Policy briefs: Economics, finance and governance of Nature-based Solutions for climate change adaptation and disaster risk management

ADAPT: Nature-based Solutions for Resilient Societies in the Western Balkans

IUCN ECARO

Policy Brief: Economics of Nature-based Solutions for climate change adaptation and disaster risk management

ADAPT: Nature-based Solutions for Resilient Societies in the Western Balkans

IUCN ECARO

Author:
Alexander Bisaro

Reviewers:
Mihaela Dragan-Lebovics, Kristin Meyer, Leander Raes

Key messages

- **Economic appraisal methods should be systematically applied when assessing NbS or hybrid projects.** NbS measures provide multiple co-benefits and often require lower cost to implement compared to many conventional measures to address climate change adaptation (CCA) or disaster risk reduction (DRR). Therefore, applying economic appraisal methods systematically is not only good practice for decision and policy-making in general, but should also provide a well-founded rationale for selecting NbS or hybrid solutions to address CCA and DRR.

- **Economic appraisal of NbS for CCA/DRR involves a number of different methods, and selecting appropriate methods is an essential task.** Selecting which economic appraisal method is appropriate to a specific CCA decisions depends on several factors. These factors generally include the time horizon of the options considered, the risk adversity of decision makers, and the knowledge (e.g. data availability) or uncertainty regarding future climate and outcomes of adaptation measures. Cost-benefit analysis methods are best applied when different options and outcomes can be formally modelled and converted to a single (monetary) metric in appraisal. For decisions that involve outcomes where it is not desirable to convert to a single metric, e.g. involving mortality or thresholds for irreversible biodiversity loss, or not feasible due to resource or data constraints other methods, such as, cost-effectiveness or multicriteria analysis may be appropriate.

- **Economic valuation methods are particularly important tools for providing a full picture of NbS benefits over the entire time horizon of the intervention.** Monetary valuation is important for NbS because of the multiple co-benefits that NbS bring, and converting these benefits into monetary values is essential for generating a full picture of the benefits that NbS bring in the economic appraisal process. Further, NbS tend to provide benefits over longer periods of time, and valuation methods should account for this long-time horizon. Tools particularly relevant for the valuation of co-benefits typically produced by NbS are, for example, contingent valuation methods, and hedonic pricing methods. Further, other valuation methods are also relevant (IBPES, 2022)

- **Discount rate methods are also essential because many NbS provide benefits that accrue over longer time periods that move beyond typical project-based, time-bound and small-scale interventions,** similar to climate adaptation in general. Further, in contrast to more conventional CCA measures, the full cumulative set of benefits derived from NbS for CCA measures may only emerge over time due to the time needed for measures such as landscape restoration, reforestation, etc. to be completed. This aspect lends even more importance to the need for comprehensive application of valuation methods. Here, it is important to choose appropriate discount rates that reflect the value of conserving, restoring and managing biodiversity over long time horizons not least because intergenerational aspects are also at issue (Stern, 2006).

- **Economic appraisal methods should be integrated into policy because they provide a sound basis for the design and implementation of NbS.** Further, evaluation of NbS through economic appraisal methods is fully aligned with the IUCN Global Standard for Nature-based Solutions™ (Criteria 4: Economic feasibility), and thus provides a firm basis for mobilising finance for NbS.

Introduction

Nature-based Solutions (NbS) are gaining importance around the world as potentially cost-effective measures that simultaneously provide environmental, social and economic benefits and help build resilience. Indeed, during the United Nations Environment Assembly, held in Nairobi in 2022, world leaders adopted a resolution on Nature-based Solutions for Supporting Sustainable Development. The resolution calls on Member States to support NbS implementation in partnership with local communities, women, youth and Indigenous Peoples and the application of a country-driven, gender-responsive, participatory and fully transparent approach. NbS are often described as no-regret options that bring benefits to people across a range of scenarios (Seddon et al., 2019). Indeed, NbS offer potential to bring diverse natural features and processes into cities, landscapes and seascapes, and address a range of societal challenges including adaptation to climate change and disaster risk management (Seddon et al. 2019).

NbS are particularly attractive because of the range of co-benefits they bring that can satisfy multiple social, economic and policy objectives across a range of sectors and scales. Indeed, recognising these various co-benefits and appropriately including them in policy and project design is key to increasing the uptake and mainstreaming of NbS as a response to address both climate change adaptation and disaster risk management. Economic analysis and appraisal of CCA/DRM options that accounts for the full range of NbS co-benefits can increase awareness of policy- and decision makers of the relative attractiveness of NbS measures compared to conventional or 'grey' solutions.

This Policy Brief discusses the economic analysis of NbS for CCA/DRR by presenting economic appraisal methods in CCA/DRR including cost-benefit and cost-effectiveness analysis, and illustrates these through NbS cases studies. Further, it discusses key issues of valuation and discounting in economic appraisal, exploring the full range of NbS co-benefits relevant to include in such analysis and their relevance to economic analysis of NbS in the Western Balkan context.

Key definitions

Nature-based Solutions (NbS) are actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN, 2016).

Climate change adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or to exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014).

Disaster risk reduction is aimed at preventing new and reducing existing disaster risk (exposure, hazard or vulnerability), and managing residual risk, all of which contributes to strengthening resilience and therefore to the achievement of sustainable development (IPCC, 2014; UNISDR, 2017).

Key message: Economic appraisal methods should be systematically applied when assessing NbS or hybrid projects.

Economic appraisal methods can be usefully applied to support decision makers in choosing or designing NbS that are appropriate and superior to other conventional methods for CCA/DRM. Economic appraisal methods in general aim to support decision makers to select the 'best' option from a set based on a given criteria and compared to a business as usual scenario. Common examples of such criteria are maximising the benefit-cost ratio, or minimising costs subject to meeting a given policy objective. Decision makers choose a particular economic appraisal method based on the criteria they find appropriate to the given decision and situation.

NbS measures provide multiple co-benefits, and in general require lower cost to implement compared to many conventional measures to address climate change adaptation or disaster risk reduction. Therefore, applying economic appraisal methods systematically is not only good practice for decision- and policy-making in general, but also provide a well-founded rationale for selecting NbS or hybrid solutions to address CCA and DRR.

Economic appraisal methods should thus be integrated into policy-making because they provide a sound basis for the design and implementation of NbS. Further, evaluation of NbS through such economic appraisal methods is fully aligned with the IUCN Global Standard for Nature-based Solutions™ (Criteria 4: Economic feasibility), and provides a firm basis for mobilising finance for NbS.

Key message: Economic appraisal of NbS for CCA/DRR involves a number of different methods, and selecting appropriate methods is an essential task

A number of approaches are relevant in economic appraisal of NbS for CCA/DRM including cost-benefit-analysis (CBA), cost-effectiveness analysis (CEA), multi-criteria analysis, as well as, approaches that explicitly consider the value of flexibility under uncertainty, such as, robust decision-making or real options analysis. Selecting which economic appraisal method is appropriate to a specific CCA decision depends on several factors. These factors generally include the time horizon of the options considered, the risk adversity of decision makers, and the knowledge or uncertainty regarding future climate and outcomes of adaptation measures (Hinkel and Bisaro, 2016). Further, pragmatic issues such as data and resource availability may also constrain the choice of methods.

For economic appraisal of NbS and CCA/DRM in particular, several characteristics need to be considered. First, it is important to note that CCA measures may have long time horizons (e.g. forests or coastal protection), with high upfront costs and benefits that accrue over decades. This has implications for decision-making because the flexibility or lock-in of a given measure should be considered by the economic appraisal method. Second, NbS have multiple co-benefits, and for many of these it may be difficult to directly attach a monetary value. Therefore, valuation of co-benefits is particularly important for economic appraisal of NbS and should be integrated into the process of economic appraisal of NbS measures addressing CCA/DRM.

For all of these approaches, a key aspect of economic analysis is establishing a baseline (i.e. counterfactual or alternative option)

against which each of the CCA/DRM measures can be assessed and the economic value of outcomes can be determined. For example, if a reforestation measure is being analysed to determine the economic value of flood risk reduction it produces for downstream communities, it is necessary to establish what the level of flood risk would be under alternative options. Such alternative options include the business-as-usual option in which no action is taken, or grey infrastructure options that can then be compared to the NbS.

Approaches to economic appraisal of NbS for CCA and DRM

Cost-benefit analysis (CBA)

Cost-benefit analysis addresses the question of which option should be selected from a set of alternatives, based on evaluating one metric by which the alternatives can be characterised in terms of their costs and benefits. That is, for CBA, it is necessary to monetise all costs and benefits of the measures. CBA can also provide an absolute evaluation of whether a measure is 'worth doing' from an economic perspective because it can evaluate whether a measure provides positive net benefits. CBA involves the following steps:

1. Identify a set of alternatives;
2. Calculate the net present value (NPV) of the different options. This entails the choice of a time horizon, which costs and benefits are taken into account and a discount rate;
3. Decision rule: chose alternative with the highest NPV or benefit cost ratio.

Challenges in cost-benefit analysis of NbS for CCA arise regarding selecting which discount rate to apply in calculating net present values of different options. Discount rates are relevant because NbS benefits and costs accrue over time. Discount rates relate future monetary values to the present, corresponding to the reality that people generally prefer current to future consumption. However, intergenerational equity concerns are also affected by discount rates, and provide a rationale for low discount rates (i.e. not discounting future consumption). Cost-benefit analyses, especially those with long time-horizons, as in the case of climate change, can be highly sensitive to the discount rate chosen (See below for more details).

It is also important to note that CBA does not typically address distributional issues associated with a given option. Costs and benefits accruing to different actors are generally aggregated additively and the issue of winners and losers is addressed separately. Therefore, CBA should be treated with caution and its results considered in inclusive and transparent governance process for NbS (see Governance Policy Brief).

Example: Cost-benefit analysis of Forest Landscape Restoration options in Kraljevo, Serbia

In Kraljevo, Serbia, the ADAPT project has initiated a pilot project on forest landscape restoration (FLR) options to increase flood mitigation and disaster risk reduction. In order to support the pilot project, a cost-benefit analysis was carried out within the framework of a Restoration Opportunities Assessment Methodology (ROAM) process to identify territorial sites suitable for restoration and sustainable landscape management, and prioritise key areas (IUCN, 2021). The Cost Benefit Analysis (CBA) considered FLR interventions for improving climate and economic resilience that qualify as NbS, based on local data on livelihoods, governance, and public revenues.

A key component of this CBA was determining the baseline ('business-as-usual' (BAU)) scenario based on local and regional biophysical and socio-economic data over the relevant time horizon for comparison with different FLR inter-

ventions under consideration. A baseline was developed for the Gledic area pilot site, consisting of a number of settlements: Gledic, Godacica, Drlupa, Petropolje, Lesevo, Ravanica, Sitnica, Milakovac, and Zakuta. Socio-economic data on, e.g., demographics, employment and economic sectors were collected from national and local authorities, while livelihood data, household expenditures, etc., was collected within settlements. Further, biophysical data on, e.g. landscape attributes was developed from GIS analysis. These data were used to estimate financial costs and benefits produced by the measures. Costs and benefits were selected based on the elements which are relevant for disaster risk reduction (DRR) and climate change adaptation (CCA) and economic development of the pilot area.

The financial costs and benefits associated with the baseline business-as-usual scenario are shown in Table 1. Indicators were grouped into private costs, direct public costs and indirect public costs from disasters and erosion. Direct public costs and benefits are of similar magnitudes, however when considering the indirect costs of disasters, public costs become much more significant in the BAU scenario. This implies that public actors may be willing to finance NbS that reduce these costs. As a next step in the BAS scenario analysis, a discounting of future costs and benefits over a 20-year time horizon was conducted to calculate the net present value (NPV) (for details see (IUCN, 2021).

The CBA then assessed three different NbS options using the same approach in order to compare these to the BAU, and select the best option. The NbS each combined different FLR interventions across the different sites, and can be characterised as follows:

- NbS1: Bio-engineering measures, Cultivation of medical and aromatic plants, and Silvo-Pastoral systems;
- NbS2: Natural Forest Rehabilitation, Rehabilitation by planting, and Enrichment Planting;
- NbS3: Bio-engineering measures, Cultivation of medical and aromatic, Silvo-Pastoral systems, Natural Forest Rehabilitation, Rehabilitation by planting, and Enrichment Planting.

Table 1. Financial indicators for costs and benefits in the baseline scenario for CBA analysis in Kraljevo, Serbia. (Source: IUCN, 2021).

Item	Unit	Unit price EUR	Quantity	Total EUR	Time Interval	Total Annual EUR
Private Costs						**14.958.365,02**
Property Tax	Household	8,84	14908	131.750,00	Yearly	131.750,00
Utilities	Household	130,73	901	117.787,73	Month	1.413.452,76
Maintenance of woodland	EUR/ha	1.486,52	6701,03	9.961.231,87	Yearly	9.961.231,87
Public costs						**486.501,72**
Civil protection costs	EUR	0,61	14908	9.073,62	Yearly	9.073,62
Tourism organisation	EUR	1,45	14908	21.522,91	Yearly	21.522,91
Management Costs						455.905,18
SG "Stolovi" staff	Wage	741,57	36	26.696,66	Month	320.359,97
LSG Kraljevo staff	Wage	706,82	3	2.120,45	Month	25.445,43
Maintenance of woodland	EUR/ha	48,81	2256	110.099,79	Yearly	110.099,79
Disaster costs						**1.364.356,11**
Disaster damage						1.364.356,11
Category infrastructure	Unit	na	na	1.364.356,11	Yearly	1.364.356,11
Erosion						**9.553,79**
Degradation of Land	M3/ha	na	na	9.553,79	Year	9.553,79
CO_2 Sequestration						**10.139.763,99**
Carbon Sequestration	T/Ha	5,92	1714498	10.139.755,49	Year	10.139.763,99
Private Benefits						**6.004.817,72**
Personal Income						5.909.379,72
Personal Income Agri	Wage	585,00	289	169.065,42	Month	2.028.785,03
Personal Income Forest	Wage	580,29	432	250.683,77	Month	3.008.205,22
Personal Income Tourism	Wage	390,86	186	72.699,12	Month	872.389,48
Subsidies	EUR/ha	34,00	2807	95.438,00	Yearly	95.438,00
Public benefits						**655.488,15**
Land lease	EUR	na		918,00	Yearly	918,00
Agri land fees	EUR	na		6.885,00	Yearly	6.885,00
Tourism	No of fees	na		10.166,09	Yearly	10.166,09
Property Tax	EUR	na		412.250,00	Yearly	412.250,00
Timber	EUR	na		225.269,07	Yearly	225.269,07

All three of these options were then evaluated based on the same financial indicators shown in Table 1 and subjected to the same discounting procedure on a 20-year time horizon to arrive at an NPV for each measure.

Figure 1 shows the resulting NPV calculated for each NbS. All three NbS options have higher NPV compared to the baseline with NbS3 showing the highest NPV. It is worth noting that NbS2, while an improvement over the baseline actually has a negative NPV though it is still more attractive than the BAU alternative. One further caveat is that the costs calculated also depend strongly on the projected disaster costs, which by the nature of extreme events have uncertainty attached. The CBA study also projected disaster costs through a modelling framework accounting for this uncertainty, and the results shown in Figure 1 represent average values of this analysis. Accounting for this uncertainty makes NbS3 even more attractive because the variance around disaster costs was smaller for NbS3 due to this option consisting of measures that directly address flood risks (for details see (IUCN, 2021)).

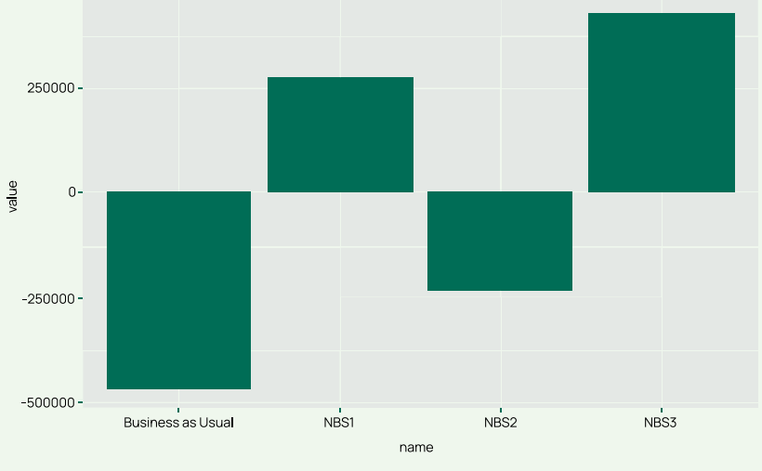


Figure 1. Net present value (NPV) calculated for baseline scenario and 3 NbS options in Kraljevo, Serbia.

Cost-effectiveness analysis (CEA) of climate change adaptation and DRM options

Cost-effectiveness analysis also addresses the question of which options should be selected from a set of alternatives. It differs from CBA in that CEA is based on two different metrics: one metric for the costs of the measures, and a different metric for impact. CEA involves the following steps:

1. choose a metric for effectiveness E (e.g., impacts on population, biodiversity, etc.)
2. choose a baseline against which the effects will be measured
3. choose a set of alternatives that may be applied to reach the target
4. for each alternative I, calculate cost-effectiveness ratio (CER): CERi = Ei/Ci
5. decision rule: choose alternative i* with the highest CER*

Cost-effectiveness analysis is only a relative measure of a set of options in relation to a defined outcome. CEA is appropriate once particular policy targets are agreed, and a decision is required regarding which measures can best achieve this.

It is important to note that CEA is appropriate when there is a single effectiveness metric for outcomes. For NbS for CCA/DRR, it is thus a limited approach to compare alternatives that have impacts on multiple different hazards because often no common outcome CCA metric can be found across hazards. For instance, metrics of CCA benefits vary according to whether the success of adaptation is evaluated in relation to number of properties damaged by flooding, increased mortalities during heat waves, decreasing agricultural yields, and so on. However, for NbS addressing particular climate-related risks, it may be easier to find appropriate outcome metrics for the effectiveness. For example, CEA of NbS measures for reducing river flood risk, for instance, through restoration of riparian forests is possible.

Example: Cost-effectiveness analysis of Grassland biodiversity in Finland

In Finland, grassland biodiversity is threatened as habitats will shift due to climate change and species dispersal corridors risk being closed off by agriculture intensification. Grassland biodiversity in Finland contributes to landscape quality and thus has socio-economic co-benefits for local communities. A recent economic analysis of different options to conserve key butterfly species under climate change conducts a cost-effectiveness analysis within different climate scenarios to choose the best (most cost-effective) option for conserving key butterfly species under all future climate scenarios (Tainio et al., 2014)their current extent in Finland is much lower than the minimum level estimated to ensure the survival of butterfly species. Projected locations of the climatically most suitable areas for butterfly species varied considerably between different modelling techniques and climate change scenarios. This uncertainty needs to be taken into account in planning adaptation responses. Analysis of potential adaptation options considered the promotion of existing measures based on the agri-environmental scheme (AES. Adaptation options include NbS involving the maintenance of dispersal corridors and translocation of grassland species. The assessment applied a bioclimatic envelope modelling approach to project habitat change for butterfly indicator species under 11 scenarios of future climate change at a spatial resolution of 2-km grid cells. The approach also conducted surveys to derive cost information on the adaptation options and assessed their cost-effectiveness under future climate change. Because of high variation in climatically suitable habitats across different models and scenarios, an evaluation of the impacts for each site across all scenarios and model combinations was necessary for a comprehensive comparison to identify the most cost-effective option across all scenarios. They found that species translocation was the most cost-effective option within each scenario.

Key message: Economic valuation methods are particularly important tools for providing a full picture of NbS benefits

One distinguishing feature of economic analysis of NbS compared to standard economic analysis of CCA/DRM measures is that NbS tend to produce multiple financial, social and environmental co-benefits underpinned by the ecosystem services they provide. Economic valuation of these co-benefits supports a comprehensive and informative economic analysis of NbS. The economic value of co-benefits produced by NbS depend on the nature of the service, the system providing it, and the attributes of the communities benefiting from them. Table 2 presents co-benefits for different types of natural systems (UNEP, 2020).

Table 2. Co-benefits of NbS for different types of natural systems (Source: UNEP, 2020).

System	Nature-based Solution	Societal benefit
Forests	Preservation	GHG mitigation through carbon sequestration in biomass in vegetation and soils; biodiversity protection; flooding, drought, and erosion protection, recreation and tourism, water infiltration and storage
	Restoration	
	Enhanced management of wood fuel harvest	GHG mitigation through carbon sequestration in biomass in vegetation and soils; provision of fuel and forest products to local communities flooding, drought, and erosion protection
	Production	Carbon sequestration in standing biomass and harvested products; sustainable income; water infiltration and storage; reduced pressure on natural forests
Grassland	Preservation	Carbon sequestration in biomass in vegetation and soils; biodiversity protection; slope stabilization
	Restoration	
	Grazing management	Carbon sequestration in biomass in vegetation and soils; slope stabilization
Coastal/ riparian	Preservation	Protecting lives and property from storms and flooding; carbon sequestration; enhancement of biodiversity and fisheries production
	Restoration	
	Maintenance of slope vegetation	Reduced erosion and slope stabilization
	Maintenance of coastal, floodplain and riverine vegetation	Protecting lives and property from storms and flooding; carbon sequestration
Agriculture	Agroforestry	Carbon sequestration in soils and biomass; reduced erosion; maintenance of soil fertility; pollinator habitat; storm protection; shading
	Reduced tillage and carbon restoration practices	Carbon sequestration in soils; maintenance of soil fertility
	Agricultural intensification	Enhanced food security; reduced pressure for conversion of other areas.
Urban	Urban forests and green spaces	Carbon sequestration in biomass in vegetation; shading; stormwater disposal and flood protection; recreation
	Green roofs	Cooling; stormwater control; pollution reduction; carbon sequestration

A number of valuation methods can be applied in order to attach an economic value to each of these different societal co-benefits, depending on the specific type of co-benefit in question. For example, for changes in real estate values due to proximity to green space hedonic pricing methods are an established valuation method (Bin et al., 2011). In contrast, for changes in environmental amenity value due to enhanced natural landscapes, contingent value methods such as willingness-to-pay methods are an established valuation method (Trombi et al., 2011). See also (Díaz et al., 2015; IBPES, 2022).

Once valuation methods have been applied to NbS co-benefits, economic decision analysis methods can be applied in order to select one or more NbS addressing CCA/DRR from a set of alternatives. As discussed above, which method is appropriate to apply depends on a number of factors, including the time horizons and costs of the measures being considered, as well as, practical considerations, such as the time, resources and skills available for the economic assessment.

Key message: Discount rate methods are also essential because many NbS provide benefits that accrue over longer time periods

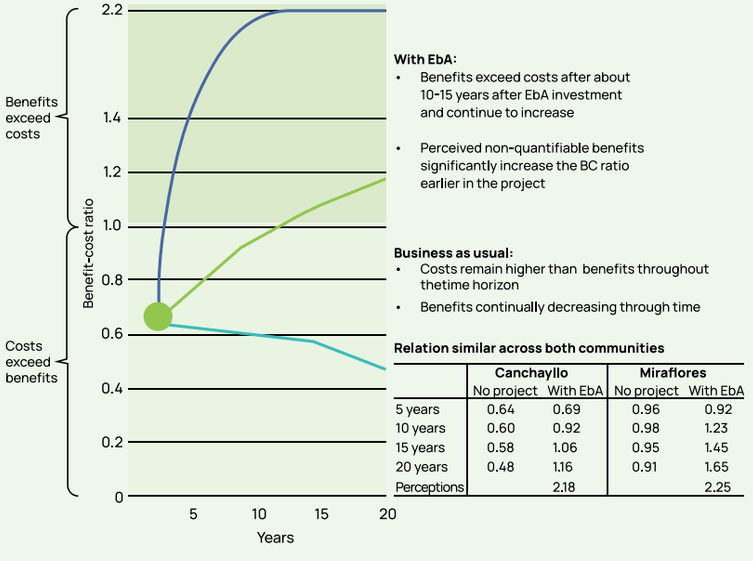
Across any economic appraisal method for NbS of CCA/DRR, discount rates are an important methodological step to arrive at

comprehensive analysis of costs and benefits of a given option. This is because the timing of both economic benefits and costs can be spread over the time span of a measure which can range from months or years up to decades or more. A recent review of NbS addressing climate change adaptation globally found that benefits can accrue in the near term, e.g. from immediate increases in agriculture or fishing income, while in other cases benefits may not emerge for up to 20 years following the implementation of the measure (Reid et al., 2019). The latter can be the case for long-term measures such as reforestation in which it takes time for trees to grow and thus for the benefits of the NbS to accrue. Indeed, the review of NbS projects found the following reasons for delays in benefit accrual:

- Accumulating water in sand dams,
- Recovering overexploited and heavily degraded natural resources,
- Tree growth,
- New institutions, management regimes, grazing or farming practices becoming effective,
- Rangeland restoration,
- Successful establishment of new businesses, and
- Ecotourism projects: which may take several years to develop marketing and demand.

Example: Cost-benefit analysis of NbS for grassland management in Canchayllo, Peru

In Peru's mountain ecosystems, a number of NbS addressing climate change adaptation where introduced in the Canchayllo and Miraflores communities. A CBA analysed benefit cost-ratios for business-as-usual in control areas in the two communities and compared these to the areas under NbS in the same communities over the long term. The analysis found that introducing Ecosystem-based Adaptation (EbA), one NbS approach, was financially beneficial when compared to business as usual, but only over the longer term for the modest discount rate of 4% considered. Indeed, NbS interventions became cost-neutral after 10–15 years (Reid et al. 2019). Further, when a wider set of benefits and costs was included in the analysis through data collected from surveys, the attractiveness of NbS interventions increased further pushing the benefits-to-cost ratio up to 2.2 (see Figure 1). The findings over increased benefits suggest that local communities' willingness to bear some short-term costs of switching to NbS measures may be partly due to the expected long-term benefits that are not easily expressed in monetary values, and that these benefits are well perceived by local communities.



	Canchayllo		Miraflores	
	No project	With EbA	No project	With EbA
5 years	0.64	0.69	0.96	0.92
10 years	0.60	0.92	0.98	1.23
15 years	0.58	1.06	0.95	1.45
20 years	0.48	1.16	0.91	1.65
Perceptions		2.18		2.25

Figure 1. Benefit-cost ratio against business as usual for native grassland management in Canchayllo, Peru. 4% discount rate used. (Source: Reid et al., 2019).

Figure 1 shows that the project accrues benefits over long periods, leading the cost-benefit ratio to be positive in the longer-term. As discount rates can significantly reduce the present value of future financial flows, high discount rates

applied cost-benefit analyses can affect economic viability of an NbS, particularly areas that have been severely degraded and therefore require long-term investments (Reid et al. 2019). The issue of timescales in economic analysis highlights the importance of valuing all co-benefits of NbS in order to get a full picture of the NbS measure compared to conventional measures or status quo. This argument is reinforced by Figure 1, which shows only a very high positive benefit-cost ratio for the measure considered, when the wider co-benefits are considered beyond what could be directly measured (Reid et al. 2019).

References

Bin, O., Poulter, B., Dumas, C.F., Whitehead, J.C., 2011. Measuring the impact of sea-level rise on coastal real estate: A hedonic property model approach. Journal of Regional Science 51, 751–767.

Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S., Báldi, A., 2015. The IPBES Conceptual Framework—connecting nature and people. Current opinion in environmental sustainability 14, 1–16.

Hinkel, J., Bisaro, A., 2016. Methodological choices in solution-oriented adaptation research: a diagnostic framework. Reg Environ Change 16, 7–20. https://doi.org/10.1007/s10113-014-0682-0

IBPES, 2022. Economic valuation methods for biodiversity. IPBES.

IUCN, 2021. Forest Landscape Restoration Opportunities Assessment, Municipality of Kraljevo, Serbia. IUCN ECARO.

Reid, H., Hou Jones, X., Porras, I., Hicks, C., Wicander, S., Seddon, N., Kapos, V., Rivzi, A.R., Roe, D., 2019. Is ecosystem-based adaptation effective? Perceptions and lessons learned from 13 project sites (IIED Research Report). IIED.

Seddon, N., Sengupta, S., García-Espinosa, M., Hauler, I., Herr, D., Rizvi, A.R., 2019. Nature-based Solutions in Nationally Determined Contributions. IUCN and University of Oxford.

Stern, N., 2006. Stern Review on the Economics of Climate Change. HM Treasury, UK.

Tainio, A., Heikkinen, R.K., Heliölä, J., Hunt, A., Watkiss, P., Fronzek, S., Leikola, N., Lötjönen, S., Mashkina, O., Carter, T.R., 2014. Conservation of grassland butterflies in Finland under a changing climate. Reg Environ Change 1–14. https://doi.org/10.1007/s10113-014-0684-y

Trombi, G., Moriondo, M., Bindi, M., Fagarazzi, C., Ferrise, R., Cai, M., 2011. The impacts of the climate change on Tuscan viticulture: qualities, areas and landscapes, in: First European Conference on Wine and Food Tourism Volterra (Pisa) Italy, April 13-15 2011. Maria Francesca Romano Edizioni.

UNEP, 2020. Economics of Nature-based Solutions: Current Status and Future Priorities. United Nations Environment Programme Nairobi.

Further resources

- Restoration Opportunities Assessment Methodology (ROAM): https://www.wri.org/research/restoration-opportunities-assessment-methodology-roam
- United Nations Environmental Assembly (UNEA) resolution on Nature-based Solutions: https://wedocs.unep.org/bitstream/handle/20.500.11822/39864/NATURE-BASED%20SOLUTIONS%20FOR%20SUPPORTING%20SUSTAINABLE%20DEVELOPMENT.%20English.pdf?sequence=1&isAllowed=y

Policy Brief: Financing Nature-based Solutions for climate change adaptation and disaster risk management

ADAPT: Nature-based Solutions for Resilient Societies in the Western Balkans

IUCN ECARO

Author:
Alexander Bisaro

Reviewers:
Mihaela Dragan-Lebovics, Kristin Meyer, Leander Raes

Key messages for financing of NbS

- **Financial constraints on public investment in climate change adaptation (CCA) and disaster risk reduction (DRR) can be overcome by investing in Nature-based Solutions that address CCA/DRR and leverage public resources through various mechanisms.** Promising mechanisms for leveraging public investments include mobilising external investment (including from the private sector), generating market revenues or increasing tax revenues through projects that produce co-benefits, such as, improved environmental quality that make areas more attractive for tourism or support sustainable fisheries, agriculture or forestry.

- **Nature-based Solutions can mobilise additional private investments because the co-benefits of improved environmental quality can create the conditions for successful business models, such as, eco-tourism, sustainable forestry, sustainable fishing and aquaculture, apiculture or sustainable agriculture.** NbS should be designed so that the opportunities for mobilising additional private sector investments are increased, by creating conditions that allow green businesses to flourish. This includes raising awareness and building capacity and leadership regarding green entrepreneurship opportunities.

- **Nature-based Solutions can attract external international climate and development finance with a mandate to de-risk private investments for nature & climate projects.** Blended finance opportunities for NbS should generally target foundations or other impact investors as commercial investors are less prominent. A notable exception to this are NbS business models involving conservation areas used for carbon offsetting. Attracting blended finance through both international finance institutions and private investors or foundations can be facilitated by designing NbS in accordance with the IUCN Global Standard for Nature-based Solutions™.

- **Nature-based Solutions can leverage public investments by producing co-benefits, such as, improved environmental quality, that can generate tax revenues from increased recreation activities.** Nature-based Solutions offer significant opportunities for public actors to generate additional tax revenues and recoup investments in adaptation and disaster risk management measures because such Nature-based Solutions produce co-benefits of improved environmental quality. This improvement can make an area more attractive for recreation and tourism thus providing opportunities for increased tax revenue generated through these activities.

- **Promote and integrate dedicated funding streams for NbS in policy and planning, as NbS finance remains a significant gap.** Recent reviews of policies in the Western Balkans show that though NbS may be articulated in policies and plans, rarely are detailed financial arrangements or funding streams in place to ensure they are implemented. A range of innovative financing instruments should be pursed for NbS, including Payment for Ecosystem Services (PES) and public-private partnerships. Further, building on existing tax instruments or user fee arrangements through surcharges or environmental levees is also a promising approach. All these approaches require mobilising dedicated budgets for NbS, and thus close coordination with Ministries of Finance.

Introduction

Nature-based Solutions (NbS) are gaining importance around the world as potentially cost-effective measures that simultaneously provide environmental, social and economic benefits and help build resilience. Indeed, during the United Nations Environment Assembly, held in Nairobi in 2022, world leaders adopted a resolution on Nature-based Solutions for Supporting Sustainable Development. The resolution calls on Member States to support NbS implementation in partnership with local communities, women, youth and Indigenous peoples and the application of a country-driven, gender-responsive, participatory and fully transparent approach.

NbS offer potential to bring diverse natural features and processes into cities, landscapes and seascapes, and address a range of societal challenges including adaptation to climate change and disaster risk management (Seddon et al. 2020). At the same time, governments around the world, including in the Western Balkans, face challenges of adapting to climate change and disaster risk management under constrained budgets and limited financial capacity. In this context, NbS may be particularly attractive for addressing CCA/DRM not only because of their relatively low cost, but also because of their potential to leverage public investments by attracting or mobilising additional external finance (e.g. development finance) or generating revenues.

This Policy Brief explores the role of NbS in leveraging public investments and mobilising finance for climate change adaptation and disaster risk reduction measures. In particular, the Brief outlines different mechanisms for leveraging finance, and illustrates these through case studies.

Key definitions

Nature-based Solutions (NbS) are actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN, 2016).

Climate change adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or to exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014).

Disaster risk reduction is aimed at preventing new and reducing existing disaster risk (exposure, hazard or vulnerability), and managing residual risk, all of which contributes to strengthening resilience and therefore to the achievement of sustainable development (IPCC, 2014; UNISDR, 2017).

Blended finance refers to the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries (OECD, 2020).

Key message: Financial constraints for CCA and DDR can be overcome by investing in Nature-based Solutions to leverage public resources through various mechanisms

Given budget constraints for governments around the world, including in the Western Balkans, an increasingly promising approach for climate change adaptation and disaster risk management is focusing on projects that can leverage public finance. Leveraging public finance refers to achieving increased outputs with the same amount of public investment. For example, if a government invests in beach nourishment for flood protection, and then generates tax revenues from increased tourist spending, the government's financing of the flood protection measure has been leveraged. NbS generally have a great potential to leverage public investments because in addition to addressing societal challenges, such as, climate change adaptation or disaster risk management, NbS also produce a number of co-benefits. Through restoring and maintaining nature and biodiversity, NbS improve environmental conditions leading to co-benefits, such as improved recreational opportunities, improved health and wellbeing outcomes, or increased carbon storage for greenhouse gas mitigation, among others.

Leveraging public investment in NbS addressing CCA/DRM can be achieved by projects producing such co-benefits. These co-benefits can be used to leverage finance through three general mechanisms (shown in Table 1): mobilising external investment in NbS by donors, philanthropists or the private sector; generating revenues through market transactions (e.g. land sale or lease); or generating revenues through tax instruments. For the last two mechanisms, NbS create additional revenue streams by improving the natural environment and thus creating value that can be captured by governments initiating the NbS.

Three mechanisms to leverage public investments through NbS are shown in Table 1. They are illustrated through examples that involve community forest development, supported by co-finance from the NGO and philanthropic sector, green urban land redevelopment, and beach nourishment leading to ecological co-benefits. Generally, the potential for leveraging through these mechanisms is highest in areas that are densely populated, or otherwise have high levels of economic value and activity. In such settings, land values and willingness-to-pay for recreational activities are high, which are necessary conditions for generating either market or tax revenues.

Table 1. Mechanisms, instruments and examples of leveraging public investments in NbS for CCA projects.

Mechanisms for leveraging public finance from NbS	Instrument	Examples
Mobilising external investment	Co-financing or blended finance arrangements Payment for Ecosystem Services	Lonjsko Polje Nature Park (Croatia, see Box 1)
Generating revenues through market transactions	Land sale or lease	Urban land redevelopment
Generating revenues through taxes	General taxes, e.g. VAT, property taxes	Beach nourishment (Sophiastrand, Netherlands) Greening urban flood risk management (Copenhagen Cloud Burst Management Plan)

Key message: Nature-based Solutions can mobilise private investment due to the co-benefits they produce, thus reducing total public investment needs in CCA/DRR

One key mechanism for leveraging public investment in NbS is the additional private investment that can be mobilised though the financial attractiveness of doing so for private actors. NbS for climate change adaptation and disaster risk reduction can also mobilise additional private investments because of the range of economic, social and environmental co-benefits they produce. Indeed, the improved environmental quality produced by NbS can create the conditions for successful business models, such as, eco-tourism, sustainable forestry, sustainable fishing and aquaculture, apiculture or sustainable agriculture (see the Case Study: Lonjsko Polje Nature Park).

NbS should be designed so that the opportunities for mobilising additional private sector investments are increased, by creating conditions that allow green businesses to flourish. Such conditions for promoting green entrepreneurship cover a number of factors, including:

- Awareness raising regarding green business opportunities among local populations;
- Capacity building and trainings for green entrepreneurship, including use of, e.g. Business Model Canvas or other tools;
- Networking, experiences exchanges, and learning between Small and Medium Enterprises (SMEs) and potential investors (e.g. matchmaking) across the Western Balkan region as well as other relevant national contexts;

- Financial incentives and support (e.g. covering start-up costs, trainings, social security payments, tax incentives) for founders and start-up costs in initial green business phases.

Box 1. Mobilising external investment in Lonjsko Polje Nature Park, Croatia

A Nature Park was established at Lonjsko Polje, which is located in the Sava River Basin, in the north-central part of Croatia. It comprises 14 settlements and with 50,650 ha it is one of the largest protected wetland areas in the Danube basin. The area faces a number of climate change challenges including increased flooding, as well as extreme droughts and changes in plant communities that require new management approaches.

Lonjsko Polje Nature Park was established with the aim of ensuring the area as a desirable place to live through biodiversity, landscape and cultural protection, support for existing land use practices for conservation and the further development of small family farms and tourism. In doing so it provides several climate change mitigation and adaptation benefits. These include utilising the natural floodplains as retention areas, reducing CO2 through restoration of riparian floodplain forests, recharging groundwater and improving drinking water supply. The Lonjsko Polje Nature Park was established through funding from the central government (70%), the projects own budget (15%) and additional funds provided through NGO or private sector donations and grants (15%). The project thus leverages the public investments by creating revenue streams for private sector rural farm and tourism operators, while reducing the costs of flood risk management in the Sava River basin.

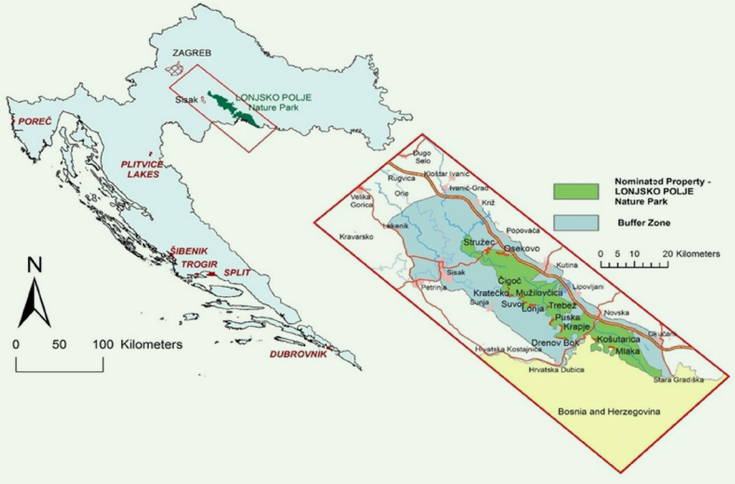
Through the NbS conservation approach a number of objectives are addressed simultaneously, including water, forest and grasslands management, while also allowing for

the maintenance of landscape values that can support the generation of revenues through tourism activities.

Regarding water management, for example, the NbS is based on preserving the basic function of natural floodplains through the protection of biological and landscape values in concert with more conventional modifications to the Flood Control System (hybrid solution). Over the entire Nature Park area, 82% of which is in the floodplain, 25,630 ha consists in controlled flood water retention zone, e.g. through sluice gates, water retention walls, etc., and 20,600 ha relies on uncontrolled nature flooding processes. The approach reduces flood damages at lower cost than entirely conventional methods, while also maintaining the landscapes values that can attract rural tourism.

Regarding grasslands, which make up 20% of the park area, the initiative supports traditional pasturing systems as a beneficial approach to nature resource management for several reasons. For pasturing, indigenous local breeds have shown to be best adapted to the habitat conditions, while also protecting the local landscape. Further, the traditional pasturing provides rural tourism benefits due to the quality of products produced and the demand for traditional landscapes from rural tourists.

Figure 1. Lonjsko Polje Nature Park NbS (Source: Lonjsko Polje Nature Park, 2019).



Key message: Nature-based Solutions can attract external international climate and development finance with a mandate to de-risk private investments for nature & climate projects.

Another key mechanism for leveraging public investments in CCA/DRR through NbS is attracting external investments from international development finance institutions with a mandate to support nature and climate related projects. Such external investment can directly reduce the overall project costs to governments by covering a portion of these costs, as well as by mobilising further private investments through blended finance arrangement that involve de-risking the project and thus making it more attractive to private investors. Blended finance refers to

the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries (OECD 2020a). Donors (or foundations) can enter blended finance arrangements through various instruments (i.e. grants, equity, public-private partnerships, guarantees, etc.) in order to mobilise additional resources for either climate or biodiversity objectives.

For biodiversity finance relevant for NbS, bilateral donors are the main providers of external finance, as bilateral flows are roughly 10 times greater than multilateral flows (Deutz et al. 2020). Multilateral development finance is however also significant both through grant and blended finance arrangements. For instance, the Green Climate Fund (GCF), as the main instrument of international climate finance, has a clear mandate to support climate projects as well as for de-risking to mobilise additional private investment towards the UNFCCC goal of USD 100 billion in total climate finance to developing countries annually. Further, the Global Environmental Facility (GEF) is one of the most significant donors with USD 1.3 billion of its current USD 4.1 billion replenishment cycle (2018-2022) committed to biodiversity.

Blended finance opportunities for NbS should generally target foundations or other impact investors as commercial investors are less prominent. In contrast to climate finance, where more than half of investments globally come from private sources (CPI 2019), biodiversity relies mostly on public finance, with only 14 per cent of investments globally coming from private sources. One notable exception to this are NbS business models involving conservation areas, whereby the mitigation benefits are sold through carbon offsetting. Attracting blended finance through both international finance institutions and private investors or foundations can be facilitated by designing NbS in accordance with the IUCN Global Standard for Nature-based Solutions™ (IUCN, 2020).

Key message: Nature-based Solutions can leverage public investments by producing co-benefits, such as, improved environmental quality, that generate tax revenues from increased recreation activities.

Another key mechanism for leveraging public investments in CCA/DRR through NbS is that the public actor, i.e. municipal, regional or national government initiating an NbS, can recoup some of its investment costs by increasing its tax revenues from increased economic activities arising from the NbS. Increased economic activities generally occur due to the co-benefits produced by an NbS making an area more attractive through improved environmental quality, which can support increased tourism or other activities such as sustainable fisheries, forestry or agriculture. While these activities produce private benefits and related revenue streams, some of these can be captured by public actors through tax instruments, thus recouping some of the initial public investment in NbS, and achieving greater returns on investment for the public actor (See Case Study Sophiastrand).

Box 2. Generating tax revenues from NbS co-benefits in Forest Landscape Restoration in Kraljevo, Serbia

In Kraljevo, Serbia, the ADAPT project initiated a pilot project on forest landscape restoration (FLR) options in achieving flood mitigation and disaster risk reduction. A Cost-Benefit Analysis (CBA) was conducted to identify the most attractive FLR options, and provide a rationale for implementing FLR compared to the baseline 'business-as-usual' scenario (see Economics Policy Brief). A key outcome of the CBA was an analysis of financial flows that would be created by implementing FLR measures compared to baseline.

The financial costs and benefits associated with the baseline business-as-usual scenario are shown in Table 1. Indicators for costs were grouped into private costs, direct public costs and indirect public costs from disasters and erosion. Indicators for benefits were grouped into private benefits and public benefits, each of which are expressed in actual cash flows. For financial analysis, it is important to focus on the costs and revenues of the measures that accrue to a specific actor (in this case, the Municipality). Financial analysis for the public actor therefore focuses on public direct costs and public benefits, each of which are expressed in cash flows, and are highlighted in Table 1. Indirect public costs do not result in actual cash flows and therefore are not included in the financial analysis. Table 1 shows that the baseline scenario in Kraljevo has a positive impact on cash flow for the government, which explains in part the existing situation. Further analysis of NbS options found that other FLR had even more positive financial impact on the public budget through the land lease, tourism and property tax instrument shown in Table 1 (see IUCN (2021) for details).

This focus on financial costs and revenues to the government can be contrasted to economic analysis, which accounts for all benefits (i.e. even those that do not result in actual cash flows). By focusing on actual cash flows to the government responsible for implementing the measure, a realistic view of the budget impacts of a given measure is obtained, and in this case, a further rationale for choosing NbS measures is provided because of the positive impact of NbS on the public budget compared to the business-as-usual scenario. Further, focussing on the financial aspects of the measure for one specific actor (i.e. actual cash flows) provides a basis for putting in place a financing plan for the NbS measure. For instance, such financial analysis may facilitate access to loans (including for climate finance) by demonstrating the future cash flows that will be unlocked by an NbS intervention.

Table 1. Financial indicators in the baseline scenario for CBA analysis in Kraljevo, Serbia. (source: IUCN, 2021). Highlighted rows are relevant for financial analysis.

Item	Unit	Unit price EUR	Quantity	Total EUR	Time Interval	Total Annual EUR
Private Costs						**14.958.365,02**
Property Tax	Household	8,84	14908	131.750,00	Yearly	131.750,00
Utilities	Household	130,73	901	117.787,73	Month	1.413.452,76
Maintenance of woodland	EUR/ha	1.486,52	6701,03	9.961.231,87	Yearly	9.961.231,87
Public costs						**486.501,72**
Civil protection costs	EUR	0,61	14908	9.073,62	Yearly	9.073,62
Tourism organisation	EUR	1,45	14908	21.522,91	Yearly	21.522,91
Management Costs						455.905,18
SG "Stolovi" staff	Wage	741,57	36	26.696,66	Month	320.359,97
LSG Kraljevo staff	Wage	706,82	3	2.120,45	Month	25.445,43
Maintenance of woodland	EUR/ha	48,81	2256	110.099,79	Yearly	110.099,79
Disaster costs						**1.364.356,11**
Disaster damage						1.364.356,11
Category infrastructure	Unit	na	na	1.364.356,11	Yearly	1.364.356,11
Erosion						**9.553,79**
Degradation of Land	M3/ha	na	na	9.553,79	Year	9.553,79
CO_2 Sequestration						**10.139.763,99**
Carbon Sequestration	T/Ha	5,92	1714498	10.139.755,49	Year	10.139.763,99
Private Benefits						**6.004.817,72**
Personal Income						5.909.379,72
Personal Income Agri	Wage	585,00	289	169.065,42	Month	2.028.785,03
Personal Income Forest	Wage	580,29	432	250.683,77	Month	3.008.205,22
Personal Income Tourism	Wage	390,86	186	72.699,12	Month	872.389,48
Subsidies	EUR/ha	34,00	2807	95.438,00	Yearly	95.438,00
Public benefits						**655.488,15**
Land lease	EUR	na		918,00	Yearly	918,00
Agri land fees	EUR	na		6.885,00	Yearly	6.885,00
Tourism	No of fees	na		10.166,09	Yearly	10.166,09
Property Tax	EUR	na		412.250,00	Yearly	412.250,00
Timber	EUR	na		225.269,07	Yearly	225.269,07

Key message: Promote and integrate dedicated funding streams for NbS in policy and planning, as NbS finance remains a significant gap.

Despite the multiple co-benefits provided by NbS and different revenue generation streams that they can provide, as discussed above, the financial planning for NbS interventions remains a major gap in policy in the Western Balkans. Even when economy-wide or sectoral plans or policies make explicit mention of NbS, rarely are detailed financial arrangements or funding streams in place to ensure that they are implemented (Bisaro and Meyer, 2022). A range of innovative financing instruments should be pursued, including dedicated NbS Funds, Payment for Ecosystem Services (PES) and public-private partnerships, as well as, dedicated tax instruments either at economy-wide or sub-national or urban levels. Indeed, an effective approach to generating revenue streams to fund NbS is through building on existing tax instruments or user fee arrangements through surcharges or environmental levees for those land-owners or business operators who will potentially benefit from the NbS. A case study of stormwater charges levied in Copenhagen to fund green urban flood risk management (see Box 3) below discusses such an example.

Box 3. Generating revenues through stormwater charges for green urban flood management in Copenhagen

Copenhagen is a coastal city of around 800,000 inhabitants, which experiences pluvial flooding through cloudburst storms and is exposed to storm surge risks exacerbated by sea-level rise. Severe precipitation events in the summers of 2010 and 2011 led the city to consider prioritising a Cloudburst Management Plan, which had already been identified as a priority in the city's Climate Adaptation Plan. Where the Climate Adaptation Plan made recommendations focusing on increasing retention and storage capacity for rainwater the cloudburst events in 2010 and 2011 demonstrated that these measures would not be sufficient to reduce risk from extreme precipitation events. Rather subsequent studies found that storage measures needed to be supplemented by large-scale drainage measures to allow storm water to drain out to the sea via roads, canals, urban waterways and even dedicated tunnels. The Cloudburst Management Plan thus includes a hybrid bundle of measures that combine public spaces with increased water drainage capacity, some of the measure being aligned with the NbS concept, such as, urban parks and canals that can be used as natural drainage water ways during major precipitation events.

The Cloudburst Management Plan includes a mix of measures, including conventional drainage tunnels, as well as NbS drainage solutions integrated into city infrastructure. Investment costs for all measures implemented over a timeframe of 20 years, were estimated at DKK 3.8 billion (EUR 510 million) in present value in 2012 (City of Copenhagen, 2012). The financing structure of infrastructure measure in the plan involves two sources: water charges from the utility, and taxes from the City. The precise mix of contributions from the utility water charges, or city taxes, depends on the measure being implemented. For conventional measures that have only a drainage function, such as, drainage tunnels, financing comes entirely from the utility water charges. For 'green' measures that integrate water drainage or storage with other uses, such as, city roads or parks, a mix of utility water charges and city taxes are used to finance the measures. In such measures, the city builds and operates the measure, and receives funds from the utility water charge in proportion to investments costs for measure attributed strictly to waste or storm water management. The remainder of the costs in the measure are covered by the city.

The additional storm and wastewater management infrastructure costs of the Plan to protect against flood risk up to the 1-100 year event are thus the responsibility of the utility company (Københavns Energi). Investment costs of the utility are funded through water charge revenues, which consist in the drainage charges paid per cubic meter of water purchased from the utility. The additional investment costs of the Plan to the utility are thus funded through a water charge increase that will have an estimated annual impact on households of an additional EUR 200-300.

Figure 3. Financing arrangements, investments and revenues streams in the Cloudburst Management Plan (Source: Bisaro, 2021).

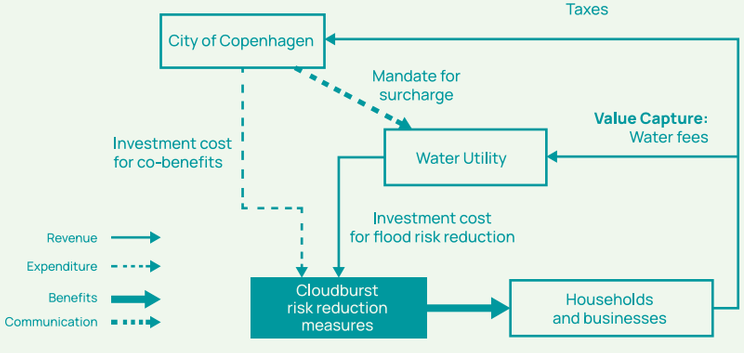


Figure 3 illustrates the financing structure of the project, showing that the project thus relies on a purely value capture structure of the water charge user fee, and general city tax instruments which capture part of the value of the risk reducing investments and amenity value increases due to the co-benefits of the measure. The city and utility make upfront investments in green infrastructure that provide direct flood risk reduction benefits, as well as, co-benefits of improved environmental amenities in the city due to increased green spaces. All measures must meet a 1-100 year storm safety standard over their lifetime. Thus, the City planning department's cost-benefit analysis comparing traditional 'grey' infrastructure drainage measures, such as underground drainage tunnels, with 'green' measures, found that including green measures reduced the costs cloudburst flood risk management plan significantly, though avoided losses were the same for the grey and green measures considered because all measures needed to meet the same safety standard.

References

Bisaro, A., Meyer, K., 2022. Integrating Nature-based Solutions into Policies for Climate Change Adaptation and Disaster Risk Reduction. A Regional Comparative Policy Analysis in the Western Balkans (ADAPT project). IUCN.

Bisaro, A. 2021. Mobilising finance for coastal adaptation in cities. C40, New York, USA.

IPCC, 2014. Summary for policymakers, in: Field, C.B., Barros, V., Dokken, D.J., Mach, K.J., Mastrandrea, M.D., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma, B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, P.R., White, L.L. (Eds.), Climate Change 2014: Impacts, Adaptation and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, USA, pp. 1–32.

IUCN, 2021. Forest Landscape Restoration Opportunities Assessment, Municipality of Kraljevo, Serbia. IUCN ECARO.

IUCN, 2020. IUCN Global Standard for Nature-based Solutions : first edition.

IUCN, 2016. Nature-based solutions to address global societal challenges. IUCN, Gland, Switzerland.

Lonjsko Polje Nature Park, 2019. Management of the Lonjsko Polje Nature Park. Lonjsko Polje Nature Park Public Institution.

OECD, 2020. Climate Finance Provided and Mobilised by Developed Countries in 2013-18, Climate Finance and the USD 100 Billion Goal. OECD. https://doi.org/10.1787/f0773d55-en

UNISDR, 2017. Words into Action Guidelines -- National focal points for Disaster Risk Reduction.

Further resources

- Restoration Opportunities Assessment Methodology (ROAM): https://www.wri.org/research/restoration-opportunities-assessment-methodology-roam
- United Nations Environmental Assessment (UNEA) resolution on Nature-based Solutions: https://wedocs.unep.org/bitstream/handle/20.500.11822/39864/NATURE-BASED%20SOLUTIONS%20FOR%20SUPPORTING%20SUSTAINABLE%20DEVELOPMENT.%20English.pdf?sequence=1&isAllowed=y

Policy Brief: Governance of Nature-based Solutions for climate change adaptation and disaster risk management

ADAPT: Nature-based Solutions for Resilient Societies in the Western Balkans

IUCN ECARO

Author:
Alexander Bisaro

Reviewers:
Mihaela Dragan-Lebovics, Kristin Meyer, Cate Owren, Jackie Siles

Key messages

- **NbS should be based on rights-based and empowering governance that is inclusive and transparent, equipping all stakeholders with information and opportunities to participate, influence and benefit from NbS.** Equitable and empowering governance should account for sociocultural power dynamics and create enabling conditions for the inclusion, sustained involvement, and increasing leadership of those disproportionately marginalised. This may necessarily include provisions to address structural barriers to inclusion on men, women and non-binary people from diverse backgrounds. Transparent and inclusive governance supports awareness raising on nature and climate change hazards and facilitates improved outcomes across all sectors.

- **Rights-based, empowering governance approaches must ensure that participation is based on mutual respect and equality, regardless of gender, age or social status, and upholds the rights of Indigenous Peoples.** This requires a conscious effort to actively involve traditionally excluded groups in decision-making processes in such a way that their dignity is upheld and their participation is encouraged. Gender analysis is one component that is key for supporting inclusive governance.

- **Inclusive governance can be enhanced through designing and implementing processes for data collection and analysis that account for different perspectives and actively engage diverse citizens and raise their awareness of the issues addressed by NbS.** Gender and stakeholder analyses are two tools for awareness raising. In addition, a number of citizen science approaches are emerging that include use of, for example, GIS or ecological and economic modelling in support of innovative means of data collection.

- **NbS design should incorporate the need to balance trade-offs.** Trade-offs occur because NbS often provide a diversity of different benefits and not all stakeholders value these benefits in the same way. Trade-offs may emerge between different economic, social and biodiversity objectives in NbS. Addressing them must be approached transparently through credible assessments with full disclosure and agreement among the most affected stakeholders, and with ecological and social safeguards in place that also recognise the importance of integrating gender-responsive safeguards and strategies. A number of new and innovative analytical tools are emerging to evaluate these trade-offs and support inclusive decision-making processes regarding trade-off limits and safeguards.

- **NbS design should incorporate mainstreaming and sustainability considerations.** It is important to ensure that NbS are supported by enabling institutional and policy frameworks, including across different sectors. An enabling environment fosters understanding of interdependencies between policy objectives and advances the identification of flexible, innovative and locally specific NbS. In that way, NbS account for long-term sustainability to ensure that outcomes last beyond the limited timeframe of a specific intervention. Further, NbS should be mainstreamed so that they facilitate further uptake in policy and practice. This involves raising public awareness of NbS, ensuring collaboration between relevant stakeholders, and promoting opportunities for local communities to lead and influence, benefit directly from as well as co-invest in NbS.

- **Mainstreaming of NbS requires mobilising finance for NbS implementation.** Such mainstreaming requires dedicated budgets for NbS, and thus close coordination with Ministries of Finance.

Introduction

Nature-based Solutions (NbS) are gaining importance around the world as potentially cost-effective measures that simultaneously provide environmental, social and economic benefits and help build resilience. Indeed, during the United Nations Environment Assembly, held in Nairobi in 2022, world leaders adopted a resolution on Nature-based Solutions for Supporting Sustainable Development. The resolution calls on Member States to support NbS implementation in partnership with local communities, women, youth and Indigenous Peoples and the application of a country-driven, gender-responsive, participatory and fully transparent approach. NbS thus offer potential to bring diverse natural features and processes into cities, landscapes and seascapes, and address a range of societal challenges, including adaptation to climate change and disaster risk management (Seddon et al., 2020).

Given the potential and increased demand for NbS, there is a need to establish a set of criteria to determine what interventions, measures or projects are in fact NbS. In the absence of such criteria, risks emerge that the NbS concept is misused, resulting in harm, rather than improvements to societies, communities and nature. Properly designing and implementing NbS requires considering a number of complex issues of interdependencies between scales, sectors, communities and ecosystems. Further, a lack of accounting for social and economic factors – for example gender inequality – can mean that even initially successful NbS interventions may ultimately not be sustainable or may in fact cause harm to communities or particular populations within communities. Over the long-term, mislabeled or poorly designed NbS projects can tarnish the case for the NbS approach – leading to an erosion of confidence in its use, and missed opportunities for protecting, restoring and sustainably managing ecosystems for the benefits of nature and people.

The IUCN Global Standard for Nature-based Solutions™ was developed to fill these gaps and address these potential risks. Indeed, the Standard aims to support funders, investors and decision makers in identifying NbS initiatives that are effective and scalable, prevent misuse, and consider potential externalities. In particular, through the set of criteria and indicators that facilitate NbS design, implementation and monitoring and evaluation, the Standard supports decision makers, who may be constrained in their access to the wide range of expertise needed for this purpose, in analysing NbS projects (e.g. on ecosystems, governance, gender equality and social inclusion, economics and finance).

Key definitions

Nature-based Solutions (NbS) are actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (IUCN, 2016).

Climate change adaptation is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm, or to exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014).

Disaster risk reduction is aimed at preventing new and reducing existing disaster risk (exposure, hazard or vulnerability), and managing residual risk, all of which contributes to strengthening resilience and therefore to the achievement of sustainable development (IPCC, 2014; UNISDR, 2017).

This Policy Brief focuses in particular on the governance dimensions of the IUCN Global Standard for Nature-based Solutions™. It aims to provide policymakers with a rationale for inclusive rights-based approaches to NbS, as well as practical examples of how such approaches are applied in practice.

Governance is important for several reasons. First and foremost, good governance is necessary to protect and promote human rights. Ensuring rights-based, gender-responsive and socially inclusive approaches to identifying, influencing, involvement in and benefitting from NbS is fundamental to the long-term sustainability of NbS for a healthy, peaceful and resilient planet. Second, good governance of NbS can also have implications for mainstreaming NbS into relevant policies and sectors at different levels of governance, especially considering that taking full advantage of the opportunities for mainstreaming is a characteristic of good NbS design. Third, many financial institutions, donors and other investors are concerned with good governance of the projects they support, and thus good governance should be considered in the initial phase of NbS design in order to attract needed finance.

The Standard provides a flexible multi-level perspective on NbS projects and their enabling environments, based on 8 Criteria and related indicators (see Figure 1). This Policy Brief presents three criteria included in the Standard with particular relevance for governance. For each criteria, case studies are presented to illustrate their applicability and how they are operationalised in practice.

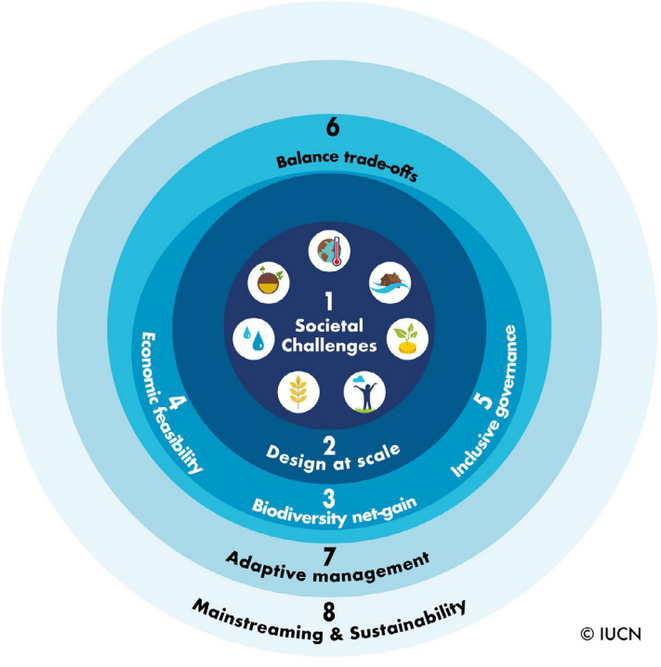


Figure 1. Eight criteria Criteria of the IUCN Global Standard for Nature-based Solutions (© IUCN).

Key message: NbS should be based on inclusive, transparent and empowering governance (Criterion 5)

"Inclusive governance" in the Standard aims to ensure that NbS involve and respond to concerns of all directly and indirectly affected stakeholders, and particularly rights holders, regardless of gender, age or social status, and upholds the rights of Indigenous Peoples. Governance of an NbS intervention involves opportunities for involvement in identification, design, decision-making, monitoring

and feedback, and grievance processes for all stakeholders, with careful attention to and support for ensuring the involvement of those commonly disenfranchised, which often include women, local communities, and Indigenous Peoples. Especially involving traditionally excluded groups in governance arrangements will support compliance of NbS. Meaningful engagement of these groups will not only increase their environmental- and sociopolitical awareness but also involve them in decision-making, which will contribute to just environmental, social and economic benefit sharing, long-term sustainability of NbS and to building community resilience.

While public participation is a key component of inclusive governance, "inclusivity" goes well beyond simply making information accessible to the public. Active efforts to be inclusive require understanding the diversity of populations in a geography being targeted by a project, and including through, e.g. gender analyses, to understand the diverse needs of populations and the diverse ways they access and use information. Such efforts are key to knowing how to include perspectives as equitably as possible. For example, in Serbia, recent efforts to develop local level Forest Landscape Restoration NbS measures explicitly included a gender analysis in identifying and designing these measures (see Box 1) (IUCN, 2021).

Box 1. Gender analysis in identifying Forest Landscape Restoration measures in Kraljevo, Serbia

A recent IUCN initiative in Serbia aimed at designing Forest Landscape Restoration (FLR) measures in the Serbian municipality of Kraljevo. Gender analysis was a core part of the FLR measure identification approach (IUCN, 2021). The initiative applied the Restoration Opportunities Assessment Methodology (ROAM), which incorporated a gender analysis in the study to identify the preferences and differential impacts of different FLR measures for women as well as other vulnerable and potentially marginalised groups.

The gender analysis objectives were to:

- assess the ways and the extent to which women and other vulnerable groups are affected by social and economic deprivation and climate change adaptation and disaster risks, and how these could be addressed by different FLR measures;
- explore prevailing gender norms and roles and how they relate to potential FLR measures and activities, in particular with regard to the access to information, ability to access project benefits, including employment; and
- increase integration of gender-responsive approaches and related capacities in FLR and NbS related activities.

Findings on gender issues:

- Gender stereotypes are still very strong, and women are main care givers for children and the elderly and they carry out the majority of unpaid work, especially in households in rural areas.
- The economic position of women is unfavourable and often men are the main decision makers and main providers in the households.
- Women in Kraljevo are less likely to be employed than men and participate less in decision-making, which is related to forms of agricultural production and related household gender roles.
- For women, there is a strategic need for increased knowledge and networking, transport and available social services, and a particular need for greater access to agriculture production technology.
- Policies largely focus on improving the position of rural women through the financial support to agricultural production, tourism development and networking.

Recommendations of the gender analysis:

- Women need to be involved in all stages of the process including public meetings and consultations. In addition to valuable inputs, the visibility of their participation, recognition and empowerment will contribute to overcoming gender stereotypes.

- Women should be consulted about the types of seeds and species and additional measures in order to scale up the potential benefits from NbS.
- Additional benefits for women could be provided within the intervention, such as solar panels or other renewable energy sources to illuminate unsafe parts of the village.
- Community activities related to natural resources or forests should be designed to make use of women's unique perspectives and knowledge and to support women's networking.

Gender analysis is indeed a key component of inclusive governance and the foundation of an inclusive gender-responsive approach. It explores the roles and relationships between people of different genders, as well as gender-specific opportunities, barriers, and decision-making power. Gender analysis enables an understanding of gender differences and systemic discrimination that must be addressed to make progress toward gender equality. With this knowledge, NbS measures can be planned and implemented in ways that recognise gender roles and dynamics while tackling discriminatory norms and practices.

Social norms and power dynamics are highly context specific, and as such, it is necessary that participatory analysis processes are carefully and sensitively designed in order to overcome assumptions and challenge perceptions that present barriers to gender equality. Because gender roles and relations change over time and circumstances, gender analysis should be organised as an on-going process that can inform monitoring and evaluation through an adaptive management approach (Criteria 7) that promotes learning and is adjusted over time. In order to ensure this, it is therefore important to empower local institutions, including women's groups and other representatives of socially excluded groups, to promote sufficient local capacities to address these issues as the NbS intervention evolves.

It is important to note that, in addition to social justice arguments for inclusive governance, recent empirical evidence on NbS also shows that inclusive and transparent governance is key to effective and sustainable outcomes for climate change adaptation and disaster risk reduction. For instance, a recent review of urban NbS aiming at green redevelopment found that participatory, inclusive governance can be enhanced through the designing and implementing process for data collection and analysis that actively engage citizens and raise their awareness of the issues addressed by NbS. Indeed, citizen science approaches which involve the development of 'citizen platforms' are emerging in which climate-relevant or environmental risk data can be made available and thus in addition to serving as an analytical resource, often prove effective in increasing citizen awareness of the value of urban nature and growing their engagement with initiatives to protect and restore urban nature (Hawxwell and et al, 2018).

There are a number of new and innovative tools to support such inclusive governance through various forms of engagement and co-production with stakeholders. For instance, a recent NbS implementation in demonstration sites in the Lower Danube and in Slovenia deployed a 'community-based monitoring system' which enables both awareness raising among participants, as well as, generating knowledge that was taken up in project decision-making to enhance the overall performance of the NbS with respect to key performance indicators. A review of the project found that the whole process of "co-definition of benefits and co-benefits, indicators definition and [community-based monitoring system] design – contributed to make the involved stakeholders aware of the wide range of benefits that can be produced through the NbS implementation" (Giordano, R. et al., 2019).

Key message: NbS design should incorporate the need to balance trade-offs (Criterion 6)

The purpose of Criterion 6 "Balance trade-offs" in the Standard is to ensure that NbS proponents acknowledge trade-offs and follow a fair, transparent and inclusive process to balance and manage them over both time and geographic space (IUCN, 2020). Trade-offs occur because NbS often provide a diversity of different benefits and not all stakeholders value these benefits in the same way. Such trade-offs are inherent in natural resources management particularly when multiple stakeholders with different preferences and different levels of power are involved. For instance, while rural tourist operators may favour the benefits of clean drinking water, other stakeholders may favour maximising agriculture outputs, and these two outcomes may conflict. Another example related to climate policy would be a large scale monoculture afforestation measure to mitigate CO2 that negatively affects biodiversity and water resources.

The identification and consideration of trade-offs among multiple stakeholders, and discussion of potential compensation interventions can reduce conflicts and enhance long-term effectiveness of NbS. Further, it is important to emphasise that such trade-offs can become a major issue when they are resolved in the same way multiple times, for example, by consistently prioritising agricultural production over biodiversity conservation, so that key ecosystem benefits are significantly reduced over an entire ecosystem or landscape scale, or that specific populations are perpetually at a disadvantage or excluded. Diverse stakeholders who are often left out – different women and Indigenous communities, for example - may also have unequal access to decision-making and information-sharing processes that ultimately undermine their ability to influence, determine, and benefit from trade-off decisions. Consideration of trade-offs and how to resolve them must take these risks into account and include gender-responsive, socially inclusive, and community-driven safeguards to avoid such negative outcomes. For example, recent experiences in Serbia developing Forest Landscape Restoration (FLR) measures also dealt with the issue of trade-offs in selecting FLR measures, as the FLR assessment methodology acknowledged that landscapes components are valued in different ways by different stakeholders. The project addressed these trade-offs by combining different FLR measures in the intervention area, and involving local stakeholders in choosing for particular sites whether to prioritise sustainable agriculture, sustainable forestry or a mix of the two (IUCN, 2021).

Consideration of trade-offs should include both social and ecological safeguards to ensure minimum safety standards are maintained. Community social analyses, including gender analyses, ensure minimum social safeguards are in place, and that minimum standards of care are provided (see Box 1 on Gender Analysis). Ecological safeguards should be defined through contextualised ecosystem or landscape-scale analysis to define key thresholds and ensure safeguards are not transgressed. Safeguards are necessary to ensure that such thresholds are not crossed, for example, by intensive industrial land use practices, and that the long-term stabilising properties of ecosystems remain intact. A number of recent developments in analytical approaches address precisely this issue of trade-offs for ecosystems and can support NbS design (see Box 2).

Box 2. Economy and nature trade-off assessment tools for NbS design: NbS for adapting to urban heat stress

One tool for analytically exploring trade-offs and safeguards for NbS design is InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs), which is a collection of open source software models that use spatial data and analysis to value the goods and services from nature at a range of scales and locations (Guerry et al., 2021). InVEST aims to support decision makers in exploring changes in ecosystems and their effects on the flows of different benefits to

people (Chaplin-Kramer et al., 2019). Given its ability to address multiple ecosystem services across different settings, InVEST provides a tool for transparently assessing trade-offs between different environmental and economic goals both to support diverse decision makers, and to enable a broader discussion of these trade-offs, and possible necessary safeguards, among different stakeholders. InVEST models use geographic information systems (GIS) and can produce outputs along biophysical indicators (e.g., degrees of urban cooling), economic indicators (e.g., avoided cooling costs), and other social indicators (e.g., changes in mortality/morbidity) (Guerry et al., 2021). InVEST can be applied to asses urban ecosystem services with respect to a number of societal challenges relevant to climate change adaptation, including urban cooling, flood mitigation, climate change mitigation, and mental and physical health.

InVEST has been applied in a number of settings to inform responses to increased heat stress in cities through urban cooling. As cities globally are increasingly exposed to rising temperatures and heat waves, urban heat stress reduction is moving up the urban policy agenda. Greening urban areas through vegetation is an important measure to address these risks, as it provides shade, increases cooling via evapotranspiration, and modifies the urban environment's thermal properties. Such measures can reduce urban heat island effects, and have the benefits of improving health and well-being outcomes for urban communities. Indeed, decreased mortality and morbidity and greater comfort and productivity are associated with reduced urban heat islands (Guerry et al. 2021). The InVEST Urban Cooling Model integrates shade, evapotranspiration, albedo, and the distance from cooling islands (e.g., parks) to develop an index of heat mitigation. The index can then be employed to generate estimates regarding the temperature reduction effects of vegetation measures in urban settings. As a final analytical step, InVest then applies one of two optional valuation methods to estimate the value of heat mitigation benefits based on energy consumption and work productivity. By comparing increased vegetation measures to a non-greening baseline, InVest supports the calculation of the benefits arising from additional cooling provided by different scenarios, supporting cities in evaluating the percentage gain or loss in service provisioning from greening measures (Guerry et al 2021). The calculation of benefits under different scenarios can be used to assess trade-offs between investment in green urban measures, and other investment options (e.g. conventional infrastructure, or no investment), along the defined biophysical, economic and social indicators.

Key message:
NbS design should incorporate mainstreaming and sustainability considerations (Criterion 8)

In order for NbS measures' effects to scale, there is a need for governance arrangements that enable NbS outcomes to influence the wider policy environment. The purpose of Criterion 8 "Mainstreaming and sustainability" in the Standard is to enable this influence by ensuring that NbS are aligned with other relevant policy frameworks, and that communication and learning processes are in place to mainstream NbS outcomes and experiences into the wider policy landscape.

Both aspects help to ensure that the outcomes last beyond the limited timeframe of a specific NbS intervention. First, alignment of NbS with existing policies is critical for ensuring long-term impacts of NbS both on sectors (e.g. forestry or agriculture) as well as related sociocultural and cross-sectoral policies and processes (e.g., to advance gender equality and women's empowerment or address multi-dimensional poverty) by ensuring that NbS out-

comes contribute to policy objectives in these domains. For an analysis of the enabling policy environment for NbS in the Western Balkans see (Bisaro and Meyer, 2022).

Second, establishing communication and learning processes for NbS mainstreaming is particularly important because NbS is an emerging concept and open exchange of information and experiences on NbS can increase learning and stimulate demand for and leadership of NbS among multiple stakeholders. Promoting such learning processes on NbS can create a virtuous circle whereby NbS design is improved based on shared learning and exchange, which in turn increases the general demand for further NbS across different policy domains because NbS outcomes are seen as effective, affordable and sustainable. This is particularly the case when, through such exchanges, NbS are designed and implemented in approaches that are complementary to existing institutional structures, policies, plans, laws, regulations and other relevant interventions. In view of the discussion above on Criteria 5, NbS should be mainstreamed so that they facilitate further uptake of rights-based, gender-responsive NbS in enabling policy frameworks.

For policy alignment, this implies that NbS for climate change adaptation and disaster risk reduction should contribute to global agreements, goals and commitments for sustainable development. For mainstreaming of NbS experiences, various approaches exist which generally rely on strategic communications and outreach. Principle audiences that may be most relevant to consider are individuals (the public, academics), institutions (national government, start-ups, non-government organisations) and global networks (Sustainable Development Goals, Paris Agreement) (IUCN, 2020).

Importantly, in addition to outreach, policy for scaling up and mainstreaming NbS should address knowledge sharing, collaboration, learning and capacity building needs. In particular, policy aimed at mainstreaming NbS should:

- Increase public awareness, for example through workshops, dialogues and online platforms, about the experiences gained through pilot projects and demonstrate that NbS successfully create multiple co-benefits, in particular by and for diverse groups of people;
- Ensure sufficient time and space for collaboration between the diverse sets of actors needed to plan and implement innovative NbS (e.g. governments, business and industry, researchers, investors, funders, NGOs, community groups such as women's networks and cooperatives, and CSOs);
- Provide training and capacity building (e.g., on technology, financial management) where necessary to ensure that different stakeholders are able to influence, implement and benefit from the NbS over the long term;
- Consider the context within which NbS are implemented, acknowledging that most solutions are context-dependent and adjustments may be needed in order for them to work in different political, legal, sociocultural and natural conditions. Tools such as intersectional gender analyses can help;
- Wherever possible, ensure that local populations co-invest (either financial or through in kind commitments) in the NbS to secure ownership of the solution;
- Enable mobilising dedicated budgets for NbS, and thus close coordination with Ministries of Finance.

References

Bisaro, A., Meyer, K., 2022. Integrating Nature-based Solutions into Policies for Climate Change Adaptation and Disaster Risk Reduction. A Regional Comparative Policy Analysis in the Western Balkans (ADAPT project). IUCN.

Giordano, R. et al., 2019. Deployment of the community-based monitoring system and implementation of the platform. NAIAD Project Deliverable 3.4.

Hawxwell, T., et al, 2018. D6.2 Municipal Governance Guidelines | UNaLab. UNALAB.

IUCN, 2021. Forest Landscape Restoration Opportunities Assessment, Municipality of Kraljevo, Serbia. IUCN ECARO.

IUCN, 2020. IUCN Global Standard for Nature-based Solutions : first edition.

Seddon, N., Daniels, E., Davis, R., Chausson, A., Harris, R., Hou-Jones, X., Huq, S., Kapos, V., Mace, G.M., Rizvi, A.R., Reid, H., Roe, D., Turner, B., Wicander, S., 2020. Global recognition of the importance of nature-based solutions to the impacts of climate change. Global Sustainability 3. https://doi.org/10.1017/sus.2020.8

Further resources

- Restoration Opportunities Assessment Methodology (ROAM): https://www.wri.org/research/restoration-opportunities-assessment-methodology-roam
- United Nations Environmental Assessment (UNEA) resolution on Nature-based Solutions: https://wedocs.unep.org/bitstream/handle/20.500.11822/39864/NATURE-BASED%20SOLUTIONS%20FOR%20SUPPORTING%20SUSTAINABLE%20DEVELOPMENT.%20English.pdf?sequence=1&isAllowed=y

This material was prepared within the project ADAPT: Nature-based Solutions for resilient societies in the Western Balkans. ADAPT is a three-year initiative funded by the Swedish International Development Cooperation Agency (SIDA), implemented by the International Union for Conservation of Nature (IUCN), Regional Office for Central Asia and Eastern Europe (ECARO). The goal of the project is to increase the resilience of ecosystems and communities to climate change and reduce disaster risks by implementing Nature-based Solutions in the Western Balkans.

Sida

This material/production has been financed by the Swedish International Development Cooperation Agency, Sida. Responsibility for the content rests entirely with the creator. Sida does not necessarily share the expressed views and interpretations.