Nature positive disaster risk reduction solutions

Discussion paper prepared by Suncorp and Natural Hazards Research Australia

December 2024

Cover: Re-vegetating the Prins Hendrik sand dyke in the Netherlands, Photo: Jan De Nul Group

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Overview

Purpose of this discussion paper

This discussion paper was jointly prepared by Suncorp and Natural Hazards Research Australia, informed by a roundtable discussion held in September 2024. It aims to help drive a national conversation across government, research, community and corporate sectors to inform and support cross-sector dialogue about nature positive disaster risk reduction solutions.

Emissions reduction and disaster risk reduction related institutions are being established – this is the crucial time to start the conversation on nature positive disaster risk reduction solutions.

Why this paper and roundtable?

Nature positive disaster risk reduction solutions (NPDRRS) have demonstrated considerable potential to help tackle multiple challenges facing Australian communities. At a systems scale these include reducing disaster risk and carbon emissions, restoring biodiversity and ecosystem health. Community co-benefits of NPDRRS include improved air and water quality, improved health and local amenities.

The need to implement NPDRRS continues to grow in urgency, with climate change increasingly overwhelming conventional infrastructure solutions and degrading existing natural environments. In Australia, this has been recognised in the National Disaster Risk Reduction Framework and the associated Second National Action Plan which defines national policy provisions for nature-based solutions. However, solutions can carry 'maladaptation' risks such as reduced biodiversity and increased disaster risk for other hazards. There are also gaps in understanding roles and opportunities.

The urgency for NPDRRS has been matched by considerable interest in, and recognition of, the potential of nature positive solutions. It has been estimated that $700 billion per year will be required to reverse the global biodiversity crisis – with this scale of investment there are significant opportunities for secondary benefits in reducing the risks of disasters. However, many of the emergent policies and mechanisms supporting nature positive solutions, such as the nature repair market, do not yet recognise the benefits of disaster risk reduction.

This discussion paper provides a timely contribution to support thought leadership and holistic decision-making regarding future investment and partnerships. The discussion paper has been reviewed by subject matter experts and finalised with feedback from participants who were invited to a roundtable event hosted by Suncorp and Natural Hazards Research Australia (Canberra, 10 September 2024). Participants at this roundtable comprised CEOs, executives, researchers, and government and community leaders.

Informing dialogue regarding nature-based solutions

The roundtable associated with this discussion paper enabled dialogue between public, private, academia and non-profit participants about the respective roles that governments and industry can play in NPDRRS.

This discussion paper focuses on NPDRRS as a subset of nature-based solutions, and in relation to disaster risk reduction. The Global Nature Positive Summit held in Sydney on 8-10 October 2024 engaged in the broader nature-based solutions conversation, with the Summit focus on global commitments under the Kunming-Montreal Global Biodiversity Framework 2022, considering:

- Indigenous knowledge and leadership
- Nature-related reporting and risks
- Technological solutions to inform measurement and evidence-based decision making
- Blue finance, supporting a healthy and resilient ocean.

In this context, this discussion paper also informs future policy deliberations, with cross-sector dialogue about the role and potential for nature positive solutions for disaster risk reduction. Investments can be holistic, addressing multiple priorities across biodiversity, environmental, climate mitigation and disaster risk reduction outcomes.

Australia's international commitments

NPDRRS are uniquely positioned to help Australia address a range of policy priorities which include the following four international commitments.

- Through the Paris Agreement 2015, Australia has committed to significant reductions in greenhouse gas emissions.
- As a signatory to the Kunming-Montreal Global Biodiversity Framework 2022 on biodiversity, Australia has committed to a range of goals to protect and restore biodiversity, including restoring 30 per cent of areas of degraded terrestrial, inland water and coastal and marine ecosystems.
- Australia is guided by the Sendai Framework for Disaster Risk Reduction 2015-2030 regarding how it will build disaster risk reduction domestically and support disaster risk reduction overseas.
- Australia agreed to the United Nations Sustainable Development Goals 2015 which includes targets in relation to biodiversity, climate change mitigation and adaptation.

Role of the insurance sector

International examples suggest that insurance can support using NPDRRS to reduce natural hazard risks. International examples suggest that insurers can protect households, business and governments by absorbing financial shocks from natural hazards through NPDRRS. Insurers can also help communities understand, prevent and reduce risk through research and analytics, catastrophe risk models and loss prevention in relation to NPDRRS.

In 2017, Swiss Re launched the world's first nature-based insurance solution to protect Mexico's Quintana Roo coral reef, collaborating with the Nature Conservancy and Mexican regional governments to protect the economic activity dependent on a healthy coral reef. Swiss Re's coverage enabled restorations and minimising coral damage following a severe storm. Swiss Re also supported the construction of the Prince Hendrik Sand Dyke on Texel Island in The Netherlands (see page 12), which involved enhancing the natural habitat with five million cubic meters of sand and the planting of two million marram grasses to create a landscape gradient.

In 2022, Aon and Revalue Nature Ltd, a nature-based solutions developer, announced that they were working together to accelerate the deployment of nature-based solutions and to reduce relevant risks associated with carbon offset transactions. Aon will help attract potential investors to these opportunities and offer innovative insurance solutions to projects and their stakeholders to aid in de-risking these assets from damage and destruction due to natural hazards and other pertinent risks and helping to advance the integrity of voluntary carbon markets around the world.

About Suncorp

Suncorp offers insurance products and services through some of Australia and New Zealand's most recognisable brands. Our ambition, to be the leading Trans-Tasman insurer, reflects our commitment to meet the evolving needs of customers while continuing to advocate strongly for measures that improve resilience to natural hazards to protect our people, customers and communities.

We also advocate for our customers for a more natural hazards risk resilient Australia through our four-point plan of investment in mitigation infrastructure that protects communities, grants for property owners to make their dwellings more resilient, enhancing building codes and better planning to ensure new communities aren't placed at risk, and removal of unfair and inefficient taxes and charges from insurance policies.

About Natural Hazards Research Australia

Natural Hazards Research Australia is Australia's national centre for natural hazard resilience and disaster risk reduction research.

The Centre is funded by the Australian Government as a collaborative research organisation, to address the major challenges arising from natural hazards, including bushfires, floods, cyclones, heatwaves, storms, and other hazards. Our mission is to deliver usable research and knowledge that creates safer and more resilient communities.

The Centre works in the broad emergency management and disaster resilience sector with partners in all states and territories, federal, state and territory, and local governments, key industry bodies, the private and not-for-profit sectors, research and other organisations with a stake in protecting Australian communities.

Where do we start? Actionable ideas

This is an agenda that will continue to be implemented over the coming decade. This discussion paper puts forward four ideas to inform next steps:

Actionable idea one

Recognise disaster risk reduction benefits in the design and prioritisation of nature positive investments

Investors including the Australian Government could consider explicitly recognising and valuing the benefits for disaster risk reduction and climate change mitigation and adaptation in emergent nature positive policies and mechanisms such as the nature repair market. Each would be holistic and long-term in focus. The design and implementation of these mechanisms would address the risk of maladaptive outcomes.

Actionable idea two

Enhance investment guidelines for disaster risk reduction initiatives to incentivise nature positive solutions

The Australian Government could consider further enhancing its investment guidelines to achieve nature positive outcomes from its investments into disaster risk reduction. As part of its response to the Independent Review of Commonwealth Disaster Funding, this would help to ensure a holistic spectrum of resilience options. The National Climate Risk Assessment and disaster risk profiles report could also be leveraged to prioritise investments in NPDRRS.

Actionable idea three

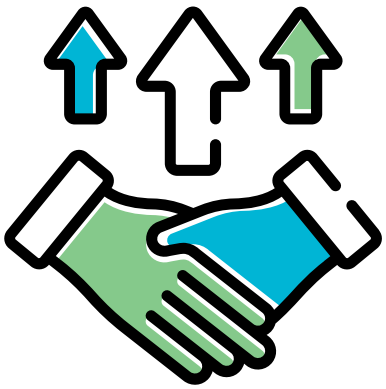
Enable public-private partnerships in support of NPDRRS

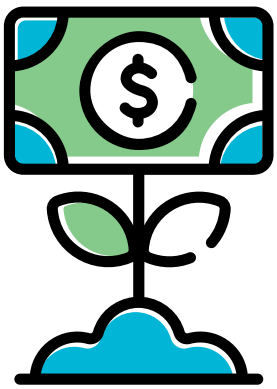
A review could be undertaken of how government funding could complement private sector funding into NPDRRS. The review would consider opportunities and ways to address current barriers in enabling public-private partnerships, alongside private investments into projects for environmental, social and governance outcomes, philanthropic or commercial reasons.

Actionable idea four

Undertake pilot studies to build confidence in, and efficacy of, NPDRRS

Federal, state and territory governments could undertake additional pilot projects to provide greater learnings into the environmental, ecological, social, economic, and engineering costs and benefits of NPDRRS. Findings from these pilot projects could be synthesised to inform investment guidelines, a case study library, policies and facilitate public-private partnerships.





What are nature positive disaster risk reduction solutions about?

Defining nature positive disaster risk reduction solutions

For the purposes of this discussion paper, we have defined 'nature positive disaster risk reduction solutions' (NPDRRS) as:

→ Solutions focusing on disaster risk reduction;

- *which* enhance, or at least preserve, the biodiversity and ecology of the local natural environment;
- *while also* providing secondary social, economic and other wellbeing enhancements for local communities.

Context

Our use of the term 'nature positive' builds on the umbrella concept of 'nature-based solutions', defined by the United Nations as actions:

→ to protect, conserve, restore, sustainable use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems,

- *which* address social, economic, and environmental challenges effectively and adaptively;
- *while also* providing human wellbeing, ecosystem services and resilience and biodiversity benefits.

Nature-based solutions can operate at both the small local scale and larger regional scales.

Our use of the term 'disaster risk reduction', draws on the definition provided by the United Nations through the Sendai Framework for Disaster Risk Reduction (2015-2030).

Our use of the term 'natural hazard risks' refers to risks that arise for communities who are exposed to hazards such as bushfires, floods, cyclones, heatwaves, storms and storm surge.

Our use of the term 'emissions reduction' is in alignment with the current state of progress and gaps outlined in the United Nations Emissions Gap Report 2023.

While NPDRRS is a relatively new term, it should be recognised that First Nations Peoples have been implementing what could be considered NPDRRS for tens of millennia given the focus on care for Country and resilience in place for many Nations. Similarly, a number of community-led groups such as Landcare and Greening Australia are implementing nature restoration projects with a specific risk mitigation component. With the focus on NPDRRS there is a great opportunity to better recognise and invest in the efforts and leadership of Indigenous and non-Indigenous communities alike.

Illustrative examples of NPDRRS

Inland flooding

- → Floodplain restoration
- → Enhanced water storage in wetlands, forests and farmlands.

Stormwater and urban flooding

- → Green roofs which can absorb, evaporate and transpire stormwater overflow
- → Rain gardens in shallow basins in yards and along streets or sidewalks.

Shoreline tidal flooding and surge

- → Protecting or restoring coastal habitats – mangroves, coral reefs, oyster reefs, beaches and rock reefs, coastal dunes, freshwater marshes and salt marshes
- → Living shorelines – native coastal habitats (oyster reefs, salt marshes, mangroves, seagrass beds).

Bushfire: rural and urban settings

- → Forest management – prescribed burns and bushfire management reducing bushfire severity and risk to communities
- → Greenbelts – forests near communities that are managed to be less flammable or irrigated to provide a firebreak, reducing fire risks.

Enhancing or at least preserving nature

Conversations about the topic also include language around nature-inspired, bio-inspired and restorative development.

There is the potential for well-intended nature-based solutions to have outcomes that do not enhance or at least preserve the natural environment. For example, interventions such as the planting of non-native trees could help to reduce disaster risk while also resulting in the displacement of native species and ecological degradation.

This discussion paper has focused on examples and precedents that prioritise ecologically beneficial outcomes alongside addressing community safety and resilience.

In this discussion paper we occasionally use the terms green, blue and grey infrastructure.

Green infrastructure relates to green spaces (e.g. forests, parklands) whereas blue infrastructure relates to bodies of water (e.g. rivers, retention ponds, wetlands). Both combine landscape elements with a degree of intervention intended to enhance function and sustainability benefits. And both highlight the fact that nature provides critical ecosystem services such as runoff management, water and air quality improvement, and tidal surge protection.

Grey infrastructure highlights conventional industrial practices involving the use of engineered materials such as asphalt and concrete for green and blue infrastructure including storm drains and sea walls.

In this discussion paper, we refer to the increasing use of green and blue infrastructure to replace or complement grey infrastructure solutions. The examples provided serve to highlight that nature, which is often framed as the hazard or adversary in emergency management contexts, is foundational to societies and can be a rich source of solutions to reduce natural hazards and social challenges. Grey, blue and green infrastructure are not mutually exclusive and can be used together to achieve a range of positive outcomes.

Image (right): Prins Hendrik sand dyke in the Netherlands

International examples of progress

PHOTO: JAN DE NUL GROUP

The Netherlands

Texel Island

Context: Texel Island is in the northern region of the Netherlands. It is below sea level but has been made habitable with the creation of dunes and dykes that protect the island from the surrounding sea. More than 70 per cent of the 24 kilometres long Wadden Sea Dyke on the island was found in a 2006 review to no longer meet safety standards, requiring reinforcement to ensure the safety of the island and its inhabitants.

The decision to choose NPDRRS:
The decision was made to restore a part of the dyke using traditional 'grey' solutions — but the Government sought to explore a NPDRRS for 3.2 kilometres of the total 24 kilometres using a dune and beach sand body.

Below: Prins Hendrik sand dyke in the Netherlands

PHOTO: JAN DE NUL GROUP

Summary of how the decision was made:

The additional cost of the NPDRRS option, compared with the conventional 'grey' solution was determined to be 5.1 million Euros.

The ongoing benefit from NPDRRS was assessed to be up to 9.63 million Euros over a payback period of nine years.

Information about the costing:

Upfront construction cost of the 'grey' solution (rebuilding the 3.2 kilometres dyke): 18.8 million Euros

Upfront construction cost of the NPDRRS (constructing a sand body): 23.9 million Euros.

Information about the value of ongoing benefits of NPDRRS:

1.07 million Euros annually inclusive of:

- 752,400 Euros annually in water quality improvement
- 37,600 Euros annually in erosion prevention
- 19,900 Euros annually in carbon sequestration.

N.B. This did not include the health and wellbeing benefits to the community and visitors, nor the flood protection impact. Avoided damage costs and casualties were expected to be consistent across the grey solution and NPDRRS.

Key insights

- **Uncertainty in construction and maintenance:** The variability of the building materials needed to create the sand body make it challenging to establish cost-efficacy and risk profile for insurance purposes. This speaks to the need to generate more data on the behaviour and impact of NPDRRS.
- **Role of insurers:** Swiss Re was a key partner on the project, delivering insurance expertise and construction insurance despite the uncertainties noted above. This highlights the need to find private sector partners who are willing to accept a higher risk profile and/or have a particular commitment to environmental, social and governance outcomes while there is less data and certainty on a given nature-based solution.
- **The importance of understanding and valuing all services:** In this instance the capital expenditure needed for the nature-based solution was significantly higher (27 per cent) than the grey infrastructure approach (often the reverse is true). If the decision had been made only on the cost and flood mitigation benefits the sand dyke would not have been constructed. However, analysis demonstrated the relatively short payback period in services provided and the significant increase in ongoing benefits. This was true even without quantifying the recreational and health benefits to the community in monetary terms. Even though there are challenges in precise quantifications, as evidenced by the fact that the relative annual benefits are anywhere from three to seven times higher, it still proved beyond doubt the benefits outweighed the higher initial investment required.

China

Sponge City Initiative

China is a leader in using NPDRRS to deal with flood risk.

The World Bank (2023) ranks China as among the world's most highly exposed countries to floods. It is estimated that 1 per cent of gross domestic product is lost on average each year due to floods, with more than 640 cities subject to flood risks. Over two thirds of China's population (67 per cent) live in flood prone areas.

In response, China has been developing a continuum of grey, green and blue solutions to build resilience, develop sustainable adaptations and improve disaster risk management.

As part of this, the Sponge City Initiative was introduced in 2014 that integrates:

- Green spaces
- Blue systems like wetlands
- Conventional grey infrastructure such as concrete embankments.

The aim is to turn 80 per cent of urban areas into sponge-like surfaces to address surface flooding, while also enhancing water conservation and improving environmental quality.

Scaling up the Sponge City Initiative requires an estimated $1 trillion – and this is why there has been focus on monetising the benefits and future returns for sustainable financing. This could include the establishment of special project vehicles that can issue dedicated bonds.

There could also be opportunities to better leverage increased property values associated within the improved urban environment, such as linking floor ratio requirements to investment commitments in nature-based solutions.

This case study is an example of the possibility of moving from piloting to true scale with NPDRRS and how grey, blue and green infrastructure can be deployed in a complementary manner to enhance outcomes.

Green firebreaks

Green firebreaks are strips of low-flammability vegetation grown at strategic locations in the landscape. China has planted over 364,000 kilometres of green firebreaks and planned a further 167,000 kilometres before 2025, leading the world in the approach, having also invested in research on their efficacy and guidelines to support this.

Through this research China has an extensive evidence base for understanding which species have proven effective in stopping the spread of fire. It has found that the green firebreaks implemented were highly effective in stopping the spread of fires they interacted with.

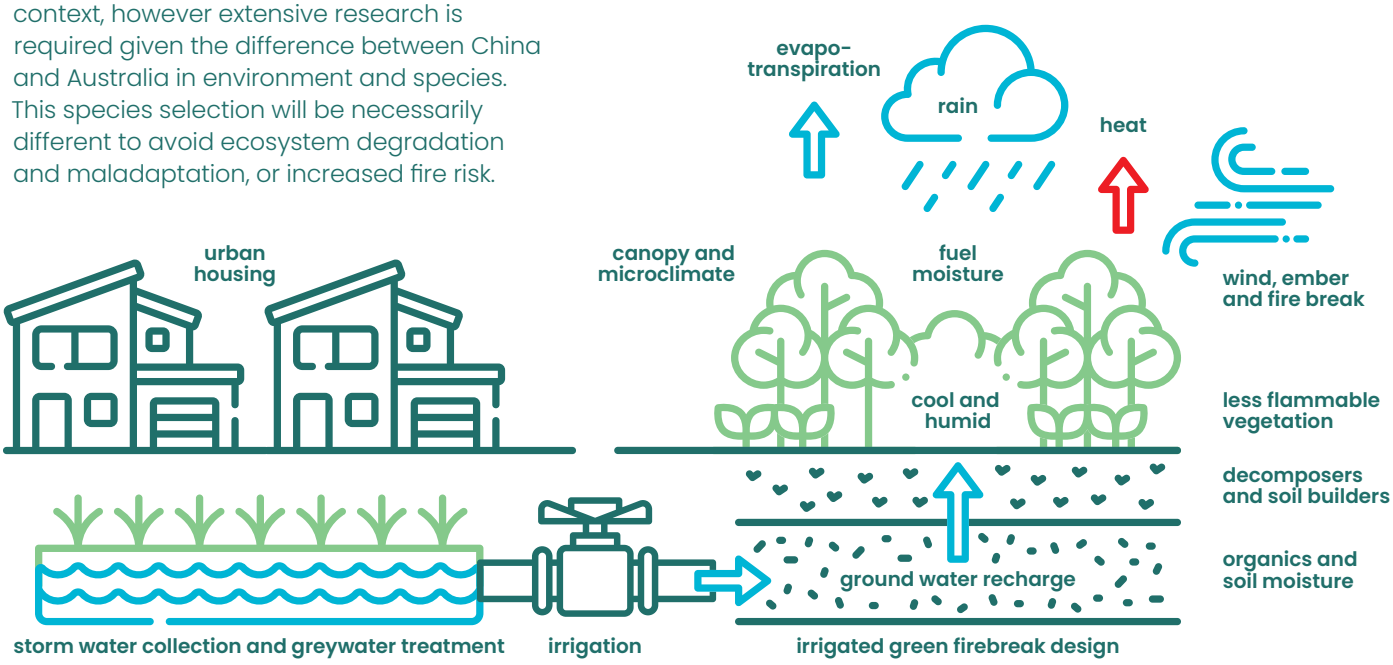
The research also suggests that green firebreaks have lower maintenance costs than common fuel breaks, are at least as effective, and can enhance biodiversity, though the latter requires careful site and species selection.

The level of investment in on-the-ground planting has been matched by research into fire-resistant tree species. The approach has also been refined to provide additional co-benefits to communities through the inclusion of edible species of plants in the firebreaks.

The research indicates significant promise for the approach to support biodiversity, while reducing bushfire risk in the Australian context, however extensive research is required given the difference between China and Australia in environment and species. This species selection will be necessarily different to avoid ecosystem degradation and maladaptation, or increased fire risk.

Research is underway in Australia, with green firebreaks irrigated at the wildland-urban interface, to reduce the potential of vegetation becoming fuel. Combining low-flammability species and ecosystems, with stormwater and greywater, predicted extremes of heat and drought are locally reduced, bushfires mitigated and co-benefits generated. Initial research by Jady Smith (University of the Sunshine Coast and Natural Hazards Research Australia) conducted in Noosa Shire, Queensland, shows that irrigated green firebreaks can complement bushfire management approaches by altering fuels and increasing moisture. A fire spread scenario on riparian green firebreaks in Noosa showed reduced bushfire spread by nearly two-thirds, however, the remaining area had no affects, and a reduced area had the potential for impacts. Further research is required, however bushfire mitigation at the wildland-urban interface, combined with potential biodiversity and carbon benefits, makes irrigated green firebreaks a consideration for nature-positive disaster risk reduction in Australia.

Below: Irrigated green firebreak design.
Concept: Jady Smith



United Kingdom

National Flood Management Program

The UK is undertaking a pilot program in NPDRRS to build community understanding.

Between 2017 and 2021, the UK Environment Agency supported a pilot program which sought to reduce flooding and coastal erosion while enhancing biodiversity by protecting, restoring and emulating the natural processes of catchments, rivers, coasts and floodplains.

With a small budget of £15 million, the pilot supported over 60 projects at the community and catchment level, many of which were proposed by community groups and NGOs. Project partners included river and wildlife trusts, local authorities, universities, local businesses, landowners, the Forestry Commission and Natural England.

The post-pilot evaluation suggested:

- **Allowing time for engagement is critical:** Taking a collaborative approach led to strong ownership. On average it took 12 to 18 months to reach agreement with landowners who had the relevant flood management infrastructure and/or natural features on their property.
- **Risk reduction modelling challenges need to be addressed:** It was more difficult to model the risk reduction impact of NPDRRS compared with more conventional 'grey' disaster risk reduction solutions. Benefits were also seen to take longer to emerge and the maintenance profile was also seen to be less clear. Despite this, the pilots provide strong practical guide for assessing future projects which have been gathered to develop an evidence directory.
- **Combining green and grey:** As with the Sponge City Initiative in China (see page 14), the pilots also found their benefits in deploying NPDRRS in combination with conventional 'grey' disaster risk reduction solutions.

The pilot was renewed in February 2024 with £25 million of additional investment and broader eligibility for funding. A National Flood Management Benefits Tool that allows the assessment of a broader set of benefits of NPDRRS is being prepared.

This highlights the value of pilot approaches to build confidence in NPDRRS and the challenges of taking them to scale as the funding amount is still relatively small in relation to the UK's overall budget for flood defence.

Framework for nature markets

In March 2023, the then UK Secretary of State for Environment, Food and Rural Affairs, the Rt Hon Thérèse Coffey MP, released a discussion paper on a framework for nature markets aimed at scaling up private investment in nature recovery and sustainable farming. The paper notes:

> *"Nature markets enable private investment in nature, through creating units or credits that can be bought and sold.*
>
> *"For investment in nature markets to grow, participants need to have clarity and confidence in the principles and standards that should be used to structure investments.*
>
> *"Clarity is also needed on the governance arrangements to ensure that these new, emerging markets will operate transparently and deliver benefits for nature, the economy, and local communities.*
>
> *"For this purpose, the UK Government will enter a new arrangement with the British Standards Institution to develop a suite of high-integrity nature investment standards. These will enable new markets to develop and emerging markets to scale up and operate soundly."*

United States

Beaver-based restoration

In the US, research has revealed that the impacts of bushfires are significantly reduced in areas that containing beaver populations building dams.

Beavers have played a critical role in the creation and maintenance of wetlands, and with their numbers reduced due to settler fur-hunting in previous centuries leading to soil erosion and reduced groundwater retention. Ultimately, this has led to increased flooding in spring and increased dryness and fire risk in summer, with a higher risk of bushfires and even megafires.

The research showed the level of burning in the areas with beaver dams was significantly lower in areas of megafires than those that had less or no beaver dams. Secondary benefits were also suggested, including better postfire ecosystem health, water quality and biodiversity.

This has led land managers to adopt 'beaver-based restoration' approaches which include the construction of beaver dam analogues. These beaver dam analogues help to restore critical wetlands in a cost-effective way by replicating the form and function of beaver dams using simple materials such as wood posts and willows. These can both restore wetlands and encourage the return and/or thriving of beaver communities.

In Colorado, 316 beaver dam analogues were constructed, largely by volunteers, in just two years, leading to 45 hectares or restored wetland and significantly reduce fire risk. This highlights that NPDRRS has a greater capacity than grey infrastructure to be community-led and maintained.

Monitoring the impacts of beaver dam analogues and beaver rewilding is still time intensive but NASA have been engaged to explore how freely available satellite imagery can be used by stakeholders to monitor and evaluate the impact of interventions.

Aside from highlighting the critical role that ecosystems play in supporting resilient communities, and the role communities can play in their implementation, this case study shows how we can use existing tools in a new way to understand the impacts of NPDRRS and create confidence for investment.

US White House report on nature-based solutions

In November 2022, the White House Council on Environmental Quality, Office of Domestic Climate Policy and Office of Science and Technology Policy prepared a report on opportunities to accelerate nature-based solutions. This found that nature-based solutions are known to be highly effective and create multiple benefits (including improving human, economic and ecosystem health) and can often come at lower cost than conventional alternatives and compatible with existing technology. But are not adopted at scale and the pace as they could be and are urgently needed to be.

The following recommendations were made for the Presidential National Climate Taskforce:

- **Updated cost benefit analysis guidance:** Agencies should update policies to make it easier to use nature-based solutions, including by updating benefit cost and accounting guidance. Natural hazard reduction standards, insurance standards, guidance and risk management tools should be established or updated to pave the way for nature-based solutions such as restoring rivers and floodplains.
- **Funding:** Federal agencies should integrate nature-based solutions into financial assistance and incentive programs. The Biden-Harris administration has guided agencies to use infrastructure funding to support nature-based solutions.
- **Lead with federal facilities and assets:** Federal agencies have focused efforts to improve resilience in their facilities and assets, but there are opportunities to do more by expanding green stormwater infrastructure, green roofs, living shorelines and nature-based solutions more generally.
- **Training a nature-based solutions workforce:** This would assist with planning, designing, building and maintaining nature-based solutions.
- **Building research in nature-based solutions:** Evidence of effectiveness of nature-based solutions is needed.

Fiji

Restoration of mangroves for livelihoods

Like many Pacific Island countries, Fiji is highly exposed to the impacts of climate and will be impacted by rapid sea level rise and severe storms and cyclones as global temperatures increase. Mangroves have considerable potential to mitigate the impacts of extreme weather on coastal areas while capturing carbon (see page 10) and support food security. A meta-analysis on mangrove ecosystem service assessments conducted by the Vienna University of Technology showed that a hectare of mangroves is estimated to provide an average of $21,100 USD of value per annum in ecosystem services.

This Kiwa project sought to sustainably manage and restore mangroves at three key sites in Vanua Levu where communities have reported extensive coastal erosion due to sea level rise, with one community, Ravirai, regularly inundated during spring tides. All communities in the area were decimated by the impacts of Cyclone Yasa in 2020.

This project followed a call to action from communities experiencing inundation while mangroves were being cleared by external actors for wood, eroding the population of crab, shellfish and juvenile fish that the areas hosted and are critical to food security.

Since project inception, the replanting of mangroves has led a to a substantial increase in the population of fish and crab species that are critical to livelihoods in the region. Some species that had been absent from the area for 30 years have now returned.

This mirrors the success of other mangrove restoration projects in countries such as Sri Lanka and Indonesia, both of which were significantly affected by the 2004 Indian Ocean tsunami. The communities that were surrounded by dense mangroves and scrub forest were shown to have been significantly less impacted by the tsunami, with mangroves absorbing 70 to 90 per cent of a wave's energy. Biodiversity has increased considerably too, providing communities with food and income.

Australian context

Regulatory developments, plans and practices

	Private & Not-for-Profit	Public Sector
Disaster Risk Reduction	First Nations Cultural Burning Infrastructure Resilience	National Emergency Management Agency (NEMA) Disaster Ready Fund (DRF) NSW Disaster Mitigation Plan
Emissions Reductions	Green bonds Nature Repair Market Mandatory climate-related financial disclosures	Environment Restoration Fund Communities Investment Program
Biodiversity Restoration	Nature Positive Development Micro Forests Agricultural Practices Taskforce on Nature-related Financial Disclosures (TNFD)	Environment Restoration Fund

Developments in disaster risk reduction

- The National Emergency Management Agency (NEMA) Disaster Ready Fund is the Australian Government's flagship initiative for disaster resilience and risk reduction. It is providing up to one billion dollars over five years from 1 July 2023. The funding supports projects that address the physical and social impacts of disasters on our communities. Disasters include those caused by climate change and other natural hazards.
- The NSW Reconstruction Authority's 2024 Disaster Mitigation Plan recommends establishing a nature-based measures knowledge hub to provide practical advice on the implementation, benefits and impacts of nature-based measures, with an emphasis on Indigenous knowledge and land management practices, alongside catchment management approaches.
- The federal Department of Climate Change, Energy, the Environment and Water is currently developing a new National Adaptation Plan. With this update there is an opportunity to make NPDRRS a central pillar of Australia's adaptation programs.
- **First Nations cultural burning:** There is growing recognition that cultural burning and other traditions safeguarded by First Nations communities in Australia and other parts of the world can be seen as NPDRRS.
- **Urban development:** Multiple cities and towns in Australia are exploring how to mitigate natural hazard risk of heatwaves and floods, enhance community and personal wellbeing and restore biodiversity through urban agriculture and re-greening initiatives such as the Living Melbourne Strategy (see page 30). The Australian Government's Draft National Urban Policy for Australia also recognises an important role for nature-based solutions in supporting the resilience of Australia's cities, while supporting human wellbeing more broadly.
- **Agricultural practices:** In the pursuit of managing floodwaters, coastal inundation and severe wind, the agricultural sector is exploring how farm design and practice can support risk mitigation while enhancing biodiversity outcomes and community safety in rural and remote areas. Soil carbon storage initiatives, which seek to enhance the level of carbon stored in agricultural soils, also have the potential to increase water storage and prevent the obstruction of stormwater infrastructure.

First Nations cultural burning and leadership

First Nations cultural burning has a deep history of NPDRRS. Australia's First Nations people have lived in Australia since time immemorial and have used cultural burning to manage the landscape. Small, controlled fires managed by First Nations communities can help regenerate vegetation – many species like finches and marsupials are said to rely on these small, controlled burns to create the right mix of habitat for them to survive.

With colonisation, many First Nations communities were displaced from their Country and constrained from practicing their culture meaning they were unable to care for Country with fire. This has led to increasing fuel loads which are a risk to communities and biodiversity alike.

Cultural burning has increasingly been recognised as critically important to protecting and restoring biodiversity and mitigating bushfire risk. Cultural burning practices have been reintroduced in northern Australia at a large scale and saw the amount of land destroyed by bushfire more than halve between 2000-2019.

The programs implemented in northern Australia have demonstrated the potential for cultural burning to restore biodiversity, manage bushfire risk and reduce carbon emissions through the reduction of bushfire using cool mosaic burns. However, it has been recognised that far more needs to be done to support First Nations practice and leadership to care for Country across Australia.

The CSIRO technical report on Climate and Disaster Resilience makes the need to "enhance and build Indigenous leadership in cultural burning and land management" a core priority through government support and recognises the need to keep growing First Nations' practices.

In recognition of the critical importance of supporting cultural burning practice, NEMA is investing $6 million in the second round of the Disaster Ready Fund to the Good Fire Gathering project. This focuses on cultural fire pathways to share knowledge and practices that enhance resilience, adaptive capacity and preparedness, through Caring for Country by communities at risk or impacted by natural hazards. It enables systemic risk reduction through cultural and social connections for cooperative community-led actions and planning.

Left: Cultural burning has many environmental and cultural benefits. Photo: Kat Haynes

Recent developments: Emissions reduction and biodiversity restoration

Australian Government Green Bonds

Australian Government Green Bonds were announced by the federal Treasurer Jim Chalmers in December 2022 as part of the Government's Sustainable Finance Strategy. This could provide a source of financing for NPDRRS.

The Australian Office of Financial Management (AOFM) released a Green Bond Framework in December 2023. This framework aims to encourage investors from around the world to back government-supported projects in Australia which contribute to climate change mitigation, climate change adaptation and improved environmental outcomes. In June 2024 the Australian Government released an inaugural green bond of $7 billion.

The AOFM is responsible for bond issuance with an amount equal to the proceeds raised from green bonds to be earmarked for Eligible Green Expenditures.

Annual allocation and impact reports will be provided on projects funded.

Eligible Green Expenditures must align with one or more of the Australian Government's three key green goals:

- climate change mitigation
- climate change adaptation – this includes activities to manage the physical impacts of climate change, adapt to climate impacts and build climate resilience, and increase adaptive capacity and/or preparedness to minimise potential impact of natural hazards created or exacerbated by climate change
- improved environmental outcomes:
  - Environmentally sustainable management of living natural resources and land use
  - Biodiversity conversation (terrestrial and aquatic)
  - Sustainable water and wastewater management.

NPDRRS has the potential to align with all three key goals. Critically, they can provide funding streams for First Nations and other community leaders to support NPDRRS.

An Australian nature repair market

The nature repair market will aim to allow all landholders including First Nations people, conservation groups, corporations, governments and farmers to undertake projects to enhance or protect existing habitat or establish or restore habitat. This could be another source of financing for NPDRRS.

The Nature Repair Act 2023 came into effect on 15 December 2023, with the Clean Energy Regulator (CER) currently aiming for the market to open in 2025. The CER is currently establishing systems and processes necessary for the effective operation of the market.

The nature repair market will work as follows:

- Projects will be allowed to be carried out on land, inland waterways (lakes and rivers) or in marine and coastal environments (within 12 nautical miles of the low water mark).
- Biodiversity certificates will be issued for these projects and subsequently traded, allowing businesses, governments and individuals to invest in nature repair projects without the need for land ownership or direct project involvement.
- There will be biodiversity integrity standards to ensure that projects deliver genuine improvements in nature and that there will be reliable information about those improvements for investors purchasing biodiversity certificates.
- Public register of projects will be established to ensure transparency, accountability and public availability of information.
- The CER will have a broad range of monitoring, compliance and enforcement power to ensure that projects are being properly conducted.

We understand that the nature repair market may not currently allow disaster risk reduction as potential 'secondary' benefit to be recognised. Stakeholders have suggested this could be one approach for the nature repair market to achieve ecological and emissions targets, while also capturing spillover benefits for resilience.

Evidence for blue carbon markets

Blue carbon is a term that recognises the ability of mangrove, tidal marsh and seagrass supporting environments to capture and store carbon in the soil, plants, or roots at a rate 30-50 times greater than terrestrial forests. These ecosystems are also important breeding grounds for commercial and threatened species.

Importantly, blue carbon initiatives can reduce the risk of storm surges and coastal inundation, with an estimated $29.6 billion of cyclone damage averted in Australia between 1967 and 2016 due to wetlands, according to research conducted by a team of US researchers working with the Australian National University Crawford School of Public Policy. This example shows that protecting and restoring mangroves and other environments has considerable potential to restore biodiversity, store carbon and improve the resilience of coastal communities. Given this the Australian government is providing direct funding for blue carbon projects, research, methods of generating carbon credits against blue carbon storage, blue carbon accounting and an accelerator fund for the broader region.

Global taskforce on nature-related financial disclosures

The Taskforce on Nature-related Financial Disclosures (TNFD) aims to create a global framework to help organisations manage and disclosure their nature related risks and opportunities.

Its recommendations of September 2023 were looking to integrate nature-related risk assessment into corporate strategy, governance and decision-making processes; alongside supporting more informed capital market decisions for investors and financial institutions. This could influence how private investors approach NPDRRS.

Key insights in Australia

Reviewing investments in nature-based solutions for flood mitigation

NEMA reviewed its progress in supporting the implementation of nature-based solutions to drive the long-term resilience of flood affected communities. NEMA shared this knowledge at the Australian Disaster Resilience Conference 2024.This review looked at how NEMA was creating an enabling environment for strengthening the use of nature-based solutions across three dimensions:

- **Providing access to finance:** NEMA has invested over $13 million in five nature-based projects across four programs, delivered in New South Wales, Victoria and Queensland. Qualitative analysis of project planning documentation identified four primary themes: revegetation, regeneration, river restoration and floodplain restoration. NEMA is also ensuring enduring investment for nature-based solutions through the Disaster Ready Fund. Funding Guidelines for Round One and Round two explicitly reference nature-based solutions as eligible projects under Stream One: Systemic risk reduction.
- **Supportive policy and establishing a link to implementation:** The Second National Action Plan to implement the National Disaster Risk Reduction Framework defines national policy provisions for nature-based solutions, within areas of coastal, river and urban flooding. NEMA is also funding a multi-disciplinary team at the Australian National University who are partnering with communities to develop the first Australian guidelines on nature-based solutions for flood mitigation and resilience.
- **Connecting local action to national policy:** All nature-based projects funded through NEMA are being delivered in partnership across state government, local government and community organisations. Two of these projects are delivered in partnership with Indigenous not-for-profit organisations, recognising the important role Indigenous cultural land management practices play in maintaining healthy landscapes.

This highlights strong federal support for NPDRRS to reduce flood risk, with lessons to be learned for the effect NPDRRS can have in mitigating risk from other hazards such as bushfire and severe weather.

While NPDRRS is still a new concept in Australia, the industry is becoming more aware of the concept and discussions are commencing. In October 2023, the Insurance Council of Australia commissioned a report from Ernest & Young Australia that notes that investing in nature can be a highly effective resilience measure in the face of climate change, and that targets and regulatory requirements are evolving to support positive action on nature. A follow up report in 2024 highlighted the roles insurers can play, including reducing premiums, when households and communities implement NPDRRS. It cited a case study in California where accounting for ecological forestry in insurance pricing would reduce premiums 41 per cent in nearby communities.

At the 2023 Australian Disaster Resilience Conference a joint presentation by the University of Queensland and Finity Consulting highlighted the critical role insurers can play in sustainable financing mechanisms for coastal ecosystems. Insurance of wetlands and mangroves will be critical to the establishment of a thriving blue carbon market.

Thinking 'beyond fire' in applying First Nations knowledges

It should be noted that First Nations knowledges of NPDRRS are not limited to fire, but extend to all hazards. First Nations Peoples are being engaged accordingly on a range of hazards. One example is the Indigenous 'Heal the Rivers' project, led by the Jagun Alliance and funded for three years through NEMA's Disaster Ready Fund. The Heal the Rivers project aims to restore cultural landscapes while implementing nature-based solutions for flood mitigation and adaptation throughout the northern rivers region of NSW.

As a principle, First Nations stakeholders should play a leading role in decision-making on NPDRRS as custodians of Country and knowledge-holders of what care for Country means in context.

Case study

Cultural burning on Minjerribah (North Stradbroke Island)

In January 2014, 80 per cent of Minjerribah's (North Stradbroke Island, Queensland) terrestrial landscape was burnt by bushfire, affecting over 150 cultural sites.

Subsequently Quandamooka Yoolooburrabee Aboriginal Corporation (QYAC) advocated to multiple levels of government for the need to better manage fire on the island to reduce risk to culture and community, and the role that traditional Quandamooka land practices could and should play.

QYAC formed a Memorandum of Understanding with the Queensland Reconstruction Authority to develop strategies to better manage fuel loads around the townships on the island.

The resulting Minjerribah Township Fire Management Strategy integrated modern disaster management approaches with traditional cultural burning practices.

These strategies have reduces fuel load and mitigated natural hazard risk to townships on the island, while also restoring the health of ecosystems. The integrity of the ecosystem communities on the island reduced significantly due to the disruption in cultural fire practice by colonisation, which lead a to a proliferation of species that increase fire risk.

The strategy was developed by QYAC and complemented the Naree Budjong Djara National Park fire management strategy, developed with Queensland Parks and Wildlife Services, to produce a plan that covers all tenures on the island with support from all land management agencies and the then Queensland Fire and Emergency Services.

QYAC now has 25 Quandmooka rangers implementing the strategy and have been recognised by both the Resilient Australia Awards and Queensland Inspector General of Emergency Management as exemplars of cooperative community-led fire management.

QYAC are also actively involved in incident management during bushfires to advise on protection strategies and help target resources in a manner that helps preserve the integrity of the ecosystem and cultural sites.

Acknowledging ecological thematic strengths in research, policies and guidelines

A preliminary review of the Australian Institute of Disaster Risk Reduction (AIDR) existing guidelines, policies and contemporary research in relation to ecological disaster risk reduction revealed a series of themes:

Balancing the extent to which ecological outcomes are prioritised: Ecosystem interventions are one part of disaster risk reduction and resilience and need to be coupled with other interventions. However, ecological interventions should be integrated with sustainable development at the earliest stages and throughout the development cycle.

Co-benefits: These were evident in the literature where incorporating ecological outcomes provided benefits beyond disaster risk reduction. These benefits should be considered as part of the value of preserving and enhancing ecological systems. This includes a greater depth of ecosystems with improved soils, water and multi-layered ecological environments; preserving habitat; maintaining ecological processes; recreation opportunities; visual and emotional benefits for the community.

Preservation of ecosystem functions leading to better outcomes: The best outcomes are achieved by retaining ecosystem functioning rather than trying to re-establish ecosystems.

Communities are central: The role of the community should be promoted as many communities have a strong desire to retain and improve ecological functions. For many people, the definition of 'home' can include the landscape and environment, meaning people have a vested interest in positive outcomes. Additionally, local knowledge can significantly assist with understanding high-risk hazards and how to increase resilience. The important roles of community in risk reduction are also recognised in the Sendai Framework Guiding Principle of 'Empowerment of local authorities and communities through resources, incentives and decision-making responsibilities as appropriate'.

Appreciating local government knowledge regarding urban solutions

Case study

Committee for Sydney Report

The Committee for Sydney's 2023 report on nature-based solutions provides useful insights into how NPDRRS could operate within an urban setting. Its recommendations include:

- Establishing education and awareness programs for communities including Indigenous knowledge.
- Establishing a Centre for Urban and Indigenous Ecology.
- Setting targets for living infrastructure (at the metropolitan and local government levels) and bringing together key metrics to monitor and review progress. The report notes that these measures need to go beyond input measures like dollars invested, or output measures like the number of trees planted, shifting towards measures that reflect the change we want to see and the impact we want to have on the future of our cities.
- Introducing a green factor tool to incentivise living infrastructure in new approvals – residential, commercial and industrial.
- Establishing a living infrastructure fund that covers upfront capital costs and ongoing maintenance expenses for living infrastructure. Funding could be derived from either a living infrastructure rate levied on all ratepayers (like the current waste levy) or a percentage of funding from (grey) asset recycling to (green) living infrastructure.
- Adopting a framework for valuing living infrastructure in major infrastructure projects – noting that there is currently no economic quantification of the benefits that living infrastructure can provide to air quality, reduced heat, social cohesion and biodiversity.
- Managing living infrastructure as an asset class.
- Embedding living infrastructure outcomes in public sector procurement systems.

Case study

Living Melbourne Strategy

The Living Melbourne Strategy was developed to create a roadmap, leading up to 2060, with a vision to create an urban forest where Melbourne's "thriving communities are resilient, connected through nature". It seeks to support human health through protecting and extending habitat connectivity, enhancing biodiversity in Melbourne while mitigating the impacts of extreme heat, drought and reducing flood risk. Increasing urban canopy is critical to this, providing a cooling effect while reducing run off.

The strategy sets out six key actions to support this initiative including:

- **Protect and restore species habitat**
- **Set targets and track progress:** Especially for increasing urban canopy and understory
- **Scale up greening in the private realm:** Incentives for landholders to adopt greening strategies and stronger regulation to protect existing canopy trees
- **Collaborate across sectors and regions:** Includes engagement of all levels of government, community and the private sector
- **Build a toolkit of resources to underpin implementation:** Aimed at enabling government and private sector practitioners with resources to implement measures consistent with the strategy
- **Fund the protection and enhancement of the urban forest:** Establishing targeted grants to support innovation while establishing long-term financing for the strategy.

The strategy set was developed in collaboration with Melbourne's 32 local government authorities, Victorian government departments and statutory agencies, technical experts, land managers, policymakers, planners, developers and community representatives.

The strategy was launched in 2019, and an implementation plan was again developed collaboratively and finalised in February 2020. The implementation of the plan places community and private sector engagement as critical components of success. The strategy is still in the early stages of implementation.

Other cities and initiatives

Other cities have similar initiatives – Adelaide has Green Adelaide which developed a Regional Landscape Plan, aiming to create a cooler, greener, wilder and climate resilient Adelaide that celebrates its unique culture. Green Adelaide focuses heavily on greening, ecosystem restoration and restoring the practices of the Kaurna people as traditional custodians of the land, and was developed with local councils, government agencies, the environmental sector, industry peak bodies and a Kaurna advisory group.

Considerations for action

Framing questions for further discussion

Project selection	Project financing	Insurance coverage	First Nations and community consultations
How do we make appropriate decisions on whether to invest or not into a NPDRRS project from: → A disaster risk reduction perspective e.g., when making investment decisions for the Disaster Ready Fund – between NPDRRS and 'grey' disaster risk reduction solutions? → A nature positive investment perspective e.g., when engaging in projects registered for the nature repair market – between NPDRRS and other nature-based solutions? → An understanding of the uncertainty of how NPDRRS will perform in the context of a rapidly changing climate?	How do we get appropriate funding for a NPDRRS project – whether from: → Governments – e.g., through the Disaster Ready Fund, or from the proceeds of the Australian Government's Green Bonds? → Private sector investors purchasing nature repair markett biodiversity certificates? → Other investments by private sector entities to meet their emissions reduction-related environmental, social and governance outcomes or nature targets? → Other investments for philanthropic purpose? → Other investments for commercial purposes – e.g., to improve supply chain resilience or investment into tourism opportunities?	How do we get appropriate private insurance coverage to support: → The implementation of NPDRRS? → The ongoing value provided by climate exposed NPDRRS that may have been invested in through the nature repair market or blue carbon markets?	How do we support First Nations and community leadership in decision-making on whether to invest or not into a NPDRRS project? How do we balance place-based community-led NPDRRS with the need to consider the cumulative effects and interactions of NPDRRS and grey infrastructure across broader systems (e.g. catchments)?

Public policy considerations: what can governments do?

Project selection	Project financing	Insurance coverage	First Nations and community consultations
Blue and green infrastructure is already eligible for the Disaster Ready Fund. Following the Independent Review of Commonwealth Disaster Funding led by Andrew Colvin AO APM, there is an opportunity for investment guidelines to better consider environmental and ecological considerations as well as the social, economic and engineering impact of a project. This could make it easier for NPDRRS to be considered as part of a spectrum of resilience options. Further work on metrics which could better capture these environmental and ecological considerations would also be useful alongside economic and social dimensions. Stakeholders have suggested the Australian Government could consider allowing disaster risk reduction to be recognised as a potential secondary benefit in the nature repair market; this could be one approach for the nature repair market to achieve ecological and emissions targets while also capturing spillover benefits for resilience.	Further consideration of how government funding could appropriately complement private sector funding into NPDRRS, rather than crowding out private investments into projects that would otherwise have attracted private investments for environmental, social and governance outcomes, philanthropic or commercial reasons. For example, this may mean that government focuses instead on other NPDRRS projects – e.g., wetland solutions that may have limited tourism potential given geographical remoteness, but may have high value for local communities and the environment.	Further consideration of risk management guidelines for NPDRRS activities which would provide greater assurance to insurance about risks and steps that will be taken to mitigate those risks. Prescribed burning is a good example of a NPDRRS which has benefited from significant progress made in risk management guidelines.	Given the potential environmental, ecological, social and economic impact of NPDRRS, it should go without saying that decisions on whether to invest or not in a project would be made only with strong community engagement and empowerment. Further consideration should also be given to rules that apply to communities with long established First Nations practices that can be categorised as NPDRRS. Where such practices exist, we should consider whether they should be adopted as a default proposition unless there were sound environmental, ecological, social, or engineering reasons to consider alternative approaches. Furthermore, the priority should be to support First Nations decision-making and implementation of these projects so that Indigenous cultural intellectual property is respected.

Investment guidelines that could allow NPDRRS to be considered

Framework	Application	Strengths	Challenges
Cost effectiveness analysis	Identifying lowest cost option to achieve given risk level	Does not require assessment of benefits and is analytically less complex	Limited applicability given the multi-benefit nature of NPDRRS and challenges of establishing identical risk levels across options
Cost benefit analysis	Estimates societal net benefit of options in monetary units	Rigorous framework for directly comparing benefits and costs	Requires all costs and benefits to be quantified in monetary terms; important other objectives (non-monetary) may be omitted
Multicriteria analysis	Ranks alternative options	Allows inclusion of qualitative effects and plural values	Potentially relies on the subjective judgement of the analytical team
Addressing uncertainty	Incorporates deep uncertainties in evaluation of options	Addresses unquantified uncertainties	Requires technical modelling expertise

Potential frameworks and considerations (World Bank, 2023)

Investment guidelines that take environmental, ecological, social, economic and engineering aspects of a project could take many forms. However, it is more likely to be difficult for multiple factors to be considered under frameworks such as cost-effective analyses – which focus on identifying the lower cost option to achieve a given risk level. It may be more likely when multiple variables can be incorporated under multicriteria analyses, although in this scenario relying on rankings of alternative options, rather than a cost-benefit ratio, may be required. It also potentially relies on the subjective judgement of the analyst and may be more easily disputed.

Possible principles for valuing NPDRRS

Principle 1: Value both risk reduction and other benefits

Given NPDRRS provide multiple advantages, other benefits such as biodiversity and livelihoods are a critical part of the value proposition.

Principle 2: Local ownership and engagement

Engage stakeholders to scope locally relevant benefits of NPDRRS given that benefits are context specific – i.e., value and socioeconomic importance of NPDRRS varies from place to place. As an example, river floodplains may benefit one community as space for agricultural production, or as water storage to prevent flooding downstream.

Principle 3: Recognise and address uncertainty

Analytics based on historical climatic conditions may not serve as realistic projection of climatic projection of climatic conditions towards the end of a project's lifetime. Given this, projects and their benefits should be considered under a range of climate change scenarios.

Principle 4: Benefits assessment

Should inform project identification, design, implementation and impact evaluation.

Principle 5: Consider investments with a systems lens

NPDRRS often have longer term-impacts and lead-in times and can have perverse outcomes if not considered in context. Given this, it will be important to recognise benefits using a systems lens to pick up the range of short and long-term benefits while managing risk.

Principle 6: Informed by seasonality

Seasonality will considerably impact the performance of NPDRRS. Given this, investments should be informed by an understanding of how risk profile change over seasons. AFAC and its members from fire, land management and emergency services are well positioned to understand these patterns and cycles, and many of the historical datasets and forward-looking tools and collaborations that they rely upon could better inform broader awareness, national policies and preparedness, investment strategies and guidelines, and nature repair priorities.

Actionable ideas

Actionable idea 1

Recognise disaster risk reduction benefits in the design and prioritisation of nature positive investments

Investors including the Australian Government could consider further recognising and valuing the benefits for disaster risk reduction and climate change mitigation and adaptation in emergent nature positive policies, investments and mechanisms such as the nature repair market. Each would be holistic and long-term in focus. The design and implementation of these mechanisms would address the risk of maladaptive outcomes.

Comments

Progress has been made regarding the use of appropriate metrics for nature positive investments. There would be significant advantages to including secondary metrics for capturing the value of disaster risk reduction, in addition to climate change adaptation and mitigation. For example, recognising disaster risk reduction benefits would provide greater incentive and returns for private investment in nature repair and biodiversity certificates. It would also respond to the Independent Review of Commonwealth Disaster Funding which recommends that the Commonwealth should require all Australian Government departments and agencies to incorporate natural disaster risk reduction and resilience in department or agency strategic considerations. Ideally metrics relating to disaster risk reduction would value ongoing and longer-term benefits.

To support the design and prioritisation of disaster risk reduction metrics within nature positive investments, guidelines could be created to support longer-term and multi-agenda programs of work to accommodate the long window of return and interconnected benefits across biodiversity, climate and disaster risk reduction agendas.

The Australian Sustainable Finance Institute's sustainable finance taxonomy is an example of this, which could embed climate change adaptation and disaster risk reduction benefits to enhance its current focus on climate change mitigation.

Actionable idea 2

Enhance investment guidelines for disaster risk reduction initiatives to incentivise nature positive solutions

The Australian Government could consider further enhancing its investment guidelines to achieve nature positive outcomes from its investments into disaster risk reduction, As part of its response to the Independent Review of Commonwealth Disaster Funding, this would help to ensure a holistic spectrum of resilience options. The National Climate Risk Assessment and disaster risk profiles could also be leveraged to prioritise investments in NPDRRS.

Comments

Investment guidelines are increasingly balancing investment logic with an impact logic to ensure projects are equitable and provide genuine benefits to communities and the environment. Incentivising nature positive solutions within disaster risk reduction investment guidelines could make provision for the potentially high upfront and ongoing transaction costs to ensure consideration of the longer lead times and impact of investments. Considering the Independent Review of Commonwealth Disaster Funding, this could help to address current challenges with market-based solutions for environmental issues having perverse outcomes or minimal impact.

For example, Natural Hazards Research Australia is funding a flood risk mitigation research project that is working with stakeholders in Queensland and New South Wales to equip communities, government and industries with improved information and tools to implement nature-based solutions. Impact is being evaluated in consultation with local governments, catchment management authorities, state governments, natural resource management agencies and water utilities. Subsequent engagement tools and guidelines will communicate the impact logic for nature-based solutions in flood mitigation.

Actionable idea 3

Enable public-private partnerships in support of nature positive disaster risk reduction solutions

A review could be undertaken of how government funding could complement private sector funding in NPDRRS. The review would consider opportunities and ways to address current barriers in enabling public-private partnerships, alongside private investments into projects that attract private investments for environmental, social and governance outcomes, philanthropic and commercial reasons.

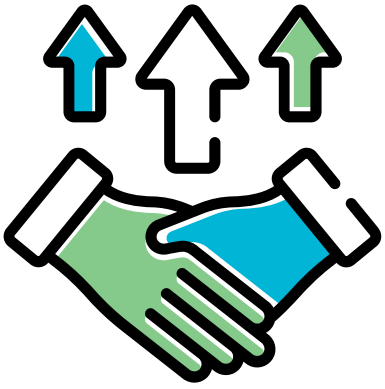
Comments

Federal, state and territory governments have a specific role to play in supporting investor confidence while ensuring that NPDRRS provide genuine outcomes.

The Australian Government's Strategy for Nature 2019-2030 positions the importance of public-private partnerships for helping to enhance biodiversity more broadly. This applies to NPDRRS, with half of Australia's land managed by farmers.

The Australian Government has announced an Agriculture Biodiversity Stewardship Package to foster environmental markets to increase private sector participation in delivering biodiversity outcomes. Similar packages could further enable the private sector to support NPDRRS, especially where the broader resilience and community benefits are clear and recognised.

There would also be a considerable benefit in enabling public-private and not-for-profit partnerships given that non-government organisations such as Landcare and the 54 natural resource management organisations in Australia have considerable experience with nature-based solutions and established partnerships and trust with communities.



Actionable idea 4

Undertake pilot studies to build confidence in, and efficacy of, nature positive disaster risk reduction solutions

Federal, state and territory governments could undertake additional pilot projects to provide greater learnings into the environmental, ecological, social, economic and engineering costs and benefits of NPDRRS.

Findings from these pilot projects could be synthesised to inform investment guidelines, policies and facilitate public-private partnerships.

Comments

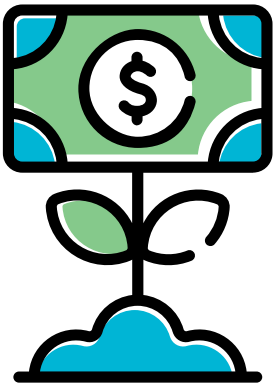
Considering the National Disaster Risk Reduction Framework, the National Climate Risk Assessment and Disaster Risk Profiles, pilot studies and projects could be prioritised based on hazards of greatest concern with consideration of the changing hazard profile due to climate change. Community-driven engagement would include exploring First Nations practices and leadership for decision-making and implementation.

Pilot studies and projects provide opportunities to design fit-for-purpose solutions that also build capability and capacity. For example in northern NSW, Richmond Landcare, partly funded by the Disaster Ready Fund, are exploring the role that NPDRRS can play in reducing flood and erosion risk in the Lismore catchment. Research and evaluation will be critical to ensure an effective knowledge base to inform decision makers.

Noting that some guidelines and supporting collateral already exists, pilot studies and projects can support the integration of evidence and practice into new or existing policies. The Independent Review of Commonwealth Disaster Funding reinforces the need for a:

- Risk-based and evidence-based approach to decision making
- Whole-of-community approach.

Pilot studies would enable an effective response to these recommendations. The insights generated could also be used to inform supporting resources such as a financing disaster risk reduction handbook, a case study library to further demonstrate the efficacy of solutions.



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