



NATURE-BASED SOLUTIONS FOR CLIMATE ADAPTATION

ROADMAP FOR SCALING USE IN AOTEAROA NEW ZEALAND

DECEMBER 2024

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EXECUTIVE SUMMARY

THE ROADMAP FOR NATURE-BASED SOLUTIONS

Aotearoa New Zealand and the rest of the world currently face the interconnected crises of climate change, biodiversity loss, and land degradation. While these crises present a global and national challenge that requires urgent action, the risks are not evenly distributed, with some vulnerable communities, industries, and habitats exposed to more severe risks than others. As the impacts of climate change are experienced in New Zealand, they interact with our natural environment first, exacerbating and adding to the pressures already threatening our unique biodiversity and iconic landscapes.

Nature-based Solutions (NbS) for climate change adaptation have the potential to effectively mitigate or avoid the impacts of acute climate change risks in New Zealand. Actions to protect, conserve, restore, and sustainably use natural ecosystems can be applied to enhance resilience to the impacts of climate change, while simultaneously providing biodiversity, economic, human wellbeing, and cultural co-benefits. With land-based ecosystems services delivering benefits equivalent to 27% of New Zealand's GDP, and all economic activities indirectly dependant on ecosystem services, high-quality NbS can underpin the prosperity of our economy, society, and communities (WWF, 2024).

To grow the use of NbS in New Zealand for climate change adaptation, a strategic roadmap is required to enable system-scale change. This report outlines a Roadmap for Scaling Nature-based Solutions for Climate Adaptation in Aotearoa New Zealand (the roadmap), setting out the key actions required to equip New Zealand with the information, tools, and resources required to scale the use of NbS. The roadmap seeks to scale the use of NbS through the implementation of actions that will grow the understanding, financing, and technical application of NbS to address a range of climate change risks.

OPPORTUNITIES & CHALLENGES

Despite the immense opportunity NbS for climate change adaptation present, currently their understanding and use remains limited in New Zealand. However, national policy and planning drivers, including the National Adaptation Plan, Aotearoa New Zealand Biodiversity Strategy, and New Zealand Climate Change Strategy, seek to 'prioritise' the use of NbS as an adaptation approach.

To inform the development of the roadmap, a national survey of NbS project managers, researchers, and advocates was conducted in 2024 to understand the current state, challenges, and opportunities for scaling NbS use in New Zealand. These insights were coupled with a national gap analysis and literature review of international NbS lessons learned by leading NbS communities of practice. The global challenges experienced by leading NbS communities of practice were found to strongly align with the challenges experienced by NbS practitioners in New Zealand and were used to inform the key opportunity objectives for the roadmap. These challenges and opportunities identified through the national survey and international literature review focused on four specific NbS system components – relating to Knowledge, Technical, Policy, and Financial objectives.

The roadmap seeks to coordinate an integrated approach to scaling NbS for climate change adaptation. Whereby future efforts in NbS research, policy, and advocacy can be focused towards addressing the common challenges and gaps that presently hinder NbS use.

Recommending seven strategic actions across four opportunity objectives, the NbS roadmap actions target the system challenges currently facing NbS practitioners in New Zealand. These four opportunity objectives are:

- **KNOWLEDGE:** Facilitate information development and sharing of NbS through case studies, research, and collaboration across government, iwi, private sector, and community groups
- **TECHNICAL:** Strengthen New Zealand's cross-sector tools and capabilities to build a common understanding and application of NbS
- **POLICY:** Integrate and mainstream a wide range of NbS policy levers and practices in New Zealand's policy frameworks for climate change adaptation
- **FINANCIAL:** Significantly increase investment in NbS use, research, and long-term monitoring through development of public and private financing frameworks and opportunities

Actions presented in the NbS Roadmap have been framed as discrete areas of work, to allow initiatives to be progressed independently or together. This reflects the variability of enabling conditions such as government funding and policy priorities. Each action may be implemented independent of other actions and still deliver significant benefits to New Zealand's emerging NbS community of practice.

Delivery of actions identified in this roadmap are intended to create the systems-scale changes required for progress towards the greater uptake and use of NbS for climate change adaptation in New Zealand.

DEFINING NATURE-BASED SOLUTIONS

The roadmap recognises the latest definition of NbS, formerly adopted by the United Nations Environment Assembly 2022 (UNEA). This definition builds upon the International Union for Conservation of Nature (IUCN) definition of NbS, previously adopted by the 2016 World Conservation Congress and Member's Assembly.

'Actions to protect, conserve, restore, and sustainably use and manage natural or modified terrestrial, freshwater, coastal, and marine ecosystems, which address social, economic, and environmental challenges effectively and adaptively, while simultaneously providing human wellbeing, ecosystem services and resilience and biodiversity benefits'



At their core, NbS for climate change adaptation are designed to yield benefits for both nature and society through adaptation driven approaches. Whilst the adaptation outcomes are paramount to the success of a NbS, for an intervention to be considered a NbS, the co-benefits to nature and society must be present and safeguarded. The roadmap emphasises actions that will support the development and use of high-quality NbS in New Zealand, ensuring the presence of co-benefits to nature and society are upheld through national standards, methodologies, and policy levers.

THE ROADMAP FOR SCALING NATURE-BASED SOLUTIONS FOR CLIMATE ADAPTATION IN AOTEAROA NEW ZEALAND

OVERVIEW

ROADMAP PURPOSE

Set out the actions required to accelerate and scale the use of Nature-based Solutions in Aotearoa New Zealand for climate change adaptation



KNOWLEDGE



TECHNICAL



POLICY



FINANCIAL

CHALLENGE

NbS can be misinterpreted and misused due to significant knowledge gaps of their definition, application, and trade-offs



Scepticism from stakeholders and decision makers about the effectiveness of NbS due to limited evidence base and available tools



Lack of high-level policy integration, prioritisation, and support for NbS, along with unclear governance practices



Lack of established financial incentives and funding enablers to support the development and maintenance of NbS at scale



OPPORTUNITY

Facilitate information development and sharing of NbS through case studies, research, and collaboration across government, iwi, private sector, and community groups

Strengthen New Zealand's cross-sector tools and capabilities to build a common understanding and application of NbS

Integrate and mainstream a wide range of NbS policy levers and practices in New Zealand's policy frameworks for climate change adaptation

Significantly increase investment in NbS use, research, and long-term monitoring through development of public and private financing frameworks and opportunities

ROADMAP ACTIONS



COMMUNITY OF PRACTICE

Facilitate the growth of a New Zealand's NbS community of practice



STANDARDS & METHODOLOGIES

Develop New Zealand NbS standards & methodologies



POLICY GUIDANCE

Develop NbS Policy Guidance for Local Government



NATURE MARKETS

Grow New Zealand's nature-based markets and other sustainable finance mechanisms



EVIDENCE BASE

Continue to grow New Zealand's NbS project experience and evidence base



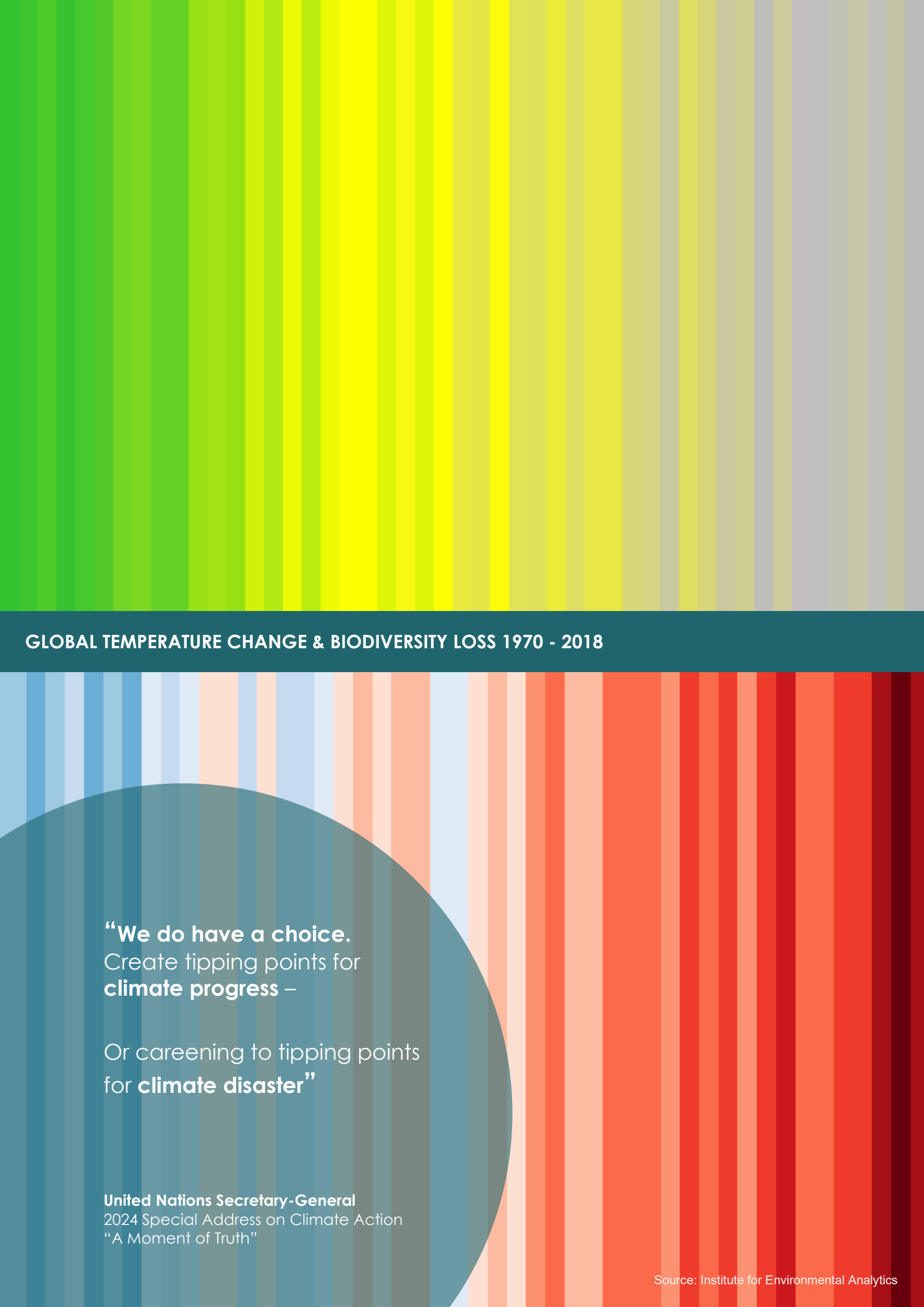
ENGAGEMENT STRATEGY

Develop & implement a NbS engagement & capability building strategy



GOVERNANCE

Establish clear NbS governance practices



GLOBAL TEMPERATURE CHANGE & BIODIVERSITY LOSS 1970 - 2018

“We do have a choice.
Create tipping points for
climate progress –

Or careening to tipping points
for **climate disaster”**

United Nations Secretary-General
2024 Special Address on Climate Action
“A Moment of Truth”

1. INTRODUCTION

The impacts of climate change are here, in New Zealand, now. Climate change is already impacting the natural environment, including New Zealand's indigenous ecosystems, and will continue to do so for the foreseeable future (IPCC, 2021). As our climate continues to change, we face a future where extreme climate-related natural hazards are projected to become more frequent and intense.

The overwhelming message from the recent assessment reports of the Intergovernmental Panel on Climate Change (IPCC, 2022) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019) is clear; this decade represents a critical window for addressing the interconnected crises of climate change, biodiversity loss and land degradation. Due to interconnected nature of these crises, it is essential that integrated solutions are scaled to address challenges equitably and economically. Healthy functioning natural ecosystems act as the first line of defence against acute climate change impacts such as flooding, coastal inundation, and wildfire. When ecosystems are healthy, they buffer us from the impacts of climate-related natural hazards and contribute to our social, economic, and cultural wellbeing (IUCN, 2020). A thriving natural environment is a fundamental climate change adaptation that goes beyond traditional risk management approaches to provide significant co-benefits for biodiversity and human wellbeing.

Nature-based Solutions (NbS) have emerged internationally and in New Zealand as practical additions to conventional 'grey infrastructure,' delivering significant adaptation benefits in the longer term and providing a host of additional co-benefits (Figure 1).¹ Applying existing conservation and restoration practices, NbS can be enabled through practical activities such as restoring wetlands and coastal ecosystems, reducing predator and browser pressures, and restoring indigenous land cover.

When implemented properly, high-quality NbS enhance the resilience of ecosystems and the societies that depend on them. NbS can provide the front-line adaptation interventions to acute climate change risk such as coastal inundation, flooding, and increasing wild-fire conditions.

Despite the significant benefits and opportunities of NbS for climate change adaptation, New Zealand's central and local government agencies are not currently enabled to effectively integrate NbS into their climate change adaptation processes (Climate Change Commission, 2024). Although New Zealanders have a history of leading the world in innovative conservation initiatives and resourcefully working with the land and water, we are still not leaders or even rapid adopters of NbS. A number of national policy and planning drivers, such as the National Adaptation Plan, Aotearoa New Zealand Biodiversity Strategy, and New Zealand Climate Change Strategy now seek to change this through the prioritising the use of NbS. These NbS policy drivers are further supported by growing nature-related focus from private sector, through initiatives such as linking nature-related risk disclosures with climate-related risk disclosures.

Globally, over the last decade, NbS have gained momentum internationally in research, policy, and practice, with greater recognition of the benefits these approaches can deliver to biodiversity and human wellbeing whilst addressing major societal challenges, particularly climate change (IUCN, 2024). As New Zealand seeks to scale its use of NbS for climate change adaptation, key learnings and examples from global NbS leaders can be applied to increase the pace and value of our work. By examining the current state of NbS nationally and applying international lessons learned, New Zealand can leverage off the growing NbS evidence-base and effectively integrate with an ever more connected international NbS community of practice.

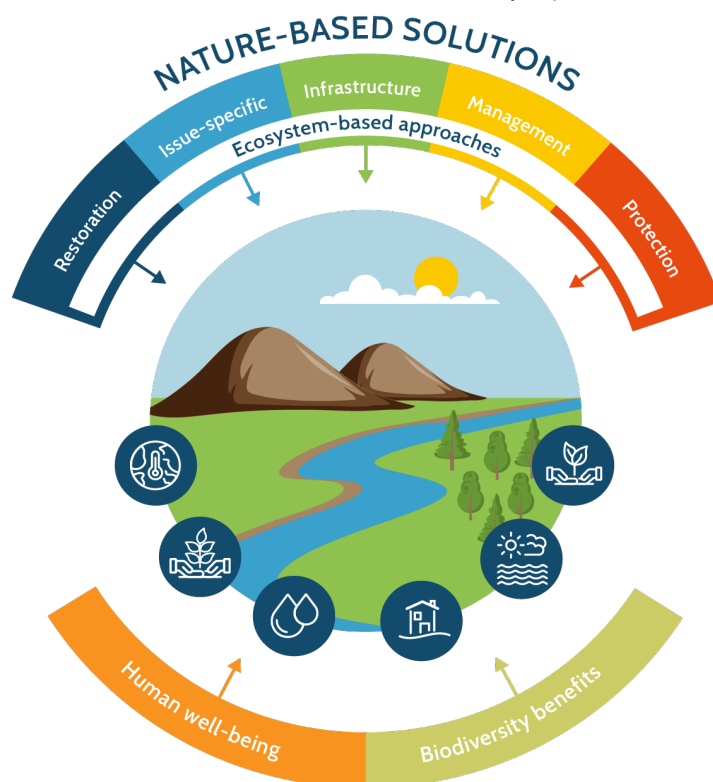


Figure 1: Nature-based Solutions for societal challenges diagram. Source: IUCN, 2020

¹ **Grey infrastructure** refers to engineered structures such as dams, seawalls, or stormwater management pipes and drains.

1.1 PURPOSE OF THE ROADMAP

The purpose of the Roadmap for Scaling Nature-based Solutions for Climate Adaptation in Aotearoa New Zealand is to set out the key actions to equip New Zealand with the information, tools, and resources required to scale the use of NbS.

This report is structured to address the following topics:

- Identify the key roadmap actions required and logical progression of work to scale NbS for climate adaptation use in New Zealand
- Detail the current state of NbS for climate adaptation in New Zealand and internationally, including the common challenge, barriers, and opportunities for implementation
- Define NbS and the strategy for how they can be applied in New Zealand in response to acute climate change risks

NbS present an integrated solution to addressing the societal challenges posed by climate change risks effectively and equitably. In order to successfully increase the use of NbS in New Zealand at the scale and pace required to adapt to climate change risks, strategic direction at a NbS systems level is required nationally.

Acknowledging the current state of NbS progress in New Zealand, this roadmap does not seek to interrupt NbS work already underway or planned. Instead, the roadmap seeks to enable a coordinated and integrated approach, whereby future efforts in NbS research, policy, and advocacy can be focused towards addressing the critical challenges and gaps that commonly hinder NbS.

Importantly, while climate change poses significant cultural, spiritual, economic, and physical risks to iwi, hapū, and Māori, the specific review of mātauranga Māori for NbS is outside the scope of this report. Recognising the governance challenge experienced internationally of NbS potentially infringing on the rights of indigenous people; further research, and development regarding the role of mātauranga Māori should be preceded by appropriate engagement with iwi and hapū concerning advice on how to proceed mātauranga NbS work and data sovereignty.

This roadmap aims to apply the lessons learned by international NbS leaders to fast-track New Zealand's pathway to scaling NbS use for climate change adaptation. New Zealand is able to benefit from utilising existing tools and proven processes by aligning with more established international NbS bodies for shared value, such as the International Union for the Conservation of Nature (IUCN).

Aligning under the four key opportunity objectives of Knowledge, Technical, Policy, and Financing, the roadmap identifies the priority research needs, tool development, policy actions, and engagement required nationally. The roadmap is designed to provide strategic direction to organisations which fund, resource, and undertake NbS research and development. However, action would be enhanced through collaboration across government agencies, sectors, and mana whenua to deliver the greatest impact. Delivery of actions identified in this roadmap are intended to create the system-scale change required for progress towards the greater uptake and use of NbS in New Zealand as illustrated in Figure 2.

Recognising that NbS can be used in response to a number of societal challenges, the scope of the roadmap and report is specifically focused on the use of NbS for adaptation to acute climate change risks.² Although, given the emphasis on co-benefits delivered through NbS, action implementation will likely benefit other societal challenges, including climate change mitigation.



Figure 2: Scaling NbS in New Zealand by creating co-dependant and connected system-scale changes

² **Acute climate change risks** refer to risks that are event-driven, such as increased severity of extreme weather events, rather than long-term shifts in climate patterns, such as sustained mean temperature increase (TCFD, 2017).

1.2 BUILDING THE ROADMAP

The key steps detailed below were taken to develop the Roadmap for Scaling Nature-based Solutions for Climate Adaptation in New Zealand. The development of the roadmap arose from a recognised shared need for greater clarity of the challenges and opportunities for NbS in New Zealand, particularly as the government seeks to grow their use for climate adaptation. NbS are specifically included in the government's Climate Change Strategy and the National Adaptation Plan, and feature in Green Financing conversations as well as a range of New Zealand's international trade agreements.

To inform the roadmap, NbS insights and perspectives were gathered through cross-sector collaboration with NbS practitioners from government agencies, local councils, NGOs, academia, and private organisations. Coupled with findings from an international NbS literature review, New Zealand specific insights were gathered through survey, interviews, and hui. Building on the subsequent findings, Ministry for the Environment team representatives were invited to a series of collaborative workshops to test and refine the priority roadmap actions.



INTERNATIONAL NATURE-BASED SOLUTION REVIEW

To begin the development of the Nature-based Solutions Roadmap, a desktop review was conducted of international NbS programmes. The international NbS review sought to gather evidence of the lessons learned of the common NbS challenges, barriers, and opportunities that other governments, NGOs, and private sector NbS programmes have identified. International evidence reviewed was sourced from the United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), The Nature Conservancy, Nature-based Solutions Initiative (UK), World Business Council for Sustainable Development, Asian Infrastructure Investment Bank, and US Army Corps of Engineers.



NEW ZEALAND NATURE-BASED SOLUTIONS REVIEW

Following the international NbS review, a desktop review was conducted of known existing and planned NbS projects of scale, as well as relevant government programmes in New Zealand to address acute climate-related hazards. The New Zealand NbS review sought to develop a comprehensive inventory of known NbS projects to build a clear understanding of the current state of NbS nationally. This inventory includes identification of the primary climate-related hazard that is being addressed, the location of the work, primary funding sources, and the accountable organisation.



NEW ZEALAND PRACTITIONER SURVEY

A survey of New Zealand NbS project managers, researchers, decision makers and advocates was completed to gather insights and perspectives concerning the current and future barriers, challenges, and opportunities for scaling NbS use nationally. The survey was structured in two parts; the first part focused on practitioner's experiences in the delivery of current and past NbS projects, and the second part focused on practitioner's perspectives on the outlook for NbS in New Zealand, including the key barriers required to be overcome and the priority resources required to improve uptake of NbS.



GAP ANALYSIS

Applying outcomes from the international and New Zealand NbS reviews, along with insights from the NbS practitioners survey, a gap analysis was conducted to identify the critical gaps for scaling NbS use nationally. The gap analysis was divided into four focus areas: knowledge gaps, technical gaps, policy and planning gaps, and financial gaps. The gap analysis outcomes were tested and refined through direct engagement with experienced NbS practitioners across government agencies, local councils, NGOs, and private sector organisations.



ROADMAP ACTION DEVELOPMENT

Roadmap actions were developed with regard to the critical knowledge, technical, policy, and financial gaps identified in the gap analysis. Indicative actions were first drafted following the gap analysis then refined in a collaborative workshop setting with teams from the Ministry for the Environment (MfE). Referencing the known national policy and planning milestones expected in the coming years relevant to NbS, the actions identified have been sequenced into a logical timeframe. This ensures actions delivered in the immediate future align with relevant national policy levers and provide greatest impact for scaling NbS, while setting an enabling environment for future actions.



THE ROADMAP FOR SCALING NATURE-BASED SOLUTIONS

THE ROADMAP FOR SCALING NATURE-BASED SOLUTIONS FOR CLIMATE ADAPTATION IN AOTEAROA NEW ZEALAND

STRATEGIC DIRECTION

VISION

NATURE-BASED SOLUTIONS ARE PRIORITISED AS SOLUTIONS FOR CLIMATE CHANGE ADAPTATION IN AOTEAROA NEW ZEALAND

PURPOSE

Set out the actions required to accelerate and scale the use of Nature-based Solutions in Aotearoa New Zealand for climate change adaptation

STRATEGIC CONTEXT

Aotearoa New Zealand faces acute risks from the interconnected crises of climate change, biodiversity loss and land degradation

The Climate Change Response Act 2002 requires that Aotearoa New Zealand takes action to prepare for, and adapt to, the effects of climate change

National policy and planning frameworks, including New Zealand's Climate Change Strategy specify Nature-based Solutions as a key pillar of a national response

OPPORTUNITY

Nature-based Solutions support Aotearoa New Zealand to effectively adapt to the impacts of climate change, delivering significant benefits for biodiversity, ecosystem services, economic, social, and cultural wellbeing

KEY OBJECTIVES



KNOWLEDGE

Facilitate information development and sharing of NbS through case studies, research, and collaboration across government, iwi, private sector, and community groups



TECHNICAL

Strengthen New Zealand's cross-sector tools and capabilities to build a common understanding and application of NbS



POLICY

Integrate and mainstream a wide range of NbS policy levers and practices in New Zealand's policy frameworks for climate change adaptation



FINANCIAL

Significantly increase investment in NbS use, research, and long-term monitoring through development of public and private financing frameworks and opportunities

OUTCOMES

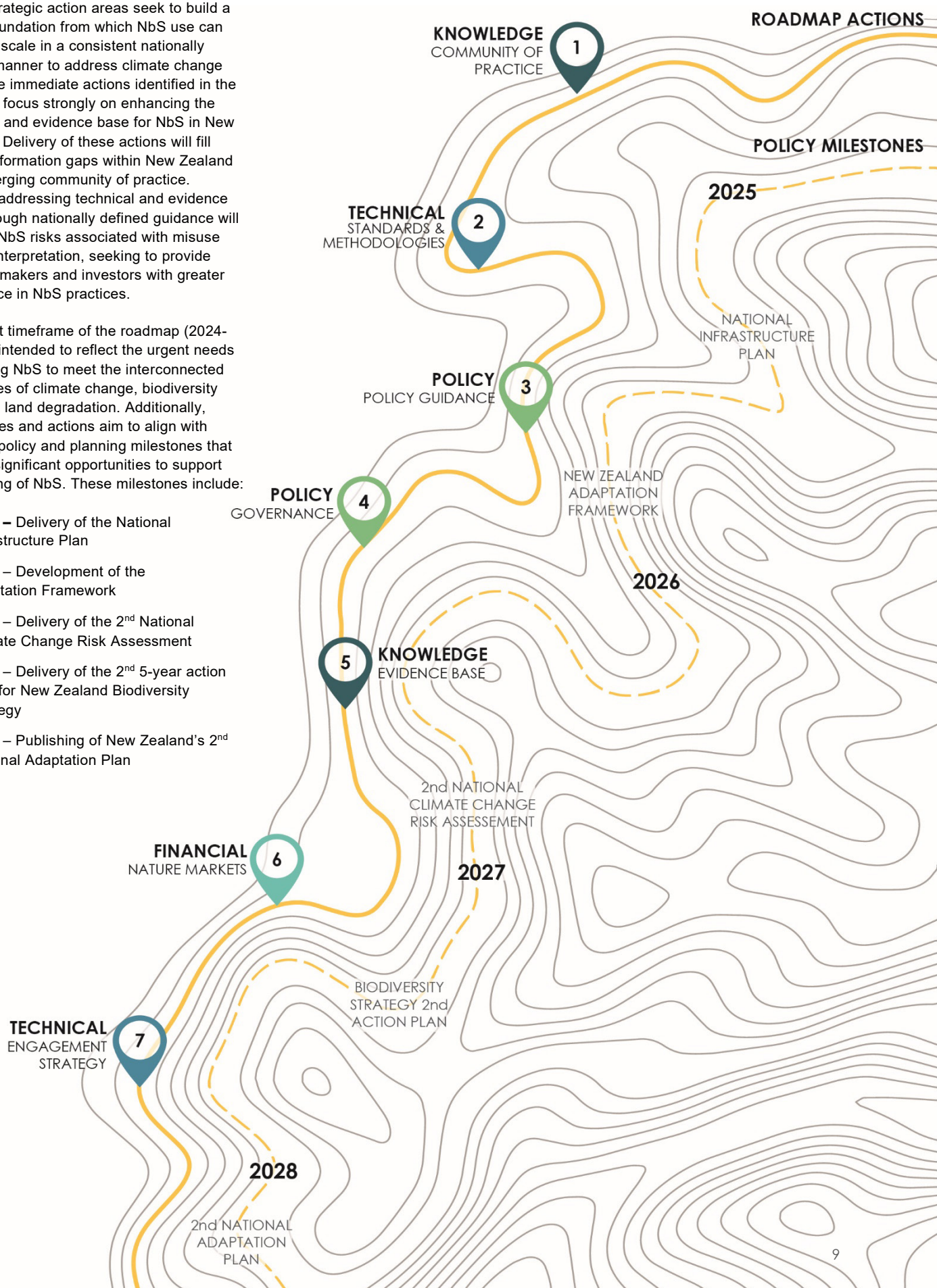
NATURE-BASED SOLUTIONS ARE USED WIDELY TO ADAPT TO THE IMPACTS OF CLIMATE CHANGE AND DELIVER CO-BENEFITS FOR LOCAL COMMUNITIES, ECONOMIES, AND ECOSYSTEMS

2. THE ROADMAP

The Roadmap for Scaling Nature-based Solutions for Climate Change Adaptation in New Zealand sets out seven strategic actions across four opportunity objectives – Knowledge, Technical, Policy, and Financial. These strategic action areas seek to build a robust foundation from which NbS use can continue scale in a consistent nationally aligned manner to address climate change risks. The immediate actions identified in the roadmap focus strongly on enhancing the technical and evidence base for NbS in New Zealand. Delivery of these actions will fill critical information gaps within New Zealand NbS emerging community of practice. Equally, addressing technical and evidence gaps through nationally defined guidance will mitigate NbS risks associated with misuse and misinterpretation, seeking to provide decision makers and investors with greater confidence in NbS practices.

The short timeframe of the roadmap (2024-2028) is intended to reflect the urgent needs for scaling NbS to meet the interconnected challenges of climate change, biodiversity loss, and land degradation. Additionally, timeframes and actions aim to align with relevant policy and planning milestones that provide significant opportunities to support the scaling of NbS. These milestones include:

- **2025** – Delivery of the National Infrastructure Plan
- **2025** – Development of the Adaptation Framework
- **2026** – Delivery of the 2nd National Climate Change Risk Assessment
- **2027** – Delivery of the 2nd 5-year action plan for New Zealand Biodiversity Strategy
- **2028** – Publishing of New Zealand's 2nd National Adaptation Plan



2.1 ROADMAP ACTIONS

Table 1: Roadmap for Scaling Nature-based Solutions in New Zealand recommended actions. Timing stated is indicative only, dependant on the availability of resources and assignment of accountability to a lead agency.

No.	OBJECTIVE	ACTION	DESCRIPTION	TIMING
1	Knowledge	Facilitate the growth of a New Zealand's Nature-based Solutions community of practice	With growth in NbS technical resources, evidence base, case studies, and other supporting information, the development and support of a well-connected national NbS community of practice will provide significant benefits for scaling NbS use in New Zealand. Facilitation of a well-connected national NbS community of practice shall seek to achieve the following tasks: - Ensure that the latest NbS information is readily available from a central 'source of truth' or inventory, and directly provided to NbS practitioners - Facilitate the sharing of NbS learnings across regions and sectors - Encourage more open dialogue and collaboration on NbS initiatives across land tenures, jurisdictions, and sectors to address shared climate change risks - Provide input into developing national NbS system tools (e.g. standards and methodologies) - Enable NbS metric reporting from community and regional level initiatives into a national measurement inventory National conservation and sustainability related NGOs shall be considered in the delivery of this action to ensure NbS community of practice effectively includes participation by the public and private sector.	Ongoing
2	Technical	Develop New Zealand Nature-based Solutions standards & methodologies	Aligning with international definition and criteria for NbS defined by UNEP and IUCN, develop New Zealand Nature-based Solutions standards and methodologies. Standards and methodologies include: - Specify New Zealand's official definition for NbS in alignment with UNEP definition which incorporates mātauranga and Te Ao Māori - Standardise NbS criteria and climate risk mitigation performance indicators for the quantification of NbS performance and co-benefit values, including development of a standard NbS screening and evaluation methodology - Standardise national NbS measurement and reporting metrics across co-benefit values, in alignment to national and international climate change and biodiversity reporting targets and commitments - Provide best practice aligned framework approach for the planning, design, implementation, and monitoring stages of NbS initiatives, aligning with Adaptive Pathway Planning approaches - Information concerning the common establishment and long-term direct and indirect costs of NbS approaches To support the understanding and interpretation of the New Zealand Nature-based Solutions standards and methodologies, well established existing NbS projects shall be applied retrospectively to the framework approach to provide New Zealand specific case study examples.	2025-26
3	Policy	Develop Nature-based Solutions Policy Guidance for Local Government	Building off the 2024 Nature-based Solutions Planning Review (Ira, 2024), identify the critical policy and planning gaps for NbS implementation and develop a Nature-based Solutions Policy Guidance for Local Government. Guidance includes: - Information regarding the national policy alignment of NbS and their role in local climate change adaptation - Identification of the common barriers and limitation for NbS in Local Government policy and planning documents and their implementation - Recommended actions for integrating NbS into Local Government policy and planning documents holistically to prioritise their consideration and enable their delivery clearly through consenting pathways Development of the Policy Guidance shall be conducted in alignment with the Aotearoa New Zealand Adaptation Framework. This will ensure NbS are recognised and provided for within significant local adaptation processes (including managed retreat) and meet Adaptation Framework approaches.	2025-26

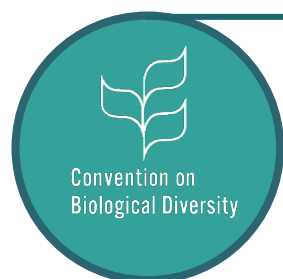
No.	OBJECTIVE	ACTION	DESCRIPTION	TIMING
4	Policy	Establish clear Nature-based Solutions governance practices	Acknowledging that NbS, both for climate change adaptation and other benefits (e.g. climate change mitigation) may often occur at a landscape-scale, spanning a number of public and private land tenures, a transparent governance framework for NbS is required to be established in collaboration with landowners, businesses, iwi and hapū. Referencing the policy and regulatory context relative to NbS use in New Zealand, a NbS governance framework shall seek to achieve the following: - Clearly define how NbS costs and benefits that span different locations, land uses, and vested interests equitably shall be shared - Define how marginalised groups and communities effected shall be engaged throughout NbS development - Define clear decision-making processes and accountabilities for NbS that span different locations, land uses, and vested interests	2025-26
5	Knowledge	Continue to grow New Zealand's Nature-based Solution project experience & evidence base	Acknowledging the current and planned NbS projects underway across New Zealand, including the NbS for flood mitigation feasibility projects, work must continue to build New Zealand's NbS project experience and evidence-base. Future funding prioritised to address key focus areas for NbS research and development shall include: - The role, benefits, and climate change risk mitigation performance of NbS in managed retreat to coastal inundation in New Zealand - How mātauranga Māori has been applied and performed to inform approaches to address climate-related risks using NbS - An assessment of the cost-benefits of NbS initiatives in New Zealand - Development of New Zealand Biodiversity and Conservation Climate Change Scenarios - The role, benefits, and climate change risk mitigation performance of NbS for wildfire reduction and resilience in inland New Zealand - The potential role and benefits for NbS in addressing priority risks identified in the 2nd National Climate Change Risk Assessment 2026 Where appropriate, future NbS projects shall seek to apply the New Zealand Nature-based Solutions standards and methodologies to support a consistent framing of NbS evidence base. Note: Further research and development regarding the role of mātauranga Māori should be preceded by engagement with iwi and hapū concerning advice on how to proceed mātauranga NbS work and data sovereignty.	Ongoing
6	Financial	Grow New Zealand's Nature-based Markets & other sustainable finance mechanisms	To support the development of financial incentives for the use of NbS and grow the private investment potential for NbS in New Zealand, continue efforts to build greater recognition and trust in the relevant nature-based markets for ecosystem services in New Zealand. Acknowledging the current work that is underway to enhance the application of the New Zealand ETS for afforestation, assess the feasibility of other novel carbon removals, and explore a biodiversity credits system; efforts shall continue to progress these initiatives. Additionally, opportunities for additional domestic and international sustainable finance mechanisms that accelerate and scale positive outcomes for nature must be explored to support NbS development. These mechanisms include green bonds and TNFD/TCFD action funds.	2026-28
7	Technical	Develop & implement a Nature-based Solutions engagement & capability building strategy	To ensure that a unified understanding of NbS in New Zealand is advanced and NbS technical information and evidence is communicated consistently across government agencies, regions, and sectors; develop and implement a Nature-based Solutions engagement and capability building strategy. An engagement and capability building strategy shall include: - Communication of New Zealand's official definition for NbS, incorporating mātauranga and Te Ao Māori considerations - Socialising the development of NbS technical and policy resources with decision makers, practitioners, and stakeholders - Targeted engagement and collaboration with existing international and national NbS communities of practice and NGO partners - Integrate NbS engagement opportunities with other engagement and capability building initiatives relevant to NbS, including for climate change mitigation - Facilitation of NbS cross-sector education workshops and/or webinars to grow the national understanding of NbS.	Ongoing

**THE ROADMAP
INSIGHTS &
EVIDENCE:
CHALLENGES,
OPPORTUNITIES
& ACTIONS**

3. EMERGENCE OF NATURE-BASED SOLUTIONS

Over the past decade, NbS have gained momentum internationally in research, policy, and practice, with greater recognition of the benefits these approaches can deliver to biodiversity and human wellbeing whilst addressing major societal challenges, particularly climate change risks. NbS have become prominent through inclusion in the Ramsar Convention, UNFCCC, UNCCD (through COP 28), and the Convention on Biological Diversity – in particular the inclusion of two NbS targets in the Kunming – Montreal Global Biodiversity Framework (IUCN, 2024)

Nationally, NbS for climate change adaptation have become visible through inclusion as goals within Te Mana o Te Taiao - Aotearoa New Zealand Biodiversity Strategy 2020 and actions within New Zealand's first National Adaptation Plan. The emerging reference and use of NbS has also been supported through the recent development of climate-aligned nature-based frameworks like Taskforce for Nature-related Financial Disclosures (TNFD) and Science Based Targets for Nature (SBTN). These frameworks offer structured methods for organisations to assess risks and dependencies to nature and identify nature-based actions to address challenges.



KUNMING-MONTREAL GLOBAL BIODIVERSITY FRAMEWORK 2022

TARGET 8: Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity.

TARGET 11: Restore, maintain, and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination, and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.



AOTEAROA NEW ZEALAND CLIMATE CHANGE STRATEGY & PLANS

THE GOVERNMENT'S CLIMATE CHANGE STRATEGY 2024: Nature-based solutions address climate change – Restoring biodiversity, while investigating new ways of harnessing nature to remove emissions from the atmosphere.

AOTEAROA NEW ZEALAND'S FIRST NATIONAL ADAPTATION PLAN 2022:

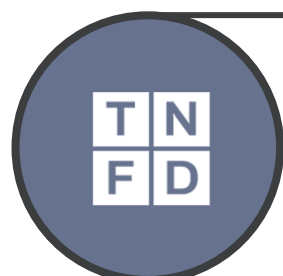
- Action 5.9 – Prioritise nature-based solutions
- Action 5.16 – Identify options to increase the integration of nature-based solutions into urban form
- Action 8.7 – Embed nature-based solutions as part of the response to reducing transport emissions and improving climate adaptation and biodiversity outcomes



TE MANA O TE TAI AO | AOTEAROA NEW ZEALAND BIODIVERSITY STRATEGY 2020

OBJECTIVE 13: Biodiversity provides nature-based solutions to climate change and is resilient to its effects.

- 2025 Goal – The potential for indigenous nature-based solutions is understood and being incorporated into planning.
- 2030 Goal – The restoration of indigenous ecosystems is increasingly being used to improve resilience to the effects of climate change, including coastal protection against rising sea levels



THE TASKFORCE ON NATURE-RELATED FINANCIAL DISCLOSURES

The Taskforce on Nature-related Financial Disclosure has developed a set of disclosure recommendations and guidance that encourage and enable business and finance to assess, report and act on their nature-related dependencies, impacts, risks, and opportunities. The framework is aligned with the goals and targets of the Kunming-Montreal Global Biodiversity Framework.



SCIENCE-BASED TARGETS FOR NATURE

Science-based targets for nature are measurable, actionable, and time-bound objectives, based on the best available science, that allow an organisation to align with ecological limits and address the key drivers of nature loss. By building science-based targets into business strategies, an organisation will help secure a healthy, resilient, and equitable world, and drive long-term resilience for their business.

Figure 3: Notable inclusion on nature-based solutions targets and actions within international and national climate change and nature-related frameworks.

4. NATURE-BASED SOLUTIONS INTERNATIONALLY

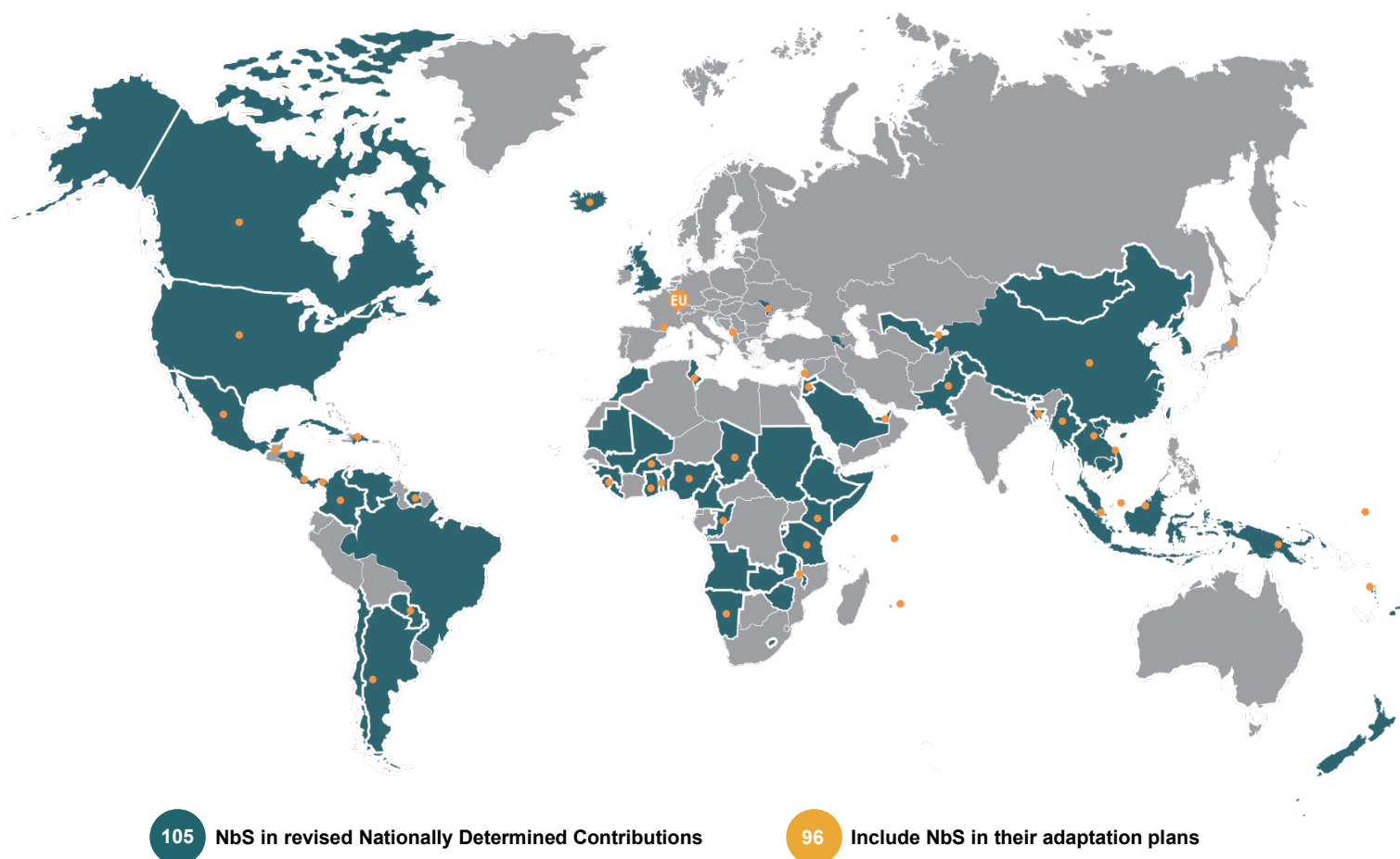


Figure 4: Inclusion of NbS-related ambitions in new and revised Nationally Determined Contributions (green). Image adapted from Nature-based Solutions Policy Platform (2024)

As leading international NbS communities of practice continue to grow off the back of early adoption of NbS practices in other countries, there is now a wealth of information available regarding the key challenges, barriers, and opportunities for scaling NbS use. Internationally, the information and lessons learned for NbS is increasingly influencing how nations adapt their climate change responses under the Paris Agreement. As illustrated in Figure 4, the role of NbS in climate change continues to grow, with 84% of revised Nationally Determined Contribution (NDC) policies under the Paris Agreement now committed to restoring or protecting ecosystems or implementing solutions such as nature-based agriculture.

With longstanding experience delivering world-leading ecosystem conservation and restoration, and an economy strongly dependant on a resilient natural environment, New Zealand can apply and leverage off international NbS lessons learned. By aligning with emerging best-practices for NbS while tailoring our approach to fit our unique physical and cultural environment, New Zealand's roadmap to scale NbS use for climate adaptation can be delivered more efficiently and effectively – avoiding common challenges experience in NbS development and targeting critical opportunities to support systems level change.

To inform the development of New Zealand's NbS roadmap, an international review of NbS leaders and early-adopter governments, international bodies, and NGOs was conducted in 2024 to identify the barriers and challenges experienced during the introduction and scaling of NbS use.

Literature was reviewed from sources including:

- The Nature Conservancy
- United Nations Environment Program
- The Nature-based Solutions Initiative (Oxford)
- The World Business Council for Sustainable Development
- International Union for the Conservation of Nature (IUCN)
- Asian Infrastructure Investment Bank
- The US Army Corps of Engineers

5. NATURE-BASED SOLUTIONS IN NEW ZEALAND

Whilst the international NbS leaders and early-adopters that were reviewed, operate in a wide diversity of political, financial, and physical environments and are seeking to apply NbS in response to significantly different climate change risks; four fundamental key challenges and opportunities for scaling NbS were consistently identified. These four key challenges and opportunities were categorised under the key opportunity objective headings of Knowledge, Technical, Policy, and Financial to inform the New Zealand NbS Roadmap.

To support the insights gathered through the international NbS literature review, a survey of New Zealand NbS project managers, researchers, decision makers and advocates was completed in 2024. While NbS for climate change adaptation is a comparatively new concept in New Zealand risk management approach, central government NbS funding initiatives through recovery and resilience budget announcements in recent years has enabled a number of NbS research and development projects to begin implementation, as illustrated in Figure 5, 6, and 7.

Additionally, as central and local government agencies seek to align with relevant NbS actions within key national strategies and action plans, NbS actions have been increasingly incorporated within numerous local government climate change and biodiversity plans.

Engaging with the known NbS project managers, researchers, decision makers, and advocates connected to the various New Zealand NbS projects and strategies, the New Zealand survey sought to gather insights and perspectives concerning the current and future barriers, challenges, and opportunities for scaling NbS use for climate change adaptation nationally. Given the recent destructive extreme weather events experienced in New Zealand, namely Cyclone Gabrielle (February 2023), the Auckland Anniversary Floods (January 2023), and Westport flooding (July 2021), survey respondent NbS experience and insights NbS projects were primarily related to NbS for flood hazard mitigation.

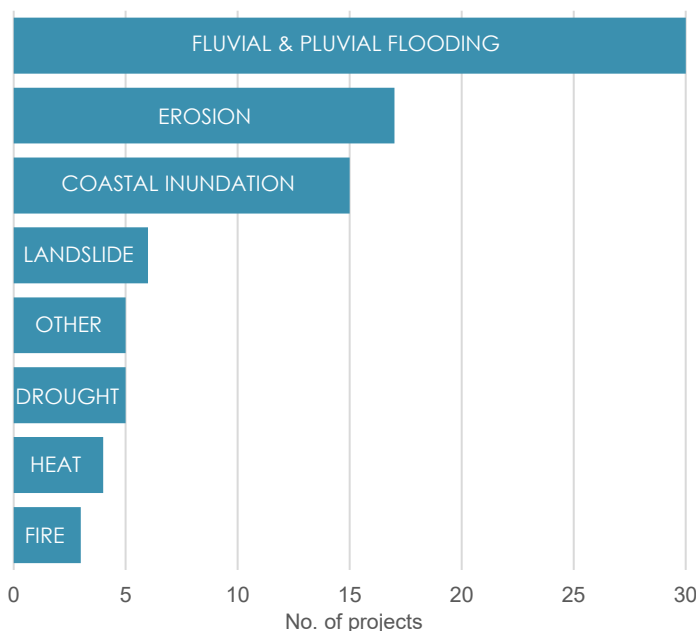


Figure 5: Climate change risk that is addressed in NbS projects in New Zealand

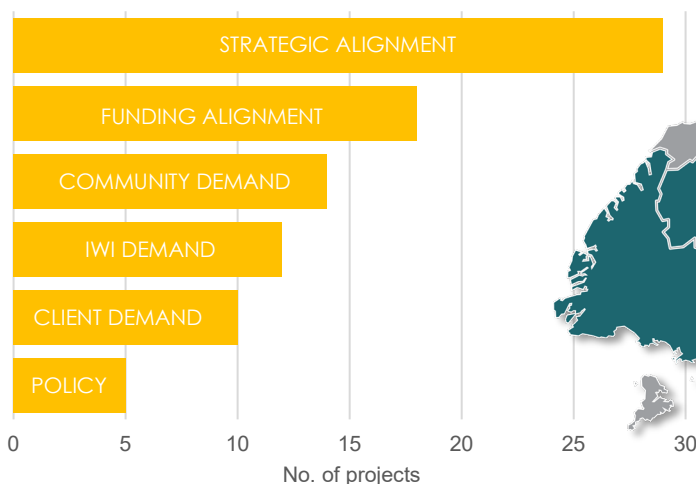


Figure 6: Primary driver for the initiation of NbS projects in New Zealand

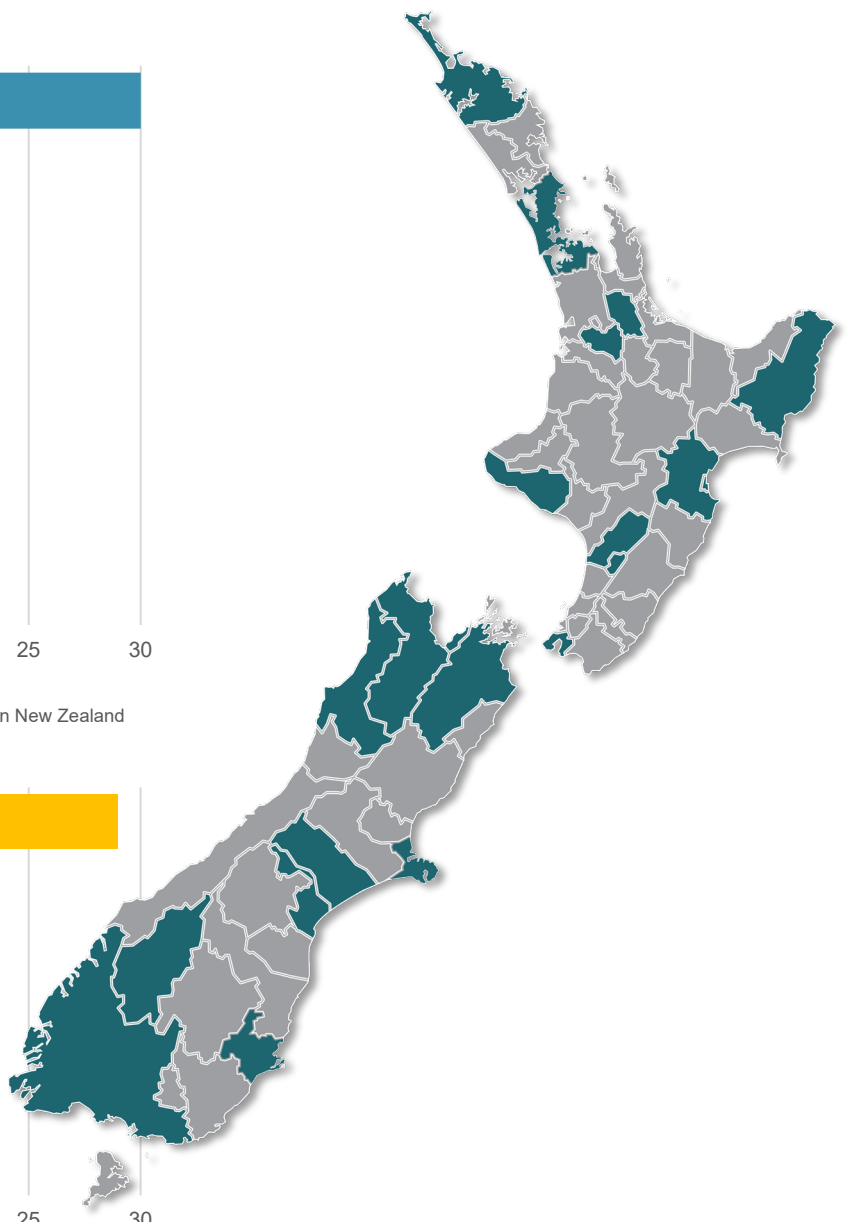


Figure 7: National coverage of the known current and planned local NbS projects (green), based on New Zealand NbS review findings and national survey insights

5.1 KNOWLEDGE CHALLENGES & OPPORTUNITIES



5.1.1 INTERNATIONAL KNOWLEDGE CHALLENGES

As a comparatively new term which acts as an umbrella term for a number of existing initiatives, such as ecosystem-based adaptation and green infrastructure, NbS can often be misinterpreted and misused by decision maker and stakeholders (UNEP, 2022).

With 'nature' being a subjective term, based on location, culture, and sector, some interventions may be labelled NbS but not meet the requirements for providing co-benefits. One of the common misconceptions is that actions designed exclusively for climate change mitigation, such as monoculture forest plantations, are considered as NbS. While NbS may consist of both natural and modified ecosystems, these actions, which reduce overall natural ecosystem integrity, as well as social wellbeing, do not meet the NbS definition provided by the UNEA 5/5 Resolution, nor the criteria of IUCN's Global Standard for NbS (IUCN, 2020).

Oversimplification of NbS interventions or avoiding analysis of their co-benefits and trade-offs can lead to emergence of poor practices that can put at risk the environmental integrity and sustainability of NbS. Whilst seemingly trivial, developing a clear understanding of the definition and effective use of high-quality NbS can mitigate risks associated with maladaptation to climate-related risks and using NbS in greenwashing.

5.1.2 NEW ZEALAND KNOWLEDGE CHALLENGES

As illustrated in Figure 8 and Figure 9, the average to poor understanding of NbS in New Zealand, particularly within core funding agencies, validates the key international knowledge challenge that NbS can be misinterpreted and misused due to significant knowledge gaps of their definition and application.

Although 44% of respondents do currently apply a specific NbS definition in their work, these definitions varied between UNEA/IUCN, European Union (EU), Water Sensitive Urban Design (WSUD), and hybrid definitions. This illustrates a clear lack of consistent NbS understanding across regions and sectors. This variety in understanding of NbS is primarily due to the fact the initial integration of NbS in key national planning documents – the Aotearoa New Zealand Biodiversity Strategy, the National Adaptation Plan, and Emissions Reduction Plan – were sourced from different international bodies. Accordingly, in the absence of national guidance on NbS, there is a general lack of coherent understanding of NbS across agencies, sectors, and regions.

Often referred to as 'green infrastructure', NbS are an umbrella concept which can encompass other more specific approaches that seek to use the natural environment and ecosystem services to address challenges, such as Water Sensitive Urban Design and Low Impact Design. Whilst providing a base of strong pre-existing experience for NbS users in New Zealand, these approaches are specific to addressing a certain risk type (e.g. WSUD for stormwater management). Whereas a clear understanding of NbS more broadly is required to ensure their potential use is not excluded for use to address other acute risks, such as wildfire.

As New Zealand seeks to design and implement a range of NbS as an adaptation to climate change risks, this misunderstanding and misuse has continued to emerge in debate as to what constitutes as a NbS. For example, debate whether intervention such as planting exotic willow species along river corridors for flood mitigation, construction of sediment traps within exotic plantation forestry areas, or grazing of grassland areas to reduce fire fuel loads qualify as a NbS for climate change adaptation

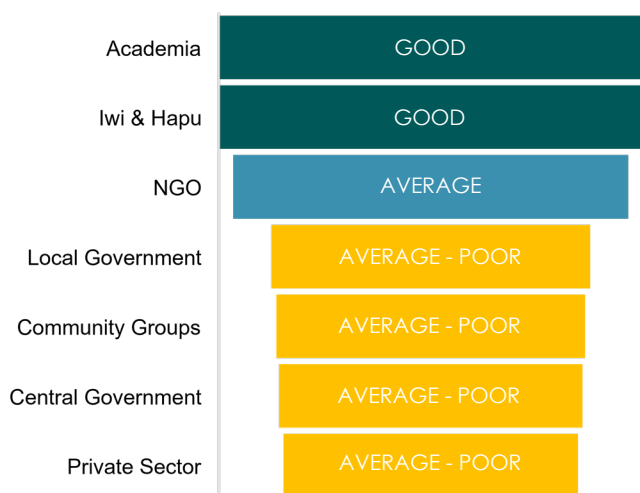


Figure 8: New Zealand NbS practitioners' perspectives of how well NbS are understood in New Zealand.

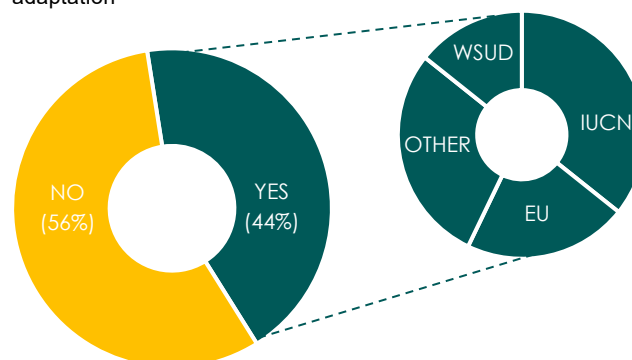


Figure 9: New Zealand NbS practitioner response to the question 'Do you use a specific definition or criteria for NbS to inform your decision making'

5.1.3 KNOWLEDGE OPPORTUNITIES & ACTIONS

To address knowledge challenges facing NbS use for climate change adaptation in New Zealand, where they can be commonly misused and misinterpreted, roadmap actions that facilitate the greater sharing of information across different government agencies, regions, sectors, and communities are recommended.

With NbS actions and objectives increasingly being included within local and central climate change and biodiversity strategies, work must continue to grow New Zealand's general project experience and research across multiple climate change risks and other areas relevant to NbS performance. While international NbS research and case studies may help grow NbS knowledge, New Zealand specific projects and research will continue to provide the greatest benefits. New Zealand specific NbS examples reflect how NbS may operate alongside Te Ao Māori considerations, our unique biodiversity, and regulatory framework, providing more relevant and applicable learnings for potential users.

In growing New Zealand's NbS project experience and evidence base, feedback from NbS practitioners in the recent survey highlighted several research priorities that are thought to provide significant benefits. These priorities include understanding the opportunities for mātauranga Māori in NbS, understanding the financial viability/cost-benefits of NbS so they can be considered within a business case, and how NbS may be applied in urban coastal inundation and managed retreat scenarios.

Additionally, as the body of evidence of New Zealand specific NbS research, projects, and learnings continues to grow, relevant NbS information must be accessible to potential NbS funders, practitioners, and decision makers. At present, NbS research and practice is split amongst a diverse range of practitioners in New Zealand including government agencies, councils, academic institutions, iwi and hapū, community groups, private sector organisations, and individual private landholders. As NbS use continues to scale, action is recommended to connect potential NbS users across both the public and private sector with up to date and relevant NbS information to develop a culture of continual improvement for NbS in New Zealand.

A variety of approaches can be applied to achieve the intended outcomes of growing New Zealand's NbS community of practice, including development of online information platforms and facilitating cross-sector collaborations on NbS initiatives. Currently across New Zealand there are a number of sector groups established focused on sharing biodiversity-related information and learnings, such as the MfE facilitated 'Biodiversity Community of Practice' or the practitioner-led 'Aotearoa Society of Adaptation Professionals'. Whilst beneficial for sharing information across those agencies involved, these groups can often become siloed, causing disconnection of relevant work that is occurring across central government, local government, community, and the private sector. To develop and grow a well-connected national NbS community of practice that spans both public and private sectors effectively, NGOs may have an important role in the delivery of this action to help remove any commercial or political bias that may affect information sharing and collaboration.



NBS KNOWLEDGE CASE STUDY: ENACT PARTNERSHIP

ENHANCING NATURE-BASED SOLUTIONS FOR AN ACCELERATED CLIMATE TRANSITION

While the potential of NbS in response to climate related challenges is widely recognised, global efforts across governments and sectors have historically been uncoordinated and siloed. With the vision of addressing the common challenges facing NbS globally, the ENACT Partnership was launched at the 27th United Nations Climate Change Conference (COP27 November 2022).

The ENACT Partnership, developed in collaboration with the Government of Germany and IUCN, builds a global partnership of government and non-government actors to accelerate collective global action to address the interconnected crises of climate change, land and ecosystem degradation, and biodiversity loss through NbS. It does so by creating a centralised community of practice for government and non-government actors working on NbS to collaborate and build support for NbS through a collective voice for evidence-based policy on NbS.

Since its launch, ENACT has sought to act as an enabler and accelerator of progress for scaling NbS use. Spanning both international climate change and biodiversity bodies, the ENACT Partnership provides the strategic approach other emerging national NbS communities of practice should seek to align with.

ENACT PARTNERSHIP 2030 NBS GOALS

CLIMATE CHANGE ADAPTATION

Enhanced protection and resilience of at least 1 billion vulnerable people

ENHANCING BIODIVERSITY

Up to 2.4 billion hectares of ecosystems and their integrity secured through the protection of 45 million ha, sustainable management of 2 billion ha, and restoration of 350 million ha

CLIMATE CHANGE MITIGATION

Significant increased global mitigation efforts through protecting, conserving, and restoring carbon-rich terrestrial, freshwater, coastal, and marine ecosystems

ENACT ROADMAP ACTIONS 2024

The inaugural 'State of ENACT NbS goals report: Year one roadmap' was launched at the sixth session of the United Nations Environment Assembly. The ENACT Roadmap Report 2024 outlines three key messages and initial actions required for assuring progress toward the ENACT Partnership vision and 2030 NbS Goals.

Integrate actions on climate change, biodiversity loss and land degradation to support human well-being through:

- Supporting a whole of government approach that mainstream NbS
- Supporting the development of globally agreed standardised indicators and tools for tracking integrated progress on global targets for nature and people through NbS
- Supporting coherence and accessibility of NbS monitoring data at a global scale, ensuring that methodologies encourage an integrated approach.

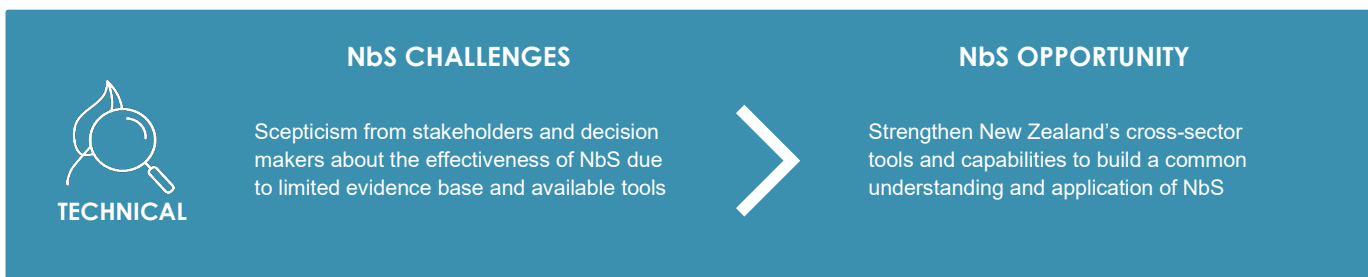
Enhance the design of funding and investment to support an integrated approach to climate change, biodiversity loss and land degradation through:

- Ensuring that NbS has priority allocation in the mobilisation of concessional finance towards the USD 100 billion goal to support developing countries in their climate objectives through to 2025
- Increasing and enhancing the impact of bilateral and multilateral funding mechanisms in support of an integrated approach
- Investing in enhancing a joint understanding of the benefits of NbS to support confidence among practitioners and decision makers in implementation across the sustainable development field.

Ensure Inclusive decision-making on all policy processes, investment decisions and implementation design related to NbS through:

- Prioritising the increase of gender-responsive funding aimed at and accessible to women and girls, as well as funding for Indigenous peoples-led work
- Increasing the capacity to communicate good practices on gender-responsive and Indigenous peoples-led planning and budgeting in NbS

5.2 TECHNICAL CHALLENGES & OPPORTUNITES



5.2.1 INTERNATIONAL TECHNICAL CHALLENGES

While the technical evidence base of NbS research, policy, and practice is continuing to grow rapidly, particularly for adaptation to climate change risks; significant scepticism remains from decision-makers and stakeholders concerning their costs and effectiveness in comparison to traditional risk mitigations.

As NbS are often difficult to quantify and value, sometimes with long time lags between implementation and benefit realisation, key evidence gaps are particularly prevalent in the monitoring and reporting of NbS intervention impacts. Failing to conduct monitoring and reporting of NbS intervention impacts over the long-term continues to exacerbate scepticisms of NbS effectiveness. A key example of this relates to the cost-effectiveness of NbS, where they are often advocated as more cost-effective compared to traditional risk mitigation measures (i.e. grey infrastructure) – however, with often higher upfront costs to establish NbS, without long-term monitoring and reporting, the wider cost benefits of NbS may not be realised. Accordingly, as scepticism of the suitability of NbS remains they are often not considered in decision making. With the increasing urgency to effectively respond to climate change risks such as coastal inundation and flooding to protect assets and livelihoods, a robust NbS evidence base is required to be comparable to traditional 'grey' infrastructure interventions.

Exacerbating the challenges in overcoming scepticism of NbS is access to centralised inventories of NbS tools and evidence applicable to the societal challenge being addressed or the operating environment within which the work is occurring. Although there are likely an abundance of longstanding NbS-related tools and practices held within environmental and restoration focused organisations, these may often be siloed within an organisation and not widely shared.

5.2.2 NEW ZEALAND TECHNICAL CHALLENGES

With NbS generally emerging as a concept in New Zealand strategies and plans in earnest only since 2020, there are significant gaps in accessible NbS technical information and evidence as shown in Figure 10. Gaps include lack of agreed national standards and methodologies for designing and applying NbS in New Zealand, and limited NbS monitoring and reporting data to provide evidence of their risk mitigation performance across different hazard types.

These technical challenges experienced in New Zealand align with the challenges experienced internationally, where the limited tools and evidence base for NbS drives scepticism from stakeholders and decision makers about their costs and effectiveness. Anecdotal evidence from surveyed NbS practitioners of the key barriers or challenges they have experienced in NbS projects commonly referred to challenges in gaining 'buy-in' from outside of the project team and gaining acceptance from stakeholders compared with engineering solutions.

While there are currently numerous NbS projects underway nationally that are contributing to growing the NbS evidence base and actively developing innovative tools and approaches, there remains critical gaps in the availability of technical tools specific to the New Zealand context that would promote the scaling of NbS use. These include:

- National NbS design standards to ensure high-quality NbS are being considered
- Common NbS evaluation criteria and methodologies to measure net value across hazard mitigation capacity and co-benefits
- Consistent reporting metrics and communication tools

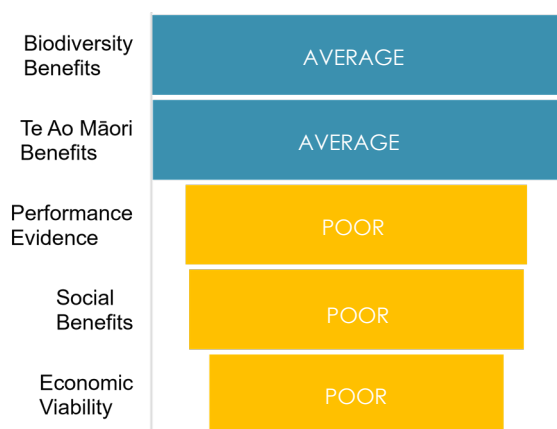


Figure 10: New Zealand NbS practitioner response to the question 'How available is the following technical information for NbS in New Zealand?'



Figure 11: New Zealand NbS practitioner perspectives of the biggest challenges faced for scaling NbS in New Zealand

5.2.3 TECHNICAL OPPORTUNITIES & ACTIONS

To strengthen New Zealand's cross-sector engagement to build a common understanding and application of NbS, actions are recommended to develop robust technical resources and an engagement strategy. These actions are recommended to address the common scepticism that is felt by stakeholders and decision makers about the quality and effectiveness of NbS for climate change adaptation.

The absence of any New Zealand technical standards or methodologies for NbS was frequently highlighted by NbS practitioners in the recent survey as a fundamental challenge for scaling NbS use. The recommended development of New Zealand specific NbS standards and methodologies would provide NbS users with clarity for defining what is a NbS, what performance criteria it should seek to achieve, and how to effectively design and measure performance of NbS for climate adaptation. This technical base is expected to reduce the perceived or unknown risks of using NbS in climate change adaptation, both from a hazard mitigation perspective and liability perspective.

In development of New Zealand NbS standards and methodologies, it is recommended that NbS planning, design, implementation, and monitoring processes align with Adaptive Pathway Planning approaches for climate change adaptation (MfE, 2024). Since they're emergence, Adaptive Pathway Planning approaches have become widely recognized and offer practical approaches to inform adaptation processes across central and local government. With a core challenge of climate change adaptation being the deep uncertainty of how projected climate changes may impact and interact with the natural environment and existing pressures (e.g., invasive pest species), Adaptive Pathway Planning principles of including early warning signals, triggers, and thresholds can be well applied to NbS project to avoid unintended perverse effects or maladaptation.

Supporting New Zealand NbS standards and methodologies, a NbS engagement and capability building strategy is recommended. An engagement and capability building strategy would ensure that a unified understanding of NbS is developed and NbS technical information is communicated consistently across different government agencies, regions, sectors, and communities. Findings based on strong stakeholder analysis found, without a dedicated approach to communication and engagement for NbS, the potential impact of NbS roadmap actions to grow the knowledge and technical base will be limited, relying on the organic spread of information rather than clear, consistent messaging and targeted engagement. With poor understanding or NbS and scepticism of their effectiveness being a fundamental barrier to NbS use in New Zealand and abroad, a delivery of an engagement and capability building strategy is viewed as an important action to scale NbS use.



TECHNICAL CASE STUDY: A DECADE OF DAPP IN NEW ZEALAND

DYNAMIC ADAPTIVE PLANNING PATHWAY USE IN NEW ZEALAND

2023 marked 10-years since Dynamic Adaptive Pathway Planning (DAPP) approaches for addressing climate-related risks was introduced in Aotearoa New Zealand. Building on the collaboration between Deltares, The Netherlands, and the Climate Change Research Institute at Te Herenga Waka Victoria University of New Zealand, with support from the Deep South Science Challenge, the Resilience to Nature's Challenges Science Challenge and Ministry for the Environment, the first DAPP public technical guidance was published in 2017. This was since been updated in 2024.

Originally used for flood risks in coastal settings, the DAPP approach, decision-making principles, and tools, are now being used widely across New Zealand to address a diversity of climate-related risks. Applying the common processes and terminology found in the technical guidance, DAPP approaches have been integrated into numerous local government planning processes. Accordingly, the knowledge and evidence base of DAPP processes in New Zealand have grown considerably in the past decade.

With the uptake of DAPP in New Zealand going through several stages since its introduction in 2013, learnings over the past decade have indicated that institutional and technical barriers can impede uptake. Similar to the technical barriers identified for scaling NbS use in New Zealand, two key technical barriers were identified in the initial uptake stage of DAPP for which, successful strategies to overcome these have emerged. These key technical barriers and strategies to overcome them summarised as follows.

KEY TECHNICAL BARRIERS:

- Lack of knowledge about DAPP and its application as an analytical approach that can encompass engagement processes
- Lack of capability to adopt new tools.

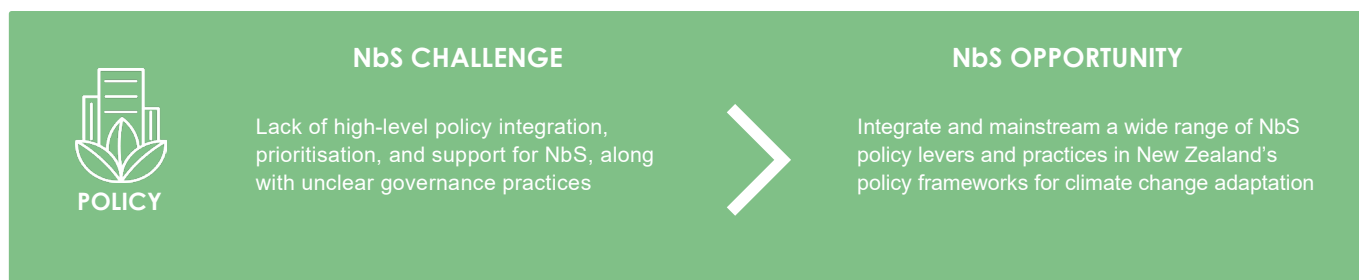
STRATEGIES TO OVERCOME BARRIERS:

- Mandate long-term strategy champions within organisations
- Ensure roles and responsibilities are shared equitably among all stakeholders to facilitate long-term buy-in
- Appoint 'knowledge brokers' to facilitate a common understanding of process and its components



Figure 12: Dynamic Adaptive Pathway Planning process wheel

5.3 POLICY CHALLENGES & OPPORTUNITIES



5.3.1 INTERNATIONAL POLICY CHALLENGES

Whilst NbS have gained momentum in international climate and biodiversity strategies and frameworks, particularly under the UNFCCC and Convention on Biological Diversity, and have been integrated as actions in national action plans and targets, they remain underrepresented in enabling policy. Additionally, poor or unclear governance practices around NbS have led to indigenous people, local communities, and other stakeholders rising concerns around the security of land tenure rights, access and use of natural resources, and ownership of NbS benefits – particularly when commoditised.

Connected to the challenge of limited enabling policy and clear governance practices, is that the way in which NbS initiatives are implemented can affect the flow of ecosystem services, including situations where the physical NbS trade-off (e.g., retirement of agricultural land for afforestation) occurs in upper catchment areas, whilst the benefits they deliver (e.g., moderating water yield, reducing contamination) may be realised in the lower catchment. Poor governance practices in such NbS initiatives can lead to inequitable distribution of costs and benefits between locations (e.g., upper catchment and lower catchment communities) and interests (e.g., private and public interests).

In accordance with both the IUCN Global Standard for NbS and the UNEA 5/5 Resolution definition, NbS governance practices must ensure that NbS planning and implementation processes explicitly address the rights of indigenous people, local communities, landholders, and other stakeholders.

5.3.2 NEW ZEALAND POLICY CHALLENGES

While NbS (or relevant concepts such as Water Sensitive Urban Design or Green Infrastructure) are included in key climate change and biodiversity planning documents and are provided for in some areas of government policy (i.e., National Policy Statement for Indigenous Biodiversity, National Policy Statement for Freshwater Management, and New Zealand Coastal Policy Statement), overall integration, prioritisation, and support for NbS is lacking. This national state mirrors the common challenge experienced internationally of a lack of high-level policy support for NbS.

A recent evaluation of Aotearoa New Zealand local government policy-planning documents found that, whilst many plans include a number of NbS-related implementation tools, these approaches are fragmented and do not enable a holistic approach for NbS use (Ira, 2024). Evident in the local policy-planning evaluation was that a lack of strong or prescriptive rules for NbS use in regional and district plans often prevented NbS objectives or policies being implemented. This provides decision-makers with room to negotiate around using NbS, particularly where the lack of evidence and clear understanding of NbS supports retention of status quo hazard mitigations.

Accordingly, the scaling of NbS use currently lacks high-level policy support in New Zealand. While high-level NbS-related objectives and actions are referenced, current policy and planning levers lack the means of effectively prioritising NbS. Recognising the knowledge and technical challenges facing NbS use in New Zealand, to overcome policy challenges effectively, first there must be national coherence of a NbS definition and standards.



Figure 13: New Zealand NbS practitioner perspectives of the policy related challenges faced for scaling NbS in New Zealand

5.3.3 POLICY OPPORTUNITIES & ACTIONS

To address the fragmented integration, prioritization, and underrepresentation of support for NbS in Aotearoa New Zealand policy and planning documents, action is recommended to develop NbS Policy Guidance for Local Government and establish clear NbS governance practices. This action seeks to enable a more holistic integration of NbS within policy and mainstream equitable NbS use through policy and planning levers.

When planning for NbS use, clarity in the consenting process and policy alignment was commonly identified by NbS practitioners as a challenge to scaling NbS. Although it is acknowledged that NbS-related policies and objectives are contained within a variety of policy and planning frameworks, these are often fragments and lack prescriptive rules or outcomes to drive NbS use. Building on the recent evaluation of New Zealand local government policy-planning documents, NbS Policy Guidance for Local Government is recommended to enhance the use of existing planning levers for NbS use. Furthermore, Policy Guidance would provide greater understanding of the policy alignment (and gaps) for NbS in New Zealand, and their common consenting considerations and pathways for users.

Additionally, establishing clear NbS governance practices where NbS interventions cross multiple land uses and vested interests will support the use of NbS in New Zealand equitably. To adequately adapt to many climate change risks, NbS must be implemented at a landscape-scale to be successful. As such, equitable governance practices must be established at the initiation of a project to clearly define how NbS costs and benefits will be shared, how marginalised groups will be engaged with, and how decisions will be made on shared outcomes.

While specific NbS policy may be considered in the long-term to fast-track or streamline NbS planning processes and implementation practices, in the near-term, the integration of NbS use in the developing 'Adaptation Framework' for New Zealand may provide significant opportunities to scale NbS use. As the framework intends to inform how New Zealand will plan for, implement, and share the costs of adapting to climate-related risks, effective integration of NbS within this framework may help provide the ability and incentive for at risk individuals, communities, and councils to apply NbS to address climate-related risks. Should the opportunity be provided to integrate NbS within the Adaptation Framework, enhancing NbS through Local Government policies and planning levers as recommended, would be very beneficial.



POLICY CASE STUDY: NATURE-BASED SOLUTIONS AT SCALE

HOW NATURE-BASED SOLUTIONS OPERATE ACROSS A LANDSCAPE

With New Zealand projected to experience increased frequency and intensity of extreme rainfall events, flood-related climate change risks present some of the most significant risks to people, property, and communities across the country.

While floods are fundamentally driven by meteorological processes, it is the interaction between a number of exposure and vulnerability factors that determines whether the extreme rainfall event results in a flood. Human induced changes in land-use, land coverage, and catchment characteristics (e.g., channelising rivers and streams, draining wetland areas, paving permeable surfaces) often drive the increase of flood risk within a catchment. Accordingly, NbS to address flood risks often need to be considered at a catchment scale, across multiple land tenures to sufficiently mitigate the risks.

As illustrated in Figure 14 below, NbS work to influence the natural processes across a catchment to accommodate and redistribute water overtime and space – changing how extreme rainfall is received by the environment and moves across the landscape. By changing these aspects, NbS can effectively manage flood risks in ways that matter to vulnerable people, assets, communities, or ecosystems.

While feasible NbS are often 'consentable' under existing regulatory requirements, significant preparation and planning is required at the initiation of a NbS project to ensure interventions are compliant with the numerous regulatory requirements across a catchment, and local stakeholders are actively engaged in processes that will affect their community.

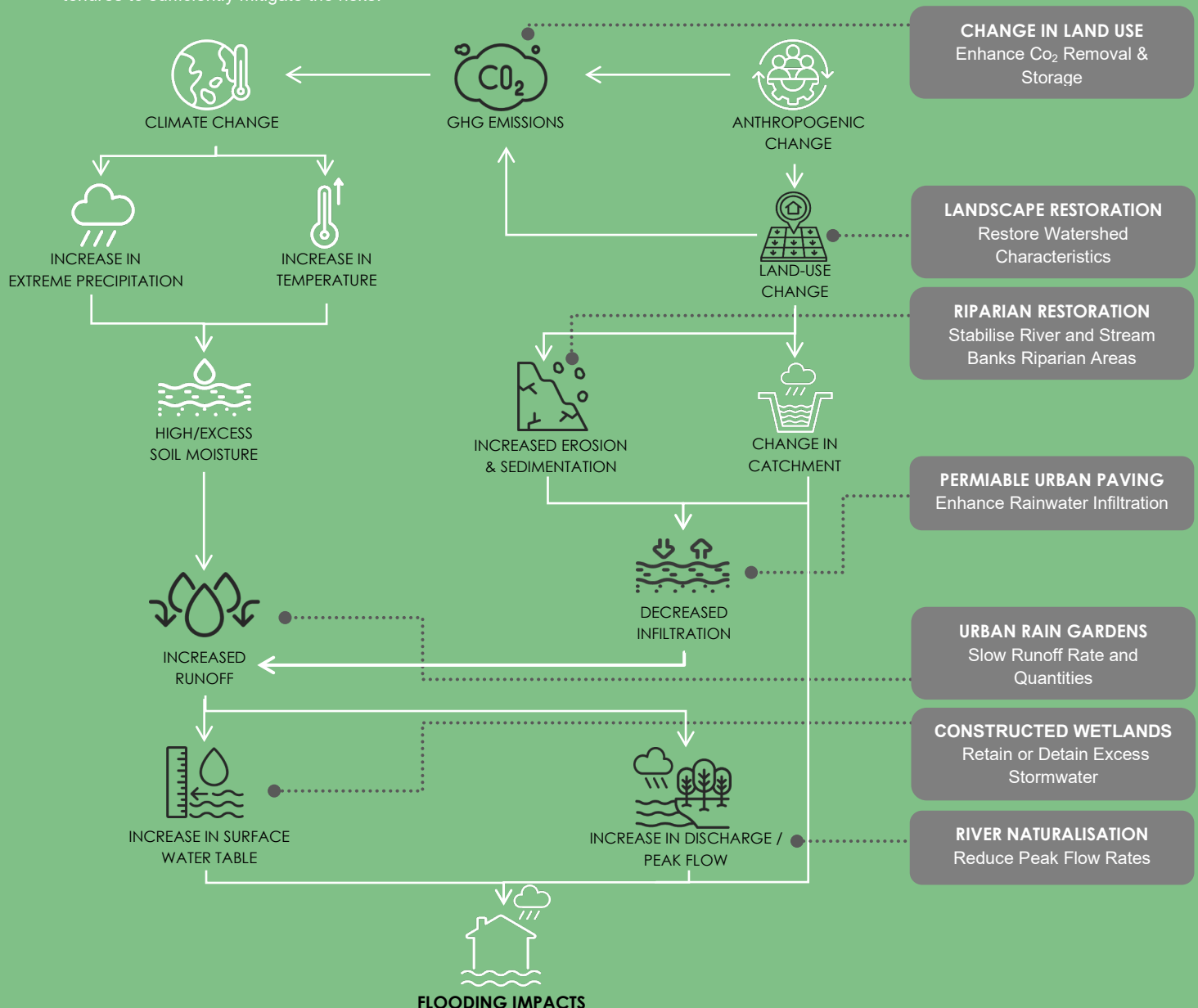


Figure 14: Flow chart of the various interactions that contribute to flood risk and common NbS approaches to mitigate this risk. Adapted from IPCC, 2021.

5.4 FINANCIAL CHALLENGES & OPPORTUNITIES



5.4.1 INTERNATIONAL FINANCIAL CHALLENGES

Globally, NbS for climate change adaptation (and other societal challenges) face well documented shortfalls in the allocation of the required financial resources. While public and private investment in nature-related action is beginning to become more prevalent, through industry initiatives such as nature-related risk disclosures, public and private sector organisations must embrace NbS as viable and attractive investment opportunities to bridge this funding gap.

The World Economic Forum has projected that to meet high-level climate change, biodiversity, and land degradation targets, investment in NbS needs to at least triple by 2030 and increase fourfold by 2050. This accelerated funding of NbS initiatives would require a cumulative total investment of up to \$8.8 trillion (USD) and future annual investment rate of 674 billion (USD) (UNEP, 2022). The G20 State of Finance for Nature report states that current investments in NbS are insufficient at \$200 billion annually (USD). Currently, the majority of NbS funding come from public sources (UNEP, 2022).

A significant challenge in scaling funding of NbS is that the vast majority of ecosystem services are not measured financially, with carbon sequestration being the most common ecosystem service commoditised. While commoditising additional ecosystem services would support scaling funding options for NbS, careful consideration must be applied to ensure financial return does not create bias in ecosystem conservation efforts away from other threatened and at-risk ecosystems.

5.4.2 NEW ZEALAND FINANCIAL CHALLENGES

The lack of funding and financing tools are a well acknowledged barrier to the uptake and scaling of NbS in New Zealand, along with the achievement of both human wellbeing and broader biodiversity conservation targets. Aligning with common NbS financing challenges experienced internationally, NbS considerations or options are often underrepresented in national funding/budget initiatives, undervalued for their hazard mitigation, amenity, and ecosystem service outcomes, and lack the tools to commoditise their values more broadly. In viewing NbS as interventions of acute climate change risks in New Zealand, at present NbS are commonly treated as ‘nice-to-have’ outcomes and often not considered critical infrastructure. While funding may be provided for initial establishment, significant challenges are experienced in their ongoing maintenance and monitoring, potentially reducing their hazard mitigation capacity.

As found internationally, central and local government organisations tend to be the core funding provider for NbS projects in New Zealand. Additionally, with carbon sequestration and storage services acting as the primary financial commodity from NbS nationally (through afforestation), financial incentives to promote NbS privately are lacking. Supported through the New Zealand Emissions Trading Scheme and other voluntary market mechanisms, the New Zealand carbon market not only limits the financial incentives for NbS in New Zealand, but it may also conversely incentivise the planting of exotic fast-growing species over New Zealand native flora. However, a number of nascent environmental markets are beginning to emerge in New Zealand in areas including biodiversity credits and blue carbon, primarily through the voluntary market.

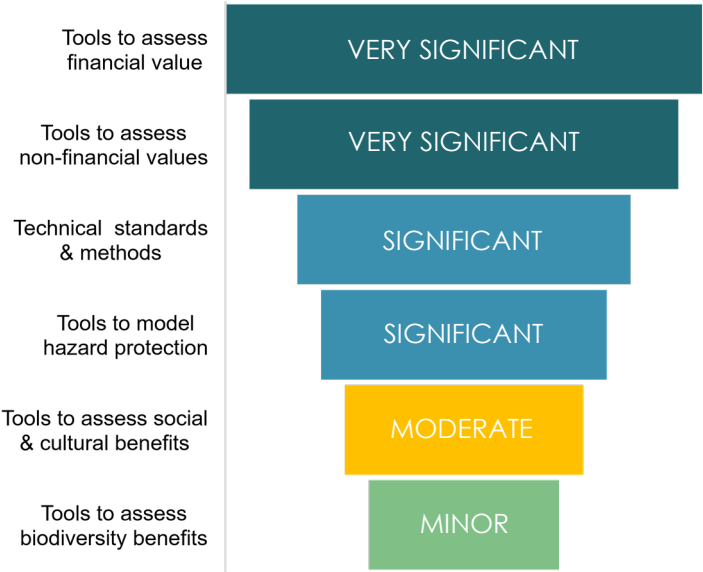


Figure 15: New Zealand NbS practitioner perspective of how challenging the following information and tools gap present to NbS uptake

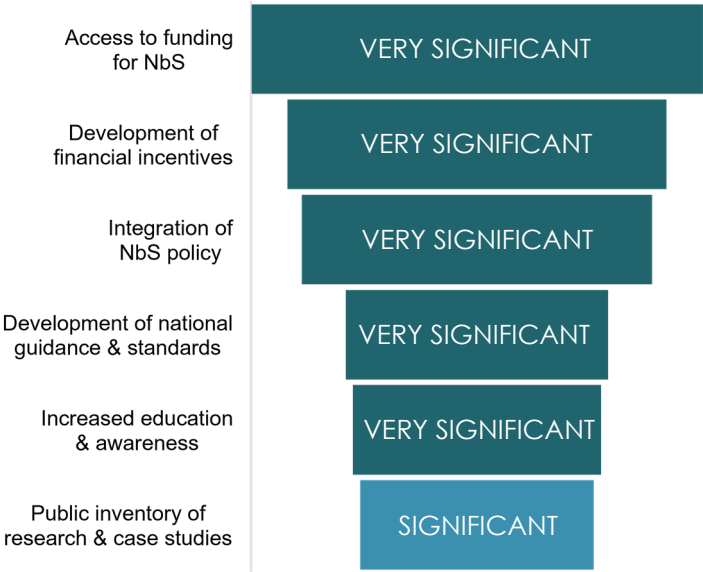


Figure 16: New Zealand NbS practitioner perspectives of how beneficial delivery of the following actions would be for scaling NbS use

5.4.3 FINANCIAL OPPORTUNITIES & ACTIONS

To increase funding and financial incentives for NbS use, research, and long-term monitoring; actions are recommended to continue to build the recognition and trust in relevant nature-based markets for ecosystem services in New Zealand. These actions seek to grow the private and public investment in NbS, through the inclusion of more diverse financial incentives. Whereas existing NbS initiatives in New Zealand are primarily publicly funded through central or local government, a proactive funding model rather than a reactive one is viewed as a key move to scaling NbS use.

Beyond the New Zealand Emissions Trading Scheme, voluntary carbon markets (VCMs) globally have proved a valuable means for leveraging private capital investment into climate change response initiatives. Primarily scopes toward climate change mitigation outcomes, without VCM mechanisms, these initiatives may not have been funded otherwise. Ensuring the right technical and regulatory settings are in place to ensure a high-integrity market, growing nature-based credit market opportunities for broader recognition of carbon sequestration in natural environments, and other ecosystem services (e.g., biodiversity, freshwater, and resilience) represents a similar opportunity to grow proactive investment in NbS outcomes. Furthermore, development of these nature-based market opportunities within New Zealand may provide long-standing restoration and conservation initiatives, such as wetland restoration or invasive pest control, the opportunity to be financially rewarded for their previous nature-gains achieved.

Acknowledging that early feasibility and investigation has been completed recently in Blue Carbon opportunities and Biodiversity Credits, actions are recommended to continue this work. In reference to the Oxford Offsetting Principles (Axelsson *et al.* 2024), the requirements of nature-based credit markets provide strong alignment to the needs of NbS, particularly the needs for ongoing maintenance and monitoring.

Offsetting principles of 'ensuring the environmental integrity of credits', demanding that credits must be measured, reported, and verified, and have a low risk of reversal' align well with supporting high-quality NbS. Whereas reactive government funding for NbS may provide the initial funding to develop a NbS, operational funding pressures may limit the amount of maintenance (e.g., suppression of invasive species) or impact on the quality of monitoring that is conducted following implementation. Ongoing maintenance and monitoring of NbS can be incentives through commoditising NbS ecosystem services such as carbon sequestration and biodiversity value. This is achieved through nature-based credit markets; whereby, to avoid the liability of incurring a credit 'write-off' if the ecosystem service diminish, sufficient maintenance and monitoring must be conducted.



FINANCIAL CASE STUDY: SCALING FINANCE FOR NATURE

UNEP RECOMMENDATIONS FOR SCALING FINANCE FOR NATURE-BASED SOLUTIONS

With over half of global GDP moderately or highly dependent on natural systems, businesses, financial institutions, and governments are increasingly recognising that NbS are critical for addressing their financial risks. Despite growing investment opportunities globally, NbS needs remain severely underfunded. Investment in NbS globally in 2022 amounted to \$200 billion USD, only a third of the investments needed to achieve climate, biodiversity, and land degradation targets by 2030 (UNEP FI, 2024). While private finance for nature has grown significantly in the past four years, from around \$9.4 billion USD in 2020 to \$102.1 billion USD in 2024, governments continue to provide over 80% of funding for NbS (UNEP FI, 2024).

Activating private finance is critical for scaling NbS. Private finance can provide the capital required to implement and grow NbS projects, help drive innovation in practice and technologies, and mobilise additional resources by leveraging public funds.

Drawing on lessons and insights from the United Nations Environment Programme's (UNEP) most recent annual State of Finance for Nature report that tracks the finance flows to NbS projects, the UNEP has provided the G20 Sustainable Finance Working Group with five recommendations that may scale finance for NbS.

UNEP RECOMMENDATIONS FOR SCALING FINANCE FOR NATURE-BASED SOLUTIONS

1. **Encourage a regulatory enabling environment to support the alignment of economic activities with global sustainability agreements, including the Paris Agreement and Kunming-Montreal Global Biodiversity Framework.**
 - Encourage the definition of NbS criteria in sustainable finance taxonomies and interoperability across geographies and sectors.
 - Promote comprehensive supply chain due diligence regulations to enhance companies' risk management on nature exposures
 - Encourage nature-related disclosure approaches to be adopted that are aligned with commitments under the Global Biodiversity Framework
2. **Support the development of innovative and credible investment products and markets for NbS.**
 - Encourage standardised guidelines for credible financial instruments that support nature conservation.
 - Support the use of public funds and concessional finance to de-risk private investment.
3. **Support a credible market for biodiversity credits through enhancing uptake and reducing transaction costs.**
 - Support measures for enhanced market integrity on the demand and supply side of NbS, for example through issuing guidance and establishing science-based market frameworks aligned with national and international policy and regulatory agendas.
 - Support capacity building for Indigenous Peoples and Local Communities for project design and leadership, ensuring adequate safeguards, and encouraging tailored pilot projects with local stakeholder engagement
4. **Prioritise Indigenous Peoples and Local Communities in the design and implementation of NbS actions.**
 - Encourage relevant projects to be led, set-up, designed, and implemented with full and fair stakeholder engagement at all levels of decision-making.
 - Support an enabling environment including relevant legislation for Free, Prior and Informed Consent (FPIC) and removing barriers for IPLCs to access finance to enable more IPLC-led NbS interventions
5. **Redirect public spending towards nature-positive activities to complement private sector efforts, including the elimination or reform of harmful subsidies, and supporting developing countries**
 - Encourage a redirecting of public spending from nature-negative towards nature-positive activities to complement and further incentivise the efforts from the financial sector.
 - Support the elimination, phasing out, or reform of harmful incentives and subsidies.
 - Support developing countries in meeting their financial obligations under the Rio Conventions.
 - Promote the integration and streamlining of national adaptation plans for climate (NAPs) and biodiversity (NBSAPs), as well as any other national environmental policy measures.

A small bird with a grey head and back and a white belly is perched on a thin, mossy branch. The background is a blurred forest. A teal-colored rectangular overlay covers the right side of the image, containing white text.

DEFINING
NATURE-BASED
SOLUTIONS
FOR
CLIMATE
ADAPTATION

6. DEFINING NATURE-BASED SOLUTIONS

6.1 WHAT IS A NATURE-BASED SOLUTION?

As an umbrella concept, NbS include a number of approaches including green infrastructure, ecosystem-based adaptation, water sensitive urban design, and ecosystem-based disaster risk reduction. While these approaches relating to NbS have been developed from a number of different sources, they share a focus on biodiversity and ecosystem services and aim to address societal challenges. In some regions and within certain land-based sectors, these NbS approaches (e.g. Water Sensitive Urban Design) have been used historically for specific risk mitigation purposes and to diversify the benefits that can be realised more broadly through risk mitigation. While these historic uses provide for well-established experience in some regions, their use has predominantly been applied to flood-related risks from extreme rainfall and coastal storm surge.

This roadmap and report recognise the latest definition of NbS, formerly adopted by the United Nations Environment Assembly 2022 (UNEA). This definition builds upon the International Union for Conservation of Nature (IUCN) definition of NbS, previously adopted by the 2016 World Conservation Congress and Member's Assembly. In development of New Zealand Nature-based Solutions standards & methodologies (Roadmap Action #2), this definition shall be applied.

The formal definition of NbS defined in Figure 17 below relates to NbS to address societal challenges, including but not limited to climate change adaptation. There is value in this definition being widely adopted across other societal challenge areas in New Zealand, including greenhouse gas emissions reductions, response to biodiversity loss, and land degradation. This will ensure that a consistent understanding of NbS is provided for across all relevant societal challenges that can employ NbS and planning frameworks that incorporate NbS actions (e.g. the New Zealand Emissions Reduction Plan).

6.2 EMERGENCE IN PRACTICE

Countries are facing increasingly complex societal challenge, including adapting to the impacts of climate change, which undermine our collective health and resilience and require integrated and innovative solutions. NbS have emerged internationally and in New Zealand as practical additions to conventional grey infrastructure for climate change adaptation, delivering greater resilience in the longer term and providing a host of additional co-benefits.

With New Zealand projected to experience increasing frequency and intensity of extreme climate-related events, the need for effective adaptation approaches is urgent. In New Zealand, physical risk reduction measures commonly rely on grey infrastructure approaches to protect against climate-related hazards, including seawalls, stormwater drainage systems, and flood protection barriers (Climate Change Commission, 2024). Whilst a historically tried and proven approach, in the face of climate change risks, grey infrastructure approaches may face long-term challenges, including low adaptive capacity, increasing maintenance costs, and creating adverse effects on natural environment values.

By applying existing conservation and restoration practices, NbS can be enabled through practical activities such as restoring wetlands and coastal ecosystems, reducing predator and browser pressures, and integrating green spaces into urban areas. NbS can be implemented across a diversity of land uses and spatial scales, from small interventions within an urban environment to landscape-scale restoration. When ecosystems are healthy, they buffer us from the impacts and contribute to our social, economic, and cultural wellbeing. Recognising the ecosystem services provided by a healthy and diverse natural environment, high-quality NbS have the potential to reduce the intensity of climate hazards by 26%, with a potential cost saving from climate change impacts of USD 104 billion by 2030 and 393 billion by 2050 (WWF, 2022).



'Actions to protect, conserve, restore, and sustainably use and manage natural or modified terrestrial, freshwater, coastal, and marine ecosystems, which address social, economic, and environmental challenges effectively and adaptively, while simultaneously providing human wellbeing, ecosystem services and resilience and biodiversity benefits'

(UNITED NATIONS ENVIRONMENT ASSEMBLY, RESOLUTION 5/5, 2022)

Figure 17: The formally adopted definition of Nature-based Solutions, agreed by the UNEA 2022.

6.3 SAFEGUARDING THE CO-BENEFITS OF NATURE-BASED SOLUTIONS

Within the context of adapting to the impacts of climate change, NbS is an umbrella term for a wide range of approaches, all of which involve working to restore, enhance, and protect nature. At their core, NbS for climate change adaptation are designed to yield benefits at the intersection of nature and society through adaptation driven approaches. Whilst the adaptation outcomes are paramount to the success of a NbS, for an intervention to be considered a NbS, the co-benefits to nature and society must be present and safeguarded.

Without safeguarding the wider co-benefits derived from NbS for climate change adaptation, interventions risk delivering maladaptation for nature-based values – generating or exacerbating adverse impacts on biodiversity, landscape values, and cultural values for example. In developing the standards and methodologies for NbS in New Zealand (Roadmap Action #2), emphasis must be placed on ensuring the presence of co-benefits to nature and society within a NbS intervention. Interventions which reduce ecosystem integrity, as well as social well-being, do not meet the NbS definition provided by the UNEA 5/5 Resolution.



Figure 18: Common Nature-based Solutions and their associated co-benefits for nature and society across an urban blue-green network. Source: Boffa Miskell Ltd.

6.4 NATURE-BASED SOLUTIONS FOR CLIMATE CHANGE ADAPTATION

Climate-related risks and their impacts occur when vulnerable people, assets, communities, or ecosystems are exposed to a hazard. A physical event alone, such as extreme rainfall or sea-level rise, does not generate a risk – it is the interaction of an event with the receiving environment that determines the magnitude and severity of the risk. Additionally, climate change response actions may also contribute to climate-related risks, where response actions create trade-offs, adverse effects, and maladaptation (IPCC, 2022). These interactions are detailed in Figure 19.

Acute hazards, such as the extreme weather events experienced across the North Island in 2023, already cause significant impacts in New Zealand. The frequency and intensity of these extreme events will increase with climate change. Nationally, the country will experience more storms and extreme rainfall, as well as more frequent and prolonged drought and heatwave conditions. These events make acute hazards like flooding and fire, more likely (MfE, 2020).

Climate change is already impacting the natural environment, including New Zealand's indigenous ecosystems. Its impacts are also affecting exposed communities across the country and the many sectors that depend on the natural environment, including tourism, agriculture, forestry, and fisheries.

Scaling the use of NbS for climate change adaptation in New Zealand can address these climate change risks, while providing co-benefits to biodiversity, cultural values, and the economic values that depend on our natural environment.

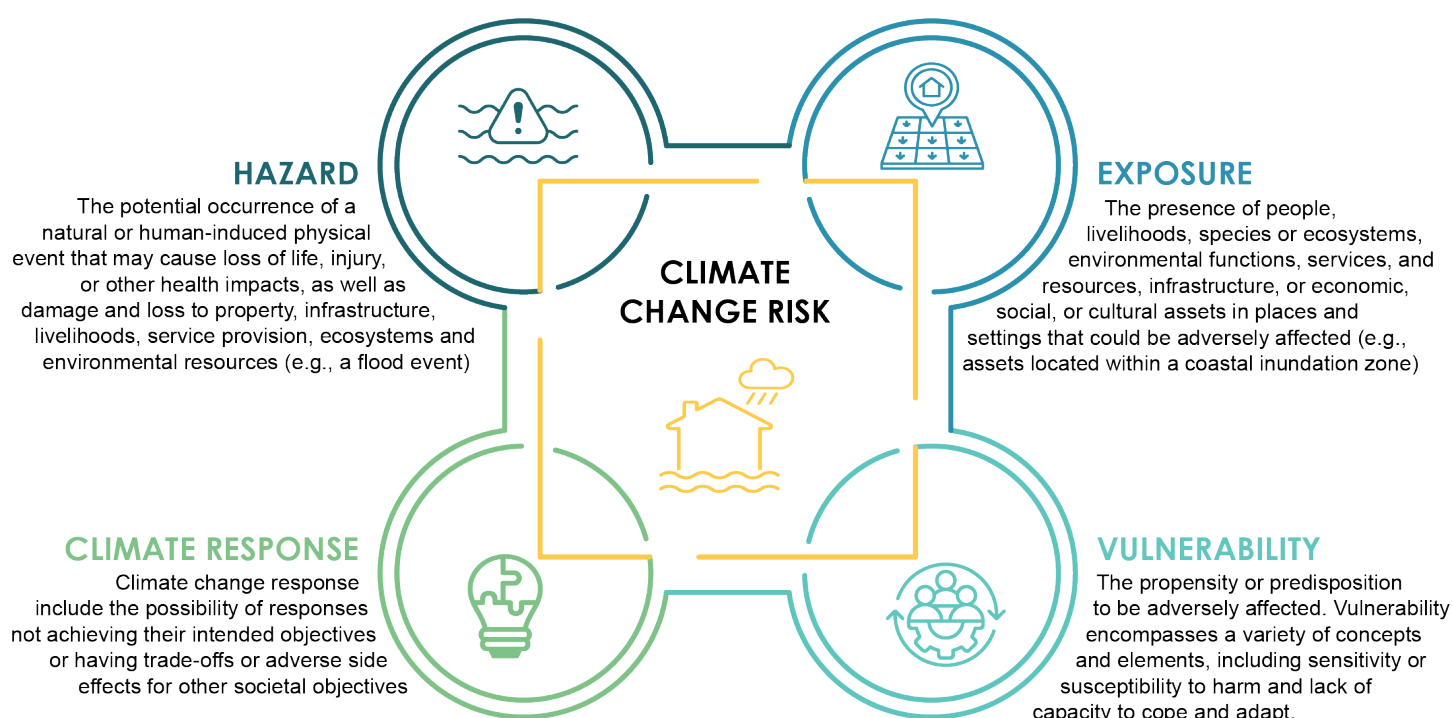


Figure 19: Interaction of climate-related hazards, exposure, vulnerability, and response actions to inform climate change risk. Summarised from IPCC, 2022.



NATURE-BASED SOLUTIONS CASE STUDY: TE AUAUNGA AWA | OAKLEY CREEK RESTORATION

Te Auaunga Awa | Oakley Creek Restoration is an Auckland Council Healthy Waters project in Mt Roskill that used NbS approaches to prevent flooding from nearly 200 homes from a 50-year flood event.

In the early 1930's, the 'swirling waters' which had previously meandered through a large wetland was converted into a straightened concrete lined stormwater channel, bordered with mown grass and pockets of exotic trees, typical of many channelised urban streams. Ever since the 1.3km stretch of undeveloped reserves between Richardson Road and Sandringham Road had been prone to flooding, significantly damaging neighbouring houses during previous extreme rainfall events.

The NbS project restored 2km of Te Auaunga, daylighted seven piped tributaries, restored eight hectares of open space, and treated the water quality of the contributing catchment. The project includes shared pathways and pedestrian bridges, community orchards, an outdoor classroom, and community fale and atea space. The restoration of Te Auaunga and Wai o Rakataura is a missing link that connects coastal habitats to hill-country environments, across diverse geologies and hydrologies. Te Auaunga was planted with approximately 120,000 representative native trees, shrubs, and grasses, including rare basalt and kahikatea swamp forest, purei sedgeland, kanuka-manuka shrublands with emergent podocarps, broadleaf forest, harakeke-ti kouka, and wetlands.

Using NbS approaches Te Auaunga has created resilient nature-based infrastructure and enhanced ecological and landscape amenity values to support future development of higher density affordable housing in Central Auckland.

The project is an exemplar of a nature-based solution to flood risks, in the sense that it preserved and restored the natural environment, provides stormwater infrastructure with multiple benefits, and create an environmental framework that enables urban intensification, uniquely within a brownfield development. During the Auckland Anniversary Weekend Floods, Te Auaunga effectively accommodated flood waters.

As a New Zealand-based NbS project, Te Auaunga Awa acts as a valuable case study of NbS in practice. Through measurable benefits to flood risk mitigation, enhancing local biodiversity and ecosystem integrity, and improving community amenity values, this case study helps to address the scepticisms that challenge NbS use in New Zealand.



URBAN FLOOD HAZARD

Developed as a public housing estate in the 1950's, residential properties remained exposed to flood events



MODIFIED CATCHMENT

Waterways were predominantly straightened and concrete lined channels with piped tributaries



STREAM NATURALISATION

Applying flood modelling, the channel was restored using NbS techniques, designed for long-term resilience and improved ecological values



FLOOD RESILIENCE

The restored Te Auaunga corridor is able to effectively accommodate and process flood flows. This image is following the 2023 Auckland Anniversary Floods

NbS ADAPTATION & CO-BENEFITS:



NATURALISATION

2km of waterways restored, accommodating excess flooding



INFRASTRUCTURE

Protection of nearly 200 homes from a 50-year flood event



AFFORESTATION

Approx. 120,000 native stems planted



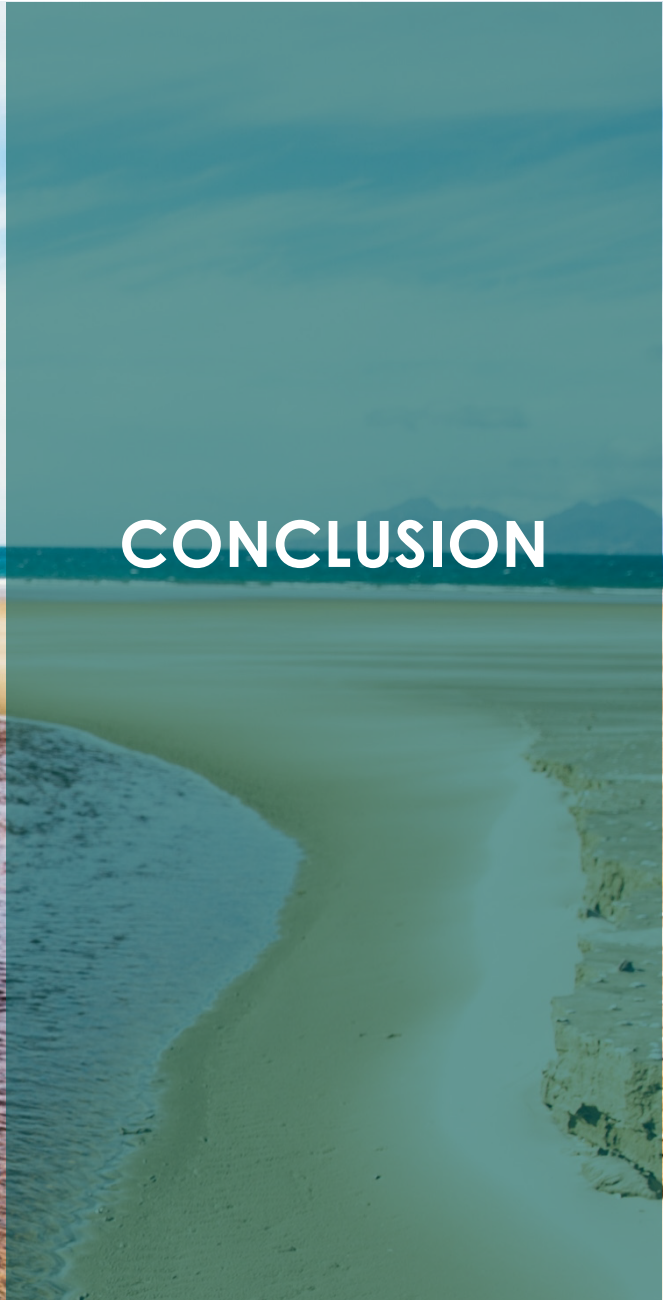
ECO CORRIDOR

Connecting coastal and hill country environments



WHĀNUA ĀTEA

Natural play areas introduced with ngā taonga tākarō



CONCLUSION



7. CONCLUSION

NbS present an integrated opportunity to effectively address the interconnected crises of climate change, biodiversity loss, and land degradation in New Zealand, that can build upon New Zealand's longstanding experience delivering world-leading ecosystem conservation and restoration. Through applying international lessons learned, aligning with emerging best practice, and supporting New Zealand's developing NbS communities of practices, NbS can meet the urgent need to scale adaptation efforts in response to climate change risks. Acknowledging commitment of New Zealand to 'prioritise nature-based solutions' for climate change adaptation, as stated in the New Zealand Climate Change Strategy and National Adaptation Plan, strategic action is required to enable this.

The Roadmap for Scaling Nature-based Solutions for Climate Adaptation in New Zealand seeks to build a robust foundation from which NbS use can continue scale in a consistent, nationally aligned manner. This pathway enables NbS users to deliver high-quality outcomes for adaptation, nature, and society. The roadmap recommends seven strategic actions across four opportunity objective areas:

- **KNOWLEDGE:** Facilitate information development and sharing of NbS through case studies, research, and collaboration across government, iwi, private sector, and community groups
- **TECHNICAL:** Strengthen New Zealand's cross-sector tools and capabilities to build a common understanding and application of NbS
- **POLICY:** Integrate and mainstream a wide range of NbS policy levers and practices in New Zealand's policy frameworks for climate change adaptation
- **FINANCIAL:** Significantly increase investment in NbS use, research, and long-term monitoring through development of public and private financing frameworks and opportunities

The seven actions identified across the four opportunity objective areas are scoped to address the system challenges currently experienced by NbS practitioners in New Zealand.

Recognising the dynamic nature of enabling conditions for supporting NbS use, including funding availability and new national policy developments, the seven actions identified in the roadmap have been packaged into discrete areas of work to enable an adaptive delivery. Accordingly, each action may be implemented independent of other actions and still deliver significant impacts and benefits to the emerging NbS community of practice. However, for a greatest benefit approach to strategically scaling the use of NbS in New Zealand, actions should seek to be delivered in full, with reference to the relevant climate change and biodiversity milestones coming in the next four years.

Climate change poses significant cultural, spiritual, economic, and physical risks to iwi, hapū, and Māori. While a specific review of mātauranga Māori for NbS is outside of the scope of this report and roadmap, the inclusion of mātauranga Māori will be integral to progressing high-quality NbS use in New Zealand. The roadmap recommends that further research, and development regarding the role of mātauranga Māori should be preceded by significant engagement with iwi and hapū concerning advice on how to proceed mātauranga NbS work and data sovereignty.

With an economy that is strongly reliant and connected to the natural environment, including tourism, agriculture, forestry, and fisheries, NbS should be considered one of New Zealand's greatest tools in the response to climate change risks. To achieve this at scale, deliberate system-scale changes must be achieved for NbS to sustainably grow in scale.

8. GLOSSARY

Table 2: Glossary of key terms relating to Nature-based Solutions for Climate Change Adaptation

TERM	DEFINITION
Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. (IPCC, 2022)
Biodiversity	The variability among living organisms from all sources, including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. (Convention on Biological Diversity, 2006)
Biodiversity Credits	A type of economic instrument that recognises in a consistent way projects or activities that provide positive outcomes for biodiversity, against which 'nature-positive' claims can be made. (MfE, 2023)
Blue Carbon	Blue carbon is the carbon stored in coastal and marine ecosystems. Coastal ecosystems such as mangroves, tidal marshes and seagrass meadows sequester and store more carbon per unit area than terrestrial forests and are now being recognised for their role in mitigating climate change. (IUCN, 2017)
Climate Change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes. (IPCC, 2022)
Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected. (IPCC, 2022)
Green Infrastructure	A strategically planned network of high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings (UNEP Glossary)
Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources. (IPCC, 2022)
Impact	The consequences of realised risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social, and cultural assets, services (including ecosystem services), and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial. (IPCC, 2022)
Maladaptation	Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli; an adaptation that does not succeed in reducing vulnerability but increases it instead. (IPCC, 2022)
Nature	A holistic term that encompasses the living environment (te Taiao), which includes all living organisms and the ecological processes that sustain them. By this definition, people are a significant part of nature. This document uses the term 'biodiversity' to refer to biological diversity and 'nature' for the wider processes, functions, and connections in the natural environment, of which biodiversity is a part. (MfE, 2023)
Resilience	The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation. (IPCC, 2022)
Risk	The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social, and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure, and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making. (IPCC, 2022)
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. (IPCC, 2022)

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APPENDIX



MĀTAURANGA MĀORI

For NbS for climate change adaptation to be successful, the solutions must be specific to both the land and the people. Mātauranga Māori supports place based NbS, ensuring NbS are best suited to the people and places they are located in with a focus on intergenerational change.

While a specific examination of NbS led by, or as it impacts on, Māori/iwi/hapū is outside the scope of this report, it is nevertheless important to acknowledge that climate change has environmental, physical, social/cultural/spiritual, and economic impacts on Māori/iwi/hapū. "Around Aotearoa, 191 marae are within 1km of the coast, and, in the Bay of Plenty alone, 41 urupā are within 1km" (Bailey-Winiata, 2021).

For Māori, self-identity and collective identity are deeply intertwined with the environment and the experiences passed down through the land by ancestors. Mātauranga reflects a Māori world view and includes knowledge and wisdom that relates to past, present, and future. Mātauranga Māori is both a noun and a verb – a 'thing' and a way of doing things. The Ministry is currently developing its own working definition for Mātauranga Māori, but this is not yet publicly available.

Mātauranga Māori practices can support a NbS for climate change adaptation to better integrate within the landscape and generate greater co-benefits for nature and society in New Zealand.

Table 3: The table below offers some examples of how mātauranga has been applied to address climate hazards and risks. It is not exhaustive but is intended to provide initial lines of enquiry for future in-depth research into Climate hazards and risks and the application of Mātauranga Māori.

EXAMPLE	NARRATIVE	EXAMPLES OF INTERVENTIONS INCLUDED
Iwi-centric climate strategies and action plans – mitigating and adapting to climate change	Multiple iwi (e.g. Ngāi Tahu, Te Arawa, Ngāa Rauru, Maketu iwi collective) have developed climate strategies and/or action plans which reflect their own unique Mātauranga. These plans are often built around Te Ao Māori values or principles - often referred to as pou (pillars) - such as Rangitiratanga (self-determination), Kotahitanga (collective action), Kaitiakitanga (safeguarding our future). Key elements of plans include using historic knowledge as well as contemporary science to understand potential hazards or risks in the face of climate change. Risks can be around a range of themes, including unearthing or loss of kōiwi (bones of ancestors), damage to the places people live (marae, papakainga), loss or harm to taonga species, damage to mahinga kai (food sources) etc.	- Wānanga – these may be to inform iwi/hapū about climate change hazards and risks; and/or to gather information to understand the values important to iwi members; and/or discuss mitigation or adaptation options to meet their needs - Protection of flora and fauna of significance (taonga species e.g. inanga, tuna, kanakana, koura), including existing ngahere (forest, bush) through wetland restoration, riparian and other planting programmes, often using marae-grown native plants nurtured from seeds that were eco-sourced (local species) - Consideration of physically raising and/or relocation of marae, kāinga (settlements), urupā (traditional burial sites), māra (gardens) where mitigation is insufficient to avoid climate impacts - Preparing for the return of iwi to the marae both from within Zealand and from overseas, as climate impacts cause geographical movement of people.
Projects where mātauranga is applied to flood mitigation	Multiple Jobs for Nature projects include flood mitigation where mātauranga is a key element	- A project exploring the feasibility of using a Mātauranga Māori framework to design, monitor and assess nature-based solutions for flood mitigation that deliver iwi aspirations in rivers across a region. - A feasibility study to assess and quantify the benefits of a suite of nature-based solutions (including mātauranga Māori practices) for managing risk under various flood event scenarios.
Projects from the National Science Challenge (NSC) where Mātauranga Māori is key element	Multiple NSC projects are investigating the relationship between mātauranga and interventions to mitigate or adapt to climate change	A project based on sources of mātauranga (waiata, haka and mōteatea) aiming to uncover innate climate knowledge and climate leadership. The research will celebrate indigenous ways of knowing and being about our land and sea and use mātauranga to investigate and plan for climate change.
The Māori Climate Platform (MCP) intends to support iwi/Māori/Hapū design and implement solutions that will support an equitable transition for Māori in the face of climate change	The platform is still in progress of being designed, but projects are likely to emerge soon.	This section can be updated when MCP projects are announced.

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Boffa Miskell is a leading New Zealand environmental consultancy with nine offices throughout Aotearoa. We work with a wide range of local, international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, Te Hīhiri (cultural advisory), engagement, transport advisory, climate change, graphics, and mapping. Over the past five decades we have built a reputation for creativity, professionalism, innovation, and excellence by understanding each project's interconnections with the wider environmental, social, cultural, and economic context.



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