

# Railway Sustainability Design Guide

## Introduction & User Guide

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Published and Issued by Network Rail, 2nd Floor, One Eversholt Street, London, NW1 2DN.



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**Issue record**

<b>Issue</b>	<b>Date</b>	<b>Comments</b>
0.1	June 2021	First release in advance of online edition

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## 1 Purpose

The purpose of the Railway Sustainability Design Guide is to support the uptake and implementation of industry best practice in sustainable design and management across Network Rail's estate and associated assets. It is intended to transform Network Rail's approach to sustainability by embedding the importance of biodiversity and the environment alongside safety and performance within planning and decision making at all scales of the organisation.

It provides guidance on how to address relevant Network Rail standards, policies, technical advice, templates and proformas and implement them across all project scales. This will help achieve Network Rail's ambition to:

- Achieve net zero carbon emissions
- Operate a reliable railway service that is resilient to climate change
- Be recognised as a leader in land management for biodiversity and take account of impacts on natural capital in all investment planning and delivery
- Respect and protect the natural, cultural and historic landscape of the railway network
- Minimise waste and embed circular economy into the rail industry
- Involve and collaborate with stakeholders to foster innovation and realise opportunities to create social value and make a positive contribution.

The structure of the guide is set out below and explained in greater detail in section 4.2 of this document.

Volume 1: Introduction & User Guide

Volume 2: Climate Change

Volume 3: Carbon Reduction

Volume 4: Biodiversity

Volume 5: Landscape & Heritage

Volume 6: Resources

Volume 7: Stakeholder Engagement

**Please note:** Due to the way that it is intended to publish these guidance notes, the numbering of volumes may vary for final, published guidance. Every effort will be made to retain valid cross references for readers.

## 2 Scope

This Introduction volume is split into two main parts.

The first part sets out the aims, objectives and structure of the Railway Sustainability Design Guide. The second part defines what is meant by sustainable design, implementation and management, sets out a number of guiding principles for achieving sustainability in the design and operation of the railway and outlines the key steps in the approach to delivering sustainable design.

The Introduction volume is supplemented by a number of appendices:

<b>Appendix A - Roles and responsibilities</b>	Presents the likely users of the Railway Sustainability Design Guide and categorised them into user groups to explain how the guide can support their work.
<b>Appendix B: Library of case studies</b>	A record of all the case studies that are presented across the Railway Sustainability Design Guide, to help users quickly navigate to appropriate case studies to their context.
<b>Appendix C: Legislation and policy</b>	Sets out the key national legislation, external and internal policies and strategies which relate to the field of sustainable design.
<b>Appendix D: PACE process</b>	Illustrates the relationship between the Railway Sustainability Design Guide and the PACE phases to demonstrate how this guide can be applied at each phase.

### 3 Definitions

<b>Term</b>	<b>Definition</b>
<b>Biodiversity</b>	The variety and variability among all forms of life, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part.
<b>Biodiversity Net Gain</b>	An approach to development that leaves biodiversity in a better state than before. Where a development has an impact on biodiversity, it encourages developers to provide an increase in appropriate natural habitat and ecological features over and above that being affected.
<b>Ecosystem Services</b>	The benefits provided by ecosystems that contribute to making human life both possible and worth living. Examples of ecosystem benefits include food and water, regulation of floods, soil erosion and disease outbreaks; and non-material benefits such as recreational and spiritual in natural areas.
<b>Environmental Net Gain</b>	The approach is built on Biodiversity Net Gain but seeks to reduce pressures on the environment and achieve overall improvements in natural capital, ecosystem services and the benefits they deliver.
<b>Natural Capital</b>	Stocks of natural elements that have value to society - such as forests, fisheries, rivers, biodiversity, soils, minerals, the air and oceans, and natural processes and functions. Natural capital includes both the living and non-living aspects of ecosystems. Stocks of natural capital provide flows of ecosystem services. These services, often in combination with other forms of capital (social, human and produced), produce a wide range of benefits.
<b>Net Zero</b>	Refers to the balance between the amount of greenhouse gas produced and the amount removed from the atmosphere. Net zero is reached when the amount added is no more than the amount taken away.

<b>No Net Loss</b>	No net loss is a goal for a development project, policy, plan or activity in which the impacts on biodiversity are balanced or outweighed by measures taken to avoid and minimise those impacts, to restore affected areas, and finally to offset the residual impacts so that there is no loss.
<b>Project Acceleration in a Controlled Environment (PACE)</b>	The incoming framework for managing project lifecycles that replaces GRIP.

### 3.1 List of abbreviations

<b>Term</b>	<b>Definition</b>
<b>BNG</b>	Biodiversity Net Gain
<b>CCC</b>	Committee on Climate Change
<b>ENG</b>	Environmental Net Gain
<b>ESA</b>	Environmental & Social Appraisal
<b>ESMP</b>	Environmental & Social Management Plan
<b>GHG</b>	Greenhouse Gas
<b>KPI</b>	Key Performance Indicator
<b>NIC</b>	National Infrastructure Commission
<b>PACE</b>	Project Acceleration in a Controlled Environment
<b>RAM</b>	Route Asset Manager

## 4 Context, Objectives and Structure

### 4.1 Introduction

The UK recognises the significant threat that biodiversity loss and climate change pose to the economy and societal wellbeing. It was the first major economy to commit to bringing all greenhouse gas (GHG) emissions to net zero by 2050<sup>i</sup> and to embedding a principle of environmental net gain into infrastructure<sup>ii</sup> and the Environment Bill mandates a requirement for net gains for biodiversity.

As the owner of over 52,000 hectares of land and the developer and operator of major infrastructure, Network Rail recognises the important contribution it can make to reducing greenhouse gas emissions, facilitating adaptation to climate change and protecting and enhancing natural capital and biodiversity. This is reflected in the company’s ambitious Environmental Sustainability Strategy which include amongst its key objectives:

- Achieve net zero carbon emissions by 2050 (and 2045 in Scotland)
- Prepare the railway infrastructure to minimise climate change impacts
- Achieve no net loss of biodiversity across the network by 2024 and net gain by 2035<sup>iii</sup>

### 4.2 Aims and objectives

The aim of this guide is to bring sustainability considerations to the centre of decisions on strategy, design, management, operations and maintenance. It provides practical guidance on how to apply the requirements set out in Level 2 standards relating to environment and sustainability. Figure 1 illustrates how the guide relates to wider Network Rail policies, strategies and standards.

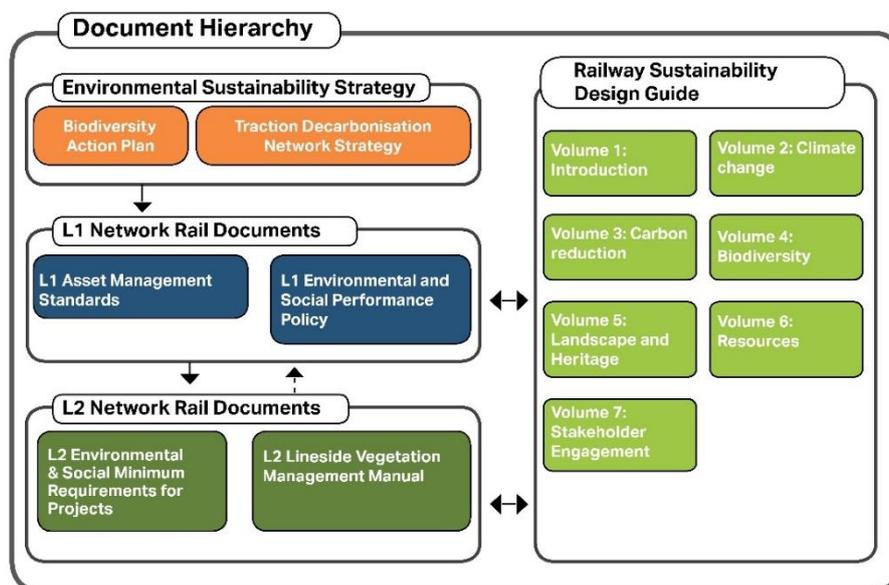


Figure 1: Network Rail’s document hierarchy

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This guidance reflects the need to:

- Treat the environment as an asset that is capable of delivering a wide range of benefits and services ('ecosystem services') in line with the findings and recommendations of the independent review of Network Rail's Vegetation Management (the Varley Review).
- Reduce GHG emissions and contribute to air quality improvements in line with Government targets.
- Enhance the resilience of the network to the effects of a changing climate, including its ability to withstand the impacts of weather events that are likely to become more frequent and more intense (see Case Study 1).
- Minimise the amount of waste produced and manage unavoidable waste better, including through more widespread adoption of circular economy thinking.
- Engage meaningfully with all relevant stakeholders, including passengers and the public, to help innovate in the delivery of sustainability improvements and in so doing create lasting social value.

#### CASE STUDY 1: Dawlish coastline damage, February 2014

Cornwall and Devon were struck by severe coastal storms which led to widespread flooding and storm damage. High sea levels and very strong winds resulted in sea walls being breached and a stretch of the coastal railway collapsing into the sea.

The London-Penzance route is the main railway line that connects the south west peninsula to London and hugs the coastline between Dawlish and Teignmouth. The incident caused eight weeks of disruption to the line, cost approximately £35million to re-establish the rail link, and required improvements to the resilience of a temporary sea wall at Dawlish. Planning permission has been granted for the development of a new sea wall to protect the railway for the next century, taking into consideration sea level rises as a result of climate change.

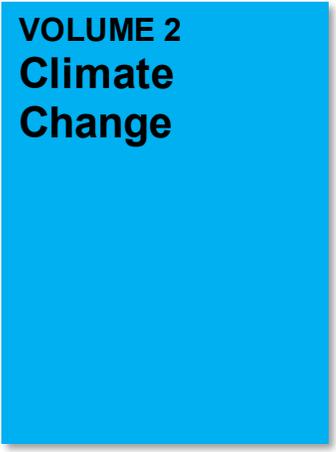


**Figure 2: Dawlish coastline damage**

The Railway Sustainability Design Guide provides a method which can be applied across all scales of operations and projects that gives users the resources and knowledge to improve the environmental performance of the railway, deliver more sustainable outcomes and raise the standard of sustainable design delivered across the network. Appendix A sets out how the guide applies to target users and their work and responsibilities; it will be an important point of reference when reviewing section 5.2 of this document.

### 4.3 Structure of the Railway Sustainability Design Guide

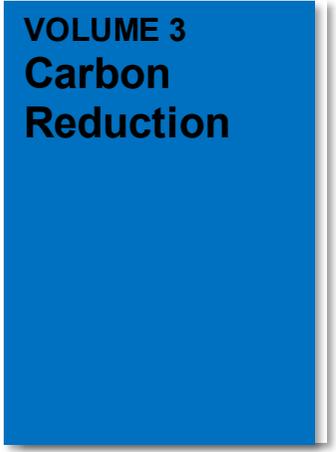
This section provides an overview of the structure and content of the Railway Sustainability Design Guide, which is divided into seven volumes – this Introduction (Volume 1) and six technical volumes. These volumes have been developed in line with the CEEQUAL Manual 6<sup>iv</sup>, which is a world-leading sustainability rating scheme for infrastructure projects. The content of the volumes has also been shaped through extensive engagement with Network Rail's five regions to understand their key aspects that need to be considered in relation to sustainable land management.



**VOLUME 2**  
**Climate**  
**Change**

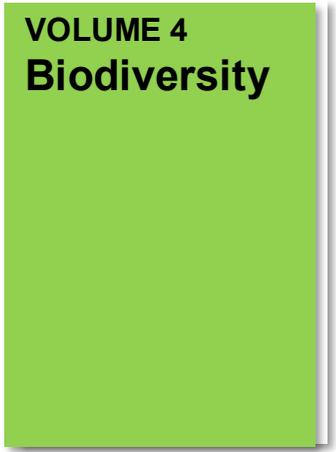
Volume 2 provides guidance on how to assess the impact of extreme weather and climate change on the operational railway. It sets out an approach to address key aspects of climate change and weather resilience through sustainable design including flood risk, erosion, droughts, and storms.

According to the Committee on Climate Change, 650km of railway lines and 94 railway stations across the UK will be exposed to major coastal flooding and erosion by 2080.<sup>v</sup> Sustainable design and management techniques can mitigate the impacts of increased rainfall and run-off from adjacent land through measures such as increasing existing drainage capacity, earthworks, and planting that slows the flow of water.



**VOLUME 3**  
**Carbon**  
**Reduction**

Volume 3 supports efforts to develop and implement carbon reduction strategies. It provides guidance, advice and case study examples on how the asset owners, designers, maintainers and contractors should collaborate to apply the carbon tools and techniques in compliance with Network Rail requirements and standards. Network Rail recognises its important role in supporting the Government's commitment to achieve net zero emissions across every mode of transport by 2050. As acknowledged in the Environmental Sustainability Strategy<sup>vi</sup>, Network Rail understands the opportunity that land and assets provide in terms of renewable energy generation and electrification of the network. There is also a significant opportunity to offset residual emissions through measures to protect and enhance the carbon storage capacity of land – for example, through tree planting.



**VOLUME 4**  
**Biodiversity**

Volume 4 presents guidance on how to assess and attribute values to biodiversity within the lineside estate. It provides aids, templates and proformas that help with formulating preferred habitat management objectives, selecting appropriate interventions and measuring biodiversity net gain (BNG). It provides detailed guidance on the design, implementation and establishment of new habitat, and on the long-term management and restoration of existing habitat.

As one of the largest landowners in the UK, Network Rail has an important role in the UK's ambition to protect and enhance biodiversity. Successful management of habitats will contribute to safe and efficient rail operation and increase the natural capital value of the lineside and estate, with the objectives of no net loss by 2024 and of net gain by 2035.

**VOLUME 5  
Landscape  
& Heritage**

Volume 5 includes guidance on how to assess and evaluate existing landscape and use the findings to develop and enhance the lineside. A landscape-led approach to infrastructure design recognises and reinforces the relationships between people, place and the natural world. This volume also provides guidance on how to define a design vision and principles which respond to local landscape character.

It also considers maintenance of heritage assets in the landscape, recognising the importance of their setting and potential for enhancement. Consideration of landscape and heritage can encourage positive integration of structures and the promotion and celebration of views, cultural assets and history which can all support the local economy.

**VOLUME 6  
Resources**

Volume 6 provides guidance on waste management and the circular economy, sustainable water management, contaminated land, pollution, products and materials, agriculture, and soils. Assessing products and materials and classifying waste as a resource is critical to sustainable management. On average, Network Rail generates more than 2 million tonnes of waste per annum which also has significant financial implications<sup>vii</sup>.

Guidance on applying circular economy principles and the waste hierarchy will support decision-making and compliance with the Environmental Sustainability Strategy. It will also deliver savings by reducing waste and carbon through better design, construction, operation and maintenance, while stimulating local economies.

**VOLUME 7  
Stakeholder  
Engagement**

Volume 7 specifies how stakeholder engagement should be approached and delivered. It includes advice for monitoring stakeholder responses, engaging with statutory consultees, and liaising with neighbours; and how this should fit into wider work by Network Rail Communications. It includes relevant examples of best practice from across the Network Rail regions.

Stakeholders play a critical role in influencing, consenting and helping to deliver sustainable design for assets and maintenance of the lineside network. By undertaking best practice engagement, Network Rail can become a better neighbour and deliver social value.

## 5 Sustainable design, implementation and management

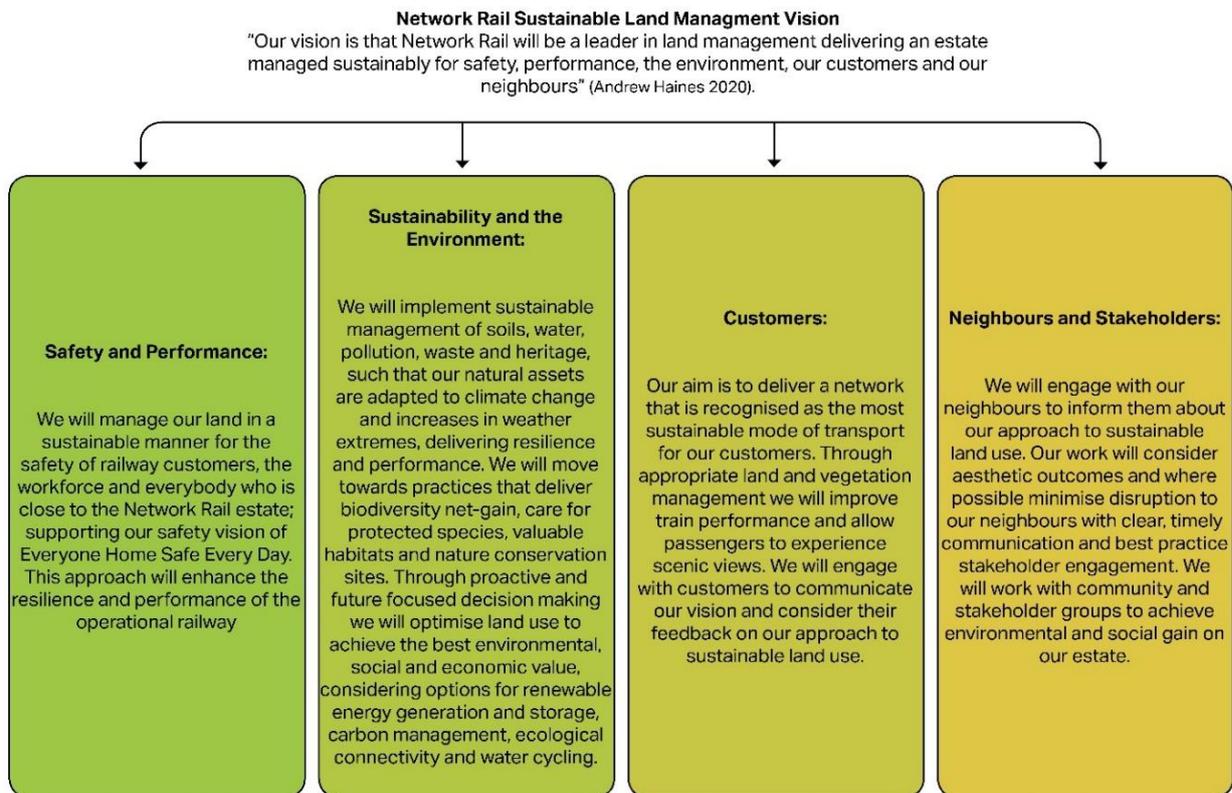
### 5.1 Definitions of sustainable development and sustainable design

Given the wide-ranging interpretations of sustainability, it is important to present a clear definition of what is meant by ‘sustainable design’ in the context of Network Rail and its assets. Sustainable design is based on the core principles of sustainable development, which was defined in the World Commission on Environment & Development’s 1987 Brundtland report as:

*“Development that meets the needs of the present without comprising the ability of future generations to meet their own needs”<sup>viii</sup>*

This definition acknowledges that development relies on environmental resources, and that exploitation or mismanagement of these resources will have a detrimental effect on the future health and development of society. As such sustainable design goes beyond efforts to minimise negative impacts on the environment. It should also provide social value, supports economic growth and delivers a rail network that protects and enhances the environment for the benefit of present and future generations.

In December 2019 Network Rail and its five regions set up a project to define sustainable land management in the context of Network Rail’s estate and operations and to develop a unified ambition for a new sustainable management approach to the estate. The resulting vision is shown in Figure 3.



**Figure 3: Network Rail’s Sustainable Land Management Vision**

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With this in mind, a key aim of sustainable design is to treat the land that Network Rail owns and manages as a range of natural assets (natural capital) that delivers a range of services and benefits (ecosystem services) on which society and the economy depends. Railway infrastructure both impacts and depends on this natural capital and sustainable design presents an opportunity to use infrastructure solutions to achieve environmental net gain, leaving biodiversity and the environment, (including soils, water and air) in a measurably better state than before.

Good design is also based on the understanding of how things function, look, and provide services. It is important to acknowledge that sustainable design is not just about new infrastructure, it is also about the optimisation and rehabilitation of existing infrastructure to make it resilient to climate change, increase energy efficiency, minimise waste and materials, and remediate damaged soils and waste<sup>x</sup>. Sustainable design means developing solutions that deliver best value when measured over the whole life of infrastructure. This requires that sustainability principles are embedded at every step of planning and delivery from optioneering and strategic masterplanning down to the detailed design and specification of maintenance and operational works. It also means looking beyond the railway corridor to identify the wider opportunities, for example to enhance natural capital and ecosystem services to deliver net gain.

## 5.2 Principles of Sustainable Design

Network Rail has adopted the National Infrastructure Commission's four guiding principles for infrastructure design.



**Mitigate greenhouse gas emissions and adapt to climate change**



**Reflect what society wants and share benefits widely**



**Provide a sense of identity and improve our environment**



**Achieve multiple benefits and solve problems well**

**Figure 4: The design principles for national infrastructure<sup>x</sup>**

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To deliver against these four principles, the NIC recommends that all projects should:

1. Appreciate the wider context;
2. Engage meaningfully; and
3. Continually measure and improve.

These principles emphasise the importance of bringing together the necessary technical expertise in order to develop infrastructure that offers best value, and works for people, climate and places. Good design is not just the responsibility of designers but should be integral to all aspects of Network Rail delivery including engineering, management, maintenance, environmental workstreams and stakeholders.

Landscapes connect people, place and nature, and are often among the highest concerns of the public and stakeholders in infrastructure projects. The rail network is intrinsically linked to the character of the landscape it passes through, and is often celebrated for its architecture, engineering, and cultural heritage, as well as its contribution to nature networks and sense of place.

In order for these principles to be integrated at the earliest possible stage in a design – whether it is of a regional or route asset strategy, a project or a maintenance programme – users may find it helpful to develop a design vision that considers these broader landscape opportunities. The vision should embrace all the principles of sustainable design while accounting for the particular context in which the project or programme is being developed and in so doing will provide the framework within which to set objectives, explore key constraints and opportunities and monitor and measure progress. Ultimately, the design vision should guide a process that results in the delivery of multifunctional design solutions that contribute to the enhancement of natural capital and support the delivery of environmental net gain.

### 5.3 Eight-step design process

This section describes eight key steps in the sustainable design approach and the role of user groups across the process, as well as setting out where these apply across the PACE phases and the management of the railway and existing Network Rail estate. (See Appendix A to understand the roles related to the user groups in Figure 5 and the purpose of this guide for those groups; see Appendix D to understand how Figure 5 relates to the PACE phases.)

This approach does not have to be prescriptive, rather, it is intended as a framework through which sustainable design principles can be applied on a project-by-project basis. It is also important to note that sustainable design is as much about process as it is about product. The principles of sustainable design should be clearly reflected within each step of planning and delivery while ongoing monitoring and evaluation should support a process of adaptive management and continual improvement (illustrated by the dashed arrow in Figure 5) by providing valuable insights to inform future decision around the management of lineside and the estate.



Figure 5: Applying the Railway Sustainability Design Guide

**OFFICIAL****STEP 1: Familiarise yourself with the guide's volumes and principles**

This step is primarily about understanding the fundamental principles of sustainable design and how to apply the guidance in practice, which is addressed through this Introduction volume. Users should take time to study the process in Figure 5 and recognise that they may need to focus on some areas of the guide more than others, depending on the nature of their role and context of their work. By applying the principles and practices set out in this Railway Sustainability Design Guide's in day-to-day activities, users across the organisation will be adopting a consistent approach to land management that will support Network Rail in achieving its environmental sustainability ambitions.

**STEP 2: Use of ESA tool to identify environmental and social priorities**

The undertaking of this step will help identify the Railway Sustainability Design Guide's volumes which are most pertinent for each user's context. The ESA tool (specified in NR/L2/ENV 015) is essential to support projects with compliance, performance and safety measures, and for the consideration of social and environmental issues. Case Study 2 provides an example of the risks to projects that do not complete an ESA.

The tool provides enablers, templates, tools and assessments to meet strategic objectives. Project-development users must make sure this step is completed. The tool is supported by a user guide which helps to prioritise environmental and social issues using a red, amber, green (RAG) scoring system. The tool outputs a list of actions that will help track opportunities, risk, assessments, objectives, and monitoring. Those working through the PACE process should follow each step of the ESA tool thoroughly.

The ESA checklist can be completed to different levels of detail – for example, for operations the tool can be used as a guide to indicate what sustainability priorities should be considered. Once the RAG scoring has been completed, the action list should be reviewed to evaluate which actions are appropriate for the scale of project.

The Railway Sustainability Design Guide can help interpret ESA tool results to:

- Identify opportunities to deliver multiple benefits and to consider the potential trade-offs between different aspects – for example, enhancing biodiversity and public amenity
- Defining additional surveys and actions to mitigate or avoid an impact highlighted within the ESA
- Providing information on design responses and management approaches to achieve maximum benefit from the ESA-prescribed actions

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**Note:** STEP 2 has two key resources:

1) The ESA tool (<https://safety.networkrail.co.uk/home-2/environment-and-sustainable-development/esd-tools-templates/>)

2) The ESMP template (<https://safety.networkrail.co.uk/wp-content/uploads/2020/06/ESMP-FINAL-FOR-ISSUE.docx>)

## CASE STUDY 2: Leeds Armley – consequences of not using the ESA tool

In 2019, Network Rail planned tree felling at a 0.3 hectare site in an urban area where residents have limited access to greenspace. No ESA was undertaken for what was considered a routine maintenance operation. However, once work to remove the trees began, local residents raised concerns and requested more information on why the habitat was being removed. This resulted in the involvement of local politicians, negative publicity, unexpected public relations costs, and an 18-month delay as Network Rail undertook ecological surveys and rebuilt relationships with the local community. Use of the ESA tool would have highlighted the need for ecological surveys and engagement with local residents which would have helped to deliver a more acceptable solution for all concerned.



Figure 6: Local residents at the Leeds Armley site

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**STEP 3: Environmental & Social Assessment**

This step is intended to help users develop a more detailed understanding of the environmental and social context of the project or site – whether it is for a regional approach to land management or for an 1/8 of a mile lineside maintenance intervention. Step 3 explains how the priorities identified in Step 2 can be resolved in compliance with Network Rail standards. Step 3 assists in:

- Identifying the standards that must be met and the resources needed to assess the site's baseline conditions, such as survey templates
- Understanding the specific data to be collected, the spatial and temporal scale, and where the data can be sourced (each of the guide's six other volumes provides templates and proformas to help present this data, and guidance on how it should be interpreted)
- Guiding on-site users through the process of collecting and analysing environmental and social baseline information in developing an accessible resource that aids understanding of the environmental and social context of the site or project.
- Establishing a vision for sustainable design reflecting the environmental and social context of the intervention, project or programme being developed

This step is critical in terms of stakeholder engagement because it provides an audit trail to help demonstrate why sustainable design decisions have been made, and it demonstrates compliance with NR/L2/ENV/015.

Collecting detailed baseline data is important to inform the development of natural capital accounts which is one of the commitments of the Environmental Sustainability Strategy. Network Rail is considering how a natural capital approach can be utilised within the context of the Railway Sustainability Design Guide. A natural capital approach would enable analysis of the different impacts that design and management decisions can have on environmental assets and their ecosystem services. By bringing together environmental, social and economic evidence for a particular region, route or site, a natural capital approach would help quantify the impacts and dependencies on decisions will have in relation to the Railway Sustainability Design Guide's different volumes.

Case Study 3 (below) illustrates how ecology surveys and stakeholder engagement could have helped mitigate the impacts of vegetation management on local residents. In this example, guidance from Volumes 4 (Biodiversity), 5 (Landscape & Heritage) and 7 (Stakeholder Engagement) would have been beneficial.

### CASE STUDY 3: Hadley Wood – tree felling

In February 2018, vegetation management work was undertaken at Hadley Wood station, which lies in a cutting on the East Coast Mainline north of London. Despite protests from the local residents association, a large section of vegetation was cleared to the boundary fence, which was 60 metres from the track. This prompted complaints about excessive clearance, ecological impact and the risk to slope stability. Following site visits with local residents it became clear that the felling was too extensive. This incident could have been avoided by rigorous data collection and consulting neighbours to get a better understanding of the site's context. A more targeted thinning would have enhanced biodiversity while retaining a visual screen that was highly valued by residents.



**Figure 7: Vegetation management at Hadley Wood**

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**STEP 4 – Setting sustainability objectives**

This step is intended to build upon the design vision established in Step 3 and set out sustainability objectives that can contribute to achieving it. Figure 8 identifies a hierarchy of key documents that provide key performance indicators (KPIs) and objectives at different scales. It is recommended that users review each of these documents to guide the development of project-specific objectives to be included in, for example, an ESMP.

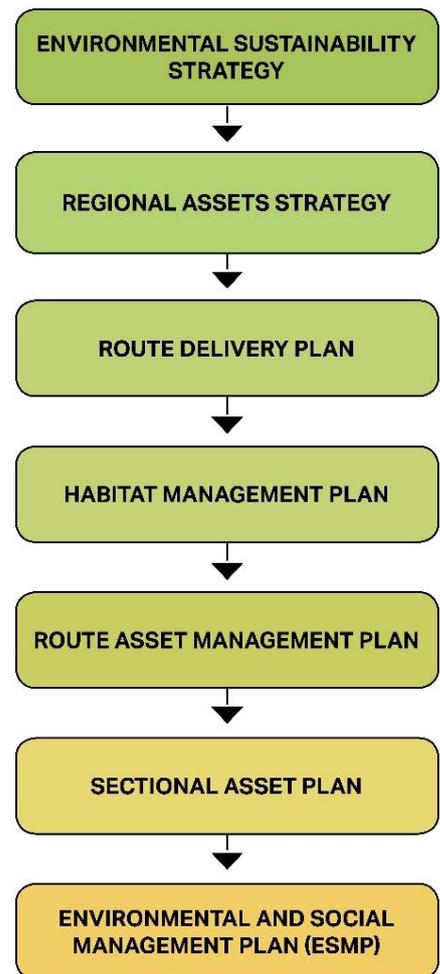
The Railway Sustainability Design Guide should be used to integrate sustainable design principles (see Section 5.1) into design and management. Ensuring these principles are considered should lead to the establishment of project-specific objectives that reflect strategic Network Rail objectives and KPIs set throughout the documents in Figure 8 as well as national policy and regulation.

The guide will also help users to understand how, through maintenance and operations interventions, they can contribute to Network Rail priorities, strategic and regional KPIs, and internal policies and standards.

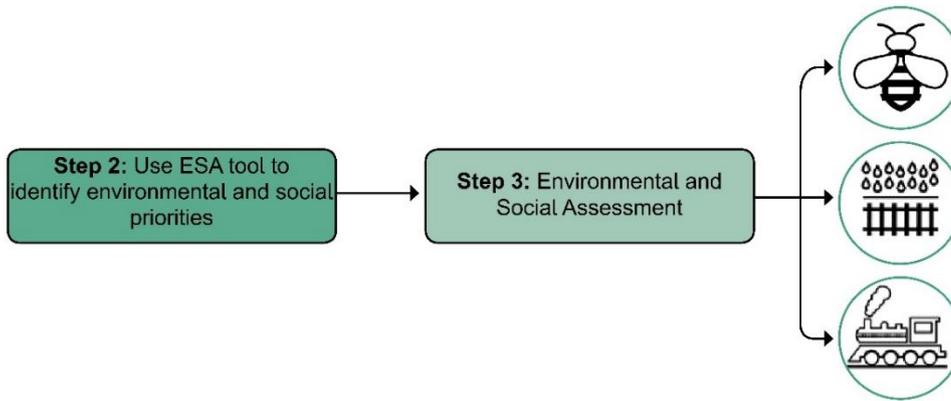
Step 4 has different implications for each of the following user groups:

- **Strategic:** understand current KPIs to guide the development of new KPIs.
- **Project Development:** use Steps 2 and 3 to establish which environmental and social topics need to be prioritised and a design vision, to help develop the most appropriate objectives for the scope of work – as depicted in Figure 8.
- **Project Delivery:** the volumes each provide technical guidance on setting objectives; this will aid the delivery of toolbox talks and work plans that ensure on-site teams are aware of sustainability objectives and their implications.

**Note:** Further details on the roles related to each user group can be found in Appendix A



**Figure 8: Network Rail sources of sustainability objectives**



**Figure 9: Process of identifying and prioritising environmental and social topics**

It is important that sustainability objectives are set out as early as possible so they can influence how work is prepared and undertaken. Figure 10 provides example objectives to show the range of objectives that may be considered for projects, programmes and procurement documents.

	<b>Climate Change</b>	<ul style="list-style-type: none"> <li>Integrate Sustainable Drainage Systems (SuDS) principles and climate change predictions into drainage design.</li> <li>Design embankment upgrade to be resilient to climate change predictions.</li> </ul>
	<b>Carbon Reduction</b>	<ul style="list-style-type: none"> <li>Undertake a carbon assessment to identify opportunities to reduce the total life-cycle energy or carbon footprint.</li> <li>Specify low emission vehicles, plant and equipment as part of contract and procurement.</li> </ul>
	<b>Biodiversity</b>	<ul style="list-style-type: none"> <li>Deliver BNG through embankment vegetation reinstatement and/or offsetting.</li> <li>Design to keep hedgerows on site to minimize the impact on local wildlife.</li> </ul>
	<b>Landscape and Heritage</b>	<ul style="list-style-type: none"> <li>Carry out a Landscape Character Assessment to inform design and management principles which reinforce local distinctiveness</li> <li>Register X number of volunteer days focused on 'Respecting</li> </ul>
	<b>Resources</b>	<ul style="list-style-type: none"> <li>Source materials with higher recycled content/ BES6001 certified and produce them locally if possible.</li> <li>Avoid or minimise excavation waste by design, reuse them if possible.</li> </ul>
	<b>Stakeholder Engagement</b>	<ul style="list-style-type: none"> <li>Identify opportunities to engage with students at nearby schools.</li> <li>Ensures that all employees and contractors follow the Network Rail behaviours and ethics policy.</li> </ul>

**Figure 10: Example sustainability objectives from recent ESMPs**

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**STEP 5 – Develop the approach**

The aim of this step is to develop design options in line with the guidance set out in the Railway Sustainability Design Guide's volumes, this will support users to develop specifications that are in line with relevant standards.

Each volume will offer instructions on what good design looks like, including key design considerations, how to develop an approach to deliver these considerations, and where further advice and guidance is available.

When potential conflicts between different sustainability objectives become apparent, risk reviews and workshops can be used to agree trade-offs and refine objectives. This process will help to refine design options into the development of a preferred option.

A natural capital assessment may be helpful in developing a more complete understanding of how the proposed project or programme may contribute to wider societal aims and of any trade-offs that affect the quality of quantity of environmental assets and the benefits they deliver. Importantly, it will help identify where mitigating actions may be required and where there may be opportunities to achieve BNG and wider environmental benefits, including opportunities to work with nature to enhance carbon storage and sequestration or reduce the risk of flooding.

Step 5 is important for the following user groups:

- **Strategic:** identify key individuals within the organisation and external experts that can shape the delivery of objectives set in Step 4 – for example, the Volume 4 (Biodiversity) can be used to understand who to engage in order to deliver BNG at a regional level.
- **Project Development:** provide practical solutions and actions to deliver against the standards set out in the relevant Level 2 documents.
- **Communication:** develop communication approaches for different scales of work; also provide guidance to develop and deliver an appropriate stakeholder engagement management plan.

In Figure 5, the dashed box covering Steps 6 and 7 represents a feedback loop. This highlights the need to review plans to shape the final design or maintenance approach. It may be that new information has come to light during delivery which may require the management plan to be amended. ESMPs should be updated every six months to monitor progress. The delivery stage may be a two-year or longer process, so it is important to assess, evaluate and refine the approach throughout project delivery to meet objectives set out in Step 4.

**OFFICIAL****STEP 6: Review and evaluate approach**

Once a preferred option is identified, Step 6 focuses on reviewing the scope against the best practice presented in this guide. Use the case studies to understand best practice and how it may be applied to achieve solutions that meet your sustainability objectives.

Good design and sustainability strategies are developed with cross-discipline input, so use this expertise to refine and enhance plans, to gather information on how to minimise trade-offs, and to maximise co-benefits across the topics presented in each of the guide's volumes.

Where a user's project involves works to a station, this is an opportunity to review the preferred design option to ensure it is in line with the guidance in NR/GN/CIV/100/04 Sustainable Design for Stations.

This is a fine-tuning stage, providing the opportunity to reflect on whether the chosen measures are the best for achieving the sustainability objectives. The guide provides:

- Management principles critical to the delivery of each volume subject.
- Guidance on management and maintenance decisions that will deliver the preferred design option and the sustainability objectives set out in Step 4.
- Guidance and support to develop an approach that will achieve strategic objectives – for example, BNG objectives can be supported by following guidance in the Biodiversity volume and considering the referenced Level 2 documents.

When reviewing and evaluating, the main sustainable design considerations should be integrated into a delivery plan (this could be in relation to an asset plan, project design, intervention work plan, or habitat management plan).

**STEP 7: Delivery**

This step focuses on applying the methods that have been developed throughout this step-by-step process. The guide's volumes support delivery, including:

- How to select and prepare sites.
- Developing activities, such as audits and inspections, to monitor compliance with environmental and social objectives through the delivery phase.
- Selecting appropriate contractors.
- Detailing an appropriate level of technical oversight and a scope-of-works timeline.
- How and when to engage stakeholders in order to develop strong and transparent relationships.

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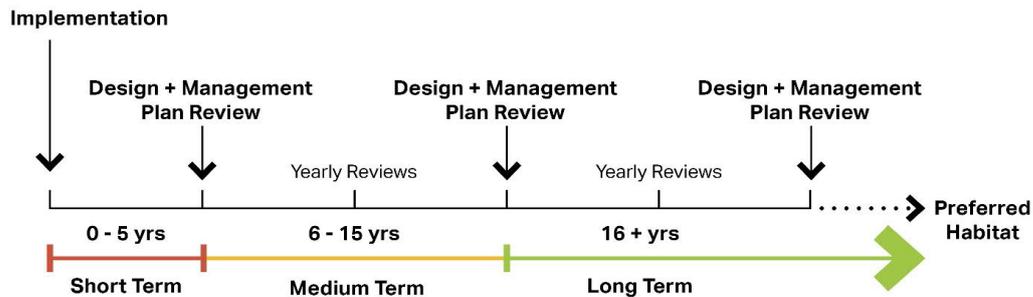
Use the case studies to develop a sustainability approach that considers all the key topics and their interrelationships (Case Study 5 illustrates this).

### CASE STUDY 5: Leeds Armley – noise reduction

Contractors turned up on site with petrol-powered chainsaws which are noisy. Following a scheduled bi-weekly site check, it was highlighted that, given the urban setting and proximity to residents, it would be more appropriate to use battery-powered chainsaws. The contractor agreed to use battery-powered saws, resulting in a reduction in noise pollution and improved relationships with residents.

### STEP 8: Monitoring and Evaluation

As per L2/ENV/015, the ESMP should be used to comply with key environmental and social controls. The designer / contractor should develop a checklist to guide inspections and audits, and organise a schedule of inspections. Essential to this is monitoring progress against priorities identified in Step 2 and the project specific objectives developed in Step 4. This guide can be used to support the design of an effective monitoring and evaluation programme. Figure 11 shows an example of a monitoring plan for habitat establishment, presented in Volume 04 (Biodiversity).



**Figure 11: Monitoring and evaluation timeline to achieve your preferred habitat option**

## **Stakeholder Engagement**

Stakeholder and community engagement is a critical part of sustainable design, and provides an opportunity to enhance social value and reduce complaints. As set out in Figure 5, this activity should feature strongly across Steps 3 to 8.

Good and meaningful stakeholder engagement is a critical tool to: gain permits, consent and licensing; address stakeholder concerns through design and construction; and reduce the risk of your programme being delayed.

This guide recognises that successful sustainable design requires meaningful engagement with communities and stakeholders to identify opportunities for achieving biodiversity and environmental net gain and increase maximising social value across the network. Volume 07 (Stakeholder Engagement) advises when and how to engage with different stakeholder groups including local communities, special interest groups and other interested and affected parties.

## Appendix A - Roles and responsibilities

Table 1 presents the likely users of the guide and its relevance to their roles.

**Table 1: User groups and the purpose of the guide**

User group	Role	Purpose of the Railway Sustainability Design Guide
<b>Strategic</b>	Executive Leadership Team	<ul style="list-style-type: none"> <li>Provides an overview of best practice within Network Rail and from other countries and related sectors; once a year, users should familiarise themselves with updates in terms of best practice design and management guidance</li> <li>Informs key stakeholders and tracks progress towards the achievement of key sustainability-related objectives; it is critical that these users endorse the guide to ensure it is integrated across workstreams</li> </ul>
	Chief Environment and Sustainability Officer	<ul style="list-style-type: none"> <li>Provides an overview of all sustainable design and management practices covered under their remit; also supports tracking progress towards achieving key sustainability-related objectives</li> <li>It will be important to endorse the guide and ensure its visibility across the organisation so it plays a central role in raising design standards</li> </ul>
	Route Leadership Teams	<ul style="list-style-type: none"> <li>Provides an overview of sustainable design and management practices across Network Rail</li> <li>It will be important to endorse the guide and ensure its visibility across the organisation so it plays a central role in raising design standards</li> </ul>
<b>Project development</b>	Sponsors and Project Managers	<ul style="list-style-type: none"> <li>Consider the guide throughout the programme to ensure that sustainability concerns are integral, considered before each programme phase, and support the development of a sustainable construction strategy</li> <li>Use lessons learned from case studies and best practice guidance</li> <li>Take into account in the preparation of tender documents and construction programmes</li> </ul>
	Planners and Designers	<ul style="list-style-type: none"> <li>Use the guide at the pre-planning application stage, to help integrate sustainable design and management principles, and to support a detailed understanding of the benefits of sustainable design</li> </ul>
	Planners (Consents)	<ul style="list-style-type: none"> <li>Supports the Consents team and asset managers.</li> </ul>

User group	Role	Purpose of the Railway Sustainability Design Guide
		<ul style="list-style-type: none"> <li>Planners should consider effect programme to ensure the sustainable design and management principles do not result in any delays</li> </ul>
	Route Engineers	<ul style="list-style-type: none"> <li>Integrate sustainable design and management principles into design and in line with programme</li> </ul>
	Environment Managers	<ul style="list-style-type: none"> <li>Refer to the guide during programme development to promote and support the delivery of the sustainable design and management principles through project lifecycle, and to ensure policy compliance</li> <li>Guide the sustainable management of existing assets through maintenance and operations projects</li> </ul>
<b>Project delivery</b>	Asset Engineers and Geotechnical Engineers	<ul style="list-style-type: none"> <li>Consult the guide when considering the specifications of works at a site level; users should be aware of which volume to access during different project delivery stages</li> <li>It provides guidance on how to improve management existing assets to deliver sustainable design benefits through the existing network</li> <li>Helps users to understand which specialists in the organisation they need to engage with and when to engage with them so they can be aware of the implications of their actions</li> </ul>
	Environment Specialists	<ul style="list-style-type: none"> <li>Identifies best practice approaches for supporting maintenance and sustainable management of existing assets</li> <li>Informs the development of suitable approaches to implementing sustainable design at all scales – site, section, route, regional or national – to ensure that objectives set out through planning and design can be realised through implementation</li> </ul>
	Consultants	<ul style="list-style-type: none"> <li>Consult the guide to understand Network Rail's processes, priorities and examples of best practice which should be reflected in project design and delivery</li> </ul>
<b>Communication</b>	Communications and Public Relations	<ul style="list-style-type: none"> <li>Refer to the guide when engaging with external stakeholders about Network Rail's approach to planning and implementation at all scales of work, including regional, route, project, site and maintenance interventions</li> </ul>
	External Stakeholders	<ul style="list-style-type: none"> <li>Helps external stakeholders understand Network Rail's approach to sustainable design, land management and routine operations decisions; users will be able to hold Network Rail accountable to the principles of this document</li> </ul>
<b>On-site</b>	On-site Users	<ul style="list-style-type: none"> <li>Use the guide to understand the principles and objectives that Network Rail's projects need to achieve, and how they can be delivered on site and through ongoing management of the lineside</li> </ul>

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**Appendix B - Library of case studies**

This section provides a summary of the case studies that can be found across the Railway Sustainability Design Guide volumes. It shows where to find them and identifies each case study's key features to help users navigate to the most appropriate examples of best practice. The full library of case studies can be found by accessing the first tab through this [link](#).

Case Study	Region	Volume (page)	Scale	Carbon Reduction	Climate Change	Biodiversity	Landscape & Heritage	Resources	Stakeholder Engagement	Key features
Dawlish Coastline Damage	Wales and Western	Volume 1 (p11)	N/A		Impacts of extreme weather					
Leeds Armley - the impacts of a missing ESA tool	Eastern	Volume 1 (p23)	Maintenance (0.3ha)						Number of complaints	Bad practice
Hadley Wood - tree felling	Southern	Volume 1 (p24)	Maintenance						Number of complaints	Monitoring
Leeds Armley - noise reduction	Eastern	Volume 1 (p28)	Maintenance (0.3ha)						Being a good neighbour	Monitoring
Avon Gorge SSSI, Bristol	Wales and Western	Volume 4 (p40)	Maintenance (11 ha)			Woodland	Consideration of landscape and scenic views			Monitoring
Bermondsey Dive-Under, London	Southern	Volume 4 (p43)	Lineside (1ha)			Biodiversity net gain		Contaminated land management		
Cairngorms National Park	Scotland	Volume 4 (p47)	Site specific (2ha)			Heathland and shrub restoration			Being a good neighbour	Monitoring

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Freckland Wood, Nottinghamshire	Eastern	Volume 4 (p50)	Site specific (20ha)			Biodiversity net gain	Contribution to local population			Monitoring
Belvoir Park Forest, Belfast	N/A	Volume 4, Woodland Design & Management Guide (p55)	Site specific (75ha)			Woodland				Invasive Species
Hating Down, West Sussex	N/A	Volume 4, Woodland Design & Management Guide (p57)	Site specific			Woodland			Design collaboration	
Ardtornish	N/A	Volume 4, Woodland Design & Management Guide (p62)	Landscape scale (14,000ha)			Woodland				ESA

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## Appendix C - Legislation and policy

### C.1 National Rail Policy

The guide will help to achieve compliance with the key legislation, policies and strategies shown in the table below. Recognising the wider context for decisions and actions puts Network Rail in a better position to manage its estate in a way that satisfies legal requirements, contributes to wider policy objectives, and, ultimately, benefits Network Rail and the communities it serves.

Current Legislation	
<a href="#">Town &amp; Country Planning Act 1990</a> <sup>xi</sup> (England and Wales)	Regulates the development of land in England and Wales, and provides a framework for local authorities to take a development plan-based approach; covers legislation for the provision of 'statutory undertakings', including railway and light railway development schemes.
<a href="#">Town &amp; Country Planning Act 2006</a> <sup>xii</sup> (Scotland)	Guides future development and land use in Scotland for the long-term interest of the Scottish public; identifies four key development objectives: <ul style="list-style-type: none"> <li>• Support sustainable, well-designed places;</li> <li>• Reduce carbon emissions and adapt to climate change;</li> <li>• Protect and enhance natural and cultural assets; and</li> <li>• Support better transport.</li> </ul>
<a href="#">The Environment Bill (Draft)</a> <sup>xiii</sup> (England)	Sets out legally binding targets to tackle air pollution, waste, biodiversity loss and water resource protection; seen as a key mechanism for delivering the objectives of the government's 25 Year Plan for the Environment, it sets out a framework for environmental governance; central elements include mandatory biodiversity net gain for new developments, local nature recovery strategies, and encouraging circular economies.
<a href="#">Climate Change Act 2008</a> <sup>xiv</sup> (UK)	Sets out a framework for the UK to achieve its long-term goals of reducing greenhouse gas emissions and to implement steps that are necessary to adapt to the impacts of climate change.
<a href="#">Environment Act 2016</a> <sup>xv</sup> (Wales)	Aims to deliver sustainable management of Wales' natural resources; includes emissions targets and carbon budgets up to 2050.

<a href="#">Climate Change Act 2019</a> <sup>xvi</sup> (Scotland)	<p>This Act updates the Climate Change (Scotland) Act 2009 to set targets to reduce Scotland's emissions of all GHG to net-zero by 2045. The Act embeds the principles of a 'Just Transition' in order to maximise opportunities from meeting emission reduction targets, whilst mitigating the social and economic risks that may be associated with these targets.</p>
<b>Plans, Policies and Strategies</b>	
<a href="#">25 Year Environment Plan</a> <sup>xvii</sup> (England)	<p>Sets out Government's ambitions to protect and enhance the environment (to be enacted through the Environment Bill 2019–20); sets goals for the way land is managed in England, including targets for:</p> <ul style="list-style-type: none"> <li>• Creating better habitats for wildlife;</li> <li>• Improving air and water quality, and reducing pollution;</li> <li>• Protecting and growing natural capital;</li> <li>• Establishing the principle of environmental net gain for infrastructure development; and</li> <li>• Creating networks of wildlife habitats across the landscape to form a green infrastructure that helps plants and animals to move and recover from disturbance, and to respond to climate change.</li> </ul>
<a href="#">National Planning Policy Framework</a> <sup>xviii</sup> (England)	<p>Sets out the government's planning policies for England and how they should be applied; including the following strategic objectives:</p> <ul style="list-style-type: none"> <li>• Sufficient provision of transport infrastructure</li> <li>• Conservation and enhancement of the natural environment</li> <li>• Planning measures to address climate change through mitigation and adaptation</li> </ul>
<a href="#">National Planning Framework 3</a> <sup>xix</sup> (Scotland)	<p>Sets out the long-term vision for development and infrastructure investment for 30 years from 2014 onwards. The framework brings together Scotland's plans and strategies in economic development, regeneration, energy, environment, climate change, transport and digital infrastructure to provide a vision for the country's growth. The framework sets out a vision based on four key characteristics:</p> <ul style="list-style-type: none"> <li>• A successful, sustainable place: to ensure the opportunities of a low carbon economy are fairly distributed across communities</li> <li>• A low carbon place: to become a world leader in low carbon energy generation and develop a more energy efficient built environment including the decarbonisation of transport</li> <li>• A natural, resilient place: respect and improve natural and cultural assets and ensure the environment and infrastructure is resilient to the impacts of climate change</li> <li>• A connected place: improve internal transport links, including the electrification and development of key rail routes.</li> </ul>

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<a href="#">Future Wales – The National Plan 2040<sup>xx</sup></a> (Wales)	<p>This document is the national development framework for Wales, which sets out a strategy to address the key national priorities through the country’s planning system. The spatial plan is focused on sustaining and developing a vibrant economy, achieving decarbonisation and climate resilience, developing strong ecosystems and improving health and wellbeing of communities. The plan notes the importance of delivering new infrastructure which compliments these priorities.</p>
<a href="#">Decarbonising Transport: Setting the Challenge<sup>xxi</sup></a> (UK wide)	<p>Department for Transport policy document aims to achieve net zero greenhouse gas emission from the UK’s transport system (transport became the largest emitting sector of emissions in 2016, contributing to 28% of the UK’s emissions); sets out agenda to accelerate a modal shift to public transport, deliver localised transport solutions, and ensure that the UK is a hub for green transport.</p>
<a href="#">National Transport Strategy 2020 – 2040<sup>xxii</sup></a> (Scotland)	<p>Sets out Scotland’s transport agenda; a central principle is to take significant climate action by helping to deliver net-zero transport emissions by 2040 and by adapting to the impacts of climate change. It also sets out targets to decarbonise the country’s passenger railways by 2035.</p>
<a href="#">Wales Transport Strategy 2021<sup>xxiii</sup></a> (Wales)	<p>The strategy sets out the Welsh Government’s vision to deliver an accessible, sustainable and efficient transport system for all communities across Wales for 20 years. It has three main priorities to deliver in the next five years:</p> <ul style="list-style-type: none"> <li>• Priority 1: Deliver better physical and digital connectivity to reduce the need for people to use cars.</li> <li>• Priority 2: Invest in low-carbon, accessible, efficient and sustainable transport infrastructure to encourage cycling, walking and public transport use. Including future-proofing infrastructure to the impacts of climate change.</li> <li>• Priority 3: Encourage people to change travel behaviours towards the use of low-carbon, sustainable transport, by making these options more affordable and attractive.</li> </ul>
<a href="#">Land Use Strategy 2016 – 2021<sup>xxiv</sup></a> (Scotland)	<p>Guides land-use policy and decision-making; aims to deliver long-term benefits for the economy, environment and communities. It has three key objectives, one being the responsible stewardship of Scotland’s natural resources to deliver greater benefits to the Scottish public; at the time of writing, Scotland was consulting on its third Land Use Strategy which is due to come into effect in mid 2021.</p>
<a href="#">Rail Services Decarbonisation Action Plan<sup>xxv</sup></a> (Scotland)	<p>Sets out the rail sector’s contributions to reaching net-zero greenhouse gas emissions by 2045; focuses on decarbonising transport through modal shift to rail and decarbonising rail traction energy through the removal of diesel passenger trains from the Scottish network by 2035.</p>

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<p><a href="#">Climate Resilient Infrastructure: Preparing for a Changing Climate</a><sup>xxvi</sup> (UK wide)</p>	<p>Sets out the government's vision and policy for adapting infrastructure to climate change; provides guidance for infrastructure owners in terms of action to take, when to do it, and the challenges to action.</p>
<p><a href="#">National Policy Statement for National Networks</a><sup>xxvii</sup> (England)</p>	<p>Sets out the policies and planning guidance to deliver development of nationally significant infrastructure projects for England's road and rail networks; the Secretary of State will use this statement as the primary basis for making decisions on development consent applications; it imposes guidance on good scheme design, as well as the treatment of environmental impacts, in order to achieve sustainable development; its key strategic aims are to deliver networks that:</p> <ul style="list-style-type: none"> <li>• Have the capacity, connectivity and resilience to support national and local economic activity, and to facilitate growth and create jobs</li> <li>• Support and improve journey quality, reliability and safety</li> <li>• Support the delivery of environmental goals and the move to a low carbon economy</li> <li>• Join up communities and link effectively with each other</li> </ul>

## C.2 Network Rail Policy

Each of the volumes in this guide has been developed with reference to KPIs, aims and objectives set out in the strategies, reports and policies below. When reviewing each volume, please refer to relevant Level 2 standards to understand how they can be met to deliver sustainable design.

Strategies/Policies/Reports	
<a href="#">The Environmental Sustainability Strategy (2020 – 2050)</a> <sup>xxviii</sup>	<p><b>Purpose:</b> Long-term strategy sets out a vision to deliver a mass transport system which is clean and green</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Deliver low-emissions railway</li> <li>• Deliver reliable railway service resilient to climate change</li> <li>• Improved biodiversity of plants and wildlife</li> <li>• Minimal waste and sustainable use of materials</li> </ul>
<a href="#">The Varley Review (2018)</a> <sup>xxix</sup>	<p><b>Purpose:</b> Sets out recommendations to deliver sustainable vegetation management across the network; assesses how effectively Network Rail currently manages lineside vegetation on its estate in accordance with its statutory responsibilities to ensure a safe and reliable railway, in addition to its responsibilities to protect and enhance the natural environment</p> <p><b>Recommendations:</b></p> <ul style="list-style-type: none"> <li>• Network Rail must value and manage its lineside as an asset</li> <li>• Appropriate governance must be put in place at organisation, route and project level</li> <li>• Network Rail must improve its communication with communities and key stakeholders</li> <li>• Network Rail should publish an ambitious vision for the lineside</li> <li>• Network Rail should lead a cultural change for valuing nature and the environment across the organisation</li> </ul>
<a href="#">Social Performance Policy (2017)</a> <sup>xxx</sup>	<p><b>Purpose:</b> Sets out principles to improve social performance, deliver local social value, and leave a sustainable legacy for future generations</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Identify Network Rail's social impact and take action to care for local communities</li> </ul>

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	<ul style="list-style-type: none"> <li>• Be a caring neighbour, and engage with lineside and surrounding communities ahead of work</li> <li>• Keep communities safe by taking action to reduce the number of trespass incidents</li> <li>• Design rail infrastructure and information to be accessible to everyone</li> </ul>
<a href="#">Traction Decarbonisation Network Strategy (2020)</a> <sup>xxxii</sup>	<p><b>Purpose:</b> Sets out why decarbonising rail traction is so important and considers the three main ways of doing it: overhead electrification, battery and hydrogen fuel cells; looks at every section of unelectrified line to see where each solution can be used most effectively</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Achieve net zero greenhouse gas emissions by 2050</li> <li>• Decarbonise railway system, and support modal shift from road and air to rail</li> <li>• Deliver cost-efficient railway operations</li> <li>• Provide long-term solution to air quality issues</li> </ul>
<a href="#">Biodiversity Action Plan (BAP) (2020)</a> <sup>xxxii</sup>	<p><b>Purpose:</b> First step in achieving Network Rail's vision of a lineside managed sustainably for safety, performance, the environment, its customers and neighbours; outlines Network Rail's ambitions for its biodiversity assets, and how it intends to protect, manage and enhance the condition of these assets across five-yearly funding cycles</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Achieve no net loss in biodiversity on lineside by 2024 and achieve biodiversity net gain of 10% in each region by 2040</li> <li>• Mitigate unavoidable loss of biodiversity at the route level through habitat creation and restoration</li> <li>• Mainstream biodiversity requirements into Network Rail's planning and decision-making at all levels</li> <li>• Deliver a Network Rail estate that connects and supports biodiversity across Britain</li> <li>• Increase awareness and understanding of Network Rail's work to manage biodiversity</li> <li>• Provide open and transparent annual reports on biodiversity performance through the Route-level BAPs (Biodiversity Action Plans)</li> </ul>
<b>Level 1 Documents</b>	
NR/L1/ENV/100 Network Rail Environment & Social Performance Policy	<p><b>Purpose:</b> Mandates requirements to improve Network Rail's environment and social performance through the mitigation of risks and improved delivery of environment and social management to leave a sustainable legacy for future generations; sets out high-level requirements for environmental and social performance to help achieve Network Rail's key vision of 'A better railway for a better Britain'</p>

	<p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Implement and maintain environmental and social performance management systems</li> <li>• Manage the natural environment responsibly , including considering impacts on biodiversity</li> <li>• Reduce energy use through energy efficiency measures and delivering low-carbon design and culture</li> <li>• Ensure that Britain’s railway becomes resilient to projected future climatic conditions and manages high-risk assets which are currently disrupted by extreme weather</li> <li>• Improve social performance, deliver local social value, and leave a sustainable legacy for future generations</li> </ul>
<b>Level 2 Documents</b>	
<p>NR/L2/ENV/015 Environment &amp; Social Minimum Requirements for Projects</p>	<p><b>Purpose:</b> Sets out Network Rail’s minimum requirements for the management of environment and social risks, and opportunities during design and / or construction activities; it is mandatory for all design and construction work carried out; the standards apply to all land areas impacted by project activities; each project is expected to complete an Environmental &amp; Social Appraisal (ESA) to evaluate which environmental and / or social themes are likely to be impacted by the proposed activities</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Improve business cost-efficiency from sustainable practices</li> <li>• Increase social value</li> <li>• Reduce risk of legal and regulatory non-compliance and negative reputational exposure</li> </ul>
<p>NR/L2/ENV/122 Managing Biodiversity</p>	<p><b>Purpose:</b> Sets out key principles for the management and enhancement of biodiversity; applies to the construction of new assets as well the maintenance of existing assets; highlights the range of other benefits that can be delivered by enhancing biodiversity on rail infrastructure and maintenance projects</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Ensure adherence to environment legislation</li> <li>• Highlight requirements for production of Ecological Constraints &amp; Opportunities Plans (ECO) and Habitat Management Plans (HMP)</li> </ul>

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<p>NR/L2/OTK/5201 Lineside Vegetation Management Manual</p>	<p><b>Purpose:</b> Sets out requirements for the management of lineside vegetation to support safe running of the railway and to contribute to the sustainable management of the lineside</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Provide a structured way to plan the sustainable management of the lineside through the development of Route Vegetation Management Plans and Sectional Asset Plans</li> <li>• Improve the condition and safety of the lineside while protecting and enhancing its biodiversity</li> <li>• Set a localised strategy for managing the lineside aligned to regional asset strategies</li> <li>• Develop long-term management objectives that align to the strategy</li> </ul>
<p>NR/L2/ENV/115 Environment &amp; Social Management System Requirements</p>	<p><b>Purpose:</b> Provides framework requirements for Network Rail's business units to implement and maintain an Environment &amp; Social Management system for managing risks associated with environmental and social activities</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• Enhance environmental and social performance</li> <li>• Identify and fulfil all compliance obligations</li> <li>• Set and achieve environmental and social objectives</li> </ul>

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### Appendix D - PACE process

PACE is an industry-accepted project delivery framework that can be tailored by the project to the individual needs of each project. It is designed to support better decision making with an increased focus on improved outcomes for all of Network Rail's key stakeholders. The table below illustrates the relationship between the Railway Sustainability Design Guide and the PACE phases to demonstrate how the guide can be applied at each stage.

PACE phase	Description	Railway Sustainability Design Guide steps to support PACE phase	Key activities for these stages?
Phase A: Project Initiation	The purpose of this phase is to prepare a Project Management Plan and appoint a team required to plan an enter phase 1.	Step 1: Familiarise yourself with Railway Sustainability Design Guide volumes and principles	Network Rail encourages sustainability outputs from all scales of work in order to meet the strategic objectives set out in its Sustainability Strategy 2020.  It is important to make sure sustainable design considerations form part of the output definition, funding, interfaces, and stakeholder considerations.
Phase 1: Development and Project Selection	Phase 1 involves: <ul style="list-style-type: none"> <li>• Determining the baseline requirements for the project</li> <li>• Identifying the constraints that will impact the feasibility of the project</li> <li>• Determine a single option (the project) that meets the client requirements within the identified constraints</li> </ul>	Step 2: Use the ESA tool to identify environmental and social priorities	NR/L2/ENV/015 specifies the requirement for ESA and ESMP and requires the Network Rail Project Manager to interrogate the National Hazard Directory and GeoRINM to identify records of environmental and social risks.  This desk based process will help identify the environmental and social constraints that will impact the feasibility of the project.
		Step 3: Environmental & Social Assessment	Collect relevant baseline environmental and social data to support the development of an ESMP. A wide range of environmental assessments required at this stage, including: <ul style="list-style-type: none"> <li>• Preliminary Ecological Appraisal</li> <li>• Biodiversity Accounting</li> <li>• Air Quality Risk Assessment</li> <li>• Noise &amp; Vibration Risk Assessment</li> </ul>

PACE phase	Description	Railway Sustainability Design Guide steps to support PACE phase	Key activities for these stages?
		Step 4: Set sustainability objectives	<p>Consider how the developing options are aligned with the Environmental Sustainability Strategy and relevant regional and route strategic documents to meet PACE requirements of supporting strategic initiatives and enhancing service outcomes</p> <p>NR/L2/ENV/015 also notes that at contract award the Designer / Contractor shall agree:</p> <ul style="list-style-type: none"> <li>• Project-specific environment and social objectives performance targets</li> </ul> <p>This is the most suitable stage to confirm sustainability objectives for the identified preferred option. This should be considered through reviewing risks and opportunities, based on the environmental and social assessments undertaken in Step 3.</p>
Phase 2: Project Development	<p>The purpose of Phase 2 is to:</p> <ul style="list-style-type: none"> <li>• undertake development of the single option to agree Approval in Principle and standards to which the project shall be constructed; and</li> <li>• produce an approved ready for construction design which meets the client's requirements.</li> </ul>	Step 5: Develop the approach	<p>At Phase 2 the user should analyse all collected data and local context to develop the project approach to environmental and social requirements, which will result in an updated Design Environment Management Plan and the Environmental &amp; Social Risk Assessment.</p> <p>This is also the stage at which the project team achieves all consents, permits and licences to undertake the work.</p>
		Step 6: Review and evaluate the approach	<p>Detailed design is about ensuring everything is in place to begin the delivery steps – for example, reviewing and evaluating your approach can ensure you have all the relevant environmental and social permits, consents and licensing in place.</p> <p>It also emphasises delivering a robust engineering design. This requires input from technical experts to ensure any environmental and social risks are mitigated appropriately and to Network Rail requirements. The Railway Sustainability Design Guide steps will</p>

PACE phase	Description	Railway Sustainability Design Guide steps to support PACE phase	Key activities for these stages?
			<p>demonstrate how environmental and social opportunities can be delivered on site.</p> <p>This will result in finalised approaches to environment and social requirements and the Design Environmental Management Plan. The development of a Construction Environmental Management Plan is a key output at this stage.</p>
Phase 3: Project Delivery	<p>The purpose of Phase 3 is to:</p> <ul style="list-style-type: none"> <li>• safely and efficiently deliver the project to the specification;</li> <li>• undertake final verification and validation of requirements, testing, and commissioning; and</li> <li>• asset enters service.</li> </ul> <p>The main output is that the project is built, tested and commissioned into use.</p>	Step 7: Delivery	<p>While carrying out the work, site assessments are required to ensure the enhancement is delivered to specification and accordance with design. This is important from a sustainable design perspective because practices should be tweaked and refined throughout construction to minimise environmental impacts and ensure that the project is delivering against the sustainability objectives agreed in Phase 1.</p> <p>Use the ESA and Construction Management Plan to monitor and track progress against these objectives throughout construction.</p>
Phase 4: Project Close	<p>The purpose of Phase 4 is to:</p> <ul style="list-style-type: none"> <li>• transfer of asset from the project team to the operator;</li> <li>• Project Manager closes project systems and demobilises; and</li> <li>• Sponsor demonstrates delivery to client's requirements and formally closes the project and related support systems.</li> </ul> <p>Key to this phase is demonstrating the project has complied with consents and</p>	Step 8: Monitoring and evaluation	<p>The Railway Sustainability Design Guide should be used to understand what tools are available to help assess the scheme during hand back and to ensure adherence to the agreed criteria from an environmental and social point of view. The guide's volumes provide clear guidance on the monitoring requirements that will play a critical role in demonstrating the project has complied with the agreed scope of works from a sustainability perspective.</p> <p>Review all actions in the ESA tool and ensure a final version is complete.</p> <p>Review and finalise the ESMP and ensure that long-term monitoring plans are put in place as per the guidance in the</p>

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PACE phase	Description	Railway Sustainability Design Guide steps to support PACE phase	Key activities for these stages?
	delivered against the scope of work agreed at the end of Phase 2. The project should disband and the Benefits Assessment should commence at this phase.		Railway Sustainability Design Guide. This will provide supporting information for the Benefits Assessment.

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