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Decent Work in Nature-based Solutions 2024

Unlocking jobs through investment in skills and nature-based infrastructure

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Foreword

In a world grappling with interlinked crises of accelerating climate change, biodiversity loss and land degradation, alongside persistent socioeconomic issues such as conflict, poverty, inequality and unemployment, the need for transformative solutions has never been greater. Nature-based solutions (NbS) have gained increasing recognition as actions that offer a holistic approach to addressing these interconnected challenges.

NbS are rapidly being incorporated into multilateral frameworks, such as the three United Nations Rio Conventions, owing to their potential role in addressing this intertwined set of societal challenges. They are also reflected in an increasing number of national policies, as well as sector-, regional- and community-level initiatives. This growing momentum for NbS makes it imperative that we understand all dimensions and implications of NbS, including work-related transitions that are required to enable the wider use of NbS and the creation of decent work for all.

For these reasons, the International Labour Organization (ILO), the United Nations Environment Programme (UNEP) and the International Union for Conservation of Nature (IUCN) have entered into a collaboration to jointly develop the Decent Work in Nature-based Solutions biennial report series. The series is planned up to 2030 and each report, each report aims to fill knowledge and advocacy gaps on how transitions to a green economy can be made just, and how NbS can create quality employment, especially for the most vulnerable in communities severely affected by the degradation of ecosystems.

This 2024 report continues from the 2022 report, by examining the global and regional development of the NbS agenda, taking stock of the progress made, further quantifying the impact of NbS on job creation and loss. In particular, it provides new insights into the implications of nature-based infrastructure on decent work and the emerging skills requirements for scaling up the use of NbS.

As the co-chairs of the advisory committee for the report series, we hope this report will contribute to the global dialogue on the importance of decent work in protecting, restoring and sustainably managing our ecosystems. We also hope it will provide guidance to policymakers and practitioners on leveraging employment opportunities when planning and implementing NbS. We would like to commend all who have made this report possible, including financial partners who have generously supported this work, the core team members from the ILO, UNEP and IUCN, the advisory committee members as well as peer reviewers of the report.

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Abbreviations

AI	artificial intelligence
CBO	community-based organization
COP	Conference of Parties
COVID-19	coronavirus disease
EGSS	environmental goods and services sector
EmpIAs	Employment Impact Assessments
ENACT	Enhancing Nature-based Solutions for an Accelerated Climate Transformation
ESG	environmental, social and governance
FTE	full-time equivalent
GBF	Global Biodiversity Framework
GDP	gross domestic product
GHG	greenhouse gas
GIS	Geographic Information Systems
ha	hectares
ICLS	International Conference of Labour Statisticians
IISD	International Institute for Sustainable Development
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
IPLCs	indigenous peoples and local communities
ISIC	International Standard Industrial Classification of All Economic Activities
ITPs	indigenous and tribal peoples
IUCN	International Union for Conservation of Nature
LDN	land degradation neutrality
LMIC	low- and middle-income countries
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
NAP	National Adaptation Plan
NbI	nature-based infrastructure
NbS	nature-based solutions
NBSAP	National Biodiversity Strategy and Action Plan

NDC	Nationally Determined Contribution
NGO	non-governmental organization
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PEPs	public employment programmes
PES	payments for ecosystem services
PWP	public works programme
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SDGs	Sustainable Development Goals
SAVi	Sustainable Asset Valuation
SEEA	System of Environmental-Economic Accounting (United Nations)
SFN	State of Finance for Nature
SNA	United Nations System of National Accounts
STEM	science, technology, engineering and mathematics
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNOPS	United Nations Office for Project Services

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The Decent Work in Nature-based Solutions 2024 report was developed by a core team of **Maikel Lieuw-Kie- Song** (International Labour Organization, ILO), **Rowan Palmer** (United Nations Environment Programme, UNEP) and **Juha Siikamäki** (International Union for Conservation of Nature, IUCN) who were also the lead editors of the report. The core team further comprised of **Hae Kyeung Chun** (ILO), **Akiko Yamamoto** (ILO), **Barney Dickson** (UNEP), **Lisa Li** (UNEP), **Daniyal Moazzam** (UNEP), **and Leander Raes** (IUCN).

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The Advisory Committee, which provided advice and guidance to ensure the relevance of the report, as well as its content and technical standard, consisted of **Moustapha Kamal Gueye** (ILO, Co-Chair), **Mirey Atallah** (UNEP, Co-Chair), **Stewart Maginnis** (IUCN, Co-Chair), **Jesse DeMaria-Kinney** (Adaptation Research Alliance), **Sabine Becker** (GIZ), **Simon Conze** (GIZ), **Maike-Christine Potthast** (GIZ), **Gitika Goswami** (International Fund for Agricultural Development), **Jonathan Hassall** (UK Foreign, Commonwealth and Development Office), **Jitendra Vir Sharma** (Energy and Resources Institute), **Kerry Max** (Global Affairs Canada), **Christian Peter** (World Bank), **Sonia Castañeda Rial** (Fundación Biodiversidad), **Elsa Patricia Galarza** (Escuela de Gestion Publica), **Natalia Alekseeva** (UNEP / UN Decade on Ecosystem Restoration), **Qiang Ma** (FAO), **Riad Sultan** (University of Mauritius), **Samantha Stratton-Short** (UNOPS).

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Executive summary

This report – the second in a series of International Labour Organization (ILO)–United Nations Environment Programme (UNEP)–International Union for the Conservation of Nature (IUCN) publications on decent work in nature-based solutions (NbS) – aims to improve the understanding of the role of NbS in the world of work and in a just transition towards environmentally sustainable and inclusive economies and societies.

The first report in the series, published in 2022, was the first major attempt to examine the nexus of NbS, jobs and decent work, and this second report aims to deepen the understanding of the relationship between NbS and the world of work; taking advantage of growing global interest in NbS among governments, the private sector and civil society, and the recognition of the central role that NbS can play in progressing towards critical global targets of the Rio Conventions and the Sustainable Development Goals (SDGs). It is intended to inform the development of global-, regional- and national-level policies and initiatives to: 1) scale-up the implementation of NbS; 2) ensure that related work is decent; and 3) make sure that the transitions required to increase the use of NbS are just, in particular for workers and affected communities.

Working towards the wider use of NbS

Since the publication of the first edition of Decent Work in Nature-based Solutions in 2022, the NbS agenda has progressed, especially at multilateral levels, with NbS now integrated into the three Rio Conventions. Notable advancements include: 1) the adoption of the Sharm el-Sheikh Implementation Plan at COP27 (of the United Nations Framework Convention on Climate Change) in November 2022 and the subsequent adoption of its work programme at COP28 (UNFCCC) in 2023, encouraging NbS in achieving climate targets; 2) the launch of the ENACT (Enhancing Nature-based Solutions for an Accelerated Climate Transformation) Initiative to enhance policy coherence across climate, biodiversity and land degradation efforts; 3) the recognition of the role of NbS in the Global Biodiversity Framework (GBF) of the United Nations Convention on Biological Diversity (UNCBD) for achieving targets related to climate resilience and ecosystem restoration; and 4) the inclusion of NbS into two resolutions of the sixth United Nations Environment Assembly (UNEA) in February 2023.

At the same time, countries have continued to integrate NbS into climate action plans, biodiversity strategies and other national policies. The number of NbS projects has grown since 2015, including in low- and middle-income countries (LMIC). However, despite increasing investment, NbS funding remains inadequate. Whilst private sector interest and investment are also rising to respond to climate risks, and societal expectations for sustainable practices and regulations that mandate transparency and sustainability practices are similarly expanding, challenges like the complexity of measuring NbS benefits, small-scale projects and policy uncertainties hinder scaling efforts.

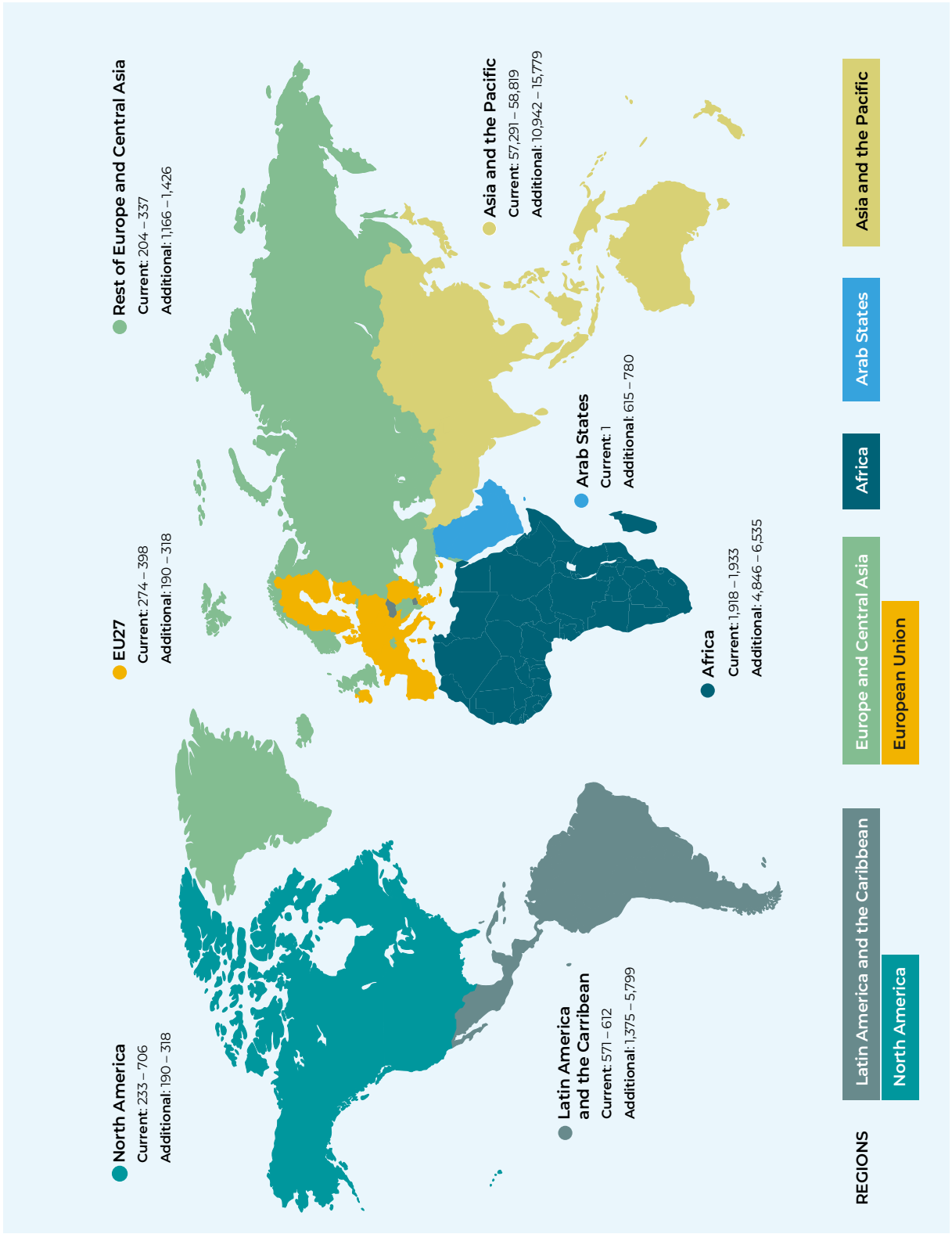
Estimating current and future employment in NbS

The second chapter of this report provides updated estimates of current and future global employment in NbS, building on the economic modelling approaches used in the Decent Work in Nature-based Solutions 2022 report. Both the current and future estimates rely on global NbS investment data from the UNEP's State of Finance for Nature (SFN) 2023 report. For the current estimates, employment data from public employment programmes (PEPs) and payments for ecosystem services (PES) that invest in nature were added as well and are based on the assumption that NbS investments lead to direct, indirect and induced work.

For current employment in NbS, two scenarios are modelled: a standard scenario based on economic sector relationships and two alternative scenarios that account for NbS-specific employment coefficients and regional productivity differences. The models estimate that 60.5–63 million people currently work in NbS globally, representing 1.8 per cent of total global employment (see Figure ES1). Most (95 per cent) of this employment is concentrated in Asia and the Pacific, primarily driven by India's Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). The majority of NbS employment is in LMIC and is characterized by part-time or project-based work.

Apart from Asia and the Pacific, Africa and Latin America have relatively significant shares of the global total. In contrast, Europe and North America have fewer workers but a higher percentage of them tends to be employed full-time. Estimates show that 14 per cent of NbS workers are youth (ages 15–29), with the highest youth participation in Africa (24 per cent). Women represent one-third of the NbS workforce globally, slightly lower than their share in total global employment. Worldwide, NbS activities contribute an estimated 0.3 per cent to gross domestic product (GDP), with variations across regions. Most NbS spending occurs in high-income countries (57 per cent of global NbS expenditure) and regionally Asia and the Pacific has the largest share (44 per cent of global NbS expenditure). In low-income countries, government spending through Official Development Assistance (ODA) significantly contributes to GDP.

Figure ES1: Estimated current and additional employment by 2030, by geographical region (thousands of persons)



The projection of future NbS employment is based on increases in global investments needed for NbS to contribute its potential share to the Rio Convention targets for 2030 related to climate change mitigation, halting and reversing biodiversity loss, and achieving land degradation neutrality. The SFN 2023 report estimates that this requires not only an increase in annual NbS investments to US$542 billion per year by 2030, but also that investment is more evenly distributed across regions where the conditions and potential of NbS are most conducive. It is estimated that, by 2030, these additional investments could create 20–32 million new jobs, primarily in the agriculture and forestry sectors. Employment distribution could also become more balanced with the largest increases in Africa, Latin America and the Arab States as compared to the current levels of employment (see Figure ES1). This is likely to be an underestimate, however, since additional investment is likely to occur, beyond what is considered in the scope of the SFN report. While medium-skilled occupations may still dominate, a shift towards higher-skilled roles is also anticipated due to more diverse and sophisticated NbS activities which generally also involve more inputs from other sectors.

Employment in nature-based infrastructure (NbI) – opportunities and challenges

Addressing many societal challenges – such as disaster risk reduction (including climate adaptation), economic and social development, human health, food security and water security – requires the use of infrastructure to deliver various services. These services can be delivered by "built" (or "grey") infrastructure, and, in many cases, by nature, or by a combination of the two ("green-grey" or "hybrid" infrastructure). When nature is used to provide infrastructure services, it can be considered a nature-based infrastructure (NbI) solution. NbI are simply a type of NbS that provide infrastructure services – either alone or in conjunction with built infrastructure. NbI can deliver services directly, enhance and protect service delivery by traditional ("built" or "grey") infrastructure, and offer a wide range of co-benefits.

Investing even a small share of the estimated US$2.9 trillion in annual global infrastructure investment into NbI could significantly boost annual investment in nature. While high-income countries may focus on upgrading built infrastructure with NbI to enhance sustainability, middle- and low-income countries have opportunities to 'leapfrog' traditional approaches to infrastructure development by adopting NbI, leveraging their existing healthy ecosystems and labour resources.

NbI require new, interdisciplinary skill sets that merge traditional infrastructure expertise (e.g., engineering, construction) with environmental sciences and ecosystem management. This shift emphasizes adaptive, creative approaches and the integration of local and indigenous knowledge. The increased demand for skills such as geospatial analysis, environmental economics and artificial intelligence (AI) will further shape NbI's future workforce.

As with any transition to new types of work and employment, just transition policies will be needed to ensure that NbI jobs are decent and that the benefits are shared equitably and inclusively. Investments in skills development related to NbI can help to address gender

disparities in infrastructure jobs by focusing on increasing opportunities for women and marginalized groups. Such inclusive approaches would, amongst others, also integrate participative decision-making approaches and ensure fair working conditions. Using community-based models for developing NbI can foster local ownership, targeting diverse employment and skills development, while employment-intensive approaches can help to maximize local job creation, benefiting, in particular, low-income countries.

As the predominant infrastructure developer – especially in LMIC – the public sector has a major role to play in increasing investment in NbI. However, the private sector can also help drive NbI by fostering interdisciplinary job growth in planning, finance, project management and more. Successful NbI deployment will require collaboration among governments, educational institutions and private firms to align skills with demand.

Currently, scaling NbI is hindered by a lack of awareness, lack of data on performance, potentially long implementation timelines, skills gaps and lack of access to capital, especially in low-income regions. Barriers to decent work creation through NbI include the often temporary, informal and project-based nature of NbI jobs. Heat stress, exacerbated by climate change, also threatens NbI worker safety.

Skills for NbS

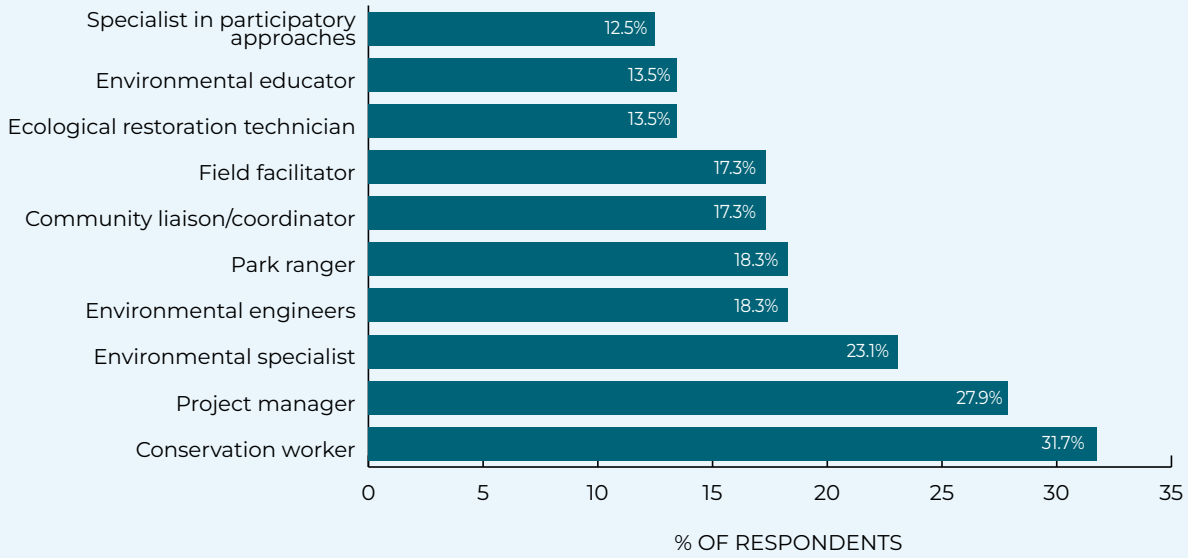
The fourth chapter of the report outlines policies, strategies and skills gaps for NbS. Scaling up NbS requires new technical and core skills, but this report finds that current workforce preparation is insufficient. While NbS-related jobs could grow significantly, effective delivery will depend on reskilling and upskilling. Core skills like adaptive management, stakeholder engagement and conflict resolution, combined with technical knowledge (e.g., ecological restoration, data analysis) are critical. Skills required also vary by sector, such as agriculture, water management or infrastructure.

Currently, only a few countries – including Canada, Scotland, Spain and New Zealand – have national policies supporting NbS skills. These policies highlight the need for inclusive training, targeting youth, women and indigenous peoples. Skills assessments in Canada, Scotland and Spain identified sector-specific skills needed across various NbS occupations such as restoration, forestry and urban greening. Key skills include ecological monitoring, remote sensing, sustainable practices and project management. And although there is an overlap between skills for NbS and green jobs, for which many countries already have initiatives, NbS emphasizes the skills required in ecosystem management and biodiversity integrity.

In an online survey of NbS practitioners, 66 per cent responded that they encountered skills challenges in the implementation of their projects, and identified key occupations directly involved in NbS implementation such as conservation workers, project managers, environmental specialists, engineers and park rangers (see Figure ES2). These roles require a mix of technical and core skills, including data analysis, ecological restoration, stakeholder collaboration and project management. Region-specific skill demands vary, reflecting diverse environmental contexts. While demand for technical training is more common, core skills like communication and problem-solving are also essential. Major skills gaps identified

include technical expertise, funding acquisition and core skills to facilitate interdisciplinary collaboration. Barriers to skills development were found to include limited funding, insufficient recognition of NbS as a career and inadequate collaboration between academia and practitioners.

Figure ES2. Main NbS occupations identified



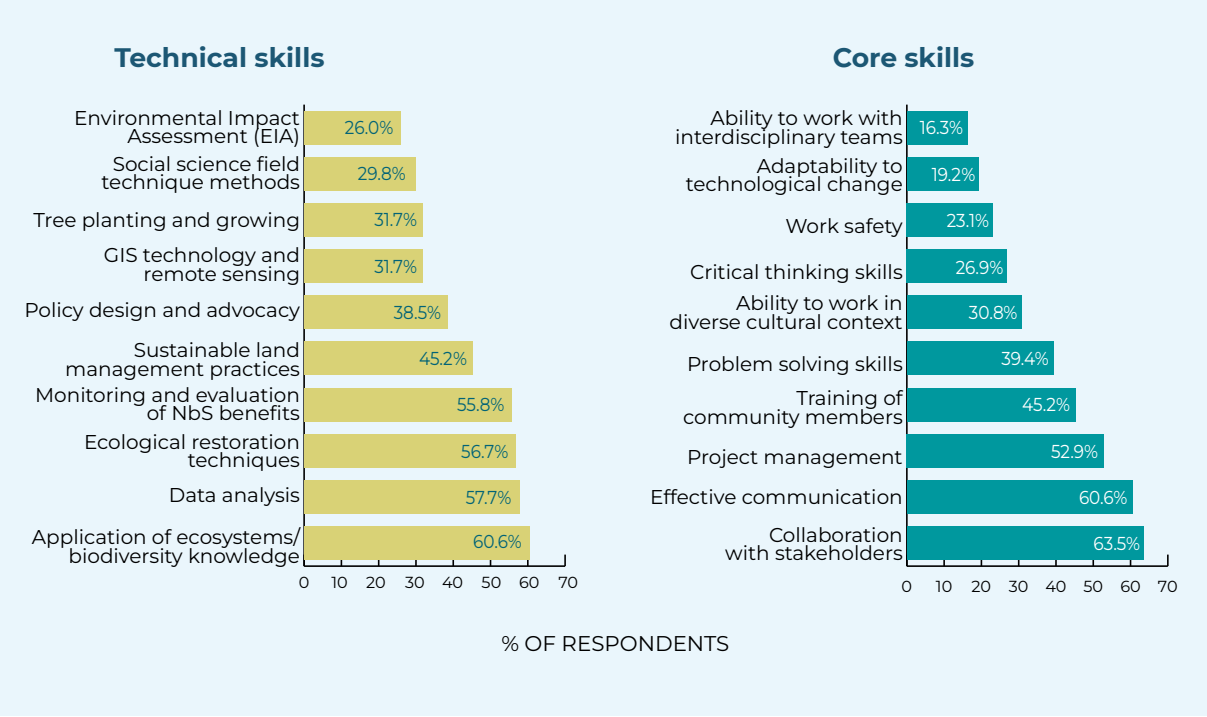
Source: Skills for NbS Survey (2024).

Note: The survey asked respondents to identify the three main occupations they considered key for the successful implementation of their NbS projects. For a description of the top ten key occupations identified in the survey, see Annex.

While training opportunities for NbS are growing, most are short-term and lack formal certification, affecting long-term career prospects. Key core and technical skills required and expected to remain in demand are presented in Figure ES3 and include monitoring and evaluation, data analysis and Geographic Information Systems (GIS) technology. Core skills like collaboration, effective communication and cultural adaptability will also be crucial. Addressing current and future skills gaps requires targeted training, increased funding and stronger policy support to facilitate sustainable career paths in NbS.

Developing skills for NbS is essential for effective implementation and job creation. Overcoming barriers like funding, skills gaps and limited training infrastructure is crucial to ensure NbS can drive sustainable development and climate resilience.

Figure ES3: Main technical and core skills required across occupations



Source: Skills for NbS Survey (2024).

Note: The survey asked respondents to select the two most relevant technical and core skills for each of the three main occupations reported. Figure ES3 presents the most frequently mentioned skills (both technical and core) identified across all the reported occupations.

Conclusions and recommendations

NbS hold significant potential to advance global sustainable development and potentially generate 20–32 million new jobs by 2030 in addition to the current 60.5–63 million jobs worldwide. However, insufficient and uneven investment in NbS, particularly in LMIC, limits their impact, especially in Africa, Latin America and the Arab States. While employment estimates currently focus on NbS for environmental challenges like climate mitigation and biodiversity loss as well as land degradation, there is untapped potential for more integrated "green-grey" infrastructure. In LMIC, where NbS work is more labour-intensive, there is large scope for creating employment opportunities for vulnerable populations. Skills gaps in both technical (e.g., ecology, engineering) and core (e.g., communication, collaboration) skills pose barriers, with most existing NbS jobs classified as medium-skilled roles. As NbS grows, higher-skilled roles are projected to rise, emphasizing the need for targeted skills development to scale projects and enhance job quality.

This report contains four key recommendations:

1. **Strengthen and align national NbS policy frameworks to capitalize on progress made at the global level:** Develop policies at different levels to better integrate NbS into infrastructure, agriculture and other sectors. Improve coordination across sectors and governance levels to ensure policy coherence, foster project pipelines and investor investment confidence. Engage private sector players to drive innovation and job creation.
2. **Invest in skills development and workforce training:** Create training programmes that address diverse skills needs in both urban and rural settings, integrate NbS into education and training curricula and develop NbS-specific qualifications. International collaboration should enhance the understanding of skills needs, enabling local programmes to identify their specific needs and adapt training to align with regional ecological priorities.
3. **Promote rights and inclusivity in the NbS workforce:** Implement measures to ensure fair wages, safe working conditions, social dialogue and social protection. Promote gender equity, youth engagement and indigenous participation in NbS jobs. Leverage public employment programmes to include marginalized communities in NbS projects.
4. **Strengthen research and data collection to better inform decision-making:** Improve data collection on NbS employment, skills and project outcomes. Develop standardized frameworks to assess NbS impacts and job creation potential, using tools like ILO's Employment Impact Assessments (EmpIAs). Collaborate across academia, governments and the private sector to enhance knowledge-sharing and scaling efforts.

NbS jobs provide immediate income and tangible benefits to local communities, which is crucial for their support and participation in NbS. Integrating decent work into NbS aligns with just transition principles, ensuring that benefits reach those affected by environmental changes. By creating sustainable livelihoods, NbS can drive both ecological and social progress, making job creation a vital element of successful NbS implementation.

Chapter 1

Chapter 1
Working towards wider use of nature-based solutions

This report – the second in a series of ILO-UNEP-IUCN publications on Decent Work in Nature-based Solutions – aims to improve the understanding of the role of nature-based solutions (NbS) in the world of work and in a just transition towards environmentally sustainable and inclusive economies and societies. It is, therefore, concerned not just with the number of jobs related to NbS, but with the quality of those jobs and how better jobs can support higher quality NbS, and vice versa.

The first report in the series, published in 2022, was the first major attempt to examine the nexus of NbS, jobs and decent work; it brought together expertise and insights from each of these areas in an effort to inform and drive better outcomes for people and nature.

This second report aims to deepen the understanding of the relationship between NbS and the world of work and take advantage of growing global interest in NbS among governments, the private sector and civil society and the recognition of the central role that NbS can play in progressing towards critical global targets related to the Rio Conventions and Sustainable Development Goals (SDGs). It is intended to inform the development of global-, regional- and national-level policies and initiatives to: 1) scale-up the implementation of NbS; and 2) ensure that NbS-related work is decent and contributes to a just transition.

1.1 Key concepts

NbS are defined by the United Nations Environment Assembly (UNEA) as "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental

challenges effectively and adaptively, while simultaneously providing human wellbeing, ecosystem services, resilience and biodiversity benefits" (UNEA 2022). They can be deployed in many sectors to address challenges such as climate change, disaster risk reduction, ecosystem degradation and biodiversity loss, food security, human health, social and economic development, and water security. NbS play an essential role in global efforts to achieve the SDGs, climate mitigation and adaptation objectives under the Paris Agreement, and the United Nations Convention on Biological Diversity (UNCBD).

For NbS to achieve the best possible results, they must be planned and implemented in the right way. The IUCN Global Standard for Nature-based Solutions provides a framework for designing, monitoring and managing NbS in a scientific, consistent, sustainable and adaptive way, to ensure that they are as effective as possible in meeting their intended objectives. It contains eight criteria and 28 indicators designed to help ensure that NbS result in net gains to biodiversity and ecosystem integrity, are economically viable and institutionally sustainable, are based on inclusive and transparent processes, and are adaptively managed to maximize synergies and benefits and manage trade-offs effectively (IUCN 2020). NbS that align with these good practices are also likely to be synergistic with the creation of decent work, given the common principles in both concepts, such as an emphasis on a rights-based approach, decision-making through consultation and dialogue with stakeholders and constituents, and promoting the skilling and productivity of workers. If they align with the good practices articulated by the 28 indicators, NbS can play an important role in a just transition by creating green and decent work (ILO, UNEP and IUCN 2022).

1.2 Major developments on NbS since last report

While the decent work in NbS agenda is still relatively new, it has been gaining momentum as part of the development of the broader agenda on NbS. Several notable developments have occurred within the global NbS landscape since the publication of the 2022 Decent Work in Nature-based Solutions report.

At the multilateral level, the inclusion of NbS into the three United Nations (UN) Rio Conventions – UN Framework Convention on Climate Change (UNFCCC), UN Convention on Biological Diversity (UNCBD) and the UN Convention to Combat Desertification (UNCCD) – are particularly important. These three Conventions[1] inform national policies and commitments on addressing these critical global concerns. There is increasing realization that NbS can play an important role in achieving the targets of all three Conventions as well as a commitment to their application by the signatories.

1 Countries become signatories to these Conventions separately and the number of countries that are parties to each Convention differs. One hundred and ninety eight countries are signatories to the UNFCCC, 193 to the UNCBD and 197 to the UNCCD.

The UNFCCC 27th Conference of Parties (UNFCCC COP27) was held in November 2022, shortly before the publication of the 2022 edition of this report. At this COP, the Parties adopted the Sharm el-Sheikh Implementation Plan, which urges Parties to consider using NbS to help achieve their mitigation and adaptation targets (UNFCCC 2022). This implementation plan also establishes a work programme on just transition pathways. While not specific to NbS, this holds relevance for NbS-related transitions that impact workers; for example, farmers and their workers switching to regenerative agriculture (UNFCCC 2022). The work programme was subsequently adopted at UNFCCC COP28. (UNFCCC 2023-CMA.4).

Another output of COP27 was the ENACT (Enhancing Nature-based Solutions for an Accelerated Climate Transformation) Initiative, launched by the governments of Egypt and Germany, along with IUCN. This initiative recognizes the potential of NbS to generate cross-cutting impacts and benefits and aims to foster collaboration across the Rio Conventions by providing a unified voice for evidence-based policy on NbS. Implementation is led by IUCN, working with a broad range of partners[2], and focuses on increasing policy coherence to integrate action on climate change, biodiversity and land degradation, including desertification; providing strategic co-finance to enhance integration of climate and biodiversity objectives in existing funding mechanisms; and building global capacity to take integrated action on climate and biodiversity objectives through sector-specific guidance. The first ENACT report serves as a roadmap to guide the initiative and identifies the UNEA Resolution 5/5 on Nature-based Solutions for Supporting Sustainable Development and the IUCN Global Standard for Nature-based Solutions as key existing frameworks that guide global alignment on NbS. It also emphasizes that NbS should complement, not replace, emission reduction efforts and states that any NbS for climate action must also enhance biodiversity and ecosystem integrity (IUCN 2024a).

In December 2022, following the UNFCCC COP27, the 15th Conference of Parties to the UNCBD (UNCBD COP15) adopted the Global Biodiversity Framework (GBF). The GBF recognizes NbS as a means of achieving two of its 23 targets:

- Target 8: Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation and disaster risk reduction actions, including through nature-based solutions and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity.
- Target 11: Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, climate, soil health and pollination, and the reduction of disease risk, as well as protection from natural hazards and disasters through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.

2 Other partners include Belgium, Canada, the European Commission, France, Japan, Korea, Malawi, the Netherlands, Norway, Pakistan, the Republic of Peru, the Republic of Slovenia, Spain, Switzerland, the United States of America, UN Climate Change High-Level Champions, United Nations Environment Programme (UNEP), the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the United Nations Convention to Combat Desertification (UNCCD).

The text of these two targets marks the first time that the UNCBD has explicitly mentioned "nature-based solutions" in an outcome document and signifies growing recognition of their importance for achieving biodiversity goals.

The GBF is also synergistic with the UNCCD's Land Degradation Neutrality targets adopted by the UNCCD COP12 in 2015. This has increased interest in adopting NbS into the UNCCD to "explore complementarities within relevant multilateral environmental agreements in the implementation of sustainable land management, ecosystem-based approaches, or nature-based solutions." (UNCCD COP 15).

In addition to the Rio Conventions, NbS have also featured in the UNEA process. In 2023, UNEP led an intergovernmental consultation process mandated by UNEA Resolution 5/5 on "Nature-based solutions for supporting sustainable development". The purpose of the consultations was to address differences and build a common understanding of NbS to aid in their implementation. Specifically, the process was structured around reviewing best practice, assessing existing – and discussing the need for new – standards, criteria and guidance, and identifying financing sources and mechanisms for NbS.

Although no recommendations were agreed to during the intergovernmental consultation process, Member States demonstrated a high level of support for NbS and there was broad agreement on the need to increase the scale of implementation as well as the importance of looking beyond financial costs and benefits and ensuring equity in the distribution of such costs and benefits. There was also a recognition of the need to increase the volume and accessibility of financing for NbS and create NbS policies that are aligned with existing national commitments and policies – e.g., National Biodiversity Strategy and Action Plan (NBSAP), Nationally Determined Contribution (NDC), National Adaptation Plan (NAP) – which are key to scaling up their use. Participants identified several challenges and produced recommendations to address them, including further analysis of available technical tools; examination of existing methods for measuring the benefits and costs of NbS; production of a guide to sources of financing for NbS; establishment of regional or national information hubs on NbS; and coordination amongst Multilateral Environmental Agreements on how they approach NbS.

Building on the momentum of the intergovernmental consultation process, Cameroon, supported by several other African Member States, proposed a UNEA-6 resolution focused on agreeing the criteria, norms, standards and guidelines for the implementation of NbS. While Member States were ultimately unable to reach consensus on a follow-up resolution at the 6th UNEA in February 2023, there remains strong support for scaling up the use of NbS as reflected by the inclusion of NbS in resolutions 6/13 on 'Effective and inclusive solutions for strengthening water policies to achieve sustainable development in the context of climate change, biodiversity loss and pollution'; and 6/14 on 'Strengthening international efforts to combat desertification and land degradation, restore degraded land, promote land conservation and sustainable land management, contribute to land degradation neutrality, and enhance drought resilience'.

Research efforts have further advanced our shared understanding of NbS. For example, a 2023 UNEP, United Nations Office for Project Services (UNOPS) and University of Oxford

report provides a detailed analysis of the role that nature-based infrastructure (NbI) solutions – a subset of NbS that includes any NbS that contributes to the delivery of infrastructure services - in realizing targets and objectives of the SDGs, GBF and Paris Agreement. The report finds that NbI can influence 95 per cent of SDG targets, which highlights the importance of NbS for addressing not just environment issues, but other challenges like climate change mitigation and adaptation, disaster risk reduction, economic and social development, human health, food security and water security.

At the national level, the development of NDCs, NAPs and NBSAPs provides the primary channel for integrating NbS into policy. Vertical policy alignment is key, as national-level plans should inform the development of sub-national policy, including at the local level. Bottom-up policy development is also important and there are many examples where cities are taking the lead, including Dar es Salaam (United Republic of Tanzania), Jakarta (Indonesia), Kathmandu (Nepal), Lisbon (Portugal), Mexico City (Mexico), Rotterdam (the Netherlands), San Salvador (El Salvador) and Singapore (Singapore) (UNEP and G20 2021). Finally, there has been growing recognition of the links between decent work and NbS, with several countries taking action. For example, the United States' Government has produced a roadmap for scaling up NbS that highlights – among other things – the potential for increased investment to create high quality jobs (White House Council on Environmental Quality *et al.* 2022). In Spain, a study on employment and ecological transition identified job opportunities and occupations critical to NbS and resulted in key improvements in the Empleaverde+ programme (See Case study 4, Chapter 4). And, in Scotland, the Nature-based Jobs and Skills Implementation Plan 2024–25 was launched which, among other objectives, aims to ensure that young people are engaged in this work and that the growing demand for workers in this sector is better understood and anticipated (NatureScot 2024).

1.2 The current state of play on NbS implementation

Significant strides have been made towards integrating NbS into both national and international policies. Many countries have begun incorporating NbS into their climate action plans and biodiversity strategies – a trend highlighted by IUCN (IUCN 2024a). Over the past twenty years, NbS projects have expanded globally, including in middle- and low-income countries. For example, analysis of investments by four major climate and development funds (the Global Environment Facility, the Green Climate Fund, the Adaptation Fund and the International Climate Initiative) suggests that support for green and hybrid adaptation solutions has risen considerably over the past two decades, with cumulative investment in projects with NbS components now standing at US$94 billion, of which 13 per cent is directed towards NbS (UNEP 2021a).

The UN Decade for Ecosystem Restoration complements the Bonn Challenge[3] and other initiatives by aiming to build political momentum and support on the ground projects for large-scale ecosystem restoration, including through the use of NbS and emphasizing restoration of all types of ecosystems, not just terrestrial ones. Since 2021, the UN Decade has launched two calls for restoration flagships, receiving over 163 nominations. Of these, 17 world restoration flagships have been selected, covering 47 countries. The seven flagships launched in the 2024 call collectively reported creating over half a million jobs (UN Decade on Restoration 2024), providing an important indication of how restoration can contribute to creating more and better jobs (See also Box 1). In addition, 18 countries reporting progress on the Bonn Challenge through the Restoration Barometer had over 14 million hectares (ha) under restoration by 2022, which generated, among other benefits, an estimated 478,593 full-time, long-term jobs in 14 of these countries (IUCN 2022a).

There has also been a notable increase in both public and private funding for NbS, with new financial mechanisms and investment opportunities emerging to support implementation (IUCN 2024a). Notably, since 2017, 21 new NbS projects have exceeded US$25 million in funding – a significant increase from previous years where projects rarely surpassed US$10 million. Since their inception, the Green Climate Fund, the Least Developed Countries Fund and the Adaptation Fund have collectively benefited over 20 million people, both directly and indirectly (UNEP 2021b).

Roughly US$200 billion was invested in NbS in 2022 globally, with public funds contributing 82 per cent and private finance 18 per cent (UNEP 2023a). This represents an 11 per cent increase since the first edition (UNEP 2021b). The relative shares of public and private finance remained stable in this period. Although public finance was attributable to most of the increase in absolute terms, private finance flows to NbS increased by 10 per cent. It should be noted that the bulk of these increases are concentrated in five countries, namely the Canada, China, Japan, Turkiye and USA. Despite these increases, funding for NbS remains inadequate relative to the scale required to meet global environmental targets by 2030. Annual finance flows to NbS need to triple to US$542 billion annually by 2030 to reach climate, biodiversity and land degradation targets (UNEP 2023a).

One reason for the increased private sector investment is that the escalating threats of climate change and biodiversity loss are increasingly impacting businesses' operations throughout the value chain. In parallel, societal expectations on responsible business conduct are prompting business enterprises to implement measures to prevent and mitigate adverse impacts on the environment and communities. While the concept of NbS as such is not yet universally recognized by business enterprises, its principles are often embedded in sustainability strategies; for example, through commitment to the SDGs, particularly on SDG 15, which focuses on protecting and restoring ecosystems. The global agenda to become 'nature positive' is further accelerating the integration of NbS into corporate agendas.

3 The Bonn Challenge, initiated in 2011 by the Government of Germany and IUCN, aims to restore 150 million hectares (ha) of degraded and deforested landscapes by 2020 and 350 million ha by 2030. The initial goal of securing pledges for 150 million ha was achieved in 2017. To date, 74 pledges from 61 countries have been made, fostering regional political and technical cooperation to restore degraded lands (The Bonn Challenge n.d.). The initiative contributes directly to the UN Decade on Ecosystem Restoration – the UNFCCC's REDD+ programme (Reducing Emissions from Deforestation and Forest Degradation) and the Paris Agreement.

BOX 1

Employment implications of transitioning to sustainable agroforestry practices: Insights from a UN World Restoration Flagship

The process of transitioning small-scale farmers to sustainable agriculture brings its own unique challenges with their own employment implications and opportunities. Trees for the Future is a non-governmental organization (NGO) promoting and supporting this transition and recognized as one of the UN Decade World Restoration Flagships. It has estimated the following employment- and outcome-related issues, based on its plans to support around 228,000 farmers in Kenya, Mali, Senegal, Tanzania and Uganda in making the shift to agroforestry.

Firstly, the activity requires a significant investment in skills development and advanced training on sustainable agriculture. This training will be provided to the 228,000 farmers to enable them to transition from subsistence farming to year-round, full-time on-farm employment through their agroforestry systems. The goal here is to change farming from a subsistence occupation into a small business, encompassing the year-round cultivation and selling of vegetables and tree crops along with the development of on-farm and crop-related micro-enterprises. This will potentially transform the employment status of these 228,000 farmers of whom 42 per cent are women, improving productivity and income as well as making it more regular and diversified.

To implement these activities, Trees for the future will create 2,000 full-time technical, agriculture extension and professional jobs. This is based on a ratio of roughly 1 extension worker per 100–115 farmers. Of the 228,000 farmers, 9,000 are Lead Farmers who receive a stipend for supporting and coaching their groups (approximately 25 farmers per Lead Farmer). Furthermore, 1,500 part-time seasonal jobs in seed bank operations and central fruit-tree nurseries will be generated.

These employment figures relate only to direct employment and do not include indirect jobs created through farm-to-market linkages and other vendor inputs into the system for implementation (tools suppliers, vegetable seed suppliers, etc.). However, they provide an important insight into how the adoption of agroforestry practices can transform existing work, improve livelihoods and create additional employment.

SOURCE: Based on data and information provided by Trees for the Future (trees.org).

This trend is further reinforced by the evolving legislative landscape and the growing market for environmental, social and governance (ESG) investments. The heightened focus on climate, biodiversity and ESG reporting creates an expectation for businesses to consider and implement NbS. This is supported by voluntary global frameworks such as the

Taskforce on Nature-related Financial Disclosure's recommendations on risk management and disclosure. Emerging regulations – like the EU's Corporate Sustainability Reporting Directive, Taxonomy Regulation, and the Corporate Sustainability Due Diligence Directive – are also indirectly promoting NbS by requiring businesses to identify, prevent and mitigate, and transparently communicate their environmental and social impacts. Moreover, these regulations emphasize respect for human and labour rights, established in the ILO Declaration on Fundamental Principles and Rights at Work, and ensuring decent work throughout their operations.

However, despite the increasing private sector investment in NbS, challenges remain in scaling it up. Many investors are unfamiliar with the benefits of NbS, and the small-scale and long payback periods of many projects reduce their appeal. Additionally, it is often difficult to quantify the environmental and social benefits of NbS, complicating the assessment of return on investment. Policy and regulatory uncertainty also create challenges for private sector involvement (EIB 2023).

Compounding these issues is the significant disparity between investment in harmful activities and NbS. Investments in activities detrimental to nature were estimated at nearly US$7 trillion per year, far exceeding NbS funding. Tracked nature-negative public finance flows in the form of environmentally harmful subsidies were estimated at US$1.7 trillion in 2022 – a 55 per cent increase from 2021 levels and more than 10 times greater than public finance flows to NbS (US$165 billion) (UNEP 2023a). UNEP (2023) calls for urgent action to phase out harmful subsidies and redirect both public and private investments towards NbS. It also advocates for innovative financing mechanisms, such as green bonds and blended finance.

1.3 NbS and decent work

Within the context of the increased adoption of NbS, this report series focuses on the relationship between NbS and decent work. Promoting jobs and enterprises, guaranteeing rights at work, extending social protection and promoting social dialogue are the four pillars of decent work as advocated by the ILO. In this framing, works consist of not only employment (paid work) but also various forms of unpaid work, such as volunteering and community work. The first report, published in 2022, laid out a conceptual framework for understanding the relationships between NbS, green jobs, decent work, just transition and high integrity NbS. It also estimated the current and future number of jobs in NbS and presented an overview of the type of activities and regions where NbS jobs can currently be found and what they are like.

This second report continues the work of quantifying how the global use of NbS promotes decent work outcomes by providing updated and more detailed estimations of current and future employment. It continues to contribute to the better understanding of the economic value of nature, complementing other work in this field such as natural capital

accounting and the UN System of Environmental-Economic Accounting (SEEA). A deeper understanding of the economic value of nature remains an essential endeavour in a world where policymaking continues to be dominated by economic rationales.

In addition to the current state of work in NbS, this report also aims to further the understanding of employment implications of closing the nature investment gap identified in the State of Finance for Nature (SFN) 2023 report, which is critical for achieving global targets, related to climate, biodiversity, reversing desertification andsustainable development. This report helps to make the case that investing in nature through the increased adoption of NbS will contribute to all of these goals, including employment creation and decent work-related goals simultaneously (See Box 1 and Case study 1). It also aims to demonstrate the required conditions to enable it, including those related to skills needs for NbS and the increased use of NbI.

1.3.1 NbS and indigenous peoples

A particularly complicated issue in decent work in NbS involves the role of indigenous peoples[4], as several dimensions of decent work are context-specific and influenced by national and local circumstances. Whilst NbS jobs need to be tailored to the specific ecological, economic and social setting, there is broad agreement among advocates of NbS on the need for the participation of indigenous peoples. The ILO's Indigenous and Tribal Peoples Convention, 1989 (No. 169) provides guidance on this and states that the peoples concerned shall have the right to decide their own priorities for the process of development as it affects their lives, beliefs, institutions and spiritual wellbeing and the lands they occupy or otherwise use, and to exercise control, to the extent possible, over their own economic, social and cultural development. The IUCN Global Standard for NbS and the UNEA resolutions are also both clear on this, referencing the right of indigenous peoples to free, prior and informed consent (IUCN 2020; UNEA 2022). While these documents place emphasis on participation in decision-making and planning, there are also questions about if and how to consider employment itself as a form of participation, and on what basis such employment should be structured. While there is a need to respect the traditional customs and relationships with nature so deeply embedded in many of these cultures, many indigenous peoples' approaches to executing work in relation to the protection, conservation and restoration of nature often do not align to modern employment practices. This raises questions about whether this work should be unpaid as was customary in some cultures when pertaining to their ancestral land, or made into some form of paid work. Views here may differ not only between indigenous peoples and parties willing to invest in NbS, but also within indigenous communities.

4 The terms 'indigenous peoples and local communities (IPLCs)' and 'indigenous and tribal peoples (ITPs)' frequently appear in discourses concerning indigenous peoples and groups that are distinguished by others as well as self-identifying as such based on their unique social, economic and political systems, cultural heritage, connection to the land, and traditional knowledge among other characteristics. Given that the definitions of IPLCs and ITPs are not universally accepted and often contested, as well as the different practices of the three institutions leading this report, the authors have chosen not to use either of these terms in this specific section. 'indigenous peoples' in this section refers to those with a strong connection to their lands and the ecosystems.

The basis on which indigenous peoples should be paid for such work is also subject to debate. One view is to take a conventional wage-based employment approach and base payments on time, effort and the type of work involved. Another view, based on the recognition of indigenous peoples as the owners or custodians of their traditional lands (even without formal legal rights to land), may argue for payment based on a share of the value of the ecosystem services the land provides. In this approach, questions arise on how to place a monetary value on these services; who should pay for services that benefit the nation or the global community; and what share indigenous peoples should receive. Furthermore, indigenous communities often bear a disproportionate burden from degraded ecosystems, which directly impacts their traditional ways of life – such as fishing, access to drinking water and food supply. This then raises a further question: whether compensation for ecosystem degradation that affects their livelihoods also needs to be factored in. The answers to these questions may also differ significantly based on the type of NbS and work involved. The work related to protection, sustainable use and restoration of land may require very different approaches to determining value and fair reward. And while there are numerous successful examples of indigenous peoples already implementing NbS, as well as indigenous communities collaborating with external partners on using more modern NbS, in many contexts or situations the questions above remain an obstacle to the wider use of NbS.

This edition of the report series is unable to provide this complex issue with the in-depth treatment it warrants, and the authors recognize that parts of the report are framed through a lens more aligned with the conventional view of employment. It is anticipated that future reports will be able to delve into this topic in more depth.

1.3.2 NbS and job losses

While this report is focused on the impact of NbS investments on employment creation, there is a recognition that the interaction between nature and the labour market is complex. It has been estimated that 1.2 billion jobs globally rely directly on ecosystem services (ILO 2018). Where nature degrades, many of these jobs and livelihoods are impacted directly through the lowering productivity of agricultural systems (ELD Initiative 2020). Thus, insufficient investment in nature also constitutes a threat to existing jobs and livelihoods. Nowhere is this more apparent than in areas impacted by the degradation and desertification of agricultural land. It is becoming increasingly apparent that this is a major obstacle to poverty reduction (Barbier and Hochard 2016 p.6), a driver of labour migration (Andreeva *et al.* 2022) and negatively impacts agricultural incomes (Mirzabaev *et al.* 2019). These negative impacts provide an important argument for increasing investment in land restoration, sustainable land management and the use of NbS.

In some circumstances, changes in land use to increase the realization of NbS can also lead to changes in employment or temporary or long-term negative effects on jobs and some livelihoods. Examples of these are restrictions to reduce overharvesting in forests or fishing grounds.

Another important NbS-related impact could arise from the repurposing of environmentally harmful subsidies and directing these towards NbS investments. In many countries the risk of job losses from reducing these subsidies is a key political stumbling block and raises questions around what a just transition in the redirection of these subsidies would look like. This edition of the report series does not focus on potential job losses directly, but some findings in the upcoming chapters do have implications for this and are helpful in providing direction in dealing with this in future editions. In this context, an increasingly relevant question is whether some of the job losses from reducing harmful subsidies could be offset by the creation of new NbS-related jobs and the extent to which those negatively impacted could benefit from these jobs. This requires that they are equipped with with the necessary skills.

1.4 Structure of the 2024 report

Chapter 2 updates the estimates for current and future employment provided in the 2022 report, based on updated financing data from the SFN 2023 report and improvements in the modelling. The modelling now includes a wider range of NbS interventions as well as more geographic differentiation, and the results now also include estimates of the impact on the employment of youth and women along with an analysis of the types of occupations and skills levels of the NbS-related employment.

Chapter 3 explores the potential for increased NbS investment through the deployment of NbI solutions across different sectors, and the impacts that this would have on the world of work. Because of the complexity and interconnected nature of infrastructure systems and the need for NbS to be integrated with 'grey' solutions, there is strong potential for high quality, skilled job creation from NbI investments. This is significant because of the scale of infrastructure investment needed to meet growing demand for services in the coming decades, most of it in the developing world. Increasing NbI's share in global infrastructure service delivery can have huge advantages over using purely 'grey' solutions, including creating jobs and decent work opportunities.

Chapter 4 covers the types of skills required to scale-up investment in, and the deployment of NbS, and how to fill the skills gaps, where they exist. It presents the findings of a global skills survey of NbS practitioners and looks at measures to make sure that skills development is done effectively and leads to decent work and just transition outcomes.

Chapter 5 summarizes the conclusions and presents the main recommendations that have emerged from the report.

Case study 1
Kenya's 15 Billion Trees initiative

Background and context

Forests are vital to Kenya's economy, providing jobs, livelihoods and essential products to millions of people. Economically, forest ecosystems support not only the forestry sector but also other sectors like agriculture, water, energy, construction, manufacturing and tourism. Despite this importance, deforestation and land degradation threaten Kenya's environment and economy.

Project description

To address these challenges, in 2022 the Government of Kenya launched the National Landscape and Ecosystem Restoration Programme including the 15 Billion Trees (15BT) initiative. By planting 15 billion trees by 2032[5], the country aims to increase tree cover from 12.13 per cent to 30 per cent and restore 10.6 million ha of degraded land, increasing reforestation ambitions beyond what is in Kenya's 2020 NDC under the Paris Agreement (Government of Kenya 2020).

Reforestation activities on degraded moist Kaptagat Forest, Uasin Gishu County, Kenya

5 Speech by HE Dr Willian Samoei Ruto, CGH, President of the Republic of Kenya "Launch of the National Program for Accelerated Forestry and Rangelands Restoration"

Because of its ambition, the 15BT initiative has the potential to transform Kenya's economy, society and environment by enhancing the productivity of the agriculture, fisheries, forestry, tourism and water sectors, while boosting other sectors further up the value chain. Once land is restored, ecosystem services like groundwater control, soil stability and fertility, pollination, and carbon sequestration will be greatly enhanced across Kenya. Another major benefit will be the increased resilience to climate change – needed urgently, as shown by the devastating impacts of the heavy rains and floods in May 2024.

Potential of the 15BT initiative for job creation

The 15BT initiative has significant potential for immediate, large-scale job creation across Kenya. Many restoration activities are labour-intensive, potentially engaging hundreds of thousands of Kenyans. It is estimated that the initiative could create 400,000–1.1 million jobs each year as shown in Table 1.

Table 1. Employment estimate

NO.	INTERVENTION AREA	TEN-YEAR RESTORATION TARGET (HA)	EMPLOYMENT FACTOR FTE[6]/HA	TOTAL EMPLOYMENT POTENTIAL FTE (MILLIONS)
1	Rehabilitation of degraded dryland landscapes	5,190,556	0.4–1.1	2–5.8
2	Growing of agroforestry trees on farmlands	3,000,000	0.25–0.375	0.75–1.125
3	Establishment of commercial private forests	750,000	0.4–1.1	0.3–0.825
4	Rehabilitation of degraded water towers, wetlands and riparian areas outside gazetted forests	500,000	0.4–1.1	0.125–0.55
5	Greening of infrastructure (roads, railway lines, dams) and tree-planting by corporates and Ministries, Departments and Agencies (MDAs)	450,000	0.4–1.1	0.18–0.495

6 FTE (Full-Time Equivalent) is a unit to measure an employed person's workload relative to a full-time work schedule. FTE allows comparison of the number of jobs created across sectors.

NO.	INTERVENTION AREA	TEN-YEAR RESTORATION TARGET (HA)	EMPLOYMENT FACTOR FTE[6]/HA	TOTAL EMPLOYMENT POTENTIAL FTE (MILLIONS)
6	Rehabilitation of degraded natural forests in gazetted forests and water towers	350,507	0.4–1.1	0.140–0.385
7	Establishment of bamboo	150,000	0.4	+- 0.06
8	Rehabilitation of degraded mangrove ecosystems	14,000	1.4	+- 0.196
9	Growing of fruit trees and woodlots in schools, colleges, universities and other institutions	70,000	0.4–1.1	0.028–0.77
10	Restocking of forest plantation in gazetted forests	54,000	0.4–1.1	0.0216–0.0594
11	Establishment of urban forests, arboretum, green spaces and roadside plantings in wards and sub-counties	50,000	1–5	0.05–0.25
	Total (ten years)	**10,579,063**	**n/a**	**3.85–10.5 million**
	Annual employment potential			**0.385–1.05 million FTE per annum**

SOURCE: Estimate by ILO based on productivity rates in ILO and WWF 2020.

The quantity and types of jobs created will vary depending on the implementation approach chosen. Whilst certain activities could be implemented by volunteers or through private sector mobilization, it will also be necessary to employ additional people. This could include direct employment through local cooperatives contracted for tree-planting or by establishing a 'green army' of young people to carry out reforestation and land restoration projects. Furthermore, the additional demand for forestry-related work could also contribute to improving the quality of employment in the forestry sector, which is currently characterized by high levels of informality.

Way forward

The 15BT initiative provides an immense opportunity for Kenya to harness NbS to drive large-scale employment creation across the value chain. This is especially important given the high unemployment rate among youth and the continued negative social and economic impacts of degraded landscapes across Kenya. To maximize the benefits of the initiative, it is crucial to address the issue of informality, particularly prevalent in the forestry sector. A key next step is to strengthen the national implementation strategy, particularly on the job creation dimension. By doing so, the 15BT initiative could showcase how large-scale ecosystem restoration can combine job creation, economic growth and environmental restoration, thereby contributing to achieving the SDGs and global commitments under the Rio Conventions. The quantification of job creation in the forestry sector will also strengthen the national economy.

Chapter 2

Chapter 2 Estimating current and future employment in nature-based solutions

2.1 Introduction

The potential for job creation from the adoption of NbS presented in the 2022 Decent Work in Nature-based Solutions report has helped inform policymakers worldwide as they work to address pressing challenges, such as climate change and biodiversity loss. In this latest report, updated estimates of current and projected employment opportunities from NbS are presented.

This chapter outlines two modelling exercises aimed at estimating the number of people currently involved in NbS employment globally, as well as a projection based on estimated global investment needs. Building on the analysis developed in ILO–UNEP–IUCN (2022) – which presented the first attempt to model NbS employment by region and country income group – this updated exercise provides new estimates based on a revised methodology and updated data. This approach is taken as there is no employment or labour force data available on NbS[7].

The estimates encompass NbS (i.e., direct impacts of NbS spending), work resulting from NbS (i.e., indirect impacts) and NbS-induced employment (i.e., further employment effects stemming from NbS expenditure). Throughout this chapter, the term "NbS employment" refers collectively to all these categories.

The chapter is structured as follows: Section 2.2 discusses the modelling exercise for the current employment estimates and presents the results, and section 2.3 does so for future employment. Section 2.4 presents the key conclusions.

7 While the 2022 report proposes an approach for doing this, it has not been implemented at any scale that would allow for reporting on global NbS employment.

2.2 Updated results on current employment

2.2.1 Data-related challenges and the associated limitations in estimating employment in NbS

The primary data source for the modelling exercise presented in this chapter is expenditure/investment information from UNEP's State of Finance of Nature 2023 (SFN 2023) report (UNEP 2023a). This report captures current global investment in NbS and estimates global investment needs in NbS, based on what is required to achieve key global targets related to the three Rio Conventions on Biodiversity, Climate Change and Desertification. The key assumption made in the modelling is that the NbS expenditure data captured in SFN 2023 gives rise to NbS employment, whether directly, indirectly (through supply chains) or via induced effects (higher incomes leading to increased economic activity). Furthermore, this reports also relies on the NbS types used in SFN 2023 for categorizing the expenditure. For further information on the SFN 2023 data, please refer to the Annex and SFN 2023.

The methodology used in the estimation of employment in NbS faces challenges and limitations[8], which need to be considered when interpreting the results. On the one hand, the data on NbS expenditure that have been used suffer from coverage gaps, resulting in underestimation of expenditure and, in turn, NbS employment. In addition, this investment data does not necessarily capture all NbS activities. For example, NbS activities not linked to reported investment – such as, for example, households, farmers or enterprises incorporating NbS into existing production methods – is not covered in the financial reporting, and the associated employment is thus also not captured in these employment estimates. This represents an important gap which results in a lower estimate of total NbS employment.

Concerning the degree of (in)formality in NbS employment, data limitations also present challenges in deriving robust estimates. Generally, informal employment is captured in the model estimates where informal activity is present in official statistics. For example, where statistics on GDP or output include informal production, the modelled employment estimates also include informal employment. However, whether informal production is included in official statistics differs by country.

In addition to the limitations of the SFN dataset, the additional data used from public employment programmes (PEPs) and payments for ecosystem services (PES) also carry limitations, since only countries with known expenditure and employment data are included[9]. The specific characteristics and limitations of the data sources are detailed in the Annex.

8 There are various ways to measure work in general as well as jobs and employment. In this chapter, the term "jobs" refers to the number or people working in NbS, independent of full- or part-time status. Full-Time Equivalents are based on the total number of hours worked divided by the number of working hours per year.

9 These include Ethiopia, India, Mexico, New Zealand, Pakistan, South Africa and Tanzania.

Given these challenges and limitations, the final expenditure dataset used as the key input to the employment modelling exercise likely underestimates total global expenditure in NbS. Consequently, the employment estimates derived from this dataset can also be expected to be lower than actual NbS-related employment.

2.2.2 Key modelling assumptions

The estimates in this chapter were derived through a macroeconomic modelling exercise using a macroeconomic model of the world's economic and energy systems and their relationship to the environment[10].

Without specific information on which economic sectors NbS expenditures fall into, assumptions were made on how these expenditures align with conventional sectors in the E3ME model – a global, macro-econometric model that uses 43 sectors, based on the International Standard Industrial Classification of All Economic Activities (ISIC) two-digit classifications[11]. First, NbS activities included in the SFN 2023 report were grouped into broader categories and mapped to standard economic sectors. This process was guided by various sources, such as the supply chains identified in the United States' federal spending on environmental activities[12], Eurostat data on output from the environmental goods and services sector by standard sectors[13] as well as other country- and project-specific information found via an extensive literature review.

This second iteration of the modelling exercise, first done for the 2022 report, aimed to introduce various improvements to enhance the accuracy of estimates of employment in NbS as well as to increase the level of detail in the results. Broadly, the alterations are described in Table 2. Additionally, this report includes disaggregation of employment by occupations following the International Standard Classification of Occupations 2008 (ISCO-08)[14]. These changes as well as comparisons to the results from the 2022 report are presented in more detail in the Annex.

10 See the E3ME model manual for a detailed description and outline of the equation sets: https://www.e3me.com/wp-content/uploads/sites/3/2022/12/E3MEManual2022-1.pdf

11 ILOSTAT, "International Standard Industrial Classification of All Economic Activities (ISIC)"

12 US SPENDING.GOV, "The Office Source of Government Spending Data"

13 eurostat, "Environmental Goods and Services Sector"

14 ILOSTAT, "International Standard Classification of Occupations (ISCO)"

Table 2: Overview of methodological improvements compared to Decent Work in NbS 2022 (ILO, UNEP and IUCN 2022)

IMPROVED MAPPING OF NBS ACTIVITIES TO STANDARD INDUSTRIAL SECTORS	ENHANCED MAPPING OF ODA DATA	GREATER NBS- AND REGION-SPECIFICITY	INCREASED GRANULARITY IN REGIONS
Country-specific supply chain sector mappings were derived for European countries based on Eurostat EGSS data. This implies a more accurate allocation of NbS expenditure across regions compared to the previous iteration, where the sector mapping for European countries was proxied by data for the US.	Public and private ODA data is now directly disaggregated across regions, based on disbursement data (OECD creditor reporting system data[15]) and then proportionally distributed across NbS types. The implication is a more precise allocation of ODA across regions.	Alongside a standard scenario which estimates employment in NbS using standard economic sector coefficients, two new, alternative scenarios are modelled in E3ME which utilize NbS-specific employment coefficients derived from literature and regional productivity differences. These two new scenarios provide enhanced NbS- and region-specificity to the employment estimates.	This iteration reports employment estimates by regions at a more detailed level compared to the previous iteration. The Americas is split between North America and Latin America, and the European Union (EU) is now separate from the rest of Europe and Central Asia.

2.2.3 Estimating current NbS employment

2.2.3.1 Scenario design

A key difference in the methodology to the employment modelling exercise presented in this report, compared to the Decent Work in NbS 2022 report, is the introduction of additional scenarios, which offer enhanced regional and NbS specificity to the employment estimates. For the 2022 report, standard sector relationships between investment, output and employment, within the model, were assumed – i.e., the characteristics and dynamics of NbS activities were not specifically accounted for. For this updated report, two alternative scenarios have been modelled alongside the 'standard' scenario, to include: 1) evidence gathered through a literature review on NbS-specific employment multipliers; and 2) further adjustments for regional productivity differences. In this report, NbS employment estimates are therefore presented as ranges, which indicate the minimum and maximum values across the three scenarios (i.e., the standard scenario with no NbS- and region-specific adjustments, and the two alternative scenarios). Generally, the employment estimates are higher for the alternative scenarios, reflecting that the higher labour intensity of NbS employment compared to standard economic sectors.

15 OECD, "OECD Data Explorer"

2.2.4 Estimates of current NbS employment

This section presents estimates of the current levels of NbS employment in both the number of individuals and FTEs. Additional analysis presents the employment results disaggregated by occupations and skill level (based on ILO definitions). Furthermore, the section includes an interpretation of the results, highlighting differences in NbS employment across various regions and sectors. Box 2 provides definitions for the key variables used in the modelling.

BOX 2
Definition of variables used in the modelling

The E3ME model structure is based on the System of National Accounts (UN SNA 2008). As such, the variables in the model follow definitions aligned with the SNA. The following are the more frequently used and presented variables:

- **Consumption expenditure:** The total expenditures of resident households on individual goods and services.
- **Investment:** Gross fixed capital formation representing resident producers' investments (minus disposals) in fixed assets during a given period. Fixed assets are tangible or intangible assets produced as outputs from production processes that are used repeatedly or continuously for more than one year.
- **Government final consumption expenditure:** All government current expenditures for purchases of goods and services incurred by government in its production of non-market final goods and services (except Gross Fixed Capital Formation), as well as market goods and services provided as social transfers in kind.
- **Employment:** Employees and self-employed persons working in resident production units (i.e., the domestic employment concept as defined in (UN SNA 2008) in thousands of persons, where employment in persons considers all persons engaged in productive activities.
- **Employment full-time equivalent (FTE):** Calculated using model results by multiplying the employment level by sector by the number of average weekly hours worked by sector, then divided by 48, i.e., the number of working weeks in a year.

2.2.4.1 Spending in NbS activities

In the modelling, global NbS expenditures used are approximately US$200 billion per year, based on the SFN 2023 report, to which another approximately US$21 billion was added from selected PEPs and PES (for more detailed information, please refer to the Annex).

Table 3 shows the global contribution NbS activities make to GDP, categorized by region and country income group. It demonstrates how NbS expenditure boosts the economy by increasing demand for goods and services in various sectors, i.e., through supply-chain effects and through higher incomes and demand from NbS activities. Currently, most public and private NbS expenditure is concentrated in Asia and the Pacific, North America, and the European Union (EU), accounting for 44 per cent, 27 per cent and 17 per cent of global NbS expenditure, respectively. In contrast, NbS expenditure is minimal in Latin America (3 per cent) and Africa (1 per cent) and even less in Arab States. Factors contributing to these low expenditures might include insufficient financial resources to support NbS, policy makers in developing countries favouring short-term projects which deliver quick gains rather than investing in long-term NbS, but also limited knowledge and evidence on NbS activities. It is possible that NbS activities are more common in these regions, but data is lacking[16], potentially also due to informality. The majority of NbS expenditure occurs in high-income countries (57 per cent) and upper-middle-income countries (32 per cent), with 10 per cent of the expenditure attributed to lower-middle-income countries and less than 1 per cent to low-income countries.

The largest direct impact on total GDP at the global level and across all regions comes from government expenditure in NbS activities, followed by investment expenditure (as seen in the two most-right columns in Table 3). In low-income countries, investment spending contributes a relatively larger share to overall GDP compared to other higher income regions.

Table 3 presents the overall contribution of NbS expenditure on GDP and its components (consumer expenditure, investment spending and government consumption), both in absolute terms and in percentage terms. The estimates include direct effects (the NbS expenditure itself) as well as indirect and induced effects (supply chain impacts, or additional expenditure because of a higher number of jobs and thus income). Globally, total NbS expenditure is estimated to account for 0.3 per cent of GDP (first column), with significant regional variations. In Asia and the Pacific along with North America, NbS expenditure makes the largest contribution to total GDP, followed by the EU and rest of Europe and Central Asia. In Latin America and Africa, the GDP contribution of NbS is much lower. In Arab States, the share is minimal.

Interestingly, the share of GDP which can be attributed to NbS activities is highest in low-income countries, likely due to Official Development Assistance (ODA) through government expenditure, and their low overall GDP. Conversely, the smallest contribution to GDP from NbS spending is observed in high-income countries.

16 For further information, please refer to the SFN 2023 report.

Table 3: NbS expenditure contribution to GDP and its components by region (by percentage of total and US$ million, 2023 prices)

REGION	TOTAL NBS CONTRIBUTION TO GDP		TOTAL CONSUMER EXPENDITURE		TOTAL INVESTMENT SPENDING		TOTAL GOVERNMENT FINAL CONSUMPTION	
	%	US$	%	US$	%	US$	%	US$
Africa	0.1	2,855	0.0	322	0.1	720	0.3	1,479
North America	0.3	64,272	0.1	6,653	0.2	10,431	1.4	46,052
Latin America	0.1	5,927	0.0	1,322	0.1	1,531	0.3	3,135
Arab States	0.0	147	0.0	-2	0.0	7	0.0	8
Asia and the Pacific	0.3	101,963	0.1	10,524	0.4	39,900	1.1	54,799
EU27	0.2	40,196	0.1	11,560	0.3	13,570	0.5	17,696
Rest of Europe and Central Asia	0.2	16,895	0.0	1,286	0.3	6,775	0.8	10,234
High income	0.2	132,516	0.1	24,836	0.3	36,663	0.7	75,371
Upper middle income	0.3	75,855	0.0	4,476	0.3	27,706	1.2	44,722
Lower middle income	0.3	22,424	0.0	2,200	0.3	8,140	1.3	12,473
Low income	0.4	1,460	0.1	152	0.6	426	1.3	838
WORLD TOTAL	**0.3**	**233,865**	**0.1**	**31,719**	**0.3**	**73,096**	**0.9**	**133,708**

NOTE: See the Annex for region classifications. Regions by income level are aligned with the classification used by the ILO (see: https://ilostat.ilo.org/methods/concepts-and-definitions/) Source: Cambridge Econometrics E3ME model.

2.2.4.2 NbS employment

Table 4 provides estimates of current NbS employment at the global level as well as by geographical and income regions. It is important to note that the results only capture the employment effects of current expenditure on NbS activities. In the long-term, NbS activities

are also likely to lead to secondary effects, where improvements in ecosystem services are expected to drive positive effects on the economy.

Based on current NbS expenditure, 60.5–63 million people are engaged in NbS activities, including NbS-related work, work created from NbS, or NbS-induced work. NbS employment, therefore, includes employment directly linked with NbS types, such as protection, restoration and sustainable land management[17] as well as employment created through the supply chains of these activities, and employment generated through income effects. The latter two, although generated through NbS expenditure, are not considered to be jobs involved directly with NbS. This figure represents around 1.8 per cent of the global employment projections for 2024 produced by the ILO World Employment and Social Outlook (ILO 2024). However, this estimate should be considered partial due to the limitations and uncertainties of the expenditure data driving the employment estimate.

The majority of global NbS employment is concentrated in Asia and the Pacific, accounting for 93–95 per cent of total NbS employment worldwide (57–59 million people). This is primarily due to the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) in India, which generates the majority of NbS employment in terms of the number of people employed (53 million people)[18]. More than half of the beneficiaries of this scheme are women[19]. However, the impact in terms of FTEs is slightly smaller, with the region accounting for 85–87 per cent of FTEs in NbS (Table 4). This is because PEPs generally provide part-time employment and a lot of this is on a project basis. In other regions, such as North America and the EU27, more people are likely working in NbS on a full-time basis, as FTE numbers are only slightly lower than total employment figures. The vast majority of current NbS employment is found in lower-middle-income countries, despite this being the region where the lowest share of total NbS expenditure happens. This can be explained by the higher labour intensity in the sectors where NbS activities can be found, compared to other regions.

At global level, 14 per cent of NbS employment is carried out by people aged 15–24, with the share of young people being largest in Africa (24 per cent) and lowest in the EU (6 per cent). The share of youth among people engaged in NbS employment is larger than their share in total employment globally (approximately 12 per cent) and in several regions, particularly in Africa and Latin America (ILO 2024a). This highlights the important role of NbS in creating opportunities for young people. While more than one-third of NbS workers globally are women, this share is lower than the share of women in total employment globally (approximately 40 per cent) (ibid), perhaps reflecting the type and labour intensity of the work performed in NbS activities. Current limitations in the available data present an obstacle in obtaining a clearer view on the characteristics of NbS workers, including the share of NbS workers who are persons with disabilities.

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17 Please refer to the Annex for further information on the types of NbS activities included.

18 This is primarily due to a reduction in the number of people working in the MGNREGS in India.

19 Government of India, "Press Information Bureau"

Table 4: Current NbS employment by region (thousand persons)

REGION	TOTAL EMPLOYMENT (THOUSAND PERSONS)	PEPs AND PES (THOUSAND PERSONS)	EMPLOYED OUTSIDE PEPs AND PES (THOUSAND PERSONS)	SHARE OF 15–24 YEAR-OLDS IN TOTAL EMPLOYMENT (PER CENT)	SHARE OF WOMEN IN TOTAL EMPLOYMENT (PER CENT)
Africa	1,918–1,933	1,697	221–236	24	40
North America	233–706	-	233–706	11–12	34–41
Latin America	571–612	442	129–170	18	22–23
Arab States	1	-	1	14–15	21–22
Asia and the Pacific	57,291–58,819	52,662	4,629–6,157	13	36
EU27	274–398	-	274–398	6	40–44
Rest of Europe and Central Asia	204–337	-	204–337	11–12	35–37
High income	1,262–2,029	3	1,258–2,025	12	34–35
Upper middle income	3,184–4,649	481	2,702–4,168	18	36
Lower middle income	54,270–54,358	52,659	1,612–1,699	21	41
Low income	1,777–1,782	1,658	119–124	14	36
WORLD TOTAL	**60,518–62,839**	**54,802**	**5,717–8,038**	**14**	**36**

NOTE: Ranges represent the minimum and maximum across the three scenarios. PEPs refers to public employment programmes. PES refers to payment for ecosystems services. For PEPs and PES no ranges are presented, as these figures are added after the scenarios are modelled. Regions by income level are aligned with the classification used by the ILO (see: https://ilostat.ilo.org/methods/concepts-and-definitions/). Source: Cambridge Econometrics E3ME model.

Table 5: Current NbS employment by region (thousand FTEs)

REGION	TOTAL EMPLOYMENT (THOUSAND FTES)	PEPs AND PES (THOUSAND FTES)
Africa	631–642	452
North America	154–498	-
Latin America	565 – 600	442
Arab States	1	-
Asia and the Pacific	12,275–13,315	8,573
EU27	222–337	-
Rest of Europe and Central Asia	174–295	-
High income	910–1,509	2
Upper middle income	2,534–3,531	461
Lower middle income	10,049–10,128	8,571
Low income	**529–533**	**433**
WORLD	**14,043–15,716**	**9,467**

NOTE: Ranges represent the minimum and maximum across the three scenarios. Regions by income level are aligned with the classification used by the ILO (see: https://ilostat.ilo.org/methods/concepts-and-definitions/). Source: Cambridge Econometrics E3ME model.

Table 6 presents the estimated NbS employment by specific NbS expenditure categories and by regions. Similarly, Figure 1 shows the shares of NbS employment by NbS expenditure categories across regions. The NbS expenditure categories are those that are reported in the underlying dataset used as input to the modelling, i.e., SFN 2023. For current NbS expenditure, both public and private finance flows to NbS via different channels, such as public funding for protected areas or payments for ecosystem services, have been included. At the global level, and across most regions, the majority of NbS employment is found within sustainable agriculture, forestry, fishing and hunting. A large share of NbS related work is also associated with protection of biodiversity and landscape in the EU, North America and Arab States. Only a small share of NbS employment across all regions is related to wastewater management and pollution abatement.

Sustainable agriculture, forestry, fishing and hunting sees the largest portion of employment resulting from NbS from current expenditure. The result is biased by the fact that all PEPs and PES employment is allocated to this category, thus showing higher employment gains to NbS expenditure compared with the other categories. If PEPs and PES employment

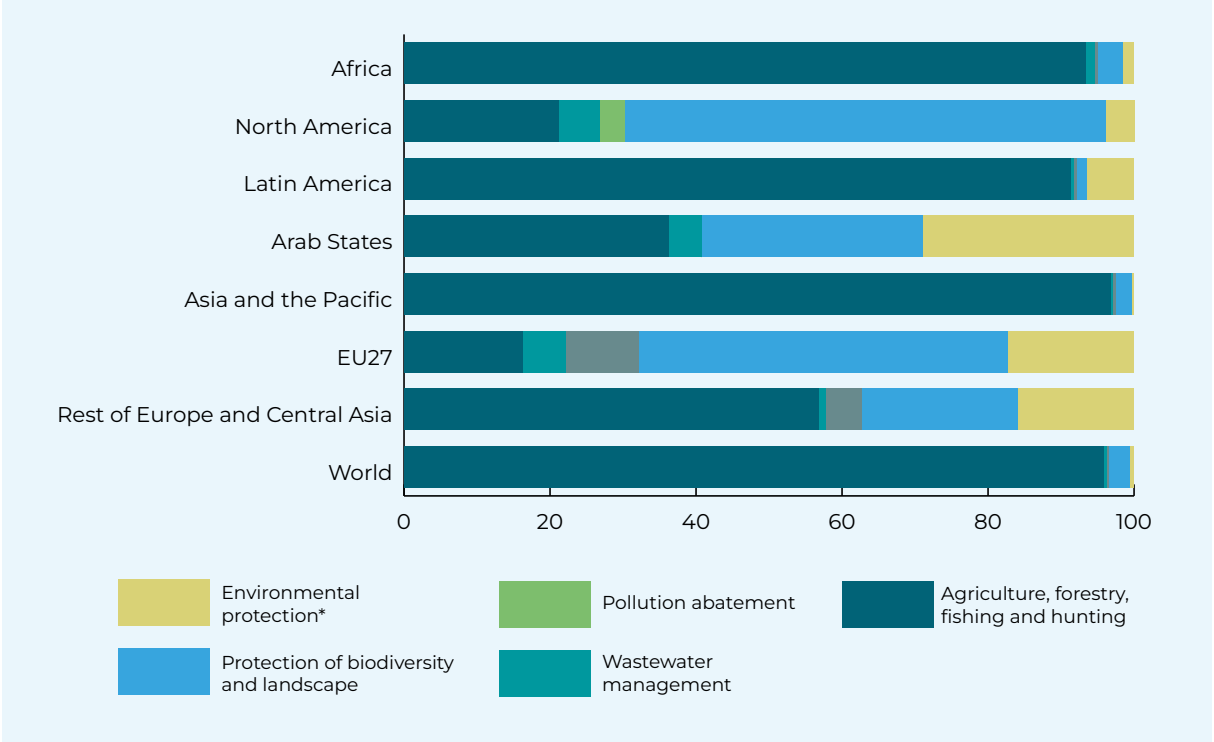
were excluded from the estimate, then the employment results would be proportional to the expenditure received, with some slight variations accounting for wage differentials and labour intensities.

Table 6: Current NbS employment by NbS types (thousand persons), standard scenario

REGION	SUSTAINABLE AGRICULTURE, FORESTRY, FISHING AND HUNTING	WASTEWATER MANAGEMENT	POLLUTION ABATEMENT	PROTECTION OF BIODIVERSITY AND LANDSCAPE	ENVIRONMENTAL PROTECTION*
Africa	1,789	24	9	67	29
North America	49	13	8	154	9
Latin America	520	3	3	7	37
Arab States	0	0	0	0	0
Asia and the Pacific	55,431	205	170	1,269	215
EU27	45	16	27	138	47
Rest of Europe and Central Asia	116	2	10	44	33
High income	756	36	41	338	93
Upper middle income	1,435	195	164	1,259	131
Lower middle income	54,007	28	19	74	139
Low income	1,753	5	3	9	7
WORLD TOTAL	**57,960**	**268**	**229**	**1,684**	**377**

SOURCE: Cambridge Econometrics E3ME model.
*n.e.c. not elsewhere classified.

Figure 1: NbS employment shares (per cent) in NbS types by region, standard scenario



SOURCE: Cambridge Econometrics E3ME model.
*n.e.c. not elsewhere classified.

Figure 2 shows the share of NbS workers (persons) by regions across sectors. The results indicate that most NbS employment globally is estimated to be in activities performed in the agriculture and forestry sector. Over 57 million people are engaged in NbS activities within this sector, accounting for 95 per cent of total NbS employment worldwide. This large share is observed across the different regions. In Asia and the Pacific, as well as in Africa, the agricultural sector contributes 96 per cent and 90 per cent of NbS employment, respectively. Here (and at global level), the PEPs employment in India, which is directed primarily at the agriculture sector, drives the results (MGNREGA 2005).

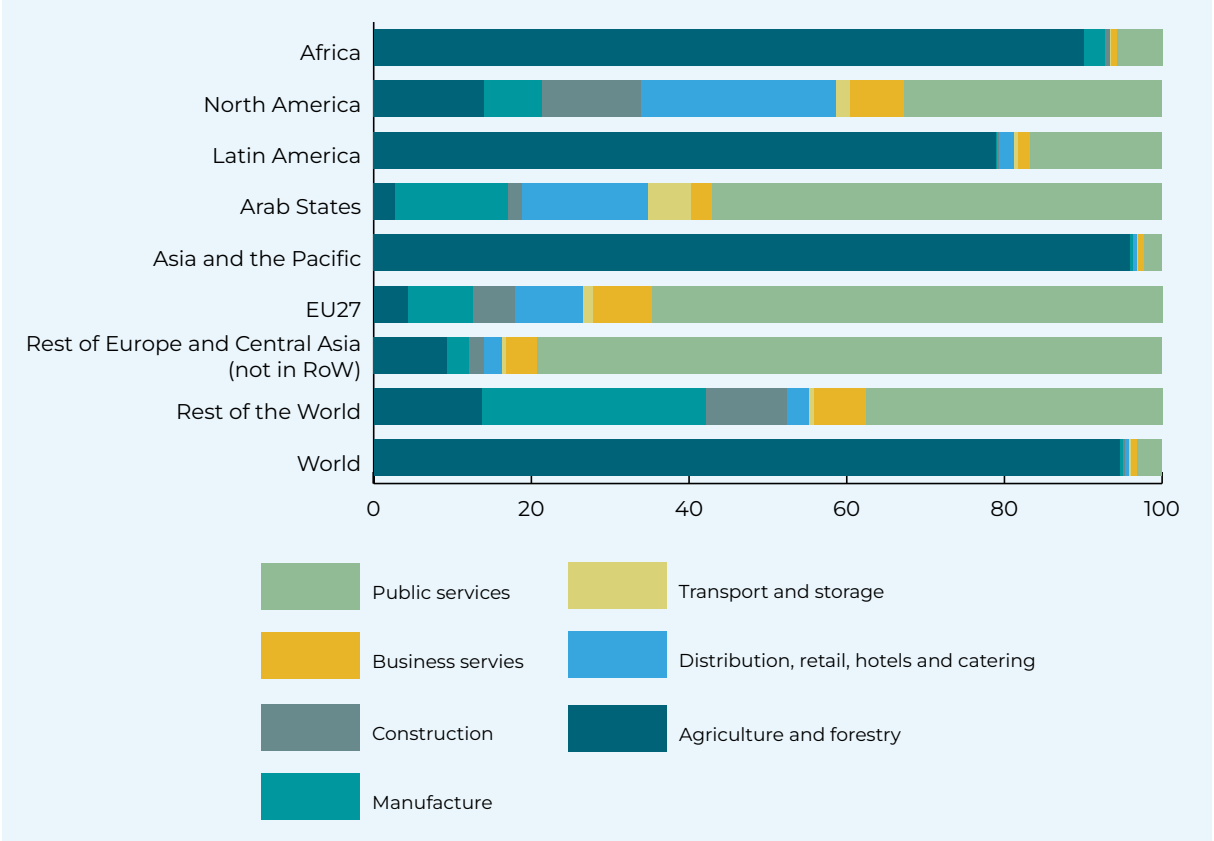
In Latin America, agriculture accounts for 79 per cent of NbS employment, driven by PEPs in Mexico[20]. Given the dominance of NbS employment in activities linked to the agriculture and forestry sectors across some regions, it can be inferred that most people working in NbS are in rural areas. In line with the 19th International Conference of Labour Statisticians (ICLS) 2013 resolution (ILO 2013a), types of work such as subsistence/ own-use farming are excluded from the statistical definition and measurement of employment by many countries. Therefore, such activities are also not included in the NbS employment estimates presented in this report. Moreover, considering the extent of agroforestry being practiced globally –

20 Information on PEPs in Mexico from https://www.gob.mx/bienestar/acciones-y-programas/programa-sembrando-vida.

with some estimates placing the number of people in agroforestry above one billion (FAO 2017) – the real number of people engaged in NbS activities within the agriculture sector is, therefore, likely substantially larger than the estimates in this chapter.

Conversely, in the EU, Arab States and North America, the agriculture sector is less relevant in NbS employment compared to other sectors, with public services being most prevalent in these regions. It is reasonable to assume that NbS employment in some sectors likely stems more from indirect or induced effects of expenditure in NbS in these regions. Employment falling under these activities cannot be considered employment which relates directly to NbS. For example, NbS employment in manufacturing likely results from indirect effects. In the business services sector – another prominent sector for NbS employment in regions like the EU and North America – NbS activities likely create employment through induced effects along the supply chain, as well as through induced jobs created as a result of increased disposable income. Concerning the construction sector, NbS employment is likely also partially attributable to indirect and induced effects but may also reasonably result from direct effects (see Chapter 3 on employment in nature-based infrastructure).

Figure 2: NbS employment across geographic region by sector (percentage of NbS employment)



SOURCE: Cambridge Econometrics E3ME model.

The 2022 edition of this report also included an estimation of the number of volunteers working on NbS related activities. This was based on ILO volunteer data available for a selected number of countries. This data is not updated as frequently as other ILO employment data, and unfortunately no updated data were available since the last report. Therefore, no new estimate of the number of volunteers is included in this 2024 report. It would, however, not be unreasonable to assume that the number of volunteers in NbS employment – estimated at 16 million people globally in 2022 – has not changed dramatically.

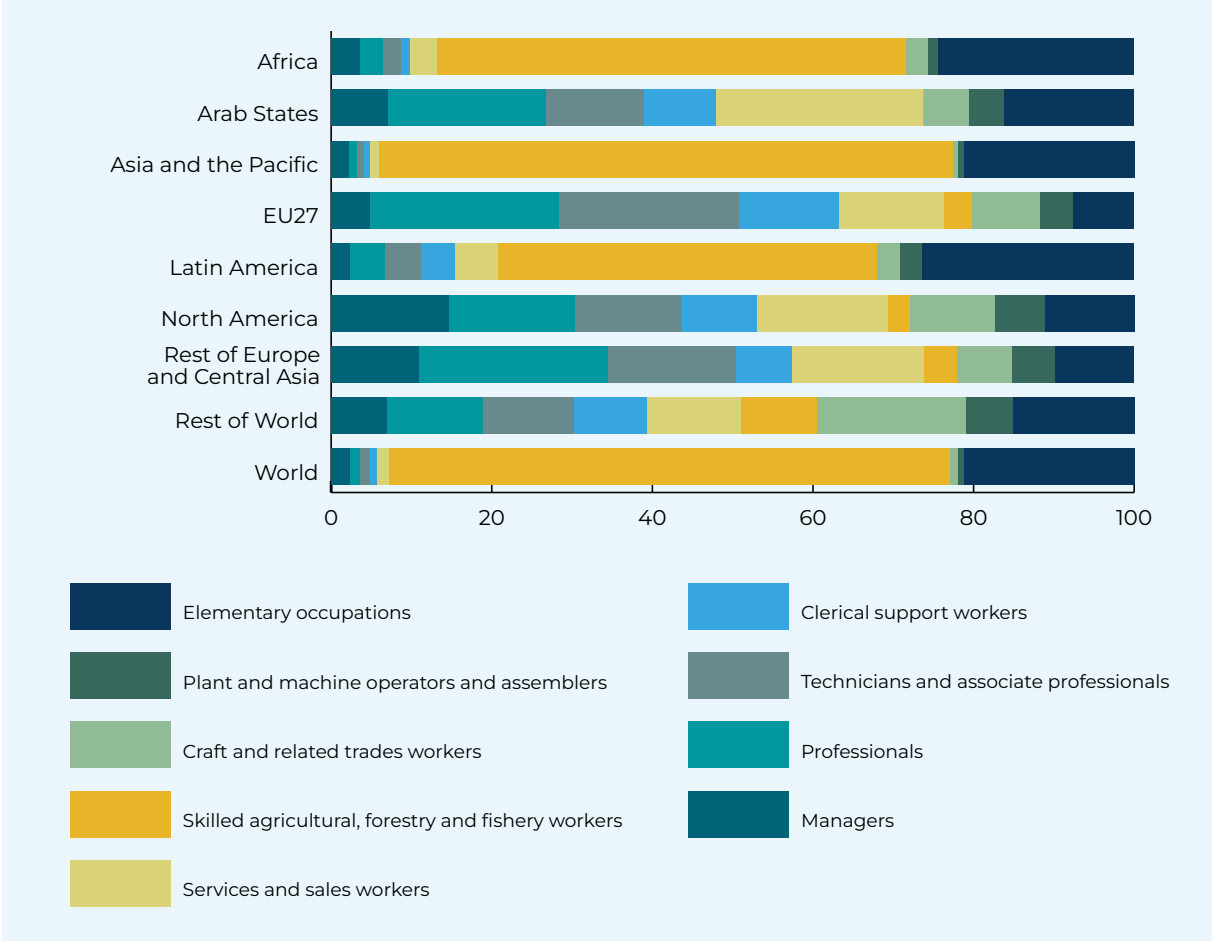
2.2.4.3 NbS employment by occupations and skill level

Figure 3 presents the occupational shares of NbS employment across geographic regions. Occupations are based on the ISCO-08 list of occupations – an international classification which categorizes occupations into groups and sub-groups in varying degrees of detail[21]. At global level, the largest occupation groups are skilled agricultural, forestry and fishery workers and elementary occupations. There is variation in the shares of occupations across regions which reflects the sectoral distribution of employment across the different regions, as shown in the figure. In Asia and the Pacific just over 70 per cent of NbS employment is carried out by skilled agricultural, forestry and fishery workers, while in Africa and Latin America the share is nearly 60 per cent and 50 per cent, respectively. Meanwhile, the share of work carried out by this group is minimal in North America and in the EU, where professional occupations make up the largest shares.

While the occupations in NbS employment, as for the sectoral analysis above, include not just direct, but also indirect and induced effects, and not all occupations can, therefore, be directly linked to NbS activities, several examples of specific occupations linked with NbS can be mentioned. These include conservation workers, project managers, environmental specialists and engineers, and park rangers. (For a further discussion on NbS occupations, please refer to Chapter 4 – Skills for Nature-based Solutions.)

21 The first level of occupation groupings is the broadest and referred to as 'one-digit level', with the next more detailed grouping referred to as 'two-digit' level and providing a higher level of granularity. For a full list and information on ISCO, please see: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_172572.pdf

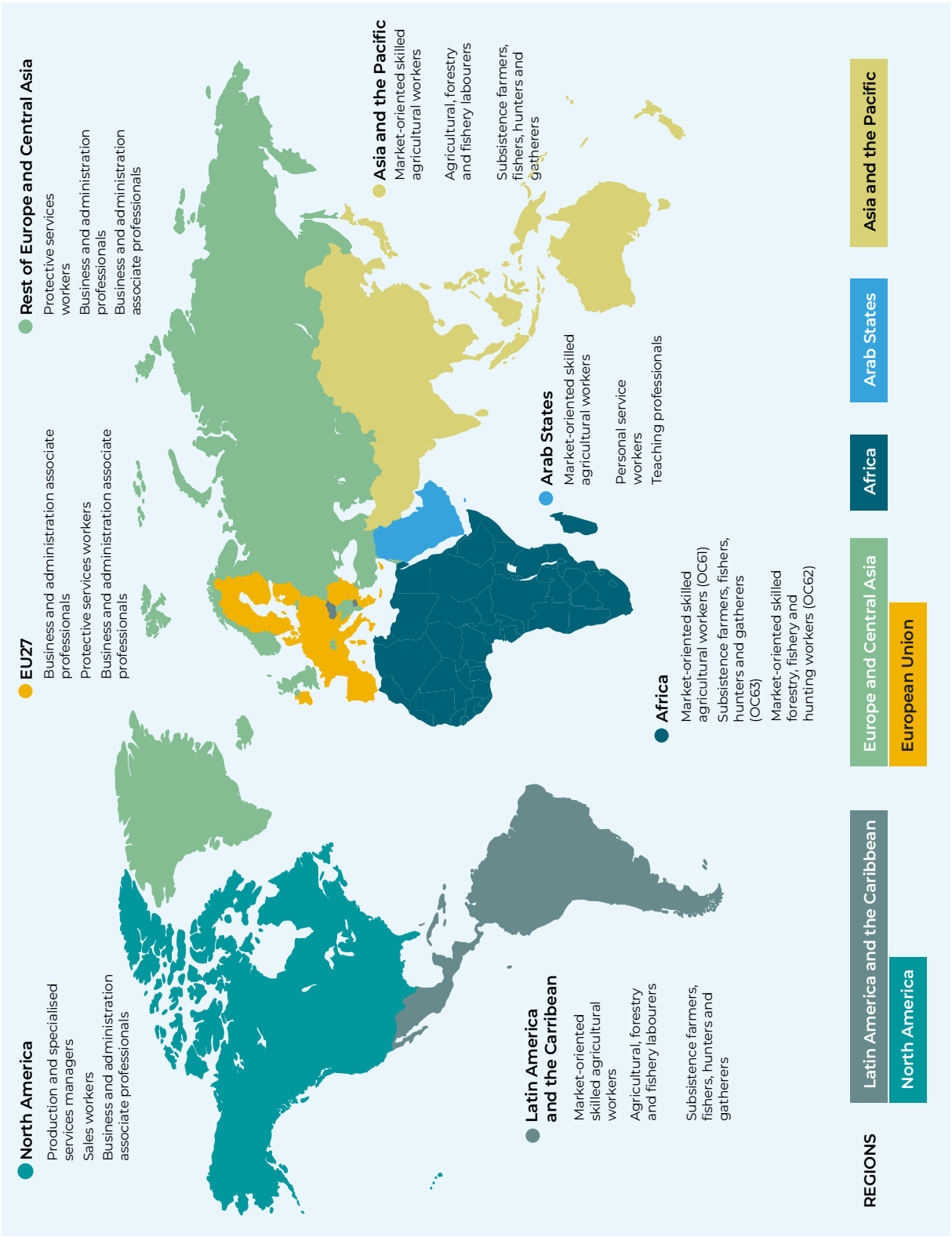
Figure 3: NbS employment by broad occupation group (percentage of NbS employment)



NOTE: Occupations measured at the ISCO-08 'one-digit' level. Occupation shares are based on sectoral employment results and occupation shares within sectors received from ILO. Source: Cambridge Econometrics E3ME model.

Figure 4 summarizes the top three ISCO 'two-digit' occupations for each region benefiting from NbS expenditure and their share out of the total employment outcome within the region. Unsurprisingly, the main employment demand is for occupations found in sectors benefitting directly from NbS expenditure (agriculture and forestry). Other in-demand occupations are linked to infrastructure activities resulting from NbS (i.e., construction, maintenance), monitoring and, more generally, management of NbS activities.

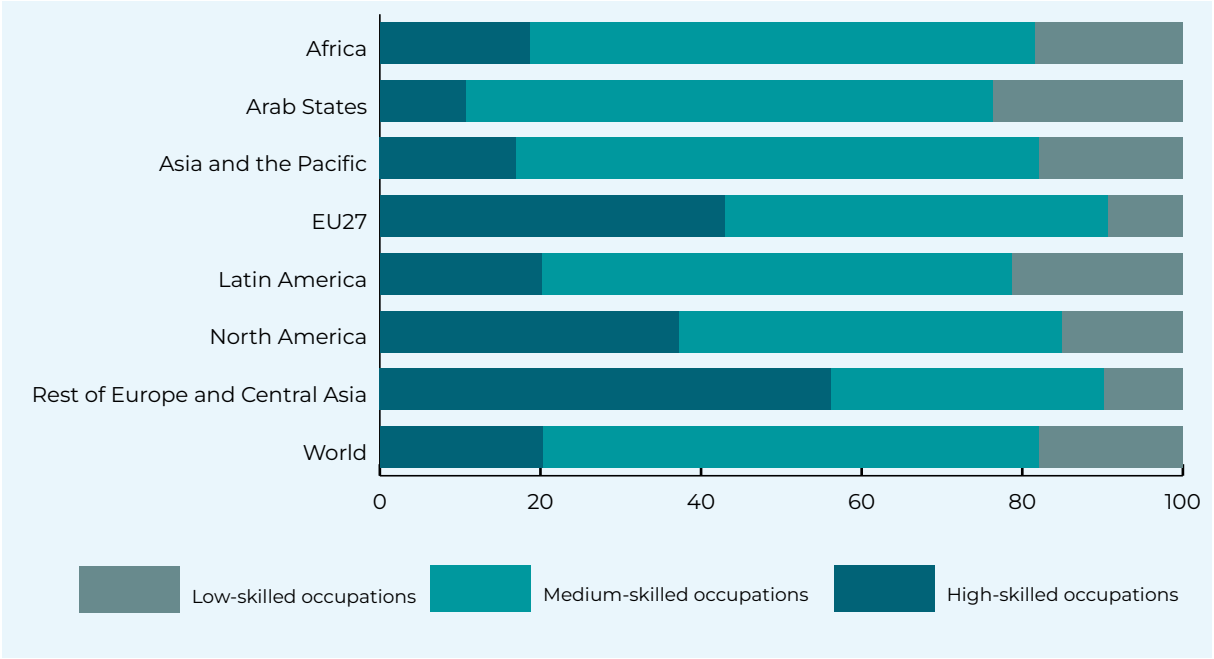
Figure 4: Top three occupations (using ISIC two-digit classification) in current NbS employment by geographical region



SOURCE: Cambridge Econometrics and ILO data.

Figure 5 shows the distribution of NbS employment across geographic regions by skill level (ILO definition linked to occupations). At global level, 74 per cent of NbS employment is in medium-skilled occupations. This group accounts for the majority of NbS employment in Africa, Asia and the Pacific, and Latin America. Conversely, in the EU and rest of Europe along with North America, high-skilled work represents the largest share of NbS employment.

Figure 5: NbS employment by skill level (percentage of NbS employment)



NOTES: High-skilled occupations are occupations listed under ISCO-08 codes 1, 2 or 3; medium-skilled occupations are those listed under ISCO-08 codes 4, 5, 6, 7 or 8; and low-skilled occupations are those listed under ISCO-08 code 9. For additional information, please refer to the ILO categorization: https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/

SOURCE: Cambridge Econometrics E3ME model.

2.3 Employment implications of future NbS investment

With the urgent need to address key societal challenges such as adaptation to climate change, disaster risk reduction, reductions of greenhouse gas emissions, human health, food security, water security, and environmental degradation and biodiversity loss, future NbS investment has the potential to increase substantially. While its full potential use is hard to quantify, SFN 2023 quantifies the NbS investment needed to enable NbS to make its contribution towards addressing the three targets of the Rio Conventions. These targets

include the United Nations Framework Convention on Climate Change (UNFCCC) target to limit global warming to below 1.5°C; the Convention on Biological Diversity (UNCBD) target to halt the loss of biodiversity around the world by ensuring that 30 per cent of land and sea areas are protected by 2030; and the United Nations Convention to Combat Desertification (UNCCD) aims for land degradation neutrality by 2030 (UNEP 2023a).

This section summarizes the outcomes of a modelling exercise, which assessed the employment impact of these future NbS investment needs. The outcomes are presented as a comparison to a business-as-usual case, where annual NbS expenditure remains at current levels, thus allowing to better highlight the potential GDP and employment effects of the additional investment.

It should be noted that the investment needs estimated in SFN 2023 are inherently limited, in that they are based on addressing only three global targets and not the full range of challenges NbS have the potential to address. Thus, the employment estimates also do not represent the full job potential of NbS, but only that of using NbS to contribute to these three targets.

2.3.1 Scenario design

2.3.1.1 Baseline

The standard E3ME baseline scenario is constructed from official projections and further adjustment of the economic trends are made to reflect that NbS investment expenditure remains at the same level as current expenditure – as presented in Section 2.1 – until 2030.

2.3.1.2 Future NbS expenditure

The future NbS annual investment needs used are based on the SFN 2023, which estimates that annual financial flows need to reach US$542 billion by 2030 (UNEP, 2023a p. 28). Future investment needed to achieve the three global targets from the Rio Conventions is allocated over 13 different NbS activities, which are grouped into three broader categories (Table 7).

Table 7: NbS activities and categories based on SFN (2023)

NBS CATEGORIES	NBS ACTIVITIES
Protected areas / avoided conversion	Avoided deforestation
	Avoided peatland impact
	Avoided grassland conversion
	Avoided mangrove impact
	Avoided deterioration – seagrass
	Protected areas
Restoration	Reforestation
	Reforestation of peatlands
	Restoration of mangroves
Sustainable land management	Agroforestry – silvoarable
	Agroforestry – silvopasture
	Cover crops
	Grazing – optimal intensity

The NbS activities, above, are taken from the SFN 2023, as the scenario uses investment information from this report to inform future expenditure requirements in NbS. For further information on the 13 NbS activities please refer to the SFN 2023 report (UNEP 2023a).

Of the total expenditure, by 2030 around 52 per cent would need to be directed towards restoration activities (of which a substantial portion would go to reforestation), 19 per cent would need be directed towards protection activities and 29 per cent towards sustainable land management. As in the estimation of current NbS employment, for the estimates presented in this section, two alternative scenarios have been modelled alongside the 'standard' scenario to include: 1) evidence gathered through a literature review on NbS-specific employment multipliers; and 2) further adjustments for regional productivity differences. NbS employment estimates are therefore presented as ranges, which indicate the minimum and maximum values across the three scenarios (i.e., the standard scenario with no NbS- and region-specific adjustments along with the two alternative scenarios). Generally, the employment estimates are higher for the alternative scenarios, reflecting that the higher labour intensity of NbS employment compared to activities performed under standard economic sectors.

2.3.2 Macroeconomic effects

Table 8 illustrates the total contribution to GDP (beyond current levels) and its components (consumer expenditure, investment spending, and government consumption) of additional NbS expenditure in 2030, both globally and by region. Most of the additional expenditure is expected to occur in Asia and the Pacific, Africa, and the Americas, contributing 51 per cent, 12 per cent and 20 per cent of future global expenditure in NbS activities, respectively (most-

left column). Notably, Africa's share of 12 per cent is significantly higher than the current 1 per cent share of NbS expenditure.

The future expenditure data suggests that by 2030, NbS expenditure will be distributed more evenly across different income regions compared to current levels, where 89 per cent of NbS expenditure is currently concentrated in high- and upper-middle-income countries (Table 6).

Globally, additional investment in NbS activities is expected to have the largest direct impact on total GDP in 2030 (third column), followed by government spending on NbS (most-right column). This contrasts with the GDP impact of current NbS expenditure, where government spending plays a larger role (Table 6). Induced impacts of investments and government spending in NbS lead to higher consumer expenditure across all regions, especially in low-income countries.

Table 8: Additional NbS expenditure contribution to GDP in 2030 by region (percentage and US$ million, 2020 prices)

REGION	TOTAL NBS CONTRIBUTION TO GDP		TOTAL CONSUMER EXPENDITURE		TOTAL INVESTMENT SPENDING		TOTAL GOVERNMENT FINAL CONSUMPTION	
	%	US$	%	US$	%	US$	%	US$
Africa	1.1	40,875	0.4	8,589	2.6	18,325	3.0	16,059
North America	0.2	39,649	0.1	21,700	0.1	5,859	0.3	9,600
Latin America	0.6	47,210	0.2	9,224	1.7	22,817	1.8	20,890
Arab States	0.3	7,174	0.1	1,669	0.6	3,345	0.7	3,599
Asia and the Pacific	0.5	205,289	0.1	18,851	1.1	159,981	0.7	36,504
EU27	0.1	24,496	0.1	8,024	0.2	11,223	0.1	4,554
Rest of Europe and Central Asia	0.3	22,763	0.1	5,396	0.4	9,618	0.8	10,789
High income	0.2	96,066	0.1	35,763	0.2	29,231	0.3	30,725
Upper-middle income	0.5	166,658	0.2	23,013	1.0	110,409	0.9	39,769
Lower-middle income	0.9	108,251	0.2	11,011	2.4	82,972	2.3	25,856
Low income	3.4	16,481	1.2	3,666	9.0	8,557	7.2	5,646
WORLD TOTAL	**0.4**	**403,144**	**0.1**	**74,309**	**0.8**	**237,435**	**0.7**	**112,076**

NOTES: Regions by income level are aligned with the classification used by the ILO (see: https://ilostat.ilo.org/methods/concepts-and-definitions/). Source: Cambridge Econometrics E3ME model.

Table 8 also highlights the percentage difference in GDP and its components compared to the baseline scenario. While the GDP impacts – i.e., the contribution of NbS expenditure to GDP (most-left column) – across all regions are relatively small, there are notable differences. The highest GDP impact compared to the baseline is observed in Africa, followed by Latin America then Asia and the Pacific. The GDP impact is expected to be greatest in low-income countries and lowest in high-income countries.

2.3.3 Employment effects

Future employment estimates in Table 9 are broken down by geographic and income regions as well as by economic sector, in addition to the global results. They include direct, indirect and induced employment effects. Finally, employment numbers are presented as the number of persons and in FTEs[22] to allow for comparisons. The employment impacts of future NbS expenditure on regional patterns as well as the economic characteristics of the regions are shown in Table 10. Regions expected to spend a larger amount on NbS in the future would be expected to see the highest increase in employment (e.g., Asia and the Pacific); however, these impacts are affected by the region's labour market characteristics (such as wage rates) as well as the nature of the NbS activities themselves (e.g., NbS activities that may need higher value-added goods and services versus lower value-added activities).

By 2030, 20–32 million people above current levels could be employed as a result of these increased investments. The majority of future NbS employment is still projected to be in Asia and the Pacific, but important increases in Africa and Latin America can be observed when compared to current employment estimates. Over half of the additional people working in NbS in 2030 will be concentrated in lower-middle-income regions (57–68 per cent, depending on the scenario modelled).

When comparing the total number of people working in NbS with the number of FTEs, the results suggest that, depending on the region, 9–33 per cent of workers are on a part-time or project-based level, as indicated by the lower number of FTEs in NbS employment[23]. From a geographic region perspective, the highest proportion of part-time work occurs in North America (33 per cent), followed by the rest of Europe and Central Asia (28 per cent).

22 Full-Time Equivalents are based on the total number of hours worked, divided by the number of working hours per year.

23 Excluding the Arab States in which only 5 per cent of people are estimated to work less than FTE in NbS employment. The estimated share of workers on a part-time or project-based level is derived from taking the difference between total employment (thousand persons) and total employment (thousand FTEs) and dividing this number by total employment (thousand persons).

Table 9: Additional NbS employment by 2030 in NbS by geographic and income regions

REGION	TOTAL EMPLOYMENT (THOUSAND PERSONS)	SHARE OF 15–24 YEARS-OLD (%)	SHARE OF WOMEN (%)	TOTAL EMPLOYMENT (THOUSAND FTES)
Africa	4,846–6,535	20–21	34–36	3,914–5,165
North America	190–318	14–15	39–42	129–219
Latin America	1,375–5,799	17–18	26–40	1,208–4,754
Arab States	615–780	19	21	449–615
Asia and the Pacific	10,942–15,779	14	34–35	9,946–13,949
EU27	139–291	7	36–39	114–257
Rest of Europe and Central Asia	1,166–1,426	11	33 - 34	838–1,054
High income	773–1673	8	35–39	582–1,347
Upper middle income	5,013–12,244	12	33–36	4,116–9,628
Lower middle income	10,944–15,265	17	33–34	9,808–13,472
Low income	2,543–3,112	18	36–37	2,090–2,508
WORLD TOTAL	**19,805–32,175**	**16**	**36**	**17,011–26,614**

NOTE: Ranges represent the minimum and maximum across the three scenarios. Regions by income level are aligned with the classification used by the ILO (see: https://ilostat.ilo.org/methods/concepts-and-definitions/).

SOURCE: Cambridge Econometrics E3ME model.

Table 10 and Figure 6 show the distribution of future additional NbS employment by NbS categories, as they are reported in SFN (2023) and by regions[24]. These three NbS categories include various more detailed NbS activities, as presented in Table 7. At global level, the largest share of additional future NbS employment falls under restoration activities. This includes activities such as reforestation, peatland restoration and the restoration of mangroves. This is mainly driven by the composition of NbS employment in Asia and the Pacific where a large share of global NbS employment generally occurs, and where restoration activities account for 58 per cent of NbS employment. Meanwhile, in other regions, restoration makes up a smaller share. A large share of NbS employment in North America and Latin America is in activities in the field of protected areas, which includes activities such as the avoidance

24 These types differ from the NbS finance types presented for the current (2024) NbS employment estimates and cannot be directly mapped to each other. Therefore, current and future employment estimates by NbS types are not directly comparable.

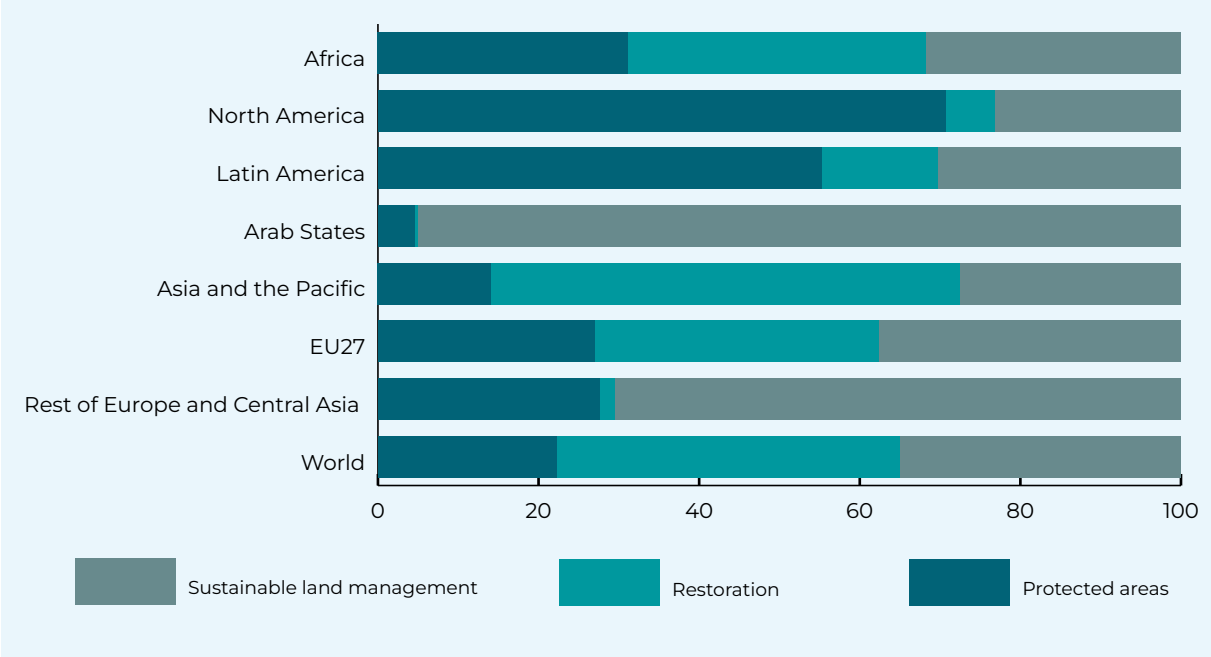
of deforestation and conversion of peatland, grassland and mangroves. One-third of NbS employment at global level is linked to sustainable land management, including agroforestry and activities linked to cover crops and grazing intensity, with these activities representing a large share of NbS in Europe and Central Asia along with the Arab States.

Table 10: Future NbS employment by NbS types (thousand persons), 2030, standard scenario

REGION	PROTECTED AREAS	RESTORATION	SUSTAINABLE LAND MANAGEMENT
Africa	1,529	1,818	1,564
North America	136	12	45
Latin America	772	203	424
Arab States	28	2	585
Asia and the Pacific	1,543	6,392	3,023
EU27	38	50	53
Rest of Europe and Central Asia	323	23	826
High income	399	78	302
Upper-middle income	1,268	1,435	2,337
Lower-middle income	1,639	5,920	3,443
Low income	1,063	1,066	436
WORLD	**4,426**	**8,517**	**6,974**

SOURCE: Cambridge Econometrics E3ME model.

Figure 6: NbS employment shares (%) in NbS category by region, 2030, standard scenario

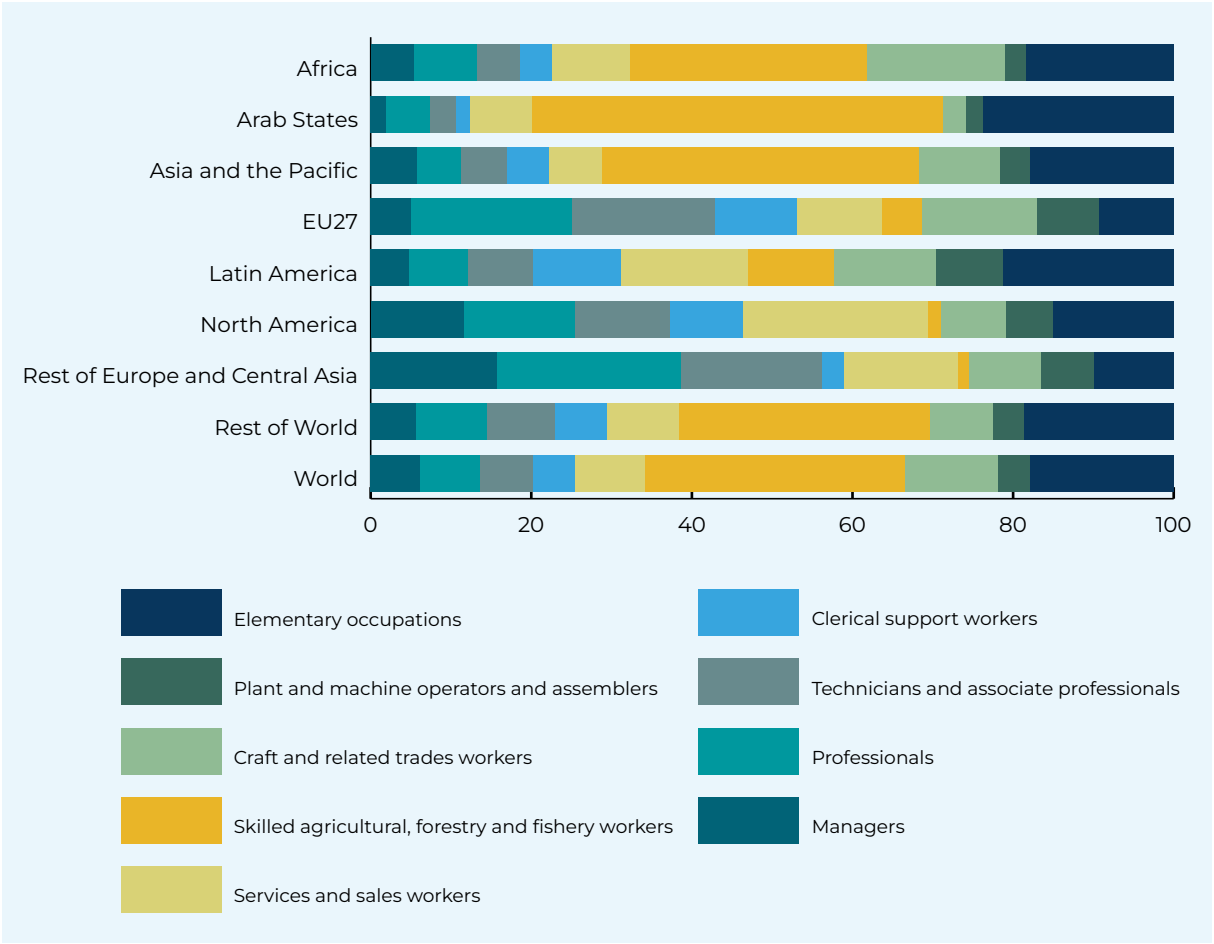


SOURCE: Cambridge Econometrics E3ME model.

Figure 7 presents the employment estimates by economic sector, and Table 11 by geographic and income region. At the global level, the results show that the majority of future NbS employment is expected to be linked to the agriculture and forestry sectors, similar to current NbS employment. Of the approximately 20 million additional jobs (lower bound estimate in Table 9) created by increased NbS spending, around 7.5 million (44 per cent) will be in the agriculture and forestry sector. However, the sectoral distribution of jobs in 2030 is more varied compared to current estimates of NbS employment. Similarly, the sectoral distribution of NbS-related work is expected to vary across regions. For instance, in the Arab States, Asia and the Pacific along with Africa, 70 per cent and 53 per cent and 35 per cent of NbS employment will be concentrated in the agricultural sector, respectively; while in other global regions this share is much lower. Most NbS expenditure considered in the estimate will take place, at least partially, in the agriculture and forestry sectors, explaining the large share of employment estimated to be directly created in this field.

Overall, the share of NbS employment in manufacturing, construction, distribution, business services and public services is substantially larger compared to the sectoral shares in the current employment results. This may reflect the varying and more sophisticated nature of the NbS activities and expenditure expected to take place in 2030.

Figure 7: NbS employment across geographic regions by sector (percentage of regional NbS employment), 2030



SOURCE: Cambridge Econometrics E3ME model.

Table 11: NbS employment by sector, absolute difference from baseline, 2030

	HIGH INCOME		UPPER-MIDDLE INCOME		LOWER-MIDDLE INCOME		LOW INCOME		WORLD	
	thousands	FTEs	thousands	FTEs	thousands	FTEs	thousands	FTEs	thousands	FTEs
Agriculture and forestry	89	70	1,331	905	6,767	5,834	564	417	8,751	7,225
Extractive industries	3	2	16	17	15	12	0	0	34	31
Manufacturing	73	64	776	793	1,234	1,095	1,167	1,000	3,249	2,952
Energy and utilities	110	83	430	408	63	60	4	3	608	556
Construction	47	38	172	148	500	489	113	98	832	773
Distribution, retail, hotels and catering	121	84	436	373	554	591	16	15	1,127	1,062
Transport and storage	6	5	75	73	177	169	6	6	264	253
Business services	117	92	708	584	346	343	77	68	1,248	1,087
Public services	207	144	1,069	815	1,288	1,216	597	483	3,161	2,658
TOTAL	**773**	**582**	**5,013**	**4,116**	**10,944**	**9,808**	**2,543**	**2,090**	**19,273**	**16,597**

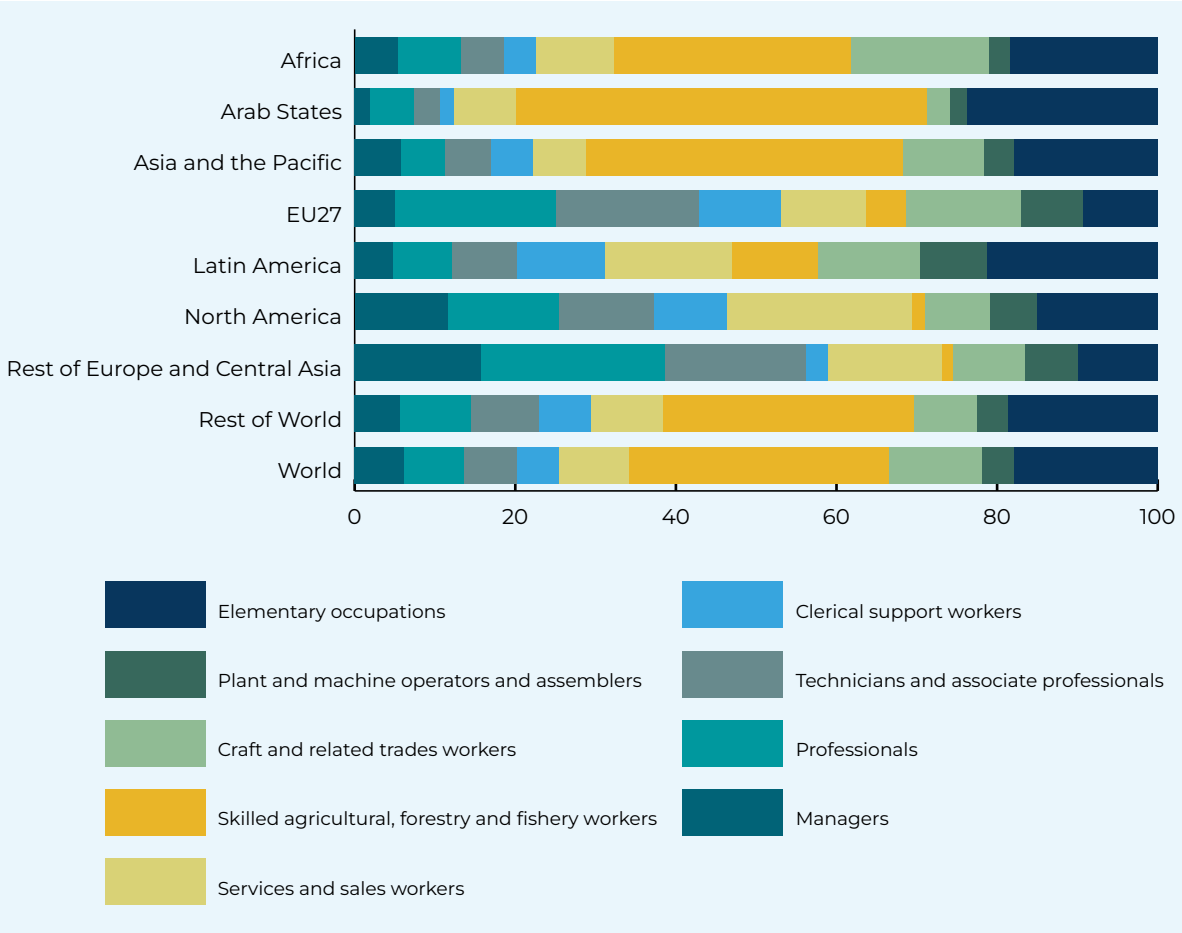
NOTES: Absolute difference to baseline, refers to the difference in levels between the scenario and the baseline levels (business as usual case if no additional NbS expenditure happens). Source: Cambridge Econometrics E3ME model.

It is important to note that, of the jobs expected to be created in the business services sector, some may link directly to NbS activities – for example, management of NbS projects – while they may also see an increase in jobs via indirect effects, such as design services. On the other hand, the estimated jobs in the distribution, retail, hotels and catering sector are a result of increased disposable incomes and can, therefore, be considered NbS-induced employment.

2.3.4 Skills and occupational effects

Compared to the current distribution of NbS employment by occupation groups (see Figure 5), the structure is projected to be more evenly distributed by 2030 (Figure 8). While skilled agricultural, forestry and fishery workers remain the largest occupation group in NbS employment, their share falls from over two-thirds to about one-third, at global level. The share of elementary occupations remains the second-largest group in NbS employment, despite its share also being smaller compared to current NbS employment. Occupation groups which represent a substantially larger share by 2030 are: craft and related trades workers, services and sales workers, professionals, and technicians and associate professionals. The increases in such occupations are linked to the changing composition of NbS and the shifts in the sectors in which jobs are created.

Figure 8: NbS employment by broad occupation group (percentage of NbS employment), 2030

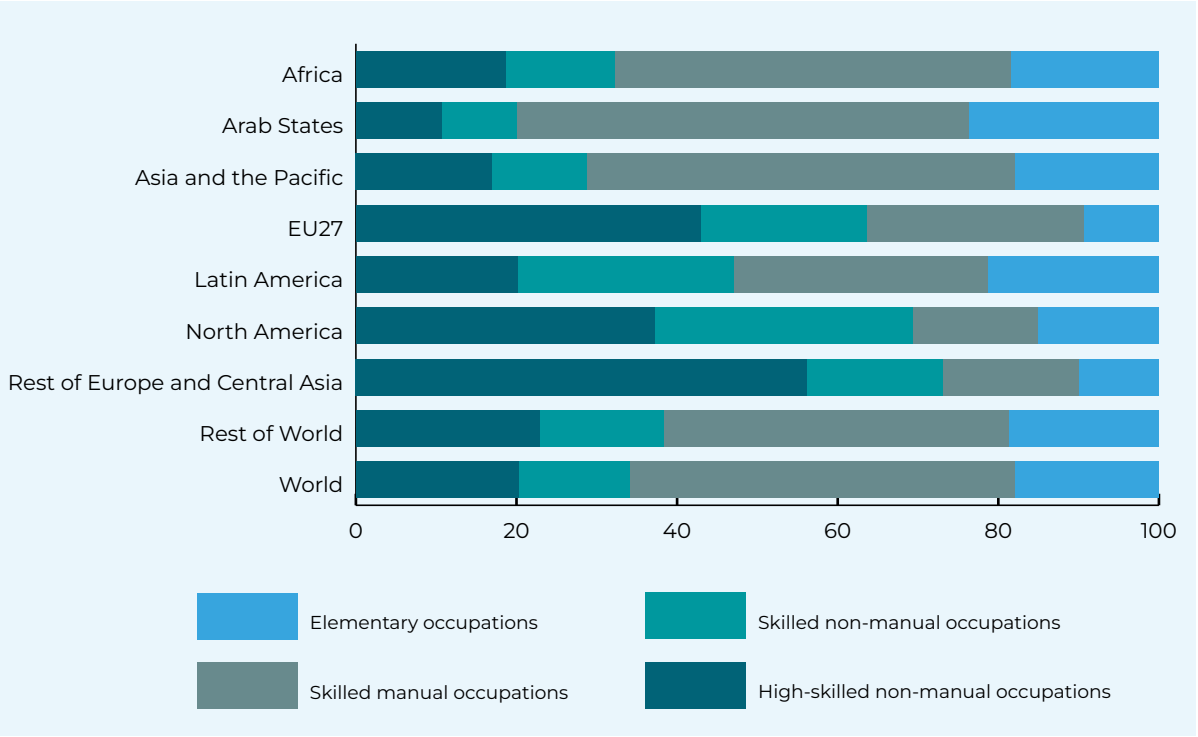


SOURCE: Cambridge Econometrics E3ME model. Occupation shares are based on sectoral employment results and occupation shares within sectors received from ILO.

Figure 9 presents the distribution of future NbS employment across skill levels, globally and by region. Around 62 per cent of NbS employment is estimated to be in medium-skilled occupations in 2030, which is a lower share than estimated for current NbS employment, which was 74 per cent (see Figure 5). Instead, future NbS employment is expected to comprise much larger share of high-skilled occupations.

Figure 10 summarizes the top three occupations in terms of the increase in employment demand in 2030. The occupations that are expected be more in demand are generally centred around certain NbS activities, such as monitoring (e.g., science and engineering associate professionals); maintenance activities (drainage system, dykes, re-seeding etc.) of different areas (e.g., agricultural, forestry and fishery labourers, building and related trades workers, excluding electricians); and infrastructure projects or management of different NbS-related projects (e.g., business and administration associate professional).

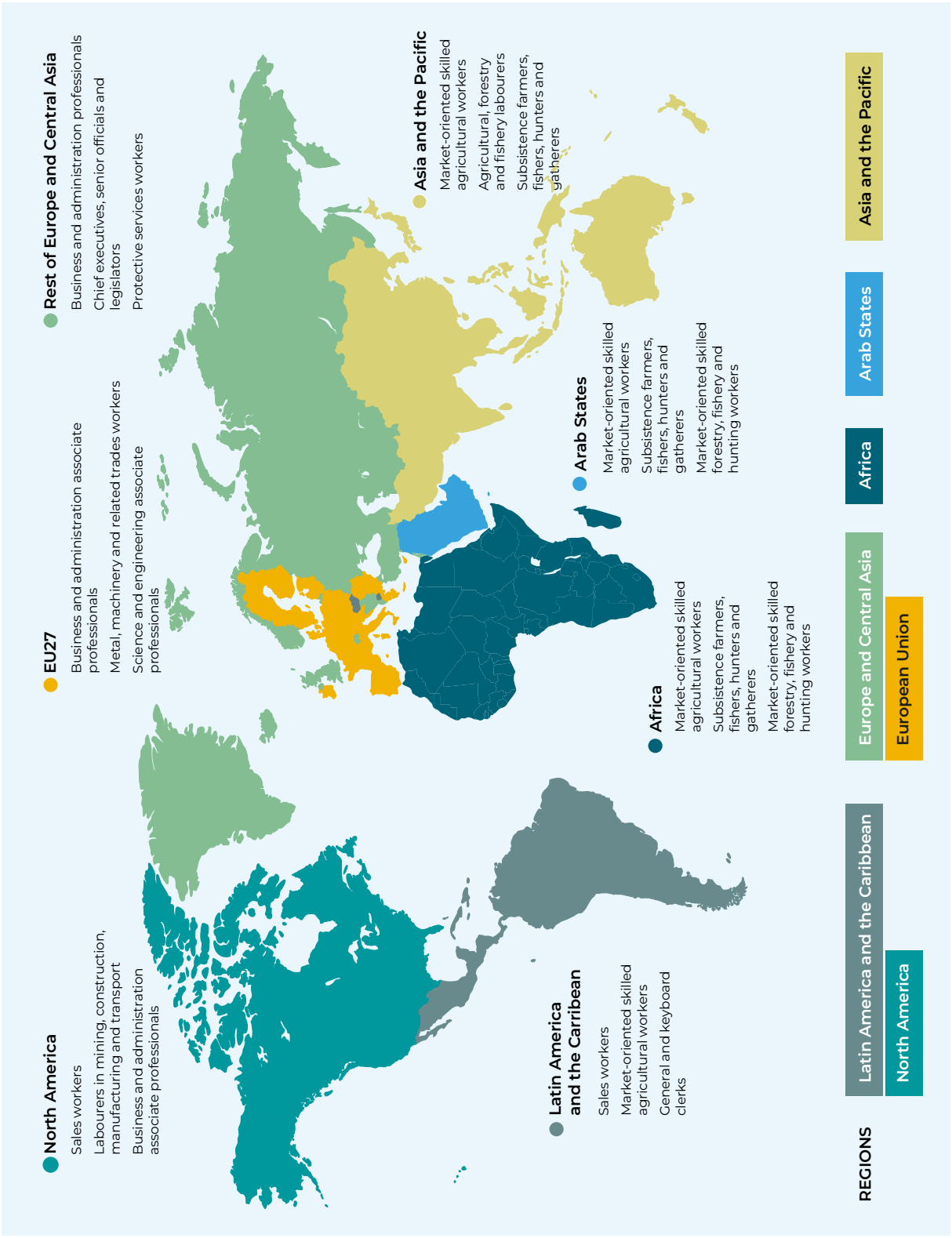
Figure 9: NbS employment by skill level (percentage of NbS employment), 2030



NOTES: High-skilled occupations are occupations listed under ISCO-08 codes 1, 2 or 3; medium-skilled occupations are those listed under ISCO-08 codes 4, 5, 6, 7 or 8; and low-skilled occupations as those listed under ISCO-08 code 9. For additional information, please refer to the ILO categorization: https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/

SOURCE: Cambridge Econometrics E3ME model.

Figure 10: Top three occupations in 2030 by region



SOURCE: Cambridge Econometrics E3ME model

2.4 Conclusions

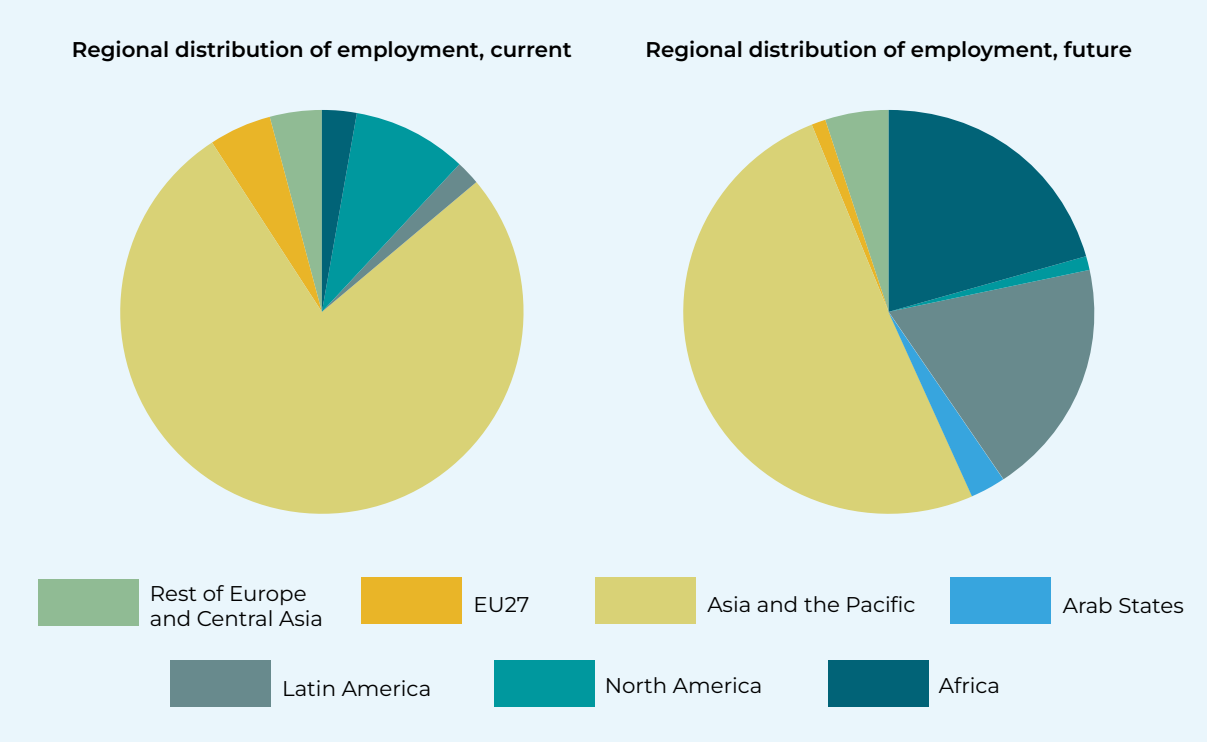
According to this partial estimate, 61–63 million people are currently involved in NbS employment worldwide, including work directly tied to NbS, jobs generated in supply chain sectors, or work created by increased economic activity from NbS initiatives. Most of this number is attributable to a specific programme in India, focused on ecological conservation activities. A significant portion of the NbS workforce (more than 90 per cent) is therefore in Asia and the Pacific, particularly in lower-middle-income countries, despite the fact that most NbS expenditure takes place in higher income regions. This reflects differences in the types of NbS activities and involved sectors and occupations, which are more labour-intensive in lower income regions. In Asia and the Pacific, current employment estimates are dominated by public employment programmes (PEPs), which typically offer part-time or project-based roles. While these programmes may not provide full-time employment, they still provide critical income opportunities for some of the poorest and most vulnerable populations, especially those reliant on natural resources. In other regions, the proportion of part-time NbS jobs appears smaller, as FTE numbers are close to total employment figures.

To develop effective policies to support NbS, it is vital to understand where the expenditure happens across the economy; i.e., which sectors and occupations are impacted. A greater understanding of the sectoral distribution of expenditure would not only provide important insights on the sectors were employment would be created, but also on the required skills and on quality-related aspects of the work. While many NbS jobs, especially in agriculture, require basic skills, there are also opportunities for more specialized roles, particularly in areas like planning, monitoring and evaluation. Promoting and developing education and training programmes which include curricula focused on NbS employment will help in building a skilled workforce, increasing employability and supporting sustainable livelihoods and is discussed in more detail in Chapter 4.

A substantial share of NbS employment benefits women and youth. The share of youth among people engaged in NbS employment tends to be larger than their share in total employment in several regions, particularly in Africa and Latin America. The share of women in NbS is slightly lower than the female share in total employment globally, perhaps reflecting the type and manual nature of a lot of the work performed. Nonetheless, more than one-third of NbS workers globally are women.

If NbS expenditure triples by 2030, an estimated additional 20–32 million people could be employed in NbS-related activities (depending on the scenario modelled). As shown in Figure 9, in a future scenario, where NbS investment is allocated based on investment needs, the regional distribution of employment changes significantly, when compared to current non-PEPs employment, with a much larger share of employment taking place in Africa, Latin America and Arab States. The share of total NbS employment in Africa would increase from 3 to 21 per cent; in Latin America from 2 to 19 per cent; and in the Arab States from less than 0.1 to 3 per cent. This provides an important indication of what could be seen as concerning levels of under investment in NbS in these regions. (See also Case study 2 on underinvestment in rangers globally).

Figure 11: Regional share of NbS employment, current and future (excluding PEPs)



SOURCE: Cambridge Econometrics E3ME model.

Interestingly, in the future scenario, there is also an important shift in the composition of occupations involved and skills required. This makes sense, as in this scenario there is a wider range of NbS used and they are implemented more evenly across the globe – thus in a much wider range of countries with more diverse economic structures. An important observation here is that there is a general upward shift of the skill levels, which also generally implies an improvement of the quality of NbS jobs. The shares of women and youth in the future employment scenario does not increase significantly as the modelling assumes current trends continue. However, it is argued that there is great potential for more young people and females to become engaged in this type of work, building on potentially more positive perceptions of nature and higher concern for the environment than their older or male counterparts (Giachino et al. 2021).

Estimating the current or potential number of jobs in NbS comes with challenges. The limitations of available data suggest that current and future NbS expenditure is likely underestimated. Moreover, the model used does not capture unpaid employment or secondary benefits that could arise from environmental improvements, nor does it account for employment resulting from NbS being integrated into existing practices by households or businesses. Additionally, NbS activities could reduce economic activity in certain sectors due to stricter environmental regulations or resource constraints which would

also have employment implications. Given the current limitations, there are clear benefits from establishing a consistent approach to collecting data on NbS activities in terms of expenditure or investment as well as employment. A standardized method for generating this information would lead to better/more accurate estimates on the benefits of engaging in NbS and aid in the development of policies to further support its adoption. Specifically, in the context of decent work, comprehensive statistics on NbS employment could guide the formulation of complementary labour market policies, facilitating the creation of decent work in NbS activities.

Finally, increasing public awareness around NbS, both in terms of their environmental impacts and their value for job creation, is vital to attract people into the NbS workforce – women and youth in particular – and reap its benefits.

Case study 2

Improving working conditions of NbS-related work: The ranger workforce

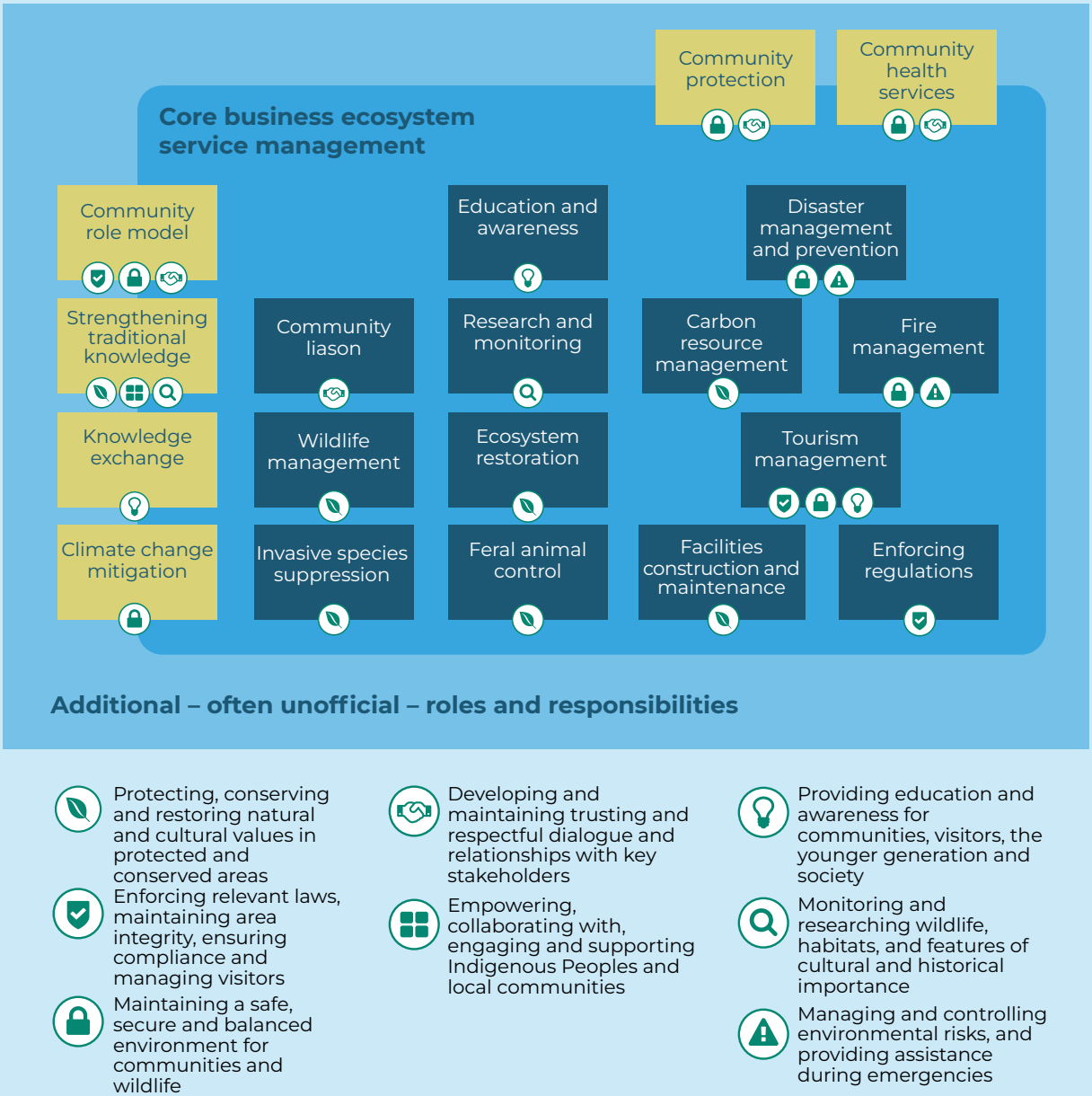
The International Ranger Federation (IRF) defines rangers as "individuals, or groups of individuals, that play a critical role in conservation, responsible for safeguarding nature, and cultural and historical heritage, and protecting the rights and well-being of present and future generations" (IRF 2021). The world's 286,000 rangers go by many titles (more than 100) including guard, scout or warden; they include not only government employees, but also private sector workers, community members, indigenous guardians, and volunteers.

Rangers and NbS

Rangers are ideally positioned for implementing NbS; they are already deployed on sites of biodiversity importance, often in deprived regions; and many of them are local community members with strong ties to the area where they work. Their highly diverse work (see Figure 12) helps to protect clean water sources, regulate local climates, provide resilience

Liliana Alzogaray, a 29 year old ranger in Copo National Park, is standing in a field of native Chaco grasslands. When the park was formed her father became a ranger there. Two of her brothers are also rangers. She takes pride in being a woman in a largely male field and loves her job and advocating for the understated and, as she says, forgotten, beauty of the Gran Chaco region. Copo National Park, Gran Chaco region in Northern Argentina.

Figure 12. The diversity of ranger roles



to the impacts of climate change and natural disasters, prevent the spread of zoonotic diseases, and provide food security for significant numbers of people. A recent paper describes rangers as "essential planetary health workers" (Stolton et al. 2023).

It has been estimated that each ranger recruited has the potential to leverage average annual benefits in terms of ecosystem services, nature tourism and other benefits of US$28,800–204,400 (Appleton et al. 2022) creating a strong economic argument for investment in these green jobs, which can stimulate local economies, enhance community development and well-being, build local ownership and agency over environmental matters, and provide new approaches and motivations for protecting and restoring natural resources.

Ranger work and employment

The global ranger workforce is currently only one-third of the number required for the effective management of protected areas. In addition, it is estimated that achieving the '30 by 30' target of the Global Biodiversity Framework will require a workforce of around 1.5 million rangers – around 5.2 times higher than the current number. Many rangers currently endure poor terms of employment and inadequate and hazardous working conditions; at least 2,351 on-duty ranger fatalities occurred in 2006–2021 (Galliers et al. 2022). The ILO has highlighted the sector as one deserving special protections due to it facing considerable violence in the workplace (ILO 2022b).

The 2019 Life on the Frontline report presents the responses of 7,110 public sector rangers from 28 countries in Asia, Africa, and Latin America (Belecky et al. 2019). This survey incorporated several Decent Work Indicators (ILO, UNEP and IUCN 2022) and highlights the lack of basic benefits such as paid sick leave (46.6 per cent), health insurance coverage (41.8 per cent), life insurance coverage (37.7 per cent) as well as access to unions or federations.

Additionally, many public sector rangers do not have access to essential facilities such as clean drinking water (42.6 per cent), adequate shelter in the field (43.7 per cent) and toilets (55.5 per cent). There are also significant gaps in training (65.5 per cent) and access to necessary equipment (54.1 per cent) for the effective delivery of their jobs as well as the occupational safety and health of rangers. Some of these working conditions create barriers for women to join and thrive in the ranger workforce.

In response to these critical needs of the workforce, the Universal Ranger Support Alliance (URSA) and the IRF have proposed a comprehensive convention on ranger employment that sets out the essential employment working conditions necessary for rangers to operate safely and securely and for their labour rights to be respected[25].

Conclusions and recommendations

The IRF, URSA, international organizations, NGOs, government, donors and ILO should work together to position to help the ranger workforce fulfil its potential in many ways:

- Increasing the visibility of the ranger sector in ILO processes and international fora and portraying ranger work as being skilled, service-focused (an environmental health service), a positive contributor to NbS.
- Working with the IRF and national and regional ranger associations to advocate for necessary improvements in line with International Labour standards. This not only helps uphold rangers' labour rights, it also motivates them, builds trust with communities and reduces the risk of misconduct.
- Demonstrating that ranger-based green jobs can provide decent employment that contributes directly to NbS, conservation and human wellbeing. The ILO should take a leading role in ensuring that ranger work, and indeed all green employment, is legal, decent and fair; and, in parallel, encourage just, rights-based and transparent governance of NbS sites with the active support of the ranger sector.

25 URSA, "A draft International Labour Standard".

Chapter 3

Chapter 3 Employment in nature-based infrastructure – opportunities and challenges

3.1 Introduction to nature-based infrastructure

3.1.1 Key concepts and functions of nature-based infrastructure

The previous chapter of this report established that investment in nature – through investment in various types of NbS – can be a driver of employment, amongst many other benefits. One potentially significant source of NbS investment is infrastructure investment. This is because: a) tens of trillions of dollars will need to be invested in infrastructure in the coming decades to meet rising global demand for associated services; and b) nature-based infrastructure (NbI) can contribute to the provision of these services (UNEP 2023b). Channelling even a small percentage of the US$2.9 trillion in annual global infrastructure investment required[26] into NbI solutions would represent a significant increase in the current volume of investment in nature, which is estimated at US$200 billion per year, as noted in the previous chapter. This chapter explores the implications that increased investment in NbI solutions can have for the world of work.

Addressing most societal challenges – such as disaster risk reduction (including climate adaptation), economic and social development, human health, food security, or water security – requires the use of infrastructure to deliver various services. These services can

26 As estimated by the Global Infrastructure Hub Outlook: https://outlook.gihub.org/

be delivered by "built" (or "grey") infrastructure, and, in many cases, by nature[27], or by a combination of the two ("green-grey" or "hybrid" infrastructure). When nature is used to provide infrastructure services, it can be considered an NbI solution. NbI are simply a type of NbS that involve the protection, conservation, restoration, sustainable use and management of natural or modified ecosystems (or elements of them) to provide infrastructure services – either alone or in conjunction with built infrastructure (i.e., hybrid infrastructure).

Examples of NbI services include protection from hazards such as coastal floods, landslides and extreme heat, the regulation of waterflow to reservoirs supplying water or hydropower, erosion control (see Case Study 3), the provision of cultural and natural heritage, improved health and wellbeing, and the maintenance of water quality (UNEP 2023b). However, other ways in which NbI can provide infrastructure services are often overlooked, especially when NbI are used in conjunction with built infrastructure whose presence and role are more visible. To fully understand the potential role of NbI in infrastructure systems, it is helpful to consider the following four functions through which NbI contributes to the provision of infrastructure services as well as their other co-benefits (Haggis et al. forthcoming; UNEP 2023b):

- **Delivering** the infrastructure service directly and, therefore, substituting for a built infrastructure asset, either partially or entirely.
- **Enhancing** service delivery by built infrastructure, either by improving its functioning or reducing requirements associated with built infrastructure systems (e.g., maintenance).
- **Protecting** built infrastructure assets and the resources that they depend upon against climate impacts and natural disasters, helping to safeguard the services they provide.
- Providing benefits to **workforces** that plan, build and manage infrastructure systems.
- Providing **co-benefits** for the environment, economies and societies beyond the provision of the primary intended infrastructure service(s), thereby increasing the positive impact of infrastructure investments.

NbI has been shown to be applicable in all infrastructure sectors through three or more of these functions and often provides the most benefits when used in conjunction with built infrastructure (UNEP 2023b; Haggis et al. forthcoming). There is, therefore, potential to create job opportunities through investment in NbI across all sectors, including those that have not traditionally brought nature into their operations. Table 12 provides examples of services provided by NbI[28].

27 Where nature is planned and managed to take advantage of the infrastructure services it provides, it can be considered "natural infrastructure". The use of natural infrastructure – alone or in combination with built infrastructure – to address a societal challenge is a nature-based infrastructure solution. Our overall infrastructure system is comprised of three components that work together to deliver a multitude of essential services: the built environment, the natural environment (i.e., natural infrastructure) and the enabling environment. See UNEP, 2023b for more on natural infrastructure and nature-based infrastructure solutions.

28 The examples provided are indicative and include mainly examples of the delivering and protecting functions. For a comprehensive analysis of the different types of services provided by NbI see UNEP 2023.

Table 12. Examples of infrastructure services provided by NbI

SERVICES	EXAMPLES OF BUILT INFRASTRUCTURE ASSETS	EXAMPLES OF NBI
Stormwater management	Curbs and gutters, pipes, permeable pavements, culverts, spillways, dykes, levees, settling ponds, water treatment plants	Green roofs, bioretention areas, vegetated swales, riparian buffers, wetlands
Water provision and water quality regulation	Reservoirs, boreholes, water treatment plants, dams, pipes	Wetlands, healthy watersheds and catchment areas, rain gardens
Coastal protection	Sea walls, groynes, breakwaters, levees, dykes	Mangroves, coral reefs, oyster reefs, seagrass beds, dunes, estuaries
Thermal regulation	Buildings, heating and cooling systems, etc.	Green roofs, shade trees, woodlands, waterbodies
Slope stabilization and erosion control	Retaining walls, shotcrete, nets, geotextiles	Terracing, trees, vegetation
Culture and recreation	Playing fields, sports and cultural facilities	Grasslands, woodlands, beaches, green spaces, parks, urban forests, lakes

SOURCE: UNEP 2023b; Haggis et al. forthcoming.

3.1.2 Integrating NbI in different socioeconomic contexts

The integration of NbI into infrastructure planning and investment is likely to differ between high-income and middle- and low-income countries. In high-income countries, NbI will form a key part of strategies to upgrade existing infrastructure systems and increase their sustainability and climate resilience. However, focusing infrastructure investments on NbI will be particularly crucial in middle- and low-income countries, which have the largest infrastructure gaps, the highest vulnerability to climate change and possess significant natural ecosystems. In addition, these countries tend to rely heavily on biodiversity and ecosystem services, while also having an abundant supply of labour (UNEA 2022; Raes et al. 2021; Chausson et al. 2020). In these countries, NbI offers an opportunity for "leapfrogging" whereby instead of following conventional approaches to infrastructure investment, which begin with built infrastructure and later incorporate NbI, countries can begin with NbI and hybrid solutions, leading to improved service provision and more efficient expenditure of limited financial resources (UNEP 2023), while still driving local job creation.

This is not without its challenges – there are several issues that will make leapfrogging difficult. For example, requirements for infrastructure investment to meet basic needs in middle- and low-income countries are high in the short-term, yet some NbI options require longer timeframes to develop and provide the service. Equally, effective NbI must

be planned well before implementation, and then maintained and monitored long-term. This requires local communities to have resources as well as sufficient skill levels, which can necessitate investment in education and training before NbI projects can be deployed and scaled. Another significant barrier to leapfrogging is the availability of green finance along with the cost of finance in middle- and low-income areas where infrastructure gaps are the highest. Despite challenges such as these, the large availability of labour in middle- and low-income countries offers an advantage for NbI compared to labour-scarce high-income countries, because of the labour-intensive nature of some NbS-related activities. The relatively high levels of existing healthy ecosystems may also offer an advantage to middle- and low-income countries; protecting and managing existing natural infrastructure is more effective and costs less than trying to restore or construct new NbI. The effectiveness of NbI has been demonstrated in the case of the restoration of wetlands in and around Rwanda's capital city, Kigali, as outlined in Box 3.

3.2. Implications of NbI on employment

3.2.1 Changing employment opportunities

The mainstreaming of NbI across global infrastructure systems is likely to lead to changes in associated employment. In some sectors, NbI may reduce the need for built infrastructure assets and lower the requirement for related jobs, whilst preserving or increasing nature-based job opportunities. For example, where mangroves, seagrass and coral reefs are identified as effective coastal protection measures, less built coastal defence infrastructure, such as sea walls, may be required, leading to reduced demand for associated jobs, but increased demand for jobs to restore or better manage those ecosystems. Where NbI is used, it will also warrant the creation of additional jobs, including the monitoring and maintenance of ecosystems as well as their health and functioning, which is essential to sustain service provision in the long-term. In many sectors, the deployment of NbI together with built infrastructure systems through hybrid approaches may be the most appropriate solution and may offer an opportunity to create a greater number of jobs through the addition of nature-based jobs alongside existing built infrastructure employment opportunities.

The employment impacts of increased NbI use differ across the infrastructure project lifecycle, from planning and design to implementation and ongoing operation, management, maintenance and monitoring:

- **Planning and design:** This stage of the infrastructure lifecycle will require more extensive consultation with different stakeholders to effectively plan and design an NbI or hybrid solution. Planning and design processes are likely to be more interdisciplinary in the case of NbI compared to traditional built infrastructure

BOX 3
Kigali's wetland restoration

Over time, urban growth and human pressures – including commercial and industrial activities, conversion for agriculture and human settlements – combined with minimal management, led to the degradation of wetlands around Kigali, Rwanda, resulting in lost ecosystem functioning and reduced capacity to provide services (Ndayisaba 2023). This has decreased the ability of the wetlands to provide services such as the treatment of water and flood mitigation. Rwanda has a goal to restore the degraded wetlands and the services that they provide with a particular focus on increasing the resilience of Kigali to flooding induced by climate change and improving the quality of the water supply.

Rwanda began with the restoration of the Nyandungu wetlands in Kigali – this consists of more than 120 hectares (ha) and rehabilitated streams and ponds for the provision of flood abatement as well as restored wetlands and reed beds for the mitigation of pollution. It is now used as a recreational park for local communities and tourists, and has already improved the livelihoods of locals and created more than 4,000 jobs (Tasamba 2022), including for young people and women (NDF date not disclosed; REMA date not disclosed).

Following the success of the Nyandungu wetland restoration, the Rwanda Environment Management Authority (REMA) announced in February 2024 that it would commence the restoration of five more degraded wetlands in Kigali city in collaboration with various partners including the World Bank. The wetlands include: Gikondo (162 ha), Kibumba (68 ha), Nyabugogo (131 ha), Rugenge-Rwintare (65 ha) and Rwampara (65 ha) (NDF date not disclosed) (Nkurunziza 2024). The Rwampara wetland is recognized as one of the key sources of water to Kigali. The restoration of the five wetlands is projected to create 112,800 employment opportunities and benefit more than 220,000 people at risk of flooding and water crises (Nkurunziza 2023a; REJ 2024). Other benefits of wetland restoration include the beautification of Kigali's landscape along with the development of recreational facilities, improved air quality, temperature regulation, enhanced biodiversity and reduced greenhouse gas emissions (Nkurunziza 2023b; REJ 2024).

assets and involve a larger number of practitioners and stakeholders. For example, in addition to the professionals required for the design of built infrastructure, such as civil engineers and urban planners, NbI will also require input from experts in the relevant ecosystems and those with an understanding of local contexts, such as ecologists, soil scientists, local and indigenous communities as well as landowners. In many countries, particularly middle- and low-income countries, women have key roles in the management of natural resources (Browder et al. 2019), which means

that the increased use of NbI can lead to improved gender inclusive employment outcomes. Integrating women's knowledge on ecosystem functioning, as well as on women's specific infrastructure service needs and priorities, can also inform more effective NbI designs (UNEP 2023b).

- **Construction / implementation:** Regardless of the infrastructure service to be delivered, the tasks and associated jobs involved in the implementation of NbI will vary according to the NbS intervention type – protection, restoration, improved management or creation – and the ecosystems involved. For example, improving the management of agricultural lands will involve more jobs to educate local farmers in sustainable agricultural practices; creating a new protected area will require more legal and administrative jobs in order to get new legislation passed; restoring a degraded coral reef will provide jobs for specialized divers and marine biologists; creating a new detention basin will include jobs related to land preparation (e.g., digging), planting and landscaping.

  While the implications of scaling the deployment of NbI and hybrid approaches compared to built infrastructure on the number of jobs is not yet clear, this phase is likely to involve a more diverse range of disciplines and skills than for built infrastructure, and therefore provide a broader range of job opportunities than for traditional infrastructure approaches. For example, the implementation of NbI will require non-construction jobs, such as establishing and running nurseries, weeding, litter clearing, planting seedlings, watering plants, pruning, raising awareness in local communities and providing training on sustainable land management or fishing practices.

  Lower-skilled or manual labour intensity peaks during the NbI establishment phases, resulting in short-term employment opportunities (Jaeger et al. 2021). This phase generally involves many labour-intensive activities and thus a large number of manual workers. It lends itself to the adoption of the ILO's employment-intensive approach, maximizing local job creation while ensuring that work is productive and meets labour standards.

- **Operation and maintenance:** This phase of the infrastructure project life cycle will be much more involved and diverse than for built infrastructure, as intensive maintenance and management will be required, particularly while new or restored NbI become established. The number of manual jobs will drop as the project progresses from implementation to operation and maintenance, but workers will still be required; for example, for periodic watering, weeding, pruning, maintenance of protective fencing, erosion control etc. to ensure the NbI continues to function as designed. Long-term monitoring of NbI health will be required to ensure proper functioning and identify the need for adaptive management where necessary, as well as to collect data that will contribute to building an evidence base of the benefits and costs of different NbI and their use across different infrastructure sectors, service needs and country contexts. The job requirements for monitoring will be varied and will include jobs using specialist equipment (e.g., drones), analytical roles

(e.g., to monitor changes in water quality data) and specialist ecological roles (e.g., to identify changes in ecosystem condition).

- **Decommissioning:** The decommissioning of built infrastructure assets provides an opportunity for NbI deployment. For example, phytocaps can be used in the closure of landfill sites in the solid waste sector; this is where natural ecosystems are planted or restored to prevent infiltration of water instead of using traditional built solutions, such as clay caps. Equally, the restoration of native ecosystems should form part of business-as-usual strategies across all sectors where land is no longer required for built assets or extractive uses.

3.2.2 The role of the private sector

As a key actor in all stages of the infrastructure life cycle, the private sector is well-positioned to drive decent job creation, productivity, innovation and the integration of diverse skills and technologies in the transition toward NbI (Kooijman et al. 2021). Private companies have the agility to explore emerging opportunities in areas such as planning and design, project management, sustainable resource management, data analytics, and the monitoring of NbI investments. This can create new markets for firms specializing in various aspects of NbI and can encourage traditional infrastructure companies to diversify by incorporating NbI-related elements. However, barriers exist. The private sector may hesitate to embrace NbI due to its reluctance to invest in and learn new approaches; the absence of clear assessment frameworks, guidelines and standards; limited proven examples; and the uncertainty and longer time frames for service provision and returns on investment. To overcome these barriers, robust policy support, regulatory frameworks and targeted incentives are necessary. Public-private partnerships (PPP) can play an important role in the transition, accelerating the job creation potential of public investment in NbI.

Development Finance Institutions (DFIs) and Multilateral Development Banks (MDBs) serve a pivotal role in unlocking private sector involvement by offering financial backing, technical expertise and risk-sharing mechanisms. By reducing financial risks and aligning projects with sustainability goals, they make NbI investments more attractive to private companies. Additionally, DFIs and MDBs fund research and pilot programmes that demonstrate the viability of NbI, enabling the private sector to see the long-term benefits and scalability of NbS. This approach helps build confidence in NbI's potential to deliver both environmental and economic returns, thereby driving greater private sector involvement. For instance, the European Investment Bank (EIB) funds NbI through its Natural Capital Financing Facility, financing projects such as wetland restoration for flood management[29]. The African Development Bank supports the Great Green Wall Initiative, which spans the Sahel region of Africa. This ambitious project aims to combat desertification, land degradation and climate change by creating a mosaic of green belts and restored lands stretching across the Sahel

29 EIB, "Alzette River Renaturalisation (NCFF)"

from Senegal to Djibouti. The project involves restoring 100 million ha of degraded land, sequestering carbon and creating 10 million jobs by 2030[30].

The private sector should actively engage in social dialogue, playing a key role in shaping and reviewing policy and regulatory frameworks. It also has responsibility to promote and adhere to principles, laws and regulations that guide the creation of decent work. Partnerships and collaboration between national authorities, academic and training institutions and the private sector are also necessary to respond to industry skill demands to fully realize the job creation potential.

3.3 Community-based and employment intensive approaches in NbI planning and development

As mentioned, many NbS-related activities, particularly during implementation and operations, are inherently labour intensive. Figures for employment generated per US$ million invested in NbS activities are of similar magnitude to using labour-intensive methods to construct rural roads (ILO and WWF 2020; ILO 2020). This is especially the case in middle- and lower-income countries where mechanization, especially in rural areas, is relatively limited. This is one of the main reasons these activities are often included in PEPs, as shown in Chapter 2. The high employment intensity of NbS-related activities allows these programmes to create large numbers of jobs.

Employment intensive approaches to infrastructure development, as promoted by the ILO, use local resource-based technologies that optimize the use of local skills, knowledge, resources and enterprises – using skills and labour from local communities in the establishment of tree nurseries along with the planting of seedlings and weeding, and in longer term maintenance activities necessary in forest restoration for watershed restoration, for example. The approach places a strong emphasis on working conditions and labour rights, thus ensuring that the jobs created are decent (ILO 2018) and that inclusive local economic and social outcomes are achieved. They have been applied to simultaneously address infrastructure deficits, environmental sustainability and employment creation, particularly in middle- and low-income countries where these needs are most critical. They are commonly integrated into PEPs to improve productivity and working conditions. These approaches are especially effective in regions where economic and labour conditions are conducive (ILO 2018). They align well with IUCN Global Standards for NbS, which also

30 ADB, "Great Green Wall Initiative"

stresses the importance of rights-based approaches and of social, equitable and sustainable outcomes.

NbI interventions are well-suited to this approach as they rely on natural and locally available resources, such as native seeds, vegetation, land, freshwater, seawater, labour and indigenous knowledge. Where conditions are favourable, the integration of well-designed and planned employment-intensive approaches can support the transition and significantly enhance its impact on job creation. For example, employing skills and labour from local communities in the establishment of tree nurseries and the planting of seedlings and weeding as well as in longer term maintenance activities necessary for forest restoration.

Rural areas are especially conducive to these approaches. The involvement of local communities, administrations and stakeholders through inclusive participatory processes – as advocated in NbS – creates opportunities for local enterprises and communities, and fosters the creation of inclusive short- and longer term employment opportunities for workers with diverse skill levels. These approaches can be used to specifically target women, youth, indigenous and marginalized groups and to transfer skills and knowledge that can be applied in other areas to support incomes. Additionally, employment-intensive approaches build local ownership and often incorporate custodial and community contracting arrangements, making them particularly relevant for the long-term sustainable management and use of NbI assets.

As the approach employs an appropriate mix of equipment and technology, tailored to the intervention scale and complexity, time constraints and safety considerations, it provides the flexibility necessary in the deployment of NbI solutions. However, the approach must be planned and executed carefully to address existing decent work deficits in the infrastructure sector such as informality, low wages and unsafe or poor working conditions, particularly in middle- and low-income countries. NbI's reliance on local resources can exacerbate these risks if proper safeguards and labour standards are not enforced (ILO 2019a; UNEP 2023b).

3.4 Skills and training needs for decent work in NbI

3.4.1 New skills and interdisciplinary approaches

While the implications for skill development for NbS are discussed in Chapter 4, the integration of NbI solutions into infrastructure systems not only broadens the range of disciplines, occupations and necessary skills, but it also requires interdisciplinarity and cross-sectoral approaches to be employed that add further complexity to the overall knowledge and skill requirements. NbI will shift skills, knowledge and technology requirements from more rigid and standards-based conventional engineering to more dynamic and creative

approaches that integrate diverse knowledge from other disciplines, such as ecosystem management, as well as conservation, and integrate technologies, such as geospatial information systems, and, increasingly, artificial intelligence (AI).

Traditional infrastructure disciplines i.e., engineering, project management, law, finance, procurement, supply chain management, monitoring and evaluation, asset management and maintenance, need to be integrated with other disciplines such as ecology, environmental science, climate science, marine biology and forestry. This is necessary to tackle the complexities of NbI and come up with innovative and effective solutions that deliver resilient, sustainable infrastructure and benefits across multiple dimensions. Infrastructure professionals will benefit from working across disciplines to broaden their technical expertise, to better understand ecosystem functions and the role of biodiversity in their resilience, and how this can be integrated into projects. They will benefit from learning new core and technical skills, such as community facilitation, analytical and systems thinking, human-centred design and adaptive management. They will need to learn to work collaboratively with local communities and to integrate local knowledge and skills. To keep up with the complex and dynamic technical knowledge, expertise and skill requirements of NbI solutions, investment in continuing professional education and interdisciplinary training programmes will be necessary. Technical training, academic curricula and accreditation frameworks will need to evolve to accommodate new specialties and skill requirements for NbI (ILO, UNEP and IUCN 2022). Many institutions may also need to redefine organizational structures and working practices to facilitate interdisciplinary, cross-sectoral and collaborative approaches and partnerships.

3.4.2 Skill levels required over the NbI project life cycle

The demand for highly specialized technical skills is particularly pronounced during the conceptualization, design and planning phases of NbI (Mabon 2023) and they are also critical for monitoring long-term outcomes. Professionals across diverse fields will need to collaborate, embrace interdisciplinarity and systems approaches and engage with local communities in order to assimilate local knowledge, to conceptualize, design, plan and manage NbI solutions sustainably.

Demand for mid-skilled workers in fields such as agriculture, forestry, irrigation, conservation, hydrology and social science increases during establishment and continues through the operations and maintenance phases. These workers may also need to expand their existing skill sets in order to effectively manage NbI systems. For example, conservationists may need to learn about the construction of terraces and other soil retention structures to effectively manage watersheds. Existing occupations related to the management of infrastructure systems may require the acquisition of new technical skills that emphasize sustainable ecosystem-based management as an integral component of an NbI system.

As mentioned above, low-skilled labour demand typically increases during the NbI establishment phase. For example, forest restoration projects will require significant

manual labour for tasks like nursery setup, planting, watering, weeding and pruning, which decreases once the forest is established. These workers require basic environmental/ecosystem awareness and simple procedural adaptation to existing agricultural practices of local communities (World Bank 2019). This opens opportunities for less skilled local women, youth and marginalized groups.

3.4.3 Skills for advanced modelling, assessments, monitoring and research

Over the longer term, fields such as environmental engineering, climate and biodiversity monitoring, geospatial analysis, ecosystem service valuation, environmental restoration planning and environmental economics will play increasingly important roles in advanced modelling, assessments, monitoring and research. This will be critical to inform NbI design and performance standards while providing the evidence necessary to guide and influence investment decisions. Investments in advanced geospatial analytics and AI technology will drive further progress. However, disparities in resources across countries to make these investments may potentially slow the global adoption of NbI innovation.

3.5. Social inclusion opportunities in NbI

3.5.1 Gender considerations

Women currently hold only 10.9 per cent of formal construction sector jobs and even fewer work on the front lines of job sites – approximately only 1 in every 100 employees onsite is a woman (World Bank 2023). NbI offers an important opportunity to target the integration of women in infrastructure related jobs. However, even in ecosystem management – where in many countries women play important roles – they often do not benefit equally from opportunities generated from related projects (World Bank 2023) and are underrepresented in decision-making and environmental governance. Scaling well-planned NbI can increase the number of non-typical construction tasks which may be more easily accessible to women and serve as an entry point for employing more women, including in leadership and management roles. As an emerging interdisciplinary field that shifts away from conventional engineering, it broadens skills and job opportunities, lowers barriers to entry and can be used to target historically marginalized social groups in roles that were previously confined to male-dominated highly skilled professionals. And, like other infrastructure investments, NbI interventions can also significantly improve women's quality of life and promote gender equality indirectly. For example, interventions that improve access to water can reduce the time that women spend collecting water, freeing time to undertake productive activities, such as education or paid work. But, even so, deliberate efforts will be required to enhance their participation and access to the direct and indirect benefits, specific measures to do so are presented in Table 13.

3.5.2 Inclusion of Indigenous Peoples and local communities

Indigenous Peoples' and local communities' cultures, livelihoods, well-being and resilience are deeply intertwined with nature and should be integrated across the NbI project life cycle. Indigenous Peoples have tenure rights on more than 25 per cent of the world's land surface, totalling approximately 38 million square kilometres (km^2) (Raes et al. 2021). Their traditional restoration and conservation approaches are integral to the health and functioning of ecosystems. The deployment of NbI is an opportunity to bring Indigenous Peoples and local communities into the infrastructure decision-making process, through inclusive and participatory processes. The integration of indigenous and local knowledge and management techniques into NbI solutions can, in turn, help to drive positive outcomes for infrastructure service provision. It facilitates the recognition and preservation of land and land tenure rights and biodiversity, and can improve the livelihoods of indigenous communities who depend upon them in ways not possible with built infrastructure (Woroniecki, Wamsler and Boyd 2019).

To better integrate the knowledge of indigenous groups and local communities in the design and planning of NbI interventions and ensure they benefit equitably from employment opportunities and other benefits, the strategies outlined in Table 15 may be adopted. However, in many contexts, differing cultural perspectives of work and employment can make it challenging to reach consensus on what constitutes fair pay and working conditions.

Table 13. Strategies for enhancing social inclusion in NbI planning, design and implementation

STRATEGIES	DESCRIPTION
Inclusive and participatory approaches	Inclusive and participatory processes respecting the agency and contribution of women, indigenous and marginalized groups to assess and define needs, design, plan, implement and manage interventions to ensure accessible and culturally sensitive NbI solutions; identify job opportunities and set targets tailored to capabilities considering the triple roles of women (reproductive, productive and community) and seasonality of labour demands
Social dialogue mechanism for supportive policy and regulatory frameworks	Social dialogue mechanisms bringing together social partners, including governments, employers and workers' organizations, play a key role in promoting social inclusion and decent work in NbI. Governments establish policy and legal frameworks for inclusive and equitable employment, while employers create inclusive workplaces with fair wages and safe conditions. Workers' organizations advocate for labour rights and represent marginalized voices in policy discussions. The Indigenous and Tribal Peoples Convention, 1989 (No. 169) guides the establishment of institutions and legal frameworks for Indigenous participation (ILO 2013a; ILO, UNEP and IUCN 2022) Capacity-building programmes can help marginalized groups organize and engage in decision-making and social dialogue

STRATEGIES	DESCRIPTION
Recognition of land tenure and cultural rights	Align roles and job opportunities with local land tenure policies, cultural rights and norms along with livelihoods to help reduce social gaps; and establish mechanisms for equitable benefit sharing for women and indigenous groups
Integration of local knowledge and practices	Integrate local knowledge, skills and sustainable livelihood priorities into NbI design, planning and sustainable management
Establish fair recruitment processes and wages; create safe working conditions and social protection	Ensure fair and transparent recruitment and equitable wages for women and indigenous groups recognizing that NbI activities may involve previously unpaid work; create safe working conditions, noting potential precarious outdoor working conditions, risks of gender-based violence, and child and forced labour
Monitoring and performance frameworks	Develop frameworks including employment data disaggregated by age, gender and social groups to accurately track the impact of NbI interventions
Targeted training programmes	Given the remote and local nature of works, provide contextualized training translated into local languages, and establish partnerships with local educational institutions
Community-based practices	Develop innovative practices integrating by local knowledge and skills to gain community buy-in and ownership; engage local community groups in managing and sustainably using NbI, fostering community ownership

SOURCE: World Bank 2023; ILO 2015a.

3.6 Barriers to decent work creation through NbI

There are many barriers and uncertainties which mean that NbI are not yet being deployed systematically and at scale as part of standard practice on infrastructure planning and investment (UNEP 2023b). This, in turn, limits the number of current employment opportunities from NbI.

Most investments in infrastructure to date have focused on the built environment, often ignoring the role of the natural environment in delivering infrastructure services. Drastically increased efforts are, therefore, required to mainstream NbI into national infrastructure planning, starting with a change in mindset about how we deliver various services, brought about through training and education. There are also technical barriers to be addressed, including a lack of long-term data on NbI performance; longer time frames to achieve service provision compared to conventional built infrastructure; the absence of NbI design and performance standards and regulations; skills gaps amongst the different actors involved;

and, in some circles, limited appreciation of local/traditional knowledge (UNEP 2023b). In middle- and low-income countries where healthy ecosystems offer significant potential for NbI and decent work creation, they may be at risk when development goals do not prioritize conservation and overlook the opportunity that NbI presents to align development with environmental protection, economic growth and sustainability.

Furthermore, where jobs in NbI are created, there is no guarantee that they provide decent work that is productive, provides a fair income, workplace security and equal opportunities (ILO, UNEP and IUCN 2022). NbI jobs are often project-based and linked to the construction sector, often involving subcontracting and temporary, informal or casual employment. This often exacerbates decent work deficits by compromising labour rights (e.g., fair recruitment, wages, healthcare access, social security and collective bargaining) and making workers vulnerable to exploitation. As with other types of NbS, remote outdoor NbI projects in harsh environments may expose workers to occupational hazards, which can lead to poor productivity, unsafe working conditions and exposure to illegal practices (ILO 2019c).

One such hazard that is increasingly pervasive is heat stress due to climate change. The ILO has warned that more than 70 per cent of the global workforce – approximately 2.4 billion people – are at high risk of extreme heat exposure, leading to millions of injuries and nearly 19,000 deaths annually (ILO 2024b). Regions such as Africa, the Arab States and the Asia Pacific are particularly vulnerable, with over 75 per cent of their workforce affected by heat stress. As temperatures rise above 34°C, labour productivity can drop by 50 per cent, posing a severe threat to livelihoods, particularly for those working outdoors or in poorly ventilated indoor environments.

For those involved in any type of NbS, extreme heat presents a significant obstacle to both worker safety and project productivity. As global temperatures continue to rise, the physical strain on workers engaged in NbS projects will intensify. The fact that the workforces most affected by heat stress are largely in regions with the biggest infrastructure needs and potential for NbI use, makes this issue particularly relevant for NbI and its decent work potential. This highlights the urgent need for protective measures grounded in a human rights approach, ensuring safe and sustainable work environments. Ensuring the occupational safety and health of workers requires specific training and protections to mitigate these risks. The fundamental right of all workers to a safe and healthy working environment should be an integral part of policies and approaches to advance the scale-up of NbI. For sector-specific guidance on addressing various aspects related to safety and health, the ILO sectoral codes of practice on safety and health in forestry work and in construction can be useful tools.

NbI can play a vital role in alleviating heat stress, when integrated into cooling strategies – such as urban greening, improved isolation and climate-sensitive design – in workplaces and across cities. This can offer natural cooling through enhanced vegetation, shade and water management solutions and generate job opportunities in the process. The interdisciplinary nature of NbI – perhaps more so than other types of NbS – also presents challenges. Decision-makers and infrastructure practitioners often lack the technical expertise and skills required to effectively plan, design, implement, sustain and monitor NbI projects.

Considering complex trade-offs such as the balance between environmental conservation and local economic needs, while ensuring stakeholder engagement and collaboration, adds further complexity. Overcoming these challenges requires investing in skill enhancement for practitioners, along with building interdisciplinary teams that work collaboratively across sectors. Many organizations and the private sector are not incentivized to invest in NbI skills development due to perceived costs and a lack of awareness about NbI benefits (EIB 2023). Skills deficits span various ecosystems and contexts, and misalignment in skill levels, types and quantities across sectors or geographies can limit job creation potential in NbI. This occurs due to several factors: evolving NbI job requirements may fail to attract skilled professionals due to the absence of clear occupation definitions, wage structures, performance standards and career advancement opportunities. Skills and education policies that are not yet adapted to the emerging NbI approaches compounds these challenges. Labour scarcity in remote, sparsely populated areas, combined with competing demands from other economic activities, can pose additional barriers (ILO 2020).

3.7 Conclusion

NbI offers a transformative opportunity to address global infrastructure needs, while simultaneously increasing investment in nature. Beyond the provision of infrastructure services, NbI can enhance biodiversity and ecosystem health, and boost resilience to climate change, natural disasters and other shocks. In addition, NbI fosters the creation of inclusive and decent work. Climate and biodiversity commitments are driving regional and national policy and regulatory frameworks that are accelerating the transition to NbI. For example, the United States' Infrastructure Investment and Jobs Act (2021) incorporates NbI by prioritizing natural solutions like wetland restoration in flood management, enhancing resilience and job creation. Similarly, the European Union's Biodiversity Strategy for 2030 (2020)[31] includes provisions for enhancing and expanding green infrastructure as part of broader climate resilience and biodiversity goals across member states. However, there are challenges associated with scaling up NbI and realizing their full job creation potential; many of these are common to all types of NbS, while some are specific or more relevant to NbI.

Challenges of particular relevance to NbI include technical expertise shortages, skills gaps, seasonal labour availability and potential trade-offs in service delivery time frames. There is a need for interdisciplinarity of technical expertise and skills development as well as collaborative approaches that integrate community, local and regional stakeholders along with enterprises across sectors and life cycles to ensure accessible and sustainable infrastructure systems, inclusive employment opportunities and other benefits are achieved. Importantly, local and indigenous communities, especially women, who hold valuable cultural knowledge and custodial rights, must be meaningfully involved, with engineers and other professionals learning from their traditional practices to ensure the sustainable

31 European Commission "Biodiversity Strategy for 2030"

management of ecosystems, contributing to more resilient and inclusive infrastructure systems. There is a need to ensure that the jobs that are created in NbI provide decent work, including fair income and security, and manage occupational hazards that can compromise the health and safety of workers. Supportive and coherent sectoral, social and economic policies, along with investments in advanced modelling and assessment frameworks, to inform decisions on the investment, design and implementation of sustainable NbI solutions, is necessary to optimize the immediate and long-term decent work outcomes.

By harnessing these opportunities and overcoming the challenges, NbI can be a key driver of sustainable infrastructure development globally; not only offering a greener, more resilient future, but unlocking decent job creation that fosters environmental and societal wellbeing.

Case study 3

Improving water security using NbI in Burkina Faso

Burkina Faso faces significant challenges related to climate change and land degradation. The increasing frequency of extreme weather events, such as flooding and severe droughts, exacerbates soil erosion and threatens agricultural productivity. Each year, approximately 105,000–250,000 ha of land succumb to degradation, reducing crop yields and undermining food security. This ongoing degradation impacts local communities and disposable incomes.

To address these issues, the Ministry of Agriculture and Irrigation Development along with the Ministry of Economy and Finance of Burkina Faso, in collaboration with the NDC Partnership, have proposed a land restoration project. This includes the development of landscape vegetation and facilitating natural regeneration. Alongside the objectives of improving the environment and local communities, the project also aims to directly benefit approximately 26,000 households by increasing employment and income opportunities.

The Nature-Based Infrastructure Global Resource Centre, led by the International Institute for Sustainable Development with support from the United Nations Industrial Development Organization and the Global Environment Facility, has assessed three project scenarios for land restoration: an NbI intervention, a hybrid solution, and a grey infrastructure solution. The NbI scenario focuses on integrating sustainable land management practices with

infrastructure development. This involves tree planting, agro-silvo-pastoral (ASP) activities, promoting climate-smart agricultural practices, grasslands and livestock production. The focus is to reduce land erosion, increase agricultural productivity and retain water in the soil.

The hybrid scenario combines a nature-based approach with a solar-powered irrigation pumping system, incorporating soil restoration practices and climate-smart agriculture. This scenario aims to combat soil erosion, enhance water management and achieve higher agricultural yields and incomes. It also commits to ensuring food and nutrition security whilst minimizing environmental impact. Lastly, the grey infrastructure scenario combines a conventional water storage and irrigation approach. Overall, this project is part of a broader effort to improve food security, increase agricultural income and build resilience against climate-induced damages.

Regions with high levels of land degradation and low agricultural productivity face severe challenges related to employment opportunities, restricting the income-generating potential of local communities. In Burkina Faso, a significant part of the population relies on agriculture for their livelihoods. However, due to degraded lands and frequent extreme weather events, agricultural yields are often low, leading to unstable and insufficient income for many households. The NbI and hybrid scenarios aim to improve environmental and labour-related conditions.

The NbI and hybrid scenarios are expected to create jobs across various sectors. In the NbI scenario, sylvo-pastoral activities generate an estimated US$900 million in income, reflecting the substantial contribution of these practices to the local economy. Additionally, the overall employment and income generated from the NbI scenario are valued at US$39.3 million, whereas the hybrid scenario generates US$17.1 million. The hybrid scenario similarly contributes to economic growth, but with significant benefits to food security and nutrition.

As shown in Table 14, the NbI and hybrid infrastructure scenarios provide better economic returns compared to grey infrastructure. The NbI scenario yields net benefits of US$1,655.8 million, while the hybrid scenario, which combines NbI with solar-powered irrigation, yields benefit of US$2,093.3 million. Both scenarios offer significant environmental benefits, with the hybrid scenario achieving a higher net cost–benefit ratio due to the increased irrigation capacity from the solar pumps. This enhancement leads to higher agricultural yields, improving food security and nutrition, which naturally reduces malnutrition.

NbS in both the NbI and hybrid approaches not only boost agricultural productivity but also enhance carbon sequestration, demonstrating the ability of NbS to provide multiple benefits simultaneously. This mitigates climate change and creates opportunities for generating revenue through carbon credits. The findings also support integrating NbS into national and regional policies to promote sustainable development, highlighting their scalability and potential for replication in other regions facing similar environmental and socio-economic challenges.

This case study exemplifies how investing in nature-based and hybrid infrastructure can foster long-term resilience and sustainability, benefiting the environment, generating higher incomes and enhancing the labour market.

Table 14. Cost–benefit analysis of the various scenarios (undiscounted values).

INDICATOR	NBI SCENARIO (US$ MILLIONS)	HYBRID INFRASTRUCTURE (US$ MILLIONS)	GREY INFRASTRUCTURE (US$ MILLIONS)
Construction costs	21.0	31.2	14.5
O and M costs	99.4	117.7	26.1
Total costs	120.3	148.9	40.6
Food security and nutrition	754.3	1,242.6	244.2
ASP area income	900.0	900.0	0.0
Employment and income	39.3	17.1	1.8
Carbon sequestration	28.1	28.1	0.0
Crop income	54.3	54.3	0.0
Total benefits	**1,776.1**	**2,242.2**	**245.9**
Net benefits/costs	**1,655.8**	**2,093.3**	**205.4**
Cost–benefit ratio	**14.8**	**15.1**	**6.1**

Chapter 4

Chapter 4
Skills for nature-based solutions

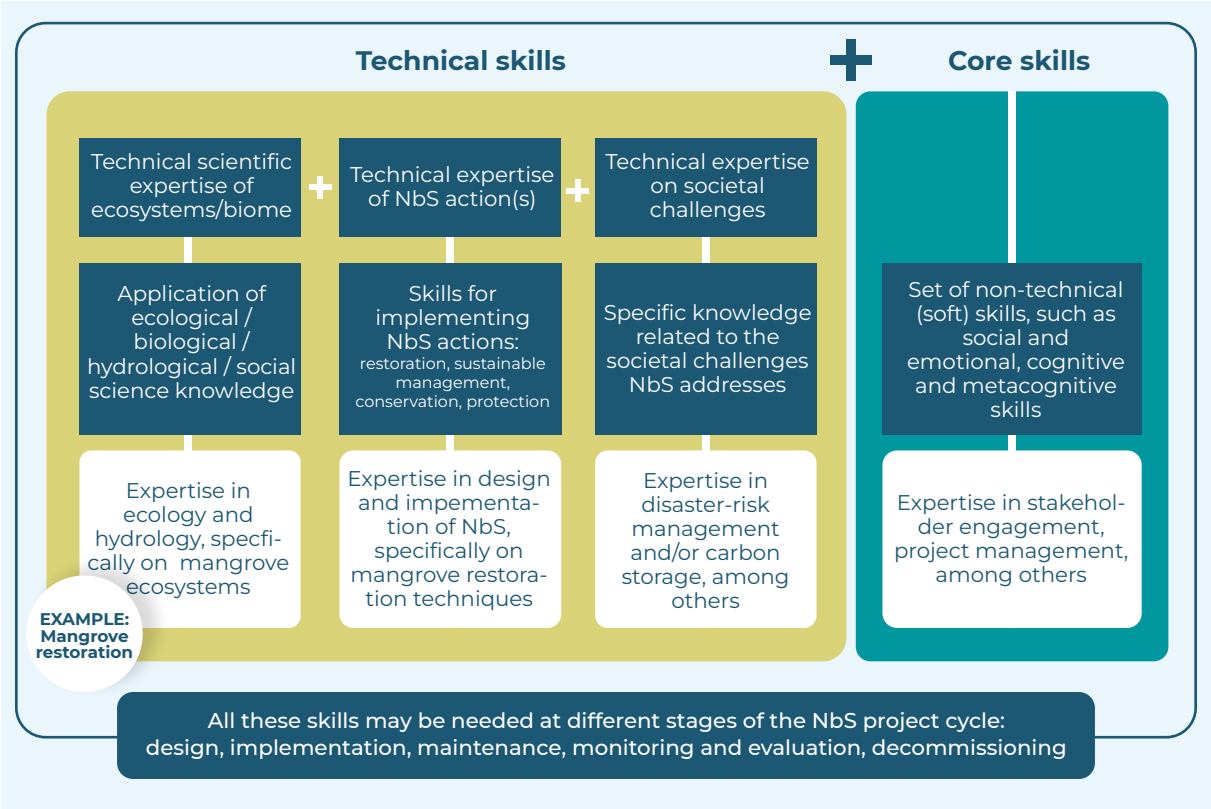
4.1 Introduction: Why do skills matter for NbS?

As we scale-up NbS implementation, the ability to anticipate skills and adapt to new and emerging skill demands will be crucial for practitioners, organizations, governments, employers and workers involved in NbS and related actions. As discussed in Chapter 2, it is estimated that there are currently 61–63 million people currently working in NbS and it is projected that an additional 20–32 million jobs could be created by 2030. However, it appears that the current workforce is not adequately prepared to meet the demand generated by the increased use of NbS, while there is a need for reskilling and upskilling the workforce to deliver these solutions effectively.

For successful implementation of NbS, a range of technical and core skills is essential. Key technical skills include scientific expertise in ecosystems and biomes, specific NbS actions and societal challenges. Core skills encompass non-technical skills such as social and emotional intelligence as well as cognitive and metacognitive skills. For example, mangrove restoration requires a diverse skills set: technical expertise in ecology and hydrology specific to mangrove ecosystems; proficiency in specialized mangrove restoration techniques; and knowledge of disaster risk management and carbon storage, given the protective and carbon sequestration roles of mangroves. This includes expertise in coastal resilience and blue carbon, among other areas. Equally vital are core (soft) skills, such as stakeholder engagement and project management, which ensure that mangrove restoration initiatives are ecologically robust, socially inclusive and foster meaningful collaboration and long-term commitment from local communities and stakeholders (see Figure 13).

It should be noted that these skills may be required at various stages of the project cycle, including design, implementation, monitoring and evaluation; and, if necessary, decommissioning. Additionally, technical skills are often sector- and occupation-specific; in some sectors, like infrastructure, advanced technical knowledge and skills in areas such as structural and civil engineering may be required as we have seen in Chapter 3.

Figure 13. Types of skills needed for NbS



SOURCE: Authors' own analysis.

The objective of this chapter is to provide a first analysis of: 1) current policies and strategies supporting skills development for NbS; 2) main occupations and essential skills for NbS, including most-in-demand in the near future; and 3) main gaps, barriers and enablers to skills development for scaling up NbS. To do so, this chapter follows a structure moving from a broad global policy perspective to the practitioner level. The first section provides an overview of the literature available on skills for NbS, including national policies shaping NbS skills and main skills considered essential for NbS. Section 2 presents the main findings from an online survey of NbS practitioners, offering detailed insights into the skills needed for implementing NbS.

4.2 Findings from literature on skills for NbS

This section focuses on literature explicitly using the NbS concept, with references to relevant NbS publications. Over the past decade, only a few countries – including Canada, New Zealand, Scotland, Spain, and the USA – have developed national and sub-national policies and strategies specifically aimed at skills development for NbS. These countries all recognized that to successfully scale-up NbS, skills development must be a core component of NbS interventions – while they also emphasized the importance of the inclusion of youth, women, indigenous groups and local communities through targeted training programmes. Evidently, all five countries mentioned are high-income countries and, therefore, while they generate important insights, they cannot be taken as representative of all countries and especially low- and middle-income countries.

4.2.1 Key national policies and strategies drawing attention to skills development for NbS

The increased investment and demand for NbS have called attention to the need for new skills along with development interventions. Spain – as part of preparing for its green transition – conducted a thorough analysis of the sectors in which green jobs are likely to be created and what the skills needs are for each sector. These included many NbS-related sectors (See Case Study 4). In Canada, Employment and Social Development Canada – the government department responsible for social programmes and the labour market – established the Future Skills Program in 2018 with the objective of identifying the demand for new skills. As part of this programme, the government funded ECO Canada (Environmental Careers Organization of Canada) to conduct research on skill needs for NbS in the British Columbia and Alberta provinces.

Similarly, in Scotland, following the National Strategy for Economic Transformation[32] and the call for the development of the Climate Emergency Skills Action Plan (Skills Development Scotland & the Scottish Government 2020)[33], an assessment on NbS jobs and skills was conducted by the nature agency of Scotland (NatureScot 2020). In the case of New Zealand, the government has supported NbS projects with capacity-building components in its Job for Nature Programme[34] (see also Box 4). It is worth mentioning that other countries have developed assessments for green jobs or environmental jobs, which might be related to

32 A ten-year plan published in 2022 for the economic growth and just transition of Scotland.

33 Led by the national skills agency of Scotland, Skills Development Scotland.

34 This programme is administered by five Government agencies: Department for Conservation; Ministry of Environment and Climate Change; Ministry for Primary Industries; Ministry of Business, Innovation and Employment; and Land Information New Zealand. These agencies have invested US$1.19 million to create jobs in nature; funding recipients include community groups, councils, iwi and hapū, charitable trusts and private companies leading nature jobs actions.

NbS, despite not explicitly mentioning it. For example, the Environmental Sector Skills Plan in South Africa identifies skills also relevant for NbS, such as coastal management (South African Department of Environmental Affairs 2010).

4.2.2 Skills assessments for NbS

In the context of NbS, some countries such as Scotland and Canada have conducted skills needs assessments focused on NbS, while other countries such as Spain have conducted broader assessments looking at different green jobs, including NbS. In Scotland, 26 sectors were identified as having nature-based jobs with implications for occupations such as civil engineers, construction-related workers and landscape architects. Skills development needs were also identified for those working on planting or maintaining natural spaces (NatureScot, 2020 and 2024). In Canada and New Zealand[35], 42 occupations related to NbS were identified in four sectors where NbS can be applied: coastal restoration; forestry; mining; and oil and gas[36]. Specific skills were identified for each sector. For example, in coastal restoration essential skills included environmental monitoring and compliance; remote sensing; data analysis and management; environmental, plant and wildlife research; and surveys and mapping (ECO Canada 2024).

In Spain, seven[37] of the 14 sectors identified were closely related to NbS. For these sectors, 40 occupations were identified. Table 14 summarizes the main occupations and skills for different NbS-related activities based on the skills assessments conducted in Canada, Scotland and Spain. For an extended version of this table, please see the Annex.

The studies reveal that there are existing occupations requiring upskilling, such as civil engineers or project managers that will need to acquire skills such as the implementation of restoration techniques or environmental and ecological monitoring skills. Moreover, new occupations will be created, such as specialists in ecological restoration or technicians in nature tourism. It is important to highlight that several skills required for NbS are shared with skills for green jobs, such as those needed for sustainable construction, agriculture and forestry sectors. This shows that there is an overlap between skills needed in green jobs and NbS; however, green jobs have a wider focus than jobs in NbS. For example, skills for repairing electric cars are relevant for green jobs but not for NbS. Conversely, skills like planting trees for carbon storage serve both green and NbS roles, illustrating that NbS jobs are a specialized subset within the green jobs.

35 Study focused on British Columbia and Alberta, supported by the National "Future Skills Program".

36 For oil, gas and mining, the focus is on the use of NbS for restoration and remediation.

37 Urban greening, management of natural heritage and protected areas, ecological restoration, sustainable nature tourism, sustainable agriculture, sustainable fisheries and aquaculture, and sustainable forest management.

Table 15. Examples of the main skills and occupations for NbS, according to skill assessment analysis in Canada, Scotland and Spain

NBS-RELATED ACTIVITIES	MAIN SKILLS	OCCUPATIONS
Restoration	■ Data analysis ■ Implementation Restoration techniques ■ Environmental/Ecological monitoring ■ Communication	■ Project manager ■ Environmental scientist, Biologist, Forester, Ecologist (Specialist in ecological restoration) ■ Field operative ■ Landscaping and grounds maintenance labourers Specialist in hydrology ■ Civil engineer ■ Consultant in NbS
Agriculture and forestry	■ Sustainable forestry and agricultural techniques ■ Digital skills ■ Data analysis ■ Remote sensing	■ Agricultural workers (Agronomist specializing in agroecology and biodiversity, sustainable and/or ecological farmer, livestock farmer specializing in sustainable and/or ecological exploitation) ■ Wildlife managers ■ Forestry professionals and contractors (including tree planting and protecting, fencing, felling, harvesting)
Flood risk management	■ Remote sensing ■ Sustainable construction/ engineering design	■ Hydrologist (Flood risk managers) Ecologist ■ Biologist ■ Civil engineer ■ Mechanical engineer biologist ■ Constructors, heavy equipment operator
Urban greening/ NbS in urban areas	■ Ecological engineering ■ Sustainable construction ■ Parks/gardens/trees Planning, installation and maintenance	■ Urban planners ■ Ecological engineers ■ Landscape architects ■ Technician in arboriculture and gardening ■ Technician in participation and governance ■ Machinery operators ■ Sustainable transport planners ■ Eco-builders ■ EV industry specialists (engineers, installers, electricians)
Fisheries	■ Sustainable fishing ■ Remote sensing ■ Environmental monitoring	■ Ecologist ■ Marine biologist (Specialist in research into natural resources and aquatic ecosystems) ■ Coastal engineer ■ Environmental manager (Specialist in sustainability and marine biodiversity) ■ Fisheries managers ■ Environmental policy advisors

NBS-RELATED ACTIVITIES	MAIN SKILLS	OCCUPATIONS
Tourism	■ Wildlife guiding ■ Marketing ■ Digital skills	■ Technician in tourism or nature tourism promotion ■ Environmental educator or Environmental education monitor ■ Technician in marketing and communication Countryside ranger ■ Biologist
Green finance	■ Natural capital accounting ■ Carbon accounting	■ Green finance analysts ■ Environmental economists ■ Sustainability consultants

SOURCE: Authors' own analysis based on NatureScot (2020), NatureScot (2024), ECO Canada (2024), Spanish Ministry for Ecological Transition and the Demographic Challenge, Biodiversity Foundation and the Spanish Climate Change Office (2023). Each study used different types of categories for NbS and may have used slightly different terminology for a similar skill (e.g., data analytics, data analysis). For the purposes of this table, comparable categories and skills have been consolidated under consistent terminology. Please note that this table summarizes the findings from these assessments. Other main occupations and skills required for NbS might have not been identified through these assessments.

National or regional policies addressing NbS skills in other countries were largely absent. Nonetheless, it is worth noticing that some countries have other programmes that are related to it. For example, the USA published a report aimed at accelerating the adoption of NbS in the country (White House Council on Environmental Quality, White House Office of Science and Technology Policy, and White House Domestic Climate Policy Office 2022). The report emphasized that workforce training (e.g., in cost–benefit analysis or construction of NbS) is a critical step for the widespread implementation of NbS in the country. Also, in many countries just transition and skills policies have targeted sectors closely related to NbS such as tourism, agriculture and water. For example, the local government of Huila in Colombia, in partnership with the ILO, identified agriculture and nature tourism as key sectors requiring training and certification as part of its just transition policies (ILO 2023). Recently, the National Administrative Department of Statistics (DANE) estimated that of the 150,579 green jobs currently in Colombia, 10,581 are directly linked to NbS, involving activities such as soil protection and restoration, safeguarding groundwater and rivers, and the conservation of biodiversity and landscapes[38].

Finally, studies from academia on NbS have also provided insights on skill demands for NbS. The skills identified in research papers can be categorized according to the stages of the NbS cycle. For project coordination and management, main skills include leadership, project management, business and entrepreneurship, financial expertise, and stakeholder engagement and communication. During the implementation phase, technical skills such as engineering, construction for NbS and GIS (Geographic Information Systems) proficiency as well as collaboration and facilitation abilities are essential. For monitoring and evaluation of

38 DANE, Cuenta Ambiental y Económica de las Actividades Ambientales y Transacciones Asociadas (CAE-AATA) provisional.

NbS, important skills include cost–benefit analysis[39], data literacy, digital skills, STEM (science, technology, engineering and mathematics) and strong analytical skills. Most-mentioned skills in these studies are communication skills essential for facilitating collaboration among diverse stakeholders (Interface Hub 2023; Frantzeskaki et al. 2020; Tomaskinova et al. 2020) along with monitoring and evaluation skills, with a focus on cost–benefit assessments of NbS (Bloomfield et al. 2019; McQuaid et al. 2021; Vera-Puerto et al. 2020). Besides, other studies highlight the importance of ecological expertise and knowledge among NbS professionals (Interface Hub 2023; McQuaid et al. 2021; Wickenberg 2024).

4.2.3 Skills development and training programmes for NbS

Opportunities to develop skills for NbS jobs are steadily emerging and expanding; these are driven by governments, international organizations and organizations implementing NbS projects. However, the availability of national-level curricula dedicated specifically to NbS remains limited, highlighting a gap in formal education and training that needs to be filled to strengthen workforce readiness in this growing field. Current training programmes range from general NbS training to specialized skills development. General courses include ITCILO's training on Decent Work through NbS; IUCN's professional certification on NbS standards; the NbS Initiative's course on the foundations of NbS; and UNEP's course on NbS for disaster and risk management. Training on specialized skills, such as controlling invasive species, are also offered by organizations like NatureScot and EcoCanada. In addition, reskilling and upskilling efforts for targeted occupations are sometimes delivered through project-specific initiatives, such as New Zealand's Jobs for Nature Programme (see Box 4). Most of the training programmes focused on NbS skills are short-term and many of them are offered as hands-on training. Some of them offer formal certification/accreditation, which can enhance employability and ensure better positioning to take on active roles in the growing NbS job market, providing both credibility and a pathway to long-term career development. Finally, it is worth noticing that public employment programmes not labelled as NbS also have the opportunity to create NbS jobs and provide training. For example, the Working for Water Program developed by the South African government hires local workers to apply NbS for the control of invasive species (ILO and WWF 2020).

Different skills assessment on NbS have revealed the need for strong STEM (science, technology, engineering and mathematics) skills. Many countries already offer STEM-focused training programmes which NbS professionals could benefit from. For example, Spain's Employment and Transition Study (Spanish Ministry for Ecological Transition and the Demographic Challenge, Biodiversity Foundation and Spanish Climate Change Office 2023) highlights different STEM training opportunities such as STEMadrid and Portal Alianza STEM, which NbS workers can benefit from. This highlights the importance of mapping and promoting these programmes to enhance skills development in green and NbS jobs.

39 Most studies focused on the cost–benefit analysis of NbS that are already implemented in order to generate more evidence on the cost-effectiveness of NbS. Nonetheless, it is important to consider that cost–benefit analysis is also important at the design phase.

BOX 4
Examples of training programmes for NbS-related skills

New Zealand's Jobs for Nature Programme

The Jobs for Nature Programme in New Zealand funded 336 projects, each with a capacity development component. Each project approaches skills development differently, according to the project's goals. For instance, Te Tapu o Tāne is an indigenous-led organization focused on catchment rehabilitation and received funding under the programme. The organization has focused on training and certifying youth on the different skills needed to participate in its rehabilitation programmes. The skills taught include the use of machinery for activities like reforestation, erosion control and waterway restoration. These critical tasks require equipment such as excavators for digging and preparing planting sites, mulchers for controlling invasive vegetation and water pumps for wetland management. Another project is the Bay Conservation Cadets – a 12-week training and employment programme for cadets of different ages and backgrounds that focuses on developing a wide range of skills for conservation including restoration, freshwater monitoring, GIS/GPS mapping and ecological identification. Cadets work in different sites as part of the training and receive a certificate after completing the programme.

Peruvian National Service for Protected Natural Areas (SERNANP) workforce training

SERNANP's workforce evaluation framework, initially created for conservation, offers a robust platform for advancing skills development in NbS across Peru. Managing 77 Protected Natural Areas over 25 million ha, SERNANP employs over 1,500 people, 60 per cent of whom are park rangers who safeguard biodiversity, restore ecosystems and engage with local communities. Despite this, the number of rangers remains insufficient to meet growing conservation demands. Rangers not only focus on conservation and restoration but also on preserving cultural heritage and fostering community relations, requiring a wide skills set. Through partnerships with the National Capital Civil Service Authority (SERVIR), SERNANP annually assesses its workforce and offers targeted training. In 2023, 64 workshops for nearly 900 participants focused on both technical skills, like drone and GIS monitoring, as well as core skills, including conflict resolution and leadership.

Kenya Forestry Research Institute (KEFRI) and the demanded future skills for NbS jobs

KEFRI has identified critical gaps in both technical and core skills required for NbS, particularly in teamwork and communication. The organization faces several obstacles in building capacity for NbS, notably the high costs involved, a shortage of local expertise in AI applications – such as satellite technology for transparent monitoring and verification – and a disconnect between theoretical knowledge and practical application. To address the growing demand for NbS skills, KEFRI is rolling out targeted training across all staff levels, expanding eLearning platforms, establishing international partnerships for enhanced cooperation, and launching strategic programmes that incorporate AI and drone technology for comprehensive ecosystem monitoring.

SOURCE: Authors' own analysis based on New Zealand Government 2024; interviews with SERNANP and KEFRI capacity-building specialists.

4.2.4 Main gaps identified

The studies highlighted here draw attention to several challenges and gaps in skills needs assessments and training provisions for NbS. Most available evidence on national programmes and policies addressing NbS skills comes from a limited number of developed countries; and, even then, training opportunities are still in their early stages. Several common challenges in skills needs assessments for the green transition may also be relevant when assessing skills needed for NbS. These challenges include insufficient data on skills for green jobs, as most countries have not yet included a "green" category in their jobs and skills classifications; limited resources for conducting these analyses, which demands advanced econometric and statistical expertise; and lack of specific data for different sectors or regions (ILO 2019; OECD 2023). The lack of comprehensive NbS skills identification may be attributed to the difficulties in conducting such assessments, further complicating efforts to design effective training programmes that meet the growing demand for a skilled workforce in NbS. Moreover, many NbS rely on unpaid jobs and volunteering (Bodin et al. 2022; Edwards, Manderscheid and Parham 2023; Mabon, 2023), which might pose a challenge when only looking at the formal economy and paid jobs.

National skills assessments have also emphasized the need to address ageing workforces and that many workers in related fields are approaching retirement. This underscores the importance of raising awareness about NbS career opportunities among younger generations to ensure a pipeline of skilled talent. Additionally, assessments from Canada, Scotland and Spain point to a gender imbalance in NbS jobs. In Scotland, women only represent 10–20 per cent of the workforce in sectors like forestry, agriculture and fishing, with the exception of tourism and the food/drink industries, where they account for roughly 50 per cent (NatureScot 2020). These different countries have highlighted the need to have a gendered approach for upskilling and reskilling the workforce for NbS to close this gap and promote greater gender equity[40].

4.3 Findings from a global survey

This section presents the main findings from an online survey of NbS practitioners conducted in connection with this report. The aim of the survey was to identify the main occupations and most in-demand skills for implementing NbS projects. It also explored the challenges to training provision and anticipated skills demand over the next few years. For a detailed overview of the survey methodology, please refer to the Annex.

40 NatureScot highlights the example of the Women in Agriculture Taskforce recommendations for addressing the gender gap, which includes establishing gender quotas on the training offered; using female trainers when possible; and offering support to ensure the accessibility of the training (e.g., childcare, appropriate timing of the workshops). In the case of Spain, MITECO also highlights good practices in STEM training, which includes women-only training and targeting young women in communication campaigns to raise awareness of the possibilities for them to pursue careers in engineering and science.

4.3.1 Sample description

The survey provides insights from 104 respondents. Their responses are based on their experiences in the most-relevant NbS projects[41] across various regions, with two-thirds of the responses coming from projects in the Global South (i.e., Latin America and the Caribbean, sub-Saharan Africa and Asia). Over half of these projects were developed in rural areas and nearly half are located in protected areas. These NbS projects were implemented in diverse ecosystems with forests the most mentioned, followed by mountains and rivers/streams. In terms of primary actions, nearly half focused on the sustainable management of ecosystems, while restoration accounted for 25 per cent, conservation made up 22.1 per cent and protection comprised 6.7 per cent. Regarding the main societal challenges these projects address, the top three were climate change mitigation and adaptation (74 per cent), environmental degradation and biodiversity loss (63.5 per cent) and economic and social development (54.8 per cent). Most NbS projects in the sample operate on a small scale in terms of workforce size, where two-thirds employed fewer than 10 people. Nearly half of the projects employed more women than men.

4.3.2 Main occupations required for NbS

The first most reported occupations in the survey were: conservation worker (31.7 per cent); project manager (27.9 per cent), environmental specialist (23.1 per cent), environmental engineer (18.3 per cent) and park ranger (18.3 per cent). These roles highlight the importance of both hands-on environmental work and management in NbS projects. Other occupations reported in the survey were community coordinator, field facilitator, ecological restoration technician, environmental educator and specialist in participatory approaches (Figure 14). A brief description of the top five occupations is given in Table 16.

Across regions (Figure 15), while some top occupations are commonly sought after, there are some regional differences: for example, park rangers and field facilitators are more relevant in Latin America, while community coordinators are more in demand in Asia. These variations may reflect the diverse environmental and socio-economic contexts that shape NbS priorities in each region.

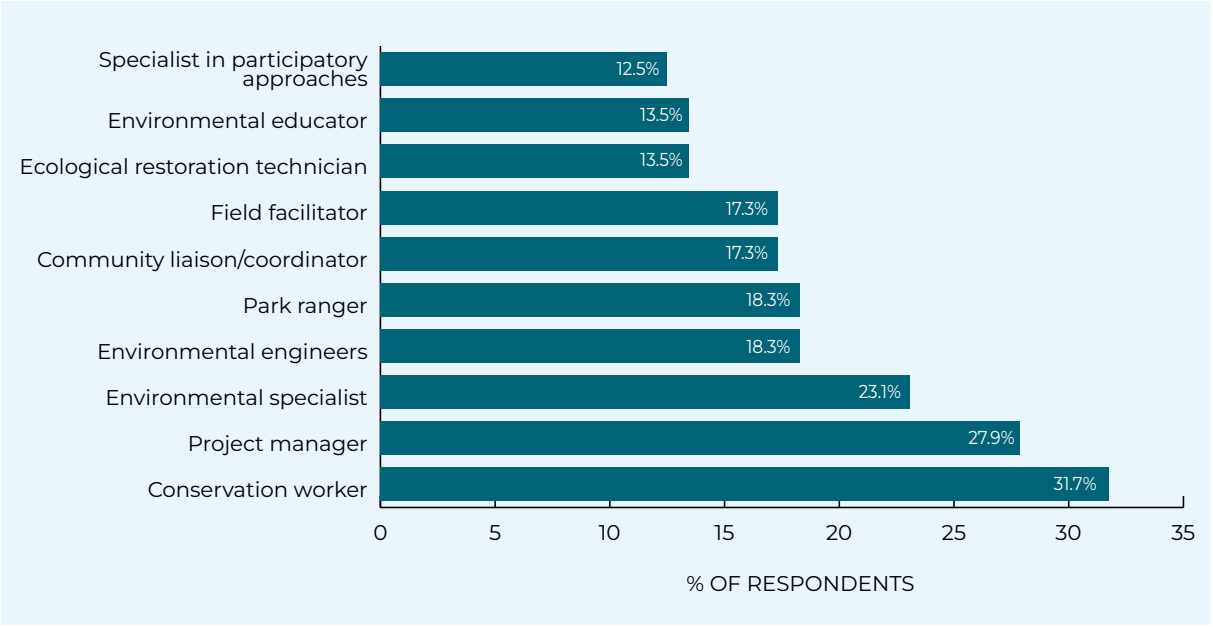
By primary action[42], main roles, like conservation workers and environmental specialists are common across all actions, indicating their centrality in NbS projects. Restoration action emphasizes technical roles such as forestry technicians and environmental engineers, essential for ecosystem recovery. Protection and conservation areas feature field-based roles like park rangers and specialize in participatory approaches, reflecting the importance of community engagement and ecosystem safeguarding. Sustainable use and management actions require a combination of managerial, technical and facilitation roles, including project managers and field facilitators, indicating a balanced approach between resource

41 53.4 per cent are currently under implementation; 41.7 per cent have been completed; and a smaller portion (4.9 per cent) are still in the design phase.

42 Primary actions are: restoration, protection, conservation and sustainable use and management of ecosystems.

management and sustainability. The result illustrates the multidisciplinary nature of NbS, where technical expertise, managerial and community-focused roles work in tandem to ensure success.

Figure 14. Main occupations identified in the survey



SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to identify the three main occupations they considered key for the successful implementation of their NbS projects. For a description of the top ten key occupations identified in the survey, see Annex.

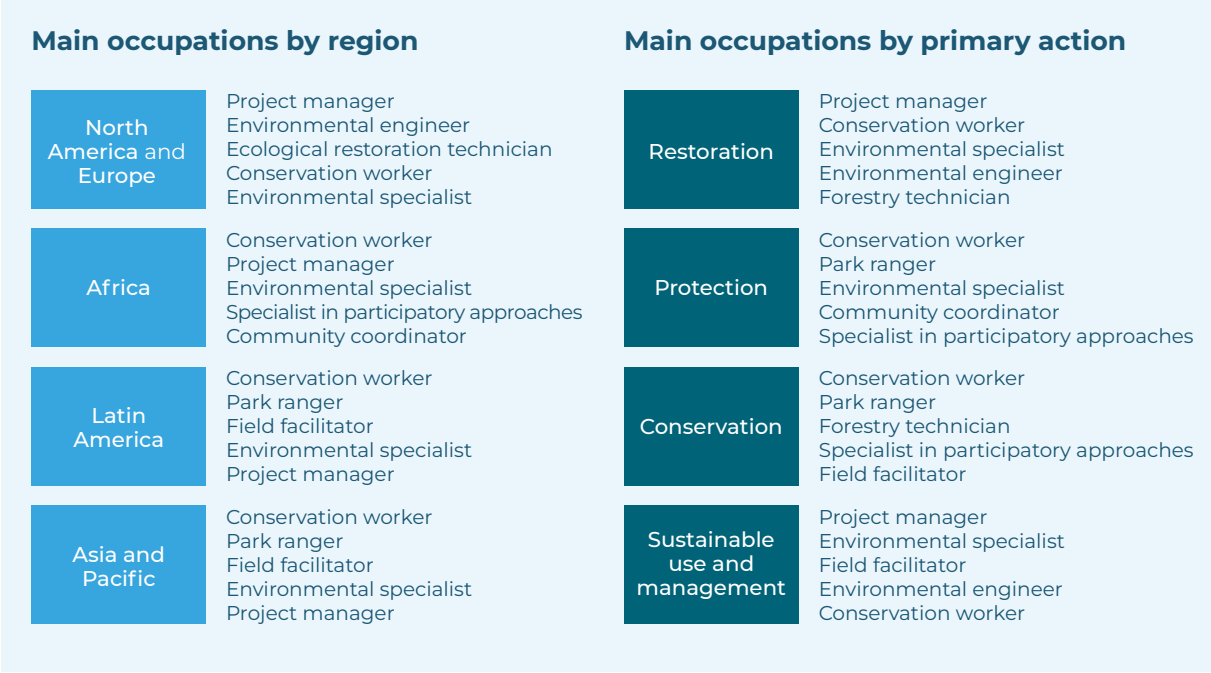
Table 16. Description of the top five occupations identified in the survey

ROLE	DESCRIPTION	SKILL LEVEL[43]
Conservation worker	Performs manual labour to restore and protect natural habitats. Their tasks include activities such as planting native species, weeding invasive plants, building protective structures and undertaking various hands-on efforts to maintain and improve the health of ecosystems	Low- to mid-level
Project manager	Responsible for overseeing the planning, execution and completion of the NbS project. This role involves coordinating multidisciplinary teams, managing resources, setting and monitoring project timelines, ensuring compliance with environmental and regulatory standards, and engaging stakeholders	High level
Environmental specialist	Often a biologist, botanist or related expert, responsible for assessing, managing and ensuring the ecological integrity of the project. They apply scientific knowledge to design, implement and monitor NbS interventions that restore, conserve or enhance ecosystems. Their work involves evaluating environmental impacts, promoting biodiversity and integrating ecosystem dynamics with sustainable solutions tailored to local contexts	High level
Environmental engineer	Responsible for designing NbS projects that use natural processes to address challenges (e.g., flood control, water purification, etc.). They assess site conditions, oversee implementation, ensure regulatory compliance and monitor the project's effectiveness	High level
Park ranger	Responsible for maintaining protected natural areas, ensuring the conservation of ecosystems and monitoring wildlife to protect biodiversity. Their duties include managing park facilities, enforcing environmental regulations, conducting ecological surveys, educating visitors and responding to emergencies, all aimed at preserving the integrity of natural habitats and promoting the sustainable use of resources	Low- to mid-level

SOURCE: Author's own analysis; Skills for NbS Survey (2024).

43 These skill levels are based on the International Standard Classification of Occupations (ILO 2012).

Figure 15. Main occupations identified in the survey by region and primary action



SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to identify the three main occupations they consider key for the successful implementation of their NbS projects. For a description of the top ten occupations identified in the survey, please see the Annex.

4.3.3 Skills currently required for NbS

The survey identified essential skills – both technical and core – for the main occupations. The most required skills for the top five occupations are presented in Figure 15. Conservation workers – as do all of the occupations – need a blend of both technical and core skills to perform their roles effectively. On the technical side, the most essential skills identified include ecological restoration techniques, tree planting and growing, application of ecosystems/biodiversity knowledge, and manual skills. In addition to these, the core skills identified were collaboration with stakeholders, training of community members and effective communication.

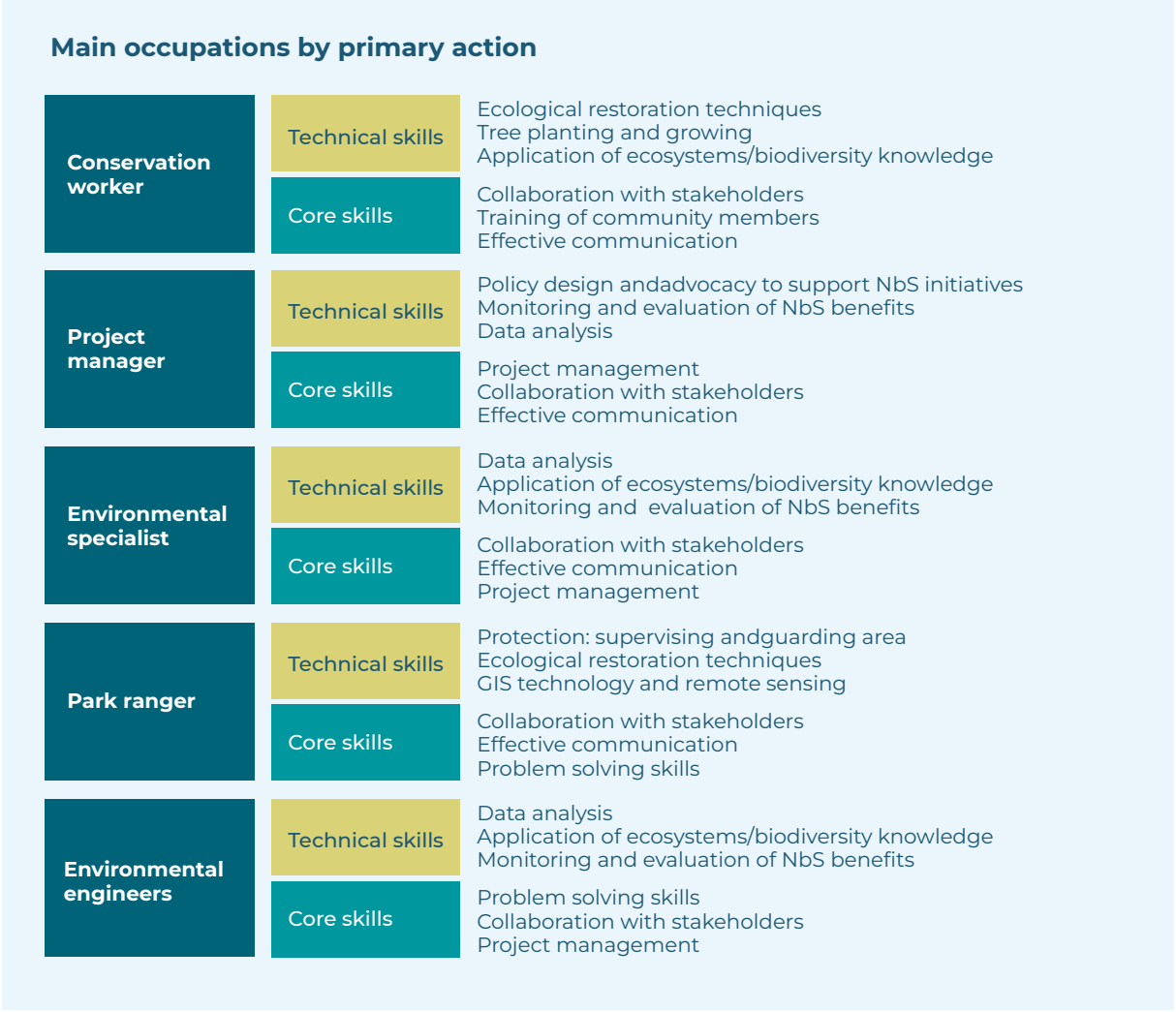
Project managers play a crucial role in supporting NbS, with two standout technical skills: policy design and advocacy to drive NbS projects along with the monitoring and evaluation of benefits. Data analysis was also identified as a main technical skill. When it comes to core skills, project management emerged as the most essential, alongside the collaboration with stakeholders and effective communication skills, both essential for navigating the complexities of NbS projects.

Both **environmental specialists and environmental engineers** require advanced technical skills, including a strong command of data analysis and the application of ecosystems/biodiversity knowledge, as well as expertise in monitoring and evaluating NbS benefits. On the core skills side, collaboration and effective communication are essential for working with diverse stakeholders. Additionally, project management was also highlighted.

Park rangers require technical skills like supervising and safeguarding protected areas as well as applying ecological restoration techniques, while GIS technology and remote sensing are essential for monitoring and maintaining ecosystems. On the core skills, collaboration with stakeholders, effective communication and problem-solving are essential for engaging with communities, managing conflicts and addressing environmental challenges.

A key distinction among the occupations lies in their specialized skills and focus areas. Park rangers and environmental engineers require GIS technology and remote sensing skills, highlighting their role in environmental monitoring. On the other hands, conservation workers prioritize hands-on restoration efforts, such as tree planting and cultivation, while actively training community members, fostering engagement and collaboration in environmental stewardship.

Figure 16. Main technical and core skills required by top five occupations

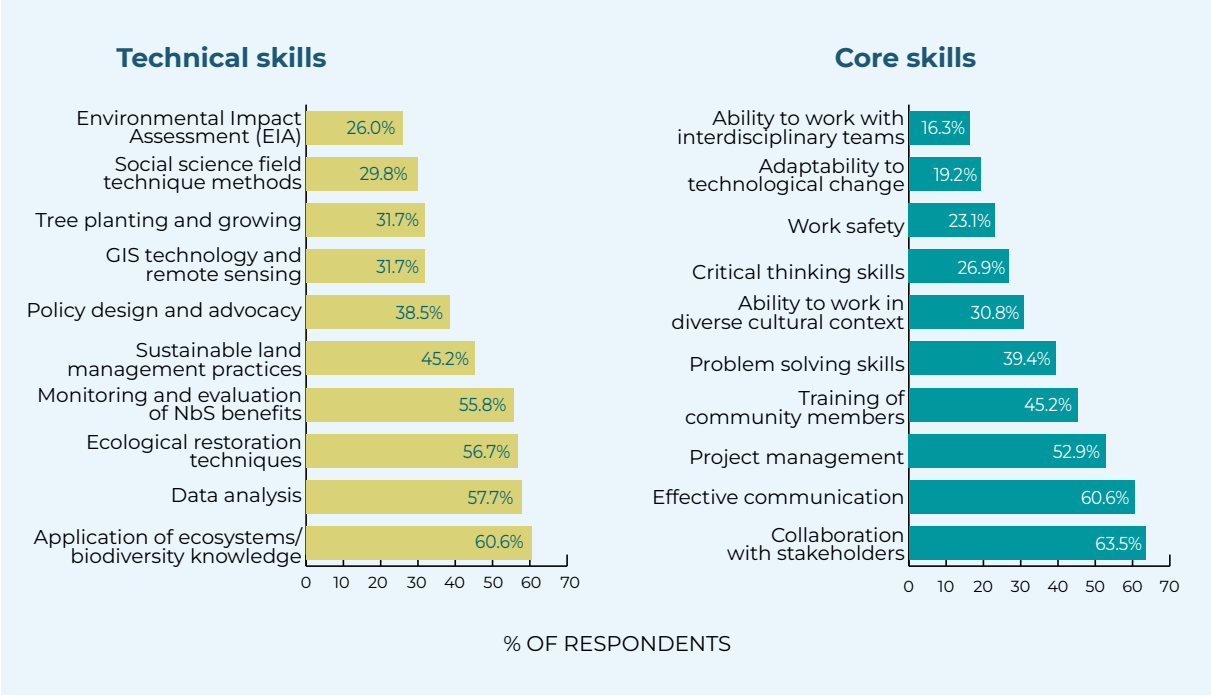


SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to select the two most relevant technical and core skills for each of the three main occupations reported.

At a broader level, across all reported occupations, technical skills most commonly identified as crucial are: the application of ecosystems and biodiversity knowledge (60.6 per cent), data analysis (57 per cent), ecological restoration techniques (56.7 per cent), monitoring and evaluation of NbS benefits (55.8 per cent) and sustainable land management (42.5 per cent) (Figure 17). On the core skills front, the most frequently reported skills across occupations were collaboration with stakeholders (63.5 per cent), effective communication (60.6 per cent), project management (52.9 per cent), training of community members (45.2 per cent), and problem-solving skills (39.4 per cent).

Figure 17. Main technical and core skills required across occupations

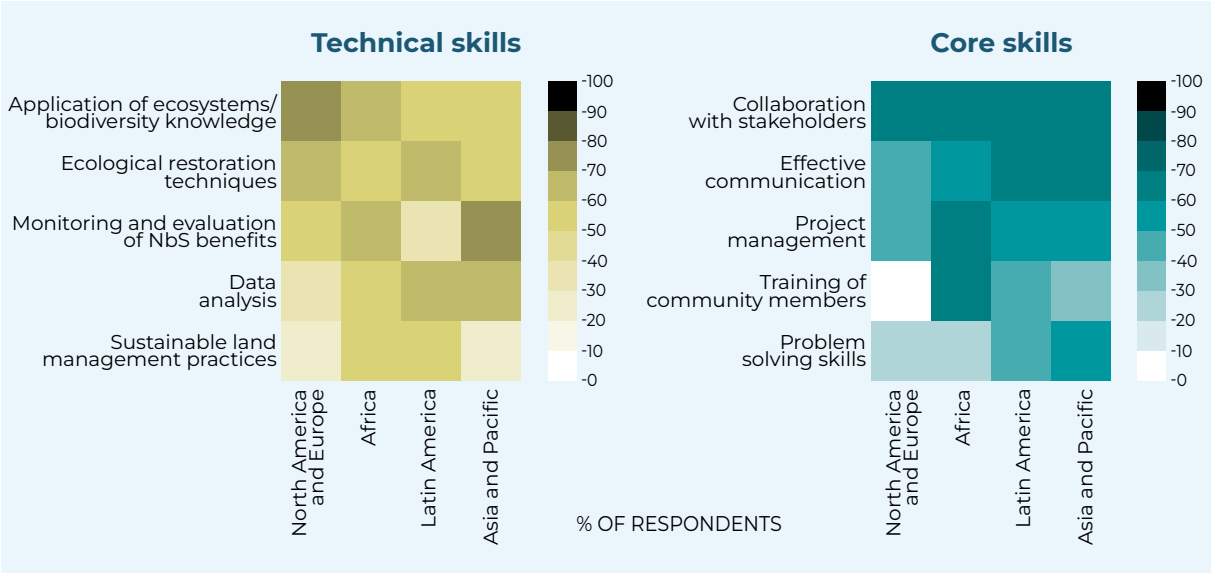


SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to select the two most relevant technical and core skills for each of the three main occupations reported. Figure 17 presents the most frequently mentioned skills (both technical and core) identified across all the reported occupations.

Across regions (see heatmaps in Figure 18), the application of ecosystems and biodiversity knowledge and ecological restoration techniques identified as main technical skills valued consistently with monitoring and evaluation of NbS benefits. On the core skills front, collaboration with stakeholders and effective communication are prevalent across all regions. Project management is also relatively high across all regions but slightly stronger in Asia. Training of community members and problem-solving skills exhibit more variation, with higher levels observed in Africa and Asia and the Pacific, respectively.

Figure 18. Main technical and core skills by region

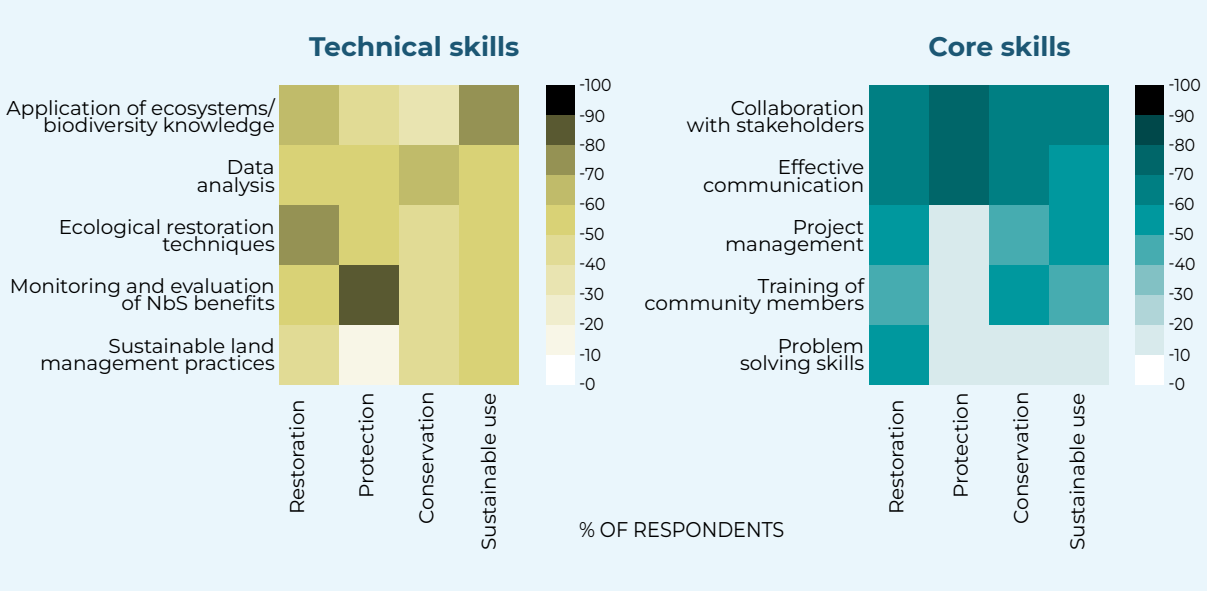


SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to select the two most relevant technical and core skills for each of the three main occupations reported.

By primary action (Figure 19), the application of ecosystems/biodiversity knowledge is highly valued in both sustainable use and management and restoration, while ecological restoration techniques are most critical in restoration action. Monitoring and evaluation of NbS benefits has high importance in protection action. On the core skills front, collaboration with stakeholders and effective communication are strong and consistent across all primary actions. Additionally, there is a pronounced emphasis on the importance of skills related to training community members in conservation actions and developing problem-solving abilities essential for restoration efforts.

Figure 19. Main technical and core skills by NbS primary action



SOURCE: Skills for NbS Survey (2024).

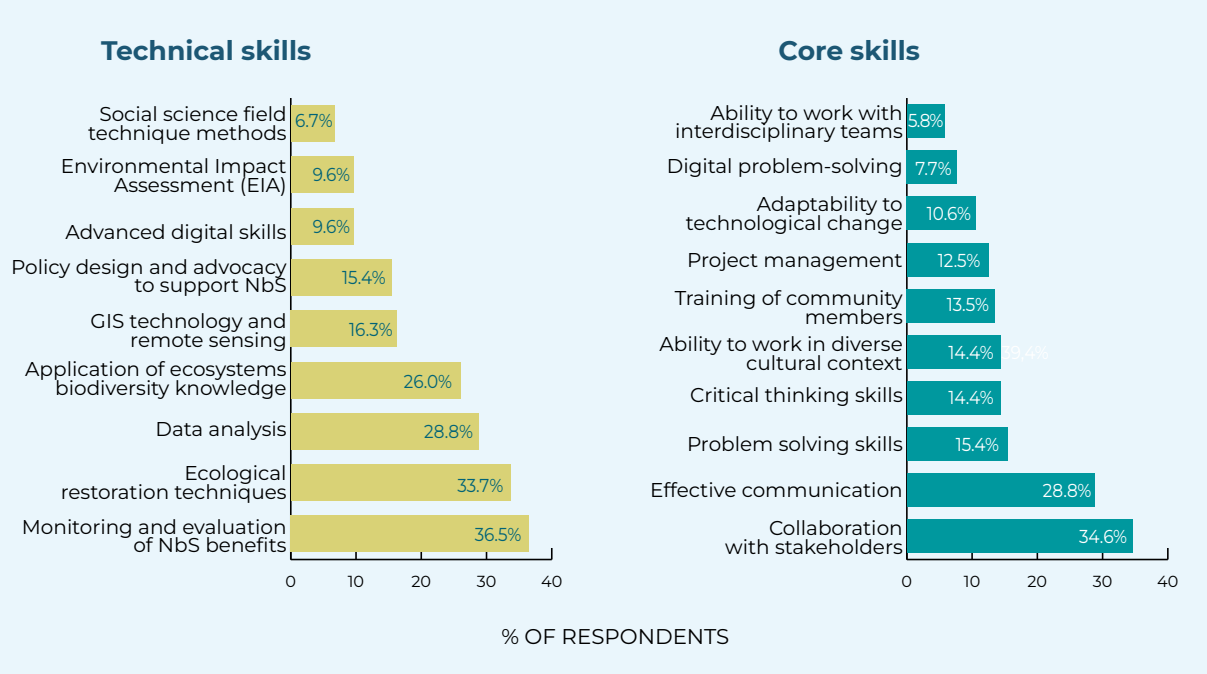
NOTE: The survey asked respondents to select the two most relevant technical and core skills for each of the three main occupations reported.

4.3.4 Skills training: access, gaps and barriers

Nearly two-thirds of respondents (71 respondents) indicated that workers in the main occupations have received some training in the past three years. 40 per cent of them indicated that this training was provided by the project, while 19.7 per cent received external training from other organizations and 40.9 per cent benefited from both internal and external training. Most training covered both core and technical skills, while one-third focused exclusively on technical skills. Training that targeted only core skills was rare. In addition, 8.7 per cent of respondents reported being very satisfied with the existing training programmes available for developing NbS-related skills in their regions, while 39.8 per cent were somewhat satisfied, 20.4 per cent expressed dissatisfaction and 12.6 were very dissatisfied.

With respect to the skills covered under this training (Figure 20), technical skills addressed are the application of ecosystems/biodiversity knowledge (32 per cent), ecological restoration techniques (30 per cent), and monitoring and evaluation of NbS benefits (27 per cent). Sustainable land management practices (21 per cent) and tree planting and growing (14 per cent) were also covered to a lower extent. Regarding core skills, project management (20 per cent), the training of community members (20 per cent) and effective communication (18 per cent) were mentioned, followed by stakeholder collaboration (18 per cent) and conflict resolution (13 per cent).

Figure 20. Most-in-demand technical and core skills in the near future



SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to identify up to two skills (both technical and core skills) that were targeted within the most relevant training experience for workers of the NbS project in the past three years.

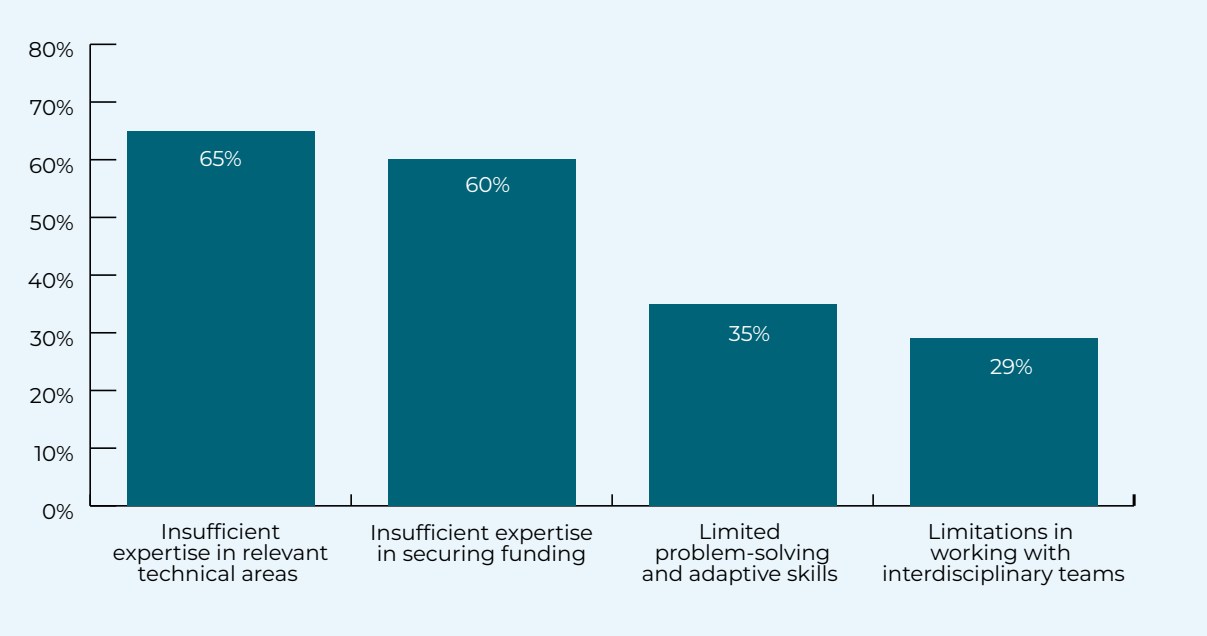
Across regions, ecological restoration techniques stand out as a key focus in North America and Europe as well as in Latin America, but less so in Africa and Asia and the Pacific. The application of ecosystems and biodiversity knowledge are prioritized in North America and Europe along with Latin America, while sustainable land management practices and tree planting received more attention in Africa compared to other regions. With respect to core skills, overall, there are no strong patterns, with most skills being moderately valued across regions, with a higher focus on effective communication in Asia and the Pacific as well as North America and Europe, training of community members in Africa along with Asia and the Pacific, and conflict resolution in North America and Europe.

By primary actions, technical skills such as the application of ecosystems and biodiversity knowledge along with ecological restoration techniques are emphasized in protection and conservation-focused projects. GIS technology and remote sensing is relevant in protection. Monitoring and evaluation of NbS benefits, are included across actions. On the core skills front, conservation projects highlight the training of community members. Project management and effective communication also emerge as skills targeted. Collaboration with stakeholders and conflict resolution were also targeted across primary actions.

Regarding skills gaps, 66 per cent of respondents reported encountering challenges while implementing NbS projects. This trend is consistent across regions and NbS primary actions, underscoring the need for targeted training to ensure the successful execution of NbS. In general, the most reported skill gaps include: insufficient expertise in relevant technical

areas (65 per cent); insufficient expertise in securing funding (60 per cent); limited problem-solving and adaptive skills (35 per cent); and limitation in working with interdisciplinary teams (29 per cent) (Figure 21).

Figure 21 Skills gaps encountered by the respondents when implementing NbS projects

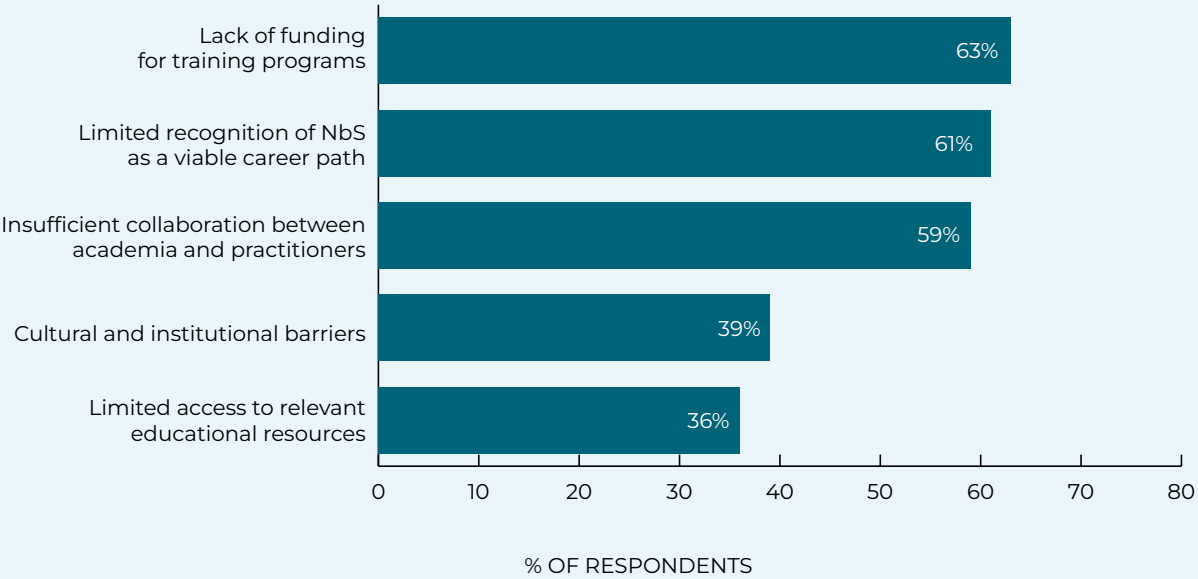


SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to report up to three skills gaps.

Regarding the primary barriers (Figure 22) for skills development in NbS, the following were identified: lack of funding for training programmes (63 per cent), limited recognition of NbS as a viable career path (61 per cent), and insufficient collaboration between academia and practitioners (59 per cent). Other challenges include the existence of cultural and institutional barriers (39 per cent) and limited access to relevant educational resources (36 per cent). Although all these constraints are observed across regions, there are some highlights. For instance, the lack of funding is very prominent in Africa (82 per cent), Latin America (61 per cent) and Asia and the Pacific (61 per cent), whereas in North America and Europe this is much lower (28 per cent). The limited recognition of NbS as a viable career is particularly significant in Asia and the Pacific (72 per cent) and Africa (61 per cent), while the insufficient collaboration between academia and practitioners is relevant in all regions (above 60 per cent).

Figure 22: Primary barriers for skills development in NbS



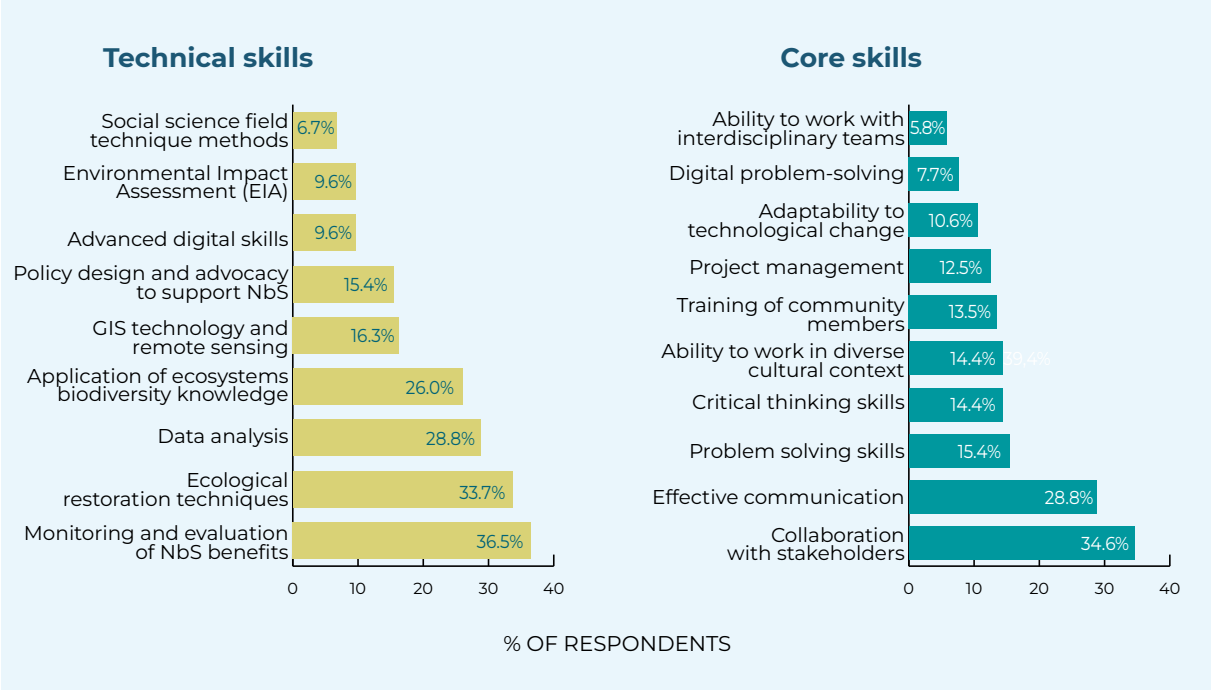
SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to identify up to three primary barriers hindering the skills development required for NbS projects.

4.3.5 Most in-demand skills in the near future

The top five most in-demand technical skills reported are (Figure 23): Monitoring and evaluation of NbS benefits (36.5 per cent), ecological restoration techniques (33.7 per cent), data analysis (28.8 per cent), application of ecosystems/biodiversity knowledge (26 per cent) and GIS technology and remote sensing (16.3 per cent). On the core skills side they are collaboration with stakeholders (34.6 per cent), effective communication (28.8 per cent), problem-solving (15.4 per cent), critical thinking (14.4 per cent) and the ability to work in diverse cultural contexts (14.4 per cent).

Figure 23. Most in-demand technical and core skills in the near future

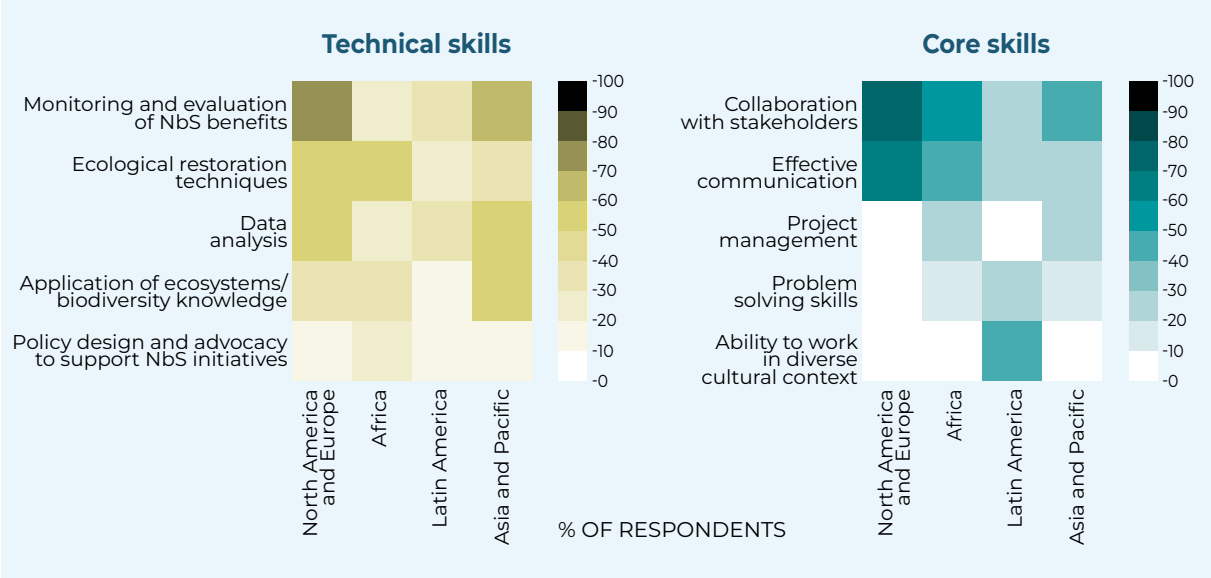


SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to select the two most relevant skills (both technical and core) that they thought would be most in demand in the next five years for NbS projects.

Across regions (see heatmaps in Figure 24), monitoring and evaluation of NbS benefits stands out with a strong focus in Asia and the Pacific as well as in North America and Europe, while moderately in Latin America. Ecological restoration techniques are also highlighted in Africa along with North America and Europe. Data analysis and the application of ecosystems and biodiversity knowledge are consistently important, with higher values in North America and Europe as well as in Asia and the Pacific, respectively. With respect to core skills, collaboration with stakeholders is most emphasized in North America and Europe, followed by Africa and Asia and the Pacific. Effective communication is moderately prioritized across regions, with North America and Europe again showing the highest focus. The ability to work in diverse cultural contexts and problem-solving skills receive high attention in Latin America.

Figure 24. Most in-demand technical and core skills in the near future by region

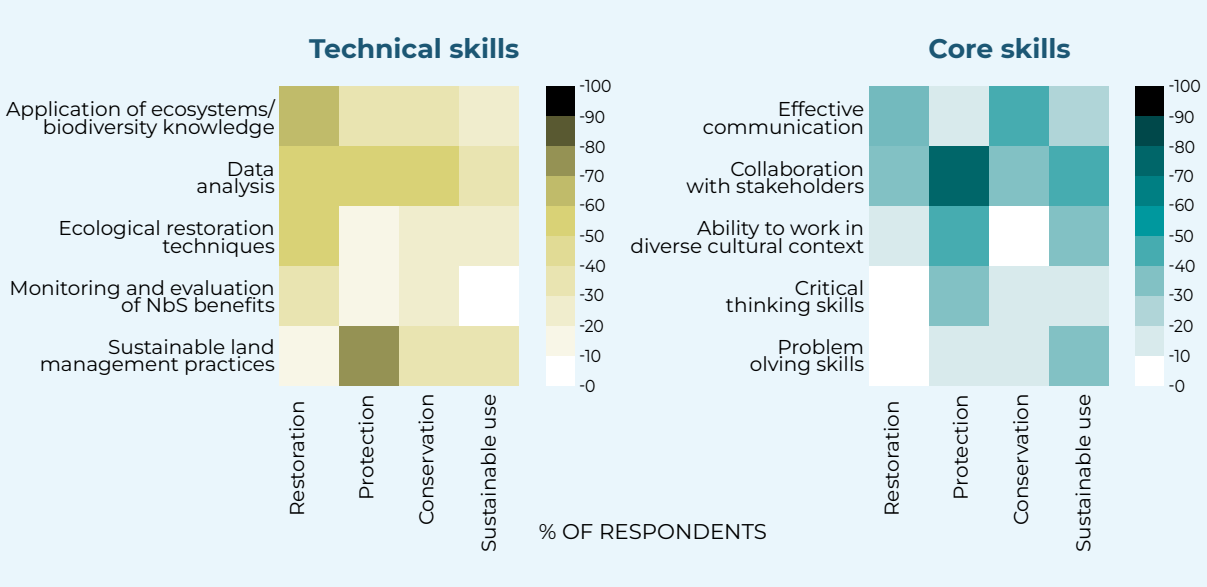


SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to select the two most relevant technical and core skills that will be most in-demand in the next five years. The percentages represent % of respondents.

By primary actions (see heatmaps in Figure 25), ecological restoration techniques show the highest emphasis in restoration; data analysis stands out, particularly in protection, while monitoring and evaluation of NbS benefits is considered highly relevant across regions. GIS technology and remote sensing is moderately emphasized in restoration but has less focus in other categories. On the core skills front, collaboration with stakeholders and ability to work in diverse cultural contexts are relevant in protection. Effective communication shows moderate emphasis across all categories, particularly in conservation, while skills like problem-solving and critical thinking receive more moderate focus, especially sustainable use in and protection respectively.

Figure 25. Most in-demand technical and core skills in the near future by NbS primary action



SOURCE: Skills for NbS Survey (2024).

NOTE: The survey asked respondents to select the two most relevant technical and core skills that will be most in-demand in the next five years. The percentages represent % of respondents.

When comparing anticipated skills with those currently in demand, several key trends emerge. Technical skills such as ecological restoration techniques, data analysis and the monitoring and evaluation of benefits will remain pivotal, underscoring the growing need for expertise in tracking and assessing the impact of NbS interventions. In parallel, core skills like stakeholder collaboration, effective communication, problem-solving and critical thinking continue to be essential. Additionally, the ability to navigate diverse cultural contexts is increasingly important. The demand for these skills reflects the complexity of NbS projects, where practitioners must address varied challenges and devise innovative solutions.

Case study 4

Identifying NbS opportunities and skills needs in Spain

Making the green transition

Since 2018 Spain has implemented an ambitious set of policy instruments and strategic action plans which form the Spanish framework for energy, climate and biodiversity conservation. As a member of the European Union, Spain's goal is to achieve an ecological transition towards a green, sustainable, decarbonized and resilient economy by 2030, with a target of net-zero emissions by 2050.

This transition will result in the creation of new jobs and the reinterpretation or transformation of existing ones, and it is critical that labour markets are able to meet these needs. In this context, vocational training has an important role to play. To succeed in transforming the Spanish labour market, it is necessary to make a transition in education, training and professional skills development. At the same time, facilitating employment and skill training are among the best tools for reducing inequality and promoting social and territorial cohesion.

Occupations and skills required for Expanding NbS

Part of the Spain's efforts to make the ecological (green) transition is its National Climate Change Adaptation Plan 2021–2030 (PNACC). It emphasizes enhancing the adaptive capacity of natural infrastructure, including the conservation and expansion of ecological corridors to support species' adaptive responses and leveraging NbS to strengthen the resilience of species and ecosystems. In realizing these goals, existing jobs will be transformed and new ones will be created.

Understanding the needs for education and training is crucial as a first step in transforming the Spanish labour market to support this transition.

That is why – Spain's Ministry for Ecological Transition and the Demographic Challenge – through the Biodiversity Foundation and the Spanish Climate Change Office, launched a study Employment and Ecological Transition: Sources of Employment, Labour Transformation and Training Challenges in Sectors Related to Climate Change and Biodiversity in Spain, published in 2023.

The study highlights the potential for decent job creation in green sectors, focusing on the anticipated growth fuelled by key national plans. The Recovery, Transformation and Resilience Plan (PRTR) 2021–2026 alone is expected to generate 800,000 jobs by the end of its implementation, with at least 702,684 relating to the green sectors analysed in the study. The PRTR is a financial assistance package agreed by the Heads of State and the Government of the European Union to alleviate the severe economic and social crisis caused by the COVID-19 pandemic and transform the European economies to make them greener and more digital and resilient.

The Programa Empleaverde project 'Geotourism guide in UNESCO World Geoparks in Spain' managed by Natures Sociedad Cooperativa Andaluza creates employment and entrepreneurship around the natural heritage (geological and biological) of the geoparks, where depopulation and lack of business networks are increasing.

The project trained 195 unemployed people as guides to the geopark's natural heritage, eight of whom found employment immediately after their training.

The training covered all aspects that define geoparks, including: geology, sustainability responsibility, environmental education, heritage and human interaction. The project was coordinated by the UNESCO Global Geopark Cabo de Gata-Níjar (Andalucía) and the UNESCO Global Geopark Villuercas-Ibores-Jara (Extremadura).

Other European structural funds such as the European Social Fund and the European Fund for Regional Development also support the growth of green, digital and resilient jobs, thus adding to the job potential.

The study also identified the main pillars of the green transition that could be sources of new employment; which jobs would be prioritized; the main skills needed to professionally perform these jobs; key instruments in the training process and actions to improve the Spanish education and training system; and active labour market policies. It focuses on labour market needs and challenges in two main areas: 1) climate change mitigation and adaptation; and 2) biodiversity conservation.

The study involved consultations with nearly 170 key stakeholders, including government representatives, employers, labour unions, non-governmental organizations and universities. It highlights seven priority areas with high potential for job transformation, conversion and creation in biodiversity-related fields and highly relevant for NBS, namely:

1. Urban greening
2. Management of natural heritage and protected areas
3. Ecological restoration
4. Sustainable nature tourism
5. Sustainable agriculture
6. Sustainable fisheries and aquaculture
7. Sustainable forest management.

Furthermore, 40 strategic occupations were identified and are available on an interactive map and include detailed job profiles to outline the general and technical competencies needed for each occupation; for example, a high-priority occupation is an NbS consultant. This role requires a strong skillset in operational techniques for NbS; integrating social, economic and environmental aspects; and expertise in aquatic and terrestrial ecology as well as in-depth knowledge of statistics, data analysis and climate and ecological modelling.

Key insights and outcomes

Spain stands out for actively identifying the skills necessary for the ecological transition, particularly concerning biodiversity goals and the implementation of NbS. This study not only assessed current and forecasted needs but also sets a way forward. It provided an overview of the Spanish training system's capacity to meet the identified needs, highlighting several critical issues, including the lack of flexibility from training programmes to adapt swiftly to the changing demands of the labour market, territorial limitations, and insufficient generational replacement in certain occupations. These could result in a decline of these professions over time or necessitate the hiring of foreign workers.

Based on the insights gained, a strategic training content map was developed to address these emerging needs. The study also includes recommendations for future employment policies, emphasizing the need for a public–private collaborative ecosystem, specialized offerings, accreditation and new methodologies.

The findings of the study, also catalyzed actions by the Biodiversity Foundation of the Spanish Ministry for Ecological Transition and Demographic Challenge. Calls for proposals to support projects to boost green jobs have been issued and the Empleaverde+ Programme is now being used to tackle many of the identified challenges.

This Programme has been operating since 2007. It is co-founded by European Social Fund and has since evolved to include hundreds of projects. It has now been redesigned to address the new needs and challenges of the ecological transition as identified by the report.

Spain's proactive and demand-driven approach in identifying and addressing the skills needed for ecological transition, particularly through its emphasis on NbS, can serve as a robust model for other countries[44].

44 Empleaverde "Employment and Ecological Transition Study"

Chapter 5

Chapter 5 Conclusions and recommendations

5.1 Overall report conclusions

5.1.1 Employment and job creation in NbS

NbS are increasingly recognized as critical to achieving global and national sustainable development targets, and their integration into policy frameworks highlights this importance. As their adoption continues to grow, this report finds that NbS also offer significant potential for additional job creation, estimated at 20–32 million additional jobs by 2030, on top of the estimated 60.5–62 million people currently in NbS-related employment. However, the current pace of investment in – and implementation of – NbS is insufficient, as highlighted in the latest SFN report, and is not directed to the regions with the greatest potential; particularly in Africa, Latin America and the Arab States.

Chapter 2 of this report shows that, although total NbS-related employment has seen a slight global decrease compared to the estimates in the 2022 edition, this is largely attributable to a significant reduction in India, where NbS employment was a key component of the COVID-19 response through the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). Outside of India, NbS employment has increased, although accurately estimating this growth remains a challenge due to the lack of comprehensive employment and productivity data specific to NbS sectors. While this progress is encouraging, the increases in NbS employment are not widespread, being concentrated in only a few countries and leaving much room for expanded global application. To fully harness the potential of NbS to address the pressing societal challenges of climate change mitigation, disaster risk reduction, economic and social development, human health, food security, water security and environmental degradation and biodiversity loss, increased and better-

targeted investment is needed. This investment should be guided by the IUCN Global Standard for Nature-based Solutions and ILO Just Transition Guidelines, which have strong synergies and would together support the implementation of high-integrity NbS while that created decent jobs in the process[45].

With targeted investments, the results in Chapter 2 show that NbS employment could increase dramatically in Africa, Latin America and the Arab States. It would impact absolute numbers, per cent share and the general trend towards skilled work. Combined employment in these three regions would increase from over 2.5 million people in current estimates to over 13 million by 2030. Their share of global NbS employment would increase from around 5 per cent currently to over 40 per cent. Another key finding is that, since the future employment estimates are based on a more diverse portfolio of NbS types than currently deployed, the types of occupations and skill levels of the employment would diversify as well. Here, the general trend is towards more skilled work, also implying an improvement in the quality of NbS employment with fewer elementary occupations and more craft and professional occupations employed.

5.1.2 Expanding beyond environmental challenges

The modelling of future employment in Chapter 2 is based on the effects of the estimated additional NbS investments that are required to meet global targets on climate mitigation and adaptation, biodiversity loss and land degradation, which can be considered 'environmental' targets, as they come from the three Rio Conventions. It is important to note, however, that NbS can be deployed to help address a far wider range of societal challenges than just climate change mitigation, reversing biodiversity loss and halting land degradation. The investment needs that the modelling is based on, therefore, do not represent the full potential for NbS use. As such, the future employment estimates that have been generated based on these investment needs do not represent a ceiling for potential future employment in NbS, and some areas with large potential for the use of NbS are not included in the estimate.

For example, there is substantial potential to increase investment in NbS as a means of delivering infrastructure services. Directing even a modest portion of global infrastructure investments towards NbI – including green-grey hybrid infrastructure – could have a profound impact on employment, particularly in LMICs. In LMICs where infrastructure investments needs are high, labour-intensive, nature-based activities, such as ecological restoration and sustainable land use, can provide vulnerable populations with jobs and increased income.

The potential of NbS in building climate resilience is also large, but this has not yet been quantified. As the impacts of climate change intensify, the role of NbS in helping communities and ecosystems adapt is becoming ever-more critical.

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45 A detailed discussion on commonalities between the IUCN Global Standard for Nature-based Solutions and ILO Just Transition Guidelines can be found in the first report of this series (Decent Work in NbS 2022).

5.1.3 Workforce development

A key challenge to the broader and more effective implementation of NbS is the shortage of workers with the necessary skills. This skills gap poses a significant obstacle to scaling up NbS projects and improving their quality. The shortage encompasses technical skills (e.g., expertise in ecology, climate change and biodiversity) core skills and interdisciplinary skill sets, which are critical for integrating various technical domains. For example, as discussed in Chapter 3, green-grey infrastructure projects require a blend of engineering and ecological knowledge, while understanding the full spectrum of benefits from NbS demands proficiency in economic valuation methods.

The importance of interdisciplinarity was found to be essential for ensuring the effectiveness and integrity of NbS projects. This was required for technical skills as well as for core skills, such as coordination, communication and consensus-building. Despite their importance, skills development initiatives related to NbS remain limited and often lack coordination, highlighting the need for more structured and targeted interventions to build a capable NbS workforce. Without addressing these skills gaps, the expansion and impact of NbS will remain constrained, especially in regions where use of NbS still appears limited and is already facing challenges.

Both the modelling estimates from Chapter 2 and skills survey findings from Chapter 4 show that there will be a growing demand for occupations and skills related to the monitoring and evaluation of NbS performance as well as the provision of benefits. This suggests that as NbS activities expand, there will be an increased emphasis on demonstrating measurable outcomes and long-term benefits. Consequently, more skilled workers will be required to assess, monitor, evaluate and report on the effectiveness of NbS interventions, ensuring those projects deliver tangible environmental and societal impacts.

The estimation of future demand for occupations and skill level is derived from quantitative projections, modelling the employment impacts of increased NbS investments. In contrast, the survey captures qualitative insights from NbS practitioners, identifying key occupations and skills critical for successful NbS project implementation. The data sources and research questions differ, but some commonalities emerge. Model estimates show that 74 per cent of current NbS work globally is in medium- or mid-skilled occupations, followed by low-skilled occupations. On the other hand, the survey highlights the importance of all skill levels, with low/mid-skilled occupations, such as conservation workers and park rangers, and high-skilled occupations, such as project managers and environmental specialists, topping the list of key roles. This may be attributed to the smaller scale of many projects managed by survey respondents, where these managerial and technical along with manual skills are all pivotal to successful project implementation.

One of the key barriers to skills development is the limited recognition of NbS as a viable and promising career path. Yet, there is anticipated high demand for both mid-skilled and high-skilled workers, particularly in agricultural, forestry, fishery and marine occupations, crafts and related trades, services and sales workers, professionals, technicians and associate professionals. In Africa and Latin America, the share of youth among people engaged in NbS

work tends to be larger than their share in total employment, pointing to a significant role for NbS in creating jobs for youth. To harness this potential, comprehensive career guidance tailored to NbS for youth is crucial, along with efforts to enhance the attractiveness of these roles to younger generations. By addressing these gaps, young people can be better equipped with the skills needed for a sustainable future and ensure that NbS becomes a more established and recognized career trajectory as the need for it increase.

Currently, NbS skills development is limited. It is also quite project-based and dependent on time-limited funding. This is related to a lack of accreditation and links to national qualification systems that can affect the quality of the training (lack of recognized quality assurance) and the value of the skills developed (lack of formal accreditation and certification). Furthermore, NbS concepts or principles should be mainstreamed into all work-related qualifications as part of the green and blue economy agenda.

5.2 Recommendations

The following recommendations provide strategic directions to address current challenges and barriers to increasing decent work opportunities through investments in NbS.

Recommendation 1: Strengthen and align national NbS policies to capitalize on progress made at the global level

National and local governments should coordinate to ensure alignment of national and sub-national policies with global policy frameworks, including Nationally Determined Contributions, National Biodiversity Strategies and Action Plans and Land Degradation Neutrality targets, and increase policy coherence across different sectors and levels of government.

To ensure that NbS becomes a well-integrated element of long-term national sustainable development strategies, it is also important that policymakers and other stakeholders enter into dialogue to build a common understanding of the roles that NbS can play in addressing a broad range of societal challenges, beyond merely environmental ones. Here, the UNEA definition and the IUCN Global Standard for Nature-based Solutions are instructive, identifying the role of NbS in addressing a diverse range of societal challenges related to, amongst others, disaster risk reduction, economic and social development, human health, food security, water security and unemployment as well as to key environment-related challenges related to climate change mitigation and adaptation, desertification, environmental degradation and biodiversity loss.

Clear and coherent policies are particularly relevant for NbI (as discussed in Chapter 3), which requires integrating NbS into the infrastructure planning processes often involving institutions with a specific sectoral mandate like water or transport. The planning, design, construction and operation of infrastructure is governed by an often-complex set of established mandates, policies, standards and regulations at different levels, which creates

challenges for the integration and mainstreaming of NbS. Systematic cross-sectoral and interdisciplinary coordination by relevant ministries and infrastructure development agencies with the involvement of local governments, communities and other impacted stakeholders, as well as the updating of relevant design standards, can help to overcome such barriers and increase investors' confidence in what may otherwise be perceived as riskier projects. For all sectors, better coordination will also help to maximize synergies and manage some of the trade-offs inherent in NbS deployment.

More programmatic approaches by actors financing and implementing NbS also have benefits for workers. Project pipeline development and clear technical standards facilitate the development of the required skills (see Chapter 4 and below for further discussion on skills). Furthermore, a more continuous stream of projects can eliminate employment gaps for individuals, allowing workers with the necessary skills and experience to more seamlessly move from project to project. While diverse stakeholder engagement and participation is important for coordination efforts and the formulation of effective policies, in the case of NbS it is particularly important to engage the private sector as it is a key driver of investment, innovation and job creation. Private-sector actors also have a responsibility to adhere to principles, laws and regulations and collaborate with other stakeholders to integrate NbS into project lifecycles, while governments must design effective incentives to foster this collaboration.

Finally, in some contexts, governments may also need to take the lead in creating an enabling environment and incentives for the local private sector to implement and use NbS, fostering the creation of 'NbS employers'. Involving the private sector may be particularly relevant in the case of NbI, given the important role of private contractors in infrastructure development. This may also include a focus on working with small and medium-sized enterprises and community-based organizations (CBOs) and supporting their formalization. This will enable them to not only offer their workers formal conditions of employment, but also strengthen the capacity of the private sector and communities to implement NbS-related activities.

Recommendation 2: Invest in skills development and workforce training

Workforce development strategies are key to addressing current and future skills gaps for planning and implementing NbS. These should address the diverse skills required for successful NbS implementation across urban and rural environments. They should consider, not only the results of Chapter 4, but also some of the findings of Chapter 2, which indicate that as the future use of NbS expands to include a wider range of NbS in more diverse contexts, the skills levels of related work are also expected to increase.

At the international level, governments and international organizations should collaborate to gain a deeper understanding of the demand for NbS-related skills. Current literature reveals that only a few countries have conducted NbS-related skills need assessments, and there is a notable lack of studies by the international community in this area. Additionally, it is also important to explore whether the skills needed for green jobs overlap with, or differ from, those required for NbS-related work. With improved information and data on skills gaps for

NbS-related work, countries would be better equipped to design, plan and implement skills development programmes more effectively.

At the national level, to more systematically address the skills needed for NbS implementation in different sectors, countries should incorporate NbS knowledge and expertise into relevant training curricula and qualification frameworks, while recognizing existing initiatives and progress on including ecosystem-based and nature-positive approaches, which are similar and/or highly relevant. This involves working with universities, technical and vocational training institutions, professional associations and other stakeholders to integrate NbS-specific competencies into disciplines such as agriculture, civil and environmental engineering, construction, ecology, fisheries, forestry, geography, hydrology, tourism and urban planning, among others. Such actions would also help to establish clear career pathways, making it easier for youth to pursue a future in this field. In addition, NbS concepts or principles (e.g., the value of using NbS) should be mainstreamed into all work-related qualifications as part of the greening agenda.

In addition to integrating NbS into relevant existing curricula and professional qualifications, the creation of NbS-specific qualifications would help to ensure that professionals in the NbS field can gain consistent recognition of their skills and align their expertise with the specific demands of evolving NbS projects and activities. Recognition of prior learning should be adopted to accelerate the identification and formalization of NbS-related skills. This is particularly important for those who have acquired skills through informal, indigenous or non-accredited learning routes, which would support an acceleration of integration and professionalization in the NbS workforce.

Although many countries do not yet have policies specifically aimed at developing NbS-related skills, existing national initiatives for the development of skills for green jobs could provide an opportunity. Governments should adapt and expand these initiatives to include NbS competencies, thus promoting the development of a skilled workforce equipped to tackle environmental challenges through nature-based approaches. This will not only hasten NbS implementation but also accelerate the greening of national economies.

Finally, at the local level, NbS projects often require highly specific skillsets depending on the region and type of initiative. For example, projects in rural areas may prioritize skills in ecological restoration, biodiversity conservation and sustainable land management, while urban projects may focus on sustainable urban planning and climate resilience. Local governments and institutions should develop flexible, adaptive training programmes that meet these varying needs. By tailoring skill development to specific ecological and social contexts, local authorities can ensure that NbS initiatives are more effective, relevant and sustainable. Furthermore, this local adaptation will empower communities to take ownership of NbS projects, fostering long-term engagement and success.

Recommendation 3: Promote rights and inclusivity in the NbS workforce

While there appears to be potential to create jobs through NbS investment, it is important to emphasize the need for improving the quality of NbS employment and that, when necessary, measures are taken to enhance inclusivity. Governments have the duty to adopt,

implement and enforce laws and regulations, and to ensure that the fundamental principles and rights at work along with ratified international labour conventions are applied to and protect all workers engaged in NbS activities, taking into account other international labour standards. This includes setting standards for fair wages; access to social protection and its benefits, especially in rural areas; and measures to ensure that workers' rights are respected. They should also promote social dialogue and liaise with workers and their organizations to promote rights at work in all NbS-related activities. One such example could be to develop occupational safety and health standards designed for different types of NbS projects. This is particularly important in high-risk environments, such as those related to protection and conservation (see also Case study 2). But, as much NbS-related work is outdoors, NbS workers will also increasingly be exposed to the impacts of heat stress, which may require specific measures and standards to be developed.

Governments should also use their leverage as the largest investors in NbS to promote and enforce these standards and regulations. NbS contracts could include specific provisions on labour rights and standards. Departments and agencies managing these contracts could play a role in monitoring and enforcing compliance, so as to not rely only on labour inspectors whose presence is often thin in rural and remote areas where NbS projects take place.

At the global level, it would be important for NbS frameworks to strengthen the focus on employment and skills related measures. For example, in revising the IUCN Global Standards for NbS, stronger labour and employment related measures and requirements could be introduced. This would strengthen the quality of implementation and the skilling/professionalization of the NbS workforce. In addition, international development cooperation agencies can play a role in helping to inform the development of robust policy frameworks.

Measures to ensure an inclusive and diverse NbS workforce will vary across regions, driven by local contexts. The level of participation of youth varies across regions, but given the high interest of this group in working on improving the environment, it is important that their motivation and energy is harnessed. In addition to the skills and career development related measures already mentioned, other measures may include specifically targeting youth for employment in NbS projects along with awareness-raising and collaboration with youth and other advocacy groups to address barriers youth may face in pursuing employment and careers in NbS-related fields. Enhanced youth employment will also ensure a more diverse pool of perspectives and skills, enhancing the resilience and adaptability of NbS projects.

The level of participation of women in NbS employment also varies, and again specific measures may be required to address this. For example, the construction sector, which is especially important in NbI, is known to be male biased and many of the measures to enhance female participation cited in Chapter 3 could be adopted across different NbS activities and projects. This could include targeted initiatives such as implementing gender quotas, providing scholarships for underrepresented groups, and actively promoting NbS career opportunities for women. These steps would not only foster equity but also drive the long-term success and adaptability of NbS projects across diverse contexts.

Indigenous Peoples and local communities are stakeholders of specific importance in NbS employment. In contexts where there is a desire to enhance their economic participation, NbS employment may provide an avenue to do so as they often have relevant skills and knowledge to support NbS implementation. Many of the measures that enhance the inclusion of other vulnerable groups may also be useful in such contexts. Their employment in this area may also allow them to influence decisions and designs, provided they are employed in positions of influence.

Additionally, governments can continue to use public works programmes (PWPs) or PEPs and PES schemes to implement NbS, while also providing employment and income to those living in the areas and ecosystems that generate ecosystem services. Given their scale in several countries, it would also be important to increase investments in skills development for workers in these programmes or schemes, thus improving the quality of the NbS-related outputs as well as the productivity of workers. Furthermore, programmes that involve large-scale infrastructure or natural resource protection, rehabilitation, construction, operation and maintenance as part of economic recovery, post-crisis response or social protection programming can significantly enhance the participation of minority groups in NbS implementation projects.

For all employment generations, it is important that investors and employers make proactive efforts to ensure diversity and inclusion. Relevant measures can include, among others:

- The use of inclusive and gender-neutral language in job descriptions, published in the main working language of a project site
- Promoting job openings through different (and non-traditional) channels that can better reach women, youth, indigenous peoples and other marginalized groups
- Using an output-based payment system that provides flexibility regarding working hours
- Incorporating reasonable accommodations for the hiring of persons with disabilities
- Providing sensitivity and awareness training to workers to prevent group-based discrimination and sexual harassment.

Recommendation 4: Strengthen research and data collection to better inform decision making

Realizing the employment potential of NbS requires a deeper understanding of current employment in NbS, existing skills gaps and future skills needs as well as the long-term performance of NbS versus other types of solutions. There is also a need for better understanding and valuation of the wide range of benefits provided by NbS so that they can be factored into planning decisions, where financial and economic considerations will always be a primary concern.

Further research is needed to fully understand the broader employment impacts of NbS and to refine future estimates. While current models provide insights into job creation, a standardized approach to tracking NbS activities, expenditure and employment is essential.

Such an approach would aid governments in adopting NbS and support data-driven policy decisions.

To grasp the global employment potential of NbS and address existing skills gaps, a robust evidence base is needed to inform NbS-related policies, infrastructure planning and workforce development efforts. Given the scale and timeframes for infrastructure investments, promoting comprehensive modelling and assessment tools that capture the full employment impacts of NbS are important.

The lack of data and statistics on the number of NbS workers mentioned remains a key issue. To address this data gap, employment statistics could be improved by including NbS employment in the statistical system. This would provide more accurate data on the number of NbS employees and help inform decision-making in this area.

Frameworks like ILO's Employment Impact Assessments (EmpIAs) and the Sustainable Asset Valuation (SAVi) by the International Institute for Sustainable Development (IISD) are examples that can be applied at the landscape or project level. These frameworks can also assess direct, indirect and induced job creation, job quality and broader socio-economic benefits and provide a clearer picture of how investment in NbS or combining green and grey infrastructure can contribute to employment and decent work outcomes.

Collaboration between academic institutions, governments and the private sector will be crucial in fostering knowledge sharing and scaling up research efforts. This may include continued support to and scaling up of 'communities of practice' and stakeholder groups to share best practices and case studies on different types of NbS. This should also include the need for enhancing the quality and availability of geospatial data to support planning as well as baseline assessment and monitoring.

5.3 Why decent work matters for scaling up the use of NbS

This report helps to demonstrate that job creation and the improvement of livelihoods are important benefits of NbS. They are benefits that can be very influential for the political economy of NbS investment. Decent jobs and improved livelihoods are some of the most direct and tangible benefits of NbS that local people can enjoy. They also enhance the ability of local communities to support NbS, since jobs can also be the key mechanism for helping them deal with some of the associated trade-offs. Many people simply cannot afford to wait for the long-term NbS benefits that eventually accrue to them to materialize if there is no other source of income. Jobs related to the implementation of NbS have the advantage of being immediate and can thus help in playing this role. This contrasts with the many other benefits of NbS, like climate mitigation, which is increasingly used to finance NbS. These benefits are not local and the financial benefits, of which often only a small share reach local communities, usually only start flowing in the medium- to long-term.

Decent work is thus particularly important for groups living on or sharing land where NbS are used. NbS is not possible without their active support and participation; and, if only a small share of the NbS benefits flow to them, asking for their support will be difficult. Especially in circumstances where there is some loss of income, some form of compensation is a necessary condition for implementing NbS. Providing NbS-related employment to those who face some loss of income can be a mechanism to provide a form of compensation. Where this is not sufficient, other avenues to be explored include certain types of transfers, like PES, or social protection schemes that can help make the green transition just (ILO, 2024c).

This places decent work in NbS firmly within the just transition debate – in many instances the increased use of NbS raises just transition questions similar to those encountered in other green transitions (e.g., the energy transition). And, thus, while the net benefit to society of the green transition is generally positive, there are specific groups who may face negative consequences related to their employment and livelihoods. Without addressing these consequences head-on and ensuring that this green transition is also just, NbS is likely to face critical obstacles to its wider adoption. This means, as the need for NbS implementation expands, not only is the mobilization of additional resources critical, but so will be just transition measures to ensure that its expansion is widely supported. The creation of decent work has a vital role to play in this regard.

Glossary

Climate adaptation

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

Biodiversity, biological diversity

The variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. (UNCBD 1992)

Built infrastructure ("grey") infrastructure

Assets, networks and facilities that provide or enable the delivery of infrastructure services. This includes the built assets of all infrastructure sectors, such as hospitals in the healthcare sector, roads and railways in the transport sector, and power stations in the energy sector. (UNEP 2023b)

Conservation

The protection, care, management and maintenance of ecosystems, habitats, wildlife species and populations, within or outside of their natural environments, in order to safeguard the natural conditions for their long-term permanence. (IUCN definition)

Core skills / core employability skills

Non-vocational, non-technical skills or competencies that are needed to perform at work and in society. They apply to work generally, rather than being specific to an occupation or industry. Core employability skills include the ability to work with others and in teams; the ability to solve problems and use technology; communications skills; and learning-to-learn skills. Core skills are also called generic skills, key competencies, key skills, portable skills, soft skills and transferable skills. (ILO 2019b)

Decent work

Defined by the ILO and endorsed by the international community as productive work for women and men in conditions of freedom, equity, security and human dignity. Decent work involves opportunities for work that is productive and delivers a fair income; provides security in the workplace and social protection for workers and their families; offers

prospects for personal development and encourages social integration; gives people the freedom to express their concerns, to organize and to participate in decisions that affect their lives; and guarantees equal opportunities and equal treatment for all. Decent work is seen as the synthesis of four strategic objectives: 1) achieving universal respect for fundamental principles and rights at work; 2) the creation of greater employment and income opportunities for women and men; 3) extending social protection; and 4) promoting social dialogue. (ILO 1999)

Decent work deficits

The decent work deficit is expressed in the absence of sufficient employment opportunities, inadequate social protection, the denial of rights at work and shortcomings in social dialogue. These failings fall into four categories: 1) the employment gap; 2) the rights gap; 3) the social protection gap; and 4) the social dialogue gap. (ILO 2001)

Desertification

Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities. (UNCCD 1994)

Disaster risk reduction

Disaster risk reduction (DRR) is aimed at preventing new and reducing existing disaster risk and managing residual risk, which contributes to strengthening resilience and, therefore, to the achievement of sustainable development. DRR is the policy objective of disaster risk management, and its goals and objectives are defined in DRR strategies and plans. (UNDRR n.d.)

Ecosystem

A dynamic complex of plant, animal and micro-organism communities and their nonliving environment interacting as a functional unit. (UNCBD 1992)

Ecosystem-based adaptation

The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. (UNCBD 2009)

Ecosystem-based approach

A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.

Employment

Persons in employment are defined as those of working age who, during a short reference period, were engaged in any activity to produce goods or provide services for pay or profit. They comprise: a) employed persons “at work”, i.e., who worked in a job for at least one hour; and b) employed persons “not at work” due to temporary absence from a job, or to working-

time arrangements (such as shift work, flextime and compensatory leave for overtime). Note: persons in employment may be engaged in multiple jobs during a given reference period. (See definition of 'job' below.) (ILO 2013b)

Environmental goods and services sector

The concept of employment in the environmental sector consists of two groups: 1) employment in production of environmental outputs; and 2) employment in environmental processes. (These concepts are defined below.) (ILO 2013c)

Full-time equivalent

Full-time equivalent (FTE) is a unit to measure an employed person's workload relative to a full-time work schedule. It allows for the comparison of the number of jobs created across sectors. FTE is usually measured in working time, such as hours of work or days of work. For example, if a full-time working week equals 40 hours, a 24-hour per week job would be equal to 0.6 FTE. It is noteworthy, however, that FTE does not indicate the number of people who benefited from the jobs generated, which should be evaluated separately.

Forms of work

There are five mutually exclusive forms of work. These forms of work are distinguished on the basis of the intended destination of the production (for own final use; or for use by others, i.e., other economic units) and the nature of the transaction (i.e., monetary or non-monetary transactions and transfers), as follows:

a) **own-use production work** comprising the production of goods and services for own final use (includes subsistence foodstuff producers defined below);

b) **employment work** comprising work performed for others in exchange for pay or profit (may be referred to as 'employment' as defined above);

c) **unpaid trainee work** comprising work performed for others without pay to acquire workplace experience or skills (in a trade or profession);

d) **volunteer work** comprising non-compulsory work performed for others without pay;

e) **other work activities** include such activities as unpaid community service and unpaid work by prisoners, when ordered by a court or similar authority, and unpaid military or alternative civilian service, which may be treated as a distinct form of work for measurement (such as compulsory work performed without pay for others).

(Note: Most of the productive activities within the forms of work framework correspond to the production boundary of the 2008 System of National Accounts (SNA). The exceptions are: 1) own-use production work producing services; and 2) volunteer work in households producing services; in these cases, the productive activity corresponds to the SNA general production boundary. (ILO 2013b)

Green jobs (policy definition)

Decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. Green jobs help to: a) improve energy and raw materials efficiency; b) limit greenhouse gas emissions; c) minimize waste and pollution; d) protect and restore ecosystems; and e) support adaptation to the effects of climate change. At the enterprise level, green jobs can produce goods or provide services that benefit the environment; for example, green buildings or clean transportation. However, these green outputs (products and services) are not always based on green production processes and technologies. Therefore, green jobs can also be distinguished by their contribution to more environmentally friendly processes. For example, green jobs can reduce water consumption or improve recycling systems. Yet, green jobs defined through production processes do not necessarily produce environmental goods or services. (ILO 2016)

Green jobs (statistical definition)

The term "green jobs" refers to a subset of employment in the environmental sector that meets the requirements of decent work (i.e., adequate wages, safe conditions, workers' rights, social dialogue and social protection). The decent work dimension of jobs in the environmental sector may be measured according to relevant indicators selected from the ILO manual on Decent Work Indicators. (ILO 2013c; ILO 2013d)

Green works

"Green works" as promoted by the ILO refer to the employment intensive development, restoration and maintenance of public infrastructure, community assets, natural areas and landscapes to contribute to environmental goals such as adaptation to climate change and natural disasters, environmental rehabilitation, ecosystem restoration and nature conservation. Common examples of green works are soil and water conservation, afforestation and reforestation, irrigation and flood protection.

Greening

Used in reference to strategies, policy interventions, actions or targets used to transform economies, enterprises and workplaces that can be characterized as environmentally sustainable, supporting social and environmental goals. (ILO 2013e)

Greening the economy

A strategy under consideration by countries to enhance the quality of life of their citizens and to pursue sustainable development goals. The transformation of traditional economies into green economies is based on making investments in technologies, systems and infrastructures that enhance productive economic activities while optimizing natural resource utilization and minimizing environmental impacts. The objective is to foster investments supporting social and environmental goals that would act as drivers for, instead of barriers to, sustainable economic growth. (ILO 2013e)

Hybrid ("green-grey") infrastructure

Infrastructure that combines elements of conventional built infrastructure and natural infrastructure.

Indigenous peoples

Although there is no universal definition, the Indigenous and Tribal People's Convention, 1989 (No. 169) provides criteria for identifying indigenous peoples, including self-identification and descent from populations who inhabited the country or geographical region at the time of conquest, colonization or establishment of present state boundaries. They retain some or all of their own social, economic, cultural and political institutions, irrespective of their legal status. (ILO 1989)

Informal employment / informality

Informal employment refers to working arrangements that are in practice or by law not subject to national labour legislation, income taxation, or entitlement to social protection or other employment guarantees; for example, advance notice of dismissal, severance pay, or paid annual or sick leave. Informality can exist even in the 'formal' sector. Casual, temporary and seasonal workers who lack social protection coverage or other employment benefits, or who fall short of full legal status, have informal employment status even when they work in the 'formal' sector. (ILO 2023)

Job

A set of tasks and duties performed, or meant to be performed, by one person for a single economic unit. A job is associated with work for pay or profit, i.e., employment. (ILO 2013b)

Just transition

A process that involves maximizing the social and economic opportunities of environmental action (including climate change action, ecosystem management and restoration, supporting biodiversity) while minimizing and carefully managing any challenges related to the impacts on the world of work, including gendered impacts, in an effort to facilitate decent work outcomes, ensuring social dialogue and respect for international labour standards in the process. The ILO Guidelines for a Just Transition are both a policy framework (covering nine mutually reinforcing policy areas) and a practical tool to help countries at all levels of development manage the transition to environmentally sustainable economies. (ILO 2015)

Labour force

The concept of the labour force refers to the current supply of labour for the production of goods and services in exchange for pay or profit. The sum of persons in employment and in unemployment equals the labour force. (ILO 2013b)

Land degradation

Reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:

- soil erosion caused by wind and/or water;
- deterioration of the physical, chemical and biological or economic properties of soil; and
- long-term loss of natural vegetation.

(UNCCD 1994)

Natural capital

Natural assets in their role of providing natural resource inputs and environmental services for economic production. (UN 1997)

Natural infrastructure

Strategically planned and managed networks of natural lands, water and soil, such as forests and wetlands, working landscapes and other open spaces that conserve or enhance ecosystem values and functions and provide associated benefits to human populations. Also sometimes called “green infrastructure” or “ecological infrastructure”. (UNEP 2022)

Nature

The phenomena of the physical world collectively, including plants, animals, the landscape and other features and products of the earth, as opposed to humans or human creations.

Nature-based enterprise

“An enterprise, engaged in economic activity, that uses nature sustainably as a core element of its product/service offering”, as proposed by Kooijman et al. (2021). Nature-based enterprises may use NbS directly by growing, harnessing, harvesting or sustainably restoring natural ecosystems, and/or indirectly by contributing to the planning, delivery or stewardship of NbS. However, it is not the expectation that everything these enterprises do would qualify as NbS.

Nature-based infrastructure

Nature-based infrastructure (NbI) solutions are a type of NbS that involves the protection, conservation, restoration, sustainable use and management of natural or modified ecosystems (or elements of them) to provide infrastructure services – either alone (i.e., natural infrastructure) or in conjunction with built infrastructure (i.e., hybrid infrastructure). (UNEP 2023b)

Nature-based solutions

Nature-based solutions (NbS) are actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits. (UNEA 2022)

Nature-based solutions(-related) jobs/employment

Jobs and employment created through the planning, design, implementation and management of NbS. They consist of those generated directly, indirectly and induced by NbS as well as NbS-related activities, and encompass activities in different sectors such as agriculture, forestry, fishing, eco-tourism, NbI (see above), city landscape planning, policymaking, education and research. While NbS(-related) jobs/employment are a subset of green jobs, it's important to note that not all NbS jobs are necessarily green jobs and not all NbS jobs meet the criteria for decent work.

Occupation

The kind of work performed in a job. The concept of occupation is defined as a "set of jobs whose main tasks and duties are characterized by a high degree of similarity". A person may be associated with an occupation through the main job currently held, a second job, a future job or a job previously held. (ILO 2012)

Payments for ecosystem services

Payments for ecosystem services (PES) is the name given to a variety of arrangements through which the beneficiaries of environmental services, from watershed protection and forest conservation to carbon sequestration and landscape beauty, reward those whose lands provide these services with subsidies or market payments. (WWF n.d.)

Protected area

A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. (IUCN definition)

Public employment programmes

Public employment programmes (PEPs) are publicly financed and government-implemented long-term investment programmes that directly create employment through productive activities with a high labour intensity, rather than through the expansion of civil services. These interventions share the primary objective of providing employment for workers who are unable to support themselves due to a shortage of market-based employment opportunities. (ILO definition)

Skill

The ability to carry out a manual or mental activity, acquired through learning and practice. The term "skills" is used as an overarching term for the knowledge, competence and experience needed to perform a specific task or job. (ILO 2019b)

Skills development

Understood in broad terms to mean basic education, initial training and lifelong learning. (ILO 2019b)

Skills for green jobs

Skills that are necessary to successfully perform tasks for green jobs (see definition of "green jobs" above) and to make any job greener. The term includes both core and technical skills and covers all types of occupations that contribute to the process of greening products, services and processes, not only in environmental activities but also in other sectors. (ILO 2019b)

Skills gaps

A term to describe the qualitative mismatch between the supply of human resources and the requirements of the labour market. "Skills gaps" exist where the existing workforce does not have adequate types or levels of skills to meet business objectives; or where new entrants to the labour market are apparently trained and qualified for occupations but still lack some or all of the skills required. (ILO 2015c)

Skills needs anticipation

Any forward-looking diagnostics used to identify skills needs expected on future labour markets, performed by any type of method, quantitative or qualitative, including interaction, exchange and signalling between labour market actors. (ILO 2015c)

Subsistence farmers

An important subgroup of persons in own-use production work (see definition under "forms of work" above). They are defined as:

a) all those who performed any activities concerning the production of "goods" (within the 2008 System of National Accounts (SNA) production boundary), specifically producing and/or processing for storage agricultural, fishing, hunting and gathering products in order to produce foodstuff that contribute to the livelihood of the household or family;

b) excluded are persons who engaged in such production as recreational or leisure activities.

(ILO 2013b)

Sustainable infrastructure

Sustainable infrastructure systems and assets are those that are planned, designed, constructed, operated and decommissioned in a manner that ensures economic and

financial, social, environmental (including climate resilience) and institutional sustainability over the entire infrastructure lifecycle. Sustainable infrastructure can include built infrastructure, natural infrastructure or hybrid infrastructure that contains elements of both. (UNEP 2021d).

Sustainable management

Management through which the present potential of the resource is used in the best possible way and does not reduce the availability of the resource.

Sustainable use

The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. (UNCBD 1992)

Technical and vocational education and training

Initial and continuing education and training provided by schools, training providers or enterprises that imparts the skills, knowledge and attitudes required for employment in a particular occupation, or group of related occupations, in any field of economic activity. (ILO 2019b)

Technical skill

Specialized skills, knowledge or know-how needed to perform specific duties or tasks in a particular occupation. (ILO 2013b)

Wages

Remuneration or earnings, however designated or calculated, capable of being expressed in terms of money and fixed by mutual agreement or by national laws or regulations, which are payable in virtue of a written or unwritten contract of employment by an employer to an employed person for work done or to be done or for services rendered or to be rendered. (ILO 1949)

Work

Any activity performed by persons of any sex and age to produce goods or to provide services for use by others or for own use. (Note: work is a broad concept that includes both paid and unpaid forms of work). (ILO 2013b)

Working time

The time associated with productive activities and the arrangement of this time during a specified reference period. Working time is determined in reference to productive activities within the general production boundary as defined in the System of National Accounts (SNA). Working time includes the time spent towards the production of all goods and services whether paid or unpaid. Working time does not take account of the legality of the activity, the type of contractual agreement covering it or the age of the persons performing it. (ILO 2008)

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