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## Policy pointers

**Researchers must** address the dearth of information on vulnerabilities, climate change and disaster risk in Chile to better understand the opportunities and limitations of EbA and Eco-DRR approaches.

**Government, private sector and civil society stakeholders** implementing NbS across all sectors and levels must continue to strengthen their Eco-DRR and EbA capacities.

**National and regional governments** must place greater value on ecosystems in terms of livelihood provision and resilience, integrating these issues into key policies and allocating funds accordingly.

**Sectors and institutions** must collaborate more deeply at all levels to further embed EbA and Eco-DRR in policy and practice. A stronger interface between science, practice and policy will support and scale up implementation.

## Using forest ecosystems to build resilience in Chile

Ecosystem-based adaptation (EbA) is an increasingly popular and tested strategy among governments looking for the best ways to help their people adapt to the challenges of climate change. The Ecosystems Protecting Infrastructure and Communities (EPIC) project in Chile promoted ecosystem-based disaster risk reduction (Eco-DRR) and EbA approaches, researching how nature-based solutions (NbS) build resilience and the protective role of native forests facing avalanches and landslides. Examining the experiences of the EPIC project, this briefing demonstrates how EbA can effectively tackle climate change and reduce the risks of disaster. It also explores some of the wider opportunities and challenges around local, regional and national policy, institutionalisation and capacity related to implementing EbA and Eco-DRR in Chile, proposing key steps for overcoming the challenges.

As EbA becomes a popular response to the linked challenges of climate change and sustainable development (see Box 1), it is useful to set out some criteria for assessing its effectiveness. To be effective, EbA projects should:<sup>1</sup>

1. Allow communities to improve their adaptive capacity or resilience and reduce their vulnerability to climate change while enhancing co-benefits that promote wellbeing
2. Restore, maintain or enhance ecosystems' capacity to continue to produce services for local communities, allowing ecosystems to withstand climate change impacts and other stressors, and
3. Be economically viable.

The joint IIED, IUCN and UN Environment-WCMC project — 'Ecosystem-based approaches to adaptation: strengthening the evidence and informing policy' — studied 13 initiatives around the world to learn more about the effectiveness and opportunities of EbA, its implementation

challenges and how to overcome them.<sup>2</sup> The EPIC project in Chile was one of these initiatives.<sup>3</sup>

### The EPIC project in Chile<sup>4,5</sup>

EPIC aimed to build community resilience by implementing and/or promoting nature-based solutions to DRR (see Box 1) and climate change adaptation through pilot projects in six countries. From 2012 to 2017, EPIC in Chile worked both nationally and in the Corredor Biológico Nevados de Chillán–Laguna del Laja Biosphere Reserve, which straddles the Biobío and newly established Ñuble regions.

The biosphere reserve, declared by UNESCO in 2011, extends over an area of 565,807 hectares. The reserve management seeks to reconcile biological conservation and cultural diversity with economic and social development.<sup>6</sup> The EPIC study site was in Las Trancas Valley (Pinto municipality), the most urbanised area of the reserve. Here, increasing temperatures and variable rainfall patterns associated with climate

change are melting glaciers and increasing avalanche and landslide risks, impacting skiing and tourism, the major sources of livelihoods.

## *Healthy forest ecosystems can play a crucial role in protecting infrastructure and communities from avalanche and landslide hazards*

The EPIC project did not work directly with communities. Instead, it worked with a range of local-, regional- and national-level stakeholders, including government officials engaged in reserve management, civil society, academics and

non-governmental organisations (NGOs).

Its overall goal was to promote the conservation of forest ecosystem services as an integral part of policies, strategies and programmes for DRR and climate change adaptation. In particular, it aimed to:

- Gather scientific evidence on ecosystems and their services to demonstrate the importance of sustainable forest ecosystem management for DRR and adaptation
- Strengthen capacities for, and communicate about the potential of, sustainable ecosystem management for DRR and adaptation, and
- Disseminate through multi-stakeholder platforms lessons learned and practical solutions that can be replicated or used to inform other programmes and public policies.

### Measuring effectiveness

We found that the stakeholders who participated in EPIC activities and the people living in Las Trancas Valley had improved their adaptive capacity and resilience and reduced their vulnerability. This means the EPIC project met the first criterion of EbA effectiveness: its activities helped improve community resilience and adaptive capacity and provided the basis for reducing vulnerability to disaster and climate change risks over the long term.

By bringing together and strengthening links between reserve management, civil society, NGOs and academics, the project increased stakeholders' capacities to identify current and future drivers of risk and vulnerability and improved their knowledge and collective learning. This strengthened local capacity to cope with

risks and provided opportunities for implementing DRR and adaptation measures in the future.

EPIC used avalanche modelling in Las Trancas Valley to quantify and optimise the value of mountain ecosystems for local risk reduction. It used tree-ring dating to reconstruct avalanche patterns over past decades and simulation models to determine different avalanche patterns — such as maximum run out distances and impact pressures — for the area's forests and other forest and non-forest scenarios. The study demonstrated the crucial role that healthy forest ecosystems can play in protecting infrastructure and communities from avalanches, falling rocks and landslide hazards.<sup>7</sup> By sharing the study results among project stakeholders, EPIC enhanced awareness of the relevance of NbS.

EPIC also carried out complementary studies on local perceptions of risk, climate change and ecosystem services, including water provision. Government officials have started to integrate EbA and lessons from EPIC into policies such as the Biosphere Reserve Management Plan, regional land-use plans and guidelines for ecological restoration, improving regional and reserve governance. EPIC is also named in the National Climate Change Adaptation Plan, as one of the 50 actions under the Plan's fourth objective.

Adopting participatory processes — such as consultations and workshops — has helped build adaptive capacity. For example, a workshop in Las Trancas Valley in 2013 brought together representatives from local and regional governments, research centres and universities, local business owners, national and local NGOs and local community representatives for a community-based analysis of vulnerability and adaptive capacities in relation to climate change. Several other spaces throughout the project facilitated discussion about opportunities and challenges for implementing NbS and the need for inter-sectoral and multi-territorial efforts. Social co-benefits have also emerged from the EPIC project, including improved social cohesiveness among public services staff and other stakeholders in the reserve and Pinto municipality.

Because EPIC did not implement any EbA or Eco-DRR activities on the ground, it had no direct effect on ecosystem resilience. But it did highlight the factors threatening local ecosystems and ecosystem service provision, and the project institutions and local stakeholders identified some possible activities to address these. So, it is probable that the EPIC project will lead to long-term improvements in ecosystem resilience and service provision, meeting the second criterion of EbA effectiveness. For example, EPIC recommendations to improve forest

### Box 1. What are EbA and Eco-DRR?

**EbA** uses biodiversity and ecosystem services to help people adapt to the adverse effects of climate change, forming part of an overall national strategy for adaptation.<sup>8</sup>

**Eco-DRR** is the sustainable management, conservation and restoration of ecosystems to reduce disaster risk to achieve sustainable and resilient development.<sup>9</sup>

management practices and increase tree cover or quality, together with capacity-building activities, could reduce avalanche and landslide risks. Project proposals for sustainable watershed management could also improve ecosystem service provision in the reserve and beyond to watershed level.

There could also be trade-offs in terms of who might benefit if measures alter where tourism activities such as skiing can take place, thus affecting the livelihoods of people who rely on these activities. Similarly, more careful water management in Las Trancas Valley could lead to potential trade-offs between upper and lower water users in the watershed. Synergies are possible, too — for example, as well as protecting people and infrastructure from risk, tree planting could improve downstream water provision. However, evidence on potential trade-offs and synergies is scarce.

### The economic case

Results from the project's avalanche modelling study suggest that appropriate afforestation could reduce the risks related to avalanches and landslides in Las Trancas.<sup>7</sup> The EPIC study did not compare the cost-effectiveness of Eco-DRR approaches and hard engineering solutions such as snow-retaining structures, so we cannot say whether it meets the third criterion of EbA effectiveness: economic viability. But evidence from an EPIC study suggests that healthy forests play a protective role in mountain ecosystems. So, as well as reducing the likelihood of damage to (and therefore the cost of repairing) infrastructure, it would reduce the need for expensive structural alternatives. Such risk reduction measures could create significant economic savings for local community members who provide private sector ski resort services and enhance their income from tourism. On the other hand, planting trees could limit the areas available for skiing and ski resort infrastructure and the associated economic benefits this could provide.

### Implementing EbA: enablers and challenges at local, regional and national levels

The EPIC project also generated lessons about a range of policy, institutional and capacity-related issues. Eco-DRR and EbA approaches are not widely used in Chile, so there is a need to enhance knowledge and experience of both concepts and map existing experiences. Local, regional and national authorities must make more information available on vulnerabilities, climate change and disaster risk at all levels, identifying NbS to address them. The EPIC project has done much to tackle this challenge, but more needs to

be done. Authorities should gather and share data from monitoring and modelling hazards such as avalanches, drought and wildfires as well as tourism levels. They must also develop a better understanding of the economic benefits and costs of EbA and Eco-DRR approaches and of NbS overall.

Technical capacity levels for implementing EbA and Eco-DRR are quite good in the biosphere reserve and in Chile in general. EPIC has contributed to this. But civil society, private sector, NGO and government capacity and technical skills for addressing vulnerabilities and climate change impacts and for reducing disaster risk could improve. For example, Pinto municipality lacks official land-use plans and regulations and local hazard maps.

Chile has strong government institutions dealing with DRR, adaptation and ecosystem management. Seizing these opportunities, EbA and Eco-DRR, and in general NbS, should be promoted and championed at all governmental levels. The government is developing a climate change law promoting engagement with stakeholders at various levels to ground climate change strategies and plans. At the local level, the institutionalisation of Eco-DRR and EbA approaches needs to be consolidated both in the biosphere reserve's planning and management processes and in the Pinto municipal regulatory plan to ensure maximising NbS benefits.

But government bodies and policies do not always prioritise and support EbA and Eco-DRR approaches; they need to further institutionalise and give policy support to climate change adaptation, Eco-DRR and EbA. For example, they should explicitly infuse ecosystem-based approaches into existing DRR and adaptation policies, strategies and plans. Some public service providers struggle to allocate funding to adaptation-related matters if their laws and policies do not explicitly identify climate change as a threat. And while international financial support could potentially fill these funding gaps, the public sector is currently unable to receive and include this support in its annual budgets. Lastly, perverse incentives can also undermine EbA and Eco-DRR efforts. For example, incentives to expand farming or industry can lead to deforestation.

Chile has established inter-institutional committees and arrangements for cross-sectoral coordination at national level, and various organisations were engaged in implementing the EPIC project at regional level. Locally, community cohesiveness has improved, as EPIC supported those involved in managing the biosphere reserve to work together to improve management.

Despite this, cross-sectoral and cross-institutional collaboration and coordination remains insufficient at all levels. At the national level, approaches to addressing DRR, adaptation and ecosystem management are often segregated. Limited skills and mandates in government institutions can make it difficult for them to support new ecosystem-based approaches. For example, the national office for managing emergencies and disasters, responsible for DRR in Chile, focuses on disaster response rather than prevention. Cross-sectoral institutional collaboration among the diverse public services operating in the Biobío Region is also inadequate. Public sector actors working in the reserve need to collaborate more with each other and with other actors, including those from the private sector. The National Forestry Corporation was only marginally involved with reserve management at the start of EPIC. And although this has changed, securing their involvement was challenging.

## Recommendations for overcoming challenges

**Increase information availability.** We need more information on vulnerabilities, climate change and disaster risk in Chile. Researchers must thoroughly document and analyse key hazards and their interactions with natural ecosystems and services.

**Build stakeholders' capacity.** A range of stakeholders in Chile need to build their Eco-DRR and EbA capacity. Those implementing NbS — including NGOs, international donors and academia — should take the lead on this, increasing their capacity to effectively implement adaptation plans using nature-based approaches.

**Institutionalise and give policy support to climate change adaptation, Eco-DRR and EbA.** National and regional development,

management and land planning strategies must prioritise these issues and allocate funds accordingly, by:

- Incorporating EbA and Eco-DRR into the National Territorial Planning Policy
- Updating the National Rural Development Policy to better incorporate protecting and restoring ecosystems, especially those that reduce risk from natural and anthropogenic threats such as fire
- Integrating lessons from the EPIC project into regional land-use plans, and
- Making ongoing government, private and civil society organisation funding available to ensure adaptation implementation and continuity.

**Deepen collaboration between sectors and institutions at all levels.** To further embed EbA and Eco-DRR in policies and practices, institutions and actors must coordinate and interact better within and across national, regional and municipal levels and sectors. This includes:

- Central government working effectively with subnational regional and municipal entities
- Cross-sectoral institutional collaboration between public, private sector and civil society actors and others working in the reserve, and
- Coordination between scientists, implementers and decision makers at all levels.

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## Knowledge Products

The International Institute for Environment and Development (IIED) promotes sustainable development, linking local priorities to global challenges.

The International Union for Conservation of Nature (IUCN) is a membership union composed of both government and civil society organisations. It harnesses the experience, resources and reach of its more than 1,300 member organisations and the input of more than 16,000 experts. The IUCN is the global authority on the status of the natural world and the measures needed to safeguard it.

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## Notes

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