IUCN Nature-based Recovery Initiative

Technical Paper No. 3

Nature-based Recovery can create jobs, deliver growth and provide value for nature

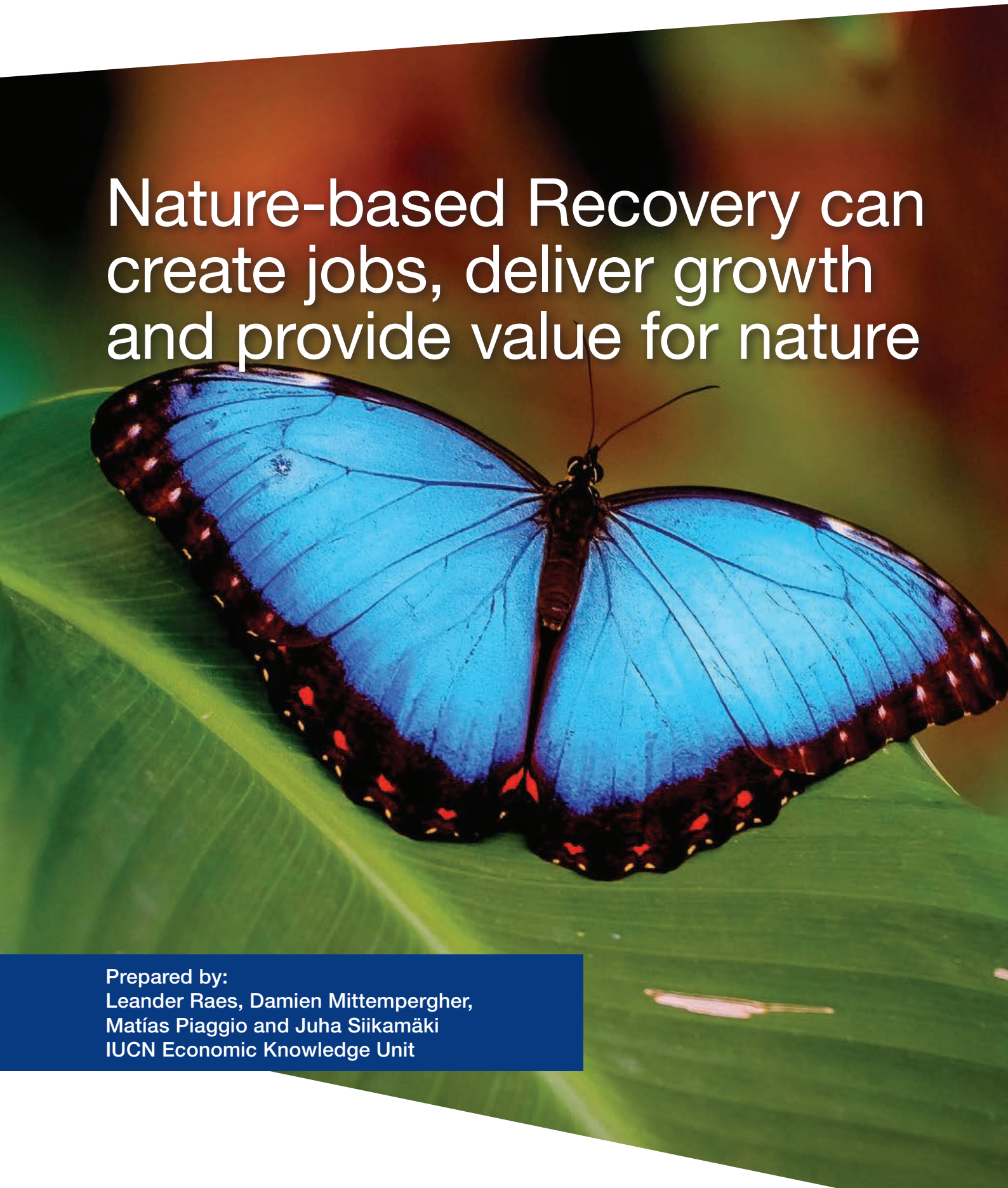

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Photo credits: Cover page: matthiasfr_Pixabay. **Page iii:** Coffee bushes in a shade-grown organic coffee plantation on the western slope of the Andes in Ecuador, Shutterstock/Morley Read. **Page iv:** People wearing face masks (Italy), Unsplash/Gabriella Clare Marino. **Page 11:** Unsplash/Evie S. **Page 17:** Biorocks of coral reefs (*acropora*) (Indonesia). Credit shutterstock_227152321. **Page 18:** Land restoration (Rwanda), IUCN/Donatha Dukuzumuremyi

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Content

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List of acronyms

FLR Forest landscape restoration

GDP Gross Domestic Product

IUCN International Union for Conservation of Nature

NbR Nature-based Recovery

NbS Nature-based Solutions

IPBES Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

TEEB The Economics of Ecosystems and Biodiversity

ZAR South African Rand

CAD Canadian Dollar

PES Payment for ecosystems services

NDCs Nationally Determined Contributions

IPLC Indigenous peoples and local communities

Key findings

- **Economies at global, national and local levels depend on nature.**
- **People benefit from nature in many ways, ranging from ensuring a clean water supply, supporting pollination and other ecosystem services for food production, stabilising global climate, and protecting against natural hazards.**
- **Investment in nature, through cost-effective and privately and socially profitable solutions, not just benefits nature, but also help create jobs and support human well-being and economic prosperity.**
- **Evidence from forest landscape restoration in Central America shows that more jobs per million dollars invested in restoration were created than many other economic sectors that are conventionally targeted to boost the economy.**
- **Restoration can create jobs both in the short- and long-term, specifically in rural areas.**
- **During the implementation phase, demand for jobs is higher, creating opportunities to address short-term labour losses due to the pandemic such as those in the tourism sector and related activities.**
- **Design is crucial to fit the objectives. Women and youth can be specifically targeted for employment, and manual restoration employs more people on a per hectare basis than mechanised restoration.**

1 Introduction

Economies at global, national and local levels depend on nature. The linkages are all-encompassing, from insects pollinating crops to the regulation of the global climate by ecosystems and involve direct contributions to economy. For example, agriculture as a sector relies strongly on ecosystem services, generating between 0.03% and 86.2% of employment across countries (World Bank, n.d.a). Agriculture, forestry and fishing as a combined sector contribute between 0.03% and 54.3% of countries' economic output as measured by their Gross Domestic Product (GDP) (World Bank, n.d.b). Globally, an estimated 1.2 billion jobs depend directly on healthy environment and ecosystems, including jobs in farming, fishing and forestry (ILO, 2018).

As the Dasgupta Review notes, economies are embedded in nature and failing to recognise this and manage nature as a valuable integral asset has led to a lack of investment in nature with detrimental consequences (Dasgupta, 2021). Since 1992, the world has increased the amount of produced and human capital per capita by 100% and 17%, respectively, but failed to sustainably manage its natural capital, leading to a decrease of 40% in its asset value. Swiss Re Institute estimates that 55% of global GDP depends on high-functioning biodiversity and ecosystem services (Retsa et al., 2020). Because natural capital ultimately sustains all economic well-being and development, the degradation of nature puts our entire economies at risk.

Current focus on economic recovery from the COVID-19 pandemic provides both an opportunity and urgent need to strengthen economies and human well-being while balancing the ecosystem with the socio-economic system. For instance, recent research suggests that ecological investments, such as afforestation, parkland expansion and restoration of rural ecosystems, should have high priority as part of COVID-19 recovery stimuli (UNEP, 2020). This would also help to achieve global environmental goals, such as those established in the Sustainable Development Goals, the United Nations Convention to Combat Desertification, the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change and the Bonn Challenge.

Currently, only 3% of long-term investment in economic recovery goes to green recovery (see Technical Paper No. 1 for a detailed discussion). Green investment as part of nature-based recovery can positively influence economic recovery, including via job creation. Through this report, we display evidence to support the case

that investment in nature can be an effective policy to create jobs and support positive economic outcomes. To do so, we highlight global data along with evidence from a range of illustrative case studies that show that when investment is available it can have a positive impact (Figure 1).

IUCN Nature-based Recovery Initiative aims to ensure that governments consider nature in policy measures to support economic recovery from the COVID-19 pandemic. To achieve this, this initiative capitalises on IUCN's strengths, including engaging with its Members to ensure that recovery investments take advantage of nature-based recovery. More concretely, IUCN's ambition is twofold: 1) that economic investment post-COVID does no harm to nature and livelihoods; and 2) that at least 10% of overall recovery investment provides value to nature.

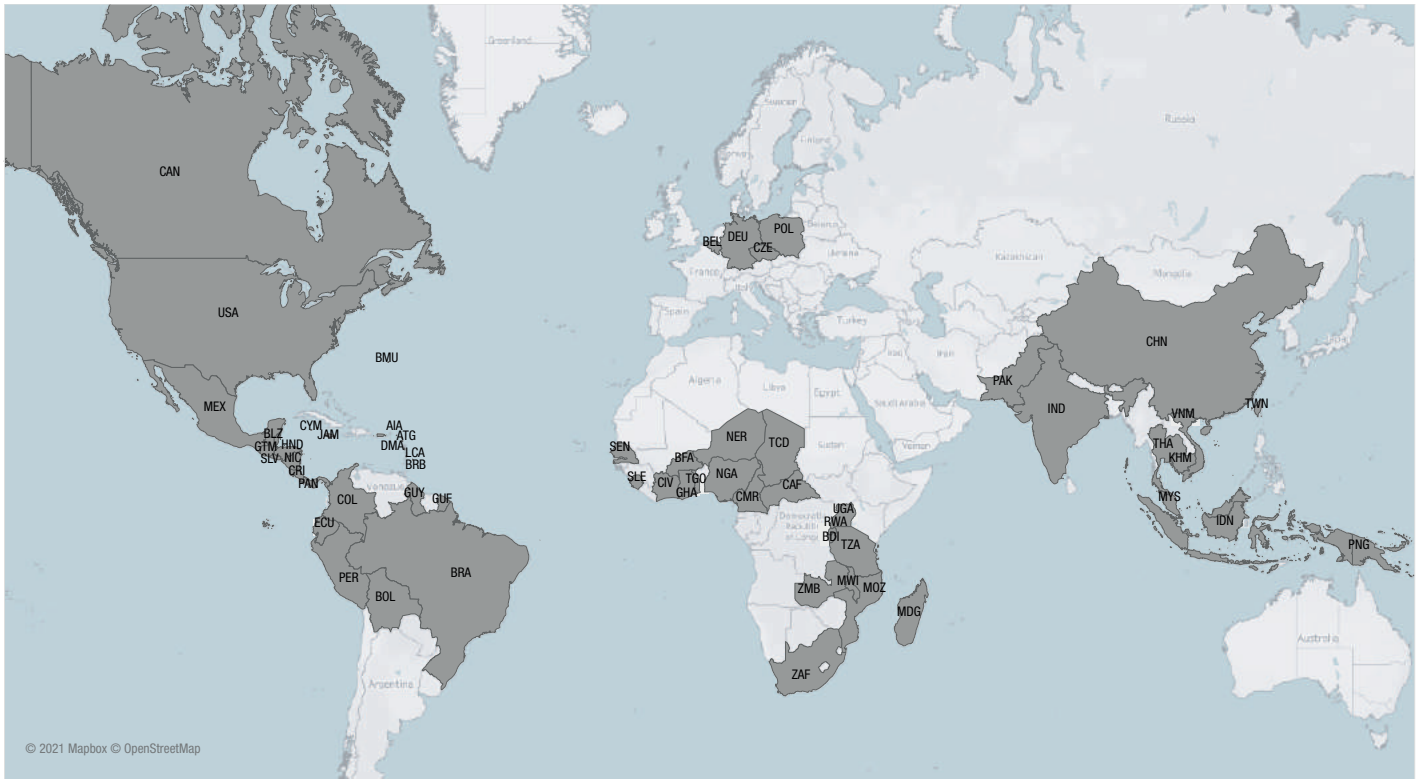
This manuscript is the third in a series of three technical papers that serve as background documents to inform and support the IUCN NbR Initiative. The objective of this manuscript is to examine the role of nature and its conservation and restoration to job creation and economic well-being and development. The main aim of Technical Paper No. 3 is not to provide prescriptive policy recommendations, but to develop evidence to help policy makers recognise and take advantage of some of the different options available. Although it is not fully comprehensive, the evidence consists of a robust set of case studies on a range of scales, actions and geographical settings (Figure 1).

The other two technical papers to support the IUCN NbR Initiative provide and discuss evidence on the **economic impact of the pandemic and economic policy measures** to respond to them and **the role of nature-based solutions (NbS)** in this context.

At the outset, we note that while the focus of this manuscript on job creation and other recovery-related economic aspects of restoration and conservation of nature is purposeful in the context of the IUCN NbR Initiative, it is also clear that this scope provides only a partial accounting of the broad range of benefits brought by conservation and restoration. While we recognise the critical importance of considering all the benefits from investing in nature in policy decisions, assessing them comprehensively is both outside the scope of this assessment and subject to several well-known sources such as IPBES reports.

FIGURE 1

Overview of countries addressed in the case studies



Source: Authors.

2 Nature-based recovery and job creation

One of the main impacts of COVID-19 on economies has been the loss of jobs, as documented in Technical Paper No. 1. Addressing the job losses is a key objective for economic recovery and we illustrate here the potential for NbR to support job creation in both short and long-term. We examine this by presenting data from IUCN's assessments related specifically to estimating job impacts of forest landscape restoration,[1] as well as global and local studies on the impact of different nature-focused actions on employment.[2]

Assessments of the employment impacts of investments often classify direct, indirect and induced jobs. Direct jobs are those taking place directly in the new economic activity (e.g. restoration of nature). Indirect jobs happen in other economic activities following new investment, including by businesses supplying tools, materials, plants and equipment for restoration. Induced jobs emerge through forward linkages, such as households benefiting from direct and indirect jobs and spend some of their additional income on goods and services in the economy.[3] When the new economic activity displaces another economic activity, such as restoration replacing the use of non-restored lands, additional jobs, including additional direct, indirect and induced jobs, are calculated as the number of jobs related to the new economic activity (restoration) minus the jobs that exist in the replaced economic activity (non-restored land uses).

2.1 Direct job impacts of landscape restoration

Figures 2 and 3 show estimates of direct job impacts, based on labour inputs of a range of different landscape restoration actions, including total direct jobs needed and additional direct jobs created on a per hectare basis. These data have been generated by IUCN for Belize, Togo,[4] El Salvador (Raes et al., 2017) and Honduras (Nello et al., 2019) as part of efforts to support countries' restoration planning in line with their commitments to the Bonn Challenge. The job impacts vary between implementation and maintenance stages and as Figure 2 shows, these are categorised according to the total number and additional direct jobs created on average during the implementation phase of the restoration action (year 1 of the restoration timeline). Figure 3 shows the results on a more permanent basis in the maintenance or production phase (from year 2 onwards).[5]

Job creation varies highly on a per hectare basis between different restoration activities, but both total and additional needs for labour are almost unequivocally positive regardless of activity. Additional need for labour (job creation) tends to be higher during the implementation phase as compared to the maintenance phase. **High demand for labour during the implementation phase** is particularly relevant when evaluating economic recovery packages, as part of the demand for job creation will focus on offsetting current job losses in the short-term. Over the longer term, jobs lost in the hardest

1 For example, see the work undertaken as part of the Bonn Challenge Barometer.

2 To support countries or regions in achieving their restoration targets as part of the Bonn Challenge, IUCN implements and supports Restoration Opportunity Assessment Methodology or ROAM process.

3 These definitions follow ILO; see for example *Employment Impact Assessment: Analysing the employment impacts of investments in infrastructure* (ILO, 2021), available at https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_774061.pdf.

4 The results of the Belize and Togo ROAM process will be in presented in forthcoming publications.

5 Jobs are based on labour needs and adjusted to full-time equivalents (FTE) on a per country basis. Labour includes household labour, community labour, as well as hired labour. Additional labour is the difference between total labour needs for the restoration action and the estimated labour used on non-restored land.

FIGURE 2

Total direct jobs needed and additional direct jobs created by restoration during implementation phase, by restoration activity (year 1 of forest landscape restoration; full-time equivalent per hectare per year)

Source: Authors.

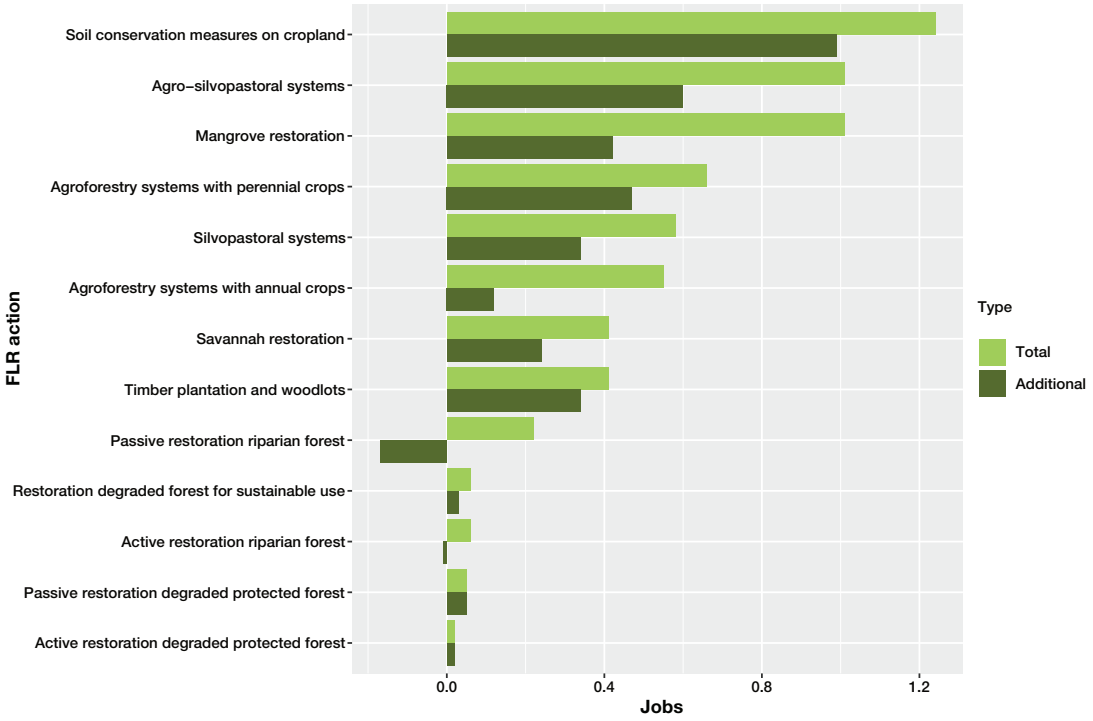


FIGURE 3

Total direct jobs needed and additional direct jobs created by restoration during the maintenance phase, by restoration activity (from year 2 onwards; full-time equivalent per hectare per year)

Source: Authors.

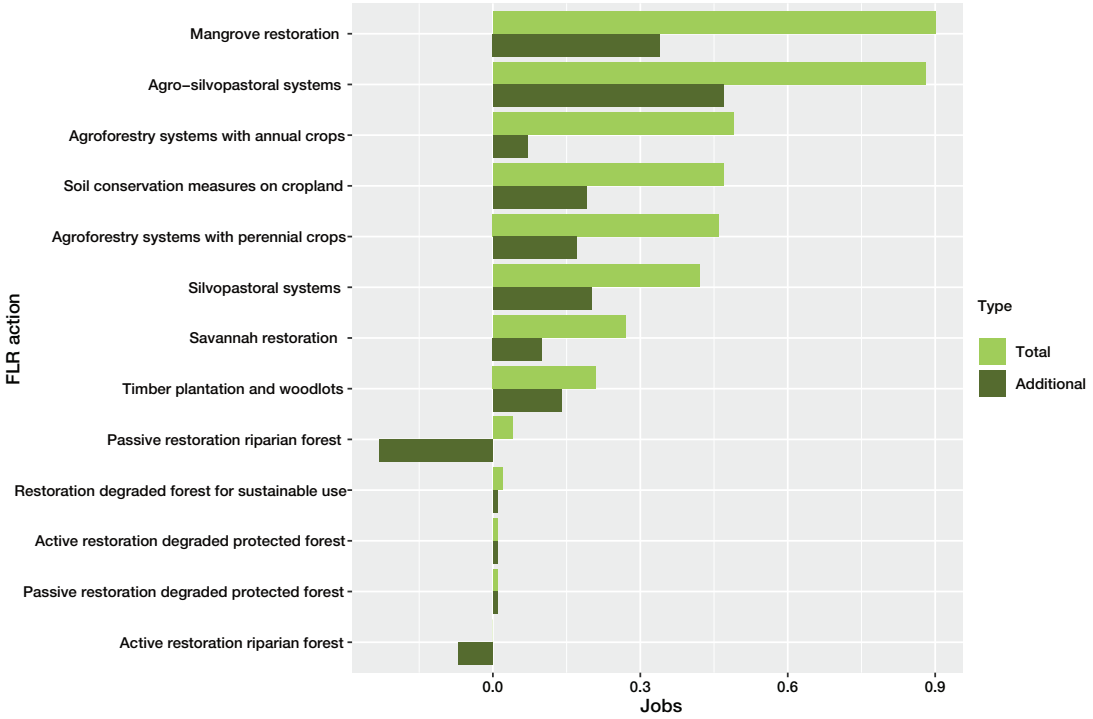
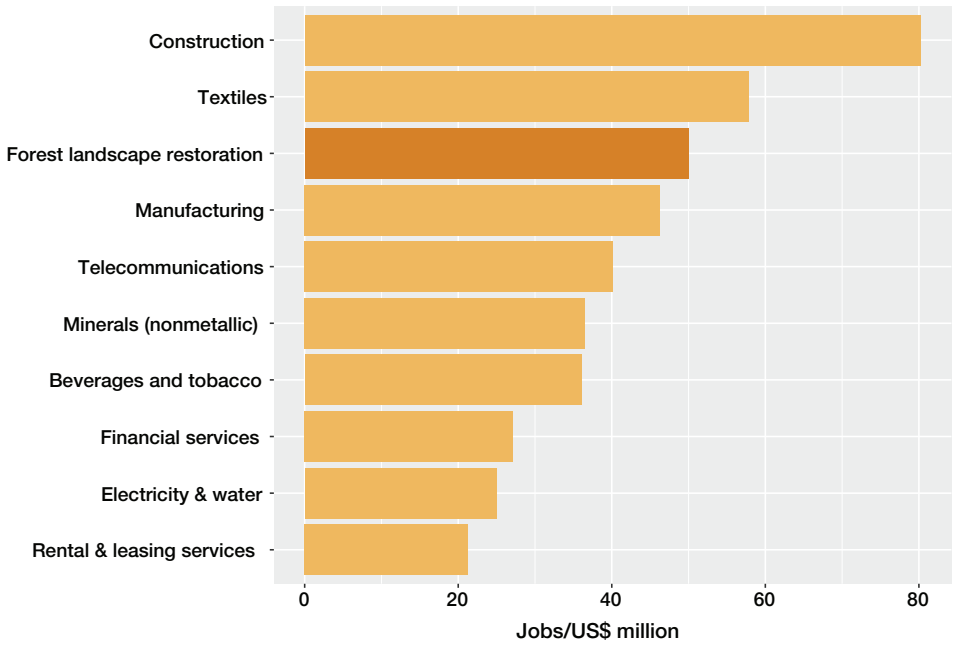


FIGURE 4

Comparison of job creation per million dollars injected into forest landscape restoration, as compared to various industries in El Salvador

Source: Authors.



hit sectors, such as tourism, will recover. Therefore, additional needs for job creation will decline over time, reducing demand for job creation in the longer run relative to immediate needs after the pandemic.

Potential negative impact on jobs can take place when productive land uses are restored for conservation, and the conservation actions in question yield fewer jobs than activities that took place prior to restoration (see, for example, the case of riparian forests in Figure 2). Such negative impacts may be possible to offset by including additional job creation efforts, such as the production of non-wood forest products, as part of the design.

2.2 Job creation in restoration versus other economic sectors

IUCN recently developed input-output models to assess both direct and indirect job creation per million dollars invested in El Salvador in the implementation and maintenance of restoration in 2018 (an approach similar to the assessment of jobs created in coastal restoration in the economic recovery from the 2007–2009 Great Recession).[6] **Restoration created an estimated 50 jobs per million dollars invested**, somewhat lower than in construction (80) and textile (58) sectors, but greater than in other manufacturing, telecommunications and several other industries (Figure 4). Moreover, restoration-related jobs concentrate in rural areas.

2.3 Targeting specific groups such as women and youth

Specific groups, such as **youth, can be targeted** to ensure their employment within these actions. However, some activities, such as tree planting, can be carried out only after a short training. In connection with targeting youth for job creation, Sulich et al. (2020) analysed the proportion of young people in three European countries who report a 'green job' as their first job. According to the study, around 15% of young people in Belgium and Poland searched for their first job in the green jobs sector. However, this percentage decreases to 1.8% for the Czech Republic. The authors concluded that green jobs seem to provide part of the solution for young people's difficulties in the labour market, although with clear differences among the countries studied. Nonetheless, it shows that NbR could have a positive impact on youth unemployment.

6 The study on El Salvador is part of the Bonn Challenge Barometer/InfoFLR, where job creation is one of the socio-economic indicators.

FIGURE 5

Short- and long-term job creation disaggregated by sex in Rwanda

Source: InfoFLR (n.d.).

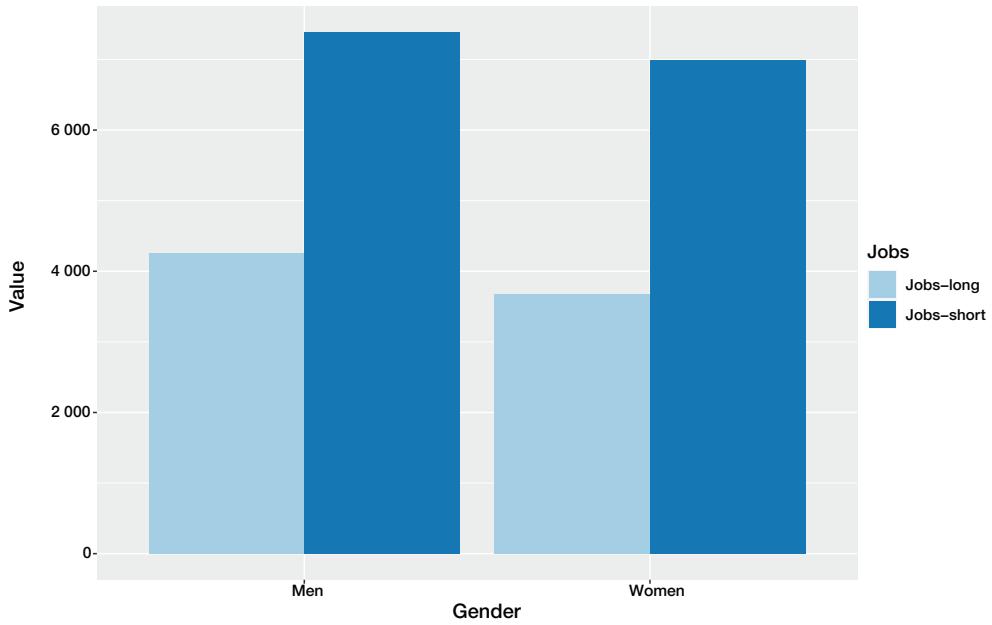
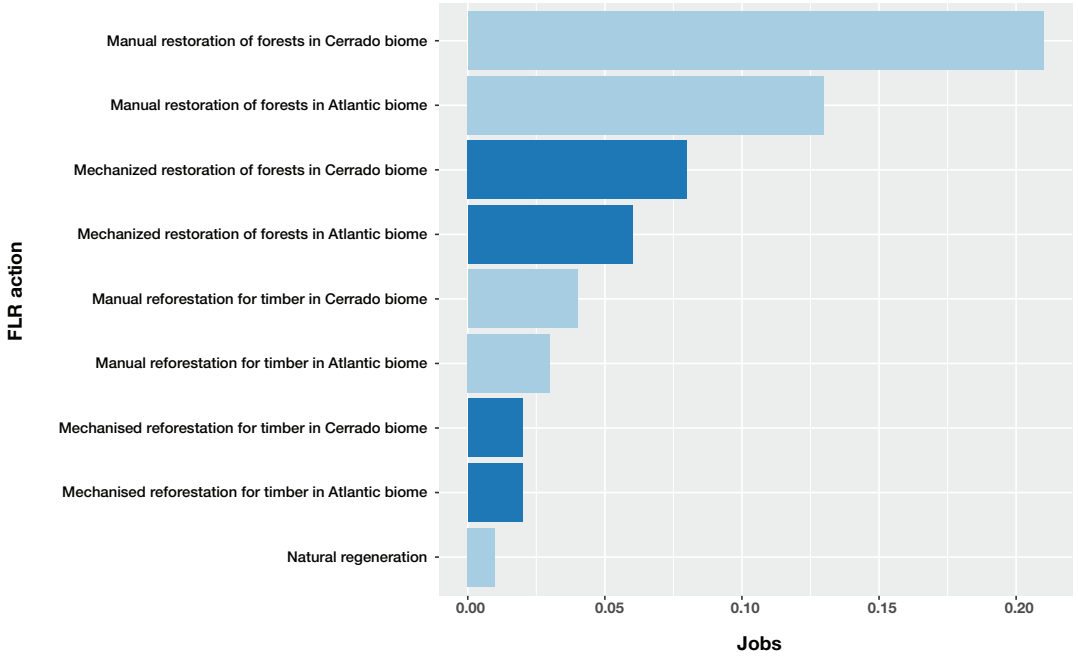


FIGURE 6

Full-time equivalent jobs per hectare in restoration in Minas Gerais (Brazil) in 2016

Source: Authors.



Worldwide, women are overrepresented in informal and vulnerable employment (ILO, 2018; UNW, 2018). NbR can help open opportunities for women to access employment and contribute to reducing gender gaps, improving women and their family's well-being. For example, data in Figure 5 show the number of short- and long-term jobs by gender that were created in Rwanda as part of the country's effort to restore 708,629 hectares under its Bonn Challenge pledge. The data show that women benefit 49% of the short-term jobs and 46% of the long-term jobs. The results showed **women benefits are roughly equal to those of men concerning access to jobs.** Therefore, unlike in many other sectors, the benefits of these jobs can support those whom the pandemic has hit hardest.

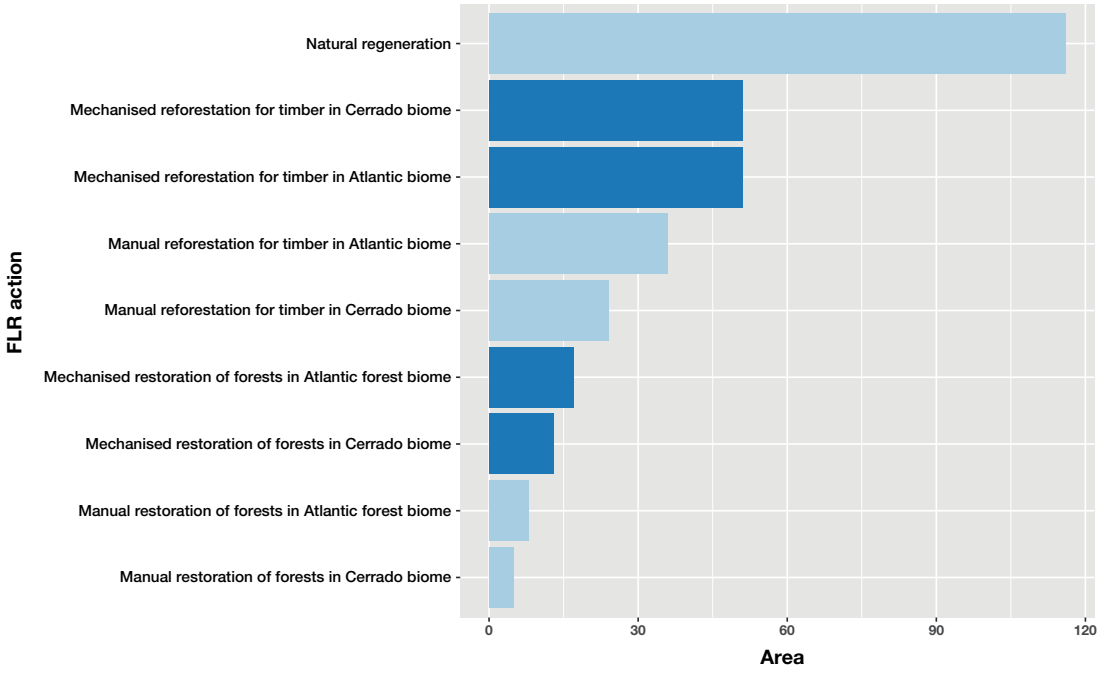
2.4 Mechanised versus manual restoration

Finally, as in any economic activity, needs for jobs may vary based on specific techniques employed. In the context of restoration, a key determinant is whether restoration is mechanised or manual. Figure 6 shows evidence of the full-time equivalent jobs needed

FIGURE 7

Hectares restored per full-time equivalent jobs by restoration actions in Minas Gerais in 2016

Source: Authors.



per hectare as part of restoring areas (implementation) or maintaining restored areas in Minas Gerais (Brazil) in 2016.[7] **Manual restoration employs more people on a per hectare basis**, although a trade-off occurs between the number of people employed and the total area restored (Figure 7). Considering the current need to offset job losses due to the pandemic, countries choosing to implement NbR policies may opt for manual-focused activities to amplify job creation on a given unit of land, versus employing fewer people but restoring a larger area.

2.5 Additional benefits from restoration and conservation

Investing in actions, such as landscape restoration or conservation among others, does not only have the potential to generate both short-and longer-term jobs, but it can also **generate additional benefits**, such as **financial and a broad range of environmental benefits,** while creating employment opportunities**.** Table 1 provides an example of direct job creation and financial benefits from restoration in Mexico. Table 2 considers environmental benefits in the form of carbon sequestration and reduced emissions through restoration in Honduras and El Salvador. Both assessments were developed by IUCN.

2.6 Assessments in regional, national and local scales

On a regional level, according to a study by the International Labour Organization in Latin America and the Caribbean, shifting to a net-zero emissions strategy by 2030 would create an estimated 60,000 direct new jobs in the forest sector alone, corresponding to a 6% increase of jobs in the sector in the region (Saget et al., 2020).

At the national scale, an analysis in South Africa evaluated the country's Working for Water Programme. Launched in 1995, this programme fights the spread of invasive alien plant species by paying small businesses to hire individuals and local communities to eradicate such species in upper-watersheds. In order to prioritise the most vulnerable people, the Working for Water programme sets parametres for contractors in the selection of workers, giving preference to single-headed households, women, disabled people and youth (Bek et al., 2017). The study found that that by 2015, an average of 39,000 people were benefiting from employment each year, although it is important to note that most of these jobs were short-term jobs.

7 In Minas Gerais, the timber plantations are exotic species such as Eucalyptus. By definition, these should not be considered a restoration action, but have been added here for comparison with the restoration of natural areas.

TABLE 1

Job creation and financial indicators for restoration in Oaxaca, Mexico

FLR ACTION	DIRECT JOB CREATION (HA/YEAR)	TRANSITION COSTS (MXN/HA)	TOTAL NET PRESENT VALUE (MXN/HA)	NET PRESENT VALUE, ON AVERAGE PER YEAR (MXN/HA/YEAR)
Agave agroforestry	0.20	48 900	1 572 972	78 649
Milpa system with fruit trees on hillsides	0.40	89 750	750 774	37 539
Coffee agroforestry system	1.23	219 700	1 955 937	97 797
Silvopastoral conservation system	0.12	32 700	216 295	10 815

Source: Adapted from Simonit et al. (2020).

TABLE 2

Job creation indicators and carbon balance* for restoration

* The carbon balance is the net balance from all greenhouse gases (GHGs) expressed in carbon dioxide equivalents (CO_2eq) that will be emitted or sequestered through restoration, as compared to a business-as-usual scenario (land-use which will be restored). Carbon balances were calculated with FAO's EX-ACT tool, a land-based accounting system that estimates carbon stock changes as well as GHG emissions.

FLR ACTION	ADDITIONAL JOBS IMPLEMENTATION (FTE*/HA/YEAR)	ADDITIONAL JOBS MAINTENANCE (FTE/HA/YEAR)	CARBON BALANCE (CO_2E/HA/YEAR)
Agroforestry systems with annual crops	0.12	0.07	44
Agroforestry systems with perennial crops	0.59	0.17	31
Silvopastoral systems	0.37	0.29	4
Agro-silvopastoral systems	0.20	0.12	37
Timber plantation and woodlots	0.07	0.04	30
Restoration degraded forest for sustainable use	0.03	0.00	3
Mangrove restoration	0.42	0.34	83
Soil conservation measures on cropland	0.27	0.24	70
Passive restoration riparian forest	-0.16	-0.20	127

Source: Adapted from Raes et al. (2017) and Nello et al. (2019).

* FTE – Full-time equivalent

On a local scale, a study in Hawai'i evaluated the benefits, including jobs from a coral reef restoration project in Maunalua Bay, O'ahu. During the project, 11 hectares of coral reefs were freed from invasive marine microalgae. This project financially supported 81 individuals through direct job creation. When taking into account the size of each household supported during the project, 251 people benefited during the restoration process. According to a survey, the project also had a positive impact on the workers' perceived health and mental well-being (Kittinger et al. (2016).

Another example of the impact of restoration on employment at the local level is advanced by Shrestha and Mehmood (2018), who assessed the economic impact of a community restoration project in the Ouachita National Forest of Arkansas and Oklahoma in the United States. The project created directly 153 jobs in the region (275 when indirect and induced jobs were factored) and, when extended to the whole country, it led to the creation of 433 direct, indirect and induced jobs. The regional employment multiplier of the project was estimated at 1.8.

Protected areas can help sustain or create employment opportunities at both local and broader scales, notably through their attractiveness to tourists. For example, a study estimated that the South Luangwa National Park in Zambia accounted for 1,492 jobs at the local scale (directly around the park) (Chidakel et al., 2021). Furthermore, the study on the national park considered that around 1,500 other indirect jobs could be linked to the protected area at the country scale.

2.7 Short- versus long-term jobs

In a global assessment, Vivid Economics estimated the short-term impact of including NbS in the stimulus packages and compared those with the business-as-usual scenario (Vivid Economics & SYSTEMIQ, 2020). The NbS scenario considered in the study involved a range of actions aimed at restoring the world's natural ecosystems, as well as increasing the integration of nature into cities and farming systems, both terrestrial and marine. The study finds that directing less than 5% of the total stimulus (US$ 552 billion at the time of the report) into NbS could create about 7% more jobs than business-as-usual. The assessment asserts that the NbS scenario could deliver 110 million short-term jobs globally, an estimated 7 million more jobs than business-as-usual.

In addition to job creation in the short term, actions such as **restoration can provide more permanent employment** in sectors such as, for example, sustainable agriculture, forestry, fisheries and tourism. For instance, the Emscher Landscape Park programme in the Northern Ruhr area in Germany aimed to regenerate the natural environment and create a coherent park system (Naturvation, n.d.). Implemented from 1999 to 2020, the project helped in creating 56,579 jobs throughout Germany, most of them in the Ruhr region, or 250 full-time equivalent jobs per US$ 1 million invested (WWF & ILO, 2020). Longer-term job creation can also happen through value chain development related to agricultural and forestry products. Direct and indirect job creation in the context of restoration and other NbS is of particular interest to rural communities, but in urban areas job creation can also take place, for example, in the design and maintenance of green infrastructure (Enzi et al., 2017), with the potential to target specific groups such as the urban poor (Titz & Chiotha, 2019).

BOX 1

Job creation and nature-based recovery in North America

In North America, several studies have estimated the importance of sectors directly working with nature, estimating impacts on employment. In Ontario, an assessment looked at employment in green infrastructure sector, considering the following sub-sectors: landscape horticulture and open spaces, green roofs and walls, green stormwater management, urban forests, parks, natural heritage and cross-sectoral support services. They found that in 2018, the whole sector employed around 84,400 people directly. Employment has broader effects, and can include not only direct, but also indirect and induced effects. When accounting for indirect and induced impacts, green infrastructure covered approximately 122,000 jobs (The Delphi Group, 2020). Jobs were also created in urban environments, such as the case of Ontario urban sub-sectors, where 'green roofs and walls' or 'urban forests' directly employ directly 4,259 people. When accounting for the indirect and induced impacts of these sub-sectors, they created 1,734 additional jobs.

In the United States, a recent assessment evaluated ecological restoration as an economic sector, finding that it directly employs around 126,000 workers and supports an additional 95,000 jobs. The overall restoration sector thus supports approximately 221,000 jobs, including direct, indirect and induced effects (BenDor et al, 2015).

In other places, opponents to the protection of natural areas sometimes claim that it slows down economic development. Recent work shows different results from western United States. A study assessing the economic impacts of the establishment of national monuments (protected areas representing unique geologic, archaeological and cultural importance) in the Mountain West region of the United States found that they had a positive effect (8.5%) on the total number of jobs near (25 km or less) the monument. Moreover, other industries, such as mining and ranching, which take place on public lands, were not negatively affected (Walls et al., 2020).

NbR has a proven potential to stimulate jobs and the economy. In the aftermath of the 2007-2009 Great Recession, coastal restoration was included as part of the United States economic recovery package. Estimates of 44 restoration projects showed that 951 direct jobs were created, while a total of 1,409 jobs were created, including indirect and induced, based on US$ 89 million in expenditures as part of the recovery package (Edwards et al., 2013). From the assessment of employment impacts from a broad range of economic recovery investments (many of them not related to nature), reforestation, land and watershed restoration, and sustainable forest management had the highest estimated number of jobs created per US$ 1 million (39.7). This compared favourably to renewable energy investments and greatly outperformed traditional industries, such as oil and gas or financial industries, which showed the lowest rates of job creation (5.2 and 7.2 jobs per US$ 1 million). Coastal restoration created, on average, 17 jobs per US$ 1 million in the first 1.5 years after implementation. The conservation industry (parks and land water conservation fund) created an estimated 20 jobs per US$ 1 million.

The impact on job creation of investing in urban areas is exemplified by a study of an urban forest Verde Landscape in Portland (Ecotrust & PolicyLink, 2017). For every US$ 1 million invested, 24 year-round full-time jobs are created, and for every full-time job created through this green infrastructure project, nearly two additional jobs are created throughout the economy.

BOX 2

Green recovery and job creation: India and Pakistan

In line with past successful policies, such as the Civilian Conservation Corps created by Franklin D. Roosevelt in 1933 or South Korea's support post-Korean war economic recovery through forestlands restoration, India and Pakistan are using part of their COVID-19 recovery package to help restore nature and create new jobs (World Bank, 2020).

In India, the government launched the Garib Kalyan Rojgar Abhiyaan initiative to boost the employment of migrant workers returning home due to the pandemic (PIB Delhi, 2020). Started on 20 June 2020, a budget of INR 50,000 crores (est, US$ 7 billion) had been engaged for 125 days. Part of the funding was allocated to reforestation projects. So far, an increase of 72,748 hectares has been achieved. The country also increased the contribution to the Compensatory Afforestation Fund Management and Planning Authority by INR 6,000 crores (est. US$ 900 million) in June 2020 (ETBFSI News, 2020).

In Pakistan, several initiatives were launched. Firstly, the government decided to build on its "10 Billion Tree Tsunami programme" (PKR 7.5 billion, or a US$ 46 million project) to provide employment opportunities to the unemployed. The programme created more than 63,600 direct jobs. The work, which can consist of planting saplings or setting up nurseries, expands on 6,000 hectares (Kahn, 2020a). Secondly, through the Protected Areas Initiative (amounting to PKR 4 billion, US$ 24 million), Pakistan aims to expand protected area coverage from 12.3% to at least 15% by 2023 and to list at least seven leading national parks under the IUCN's Green List of Protected and Conserved Areas. The direct outcome in terms of employment is approximately 5,000 jobs for young people (Kahn, 2020b).

3 Nature, the economy and investing in nature

One of the main aims of this paper is to provide evidence on how different nature-related actions can support job creation efforts. Similarly, investing in nature can also provide a broad range of other positive socio-economic impacts, which are highlighted in the next sections.

3.1 Agricultural benefits

Economy and well-being depend on nature in many ways, ranging from ensuring a clean water supply, stabilising the global climate and protecting against natural hazards. Linkages between nature and economy can also be through 'free inputs' provided by nature into production processes, such as pollination services for agriculture. Both wild and managed pollinators have significant roles in crop pollination and productivity. Pollinator-dependent crops contribute to 35% of global crop production volume and supply many micronutrients, vitamins and minerals (IPBES, 2016). The leading pollinator-dependent crops are vegetables and fruits, followed by edible oil crops, stimulants, nuts and spices (Kjøhl et al., 2011). Pollinators are declining globally and in the absence of pollination services, changes in global crop supplies could result in a potential annual net loss of US$ 160–191 billion (IPBES, 2016).

Although agriculture depends on natural processes for part of its productive system, neither benefits from these processes to agriculture nor costs of agriculture to the environment are typically explicitly assessed when determining the value of the agricultural sector. For example, a study carried out by the TEEBAgriFood programme on palm oil production in 11 countries[8] found that whereas the annual value of the commodity is around US$ 50 billion, the annual natural capital cost is US$ 43 billion. Most of the natural capital costs are a result of land-use change, followed by fertiliser use. If these costs were added to the weighted average market price, the overall cost per tonne of palm oil would almost double (Raynaud et al., 2016).

3.2 Ecosystem service provision

This dependency of the economy on nature and the economic gains from the natural environment are illustrated by a recent study aiming at estimating the economic impact of protecting 30% of the world's land and oceans (Waldron et al., 2020). The results show that the benefits of protection are higher than continuing on a business-as-usual pathway, both in terms of financial results and non-monetary outcomes. In addition, the study says that these benefits are at least five times higher than the costs of achieving this goal. It argues that the 30% protection scenario could increase global economic output by US$ 64–454 billion annually by 2050, compared to business-as-usual, or by US$ 170–534 billion by 2050 if benefits from ecosystem services are included. As such, the report contends that protection of nature can strengthen economic recovery, not restrain it.

Further evidence on the importance of natural processes for economies is found at the regional level as well. In Pursat Basin (Cambodia), the World Bank estimates that the economic benefits provided by pristine forests through their ecosystem services (around US$ 99 million) greatly exceed their market values from cutting them, which are estimated at US$ 22 million. Investing in forest maintenance has a net positive economic impact. Indeed, the public costs needed are 20 times lower than the services provided by the forests alone (Rawlins et al., 2020).

8 Brazil, China, Colombia, Côte d'Ivoire, Guatemala, Honduras, Indonesia, Malaysia, Nigeria, Papua New Guinea and Thailand.

3.3 Ecological and landscape restoration

In addition to the overall dependency of economies on nature and the services it provides, there are specific sectors that are particularly closely linked to the conservation of nature. In the United States, the ecological restoration sector is found to generate around US$ 9.5 billion in economic output annually. The sector also supports an additional US$ 15 billion in economic output through indirect (business-to-business) linkages and increased household spending. Moreover, the restoration economy supports approximately US$ 1 billion of local and state public sector revenue and an additional US$ 2.1 billion for the Federal government (BenDor et al, 2015).

On a local level, a community restoration project in the Ouachita National Forest of Arkansas and Oklahoma in United States added US$ 14.6 million of value to the regional economy, increasing to US$ 31.9 million when extended to the whole country. The project has a regional multiplier of the value-added of 2.18 (Chidakel et al., 2021).

Globally, according to a recent study by Vivid Economics, the **NbS-focused scenario to economic recovery outperformed a traditional business-as-usual scenario in all regions of the world** – delivering US$ 1.2 trillion of domestic gross value added in the short term, US$ 86 billion more than business-as-usual (Vivid Economics & SYSTEMIQ, 2020).

Investment in nature is often a cost-effective or even a profitable solution to addressing a specific societal objective. Based on a meta-analysis conducted on the restoration of a broad range of biomes, the average benefit-cost ratio ranges from 0.4 (for coastal systems) up to as high as 110 (for coastal wetlands), with most biomes at about 10 on average (de Groot et al. 2013). Verdone and Seidl provide another example of the value of investing in restoration, with a focus on restoring degraded landscapes (Verdone & Seidl, 2017). At global scale, they estimated that each US dollar invested in restoring degraded forests gives back between US$ 7 and US$ 30 in economic benefits. In addition to forest landscape restoration, other restorative actions have proven a positive impact. In South Africa, since 1995, the Working for Water programme cleared 2.5 million hectares of invasive alien plant species at an estimated cost of ZAR 1.5 billion per year. The project showed benefit cost ratios between 1.03 and 1.6 (Hassan & Mahlathi, 2020).

3.4 Disaster risk mitigation

Economies do not only depend on nature through agriculture, or fisheries and forest sectors, but there are many other dependencies, such as the protection nature provides against natural disasters. In Central America,[9] areas not protected by mangroves saw a decrease of up to 24% in nightlights (a proxy for economic activity) after hurricanes, whereas the impact was fully mitigated in areas protected by mangrove belts 1-km wide or wider (del Valle et al., 2020).

In disaster risk mitigation, NbS are often the most cost-effective solution compared to other possible policies. For example, coral reefs have been shown to provide substantial protection against natural hazards, reducing wave energy by an average of 97%, comparable to artificial defences such as breakwaters (Ferrario et al, 2014). Moreover, coral reef restoration has been found to be less expensive than building a breakwater. In the Caribbean region,[10] NbS have been shown to be the most cost-effective interventions to mitigate hazards from climate risks (CCRIF, CCCCC & UN ECLAC, 2010).

Some countries can avoid up to 90% of the expected damage by implementing cost-effective adaptation measures. In addition, coastal wetlands also have a function as natural infrastructure for disaster mitigation. It was estimated that wetlands prevented US$ 625 million of flood damage from Superstorm Sandy in 2012 and lowered flood damage by 11% on average (Narayan et al., 2017).

9 The study looked at Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua and Panama.

10 The countries included in the study are Anguilla, Antigua and Barbuda, Barbados, Bermuda, Cayman Islands, Dominica, Jamaica and Saint Lucia

3.5 Green infrastructure

Investment in **green infrastructure**, such as including green infrastructure in urban renewal, has also been found to be **cost-effective** in many cases. A study in the Taichung Station District in Taiwan, showed that a renewal plan based on green infrastructure would have higher up-front costs, but its long-term positive impact would be greater than the non-green version, with benefits of US$ 1.2 million per year (Hsu & Chao, 2020).

At a national level, a cost-benefit analysis conducted in Vietnam of different types of measures to prevent damages from sea level rising, including earthen dikes and mangrove forests, showed that the best option was mixing grey and green infrastructures. The net benefits for coastal inhabitants amount to between US$ 12 and US$ 19 billion by 2100 (Oanh, 2020). The benefit to cost ratio varies depending on various parameters, such as five socio-economic scenarios and a change in discount rate, but is always far greater than one (between 182 and 230). Despite not being the most cost-effective option, the use of green infrastructures alone was still estimated to have a net positive economic outcome. Indeed, the cost-benefit ratio amounts to between 151 and 170 with both the expected costs and benefits greater than the mixed option.

In Canada, Ontario green infrastructure contributed CAD 4.6 billion in direct gross domestic product (0.64% of Ontario's GDP) and generated CAD 8.6 billion in gross output (revenues). When accounting for indirect and induced impacts, green infrastructure contribution to GDP rises to CAD 8.3 billion (1.1% of Ontario's GDP) (The Delphi Group, 2020).

3.6 Biodiversity conservation

Investing in biodiversity conservation can also have positive impacts on the economy. A study by IMF (Batini et al., 2021) estimating biodiversity-spending multipliers[11] was recently carried out on a sample of 16 countries.[12] The study specifically evaluated a subset of spending that directly conserves biodiversity such as funding nature reserves. The results show that spending to sustain natural ecosystems has strong positive effects on the economies that invest in biodiversity conservation. Specifically, for every dollar spent in conservation, almost seven more are generated in the larger economy in the medium term (after five years). Conversely, the study finds the multipliers of spending to support instead a non-eco-friendly land use, highly mechanised and imported-input-dependent industrial crop and animal agriculture are below one at every horizon, and thus return less than was originally invested.

3.7 Human well-being

In addition to generating direct benefits to the economy or providing cost-effective solutions, **nature-based investments also positively affect human well-being** in other ways. For example, Duboz et al. (2019) assessed the impact of the Green Great Wall on the state of health of populations in Tessekere, Senegal. They concluded that the increase in plant biomass and biodiversity was likely to have a positive impact on inhabitants' health through an increase of traditional treatments for non-communicable diseases or the inclusion of more sources of potassium in food).

Furthermore, a study assessing protected areas in 34 developing countries provided evidence on the positive impact of these areas on poverty alleviation (e.g. they directly or indirectly provide opportunities for tourism, or increased wild plant populations in or near the protected areas). The results show that households near protected areas (within a 10 km) with tourism had higher wealth levels (by 16.7% on average) and a lower likelihood of poverty (by 16.1%) (Naidoo et al., 2019). Moreover, a positive impact was identified related to the correlation between proximity to protected areas and child development as children appeared to have higher height-for-age scores and were less likely to be

11 A multiplier analysis aims to estimate the increase in output of an investment. A multiplier equal to 1.1 shows that an investment of US$ 100, for example from public spending, will have an effect of US$ 110 on the GDP. A cumulated spending multiplier, as used in this study, can be interpreted in the same way, but looks at the cumulated impact over a specified period. For example, a cumulated spending multiplier of 3 in year five, shows that after five years from the occurrence of the investment, the cumulative increase in output is three times the size of the cumulative increase in expenditure.

12 Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Ghana, Guatemala, Malawi, Mozambique, Niger, Senegal, Sierra Leone, Madagascar, Tanzania and Uganda.

stunted. These positive outcomes could be linked to an increased income from tourism, enabling additional food, medicine or medical clinic visits. There was no evidence of negative impacts from protected areas on human well-being.

3.8 Protected areas

Protected areas are a key sector for many economies. It has been estimated that the world's terrestrial protected areas received around eight billion visitors per year, before the pandemic. The visits to these areas generated an estimated US$ 600 billion per year in direct in-country expenditure and US$ 250 billion per year in consumer surplus (Balmford et al., 2015). The evaluation of the economic impact of protected areas in developing countries is still rare. In 2021, researchers assessed the local and national impact of the South Luangwa National Park in Zambia. The total value added of the park was found to be around US$ 38 million (Chidakel et al., 2021). The value includes wages, pre-tax profit and value added tax, and comes from park fees and money spent by tourists among others. The total value can be divided into local direct, indirect and induced effects and national effects, which are respectively, US$ 13.3 million, US$ 0.27 million, US$ 0.43 million and US$ 15.5 million.

Both the global assessment and the Zambia study did not take into account the many ecosystem services provided by protected areas. A complete assessment of the broad range of benefits provided by protected areas goes beyond the scope of this report, but the importance of protected areas for health and well-being cannot be underestimated (IUCN, 2015; Moore & Hopkins, 2021).

Different tools exist, such as IUCN's Protected Areas Benefits Assessment Tool (PA-BAT+) (Ivanić et al., 2020), that can support evaluations of benefits from protected areas. In order to achieve the most positive conservation and socio-economic outcomes possible, protected areas need to adopt co-management regimes, empower local people, reduce economic inequalities and maintain cultural and livelihood benefits (Oldekop et al, 2017).

3.9 Payments for ecosystem services

In addition to protected areas, other conservation activities have shown positive impacts on household poverty levels. For example, many countries are implementing cash-transfer programmes to support poor households. These often build on existing conditional cash-transfer programs. There are also programmes that provide funds based on fulfilling a series of environmental conditions, specifically payments for ecosystem services (PES) which are programmes that transfer funding on the condition that ecosystem services are restored or conserved. Although not always designed with the specific goal of reducing poverty, PES have shown to be a tool that when designed properly can have both a positive impact on the environment and on poverty reduction.

In Mexico, a study estimated the impacts of protected areas and the country's PES programme on forest conservation and poverty reduction in the 2000s (Sims & Alix-Garcia, 2017). The study showed that biosphere reserves and PES balanced conservation and livelihood goals better than strict protected areas or mixed-use areas. Both policies conserved forest, generating an approximately 20–25% reduction in expected forest cover loss. PES led to small, but significant poverty alleviation.

Biosphere reserves appear to be more effective in protecting forest cover while PES may alleviate more local populations in poverty. A review of cases from Cambodia, Guatemala, and Tanzania also provides positive evidence for PES as a way to conserve biodiversity and support local livelihoods (Ingram et al., 2014). A study in China showed different effects depending on the programme, with one programme having a positive impact on high-to-medium income groups and another one, focusing on job creation, having a positive impact on the income of low-income households (Le & Leshan, 2020). In any case, not all PES programmes are permanent. In the case of non-permanent PES designed with a focus on poverty reduction, a key question is what exit strategy can be considered to ensure lasting impacts on poverty reduction, once the cash transfer programme is phased out.

4 Nature and climate change mitigation

In the context of climate change, the way the world's ecosystems are managed can either contribute to the problem or provide effective NbS to solving it. As a contributor to the climate crisis, the loss and degradation of forests alone currently constitute around 12% of human-caused CO_2 emissions. The land sector as a whole, including agriculture, forests and other land uses, is responsible for nearly one-quarter of global emissions.

4.1 Nature-based solutions for climate mitigation

The avoidance of emissions through **better conservation and land management actions offers a feasible, cost-effective option to mitigate climate change** that is available in the near term. Moreover, restoring degraded lands and enhancing existing ecosystems can help absorb additional CO_2 generated from other sectors.

Many actions that could be implemented as part of a NbR provide climate benefits. This included many NbS, whether specifically developed to focus on climate benefits, or on other benefits provided by nature, such as water filtration, flood buffering, soil health, biodiversity habitat and enhanced resilience. Managing nature for sequestering GHGs and avoiding their emissions can make significant contributions towards global climate mitigation efforts. Nature plays a key role in many Nationally Determined Contributions (NDCs), and there is a large potential for NbR as well. For example, in the United States, improved conservation, restoration and management of natural and agricultural lands could mitigate 21% of current net annual emissions of the United States. About one-quarter of that potential is achievable at low cost (US$ 10 per Mg CO_2e) (Fargione et al., 2018).

NbS, through alternative conservation, restoration and improved land management pathways, **have been found to provide cost-effective potential to reach 37% of mitigation needed globally through 2030 to hold global warming below 2°C** (Griscom et al., 2017). In other words, NbS for climate can deliver that amount of climate mitigation for a cost comparable to or below the cost of achieving similar mitigation in other sectors of economy such as transportation or energy. Forests make up about two-thirds of all nature-based climate solutions globally, with reforestation and avoided deforestation as the most important pathways. Grasslands and agricultural lands offer about one-fifth of NbS to hold warming below 2°C.

Restoring 350 million hectares of degraded or deforested landscapes by 2030, as agreed in the Bonn Challenge, could sequester up to 1.7 Gt of CO_2 equivalent per year, and around 6 Gt could be sequestered by 2030 if the 2030 milestone is reached (InfoFLR. n.d.). So far, the Bonn Challenge has produced forest restoration commitments of over 210 million hectares (Bonn Challenge, n.d.). Yielding already a large part of the climate benefits of the potential to go beyond these commitments is considerable. Managing nature well can thus make a significant contribution towards global climate mitigation efforts.

In addition, wetlands, although not as extensive in area as forests and grasslands, hold the greatest volume of carbon on a per unit area basis (Siikamäki et al., 2012). For example, preserving mangroves, which are highly valuable but rapidly disappearing ecosystems, is justified on cost-effectiveness grounds in most places around the globe based solely on their carbon storage capacity, even without considering the broad range of other benefits they provide, such as coastal protection, nursery and protection for fisheries, water quality regulation, wood, and habitat for wildlife.

Concerning protected areas, several studies have estimated the carbon storage potential of wetlands at various levels (Scharlemann et al., 2010; Vačkář

et al., 2016; Lu et al., 2018). The findings show that protected areas provide effective means for carbon storage and avoided emissions. At the global level, Shi et al. (2020) estimated the impact of protected areas (larger than 10 km^2) on carbon sequestration. They found that, as a public policy, global protected areas increase the carbon sequestration capacity by 0.4% on a global scale. The result varies across continents, with the highest value found in Africa (1.5%) and a negative value found in North America (-0.2%). These discrepancies stem mainly from differences in policy making and management ability.

4.2 Indigenous peoples and local communities

Globally, Indigenous peoples' lands, specifically forests, are key for mitigating climate change and conserving biodiversity. It is estimated that Indigenous peoples manage or have tenure rights over around 38 million km^2 on all inhabited continents. This is over 25% of the world's land surface, and intersects with around 40% of all terrestrial protected areas and ecologically intact landscapes (Garnett et al., 2018).

In Latin America, Indigenous peoples occupy around 20% of the total area of the region, containing nearly 30% of the carbon stored in the region's forests (Garnett et al., 2018; FAO & FILAC, 2021). In the Amazon Basin, almost half of the large non-degraded areas of forest are found in Indigenous territories (FAO & FILAC, 2021). There is growing evidence that land managed by Indigenous peoples and local communities (IPLC) are buffers against carbon emissions.

An assessment of a network of Indigenous territories and protected areas in the Amazon[13] found that in 2016, these lands stored almost 60% of the region's carbon (41,991 MtC), while they were only responsible for 10% of the total net change of -1,290 MtC. From 2003 to 2016, more than double the amount of carbon were lost outside of Indigenous territories and protected areas in the Amazon (-2,185 MtC) as inside (-956 MtC). In Indigenous territories in the Amazon, the carbon loss was mainly due to forest degradation and disturbance, whereas losses from forest conversion were low.

Indigenous land tenure and management decisions are key to safeguarding Amazonian forests against drivers of degradation, helping to protect globally important forest carbon storage and a broad range of other ecosystem services. The contributions of IPLC to the conservation of tropical forests in regions, such as the Amazon Basin, provide a replicable model of a successful and cost-effective nature-based climate solution. The results also highlight the importance of sustained support for stewardship by IPLC of Amazon forests is critical (Walker et al., 2019).

13 In the following countries or regions: Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname and Venezuela.

5 Discussion

Economies are embedded in nature and depend on it. As such, nature plays several key roles in the economy. This paper addresses the specific role for conservation and restoration of nature as an instrument to contribute towards economic recovery from the pandemic. Within this context, one central problem is the loss of jobs due to the economic downturn caused by the pandemic. The assessments here provide evidence of how conservation and restoration of nature can create jobs, and thus assist countries in efforts to recover their economies. The evidence provided shows that investing in nature can provide options that compare favourably to investments in other sectors of the economy, such as infrastructure or manufacturing, in generating jobs for the same amount of investment.

Moreover, investment in nature can help address specific vulnerable groups such as women and rural poor. Targeted design of NbR actions can assure benefits through employment creation, income-generating opportunities, and can go specifically to women, youth and more marginalised households.

The evidence also shows that there is a great deal of variation in the job impacts between different conservation and restoration options. Importantly, conservation also provides a broad range of additional benefits, such as protection against natural hazards, increased carbon sequestration and contributions to many other ecosystem services.

With some exceptions, this paper discusses and develops assessments that concern specific regions, countries and sub-national areas, as well as many different biomes and ecosystem types. More knowledge and experience are needed to better understand how different nature-based actions, such as restoration, create jobs in different environmental and socio-economic contexts, including how this can differ based on different biomes, or by country or even on a local level. Further work should be undertaken to understand which actions generate job opportunities to support gender equality and ensure that no-one, including Indigenous peoples, is left behind; which groups benefit from which type of action; and high potential pathways for creating jobs

in the short- and long-term for youth. In addition, the scope of actions analysed should be broadened to include a wide range of nature-based actions.

Other aspects that need to be considered are related to the types of jobs created and supported by conservation, including understanding connections to living income and minimum wages, productivity, duration of employment, workers' health and safety, and other job quality aspects that support decent work, and sustainable communities and economies.

Economic recovery needs to create jobs as soon as possible, and investing in nature-based jobs can contribute both short and long-term jobs. Preparing for the long-term job impacts will require policies to support technical skills development in areas such as design and maintenance of green infrastructure, use of new technologies and the certification and commercialisation of products. Further evidence-based research based on tools that target nature-based employment, data collection and analysis of job quality, and emerging best practices in countries regarding skills development and training will be essential.

What generates value in conservation may vary greatly between countries and within them, as well as depend on how these benefits are distributed within and among countries. Actions related to NbR need to reflect the innate features of each country, the characteristics and needs of specific regions, including urban and rural areas, and the types of sectors targeted. NbS that involve a mixture of different actions, across ecosystems that vary in the degree of human influence, may often prove the most effective solutions. This will translate into longer term benefits, including improved livelihoods and quality jobs, an overall greening of economies, and the achievement of global environmental goals, including a reduction in the impacts of climate change.

Finally, one of the ultimate goals of NbR is to set the path for a transition toward sustainable economies. This involves issues that go way beyond the short-term scope of economic recovery. Nevertheless, nature-based recovery can serve as a productive step towards the long-term goal of achieving a sustainable economy and should be assessed and welcomed as such.

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