



**TRANSPORT
SCOTLAND**
CÒMHDHAIL ALBA

Biodiversity Reporting Duty 2021 – 2023

4

Contents

Executive Summary	4
Introduction	5
Context	5
The Climate Emergency & Biodiversity Decline.....	6
The Approach in Scotland	7
The Environment Strategy for Scotland	7
Scotland’s National Biodiversity Strategy	9
About Transport Scotland	11
National Transport Strategy 2.....	11
National Transport Strategy Delivery Plans	13
Strategic Transport Projects Review 2.....	14
Corporate Delivery Plan.....	16
Climate Change and Sustainability.....	17
Climate Change Adaptation	17
Scottish Climate Change Adaptation Programme.....	18
Approach to Climate Change Adaptation & Resilience.....	19
Vulnerable Locations Group	20
Carbon Management	21
Carbon Sequestration	24
Low Carbon Economy	25
Air Quality	26
Mainstreaming and Governance	27
Transport Scotland Landscape Policy	27
Proposed TS Biodiversity Strategy	27
Trunk Road Network Natural Capital Assessment.....	29
Monitoring.....	32
Natural Capital Monitoring.....	33
Post-scheme Evaluation	34
Scheme Maintenance	35
Network management.....	35
Research & Development Impacting Biodiversity.....	36
The Effectiveness of Wildlife Mitigation Measures.....	36
Vegetation Chippings.....	37

ViaVerde: Application for Scotland	39
Engagement, Communication & Partnerships	40
Virtual Exhibitions	40
Environmental Forum	41
Linear Infrastructure Environmental Management Group	42
Policy and strategy development.....	43
European Landscape Convention Coordination Group.....	43
Scotland’s Beaver Strategy 2022 - 2045 and Scottish Beaver Advisory Group ..	44
Biodiversity Highlights & Challenges.....	45
Actions taken in support of biodiversity.....	45
Species & Habitat: To halt the loss biodiversity and continue to reverse previous losses through targeted action for species and habitat	45
People: To increase awareness, understanding and enjoyment of biodiversity, and engage many more people in conservation and enhancement.....	52
Landscape and Ecosystems: To restore and enhance biodiversity in all our urban, rural & marine environments through better planning, design & practice	54
Integration & Co-ordination: To develop an effective management framework that ensures biodiversity is taken into account in all decision making.....	63
Knowledge: To ensure that the best new and existing knowledge on biodiversity is available to all policy makers and practitioners.....	65
Acknowledgements.....	67

Executive Summary

This Biodiversity Duty Reporting document is the fourth such report prepared by Transport Scotland since the requirement was first stipulated under the terms of the Wildlife and Natural Environment (Scotland) Act 2011 (WANE). The previous three reports are shown in Figure 1 and are all available on the [agency's website](#).



Figure 1 Front covers of the previous three Biodiversity Duty Reports

The current document covers a three year period from January 2021 until December 2023 and encapsulates the processes employed by Transport Scotland, the national transport agency, and its partners at Network Rail in support of the Scottish Government's commitment to the protection and enhancement of our nation's rich biodiversity.

The report describes the work and procedures delivered and supported by Transport Scotland, primarily through the road and rail delivery divisions, in support of our obligations to protect and enhance biodiversity within our area of operation, and including connectivity with the adjacent environment. The report acknowledges the important national and global context regarding the decline of biological diversity and its inextricable connection to climate change.

The report also looks at how the Agency has adopted processes to help mitigate and adapt to the very significant global changes affecting our planet and the impact these are having on our fragile ecosystems. The agency is leading in a number of initiatives aimed at reducing these impacts whilst working in partnership with other organisations at home and abroad to ensure the protection of biological diversity remains a key focus for the future.

Introduction

Context

'Biodiversity' is the variety and variability of life around us and includes every species of plant and animal on the planet - the genetic material that makes them what they are, and the communities that they form. These communities, habitats and natural systems cover every part of the world, with the component parts reflecting the local conditions. Sometimes this leads to the formation of unique ecosystems found in very specific situations whilst, conversely, some habitats and the communities they support are replicated in many different parts of the globe.



Figure 2 Examples of biodiversity. Biodiversity is the natural world around us, and the variety of organisms it contains, including plants, animals, insects and microorganisms.

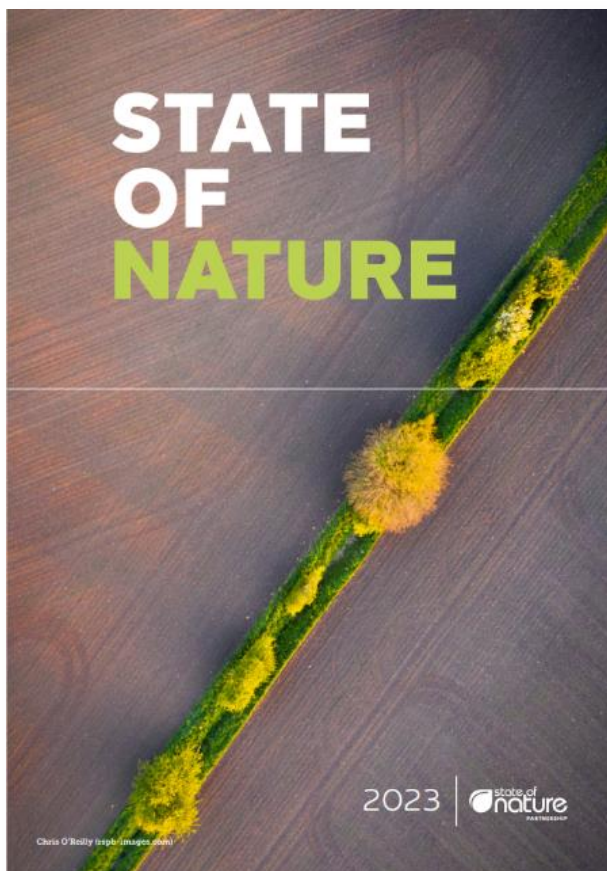
All ecosystems are interconnected in some way, and even the most remote habitats can be affected by changes occurring elsewhere on the planet. This has happened repeatedly for over a million years through fluctuating changes in the level of atmospheric gases, the amount of precipitation and the global temperature. In the past, these climate changes have occurred over long periods of time and this has allowed species to adapt and change through processes of natural evolution.

Due to the impacts and ever-growing population levels of the most successful species on Earth – humans – these climatic changes are now occurring at an alarming pace and much faster than the natural world can adapt to keep up. Natural levels of gases such as methane, carbon dioxide and ozone (greenhouse gases) are being greatly increased by emissions from human activities leading to rising global temperatures. This is having a critical impact on climatic conditions, driving rapid changes in the habitats and ecosystems that species all around the world rely on for survival. The result is a dramatic decline in biodiversity across the world including within the UK.

In recognition of the urgent need for action, the [Nature Conservation \(Scotland\) Act 2004](#) was introduced to require all public bodies in Scotland to further the conservation of biodiversity when carrying out their responsibilities. Amended legislation in the form of the [Wildlife and Natural Environment \(Scotland\) Act 2011](#) (the WANE Act) requires every public body in Scotland to produce a Biodiversity Duty Report every three years to demonstrate how the organisation is delivering their responsibilities to biodiversity. This is the fourth such reporting cycle.

The Climate Emergency & Biodiversity Decline

The recently published [State of Nature 2023](#) (Figure 3) is a comprehensive assessment of the wildlife and habitats across the UK and was prepared by a wide collaboration of both statutory and nature organisations and wildlife charities operating across the UK. It examines changes to biodiversity, including the abundance of species, their distribution, and their risk of extinction. The research also looked at the condition of the UK's most important habitats – woodlands, wetlands, and wildflower meadows.



The conclusions are dire, with clear evidence of serious and sustained decline and loss of species and continuing threats to the condition and extent of habitats.

The State of Nature Report concludes that the UK is now one of the most nature-depleted countries in the world.

Figure 3 Front cover of the State of Nature 2023 report

There are many interconnected reasons why biodiversity is in such decline, including habitat loss resulting from land management choices; changes to agricultural practices; increased pollution levels; hydrological change; increases in invasive non-native species; and, crucially, climate change. We have all experienced unusual fluctuations in normal weather patterns, with periods of intense heat alongside excessive rainfall and flooding – 2022 was the UK’s warmest year on record, whilst 2023 has seen severe flooding events in many parts of the country. These are the immediately visible signs of a changing climate – the associated effects are the impacts on our native wildlife, with increasing numbers of species in worrying levels of decline, whilst some have been lost altogether.

The Approach in Scotland

The Scottish Government has declared twin, interlinked crises of Climate Change and Biodiversity Loss. Scottish Ministers have agreed two key milestones:

- immediate action now to halt biodiversity loss at the latest by 2030; and
- restore and regenerate biodiversity and reach NetZero emissions by 2045.

The Scottish Government has recognised the urgent need to consider and address the issues of climate change and biodiversity loss together: they are inextricably linked, with the changing climate driving the loss of biodiversity, whilst destruction of ecosystems, and the vital services they provide, significantly affects the ability of nature to mitigate the impacts of, and our vulnerability to climate change through its capacity to regulate greenhouse gases, sequester carbon emissions and protect against extreme weather fluctuations.

The Environment Strategy for Scotland

The Scottish Government published its [Environment Strategy for Scotland: Vision and Outcomes](#) in 2020 with a series of commitments aimed at avoiding the worst impacts of climate change and halting the loss of the Earth's biodiversity.

The Environment Strategy sets out the following vision for Scotland:

One Earth. One home. One shared future.

By 2045: By restoring nature and ending Scotland’s contribution to climate change, our country is transformed for the better - helping to secure the wellbeing of our people and planet for generations to come.

The Strategy provides an overarching framework to bring together legislation and regulation to deliver the transformative change needed to tackle the global climate and nature crises. The Strategy encompasses proposals for greenhouse emission reductions; improved waste management; sustainable development; air and water quality enhancements; and crucial targets for biodiversity and habitat recovery and expansion.

The graphic below illustrates how the climate crisis and the nature crisis are interconnected, and the efforts to limit climate change to below 1.5° will also help to protect and restore nature, and vice versa. It shows a cycle chart linking the following stages with arrows:

1. Climate change limited to 1.5C
2. Worst impacts on nature avoided
3. Nature protected and restored
4. Natural climate solutions - lock in carbon (which links back to 1)

Complementary text next to stage 2: Impacts on biodiversity will be significantly greater if warming exceeds 1.5 °C.

Complementary text next to stage 4: Nature-based solutions could provide over a third of the global effort to deliver the Paris agreement.

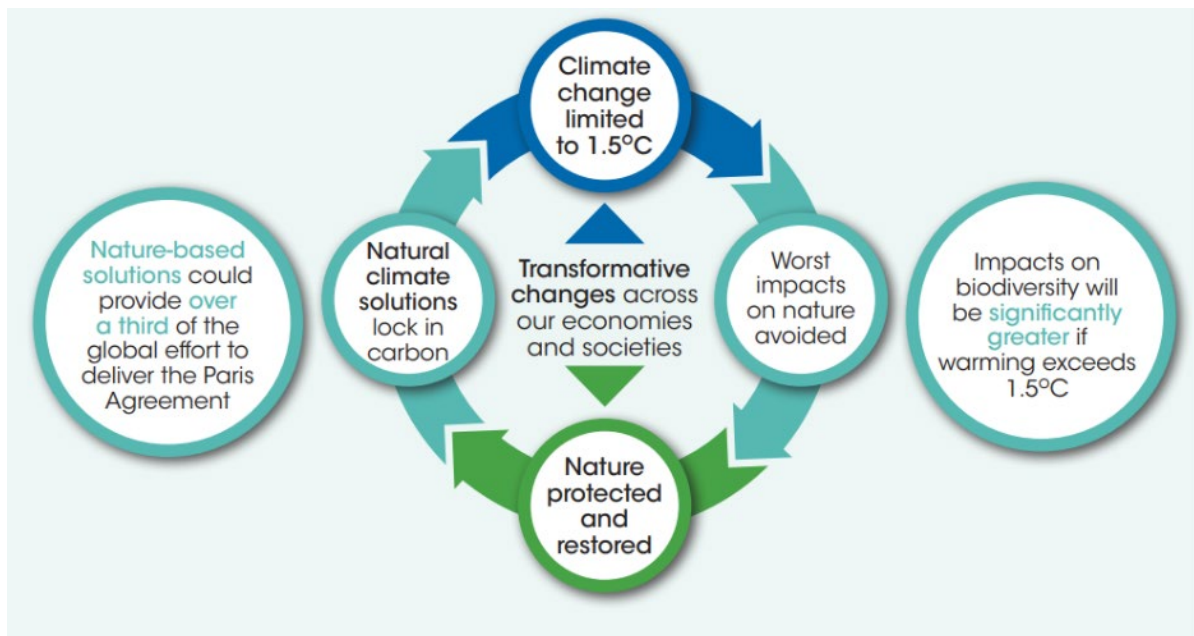


Figure 4 The intrinsically linked climate and natural crises (source: www.gov.scot)

In line with Figure 4, the Strategy sets out a series of outcomes, including three aimed specifically at the national approach to collectively tackling nature decline, climate change and sustainable resource-use:

- Scotland's nature is protected and restored with flourishing biodiversity and clean and healthy air, water, seas and soils.
- We play our full role in tackling the global climate emergency and limiting temperature rise to 1.5°C.
- We use and re-use resources wisely and have ended the throw-away culture.

March 2022 saw the publication of the first [progress report for the Environment Strategy for Scotland](#). The report lists a number of associated bills, strategies and plans that have been, or are in the process of being brought forward to meet the vision and objectives of the Environment Strategy.

In respect to the outcome to protect nature, the report identifies commitments made by the Scottish Government and other international governments at COP26 in Glasgow to reverse biodiversity loss and create a 'nature-positive' world by 2030. In support of this, the Scottish Government published a new biodiversity strategy in 2022 setting out the transformative approach to protecting and restoring Scotland's biodiversity, whilst describing how Scotland's contribution to the goals of the [Global Biodiversity Framework](#) will be delivered.

Scotland's National Biodiversity Strategy

The [Scottish Biodiversity Strategy to 2045](#) published in December 2022 acknowledges the imperative need to accelerate and scale up efforts to drive landscape and seascape scale recovery. This strategy sets out the ambition for Scotland to be Nature Positive by 2030, and to have restored and regenerated biodiversity across the country by 2045. The Scottish Biodiversity Strategy sets out an ambitious Vision for the country's biodiversity:

“By 2045, Scotland will have restored and regenerated biodiversity across our land, freshwater and seas. Our natural environment, our habitats, ecosystems and species, will be diverse, thriving, resilient and adapting to climate change. Regenerated biodiversity will drive a sustainable economy and support thriving communities, and people will play their part in the stewardship of nature for future generations.”

The Strategy identifies the following six objectives for halting the loss of biodiversity in Scotland and being nature positive by 2030



- Accelerate restoration and regeneration;
- Protect nature on land and at sea, across and beyond protected areas;
- Embed nature-positive farming, fishing and forestry;
- Protect and support the recovery of vulnerable and important species and habitats;
- Invest in Nature; and,
- Take action on the indirect drivers of biodiversity loss.

Figure 5 Recovery of biodiversity is vital in both land and sea.

This Strategy represents the first element in Scotland’s Biodiversity Delivery Framework. This has been developed to ensure that we move beyond ambitious words and a strategy that sits on a shelf to a point where we mobilise actions and investment of sufficient scale and scope to deliver a nature positive future. The Framework comprises five elements:

- A high-level Strategy setting out a 2045 Vision for biodiversity in Scotland, a set of Outcomes which articulates what ‘success looks like’ and a set of Priority Actions.
- A Natural Environment Bill which will contain provisions to put in place statutory targets for nature restoration that cover land and sea and a framework for setting, monitoring, enforcing and reporting on those targets. These targets, like our climate targets, will form an important part of our Accountability Framework, driving action across Government.
- A series of five-year rolling Delivery Plans which will set out in detail the range of actions needed to deliver the outcomes and vision. The delivery plans will incorporate a fundamental programme of mainstreaming biodiversity across Government.
- An Investment Plan which will set out our assessment of the investment required to deliver a nature positive future and the actions needed to mobilise public, private and philanthropic finance.
- A Reporting Framework.

Transport Scotland has been part of the process to develop the national strategy – inputting via the Scottish Biodiversity Partnership Stakeholder Group. The Agency is continuing to develop its own bespoke approach to enhancing and protecting biodiversity within our area of operation, using the framework of the national strategy as a basis.

This ensures the actions and plans taken forward by Transport Scotland and its agents are appropriate to our landholdings and remit, whilst remaining integral with adjacent interests and consistent with the national context.



Figure 6 Capercaillie – one of our native species in need of careful protection (image by Fergus Gill)

About Transport Scotland

Transport Scotland is the national transport agency for Scotland. The agency is responsible for delivering a safe, efficient, cost-effective and sustainable transport system for the benefit of the people of Scotland. Our work is underpinned by a corporate plan that reflects the [National Transport Strategy 2020](#) (NTS2) which was published on 5 February 2020.

National Transport Strategy 2

The NTS2 is for the whole transport system, people and freight, and considers why we travel and how those trips are made, by including walking, wheelchair use, cycling, and motorised transport - travelling by bus, train, ferry, car, lorry and aeroplane. It is a strategy for all users: those travelling to, from and within Scotland.

The NTS2 sets out the strategic framework for a 20-year period (2020 - 2040), within which future decisions on investment will be made. It sets out a Vision for our transport system, which is underpinned by four priorities, namely:

- Reduces inequalities;
- Takes climate action;
- Helps deliver inclusive economic growth; and
- Improves our health and wellbeing.

Each of these priorities represent the ingredients required for a sustainable transport network and none more so than the commitment to take responsible action to tackle climate change. The inextricable link with Biodiversity loss, outlined above, means that there is even more emphasis on the need to mitigate and adapt to the impacts Climate Change. The following two priorities are particularly relevant to our approach to biodiversity:

- Takes climate action:
 This priority focuses on mitigation, adaption and delivering Net-Zero targets whilst making cleaner, greener choices.
- Improves our health and wellbeing:
 This priority focuses on creating better, safer and more sustainable communities.

To achieve the priorities set out in NTS2, decision making is further underpinned by the Sustainable Travel Hierarchy which promotes walking, wheeling, cycling, public transport and shared transport options in preference to single occupancy private car use for the movement of people.

In addition, the Sustainable Investment Hierarchy is used to inform investment decisions and ensure transport options that reduce the need to travel unsustainably are prioritised over options that require constructing new infrastructure. The Sustainable Hierarchies are presented in Figure 7, below, and illustrate the order of supported travel mode from walking and wheeling at the top, through public transport options and down to the private car. The Sustainable Investment Hierarchy looks to avoid unsustainable travel, make best use of existing assets and capacity before focusing on targeted improvements.

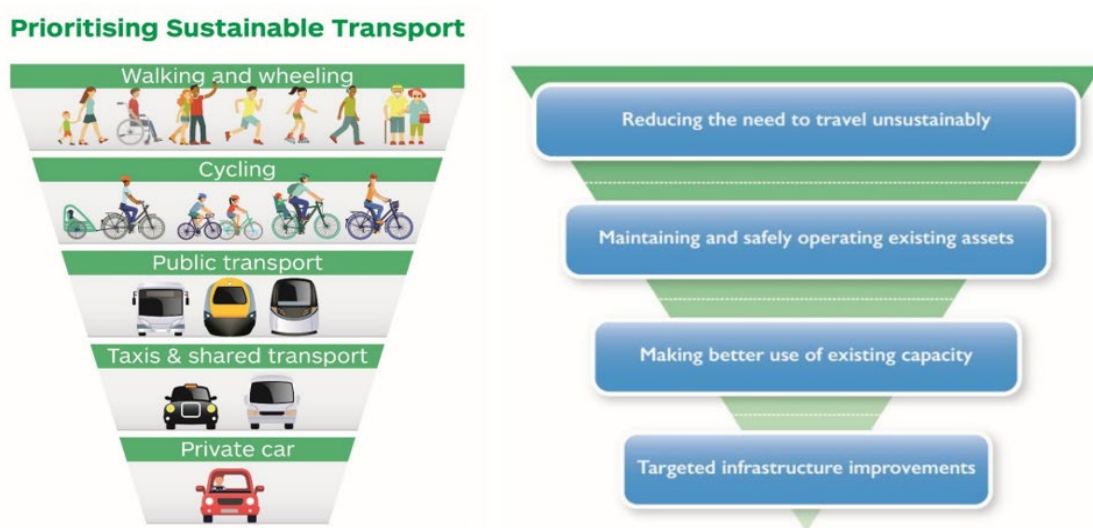


Figure 7 The Sustainable Travel Hierarchy and Sustainable Investment Hierarchy (source: www.transport.gov.scot).

National Transport Strategy Delivery Plans

The NTS2 does not identify and present specific projects, schemes, initiatives or interventions. Therefore, the Agency produces Delivery Plans that set out the actions we will take to support delivery of the NTS2 and provide a transport system that is sustainable, inclusive, safe and accessible.

The [first National Transport Strategy 2 Delivery Plan](#) covers the initial two years of the NTS2 (2020 – 2022) and presents the broad actions taken forward by the Scottish Government and its agencies (including Transport Scotland) to deliver on its vision and priorities up to end-March of 2022, taking account of the impact of COVID-19 and global climate emergency.

Of particular relevance to the preservation and restoration of biodiversity are actions that contribute towards the NTS2 priority of “taking climate action”. The Delivery Plan includes a breadth of actions taken forward the agency that are applicable to this priority.

The strategic policies that these actions address are the following:

- Reduce emissions generated by the transport system to mitigate climate change and improve air quality;
- Support management of demand to encourage more sustainable transport choices;
- Facilitate a shift to more sustainable and space-efficient modes of transport for people and goods;
- Ensure the transport system adapts to the projected climate change impacts; and
- Improve the quality and availability of information to enable all to make more sustainable transport choices.

As part of the green recovery, the actions set out in the Delivery Plan seek to support people to make active travel choices, for instance, making permanent, where appropriate, some of the active travel infrastructure introduced during the COVID-19 outbreak.

The [second NTS2 Delivery Plan](#) covers the period 2022 to 2023 and builds on the previously announced measures on transport and headline areas of work from across Government.

As part of this Delivery Plan, actions towards delivering a green, sustainable and active transport system encompass the following:

- Supporting the transition from car use to active travel;
- Transforming bus travel, primarily by decarbonising our bus fleet and implementing bus priority measures;
- Enabling the transition to electric vehicles; and
- Investing in innovation to increase the uptake and availability of low carbon and more efficient technologies and approaches.

Strategic Transport Projects Review 2

The Strategic Transport Projects Review 2 (STPR2) published in January 2022 is the second Scotland-wide review of the strategic transport network seeking to deliver the vision, priorities and outcomes of the NTS2.

This review of the strategic transport network's performance will inform transport investment in Scotland for a 20-year period between 2022 and 2042, by providing evidence-based recommendations on which Scottish Ministers can base future transport investment decisions.



Figure 8 The STPR2 considers the transport needs of all communities and travel modes.

The STPR2 considers the transport needs of Scotland's people and communities, and examines active travel (walking, wheeling, cycling), bus, ferry, rail and motorways and trunk roads as well as passenger and freight access to major ports and airports. These needs are reviewed from national and regional perspectives to reflect their different geographies, travel patterns and demands.

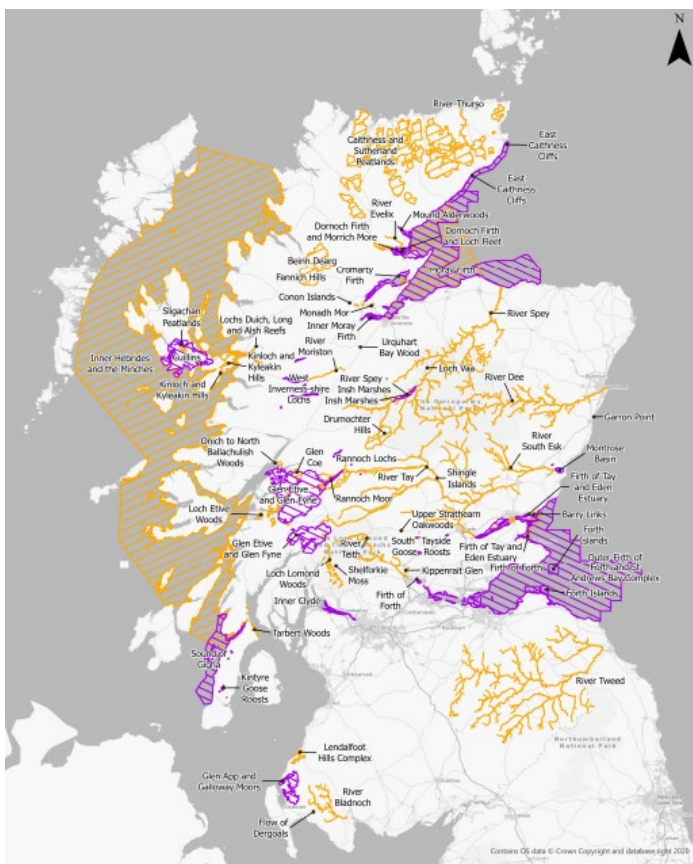
The STPR2 process follows Scottish Transport Appraisal Guidance (STAG), an established evidence-based approach to identify problems and opportunities, set transport objectives to address these and generate, sift and appraise options for changes to the transport system. In STPR2, the STAG process led to 45 recommendations grouped around six key themes, namely improving active travel infrastructure; influencing travel choices and behaviour; enhancing access to affordable public transport; decarbonising transport; and increasing safety and resilience on the strategic transport network.

Furthermore, as part of STPR2, [Habitats Regulations Appraisal \(HRA\)](#) was carried out to determine any likely significant effects on European Union-designated 'European sites'. These sites include Special Areas of Conservation (SACs) designated under the Habitats Directive (92/43/EEC) and Special Protection Areas (SPAs) designated under the Birds Directive (2009/147/EEC).



Figure 9 STPR2 info graphics used to indicate the multimodal nature of the review criteria.

As such, each stage in the development of the STPR2 was reviewed to determine any potential indirect or direct likely significant effects on the integrity of sites designated due to the presence of specific habitats and species of internationally important biodiversity value, otherwise known as 'qualifying interest features' (Figure 10).



Each STPR2 recommendation was appraised against certain categories of potential impact, namely direct loss of habitat; loss of functionally-linked habitat; waterborne pollution; airborne pollution; hydrological changes; disturbance of qualifying species; barriers and/or displacement; injury or mortality; changes to predator-prey dynamics; spread of invasive non-native species. The HRA concluded that no likely significant effects were identified due to the intentionally high-level of detail in the 45 STPR2 recommendations. This provides the opportunity to design schemes to avoid or adequately mitigate effects on European sites in Scotland.

Figure 10 European sites of Scotland relevant to STPR2 (source: www.transport.gov.scot)

Corporate Delivery Plan

The [Transport Scotland Corporate Plan 2020 - 2021](#) published in January 2021 sought to introduce a one-year update to our [2017-20 Corporate Plan](#).

For 2020-21, the Agency set out actions to be delivered, whilst keeping a clear focus on our vision as set out in the NTS2. We will play our part in setting up a future that enables sustainable, inclusive, economic growth with a focus on protecting our climate.

Environmental Sustainability is a crucial and integral aspect of Transport Scotland's activities, and over this Corporate Plan period there has been a significant emphasis on air quality and climate change, as shown in the following objectives set out in the Corporate Plan:

- We will support decarbonisation, including establishing a Zero Emission heavy duty vehicle programme and invest in a zero drivetrain testing facility in 2021.
- Our goal is to improve air quality and protect public health, we have restarted work to introduce Low Emissions Zones across our four largest cities by early 2022.
- We will expand the Low Carbon Transport Loan scheme, to support Scottish households and business in purchasing ultra-low emission vehicles, to include used electric vehicles, removing more upfront costs for people, and increasing the accessibility of the scheme for lower income households.
- We will continue our programme of trunk road improvements and maintenance projects, strengthening our overall network resilience.

The following sections relate primarily to the management of the Trunk Road Network, its maintenance and development.

The response relating to Scotland's rail network is included in a separate, interlinked document prepared by Network Rail entitled Scotland's Railway Biodiversity Duty Report 2021-23 (Figure 11).



Figure 11 Network Rail Biodiversity Duty Report cover

Climate Change and Sustainability

An understanding of climate change impacts and the related effects this has on our natural resources, together with the required mitigation and adaptation approaches, is at the core of Transport Scotland's actions. Each directorate within the agency considers the impacts of climate change in all operational and policy decision making.

Climate Change Adaptation

The [Climate Change \(Emissions Reduction Targets\) \(Scotland\) Act 2019](#) has been adopted by the Scottish Parliament since 2019, setting a net-zero emissions target for all greenhouse gases by 2045, and new incremental targets for 2030 (to 70% reduction) and 2040 (to 90% reduction).

These are bold and challenging targets, and it is hoped that Scotland's lead will encourage other nations, both domestic and foreign, to match this commitment. At the time of writing it is understood the UK government is on the verge of announcing similar greenhouse gas reductions. The [UK Climate Change Committee \(CCC\)](#) has stated that realising net-zero emissions targets across the country as a whole will require an integrated, multi-sectorial approach including behavioural or societal changes. The Scottish Government recognises this need, and the response has been to engage in broad consultation to ensure national understanding of the challenges and the opportunities.

The [UK Climate Change Act \(2008\)](#) requires the UK Government to conduct a UK-wide Climate Change Risk Assessment every five years. The [latest report](#) of the third Climate Change Risk Assessment (CCRA3) was prepared by the CCC and was published in 2021. The CCRA3 report identifies and analyses 61 climate change risks and opportunities for the UK, each of which is assigned one of these urgency scores: More Action Needed; Further Investigation; Sustain Current Action; and Watching Brief.

Out of these 61 risks, seven key climate risks specifically pertain to transport infrastructure. Those requiring further action include the following:

- Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures;
- Risks to infrastructure services from river, surface water and groundwater flooding;
- Risks to transport networks from slope and embankment failure; and,
- Risks to transport from high and low temperatures, high winds, lightning.

Risks to transport in Scotland that urgently require further investigation to assess the need for further action, are the following:

- Risks to infrastructure services from coastal flooding and erosion;
- Risks to bridges and pipelines from flooding and erosion; and
- Risks to subterranean and surface infrastructure from subsidence.

Alongside the 61 individual climate risks and opportunities, the CCC also set out 8 priority risk areas for further adaptation within the next 2 years, with four risks associated with transport infrastructure, and illustrating the inextricable link between climate change and biodiversity.

Scottish Climate Change Adaptation Programme

To meet these statutory requirements, the Scottish Government has recently published [Climate Ready Scotland: Scottish Climate Change Adaptation Programme 2019-2024](#) (SCCAP2), which is a five-year programme of policies and proposals for Scotland to adapt to climate change. Transport Scotland was a key author of the policies and proposals related to the transport sector.

SCCAP2 takes an outcomes-based approach, derived from both the UN Sustainable Development Goals and Scotland's National Performance Framework. These are:

Outcome 1: Our communities are inclusive, empowered, resilient and safe in response to the changing climate.

Outcome 2: The people of Scotland who are most vulnerable to climate change are able to adapt, and climate justice is embedded in climate change adaptation policy.

Outcome 3: Our inclusive and sustainable economy is flexible, adaptable and responsive to the changing climate.

Outcome 4: Our society's supporting systems are resilient to climate change.

Outcome 5: Our natural environment is valued, enjoyed, protected and enhanced and has increased resilience to climate change.

Outcome 6: Our coastal and marine environment is valued, enjoyed, protected and enhanced and has increased resilience to climate change.

Outcome 7: Our international networks are resilient to climate change.

Within the adaptation programme, Transport Scotland has key responsibility for delivering a number of Outcomes, including Outcome 5 concerning the need to protect and enhance our natural environment.

Approach to Climate Change Adaptation & Resilience

Adapting to the current and future impacts of climate change is imperative to avoid costly and disruptive consequences for our people, communities, environment and economy, and form a vital element of Transport Scotland’s planning and operations. Even if we were able to stop all emissions today, there would still be adverse impacts from climate change that are ‘locked in’ due to past emissions.

Climate change is also one of the main drivers of biodiversity loss, with the destruction of ecosystems undermining nature’s ability to regulate greenhouse gas emissions and protect against extreme weather, thus accelerating climate change and increasing vulnerability to it.

In recognition of these inevitable climate-related effects to the transport network, Transport Scotland has recently published our [Approach to Climate Change Adaptation and Resilience \(ACCAR\)](#).

This work provides a strategic overview of our approach to adaptation for our Road, Rail, Aviation and Maritime transport networks and sets out an ambitious vision for a well-adapted transport system in Scotland which is safe, reliable and resilient in relation to climate change.

This vision will be delivered through four high-level Strategic Outcomes and various Sub Outcomes, which will address the seven transport-related climate change risks identified in CCRA3.

The ACCAR sets out the Vision for “a transport system which is well adapted and prepared for the current and future impacts of climate change. It is safe for all users, reliable for everyday journeys and resilient to weather-related disruption.

The ACCAR has reviewed and set strategic directions for the agency’s current climate change adaptation and resilience activities, and provides recommendations on how to enhance adaptation and resilience and enable the establishment of an appropriate and proportionate governance structure to oversee adaptation and resilience activity within Transport Scotland. The diagram below shows how the three elements of Safety, Resilience, and Reliability interlink to form the Transport Scotland Adaptation and Resilience Vision.

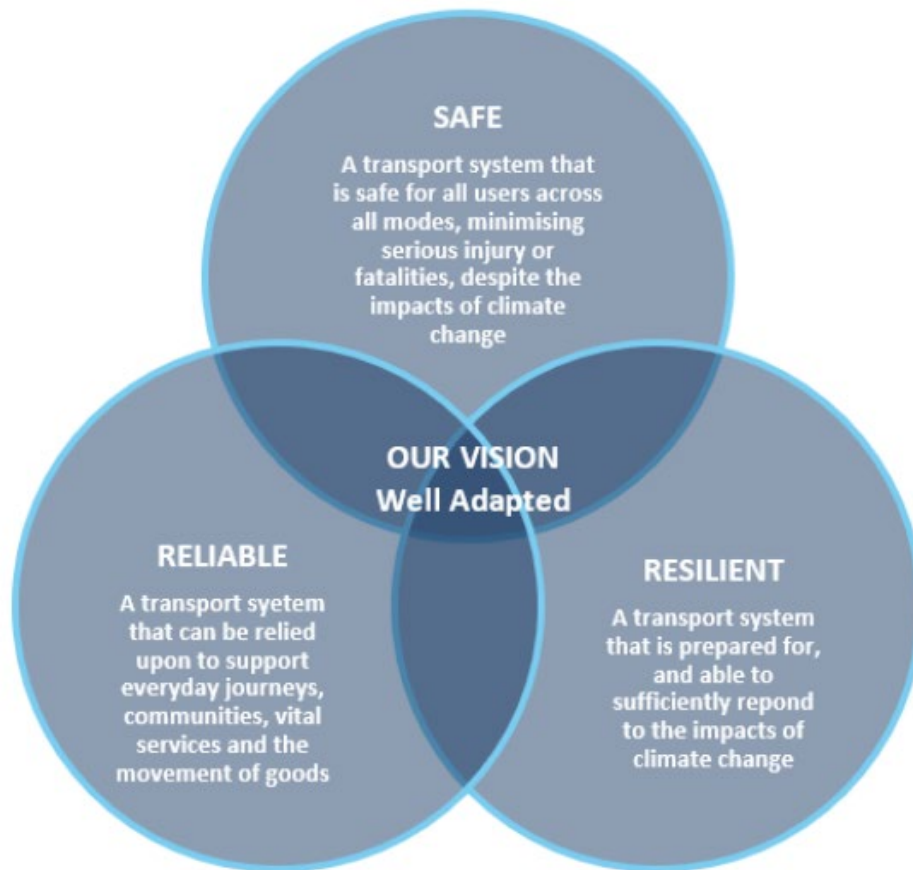


Figure 12 Transport Scotland's Adaptation and Resilience Vision

Vulnerable Locations Group

In December 2020, the National Transport Strategy Delivery Plan 2020 - 2022 committed Transport Scotland to establishing the Vulnerable Locations Group (VLG) to identify Vulnerable Locations on Trunk Roads and drive our strategic approach to climate change adaptation. The VLG was established in 2021, with an initial focus on short-term cost-effective actions, whilst developing a move to a long-term proactive approach, including a dedicated budget for climate change adaptation.

In early 2021, the VLG agreed to establish the Vulnerable Locations Operational Group (VLOG) to lead on the operational alignment required to manage a Pilot Adaptation Programme (PAP) to deliver schemes to mainstream climate change adaptation across the Roads Directorate.



Figure 13 The impacts of a changing climate can be devastating to many parts of the trunk road network and its users.

These schemes were required to deliver a “Going Beyond Maintenance” policy, to adapt the network to the current and future impacts of climate change while delivering a safe, reliable and resilient Trunk Road Network.

The VLOG was tasked with the following:

- Promoting and mainstreaming climate change adaptation across the Roads Directorate;
- Communicating and sharing the good adaptation work already undertaken, encouraging innovation and delivery on adaptation;
- Reporting on progress to the VLG.

In 2022/23, the VLOG has identified areas of focus, fed into the budget allocation process, fostered collaboration, and communicated internally and externally as appropriate. The VLOG also delivered six defined schemes in 2022/23 to effect adaptation and build resilience, and has sought and reviewed innovation to bring improvement to the management and maintenance of the Trunk Road Network:

- A78 Seamill, adjacent to Waterside Hotel: upgrading of drainage system including upsizing eight pipes;
- A76 West Polquhirter/ Brunton Farm: new filter drain system;
- A75 Barlae: verge and filter drain works;
- M80 River Carron to Haggs: drainage improvement scheme;
- A889 Dalwhinnie; and
- A83 Rest and Be Thankful Hillside watercourse realignment.

Carbon Management

Scotland’s ambitious climate change legislation, the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 (amended in direct response to the international Paris Agreement), sets a target date for net zero emissions of all greenhouse gases by 2045. To meet Scotland’s targets, a rapid transformation across all sectors of our economy and society is required.

The [17 UN Sustainable Development Goals](#) shown in Figure 14, below, are designed to be a blueprint for a more sustainable future for everyone. These goals have influenced both Scotland’s National Performance Framework and the outcomes associated with Climate Ready Scotland, and directly informed the development of Transport Scotland’s Carbon Management Plan 4.



Figure 14 The 17 UN Sustainable Development Goals

[Transport Scotland's Carbon Management Plan: 4th Edition](#) (CMP4) covers the Agency's operation emissions and network energy emissions, the latter being associated with the lighting of the Trunk Road Network.

This plan sets our corporate carbon emission baseline along with associated targets and projects to 2027, with the overarching goal to reduce emissions within our sphere of influence.

The goal of this plan is to not only achieve Net Zero across our own corporate activities, but to also challenge the way in which emissions are managed throughout our supply chain.

Our emission sources are as follows:

- Scope 1 – Gas Consumption (George House and Traffic Control Centre);
- Scope 2 – Electricity Consumption (George House, Traffic Control Centre and Roadside Electrical Assets);
- Scope 3 – Business and commute travel, employee home working, water consumption, waste generated through corporate activities; and
- Scope ‘i’ – Transport Contracts (ScotRail, HIAL, CalMac Ferries Ltd, Caledonian Maritime Assets), Trunk Road Operating Company Contracts (Operations, Construction and Maintenance Infrastructure projects), Fugitive emissions (leaks and other irregular releases of gases or vapour from a pressurised containment).

Setting measurable, achievable, and realistic targets against a timeline relies on credible data. We have set the following Corporate Emission targets:

- By 2025, Transport Scotland’s Scope 1 emissions will be zero.
- By 2025, Transport Scotland’s Scope 2 emissions will be Net Zero.
- By 2025, Identified Scope 3 emissions will be Net Zero primed, with an associated target of 15% reduction (for Scopes 2 & 3) by 2027.
- By 2045, Transport Scotland’s Scope ‘i’ emissions will be Net Zero.

Key targets identified in CMP4 aim to meet the latest legislative requirements to set zero direct and net zero indirect emissions targets associated with our operational control.

The target to emit zero direct emissions by 2025 is ambitious but achievable, as long as transformative action is taken now; meaning the adoption of wholesale changes in our processes and functions. The target encompasses our Scope 1 emissions - those that are owned or controlled directly by Transport Scotland.

Transport Scotland aims to be net zero by 2025 for Scope 2 emissions, which are those that result indirectly from the purchase of energy.

We will also aim to reduce our scope 3 emission as much as practically possible – these are emissions as a consequence of our activities (i.e. operating the trunk road network) but occur from sources not owned or controlled by Transport Scotland.

Carbon Sequestration

However, there are limitations as to what can be decarbonised as technologies and policies are still developing. Carbon sequestration, through tree planting on our estate (insetting), will therefore form a major element of our journey towards net zero and our aim to being “net zero primed” by 2025, and this has been identified and promoted through CMP4.

Insetting refers to interventions along a company’s value chain (all the activities and processes involved in creating a product or performing a service – such as managing a transport network) that are designed to generate reductions in greenhouse gas GHG emissions and to deliver carbon storage, and at the same time create positive impacts for communities, landscapes and ecosystems.

This is different to carbon off-setting which refers to an organisation seeking to reduce GHG levels externally in order to compensate for their own excessive emissions. Ultimately, both processes are viable in the fight against climate change, but insetting is considered more sustainable as it reduces the need to purchase carbon credits or invest in carbon offsetting projects by directly controlling emissions at source.

We cannot address our planet’s climate emergency without reversing the loss of nature. Evidence shows that strong and healthy ecosystems can help to fight climate change as well as build resilience and help us adapt to climate impacts. Insetting projects help to protect, value and reverse the loss of nature, create regenerative processes in an organisation’s operations, and support the business case for investing in nature. This allows businesses to integrate investment in nature into sustainability strategies and goals, providing a way to scale nature-based solutions across industries, sectors and areas.

Over the past few years Transport Scotland has commenced large scale tree planting across our estate, with planting verified via the Woodland Carbon Code. Transport Scotland is the first public sector body to begin such insetting projects as part of our net zero journey, with woodland creation projects already registered and underway in Argyll & Bute (A83) and Dumfries & Galloway (M74). However, in order to meet the Scottish Government’s ambitious climate change goals and reach Net Zero by 2045 we must continue with this vital work to sequester carbon and offset emissions associated with our operations (Scope 1 and 2 emissions).

Details of the Carbon Sequestration projects underway are included in the Landscape and Ecosystems section (page 54).

Low Carbon Economy

In September 2018, the Scottish Government announced its intention to phase out the need for new petrol and diesel cars by 2032 placing Scotland among the world's leading countries in the shift away from fossil fuels for light vehicles. This commitment has just been matched by the UK government with the recent announcement by the Prime Minister to phase out the sale of new single fuel combustion engine vehicles by 2030.



Figure 15 The wide-scale uptake and conversion to using electric vehicles is an important part of the Scottish Government's approach to lowering carbon emission.

Scottish Ministers have reinforced their intentions to tackle climate change, improve air quality and ensure Scotland is a net-zero carbon society. Within Transport Scotland, the Low Carbon Economy Directorate has a clear focus in facilitating and contributing to these outcomes, with the following vision and outcomes:

Vision:

A transformative shift to sustainable, low carbon mobility.

Outcomes:

- Scotland is at the forefront of markets for Ultra Low Emission Vehicles.
- Scotland is a global destination for innovation and investment in sustainable, low carbon mobility.
- People and places benefit fairly from the shift to sustainable, low carbon mobility.

Air Quality

Poor air quality and air pollution can have a serious detrimental effect on ecosystems and species. The health, condition and ability for ecosystems to grow and thrive is threatened in such circumstances, affecting their ability to provide associated benefits (ecosystem services), e.g., nutrient and carbon cycling, pollination, food production etc., on which we are all dependent.



Figure 16 One of a number of public awareness images used for ensuring the people of Scotland understand the approach to Low Emission Zones, and get prepared.

As ecosystems are impacted, so is the biological diversity. This is the same in relation to humans – both as a direct consequence of breathing harmful pollutants, and indirectly through the associated impact on our environment, such as the plants and the processes they support, which we all rely on.

The ongoing development of Low Emission Zones (LEZs) in Scotland has been a key task in recent years. LEZs set an emissions limit for certain road spaces, restricting access for the most polluting vehicles to improve air quality. This helps protect public health within our towns and cities, making them and the wider environment more attractive and healthy places in which to live, work and to visit.

On 1st June 2023, the Glasgow's LEZ came into force, which effectively excludes the most polluting vehicles from the city centre. The zone covers an area of the city centre bounded by the M8 motorway to the north and west, the river Clyde to the south and Saltmarket/High Street to the east. It is anticipated that LEZs will be also introduced in Edinburgh, Dundee and Aberdeen.

The introduction of LEZs, coupled with the regulatory powers to be provided by the Transport (Scotland) Act 2019, is likely to contribute to the agency meeting the carbon reduction targets that are required to tackle Climate Change.

Mainstreaming and Governance

Transport Scotland Landscape Policy

For over two decades the Agency has promoted an approach to landscape design and the management of the land within its remit that encourages designers and managers to take inspiration from the natural processes that shape the wider environment. This is further articulated within the current landscape policy, [Fitting Landscapes: Securing more sustainable landscapes](#). The policy is mandatory for all involved in works affecting the trunk road estate and renews and reinforces the Agency's commitment to appropriate environmental custodianship.



It is notable that Scotland Environmental Strategy, published in 2020, reflects similar objectives to those promoted by the Agency's current and previous landscape policy – the protection of nature; mitigation against climate change; and the wise use of resources.

Figure 17 A1 East Lothian

Proposed TS Biodiversity Strategy

Scottish Ministers have stated that the challenges facing biodiversity loss are as important as the challenge of combatting climate change. Influential publications, including the [State of Nature Report \(2023\)](#) and the earlier [State of Nature Scotland Report \(2019\)](#), clearly identify the extent of the emergency we face and the importance of investing in nature.

For example, support for projects to increase tree planting and improve grasslands makes a significant contribution to reducing the impacts of climate change by sequestering carbon to reinforce our NetZero commitments, whilst at the same time achieving critical biodiversity improvements.

As the agency responsible for one of the Scottish Government’s most valuable assets and a significant landholding, Transport Scotland must ensure its own policies and programmes align with these challenging targets, and a sectoral biodiversity strategy is considered key to understanding and delivering the changes this requires.

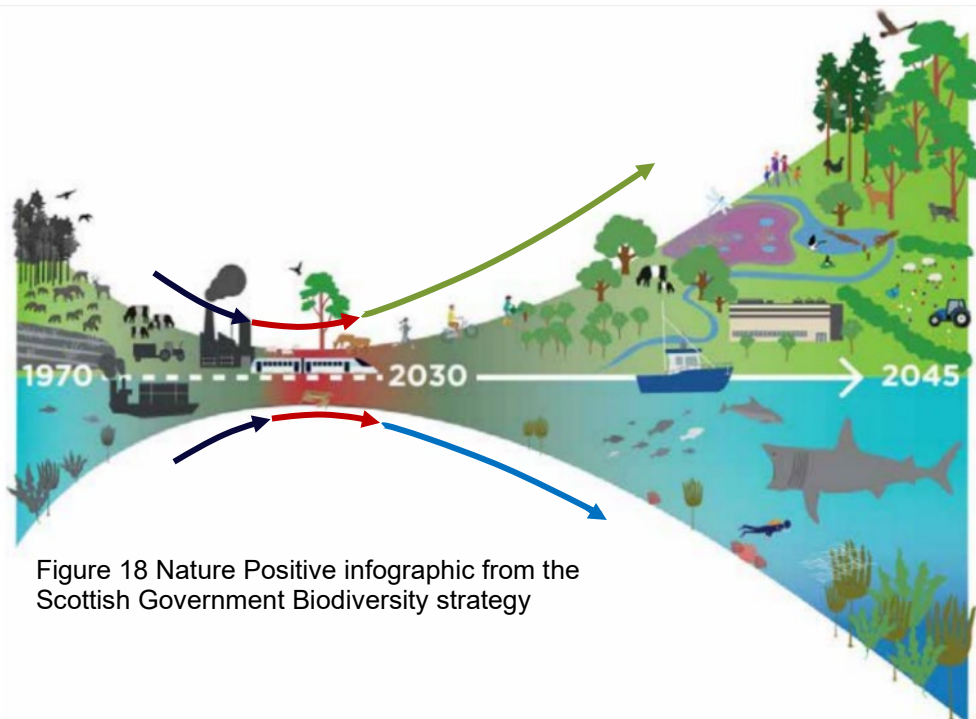


Figure 18 Nature Positive infographic from the Scottish Government Biodiversity strategy

The government has announced ambitious targets for nation to be nature-positive by 2030, and to have restored and regenerated biodiversity across the country by 2045. This is detailed in the recently published Scottish Biodiversity Strategy 2022-45 which identifies that biodiversity conservation calls for an ecosystem approach - seeking the integrated management of land, water and living resources that promotes conservation and sustainability in an equitable way. As shown in Figure 18, the intention is to reverse the downward curve of biodiversity loss before 2030 so that levels of biodiversity are once again increasing.

At the same time, the strategy promotes a framework of action aimed at delivering to a ‘nature positive’ nation, where biodiversity is systematically mainstreamed across sectors and the wider policy landscape.

It is important that Transport Scotland, like other public bodies, is prepared to introduce the required changes to our processes and practices to ensure the agency does all it can to support the national outcomes and targets we need to deliver. The quality and interconnectivity of ecosystems associated with the agency’s assets require urgent attention to ensure they are in the best condition to mitigate and adapt to climate change and for delivering positive outcomes for biodiversity.

Due to the challenging fiscal environment, delivery of the proposed Transport Scotland biodiversity strategy has been delayed, pending budget approval. The procurement process is underway, and it is planned to deliver the strategy next financial year.

In the meantime, work is continuing to prepare and deliver a Natural Capital baseline assessment (and set of accounts) of the Scottish Trunk Road Network. This work will directly link to and inform the planned biodiversity, whilst helping to mainstream consideration for all aspects of the environment in all the Agency's operations.

Trunk Road Network Natural Capital Assessment

There is currently no mandate or obligation in Scotland for organisations to prepare natural capital accounts. However, there is clear recognition of the importance of understanding and measuring natural capital if Scotland is to enhance its accountability and ability to achieve policy goals and become Nature Positive by 2030 and to restore and regenerate biodiversity by 2045.



Figure 19 Ben Lomond

These are the primary targets in the Scottish Biodiversity Strategy to 2045 which will focus on the identified needs of strategic working that mainstreams biodiversity across all sectors, supported by appropriate levels of funding. In addition, the Strategy requires evidence-based monitoring to ensure targets are achieved. Natural capital accounting is seen as vital part of this framework and will be embedded into future policy making.

Transport Scotland recognises the need to incorporate natural capital into our decision making; not only at the individual scheme/investment level but also in our operational strategy and decision making going forward. The protection and enhancement of the natural environment is an important aspect of all transport projects, to which the Agency is fully committed. To facilitate this thinking, a cohesive, coordinated approach is required that can be scaled appropriately to support our various operations, maintenance regimes and capital programmes across the Trunk Road Network.

Some transport projects have already begun to incorporate natural capital; however, it was determined that a full baseline and account of the entire Trunk Road Network will provide a useful resource to shape future projects and programmes, inform decision making, and measure progress.

Natural Capital is defined by the [Scottish Natural Capital Accounts](#) (SNCA) as:

“the world's stock of natural resources. This includes air, water, minerals, and all living things. These natural resources underpin our society and economy because they provide a wide range of benefits”

One of the benefits of taking a baseline approach is to help focus on the "big things" that would make a difference. This may include action on peatland surveys and restoration programmes and to understand the scale of woodland creation that might be required. Applying Natural Capital approaches ensures that the benefits nature brings are not overlooked and can be protected and enhanced. It is also a means by which changes relative to the baseline over time can be measured to assess progress. This is discussed further in the Monitoring Section.

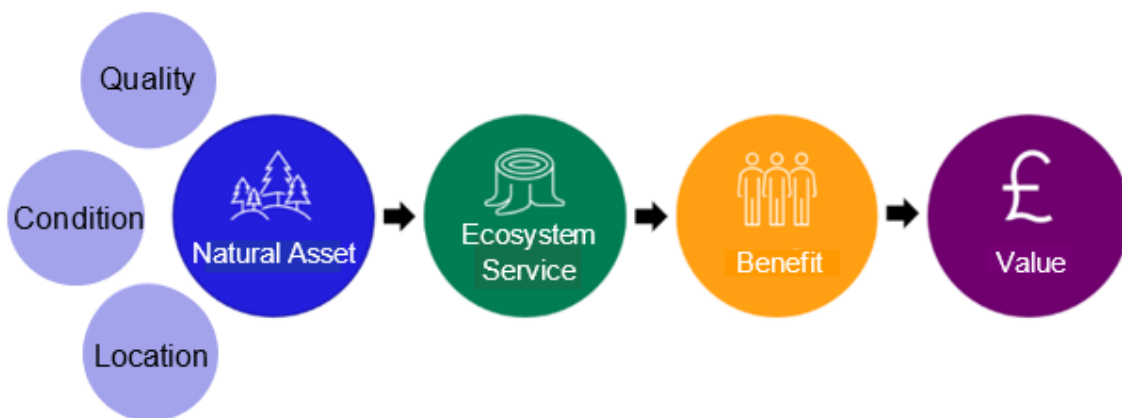


Figure 20 Logic chain characterising the Natural Capital

Following a research and development process by experienced consultants, a methodology was devised that was appropriate to assessing and evaluating the natural capital of the trunk road network. The methodology utilised a logic process incorporating the following steps, as illustrated in Figure 20, above:

- (1) **natural asset**, (assessed by quality, condition and location), *leading to*;
- (2) **ecosystem service**, *leading to*;
- (3) **benefit**, *leading to an assessment of*;
- (4) **value**.

The Scottish Trunk Road Network represents a significant sized linear landholding, as shown in the map below, and this presents a particular challenge for a natural capital baseline assessment methodology. This methodology was tested in Phase 1 of the initiative, which saw the development of a spatial tool hosted on a geospatial platform. This provides a dynamic, interactive interface where the user can zoom in or out on a geography and understand the biophysical and (in some instances) monetised values for different ecosystem services.



Figure 21 The Scottish Trunk Road Network represents a significant sized linear landholding and a particular challenge for a natural capital baseline assessment methodology

Numerous ecosystem services have been quantified and, in some cases, valued. These include food production, wood production, carbon sequestration and storage, flood regulation, water quality recreation, noise reduction, pollination and biodiversity. The majority of the approaches utilised to quantify and value these ecosystem services are aligned to those recommended by Defra's [Enabling a Natural Capital Approach](#).

At this stage, the work has been applied at two scales: The first is an assessment of selected ecosystem services within the maintenance boundary of the trunk road network - the land managed by Transport Scotland, or over which the Agency has a legal responsibility (referred to as Scope 1). The second scale is a 1km buffer area either side of the road, representing land that our operations may have influence over, and vice versa (referred to as Scope 2).

This approach is aligned with the BSI BS 8623:2021 Natural Capital Accounting for Organisations standard, and ensures the developing tool facilitates appropriate consideration of adjacent land interests, promoting greater opportunities for enhancing habitat connectivity and for partnership working with other public and private sector landowners.

Monitoring

Monitoring of progress and performance is a key part of effective business management, and this is true for Transport Scotland and its operational delivery. However monitoring is not an isolated element or a means to an end – it is part of an iterative process aimed at ensuring the objectives of each intervention are met and, where appropriate, lessons are learned to enhance the design and delivery of future workstreams. This is only possible where there is clear understanding of the intended objectives, whether these are at the strategic level or more project-specific.

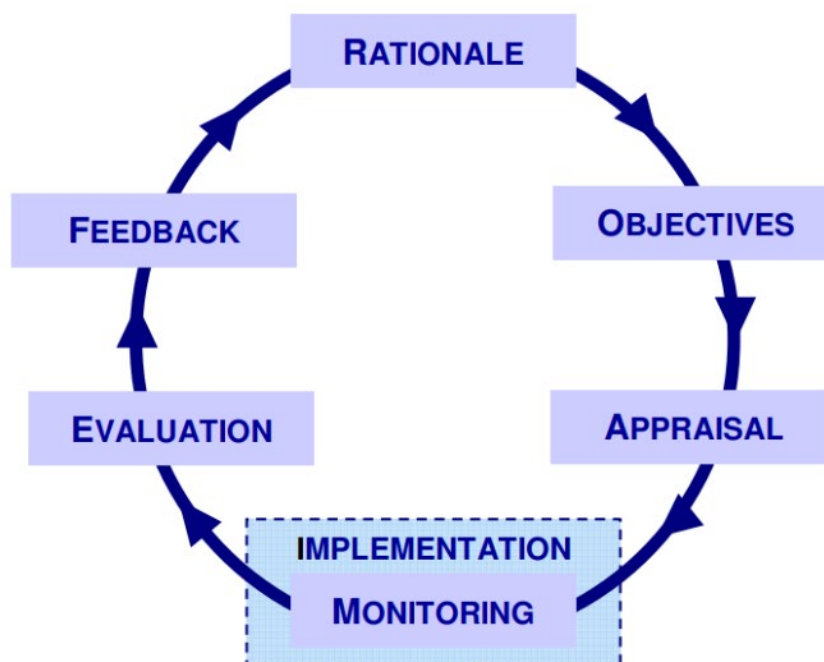


Figure 22 Rationale, Objectives, Appraisal, Monitoring, Evaluation and Feedback (ROAMEF) Cycle (HM Treasury)

Figure 22, illustrates the interconnected cycle for monitoring from **Rationale** to **Objectives**, **Appraisal**, **Monitoring**, **Evaluation** and finally **Feedback**, which informs the **Rationale**. Monitoring therefore relies on a well-defined and robust assessment and analysis of what the intervention is planned to achieve, together with its impacts on the wider environment.

For Transport Scotland, this process is underpinned by the Scottish Government's vision for transport set out in the NTS2 and the associated Delivery Plans. The Plans are reviewed and assessed by applying the STAG.

STAG requires evaluation against indicators and targets derived for the Transport Planning Objectives originally set for a scheme or project. STAG criteria cover Environment, Climate Change, Health, Safety and Wellbeing, Economy, Equality and Accessibility, with biodiversity and habitats included in the Environment section.

The Guidance notes that transport infrastructure has a number of potential effects on biodiversity and habitats, including;

- Direct damage to nature conservation sites or the habitats of protected species;
- Fragmentation or loss of habitats;
- Barriers to the movement and genetic interchange between populations;
- Disturbance of habitats and species due to factors such as noise, light pollution and contaminated run-off.

The overall objective of the appraisal is that schemes should aim to maintain the level of biodiversity in the study area, including wildlife habitats and species, and to improve the status of rare and vulnerable species wherever possible. This reflects one of the key milestones of the National Biodiversity Strategy, to halt biodiversity loss by 2030.

The Strategic Delivery Framework in support of the National Biodiversity Strategy commits us all to seek to demonstrate performance against clear objectives and this provides the momentum to reinforce our processes and procedures to align with the overarching national vision and outcomes.

Natural Capital Monitoring

According to the [Natural Capital Committee](#), a Natural Capital baseline can be defined as:

'the starting measurement point of Natural Capital assets - changes relative to the baseline over time provide a measure of progress or decline.'

The work Transport Scotland is currently engaged in to prepare a natural capital baseline assessment of the Trunk Road Network will provide the Agency with a robust means to record and value change over time.

It will facilitate the assessment of progress in support of the biodiversity targets, as well as the protection and enhancement of a range of ecosystem services provided by the estate, including the impacts and inter-dependencies across the whole value chain.

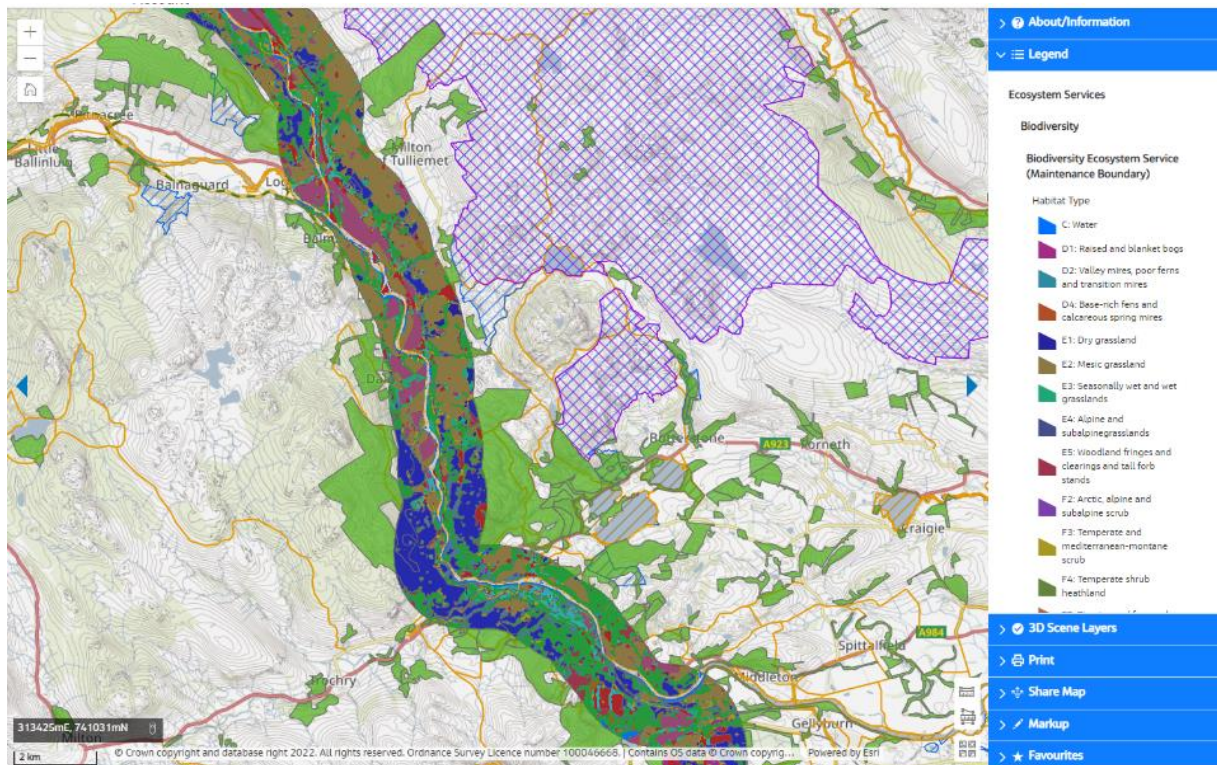


Figure 23 An extract from Transport Scotland’s developing natural capital tool.

For Transport Scotland this work is still in progress, but it presents a real opportunity for Agency to make better, more informed decisions on where and how to deliver changes to the estate that are inherently sustainable and in support of the critical resources on which society depends.

Post-scheme Evaluation

The evaluation of trunk road projects after construction is set out in Scottish Trunk Road Infrastructure Project Evaluation (STRIFE), with two separate, programmed evaluations carried out on relevant projects, as follows:

- A one-year after Evaluation (1YA) – prepared one year after opening, this report should provide early indication that the project is operating as planned and is on-track to achieve its objectives. This includes a detailed assessment of the environmental objectives of the scheme, including delivery against any biodiversity targets. As this evaluation is within the establishment period of the works there is ample opportunity to redress any noted failings.

- A Detailed Evaluation – undertaken between three and five years after opening. This second evaluation considers a project's impacts, whether it has achieved its objectives and reviews the actual impacts against forecasts and determines the causes of any variances. This is important as a 'lessons learnt' approach for the preparation, delivery and maintenance of future schemes.

Scheme Maintenance

All new interventions have an associated maintenance period as part of the contract requirements.

For Transport Scotland trunk road schemes this is usually between 3 – 5 years. The contractor is required to manage and maintain the scheme in accordance with the obligations set out in the contract and there are periodic inspections to monitor progress towards delivery before the scheme is fully complete and subsumed as part of the trunk road network.

Network management

The existing trunk road network is managed and maintained by Operating Companies working to term commissions of between 5 – 7 years duration. The actions of these companies is monitored, assessed and audited by an independent company - Performance Audit Group (PAG).

PAG employ specialists to ensure the contractors deliver all their contract obligations and that all interventions are undertaken in accordance with the contract requirements and related legislation/policy.

This includes all environmental matters, from grass cutting to discrete design projects. This assessment and monitoring is supported by Transport Scotland in-house staff.

Research & Development Impacting Biodiversity

The Effectiveness of Wildlife Mitigation Measures

Many of Transport Scotland's trunk road schemes are designed with mitigation to prevent or reduce wildlife mortality. For many mammals, including nationally or internationally protected species (e.g. otters, badgers, red squirrel, pine marten, bats etc.), this often takes the form of underpasses, over-bridges, ledges along culverts and mammal fencing. This mitigation generally results from commitments made through the Design Manual for Roads and Bridges (DMRB) Stage 3 impact assessment and is required to avoid or reduce residual impacts on the populations and distribution of these species.

The primary objective of this research is to collect and utilise information from various sources to provide the Agency and the wider industry with evidence as to the effectiveness of existing mitigation. Information is being compiled from various sources including a desk study and targeted surveys on the trunk road network.

There is a widely acknowledged lack of understanding of how road networks impact on protected species at the local and regional landscape scale and how effective mitigation is in avoiding residual long-term impacts. This is articulated further in [SNH Commissioned Report 1003: Developing a mitigation monitoring approach for the A9 and A96 dualling projects](#).

To fully quantify these impacts would require detailed long-term before and after studies, which is not an available option at this time for Transport Scotland. For this reason, the current research project seeks to focus on a subset of common mitigation structures which are installed for a range of species and are relatively easily studied. This mitigation includes underpasses, over-bridges, ledges along culverts and mammal fencing. By focusing on these structures, it is considered realistic for the research to output findings that can meaningfully inform future design and installation of these types of mitigation.

This research project is still underway and is due to report its findings by April 2024.

Vegetation Chippings

One of the commonly used methods of dealing with branches, small trees and other bits of vegetation resulting from verge-side maintenance activities is to reduce the arisings to small chippings by passing it through a mechanical chipper. This makes the waste material more manageable, particularly for transporting off site.

In years gone by, chipped vegetation was often spread straight back on the ground near to where it was removed. However, the chippings can have a detrimental effect on the roadside verges, restricting the growth of desirable ground flora and often looking unsightly. In some circumstances where the verge is on sloping ground, such as embankments or cuttings, the reduction in ground vegetation due to the covering of chippings can lead to structural slope instability due to the limited root binding affect.

According to the [EU Waste Framework Directive](#), all waste producers have a statutory duty to apply the waste hierarchy, namely (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, including energy recovery; and (e) disposal. This is illustrated in the figure below. The Scottish Government has set several ambitious targets for reducing waste and increasing recycling. By 2025, the aim is to reduce total waste arising in Scotland by 15% against 2011 levels, recycle 70% of remaining waste, and send no more than 5% of remaining waste to landfill.



Figure 24 Waste Hierarchy (source: environment.ec.europa.eu)

Based on the above, it becomes clear that disposal of timber residues to landfills should be the last resort. Several options have been therefore considered as alternative uses of wood chips, as shown below:

Woodchip pads for sustainable out-wintering of livestock

Wood chips (WC) can be used to form pads (livestock heavy-use areas) that have a drainage layer overlain by wood chips.

Wood chips as a restoration strategy for well pad sites

WC can be used to manipulate plant community composition and improve soil parameters negatively affected by the drilling process in well pad sites.

Wood chips in reducing sheet erosion on slopes, and erosion in cut and fill slopes of forest roads

The main reason for erosion of forest roads is the elimination of protective flora on the road slopes. WC show potential in reducing the loss of sediment in the slopes of forest roads. Additionally, they can further reduce erosion of cut and fill slopes of forest roads.

Wood chips as a soil cover for construction sites with steep slopes

WC can be utilised as a soil cover to reduce the off-site movement of soil during construction activities.

Wood chips for dust control on surface-mini haul roads

Instead of using water trucks with sprinkles to wet the road surface, WC can be used to reduce the need to sprinkle for dust control.

Lightweight concrete

When the density of WC is low, then they can be used as a lightweight aggregate in concrete.

Structural reinforcement layer with woodchips for forest roads

Local waterlogging occurs in forest roads especially in the sections that are inappropriately routed. Instead of using coarse crushed stone in these sections, WC can be here employed.

Wood chips in low-volume road construction

WC fills can be here used as a means of constructing roadway embankments across swamps.

Wood chips as biomass

WC may be converted to energy, specifically as a biomass solid fuel.

After discussions with the Environmental Forum, the consensus is to employ wood chips as a source of biomass. This is because Energy from Waste (EfW) could ultimately contribute up to 31% of Scotland's renewable heat target and 4.3% of our renewable electricity target under the Climate Change (Scotland) Act 2009. This work is still in progress, and we are currently seeking to engage with biomass manufacturers in Scotland in order to progress with this selected option.

ViaVerde: Application for Scotland

The agency has been in discussions with a company from Mexico, ViaVertical, that has developed a project entitled ViaVerde in Mexico City to transform the transport network of the city to be a healthier and more attractive urban space for the residents and road users, whilst also improving conditions for local biodiversity. This has been achieved by establishing an innovative system of ‘intelligent’ vertical gardens installed on columns, retaining walls and other infrastructure elements associated with the urban motorways. The system, once installed, is fully automated, with computer-controlled irrigation and monitoring.

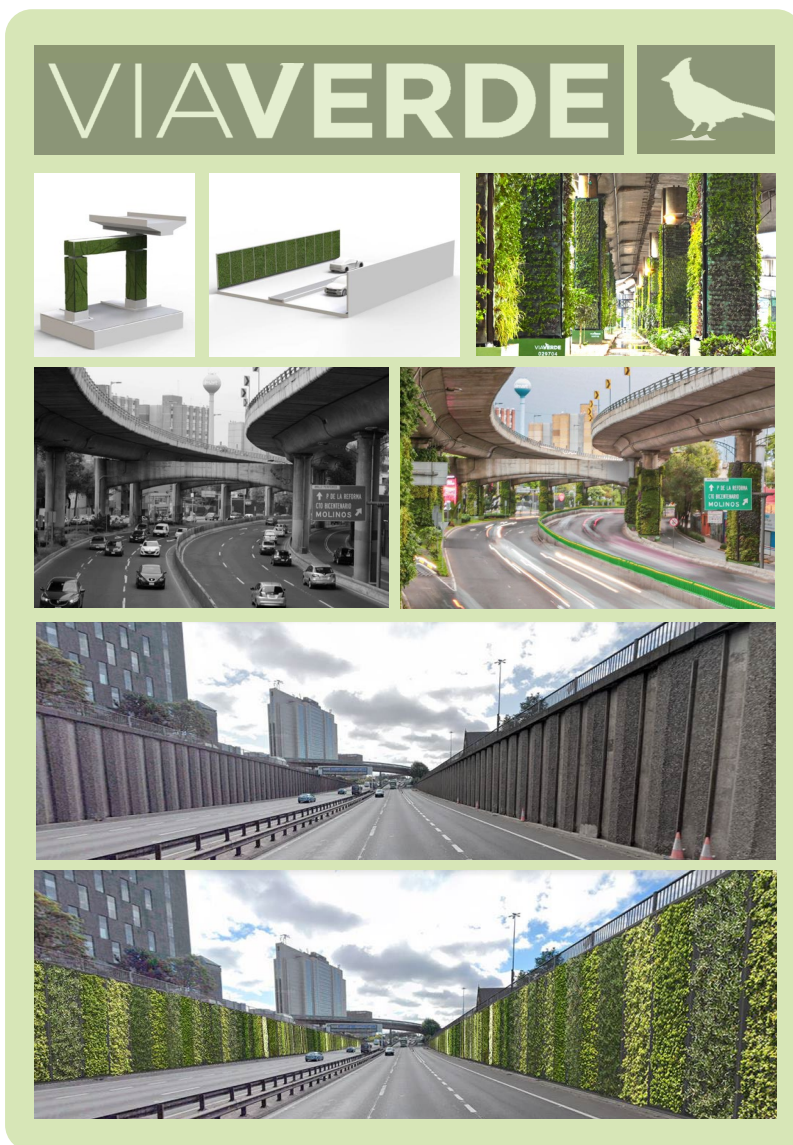


Figure 25 Composite of the ViaVerde project, approach to urban enhancement and how this may appear when applied in Scotland. (Images: ViaVertical, Mexico)

Transport Scotland, on behalf of Ministers, has been in discussions with the company to determine how applicable the system might be for parts of the urban / peri-urban trunk road network in Scotland. There are significant differences between the environment, climate, and regulative context within Mexico and Scotland, which will all have an impact on whether the approach would be suited to this country, as well as challenges relating to road standards and legislation. The research and liaison is ongoing.

Figure 25 illustrates the concept and installation of the approach in Mexico City, together with an impression of what the M8 corridor through Glasgow could appear like if the system was introduced to Scotland.

Engagement, Communication & Partnerships

Virtual Exhibitions

Public consultation and communication is a major part of the work undertaken by and on behalf of Transport Scotland. It is crucial that plans, proposals and projects are fully understood by the stakeholders likely to be impacted. The fundamental intention behind all such interventions is to improve the network in some form or other and the process from strategic planning through to scheme delivery is robustly assessed to ensure schemes reflect the stated objectives whilst meeting legal, regulatory and social obligations, including those to the wider environment.

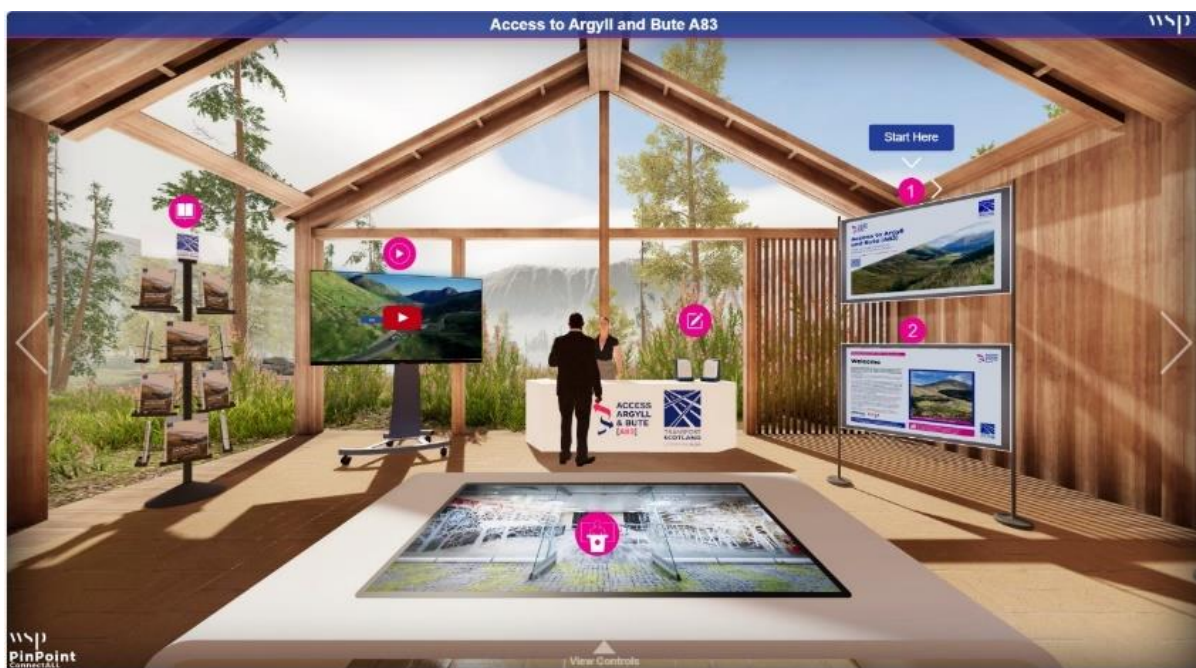


Figure 26 Navigation screen for the A83 Access to Argyll virtual exhibition

Consultation is delivered at various stages in the scheme development, helping to capture all aspects of the likely impact of the proposal. Public exhibitions are very useful for local communities to review and assess the schemes and discuss issues with the team involved. However, it is not always easy or possible for everyone concerned with the proposed development to get to a public event.

To address this and make the consultation process more accessible, recent schemes have developed virtual exhibitions in addition to the continued physical events. As technology has improved, this facility has become more detailed and expansive, with better graphics and imagery to better illustrate the proposals. An example of this approach is the recent virtual exhibition created for the plans to improve the A83 Access to Argyll, at the well-known Rest and be Thankful (RaBT) site (see Figure 26 and Figure 27).

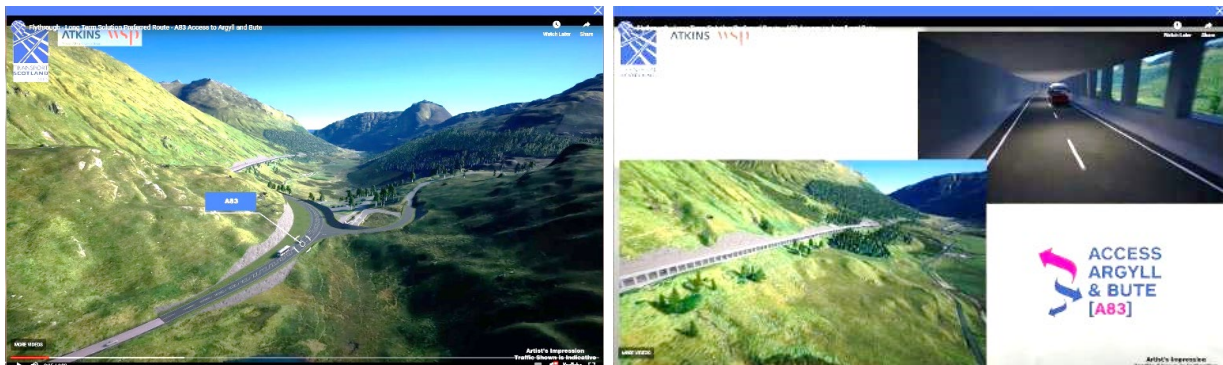


Figure 27 Examples of the simulated 'fly-through' models included within the virtual exhibition for the A83 Access to Argyll project public consultation

Environmental Forum

As part of its remit related to the management of the Scottish Trunk Road Network, Transport Scotland is supported by operating companies who are contracted to manage the estate on behalf of the agency. The contracts are complex and require the operating companies to employ a large number of specialists across a range of activities and fields. To harness this resource and ensure the collective experience is best utilised, Transport Scotland has created an Environmental Forum that meets on a quarterly basis. The forum is made up of relevant staff from all four trunk road operating companies together with representatives across the agency's Roads Directorate, including environmental specialists and colleagues involved in operational delivery.

This forum brings together key players from different organisations in a spirit of collaboration and with a common understanding of the importance of sharing environmental good practice. The format features presentations on various aspects relevant to the management of the network and the integrated protection of the environment, alongside healthy and informative discussion and comment.

This can lead directly to proposals for amending the contract requirements or introducing new procedures to further environmental net gain.

The forum is a driver for change. It provides a positive approach to our collective obligations to support the Scottish Government's objectives to harness the transformational change required to achieve the challenging Net-Zero targets, biodiversity recovery, and a sustainable future for Scotland.

The topics presented and discussed at the forum can be varied, from proposed adjustments to working procedures and practices on the ground (such as the example above regarding the treatment of vegetation chippings), to more speculative opportunities such as the introduction of 'vertical gardens' on urban and peri-urban roads, using the system developed in Mexico by ViaVertical (see ViaVerde: Application for Scotland Section).

Linear Infrastructure Environmental Management Group

Many of the assets managed by Transport Scotland are linear in profile reflecting the nature and object of transport corridors. This creates an unusual estate to manage, with inherent issues of barriers to connectivity, fragmentation of habitats and ecosystems, and a large number and assortment of neighbours to be aware of and to liaise with. However, these issues are not unique to Transport Scotland, with other organisations and bodies sharing the challenges of managing an ostensibly linear landholding.

In recognition of this, a forum was established in September 2021 to bring together organisations who have responsibility for lengthy estates or infrastructure. As well as Transport Scotland, the group includes representation from the following:

- Office of Rail and Road
- Network Rail
- Scottish Water
- Scottish and Southern Electricity Networks
- Scottish Power Energy Networks
- NatureScot (Chair)
- SEPA
- Scottish Canals

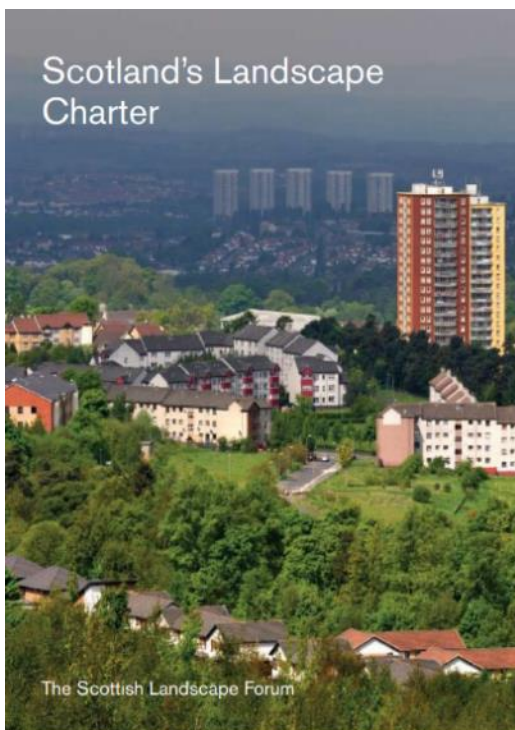
The purpose of the group is to share information on linear infrastructure issues and keep members up to date with issues such as:

- Operations and projects
- Consultations
- Research
- Guidance development

Policy and strategy development

European Landscape Convention Coordination Group

The European Landscape Convention Coordination Group (ELCCG) was established by consensus following the signing of the Convention in 2000. The group is led by NatureScot and has representation from landscape specialists from a range of Scottish public bodies. Transport Scotland is a part of the group, and there is also a link to the Landscape Institute Scotland and Scotland's Landscape Alliance (SLA), a community consists of organisations and individuals spanning a broad range of interests across urban design, protected scenic areas, biodiversity, economic regeneration, health and wellbeing and social justice.



The remit is to further the aims of the European Landscape Convention by encouraging and recording activity in support of the protection and enhancement of Scotland's landscapes (all landscapes).

The ELCCG, alongside the SLA, is keen to promote a revised and updated Landscape Charter for Scotland that would support the objectives of the Convention whilst delivering a realistic manifesto for promoting the need to protect the distinct character and quality of our landscapes.

Figure 28 Scotland's Landscape Charter

Scotland's Beaver Strategy 2022 - 2045 and Scottish Beaver Advisory Group

The re-establishment of beavers has been a notable success in Scotland. Despite being hunted to extinction in the UK in the 17th century we now have rapidly increasing population beavers across Argyll and Tayside. Whether due to the carefully controlled reintroduction programme in the Knapdale area, or the less planned development of beaver groups across Perthshire, Angus and parts of Aberdeenshire, the species is now firmly back in Scotland.



Beavers are Nature's engineers, and they can often have a positive impact on riparian ecosystems, bring wider benefits for biodiversity and habitats. However, they can also cause damage to agriculture and infrastructure and, as a result, the Scottish Government realised there was a need for a comprehensive strategy.

Figure 29 Front Cover of the Scottish Beaver Strategy

[Scotland's Beaver Strategy 2022-2045](#) supports communities to maximise the environmental benefits of beavers, while minimising negative impacts through effective management and mitigation. It was developed through the detailed consultation with and support of a range of stakeholders and interest groups, including Transport Scotland.

In addition, the agency is also part a related Scottish Beaver Advisory Group which has been established to put in place a prioritised plan of action and monitoring of the strategy delivery.

Biodiversity Highlights & Challenges

Actions taken in support of biodiversity

Action to protect and enhance biodiversity is a common theme across our transport schemes and operations, with a particular focus on our road and rail activities. Examples of actions we have taken, and outcomes we have delivered, are shown below, with the examples sub-divided across the five objectives highlighted in the biodiversity duty format guidance.

Species & Habitat: To halt the loss biodiversity and continue to reverse previous losses through targeted action for species and habitat

As highlighted in the main body of the report, all Transport Scotland schemes are carefully planned, designed and delivered to fit into the landscape as far as practicable, limiting any negative impact on the natural environment and seeking to enhance opportunities for habitat creation and the protection of wildlife. The following schemes constructed within the last three years are provided as examples of this approach.

M80 Stepps – Haggs improvements

The scheme was developed a few years ago to improve connectivity and reliability of the network by removing traffic from the local villages such as Stepps, Muirhead and Moodiesburn to a purpose-built motorway to the north west. A major part of the proposals was to ensure the scheme design reflected the character and enhanced the quality of the surrounding landscape.



Figure 30 Extensive species-rich seeding and wildflower swards have been successfully established as part of the M80 scheme.

The adjacent rolling pastures were seen to be notable in the vicinity and, in response, the scheme featured extensive areas of species-rich grass mixes as well as naturalistic Sustainable Drainage Systems (SuDS) with diverse wildflowers and emergent species. The attached images demonstrate the success of the approach.



Figure 31 One of the M80 SuDS ponds demonstrating the successful establishment of native reeds, sedges and wildflowers.



Figure 32 The rare lesser water-plantain found within the M80 project area

In addition to the intended planting design, the team involved located examples of naturally-growing lesser water-plantain or *Baldellia ranunculoides*. It is a native perennial herb that usually grows as an emergent or on damp ground at the edge of water bodies such as lakes and pools, marshes, fens.

However, *B. ranunculoides* has been in long-term decline, in Scotland and throughout its European range, for a number of reasons including habitat destruction, succession following reduced disturbance or grazing, and eutrophication.

It is really encouraging that the site team was able to locate and recognise this threatened species, and it is now subject to careful, albeit discrete, monitoring to encourage its survival and expansion in this location.

M9 10-11 65 Knockhill overbridge – concrete repairs and bat protection

This is a good example of the level of ecological input that accompanies all works where there is a potential to impact wildlife, especially protected species.

Concrete investigation and subsequent repair works were carried out on the Knockhill M9 overbridge in autumn 2021. Prior to carrying out repairs and maintenance, walkover surveys such as a Preliminary Roost Assessment (PRA) and a Preliminary Ecological Appraisal (PEA) were conducted. During the inspections, large cracks were noticed to develop vertically between the abutment and the southwest wingwall as well as the presence of small gaps at the level where the wingwall meets with the north abutment. Both locations were assessed as having roosting potential.

Bat Dusk Emergence and Dawn Re-entry surveys were therefore undertaken on 5th July 2021 and 4th August 2021 respectively, and a pipistrelle bat (*Pipistrellus pipistrellus*) roost was identified approximately 18 metres away from the area of proposed works. The limited size of the colony and its location relevant to the works meant no site-specific licence was required, and the works were permitted to proceed under a Bat Low Impact Licence (BLIMP) via NatureScot.



Figure 33 Bat roost locations (NW corner of the bridge) and a common Pipistrelle bat (image from Amey)

A Bat Protection Plan (BPP) was prepared to identify appropriate mitigation measures to ensure compliance with Consent Conditions inherent with the BLIMP licence.

The mitigation measures detailed within the BPP include:

- Provision of a roost (e.g. bat box) to a suitable nearby tree.
- A recommendation that works are undertaken outwith the hibernation period (i.e. November to March) due to the bat hibernation potential of the bridge.
- The level of activity within the roost's vicinity should be kept to a minimum by the contractors.
- Toolbox Talk TTN 008 'Working with Bats' must be briefed to all site personnel prior to works commencing.
- Works should be carried out in daylight hours wherever possible to avoid disturbance to emerging or foraging bats.



Figure 34 Suitable tree identification for mounting of bat box near to the structure

The Operating Company, BEAR Scotland, appointed an Environmental Clerk of Works (EnvCoW) to visit the site during the mobilisation period to deliver toolbox talks and the BPP, as well as to brief all site personnel on the bat roost location.

The EnvCoW was also appointed to undertake further site visits during the construction period to ensure that all the environmental mitigation measures are maintained and delivered, including those specific to common pipistrelle bats (e.g. roost/roost features are not inadvertently damaged).

Network-wide Biodiversity Enhancements

During the 2021/22 annual period, a trial reduction of the number of cuts was introduced along stretches at Spean Bridge and in Glen Coe on the A82. Ecologists were appointed to monitor the effectiveness of the change in the cutting regime along pre-identified sections of the road. In August 2021, HED Ecology carried out an initial assessment identifying the vegetation present on site. A follow up assessment, completed in September 2022, established the baseline for monitoring the uncut verges (Figure 35). It was indicated the frequency of flowering already indicates a beneficial change for biodiversity, particularly for pollinating insects.



Figure 35 Reduced cutting of roadside verges

The efforts to protect wildflowers of note, such as these Northern March Orchids, have drawn occasional favourable responses from the public, as shown in Figure 36.



Figure 36 social media post acknowledging efforts to protect wildflowers

Network A887 Bridge over Allt na H-Innse Beag, Glenmoriston

The ageing bridge was sub-standard and required to be replaced. The project was scheduled for 2021 and the programme included a temporary road diversion and crossing to maintain traffic flow along the route.

The works required a range of environmental surveys and assessments to be undertaken. The bat surveys concluded that the bridge was not an active bat roost, but three nearby structures were all identified as having roosting bats in very large numbers, with one structure determined to be of high conservation value due to the presence of a large multi-species maternity colony for soprano pipistrelles (*Pipistrellus pygmaeus*), Daubenton's (*Myotis daubentoniid*) and brown long-eared bats (*Plecotus auratus*).

Further summer and winter bat surveys, combined with the use of passive bat monitoring equipment and infrared cameras, have been conducted to inform bat licensing requirements for the works and to inform the mitigation approach.



Figure 37 Hibernating bat within the main colony and the bat boxes erected nearby

This included the installation of bat boxes in the nearby trees to supplement the colony, which was protected against any disturbance from the temporary and permanent works (Figure 37). A monitoring plan was also agreed for both during and post construction.

As well as the three bat species, otter (*Lutra lutra*) activity was detected within the site area, including prints and spraints. Two potential couches were identified by surveys, both within the footprint of the proposed works.



Figure 38 Otter captured on camera trap at the bridge

Camera traps were set up to determine how the otters were using the area and what mitigation would be suitable during construction, as shown in Figure 38. Both the temporary culverts and the newly proposed bridge have been designed to allow safe passage under the road.

A82 Altrua, Invergloy

Bear Scotland were appointed by Transport Scotland to undertake a package of maintenance works on the A82 Altrua Bridge near Invergloy. During the preliminary ecological appraisal, signs of red squirrel (*Sciurus vulgaris*) and pine marten (*Martes martes*) were noted near the bridge structure. The adjacent dense larch woodland area surrounding the bridge was highly suitable for these species with feeding signs, scats, and squirrel dreys observed within 50 metres of the bridge (Figure 39).



Figure 39 Red squirrel drey in close proximity to Altrua bridge, and evidence of squirrels feeding on larch cones

As a result of the ecology in the area, the works programme was amended to exclusively operate during the less sensitive, non-breeding season (October to January). Protection zones were also established around the identified dreys and kept active throughout the during the works period.

People: To increase awareness, understanding and enjoyment of biodiversity, and engage many more people in conservation and enhancement

To generate a greater engagement in biodiversity conservation and fully understand the benefits it brings to the health, quality and economic sector, it is fundamental to raise awareness amongst the public and all stakeholders and take new initiatives through which biodiversity can be conserved and enriched. Such engagement can take many forms, from public bulletins and project update posted on local internet forums and websites, to face-to-face dialogues and wider presentations.

Trunk not Junk

In support of Keep Scotland Beautiful Spring Clean 2022, BEAR Scotland, which manages the trunk roads in the South East of Scotland on behalf of Transport Scotland, organised the Trunk not Junk Schools Litter Campaign Design Competition. The initiative involved over 650 primary schools across the South East area and pupils were invited to submit a poster, slogan or song to encourage people not to litter on Scotland's trunk roads.



The activity raised awareness amongst the young pupils of the importance to keep the environment clean. In fact, BEAR Scotland collected over 5,000 large black bags of litter and 2,200 large objects found in the trunk roads during 2021. The competition had a great success with 45 finalists, which highlights the impact on new generations about preserving the local wildlife and the environment.



Figure 40 'What a sin, not to bin' winner poster from a P6 pupil at Roslin Primary School

Royal Horticultural Society Award – Hawick High School

BEAR Scotland has implemented community benefits that support Transport Scotland in delivering the Scottish Biodiversity Strategy post 2020 – A Statement of Intent.



In an effort to strengthen the link between biodiversity and community, a donation was raised to help Hawick High School achieve the Royal Horticultural Society (RHS) Schools Gardening Award Level 4.

Figure 41 Pupils at Hawick High School

The donation helped the school to create easy access in the garden to wheelchair-users by purchasing raised bed. Thanks to the fund, students and staff were also able to purchase new planters for the sensory garden, climbing plants, wildflower seeds for a meadow in the school's car park and many more.

Environmental Training

In 2021, the Scottish Government adopted new measures to promote the expansion of the beaver (*Castor fiber*) population and to restore biodiversity in Scotland via the 'Protecting Scotland's beaver population' news released in November 2021. In response to this, Transport Scotland adopted, through their operating companies, an approach aimed to increase awareness of the multitude of benefits that beavers can bring about to the environment, including converting depleted landscapes into thriving habitats which, in turns, have implications for the communities' connection to nature. To increase awareness, environmental related training including Beaver Ecology and Beaver Management has been delivered through online courses.

Environmental Training

Volunteer employees from Amey (Figure 42), the operating company that manages the South West trunk road unit, took advantage of their Social Impact Day to complete a beach clean at Lunderston Bay, Inverclyde.

On the day, the team recovered 50 bags full of rubbish, including cast aside toys (at least we hope so!) and a full oil drum! The effort will help many marine mammals and other sea species avoid the serious and often lethal effects of ocean pollution.



Figure 42 The Amey Team of volunteer beach cleaners at Lunderston Bay, Inverclyde

Landscape and Ecosystems: To restore and enhance biodiversity in all our urban, rural & marine environments through better planning, design & practice

Carbon Sequestration projects

As part of the actions to help deliver the obligations and targets of the CMP4, Transport Scotland is engaging in the development of a number of projects to plant trees within Scottish Ministers' land for carbon sequestration (insetting). Whilst clearly not an immediate solution, tree planting is widely recognised as delivering multiple environmental and social benefits, including increased potential for habitat connectivity and biodiversity enhancement.

Current insetting projects underway are included in the following Sections

A83 Rest and be Thankful (phases 1 and 2)

The agency is involved in a challenging project to develop a native broadleaved woodland on the steep ground above the A83 trunk road through Glen Croe. The woodland will cover approximately 80 Ha which has all been registered through the Woodland Carbon Code and will help offset a considerable amount of the agency's corporate carbon emissions.

The hillside is well-known for the various slips and landslides that have affected the road below over the years. The new planting is being delivered in two concurrent phases in partnership with Forestry and Land Scotland, who are also developing native woodland on the adjacent land. This will result in enhanced biodiversity for an area that has long only supported bracken, rough grass, and sheep.

It will also provide important habitat connectivity between the head of the glen and the more wooded areas to the east around Arrochar.

By the end of 2023 both phases will be complete, including over 10km deer fencing, and monitoring and maintenance will begin.

M74 Blacklaw

When the M74 motorway was developed it required various areas of land adjacent to the route for construction purposes. Some of these areas were sold back to the original owners but some areas remained in Scottish Ministers' ownership. One such area is a landlocked piece of land of about 8 Ha in size which has been left undisturbed for many years. Transport Scotland identified this land for the development of a native woodland to sequester carbon and add to the local biodiversity of the area, which is largely surrounded by commercial forestry interests. Due to the local situation, a new access needed to be formed to get materials, labour and machinery from an existing commercial forest road to the site.

Figure 43 shows Blacklaw site before and during the preparation and planting works.



Due to the need to protect an area of ground water dependent terrestrial ecosystem, GWDTE, the final area of planting was reduced to 5 Ha. The planting was undertaken in 2022 and the first year's beat up maintenance is currently underway.



Figure 43 Blacklaw site before and during the preparation and planting works

M80 Mollinsburn

A further surplus land site in Scottish Ministers' ownership has been identified near to junction 9 of the M74, at Mollinsburn. This is another area that was purchase to facilitate the construction of a motorway and was used for a borrow pit prior to being backfilled and topped.

A project is currently underway to introduce a small (5 Ha) native woodland that will, in time contribute to the agency's carbon emissions reduction targets, whilst also increasing the general tree cover and helping to link the motorways planting with outlying areas of woodland, in support of the aims of the Clyde Climate Forest.

Management of tree diseases

Phytophthora ramorum

The spread of the *Phytophthora ramorum* pathogen across Scotland is a cause for concern despite the efforts to contain outbreaks to within the Management Zone. The disease is still largely concentrated in the wetter south west of the country, but there are increasing numbers of infections found in the central area and further north, and Transport Scotland has received a number of Statutory Plant Health Notices (SPHN) in respect of diseased larch within the trunk road verge.

The Notices require all larch within the 250m buffer area to be removed and this can have a significant effect on the local environment. To compensate for the loss of the trees the agency has a policy of replanting other species wherever possible, even though this is not a requirement of the Notice. The number of replacement trees depends on the local situation – the number and size of the felled trees; the availability and suitability of land for the replacements; the objectives of the site, etc.



Figure 44 M8 Junction 3 area where the removal of the diseased larch has created a more balanced and diverse habitat

However, in some cases the lost larch trees can actually have a beneficial impact on local biodiversity. One such example was pm the M8 at junction 3 where the forced removal of 940 larch trees has acted as form of unintentional woodland thinning management that has opened up the area.

This helped to increase light levels and improving the immediate diversity of habitat. The former SPHN site now represents a more native and natural mosaic of woodland and essential habitats that are important for improving and enhancing local biodiversity (Figure 44).

Ash Dieback Disease

The management of Ash dieback disease continues to be a major undertaking on the trunk road network with all four operating companies heavily involved in surveying, planning and delivering felling works in their areas.

On behalf of Transport Scotland, Amey's ecology team have been working with Amey's landscape team to carry out Preliminary Ground Level Roost Assessments (PGLRA) on a number of trees known to have ash dieback.



Figure 45 Maturing ash trees affected by ash dieback diseases to the extent that they will need to be felled

Ash dieback is caused by a wind-borne fungus (*Hymenoscyphus fraxineus*) with spores that can be dispersed far and wide, making it the most significant tree disease in the UK at the present time. According to the 'Ash dieback: An Action Plan Toolkit for Scotland', ash dieback will cause the decline and death of 50-75% of ash trees in Scotland over the next two decades.

The environmental impacts bound to it include:

- long-term change to the cultural and historic landscape;
- impact on biodiversity – many species rely on ash, and;
- impact on stored carbon and sequestration of emitted carbon.

All the trunk road operating companies have been surveying their management areas to ascertain the local ash resource and to assess the condition of the trees using the national guidance developed by the Tree Council for the UK and endorsed by Scottish Forestry.

Over the past two seasons, the operating companies have managed rolling programmes to target and remove those ash trees assessed as being of the greatest risk to the trunk road network, its infrastructure, and its users. The work is resource-intensive, both in terms of operatives, technology and machinery. The nature of the disease and its impact on the species results in a particular challenge for felling – the trees can become very brittle and this poses a significant risk for operatives. To combat the problem, the operating companies have made good use of specialist contractors and machinery, such as modern grapple-saws more commonly seen in forestry operations.

As shown in Figure 46, large, highly manoeuvrable forestry equipment is being used on many routes to safely remove diseased trees – with many operations taking place at night to reduce disruption to the public.



Figure 46 Forestry equipment used on routes to remove diseased trees

The operating companies are using sophisticated GIS mapping software to accurately record the presence and condition of the ash resource on the network (Figure 47).



Figure 47 GIS software that records the presence and condition of ash resource on the trunk road network

This work is set to continue over the next few years until the safety impacts of the disease are appropriately mitigated. Work is also underway to engage with adjacent landowners with diseased ash trees on their property that are close enough to the trunk road network to be considered a potential hazard. At the same time, the recovery planning is underway, with plans and programmes to replace the felled ash with suitable alternative native species.

A887 Allt na H-Innse Beag Bridge

A new £1.5M bridge was opened to traffic in November 2021 on the A887, nine miles west of Invermoriston, following seven months of construction commenced in mid-March 2021 funded by Transport Scotland. The new precast concrete box-culvert structure has a widened single carriageway to 6 metres, with 1 metre hard strips at either side of the road, specifically designed to last for 120 years and to accommodate significantly higher flows in the Allt Na H-Innse Beag.



Figure 48 Upstream view (left) and rock armour and coir rolls installed around the new structure (right) on the A887

Construction works were carefully programmed to coincide with the summer months, in order to avoid the fish-spawning season. Rock armour and coir rolls were installed around the new structure to protect the foundation and the riverbanks from the effects of scour and to provide resilience for climate change. Mammal walkways were also incorporated into the design to allow wildlife to pass through the structure in all flow conditions. As part of the landscape reinstatement works, over 800 trees were planted in October following the completion of the new bridge.

A9 Dualling: Luncarty to Pass of Birnam – East Mains planting 2022

Following the opening of the new A9 dual carriageway at the end of August 2021, a great level of attention was focussed on the landscaping works, which progressed during the autumn season. Part of these finishing works comprised grass cutting, landscape preparation and planting of new vegetation. Particularly, the latter was carried out in November, which marks the start of the planting season, to offer the best opportunity for the new plants/shrubs to flourish.



Figure 49 A9 Dualling: Luncarty to Pass of Birnam

Following completion of the construction phase, landscaping operations continued throughout January 2022. The contractor, Balfour Beatty, will continue to oversee the planting and landscaping maintenance until December 2026.



Furthermore, to comply with the best practices to reduce the environmental impacts from the use of plastic tree shelters and ensuring to the community that a sustainable approach is adopted, Transport Scotland introduced a trial of 5,000 biodegradable tree shelters at four locations with diverse micro-climates across the A9 Dualling, Luncarty to Pass of Birnam project (see Figure 50).

The trial has involved a number of different types of shelter with regular inspection and reporting on the performance of each – both in terms of its objective to protect the plants, and how long it retains its structural integrity. The results are being used to inform future transport infrastructure planting contracts.

Figure 50 Biodegradable Tree Shelters on site at A9 Luncarty

A83 Rest and Be Thankful, Old Military Road: Emergency Bund

Transport Scotland commissioned BEAR Scotland to carry out emergency works to address identified landslide risk on the A83 trunk road at the RabT and the Old Military Road (OMR), that is used as an alternative route during closures and periods of high hazard.

The landslide risk was high to such an extent that the A83 could be closed, and the OMR only deemed safe for use in daylight hours during prolonged periods of dry weather. At night and at periods of heightened risk, e.g. forecast rainfall, traffic was subject to lengthy diversions between Tarbet and Inveraray via the A82, A85 and A819.



Figure 51 Completed temporary bund from the roadside, OMR

Due to the challenging and urgent nature of this work a temporary bund for the OMR was developed (Figure 51). The bund was created with the use of HESCO geotextile boxes and is approximately 177m long, 8.4m wide at the base, and up to 9m high.

The structure was filled with material from a recent landslide, avoiding the need for removal and import of heavy material and therefore presenting a more sustainable option through avoiding increased resource use and reduced carbon emissions.

This is adjacent to the site where that agency, in partnership with Forestry and Land Scotland, are currently establishing a native woodland on the hillside above the RabT. The Minister for Transport (at the time), Jenny Gilruth, MSP, endorsed this work:

“Using nature-based solutions like woodland creation is a win-win solution. It will help protect this important trunk road that is a vital lifeline for many people, will help capture more carbon and help increase the habitat in which wildlife can flourish.”

Integration & Co-ordination: To develop an effective management framework that ensures biodiversity is taken into account in all decision making

Recycling of Tar-Bound Materials

Road tar is processed from coal tar and was commonly used as a binder for road materials up until the mid-1980s. Coal tar became out-dated and subsequently it has been shown that tar can contain carcinogenic compounds and is highly toxic to aquatic life. As a result, tar bound road planings are classified as special waste. Currently the only options for processing this material are unsustainable and involve either hauling the material to Huddersfield for disposal at a landfill site, or to Hull where the material is loaded onto a ship and transported to Holland for incineration.

BEAR Scotland has been involved in a working group aiming to create guidance on cold recycling of bitumen and tar-bound roads in order to ensure a consistent approach is applied to in situ and ex situ recycling processes.

BEAR Scotland developed a pro-forma document to ensure key environmental information is collected and provided to SEPA for scheme approval. This was trialled in the recent A92 Ladybank South resurfacing works and a final guidance document was issued in February 2021.



Figure 52 A702 Lamington where the existing road tar has been stripped, processed and re-laid

The application of this process is an excellent example of a sustainable approach which significantly reduces road haulage emissions and waste generation.

Disposal of large volumes of tar bound material is expensive and has a large associated carbon footprint with transportation to distant disposal facilities. Two schemes on the A702 at Silverburn and Lamington utilised the cold recycling process (Figure 52), allowing reuse of the material, encapsulating it safely so it can be incorporated back into the road surface.

The use of this process and material allowed us to recycle over 1100t of tar bound arising which would traditionally have been sent to landfill. As well as reducing waste, there are energy and resource savings.

A90 Kinfauns Ditching Maintenance

A common problem for road drainage is the restriction to flow caused by the build-up of vegetation, silt and other debris. This can compromise the safety of those using the road, but also cause a backup along connecting ditch systems leading to impacts on local biodiversity and habitats. Removal of the accumulated material ensures the carriageway continues to drain effectively whilst reducing flood risk in the locale.

In this case, the principle environmental consideration during the works was to avoid water pollution as a result of mobilising silt and other debris. The road drainage in the works area discharges to two different small watercourses which enter the river Tay a short distance later. The river Tay is designated as a Special Area of Conservation (SAC). In order to minimise the risk to the environment the following steps were taken:

- Operatives were fully briefed in silt management procedures and on their responsibilities. This was achieved through delivery of a silt management Toolbox Talk (TTN-012) prior to works commencing.
- Ditch works were carried out in accordance with BEAR Procedure 112 (SUDS Feature Maintenance Operations).
- Drainage ditch inlets and outlets were blocked with straw bales during the course of the work to filter out any mobilised silt before it could enter the water environment and to avoid blocking up any other drainage infrastructure.

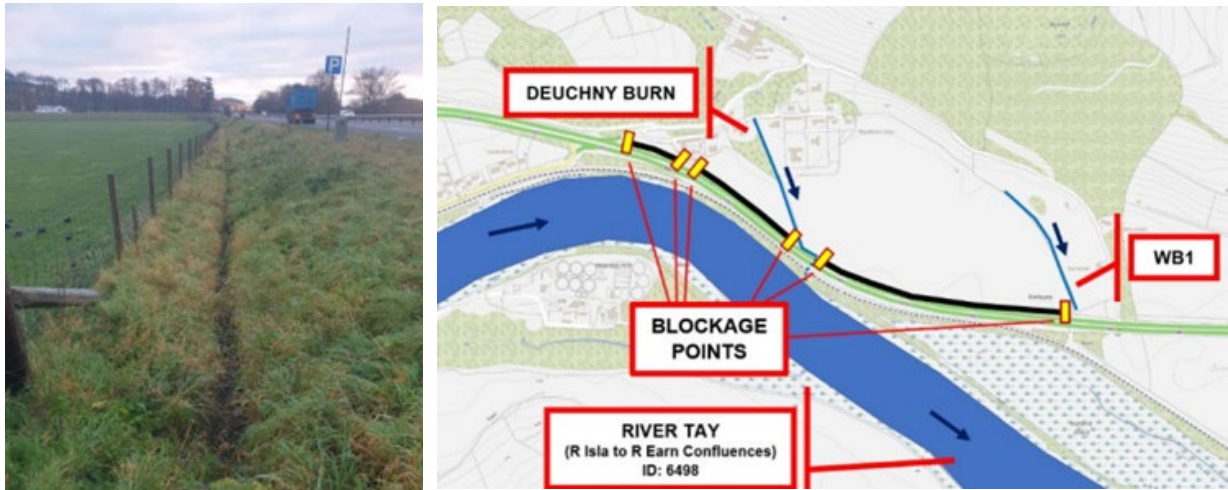


Figure 53 (left above) A90 Kinfauns, showing the overgrown ditch with the river to the left.

Figure 54 (right above) Locations of the blockage points determined by onsite surveys. The plan illustrates the proximity of the river Tay

The work has ensured the effective drainage of this area of road for the foreseeable future, reducing flood risk and the possibility of any associated damage or liability.

Knowledge: To ensure that the best new and existing knowledge on biodiversity is available to all policy makers and practitioners

Public engagement through website interactive map on active travel improvements on A82 at Inverness

Members of the public were invited to share their views through a unique interactive map available through the BEAR Scotland website, as shown in Figure 55. Users could add their comments to the map and have their say on what changes they would like to see to improve road safety and active travel on this section of the A82.

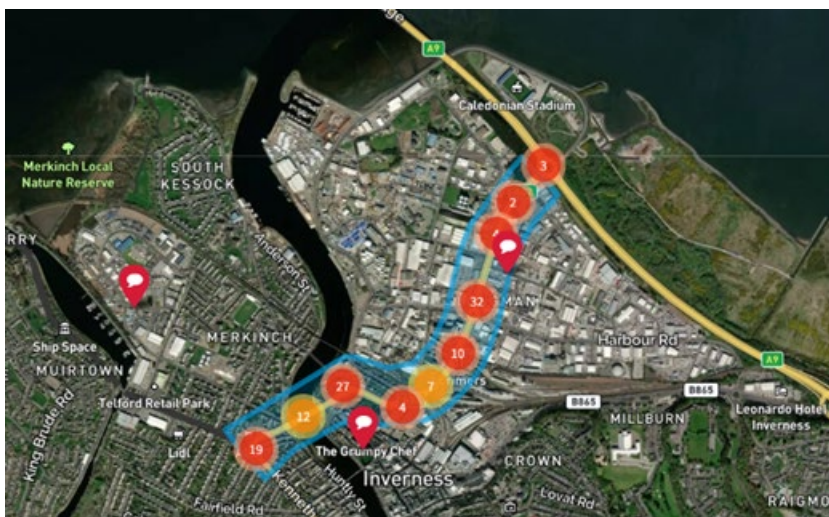


Figure 55 Interactive Map open for the public to comment

School Engagement

Amey Operatives spent 2 hours at a primary school with a CAT Scan & hand tools making trial holes to ensure the installation of a garden was safe and free from utilities (October 2021).

Mearns Primary School hosted their Values Day. This is a day where the pupils take part in activities which give the opportunity for them to celebrate and practise their school values. Two of the activities were a silent disco and also an outdoor concert. Due to Covid restrictions pupils were required to take part within their class bubbles. To support the health and safety of around 800 pupils on the day, Amey donated 200 traffic cones, 4 operatives for the set up and hazard tape which was used to mark out these areas for the pupils. Seven large areas for the silent disco were set up on their outdoor football pitch as well as 16 smaller seating areas for the concert. Amey delivered the cones in the morning of the event, along with four staff who set up the areas for the school (June 21).

The Winter Ready logo competition launched with 850 primary and ACT schools in SE. Winner was announced during November as part of our winter launch. The winning logo and slogan was designed by a P7 pupil from Holy Cross PS, North Lanarkshire.

Acknowledgements

Transport Scotland would like to thank all its staff and supply chain who are involved in delivering projects and maintaining the nation's strategic transport networks. It is through collective understanding and collaborative working that the greatest differences can be made for the benefit of Scotland's natural environment.

This report was prepared by staff from Roads: Environment Team within Transport Scotland, but it is acknowledged that it would not be possible without the input of others, and particular thanks go to those individuals involved from the following companies:

Organisation

Network Rail
Amey
BEAR Scotland
Jacobs
WSP



**TRANSPORT
SCOTLAND**

CÒMHDHAIL ALBA

© Crown copyright 2023

You may re-use this information (excluding logos and images) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit <http://www.nationalarchives.gov.uk/doc/open-government-licence> or e-mail: psi@nationalarchives.gsi.gov.uk

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

Further copies of this document are available, on request, in audio and visual formats and in community languages. Any enquiries regarding this document / publication should be sent to us at info@transport.gov.scot

This document is also available on the Transport Scotland website: www.transport.gov.scot

Published by Transport Scotland, December 2023

Follow us:



transport.gov.scot