • Social equity

Cross cutting themes: Nature-based Solutions such as green/blue urban infrastructure, forest buffers, natural infrastructure; financial and insurance products such as parametric (re)insurance, nature credits, green bonds and catastrophe bonds; intelligence and tools such as satellite imaging, early warning systems, advanced weather monitoring, advanced risk modeling and analytics

Figure 5 sets out LNAS's proposed set of systems, which are designed to be consistent with existing adaptation frameworks:

- Building on the EU's sectoral approach to taxonomy development, adopting a system-level structure can support resilience across multiple sectors and UK SIC codes.
- Structuring the framework into distinct systems — such as "cities & settlements," "natural-resource-based production," and "infrastructure" — allows targeted identification and categorisation of adaptation activities within each system. This can ensure that the taxonomy addresses the unique challenges, opportunities and resilience needs inherent in each system.
- A system-based approach allows for the development of tailored metrics to effectively measure adaptation in each area. For example, in the "natural resource-based production" system, metrics for sectors such as timber and crop production might focus on indicators like productivity or output during extreme weather events. In comparison, the "ecosystems" system could measure adaptation success through ecosystem services provided by activities such as wetland restoration.

- The proposed system structure aligns with adaptation and resilience themes outlined in global adaptation frameworks, such as the UNDRR-Climate Bonds Initiative Climate Resilience Classification Framework and the Tailwind Taxonomy for Adaptation and Resilience Investments, as well as the CCC's Adaptation Monitoring Framework across thirteen themes.[46]

- The structure also integrates cross-cutting themes such as nature-based solutions, innovative financial products and advanced intelligence tools (e.g. satellite imaging, early warning systems), that can address systemic barriers to adaptation. These cross-cutting themes are designed to apply across multiple systems, providing resilience benefits that are not confined to a single system. For example, nature-based solutions (e.g. wetlands for flood management) can enhance resilience in both "ecosystems" and "cities & settlements," while financial instruments for adaptation (e.g. green bonds, insurance products) can be utilised by various sectors in each system to support adaptation investments. These cross-cutting themes should not be seen as separate categories but as complementary components that help achieve resilience objectives across all systems.

- To mobilise capital to flow to the places that need it most, HMG should prioritise the roll out based on the urgency approach employed in the UK Climate Change Risk Assessment and CCC progress reports. This would mean, for example, focusing initially on systems that encompass high priority risk areas, such as "cities and settlements" to address risks to human health, well-being and productivity from increased heat exposure in homes and other buildings, and "natural-resource based production" to address risks to crops, livestock and commercial forestry from multiple climate hazards.[47]

2. Develop indicative adaptation and resilience goals for each system which consider priority hazards

Given that national adaptation targets are yet to be established, LNAS recommends that HMG develop indicative goals, within the taxonomy framework, for each system. These goals should highlight priority vulnerabilities and hazards and their relevant timeframes to investors, providing a clear direction for adaptation and resilience efforts across each system.

- The Global Goal on Adaptation "GGA" (2015) and its operational UAE Framework for Global Climate Resilience (2023)[48] emphasise the importance of setting A&R outcome targets across public and private systems, such as for food and agriculture,[49] human settlements[50] and infrastructure systems.[51] However, these frameworks currently lack sector-specific targets and indicators necessary for tracking progress.[52] While the UNFCCC Subsidiary Body for Scientific and Technological Advice is working to address these gaps, there is still no clear focus on targets for means of implementation, particularly through finance.

- Green taxonomies can help bridge this gap by providing frameworks to track both public and private sector expenditure on adaptation financial flows and by providing metrics that measure how economic activities contribute to adaptation targets. This can make adaptation investment opportunities more actionable and transparent for investors.

- For example, climate mitigation targets, such as the UK's and the EU's Net-Zero by 2050 targets, have guided the development of the EU Green Taxonomy by focusing on activities and criteria that support these targets. Similarly, adaptation targets can guide the identification of eligible economic activities that contribute substantially to A&R, as well as the design of metrics to evaluate their effectiveness.

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[46] CCC (2023) Adaptation Monitoring Framework
[47] CCC (2023) Progress in adapting to climate change
[48] UN and Marrakech Partnership (2023) Implementation Report: Sharm El-Sheikh Adaptation Agenda
[49] For example, 50% of food globally is produced through sustainable agriculture practices (including agroecological & regenerative approaches) by 2030.
[50] For example, US$1 trillion invested in NbS for communities in urban areas by 2030.
[51] For example, transmission and distribution grids' resilience to extreme events is increased and flexibility is enhanced to accommodate varying daily, seasonal, and inter-annual patterns of demand. Global grid investment nearly double by 2030 to over US$600 billion per year, including 359 GW of battery storage capacity.
[52] While the framework lays out 30 overarching 30 global adaptation outcome targets by 2030, these have yet to be quantified which will likely form the negotiators' work to enhance the GGA framework by 2025 at the next COP (COP 30).

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- While the UK, Scottish, Welsh and North Irish governments have outlined high-level policy goals in their national adaptation programmes, they have yet to establish a headline ambition, set sector-specific targets for adaptation and resilience, or clearly define the risk and adaptation ownership across public and private sectors. This should be a priority for future National Adaptation Plans, but in the interim, the government should set non-prescriptive goals for each system within the context of the taxonomy, highlighting priority vulnerabilities and hazards.
- Given the uncertainties in projecting climate responses to various warming scenarios,[53] priority hazards should be identified from a broader range of sources beyond the CCRA, such as the Met Office's UK Climate Projections (UKCP) and observed impacts and trends.

Establishing these system-level goals can help prioritise eligible adaptation activities and direct investment to where it is most needed.

LNAS supports recommendations made by the CCC and others, for the UK government to commit to making the country resilient to climate change by 2030 and outline specific and costed goals and delivery plans for each sector by 2025, and envisaged public/private sector roles. The development of these overarching national goals should be the top priority for the UK government and, will in turn, support the development of system-specific goals set within the taxonomy framework.

Table 1: Examples of system-level adaptation goals and investment opportunities

System	Priority hazards e.g.	Partial adaptation goal examples	Potential investments
Cities & Settlements	Heatwaves, flooding	Reduce risks of overheating for people and flood damage to buildings.	Urban greening, urban cooling technologies (e.g. reflective surfaces), drainage management systems.
Natural resource-based production	Drought, pests and diseases, flooding	Maintain productivity during extreme weather events and acute and chronic disease outbreaks.	Diversified crop systems, water-efficient irrigation, resilient crop varieties, land-based recirculation aquaculture farms, aquaponics.
Infrastructure	Flooding, storm surges, high temperatures, subsidence	Minimise damage and ensure continuity of services.	Raised roadways, reinforced bridges, concrete seawalls, natural and hybrid infrastructure (e.g. constructed wetlands and oyster reefs).
Ecosystems	Flooding	Protect and restore ecosystems to provide natural defences against flooding.	Wetland restoration, reforestation using native species.
Cross-cutting	Multi-hazard	Activities and measures which support resilience objectives across all systems.	Parametric insurance, software enabling physical climate risk management, technical consultancy dedicated to adaptation.

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[53] As illustrated by the unprecedented breach of 40°C in the UK in 2022, despite the UK Climate Change Risk Assessment (CCRA, 2021) projecting a low probability of this occurring by 2040.

3. Develop a more comprehensive and targeted list of economic activities for adaptation

Building on the learnings from the EU Green Taxonomy and the developed adaptation goals, LNAS recommends that HMG should develop a more comprehensive and targeted list of economic activities that can contribute to adaptation and resilience.

3.1. Refine the categorisation of adaptation activities

LNAS recommends refining the EU's categorising of adaptation economic activities within the UK Green Taxonomy, to provide clearer distinctions between enabling types and to provide greater flexibility for the type of technical screening criteria (TSC) applied to each type

Adapted: Activities which are adapted through adaptation measures, actions or solutions which minimise the direct impact of hazards and physical climate risks to the asset or activity by directly responding to the climate change impacts (e.g. renovating existing buildings to the risk of occupants overheating). In this situation, adaptation is not the primary objective of the economic activity. There could be another primary objective (e.g. providing office accommodation or homes), and adaptation is mainstreamed, or adaptation could be one of a number of objectives.

Enabling: Activities which have a substantial potential to reduce climate change impacts or increase the resilience to climate change of other economic activities, people, nature and assets. In this situation, adaptation is the primary objective of the activity. Through at least one of the following:

1. **"Enabling Type 1" Dedicated adaptation activities:** Activities which directly reduce material physical climate risks or their associated adverse impacts on other people, nature, physical assets or other economic activities (such as constructing green and grey coastal defences to protect communities, businesses, and infrastructure from increasing flood risk and the manufacturing and/or installation of adaptation measures e.g. drip irrigation equipment).

2. **"Enabling Type 2" Addressing systemic barriers to adaptation:** Activities which address barriers to adaptation including the removal of – information, technological, capacity, governance and/or financial barriers to adaptation by others (e.g. high-resolution weather and seasonal forecasting models for crop growing). Examples of this activity could include the planning, governance and implementation of coastal retreat or relocation, citizen engagement in flood risk management, changes in urban design and form to address heat, or adaptation pathway thinking for key systems.[54]

It is important to highlight the specific need for Enabling Type 2 activities. When summarised, Enabling Type 2 activities may seem overly complex. However, it is highlighted that there is a large global and domestic gap between the climate risks and impacts, and level of preparedness, which suggests the need for a transformational approach will be required to bridge the gap.[55][56] Much of the scientific literature emphasises the need for these types of Type 2 activities as solutions to address the deep uncertainty unique to adaptation planning and implementation, as well as to address the place and context specific adaptation.[57]

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[54] ClimateReadyClyde (2020) What Does Transformational Adaptation Look Like? See page 27 for examples.
[55] UNEP (2024) Adaptation Gap Report
[56] CCC (2023) Progress in adapting to climate change
[57] IPCC (2022) Climate Change 2022: Impacts, Adaptation and Vulnerability

Differences between the EU categorisation and those recommended by LNAS

LNAS does not recommend including a distinct category for "Adapted-Enabling" activities (e.g. climate-proofed adaptation), as defined by the EU, which requires these activities to first adapt to climate risks themselves before enabling adaptation for others. This requirement can be overly confusing and restrictive for users and may deter investment into projects, such as urban green spaces, which can contribute positively to adaptation and resilience but cannot meet every "adapted" criterion.

Instead, LNAS offers a more detailed breakdown of enabling activities, to distinguish between direct activities which enable adaptation and activities that address broader systemic issues. This dual categorisation can provide greater precision in classifying and understanding the different roles enabling activities can play, and thus the type of criteria that will be needed to measure their degree of adaptation and/or resilience. It also recognises that different types of finance will flow to different types of adaptation, with transformative, systemic adaptation more challenging to finance, and more likely to need support from blended or public finance.[58]

3.2. Refine the list of adaptation activities in the EU Green Taxonomy

LNAS recommends that HMG evaluate the list of activities that the EU currently recognise as making a substantial contribution to adaptation. Activities that are primarily focused on mitigation, and where the adaptation element is minimal or can be sufficiently addressed through "Do No Significant Harm" (DNSH) adaptation criteria, should be excluded from the substantial contribution (SC) adaptation criteria.

- Including activities that are primarily mitigation-focused within the substantial contribution to the adaptation objective, such as the installation, maintenance and repair of charging stations for electric vehicles, risks diluting the effectiveness of the taxonomy. Many of these activities, while important for mitigation, do not inherently contribute to adaptation and resilience (A&R).
- If non or minimum adaptation activities are allowed to qualify as making a substantial contribution to A&R, there is a risk that investment will be directed towards these areas at the expense of true adaptation efforts. This could result in a misallocation of resources, where funding intended for adaptation is instead funnelled into projects that do not enhance climate resilience. Such an outcome could undermine the adaptation taxonomy by crowding out investments needed to address the UK's adaptation and resilience needs.
- By refining the EU's current list of economic activities, which are deemed to substantially contribute to adaptation, to exclude activities better suited to the DNSH to adaptation criteria,[59] HMG can ensure that the taxonomy remains focused on genuine adaptation efforts, aligned to the UK risks, thus fostering more targeted and effective investments in resilience.

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[58] UNEP (2024) Adaptation Gap Report
[59] It should be noted that the Green Technical Advisory Group (GTAG) set out a series of recommendations to the UK government on how to approach the development of DNSH criteria in the UK Green Taxonomy in its August 2023 paper. There have been usability issues observed in DNSH criteria in other jurisdictions to date, which include issues due to the drafting of the criteria themselves, and GTAG provided advice on potential ways to fix these issues. Therefore LNAS recommends that the DNSH criteria adaptation activities be fully developed once the UK government has clarified its approach to DNSH in the UK Green Taxonomy.

3.3. Identify a more comprehensive list of activities using developed A&R goals

LNAS recommends that HMG expand the range of economic activities that can contribute towards the adaptation and resilience goals, for inclusion in a UK Green Taxonomy. Activities which can address the priority hazards should be prioritised for inclusion.

- Utilise the system-based A&R goals and priority hazards established earlier by the framework to pinpoint economic activities and investments most needed to address those hazards. This focus should shift from mitigation to adaptation, prioritising areas where adaptation is urgently needed and where adaptation could deliver economic benefits in the near term.
- Conduct a review of existing adaptation activities within the EU Green Taxonomy to identify sectoral and activity-specific gaps relevant to the system of focus. For example, the EU Green Taxonomy has limited coverage of the "natural-resource based production" system, particularly in vulnerable sectors such as agriculture and while buildings are well-covered in the EU Green Taxonomy, there are activity-specific gaps to address heat exposure and other hazards in buildings. Additional adaptation activities could include "dedicated adaptation activities" (e.g. constructing coastal defences or developing resilient crop varieties) as well as activities that address systemic barriers (e.g. developing high-resolution weather forecasting models to support agricultural resilience and parametric insurance schemes for production losses in agriculture).
- When identifying additional activities, HMG should leverage existing resources. For example, the Resilient Planet Finance Lab has compiled a comprehensive inventory of adaptation taxonomies, covering over 35 jurisdictional and non-jurisdictional frameworks that seek to identify adaptation investments,[60] and K-Matrix has mapped economic activities for adaption and resilience in London and the Glasgow City Region.[61] These can provide valuable resources for HMG to draw upon, offering investments into a wide range of sectors and systems.
- HMG should use the three-yearly taxonomy review periods to refine and/or expand the list of adaptation activities as new climate data, adaptation needs and sectoral insights emerge.

4. Design TSC to qualify the eligible activities as substantially contributing to A&R goals

Substantial Contribution (SC) TSC is a means of assuring that an economic activity is making a substantial contribution to climate adaptation and/or resilience.

Do no significant harm (DNSH) criteria is a means of assuring that the economic activity does no significant harm to the remaining five environmental objectives. It should be noted that the GTAG set out a series of recommendations to the UK government on how to approach the development of DNSH criteria in the UK Green Taxonomy in its 2023 paper.[62] There have been usability issues observed in DNSH criteria in other jurisdictions to date, which include issues due to the drafting of the criteria themselves, and GTAG provided advice on potential ways to fix these issues. Therefore LNAS recommends that the DNSH criteria for adaptation activities be developed once the UK government has clarified its approach to DNSH in a UK Green Taxonomy.

This section provides LNAS's recommendations on the principles that HMG should employ to guide the development of SC TSC, explores the various types of SC criteria and offers recommendations for the types of SC TSC required for each activity type. As outlined in <u>section 3.1.</u>

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[60] Martín et al. (2024) <u>Adaptation Taxonomy Synthesis, Analysis and Comparison</u>
[61] K-Matrix (2019) <u>The Adaptation Economy of Glasgow City Region</u>
[62] GFI, GTAG (2023) <u>Streamlining and increasing the usability of the Do No Significant Harm (DNSH) criteria within the UK Green Taxonomy</u>

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4.1. Principles for designing substantial contribution technical screening criteria:

LNAS recommends that HMG adopt the following principles, as recommended by GTAG,[63] to guide the development of TSC for climate adaptation and resilience activities:

Robust and evidence-based:
Where feasible and relevant, TSC should incorporate measurable, quantitative metrics that address priority hazards identified in the system-specific goals. For example, the National Infrastructure Commission's (NIC) proposed resilience standards can offer evidence-based metrics for infrastructure:[64]

- Flood resilience: A building is designed to withstand a 1 in 200-year flood event.
- Heat resilience: A rail is designed to a stress-free temperature of 27°C.

Accessible:
TSC should be simple, practical and useful for financial institutions and project developers, and data requirements should be available or achievable without creating undue burdens. For example, criteria that reflect economic or resilient outcomes can provide decision-useful data – for integration into risk models, underwriting processes and investment decisions. However, LNAS recognises that quantitative metrics such as degrees of temperature reduction in hot periods or exact flood event probabilities might stifle investments in smaller-scale, yet beneficial, adaptation projects. In this case, HMG should adopt a pragmatic approach. For example:

- Engineering infrastructure activities, such as seawalls and flood barriers, could be required to report on the area of homes, communities and businesses that will be protected in a flood plain over an appropriate timeframe.
- Smaller-scale enabling activities, such as green space in cities, could allow for qualitative assessments that provide insight into their adaptation effectiveness. For example, qualitative ratings that evidence the expected resilience benefit over an appropriate time frame.
- To reduce process burden a screening process could be introduced to identify significant risks. This would allow for a tiered approach where not all hazards are required to be assessed. This is a commonly used process in multilateral development banks and public investment in infrastructure.[65]

Built for the UK Context:
- TSC should focus on addressing the priority hazards and go beyond regulatory minimums where needed. HMG should leverage well-established best practices and standards utilised in the UK, such as the Building Research Establishment Environmental Assessment Methodology (BREEAM) for buildings, the IIGCC-led Physical Climate Risk Assessment Methodology (PCRAM) for infrastructure[66] and the UK Green Building Council's (UKGBC) Climate Resilience Roadmap for the built environment.[67] HMG should also draw on sector-specific guidance from bodies like the National Infrastructure Commission (NIC), the Climate Change Committee (CCC), and the Chartered Institution of Building Services Engineers (CIBSE).
- TSC should be consistent with local, regional, and national adaptation plans.

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[63] GFI, GTAG (2022) Advice on the development of a UK Green Taxonomy
[64] NIC (2024) Developing resilience standards in UK infrastructure
[65] European Investment Bank (2021) Assessing climate change risks at the country level: the EIB scoring model
[66] IIGCC (2024) PCRAM in Practice: Outputs and insights from climate resilience in action
[67] UKGBC (2024) UK Climate Resilience Roadmap Consultation

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4.2. Types of substantial contribution technical screening criteria

Quantitative technical screening criteria

Quantitative TSC can provide the highest level of accountability and provability by relying on measurable metrics and thresholds. For example, energy performance metrics for buildings, such as Primary Energy Demand (PED), are used in the EU Green Taxonomy and are tied to government-set targets for net-zero.

This approach can be particularly useful for adapted activities, where assets are climate-proofed based on projected hazard data. For example, requiring that buildings can withstand existing and projected wind speeds, flood events and/or maintain safe indoor temperatures during heatwaves. This approach can also be useful for evidencing resilience benefits for enabling activities, for example requiring that a seawall can reduce flood risk to communities by X% over a 30-year period. However, unlike mitigation, where long-term net zero goals are well-defined, the UK lacks similarly detailed adaptation targets. This can prove challenging to develop adaptation-specific quantitative TSC. Despite this, when clear targets are in place, quantitative metrics offer the highest level of accountability and should be prioritised over qualitative or principle-based criteria, where relevant.

Process and principle-based TSC:
This option relies on adherence to best practices and principles, rather than quantitative metrics, to ensure substantial contribution. This could require alignment with national strategies, following due diligence processes and following the best available scientific methodologies. The EU's TSC for adaptation activities is an example of process and principle-based TSC and this TSC type often requires supplementary guidance to demonstrate compliance.

This approach can be useful for the "Enabling Type 2" activities, which address systemic barriers to adaptation (e.g. requiring that climate risk software align with IPPC risk methodologies) and smaller-scale "Enabling Type 1" activities, such as urban green spaces and installation of adaptation measures, which could involve qualitative assessments of resilience benefits over time.

Whitelist approach

The whitelist approach involves listing specific activities that are considered to make a substantial contribution to adaptation and resilience without requiring technical screening criteria (TSC) for taxonomy alignment. This approach has been adopted in taxonomies developed by China, Mongolia, and Russia. This approach may be useful for universally beneficial adaptation activities, that can deliver a substantial contribution in a broad range of contexts and do not lead to maladaptation. Or where there is an already established metric and threshold that the activity will always fall well below. This approach is employed by the EU Green Taxonomy for electricity production from certain renewable energy technologies.[68] However, given the potential for ambiguity and lack of adaptation and resilience metrics, the whitelist approach is not recommended as a standalone option.

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[68] In the EU Green Taxonomy the production of electricity from solar PV does not need to demonstrate compliance with technical screening criteria to sustainably contribute to climate change mitigation, as life-cycle emissions will likely always fall well below the 100gCO2e kWh-1 threshold developed for electricity production.

4.3. Recommended TSC across activity categories

While the EU's process-based approach provides a solid foundation, HMG can adapt and improve upon this model. This can involve incorporating proportionality, introducing quantitative, measurable metrics and ensuring that the criteria are flexible enough to accommodate a pragmatic approach. LNAS recommends a hybrid approach, which balances quantitative and qualitative criteria, for TSC development tailored to the type of activity:
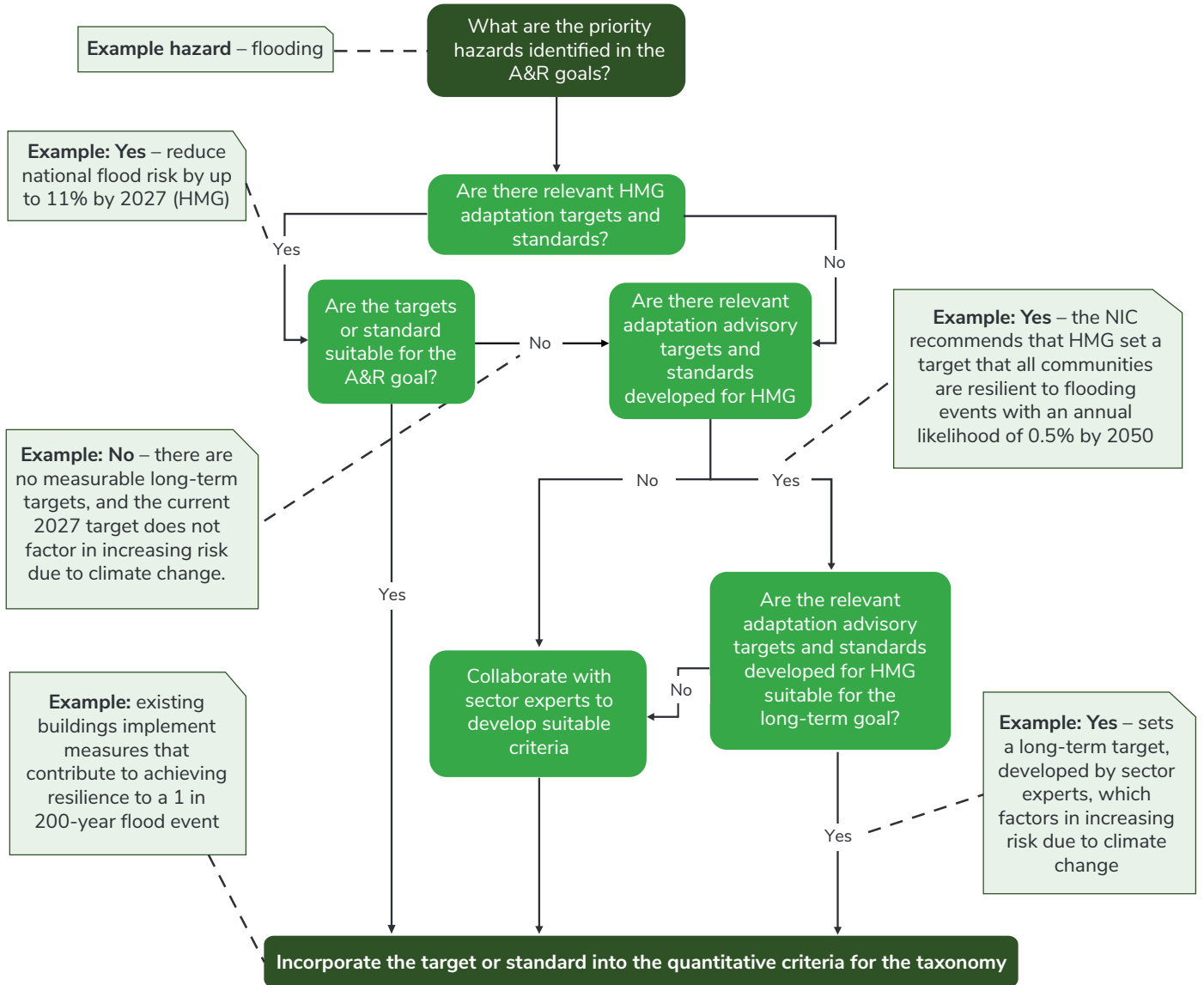
Adapted Activity Type (climate-proofing focus)

For activities that require climate-proofing (e.g. new or retrofitted buildings, transport infrastructure, crop production), the TSC should be tied to quantitative metrics where possible. As with the EU approach, LNAS recommends that these activities follow a screening process and risk assessment to determine and assess the significant hazards they face. Once identified, quantitative metrics developed by HMG and sector experts, can then be used to demonstrate climate-proofing. Figure 6 offers a flow chart for how HMG could develop the quantitative metrics for adapted activity types. For example:

- If the screening process and risk assessment show a significant risk of flooding to a building, then the building would need to be designed or retrofitted to achieve, for example, a 1 in 200-year flood event resilience. For heat risk, the building could be designed to maintain indoor temperatures below 28°C for a specific portion of occupied hours, as recommended by the Chartered Institution of Building Services Engineers (CIBSE).[69]
- The adaptation measures implemented are monitored and measured against the quantitative metrics and thresholds and remedial action is considered where progress is not being made.
- HMG should provide supplementary guidance for users to perform the screening process, robust risk assessment and to identify effective adaptation measures that can support achieving the quantitative outcomes. LNAS has provided recommendations on this guidance in the following section.

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[69] GOV.UK (2022) Guidance: Accommodation: lighting, heating and ventilation

Figure 6: Recommended flowchart for how HMG could develop quantitative metrics for adapted activity types

Enabling Type 1: Dedicated adaptation activities

For Enabling Type 1 activities, LNAS recognises that not all enabling activities will require full climate-proofing. Instead, they may focus on evidencing resilience benefits over an appropriate time frame, either through quantitative or qualitative TSC, depending on the activity. Many of these activities, such as urban cooling measures or coastal wetland restoration, can deliver significant adaptation benefits without the requirement to undergo the same rigorous climate-proofing process as adapted activities.

As such, LNAS recommends that HMG prioritise criteria which evidence resilience benefit, while incorporating climate proofing criteria where the enabling activity is directly exposed to the climate risks it seeks to mitigate. For example:

- **Engineered enabling activities:** the construction of large-scale infrastructure projects that provide dedicated adaptation (e.g. sea walls, flood barriers) should evidence their resilience benefit through quantitative TSC, such as the capacity to reduce flood risk by a specific percentage or the area protected in a flood plain. For these activities, climate-proofing should also be considered, as these structures are directly exposed to the physical climate risks they are designed to address. These activities therefore could also be required to undergo the same process as adapted activities, where relevant. This includes following a screening process and risk assessment to identify significant hazards, and once identified, using quantitative metrics to demonstrate climate-proofing.
- **Nature-based and smaller-scale enabling activities:** Activities like developing urban green spaces, wetland restoration, installation of urban cooling technologies (green roofs and walls, reflective surfaces etc.) and research into drought-resistant crop varieties, may not need full, or any, climate proofing nor be able to meet specific quantitative metrics that asses their resilience benefit, such as degrees of temperature reduction in hot periods. Qualitative criteria should be employed in such cases, with assessments based on expected resilience benefits over time. A qualitative assessment could involve ratings for how effectively green spaces reduce localised heat during extreme heat events, from low (limited shade and cooling) to high (green space provides substantial shade and cooling benefits). This type would likely require supplementary guidance to demonstrate compliance.

In all cases, quantitative resilience criteria should be applied where possible, especially for engineered or large-scale activities. However, for smaller-scale or nature-based enabling activities, qualitative criteria may be more suitable to capture the long-term resilience benefits that are challenging to measure.

Enabling Type 2: Activities which address systemic barriers to adaptation

For Enabling Type 2 activities, such as those that provide information, technological, or capacity-building solutions that support climate adaptation and resilience, LNAS recommends a streamlined approach to the TSC.

LNAS agrees with the core elements of the EU Taxonomy approach for these activities but proposes that HMG adopt a simplified version. Specifically, LNAS recommends that Enabling Type 2 activities be required to demonstrate adherence to best practices and state-of-the-art scientific standards but without the need for additional risk assessments or potentially burdensome compliance steps.

- As with the EU approach, where relevant, the activity should use methodologies and data that align with best practice standards and scientific guidance for vulnerability and risk analysis, such as the most recent Intergovernmental Panel on Climate Change (IPCC) reports and climate risk and adaptation standards, such as EN ISO 14090:2019 and ISO 14091:2021.

- The activity should provide documentation to demonstrate that it followed best practice guidelines in its development and implementation, and to include the sources of data and models used.
- As these activities are focused on enabling adaptation in other sectors and systems, they do not need to be "climate-proofed" themselves.

By agreeing that these activities are included in the taxonomy, their enabling benefit (i.e. "removing information, technological or capacity barriers") is inherently recognised. The necessity for further steps, such as detailed climate risk assessments or monitoring the activity against pre-defined indicators, is not required, as they must rely on robust, internationally recognised methodologies and standards for taxonomy alignment.

5. Develop supplementary guidance to support criteria alignment

For activities which require supplementary guidance to demonstrate alignment, LNAS recommends that HMG identify existing guidance or develop additional guidance with experts to support compliance.

Screening process

For activities requiring a climate risk assessment, LNAS recommends starting with a screening process to identify risks that pose significant hazards. This ensures that only material risks are subjected to a full climate risk and vulnerability assessment. LNAS recommends that HMG adopt the screening phase outlined in the EU's technical guidance on climate-proofing infrastructure as a model for this step.[70] Further details can be found in Annex 2.

Climate risk assessment

The Climate Financial Risk Forum Adaptation Working Group (CFRF AWG), in consortium with the scientific community, has developed a risk assessment methodology which focuses on assessing climate risks using a scenario analysis framework that accounts for both short-term and long-term climate response uncertainties, and using local hazard data to support analysis.[71]

LNAS recommends adopting the CFRF AWG approach for climate risk assessment, with the integrated screening process mentioned above. This method can improve upon the EU's methodology, by considering both short-term and long-term climate uncertainties, and provides a more proportionate approach better aligning with the principles laid out in the HMT Green Book.[72]

- For the short-term (up to 5 years) assessments should focus on short-term variability and localised hazard projections.
- For activities and assets with a lifespan beyond 5 years, both emissions pathways and climate response uncertainties must be considered, particularly for periods beyond 10 years.

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[70] EU (2021) Technical guidance on the climate proofing of infrastructure in the period 2021-2027
[71] FCA, CFRF (2024) Mobilising adaptation finance to build resilience
[72] HM Treasury (2022) The Green Book

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The CFRF AWG methodology focuses on scenario analysis and climate response uncertainties across three possible futures using an Aim-Build-Contingency (ABC framework):[73]

1. **Aiming for 1.5°C (strong mitigation):**
   a. Proxy: IPCC's Shared Socioeconomic Pathway (SSP) 1-1.9 scenario
   b. Assumes rapid global emissions reduction, aiming for a 1.5°C limit.
   c. Median climate response is considered.

2. **Building and budgeting for 2°C by 2050 (Moderate Action):**
   a. Proxy: IPCC's SSP2-4.5 scenario
   b. Assumes moderate emissions reductions, leading to ~2°C warming by 2050.
   c. Median climate response is considered.

3. **Contingency planning for 2.5°C by 2050 (backtracking scenario):**
   a. Proxy: IPCC's SSP3-7.0 scenario
   b. Assumes backtracking on emissions targets and heightened climate sensitivity.
   c. 95th percentile of the climate response is used for this worst-case scenario.

The accompanying flowchart (Figure 7) illustrates how the CFRF AWG methodology can be operationalised for taxonomy alignment.

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[73] In certain cases the UK government may wish to advise on design or risk assessment for more extreme scenarios.

Figure 7: Flow chart and scenario key for the CFRF AWG risk assessment methodology
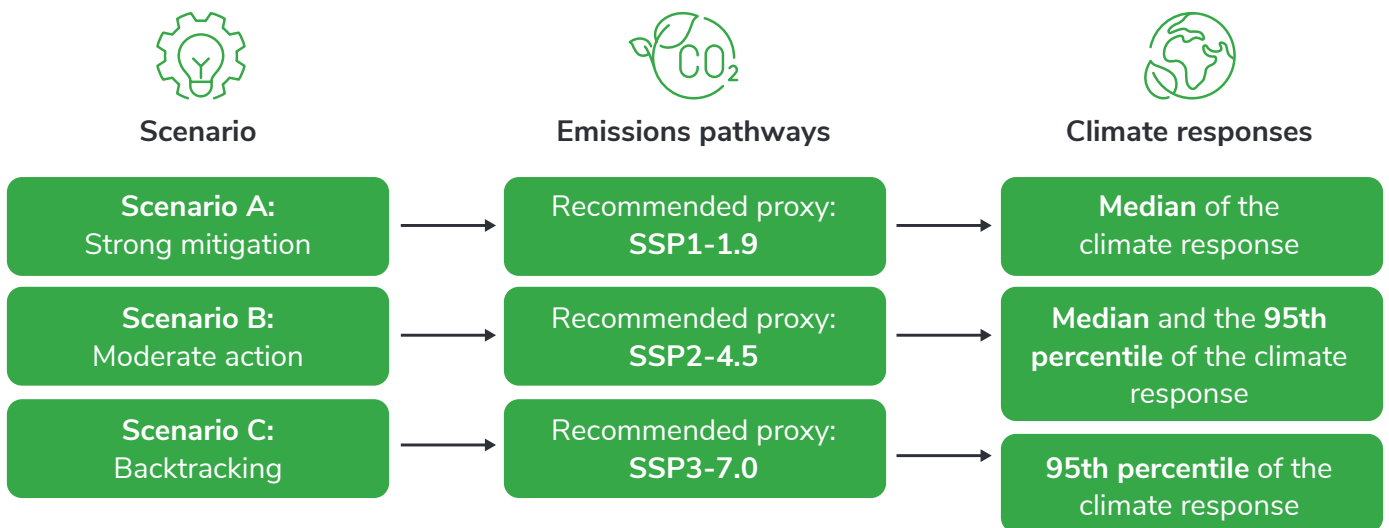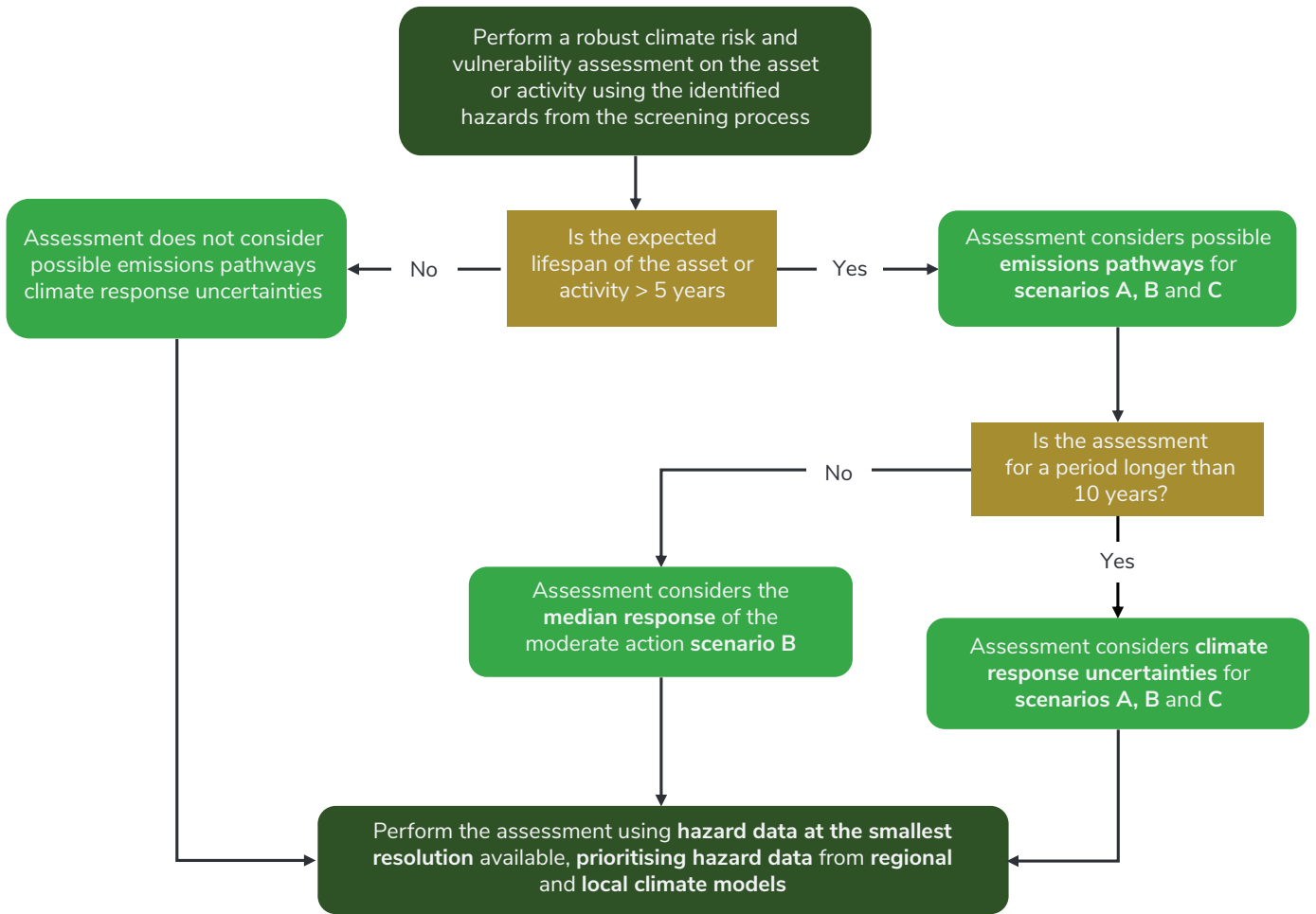
Effective adaptation measures

For adapted activities and assets, these will need to implement measures that contribute to specific resilience outcomes. While there is a range of literature on assessing the effectiveness of adaptation options, practical guidance on selecting effective adaptation measures tailored to specific risks and assets is limited. LNAS recommends a two-step approach for HMG:

1. Commission research to synthesise existing literature and guidance on the effectiveness of adaptation options to inform the development of practical guidance.
2. Develop a non-prescriptive list of proven adaptation measures tailored to specific risks and relevant assets, focusing on the priority hazards.

Box 2: Existing frameworks and resources to support guidance development

- PRCAM provides an open-source framework to assess material physical climate risks and identify resilience options, for assets in any infrastructure sector.[74] PCRAM 2.0 will expand the scope to real estate, it will also incorporate wider resilience options such as nature-based solutions, include a multi-hazard function and an insurability function and quantify intangible costs and systems benefits. The methodology will continue to be evidence-based and include new case studies from the public as well as the private sector.
- The Dutch Green Building Council (DGBC) has developed an open-source methodology for identifying adaptation measures and including these measures in risk assessments for the renovation of existing buildings.[75] HMG could consider adapting this resource to the UK context as a tool to support renovation activities.
- The UK Green Building Council's (UKGBC) Resilience Roadmap has developed a framework of metrics and indicators for climate-related risk associated with overheating, flooding, drought, wildfire and storms for the built environment.[76] HMG could use this to inform specific adaptation measures. See Annex 3.

Additionally, the Resilient Planet Finance Lab inventory of adaptation taxonomies offers comprehensive compilations of investments and measures across various sectors. HMG can draw from such inventories to inform the development of the non-prescriptive list.

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[74] IIGCC (2024) PCRAM in Practice: Outputs and insights from climate resilience in action
[75] DGBC (2024) Framework for Climate Adaptive Buildings
[76] UKGBC (2024) UK Climate Resilience Roadmap

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Worked example:
Cities and settlements

The following outlines a worked example for the of "cities and settlements" system.

Step 1: Select system for development focus

LNAS applied the framework to cities and settlements to exemplify the process:

- Cities and settlements are a Defra priority for climate change adaptation, and the CCC identified risks to people from increased exposure to heat in buildings as one of the highest priority risk areas.[77]
- As of 2023, 85% of the UK's population lives in urban areas,[78] making them essential for immediate adaptation efforts to safeguard public health, economic activity and resilience.
- Adaptation measures and activities in cities, such as nature-based solutions and urban cooling, can provide wide-reaching benefits, including improved health outcomes, reduced heat islands and disaster risk reduction.
- In future rounds, "Natural-based resource production" should be prioritised due to its importance to food security and the vulnerability of agricultural sectors to climate change impacts.

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[77] CCC (2023) Progress in adaptation to climate change
[78] World Bank Group (2023) Urban population (% of total population) - United Kingdom

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Step 2: Develop indicative adaptation and resilience goal, which considers priority hazards

Example of a non-prescriptive goal for cities and settlements:

Private and public sector finance is mobilised towards economic activities and measures that enhance the resilience of cities and settlements to priority climate-related hazards, primarily flooding and heatwaves. By 2030, these activities and measures should ensure that cities and settlements can adapt to current and expected climate impacts up to at least 2050 while maintaining their economic, social and public functions.

The focus on flooding and heatwaves as priority climate-related hazards is based on the significant risks they pose to the UK's cities and settlements, as identified in the UK's Climate Change Risk Assessment (CCRA3)[79] the National Adaptation Programme (NAP3) and other bodies such as the National Infrastructure Commission (NIC)[80] and the Met Office's UK Climate Projections (UKCP).[81] This indicative goal aligns with the broader objectives of the third National Adaptation Programme (NAP3), which calls for reducing the risk of high temperatures and improving resilience to flooding through targeted measures such as regulation, planning, and infrastructure investments.

1. **Heatwaves:** The CCRA3 projects that heat-related deaths could triple by the 2050s, the Met Office projected sustained higher temperatures and peaks above 40°C in the warmest locations and summer temperatures potentially increasing by up to 5.4°C by 2070.[82] These projections highlight the urgent need for cities and settlements to adapt to higher temperatures to protect public health and maintain liveability.
2. **Flooding:** Flood risk is also a critical concern, with the CCRA3 predicting a doubling of people at significant risk of flooding by 2050, from 1.9 million to 3.8 million, while the NIC projects that 1.1% of properties in England are expected to have a 60% chance of flooding within the next 30 years. These projections highlight the importance of improving the resilience of cities and settlements to flood risks to protect people, the environment and the economy.

Step 3: Develop a more comprehensive and targeted list of economic activities for adaptation

Step 3.1. Refine the list of adaptation activities in the EU Taxonomy

Evaluate the list of activities that the EU currently recognise as making a substantial contribution to adaptation. Activities that are primarily focused on mitigation, and where the adaptation element is minimal or can be sufficiently addressed through "Do No Significant Harm" (DNSH) criteria, should be excluded from the substantial contribution (SC) adaptation criteria.

Box 3: Refinement process for activity evaluation

1. Is the activity primarily focused on climate change mitigation?
2. Can the adaptation element be sufficiently addressed through the DNSH risk assessment criteria?
3. Does this activity substantially contribute to adaptation and resilience?

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[79] CCC (2021) Independent Assessment of UK Climate Risk
[80] NIC (n.d) National Infrastructure Commission
[81] Met Office (n.d) UK Climate Projections
[82] Met Office (2018) Most detailed picture yet of UK's future climate

Activities that are needed for adaptation and directly address climate risks should remain eligible for SC adaptation criteria. Activities that focus mainly on mitigation or can meet adaptation needs through DNSH criteria should be excluded.

Table 2: Example of the refinement process for activities relevant for cities and settlements

System	Adaptation Activities in the EU Green Taxonomy	LNAS Recommendation	Rationale
Resilient cities and settlements	Renovation of existing buildings	Include	These assets are vulnerable to existing and projected climate hazards. SC adaptation criteria can ensure renovations incorporate adaptation measures to substantially manage climate risks.
Resilient cities and settlements	Installation, maintenance and repair of energy-efficiency equipment	Remove	Primarily focused on mitigation. Adaptation elements, if any, can be covered through DNSH criteria.
Resilient cities and settlements	Installation, maintenance and repair of charging stations for electric vehicles in buildings	Remove	Primarily focused on mitigation. Adaptation elements can be captured through DNSH to adaptation criteria.
Resilient cities and settlements	Installation, maintenance and repair of renewable energy technologies	Remove	Primarily focused on mitigation. Adaptation elements can be captured through DNSH to adaptation criteria.
Cross-cutting	Software enabling physical climate risk management and adaptation	Include	Directly addresses systemic barriers to adaptation by enabling improved climate risk management.

Step 3.2. Identify a more comprehensive list of activities using developed A&R goals

Identify a richer list of economic activities, that are absent from the EU Green Taxonomy, that can contribute towards the adaptation and resilience goals. These activities will likely focus more on dedicated enabling activities and activities which address systemic barriers to adaptation (Enabling Type 1 and 2, respectively).

The table below outlines an exemplary, but not exhaustive, list of economic activities that can contribute to resilient cities and settlements. These activities directly address priority hazards such as flooding and heat, while also offering cross-cutting benefits. These activities draw upon the comprehensive inventory of adaptation taxonomies developed by the Resilient Planet Finance Lab.

Table 3: Example for identifying a richer list of economic activities relevant for cities and settlements

Identify a richer list of economic activities	Contribution type	Rationale
Planning, development and restoration of urban nature-based solutions (NbS) such as wetlands, floodplains and green spaces	Enabling Type 1	Urban NbS can mitigate flood risk, heat stress, and improve water quality in cities.
Installation, maintenance and repair of green roofs and walls in residential, commercial and public buildings	Enabling Type 1	Green roofs and walls contribute to cooling cities and can reduce energy demand during heatwaves and manage stormwater. Particularly useful in dense urban areas where space for larger-scale green infrastructure may be limited.
Planning, development, and maintenance of sustainable drainage systems (e.g. permeable surfaces, swales, detention basins)	Enabling Type 1	Sustainable drainage systems (SuDS) can reduce flood risk in cities, managing rainfall more effectively.
Manufacturing and installation of cooling technologies in urban areas (e.g. cool pavements, shade structures, reflective surfaces)	Enabling Type 1	Urban cooling technologies can provide immediate resilience benefits, reducing indoor and outdoor temperatures.
Parametric insurance schemes for flood risk	Enabling Type 2	Parametric insurance can help distribute risk and protect urban infrastructure from losses, offering economic protection in the face of increasingly frequent floods. Such schemes can provide adaptive capacity by ensuring cities are financially resilient to climate impacts.
Provision and deployment of real-time climate data and emergency alert systems	Enabling Type 2	Real-time weather data and climate emergency alert systems can support adaptive capacity by providing timely information to urban populations and local authorities, allowing them to prepare for and respond to climate impacts such as extreme heat, flooding, and storms. Additionally, networked devices that provide real-time updates can increase public awareness and responsiveness.

Step 4: Develop technical screening criteria for the eligible activities

LNAS has developed recommended TSC for exemplar activities across each activity type, using the recommendations in Section 4. This can provide examples for HMG to guide TSC development. HMG should ensure that all TSC added to the taxonomy following the work by LNAS in this report are fully consulted on before implementing into UK legislation.

Adapted Activity: "Renovation of existing buildings"

Activity: Renovation of existing buildings

Description: Construction and civil engineering works or preparation thereof.

The economic activities in this category could be associated with several UK SIC codes, in particular F41 and F43 in accordance with the UK Standard Industrial Classification of economic activities.

Recommended substantial contribution criteria:

1. **Screening process and climate risk assessment:**
   a. A climate risk screening must be conducted to identify potential significant hazards, using the guidance outlined in Section 5.
   b. If the screening process shows that the identified hazards pose no or significantly low risk up to 2050 (or beyond, if applicable), and these risks can be managed through standard building practices, the analysis must be published as evidence of climate-proofing for taxonomy alignment.
   c. If significant risks are identified, a full climate risk and vulnerability assessment must be conducted for those risks, following the guidance in Section 5.

2. **Quantitative metrics:**
   a. The building implements both physical and non-physical measures which contribute towards achieving quantitative outcomes, developed by HMG, relevant for the significant risks identified, by 2030. For example:
      i. Flood risk: implement measures that contribute to achieving resilience to a 1 in 200-year flood event.
      ii. Heat risk: implement measures to maintain indoor temperatures below 28°C during peak heat periods for no more than 1% of occupied hours.

3. **Adaptation measures:**
   a. Measures can include physical (e.g. structural retrofits, improved insulation, flood barriers) and non-physical (e.g. early warning systems) solutions that substantially reduce the buildings' and occupants' vulnerability to identified climate risks.
   b. Nature-based measures, such as green roofs and walls, should be prioritised where feasible.
   c. Measures should align with any local, regional, and national adaptation plans.

4. **Monitoring and reporting:**
   a. The effectiveness of the adaptation measures should be monitored and measured against the quantitative metrics set by HMG. Regular progress reports should be required to ensure the building continues to demonstrate progress toward the outcomes or that it remains resilient up to 2050 and beyond, where applicable.
   a. Remedial actions should be specified in the event that the building is failing to meet the prescribed metrics or if climate conditions change faster than expected.

Supporting guidance:

1. The Dutch Green Building Council (DGBC) has developed an open-access methodology for identifying adaptation measures and including these measures in risk assessments for the renovation of existing buildings.[83] HMG could consider adapting this resource to the UK context as a tool to support the renovation process. See Annex 3 for further details.
2. To support 4a, HMG could draw on the UK Green Building Council's (UKGBC) Resilience Roadmap.[84] This framework provides metrics which could be used to measure and monitor the adaption effectiveness of the implemented measures. For example, the UKGBC recommends using "elevation of asset (m)" for reducing flood risk, the "proportion of green vs grey roof (% of roof)" for reducing heat risk and the "number of water efficiency measures in building" for addressing drought risks.

Enabling Type 1: Planning, development and restoration of urban nature-based solutions (NbS)

This activity involves the planning, development, and restoration of urban nature-based solutions aimed at building resilience to climate risks in cities and settlements. These activities can include creating or restoring green spaces (such as parks and forests), coastal wetlands and other natural areas within urban environments to enhance urban resilience.

The economic activities in this category could be associated with UK SIC codes N81 or M71, in accordance with the UK Standard Industrial Classification of economic activities.

Recommended substantial contribution criteria:

1. **Qualitative assessments:** should be used to evidence the resilience benefits these activities seek to provide:
   a. Flood risk: the activity must evidence that it can lead to a significant reduction in surface water runoff and flood risk, up to 2050.
   b. Heat risk: the activity must evidence that it can lead to significant cooling benefits, with large areas of green space offering shade and cooling during heatwaves, up to 2050.

2. **Climate Risk Screening:** Since these activities are often designed to enable resilience a full climate-proofing assessment is not required. However, a climate risk screening should be conducted to ensure the solution itself is not vulnerable to climate risks (e.g. risks that might undermine the NbS over time). If significant risks are identified, a more detailed risk assessment should be considered.

3. Activities should align with any local, regional, and national adaptation plans.

4. **Monitoring and Reporting:**
   a. Regular monitoring should assess whether the NbS is delivering the anticipated resilience benefits, such as reducing localised heat and improving flood resilience. This may involve assessments of vegetation health, water retention capacity or community feedback.
   b. The effectiveness of the activities should be evaluated over time, and remedial action should be proposed if the expected resilience benefits are not being realised. Reports should be submitted at regular intervals (e.g. every 5 years) to ensure ongoing benefits.

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[83] DGBC (2024) Framework for Climate Adaptive Buildings
[84] UKGBC (2024) UK Climate Resilience Roadmap

Enabling Type 2: Software enabling physical climate risk management and adaptation contribution to climate adaptation

Activity: Software enabling physical climate risk management and adaptation contribution to climate adaptation

Description: Software development or programming activities that directly contribute to adaptation and resilience by providing services for:

- **Climate risk forecasting** (e.g. high-resolution climate models, hazard mapping);
- **Early warning systems** for climate-related hazards (e.g. floods, heatwaves, wildfires);
- **Climate risk management** (e.g. tools for assessing exposure and vulnerability, risk mitigation, and adaptation planning).

The economic activities in this category could be associated with the UK SIC code J62, in accordance with the UK Standard Industrial Classification of economic activities.

Recommended substantial contribution criteria:

- The activity uses a methodology and data that are based on best practice and available guidance and take into account the state-of-the-art science for vulnerability, risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate or Change (IPPC) report or aligned with climate risk and adaptation standards such as EN ISO 14090:2019 and ISO 14091:2021.
- Documentation should demonstrate that development followed these guidelines.

Software enabling adaptation is not required to be "climate-proofed" itself, as its primary function is to inform others' adaptation efforts.

Next Steps

What LNAS has provided is a framework for His Majesty's Government (HMG) to strengthen adaptation in UK Green Taxonomy. Along with worked examples of how the framework can be implemented.

To mobilise capital to flow to the places that need it most, LNAS recommends HMG should prioritise the roll out based on the urgency approach employed in the UK CRRA. This would mean focusing initially on systems that encompass high priority risk areas, such as "cities and settlements" to address risks to human health, well-being and productivity from increased heat exposure in homes and other buildings, and "natural-resource based production" to address risks to crops, livestock and commercial forestry from multiple climate hazards.

LNAS recommends that the government secures the capacity to work with sectoral experts to develop detailed criteria, drawing on sectoral experts' specific knowledge of metrics and criteria relevant to their sectors – a task which will be done easier if it does so in tandem with developing sectoral adaptation and resilience-focused objectives, targets and metrics.

Annexes

Annex 1: Table of climate-related hazards to identify as potentially significant during the screening process

	Temperature-related	Wind-related	Water-related	Solid-mass related	Biological-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion	Vector-borne diseases
	Heat stress		Precipitation or hydrological variability	Soil degradation	Pests and pathogens
	Temperature variability		Ocean acidification	Soil erosion	
	Permafrost thawing		Saline intrusion	Solifluction	
			Sea level rise		
			Water stress		
Acute	Cold wave/frost	Cyclone, hurricane, typhoon	Drought		Vector-borne diseases (during outbreaks)
	Heatwave	Storm (including blizzards, dust and sandstorms)	Heavy precipitation patterns and types (rain, hail, snow/ice)	Landslide	Pests and pathogens (during infestations or spikes)
	Wildfire		Flood (coastal, fluvial, pluvial, ground water)	Subsidence	
				Sink hole	

Source: Adapted from the EU Green Taxonomy: European Commission (n.d.) <u>APPENDIX A: GENERIC CRITERIA FOR DNSH TO CLIMATE CHANGE ADAPTATION</u>

Annex 2: Recommended screening process, adapted from the EU's Technical guidance on climate-proofing infrastructure

Summary

- Carry out a climate sensitivity, exposure and vulnerability analysis;
- If there are no significant climate risks warranting further analysis, compile the documentation and summarise the analysis in a climate resilience screening statement, which in principle gives a conclusion on climate proofing as regards climate resilience;
- If there are significant climate risks warranting further analysis, proceed to the risk assessment.

Screening process:

- The sensitivity analysis should cover the project in a comprehensive manner, looking at the various components of the project and how it operates within the wider network or system, for example by distinguishing between the four themes:
  - on-site assets and processes,
  - inputs such as water and energy,
  - outputs such as products and services,
  - access and transport links, even if outside the direct control of the project
- A score of 'high', 'medium' or 'low' should be given for each theme and climate hazard, from the hazards outlined in Annex 1
  - high sensitivity: the climate hazard may have a significant impact on assets and processes, inputs, outputs and transport links;
  - medium sensitivity: the climate hazard may have a slight impact on assets and processes, inputs, outputs and transport links;
  - low sensitivity: the climate hazard has no (or an insignificant) impact.
- The exposure analysis aims to identify which hazards are relevant to the planned project location, irrespective of the project type. For example, flooding could be a significant climate hazard for a location next to a river in a floodplain.
  - The exposure analysis therefore focuses on the location whereas the sensitivity analysis focuses on the type of project. The exposure analysis can be split into two parts: exposure to the current climate and exposure to the future climate.
- The vulnerability assessment aims to identify potential significant hazards and related risks and it forms the basis for the decision to continue to the risk assessment phase. Typically, it unveils the most relevant hazards for the risk assessment (these can be considered as the vulnerabilities ranked as 'high' and possibly 'medium', depending on the scale).
  - If the vulnerability assessment concludes that all vulnerabilities are ranked as low or insignificant in a justified manner, no further (climate) risk assessment might be needed (this concludes the screening and phase 1).

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Phase 1 (screening)

SENSITIVITY ANALYSIS

Indicative sensitivity table: *(example)*	Climate variables and hazards			
	Flood	Heat	...	Drought
On-site assets, ...	High	Low	...	Low
Inputs (water, ...)	Medium	Medium	...	Low
Outputs (products, ...)	High	Low	...	Low
Transport links	Medium	Low	...	Low
Highest score 4 themes	High	Medium	...	Low

(Themes)

The output of the sensitivity analysis may be summarised in a table with the sensitivity ranking of the relevant climate variables and hazards for a given project type, irrespective of the location, including critical parameters, and divided in e.g. the four themes.

EXPOSURE ANALYSIS

Indicative exposure table: *(example)*	Climate variables and hazards			
	Flood	Heat	...	Drought
Current climate	Medium	Low	...	Low
Future climate	High	Medium	...	Low
Highest score, current+future	High	Medium	...	Low

The output of the exposure analysis may be summarised in a table with the exposure ranking of the relevant climate variables and hazards for the selected location, irrespective of the project type, and divided in current and future climate. For both the sensitivity and exposure analysis, the scoring system should be carefully defined and explained, and the given scores should be justified.

VULNERABILITY ANALYSIS

Indicative vulnerability table: *(example)*		Exposure (current + future climate)		
		High	Medium	Low
Sensitivity (highest across the four themes)	High	Flood		
	Medium		Heat	
	Low			Drought

Legend: Vulnerability level
High
Medium
Low

The vulnerability analysis may be summarised in a table for the given specific project type at the selected location. It combines the sensitivity and the exposure analysis. The most relevant climate variables and hazards are those with a high or medium vulnerability level, which are then taken forward to the steps below. The vulnerability levels should be carefully defined and explained, and the given scores justified.

Annex 3: Dutch Green Building Council's Framework for Climate Adaptive Buildings (FCAB)

The FCAB methodology consists of three separate steps and accompanying guidance:

1. **A methodology for determining the Building Environment Score**
   a. This step corresponds with general risk assessment methodologies by assessing the hazard and exposure for a specific location, regardless of the building type
   a. Physical climate risk of a building = Hazard x Exposure x Vulnerability.
   a. This stage is based on open data from the Dutch Climate Impact Atlas. Selected 7 hazard databases that are relevant to buildings (heat stress, wildfires, soil subsidence, heavy precipitation, groundwater flooding, flooding from rivers or the sea).

2. **A methodology for determining the Building Vulnerability Score and the Building Climate Risk Score:**
   a. For the Building Vulnerability Score, a list of relevant building characteristics has to be taken into account.
   b. Examples of building characteristics are construction year, window surface in relation to total façade surface, roof type and colour, isolation material, the height of the doorstep, presence of basement and more.
   c. For each climate theme, there is a table with all relevant building characteristics and the corresponding scores and weights. The total score per climate theme is the building vulnerability score (0-100), with high scores meaning high vulnerability
   d. After the Building Vulnerability Score is determined. it can be combined with the Building Environment Score to determine the Building Climate Risk Score. For each climate theme, there is a risk matrix with the obtainable Building Environment Scores and Building Vulnerability Scores on the axes. This matrix defines five risk classes: very low, low, medium, high and very high.

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e. The Framework suggests that buildings with a Building Climate Risk Score of 'high' or 'very high' should be considered a 'material risk' that (under the EU Taxonomy) should be significantly reduced by taking climate adaptation measures.

f. The Building Climate Risk Score identifies 'red flags' within a building portfolio. It indicates the level of risk, not the actual risk in terms of damage or costs. For the 'red flags' a further deep dive into impacts at the building level is advised.

3. **A guide for evaluating the risks and implementing climate adaptation measures (adaptation plan).**

a. When it comes to taking measures to significantly reduce the climate risk, the Framework suggests three different kinds of approaches:

   i. non-physical measures such as evacuation plans or the education of building users.

   ii. measures in the surroundings of the building that decrease the exposure and

   iii. measures at the building level that decrease the building's vulnerability

b. It is also useful to consider the sensitivity of the building user (e.g. elderly people) or the alignment of measures with the organisation's strategy (e.g. mission or risk appetite policies).

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