



International
Labour
Organization

UN 
environment
programme



Decent Work in Nature-based Solutions 2022



Decent Work
in Nature-based
Solutions **2022**



© International Labour Organization and the United Nations Environment Programme 2022



Some rights reserved. This work is available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>). Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited, as indicated below. In any use of this work, there should be no suggestion that the International Labour Organization (ILO) and/or the United Nations Environment Programme (UNEP) and/or International Union for Conservation of Nature (IUCN) endorses any specific organization, products or services. The use of the ILO, UNEP or IUCN logo is not permitted.

Required citation: ILO, UNEP and IUCN. 2022. Decent Work in Nature-based Solutions 2022. Geneva. Licence: [CC BY-NC-SA 3.0 IGO](https://creativecommons.org/licenses/by-nc-sa/3.0/igo)

If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: "This translation was not created by the International Labour Organization (ILO), the United Nations Environment Programme (UNEP) or International Union for Conservation of Nature (IUCN). ILO, UNEP and IUCN are not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition".

Third-party materials. This CC license does not apply to non-ILO copyright materials included in this publication. If the material is attributed to a third party, the user of such material is solely responsible for clearing the rights with the right holder.

ILO Photographs. ILO photographs are copyrighted and are not to be reproduced in any medium without obtaining prior written permission. Requests for permission to reproduce ILO photographs should be addressed to: multimedia@ilo.org

Any dispute arising under this license that cannot be settled amicably shall be referred to arbitration in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL). The parties shall be bound by any arbitration award rendered as a result of such arbitration as the final adjudication of such a dispute.

ISBN 9789220379714 (print); 9789220379721 (web PDF)

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the ILO and/or UNEP and/or IUCN concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the ILO, UNEP and IUCN in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

The responsibility for opinions expressed in signed articles, studies and other contributions rests solely with their authors, and publication does not constitute an endorsement by ILO and/or UNEP and/or IUCN of the opinions expressed in them.

All reasonable precautions have been taken by the ILO and/or UNEP and/or IUCN to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the ILO and/or UNEP and/or IUCN be liable for damages arising from its use.

Table of contents

Acknowledgements	12
Abbreviations	16
Executive summary	17
Chapter 1. Introduction	29
1.1 What are NbS?.....	32
1.2 What are decent work, green jobs and a just transition?.....	35
1.2.1 Work, decent work and green jobs	35
1.2.2 Just Transition	37
1.2.3 The ILO Just Transition Guidelines	39
1.2.4 International labour standards	41
1.3 Opportunities for employment and decent work in NbS	41
1.4 Global policy context	44
1.5 Structure of the report	47
Key messages	56
Chapter 2. Just transition policies and pathways	57
2.1 Challenges and opportunities	60
2.1.1 Macroeconomic and growth policies	62
2.1.2 Industrial and sectoral policies.....	62
2.1.3 Enterprise policies	63
2.1.4 Skills development.....	63
2.1.5 Occupational safety and health.....	65
2.1.6 Social protection.....	65
2.1.7 Active labour market policies.....	65
2.1.8 Rights.....	66
2.1.9 Social dialogue.....	67
2.2 Commonalities between IUCN Global Standard for NbS and ILO Just Transition Guidelines.....	69
2.3 Just transition through NbS as driver for decent work.....	71
Chapter 3. An overview of current work in NbS	84
3.1 Agriculture and work in NbS.....	86
3.2 Nature-based enterprises	92
3.3 Infrastructure development.....	95

3.4 Payment for Ecosystem Services.....	98
3.5 Public Employment Programmes	102
3.6 Volunteer work	105
3.7 Conclusions	109

Chapter 4. Conceptual framework for linking NbS with work and decent work outcomes 123

4.1 Construction of the framework	125
4.2 Concept scope and direct linkages	128
4.2.1 Definitions.....	128
4.2.2 Scoping the NbS/work relationship	132
4.2.3 Direct linkages between NbS activities, productive units and work in NbS	133
4.3 Conceptual framework	135
4.3.1 Direct, indirect, induced and secondary effects.....	135
4.3.2 Some considerations	140
4.4 Applying the framework.....	141
4.4.1 Types of work in NbS and skills needs.....	142
4.4.2 Distributional effects of NbS by demographic and other characteristics	143
4.4.3 Aggregating across NbS activities and multiple jobholders in NbS.....	144
4.4.4 Potential locations for NbS activities	144
4.5 Conclusions	145

Chapter 5. Measurement framework concerning decent work in NbS149

5.1 Overview of the measurement framework and key indicators	150
5.1.1 Measurement framework.....	152
5.1.2 Key indicators	157
5.2 Measurement of NbS activities, forms of work, decent work and green jobs	161
5.2.1 Relevant statistical guidance.....	161
5.2.2 Defining environmental activities and the links to NbS activities.....	162
5.2.3 Measuring economic effects.....	164
5.2.4 Measuring environmental effects	164
5.2.5 Measuring employment, work and forms of work	165
5.2.6 Measuring decent work	165

5.2.7 Measuring employment in the environmental sector, green jobs and decent jobs in NbS	168
5.2.8 Direct labour demand and supply	170
5.3 Key measurement challenges	171
5.3.1 Developing data collection methods.....	171
5.3.2 Classifications.....	171
5.4 Future areas of research.....	173
Chapter 6. Estimating current and future employment in NbS.....	178
6.1 A partial global estimate.....	179
6.1.1 Challenges.....	179
6.1.2 Estimating the current state-of-play in NbS work.....	180
6.1.3 Limitations of the approach	184
6.2 Estimates of the current state-of-play in NbS work.....	186
6.2.1 Spending in NbS activities.....	187
6.2.2 NbS work.....	190
6.3 Future potential for NbS-related employment	198
6.3.1 Estimating the future potential of work in NbS	199
6.4 Scenario design.....	199
6.4.1 Baseline scenario.....	199
6.4.2 Future NbS expenditure.....	200
6.5 Results of the scenario modelling.....	201
6.5.1 Macroeconomic effects	201
6.5.2 Employment effects.....	203
6.5.3 Results within the context of global climate goals.....	209
6.6 Conclusions	216
Chapter 7. Realizing the full potential of decent work in NbS	228
7.1 Measuring the quantity and quality of work in NbS.....	229
7.2 Quantity of employment in NbS	231
7.3 Quality of work in NbS	232
7.4 Way forward	234
Glossary.....	238
References	249

List of boxes

Box 1.1	Direct, indirect and induced employment opportunities from NbS.....	30
Box 1.2	Best practices for NbS implementation, according to the IUCN Global Standard for NbS.....	33
Box 1.3	Practical examples of NbS and the challenges they address	34
Box 1.4	Key global policy processes relevant to NbS and employment.....	45
Box 2.1	List of key informants.....	59
Box 2.2	Some characteristics of the new jobs created through Nature-based Solutions	64
Box 2.3	Indigenous peoples' participation in Nature-based Solutions: Vital for biodiversity conservation, climate action and a just transition for all.....	67
Box 2.4	Meaningful and inclusive social dialogue in Spain: A key driver for decent work creation through Nature-based Solutions	68
Box 3.1	NbS and the engineering profession	97
Box 3.2	Mahatma Gandhi National Rural Guarantee Scheme (MGNREGS).....	102
Box 4.1	Stakeholder survey on decent work in Nature-based Solutions....	126
Box 4.2	Green jobs concept and linkages with decent jobs in NbS.....	131
Box 5.1	Sustainable Development Goal 8: Relevance of selected indicators for measuring decent work in NbS	166
Box 6.1	Definition of variables used in the modelling.....	187
Box 6.2	Guatemala “deep dive”.....	210
Box 6.3	France “deep dive”	213

List of figures

Figure 1.1	ILO's Decent Work Agenda	36
Figure 1.2	Shift to greener economies targeting NbS: Impacts on jobs and unpaid work activities.....	38
Figure 1.3	The ILO Just Transition Guidelines and intervention model.....	40
Figure 1.4	Variation in employment intensity resulting from selected Nature-based Solutions	43
Figure 2.1	IUCN global standard for Nature-based Solutions and ILO Just Transition Guidelines: Common themes.....	70
Figure 3.1	How Nature-based Solutions involve people working with nature	85
Figure 5.1	Relationship between total employment, jobs in the environmental sector, jobs in NbS, decent jobs and green jobs.....	169
Figure 5.2	Direct labour demand and labour supply in Nature-based Solutions (excluding unemployment and potential labour supply).....	170
Figure 6.1	Mapping of data sources to estimate NbS employment	182
Figure 6.2	NbS employment across geographic region by sector (percentage of sectoral NbS employment).....	195
Figure 6.3	NbS employment (thousands) across geographic regions by sector (percentage of regional NbS employment).....	207

List of tables

Table 3.1	Certified organic agricultural land and producers worldwide (2020)	89
Table 3.2	Examples of activities undertaken by nature-based enterprises	93
Table 3.3	Selected national PES or PES-like schemes.....	100
Table 3.4	Selected Public Employment Programmes and associated NbS-related employment	104
Table 3.5	Volunteering on protecting or preserving nature in countries where data are available	107
Table 5.1	Topics and selected measures on forms of work and decent work in NbS and related economic measures and ecosystem effects, by environmental sector and non-environmental sector	155
Table 5.2.	Proposed key indicators of employment, decent work and unpaid forms of work in NbS	159
Table 6.1	Expenditure allocation on Nature-based Solutions, excluding Public Employment Programmes and Payments for Ecosystem Services programmes (million USD, 2020 prices)	183
Table 6.2	NbS expenditure contribution to GDP and its components by region (by percentage of total and million USD, 2020 prices)	189
Table 6.3	Employment and volunteers in NbS by region (thousand persons).....	192
Table 6.4	Employment in NbS by region (thousand FTEs).....	193
Table 6.5	Jobs (FTEs) created by NbS investment/expenditure.....	197
Table 6.6	Additional NbS expenditure contribution to GDP in 2030 by region (percentage and million USD, 2020 prices)	202
Table 6.7	Additional employment by 2030 in NbS by region	205
Table 6.8	Employment in NbS by sector and income region, absolute difference from baseline	208

Acknowledgements

CORE TEAM

The Decent Work in Nature-based Solutions 2022 report was co-directed by **Maikel Lieuw-Kie-Song** (International Labour Organization, ILO), **Monica Castillo** (ILO), **Emanuele Brancati** (ILO), **Barney Dickson** (United Nations Environment Programme, UNEP), **Rowan Palmer** (UNEP), **Juha Siikamäki** (International Union for Conservation of Nature, IUCN) and **Leander Raes** (IUCN).

STEERING COMMITTEE

The Steering Committee, which provided advice and guidance to ensure the relevance of the report, as well as its content and technical standard, consisted of **Claire Harasty** (ILO, Co-Chair), **Jonathan Hassell** (UK Foreign, Commonwealth and Development Office, FCDO), **Jesse DeMaria-Kinney** (Adaptation Research Alliance), **Natalia Alekseeva** (UNEP), **Christian Peter** (World Bank), **Riad Sultan** (University of Mauritius/ GAIN Network), **Reuben Sessa** (FAO), **Samantha Stratton-Short** (United Nations Office for Project Services, UNOPS), **Garo Batmanian** (World Bank) (replaced by **Christian Albert Peter**, World Bank, in Sept 2022).

CHAPTER AUTHORS

Chapters of this report were prepared by authors who contributed their expertise from diverse technical and policy perspectives. We are grateful for their contributions.

Chapter 1. Introduction: **Hannah Reid**

Chapter 2. Just Transition policies and pathways: **Gabriela Balvedi Pimentel**, **Monica Castillo** and **Kees van der Ree**

Chapter 3. An overview of current work in NbS: **Maikel Lieuw-Kie-Song**, **Leander Raes** and **Hannah Reid**

Chapter 4. Conceptual framework: **Monica Castillo** and **Carl Obst**

Chapter 5. Measurement framework concerning decent work and employment in NbS: **Monica Castillo** and **Carl Obst**

Chapter 6. Estimating current and future employment in NbS: **Jennifer Dicks**, **Cornelia-Madalina Suta**, **Eva Alexandri**, **Robin Lechtenfeld** and **Leander Raes**. Additional contributors: **Stephen Lambert**, **Alistair Smith** and **Francisco Arsénio**

Chapter 7. Conclusions: **Maikel Lieuw-Kie-Song**, **Barney Dickson** and **Juha Siikamäki**

CASE STUDY CONTRIBUTORS

CASE STUDY	IMPLEMENTING INSTITUTION/ PARTNER	AUTHORS	COLLABORATORS
The Gambia	UNEP	Oscar Ivanova	Daniel Pouakouyou (UNEP) Malanding S. Jaiteh (Ministry of Environment, Climate Change and Natural Resources, The Gambia), Barney Dickson (UNEP)
Restoration Barometer	IUCN	Leander Raes (IUCN)	Tony Nello (IUCN Regional Office for Mexico, Central America and the Caribbean, ORMACC)
Costa Rica	FONAFIFO (government)	Gilmar Navarrete Chacón (Fondo Nacional de Financiamiento Forestal FONAFIFO, FONAFIFO)	Pavel Rivera (IUCN-ORMACC)
South Africa	Environmental and Rural Solutions (ERS) (NGO)	Sissie Matela (ERS, Environmental and Rural Solutions), Nicky McLeod (ERS), Kgomotso Matthews (Conservation South Africa, CSA), Samir Randerer-Rees (World Wildlife Fund, WWF), Diego Portugal Del Pino	Caroline Gelderblom (WWF), Alice Barlow-Zambodla (CSA)
Kenya	Plan International (NGO)	Chiara Ambrosino, Phanuel Owiti	Harriet Osimbo (Plan International), Swalehe Nzao, Albert Mlamba (Plan International), Andrew Nyamu
Peru	Instituto de Montaña (NGO)	Mirella Gallardo (Instituto de Montaña), Yadira Mori (Instituto de Montaña), Daniella Vargas-Machuca (Pontifical Catholic University of Peru), Florencia Zapata (Instituto de Montaña), Diego Portugal Del Pino	
Pakistan	Ministry of Climate Change	Asim Jamal (Third Party M&E Consortium for Ten Billion Tree Tsunami Programme, TBTP), IUCN Pakistan) and Mehmooda (IUCN Pakistan)	
Colombia	Grupo Argos (Private)	Maria Camila Villegas (Grupo Argos), Jose Erlin Guerrero Martinez (Grupo Argos), Jairo Alberto Villada Arroyave (Celsia Energía), Alex Mauricio Vargas Vacca (Celsia Energía), Daniela Bueno Londoño (Grupo Argos)	

ACKNOWLEDGEMENTS

CASE STUDY	IMPLEMENTING INSTITUTION/ PARTNER	AUTHORS	COLLABORATORS
Australia	City of Melbourne	Kelly Hertzog (City of Melbourne), Giuliana Leslie (City of Melbourne) and Diego Portugal Del Pino	
Mexico, Belize, Guatemala and Honduras	WWF	Alejandra Calzada Vázquez Vela (WWF), Diego Portugal Del Pino	María Amalia Porta (WWF), Pilar Velásquez (WWF), Mauricio Mejía (WWF), Lilian Márquez (WWF), Nadia Bood (WWF), Rosario Calderón (WWF), Janne Rohe (WWF)
Sierra Leone	Government/ World Bank	Larissa Jenelle Duma (World Bank), Diego Portugal Del Pino	Robert Reid (World Bank), Davison Muchadenyika (World Bank) and Brenden Jongman (World Bank)
China	Government	Yuli Chen (ILO)	
Burkina Faso	ILO	Yuli Chen (ILO), Frédéric Bandon Mboyong (ILO)	
Portugal	Municipality of Almada	Patricia Pinto da Silva (Municipality of Almada), Diego Portugal Del Pino	Duarte Mata (Municipality of Almada)

BOXES (where not by chapter authors)

Engineering profession and NbS: **Rowan Palmer, Joseph Price** and **Maximilian Beck**

Guatemala Deep Dive: **Leander Raes**

France Deep Dive: **Stephen Lambert**

Stakeholder survey on decent work in Nature-based Solutions: **Devora Levakova** and **Monica Castillo**

REVIEWERS

We would like to extend our gratitude and recognition to the following reviewers for their precious time and dedication. Their valuable comments and suggestions helped strengthen the report.

Andrea Lorenzetti
 Angela Andrade
 Anna De Palma
 April Connelly
 Bert De Wel
 Boris Van Zanten
 Carl Obst
 Catarina Silveira

Chidi King
 Christian Peter
 Christoph Ernst
 Claire Harasty
 Dinara Akhmetova
 Dorsa Sheikholeslami
 Ekkehard Ernst
 Elisa Selva

Elisenda Estruch Puertas
 Emanuela Pozzan
 Emmanuelle Cohen-Shacham
 Esteban Tromel
 Eva Majurin
 Fanni Moilanen

Gabriela Balvedi Pimentel	Kee Beom Kim	Ruth Tiffer Sotomayor
Gitika Goswami	Liette Vasseur	Salman Hussain
Hannah Reid	Lucie Servoz	Stephen Mooney
James Kairo	Marek Harsdorff	Susan Mutebi-Richards
Jessica Smith	Maria Vandoni	Swati Hingorani
Jitendra Vir Sharma	Mariangels Fortuny	Syed Mohammad Afsar
Joana Pedro	Matias Piaggio	Valentina Stoevska
Jonathan Hassell	Melissa De Kock	Valeria Giner
Jonathan Whiteley	Michelle Leighton	Waltheri Katajamäki
Jose Rehbein	Nathanael Pingault	Xiaoting Hou Jones
José Luis Viveros Añorve	Nicholas Conner	Yasuhiko Kamakura
	Ritesh Kumar	

SPECIAL THANKS

Maikel Lieuw-Kie-Song (ILO) is very much appreciated for his role in coordinating the outputs and timelines of the report, interagency cooperation agreements, reporting to donors and other coordination aspects in close collaboration with core team members, in addition to supervising chapters 1, 3 and 6. We very much appreciate the contributions of **Monica Castillo** (ILO) for her role in coordinating and supervising chapters 2, 4, 5 and the Stakeholder Survey on Decent Work in Nature-based Solutions (Appendix 1). **Emanuele Brancati** (ILO) is well appreciated for coordinating the development of the case studies.

We appreciate the support of **Diego Portugal Del Pino** for identifying and developing many of the case studies, **Yuli Chen** for her support in various roles, **Erin O'Connell** for the report editing, **Dóra Almássy** for sharing relevant information and analysis from the **Urban Nature Atlas**, and **Kym Whiteoak** for background research for Chapter 3. This report was made possible through financial support from the **UK Foreign, Commonwealth and Development Office (FCDO)**, **Ministry of the Environment, Finland**, and **IUCN Restoration**.

The authors declare no conflict of interest in the writing of this report. The views in this report are those of the authors and are independent of the funding institutions. All errors and omissions remain the authors' own.



**This report is a joint contribution
of ILO, UNEP and IUCN to the
UN Decade on Ecosystem Restoration**

Abbreviations

CBD	United Nations Convention on Biological Diversity
COVID-19	coronavirus disease
EBA	Ecosystem-based Adaptation
FTE	full-time equivalent
GDP	gross domestic product
GHG	greenhouse gas
ICLS	International Conference of Labour Statisticians
ILO	International Labour Organization
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ITC	International Trade Centre
IUCN	International Union for Conservation of Nature
NAP	National Adaptation Plan
NBE	nature-based enterprises
NBS	Nature-based Solutions
NBSAP	National Biodiversity Strategy and Action Plan
NDC	Nationally Determined Contribution
OECD	Organisation for Economic Co-operation and Development
PEP	Public Employment Programme
PES	Payments for Ecosystem Services
SDG	Sustainable Development Goal
SEEA	United Nations System of Environmental-Economic Accounting
SME	small and medium-sized enterprise
SNA	United Nations System of National Accounts
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNEA	United Nations Environment Assembly
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WEF	World Economic Forum
WWF	World Wildlife Fund

Executive summary

Nature-based Solutions can generate millions of new jobs, but ‘just transition’ policies are needed

Given their potential to deliver a wide range of socio-economic benefits and services while also combatting climate change and addressing biodiversity loss, Nature-based Solutions (NbS) are increasingly seen as a way to meet the objectives of several global agreements. In a resolution on NbS adopted at the UN Environment Assembly (UNEA) in March 2022, NbS are defined 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 well-being, ecosystem services and resilience and biodiversity benefits”.

Work comprises 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. Decent work is a multidimensional aspirational concept that is central to achieving social justice. Recognized by the UN system and the broader international community, and incorporated in the Sustainable Development Goals, the concept of decent work aims to provide opportunities for work that is productive and delivers: a fair income; security in the workplace and social protection for families; better prospects for personal development and social integration; freedom for people to express their concerns, organize and participate in the decisions that affect their lives; and equality of opportunity and treatment for all people.

Green jobs help preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in emerging green sectors such as renewable energy and ecosystem restoration. They help improve energy and raw materials efficiency; limit greenhouse gas emissions; minimize waste and pollution; protect and restore ecosystems; and support adaptation to the effects of climate change. According to an international statistical standard adopted in 2013, green jobs are defined as a subset of employment in the environmental sector that meets the requirements of decent work.

Some but not all work in NbS can be considered decent work. Moreover, because not all NbS work is decent work, only part of all employment opportunities in NbS are truly green jobs. Yet there is great potential for NbS to contribute to decent work and green jobs, as well as to the achievement of national and global climate and biodiversity goals. We need to understand not only the full range of benefits they can deliver but also the potential risks if NbS are not implemented appropriately.

There are many challenges to estimating the number of current jobs or total employment in NbS, or that could be created through further expenditure in NbS. These include limitations related to the coverage of the data, the inability of the modelling to capture several types of employment that are likely to result from NbS activities and employment related to NbS not driven by increased investment, and the difficulty in separating net effects, as NbS activities might lead to decreases in economic activity in other sectors. Further research and data collection efforts are required to understand these additional employment impacts of NbS activities for the accuracy of future employment estimates to be improved.

Assessing the quantity and quality of work in NbS requires both clear concepts of 'work' and activities in 'Nature-based Solutions', as well as the ability to connect the former to the latter. But while an international statistical standard definition exists for the concept of work, and there is also a good understanding of the concept of NbS, the challenge lies in applying the concepts to particular activities. This 'application problem' poses a major challenge to estimating the quantity and quality of current and future NbS-related work. As defined, NbS are required to provide 'human well-being' and 'biodiversity' benefits, but ascertaining whether these requirements are met can be challenging in practice and requires careful assessments almost on a case-by-case basis. Further complications arise in instances where NbS are combined with other approaches, such as in 'green-grey' infrastructure.

With this caveat, the analysis in this report suggests that an estimated nearly 75 million people are currently working in NbS. Much of this employment is part-time, and total employment is around 14.5 million full time-equivalents (FTEs). Tripling investment in NbS by 2030 to achieve climate change mitigation, biodiversity and land restoration goals – as called for in the State of Finance for Nature 2021 Report¹ – can generate an estimated additional 20 million jobs (16 million FTEs).

These figures must be considered partial, as they are based on limited data and modelling of public and private investments in NbS, combined with

¹ UNEP, *State of Finance for Nature 2021*.

administrative records for Public Employment Programmes (PEPs), which may not capture existing NbS work not linked to reported expenditure figures. Moreover, they do not capture any job losses and displacements that may occur with the implementation of NbS. Further work and complementary approaches may be required to develop a more complete picture of all NbS-related employment, including issues relating to gender parity.

However, while partial, these estimates illustrate the importance of NbS for the world of work. As a result of the necessary transitions brought about by increased adoption of NbS, new employment and work activities will be created, some will be substituted or redefined, and some employment and (unpaid) work activities will be eliminated. Increased use of NbS can pose important short- to medium-term risks to jobs and livelihoods, particularly in areas where it requires a transition away from the current unsustainable use of nature. Just transition measures to mitigate the impacts of these transitions can include job placement services, re-employment training, early retirement, ensuring access to unemployment benefits, and the use of PEPs and payment for ecosystem services (PES) programmes.

Just transition is key to creating decent work in NbS.

In addition to helping to mitigate the risks of the transitions related to increased use of NbS, the right mix of just transition policies can also help to ensure that the implementation of NbS leads to the creation of decent work opportunities, especially in rural areas.

There is currently no guarantee that employment in NbS will be decent or result in green jobs. Further, as countries respond to the triple planetary crisis of climate change, biodiversity loss and pollution, inaction in developing and implementing just transition policies could result in missed opportunities for businesses and decent work, thereby deepening existing inequalities, reducing productivity, and increasing social discontent.

A just transition aims at greening the economy in a way that is fair and inclusive to all concerned by maximizing the social and economic opportunities of environmental actions – including climate action and protecting biodiversity – while minimizing and carefully managing the negative impact on workers and enterprises. It aims to support workers, enterprises and communities affected by economic shifts away from certain sectors and regions, and seeks to ensure that no one is left behind in the transition. The goal of the transition is to create green jobs and decent work for all in environmentally sustainable societies and economies.

The ILO Just Transition Guidelines provide a framework to leverage opportunities for decent work and green jobs in NbS while providing a platform to enable the full participation of social partners, women, and indigenous peoples. Implementing a just transition does not erase the trade-offs inherent to transitions, including those related to NbS, but these guidelines indicate how to manage the trade-offs in a fairer way. Inclusive monitoring and evaluation mechanisms can help identify and address challenges that may emerge in the process. Interventions along the nine policy areas of the guidelines – macroeconomic and growth policies, industrial and sectoral policies, enterprise policies, skills development, occupational safety and health, social protection, active labour market policies, rights, and social dialogue and tripartism – could help ensure that employment in NbS is decent.

The IUCN Global Standard for NbS, which provides detailed guidance on the key characteristics of successful NbS, and the ILO Just Transition Guidelines share common themes that can be leveraged to support decent work in NbS. These themes include: evidence-based decision-making, inclusive and meaningful stakeholder engagement, policy coherence and use of tools across portfolios to maximize opportunities and mitigate risks, and upholding of rights and fostering empowerment.

We need to understand the role that NbS can and do play in creating employment and decent work – especially for the poorest and most vulnerable people.

NbS, work and decent work interact in complex ways. Understanding these interactions in a given context is critical for informing the various policy, programme, and project-level interventions that can be made to implement NbS with a view to decent work outcomes.

However, despite calls from related global initiatives for the application of a general approach towards the coherent integration of data across environmental, economic and social domains, there is presently no systematic long-term effort to measure, track, analyse, model and forecast the quantity, duration and decent work dimension of work generated by investments in NbS. Without a better understanding of the role that NbS play in creating employment, it will be difficult to put in place the right policy frameworks, ensure the necessary finance is available, and win broad support. Understanding the risks and benefits of the potential options requires the definition and monitoring of different work outcomes associated with NbS actions.

Until comprehensive data are available, measurement of employment, unpaid forms of work, and decent work in NbS over the long term can be carried out through the integration of various datasets relevant to both decent work and NbS by applying and adapting existing statistical standards and methodological guidance. Supported by the Stakeholder Survey on Decent Work in NbS,² this report proposes a **conceptual framework** and a **measurement framework** with a view to supporting discussion of decent work in NbS, informing the integration of relevant policies, and encouraging dialogue between specialists towards a better understanding across the different policy areas of NbS and decent work. The measurement framework includes a set of indicators of employment, decent work and unpaid forms of work in NbS to support evidence-based policy making.

This report explores two approaches to assessing work in NbS. The first approach is to propose the integration of existing data and possibly new sources of data based on existing statistical standards and guidance for the improved statistical measurement of the quantity and quality of work in NbS. Such an approach would deliver reliable estimates on levels and trends of selected indicators about the quantity and quality of work in NbS at the national level. These estimates could then be aggregated to regional or global levels if sufficient countries participated. However, the approach would also need to find a way to overcome the challenges of the ‘application problem’ noted above.

The second approach, which is used in the report to provide international-level estimates of the quantity of employment in NbS, makes use of both existing data sources and modelling tools, and tries to find ways around the application problem by focusing on sectors where it is easier to determine whether work is likely to count as NbS, combined with a readiness to make assumptions where information is incomplete. While this approach is able to generate estimates about the quantity of work in NbS both currently and in the future, its limitations are that the picture is inevitably partial – because of the focus on particular sectors and the reliance on currently scarce available data – and uncertain, because the underlying assumptions are weakly supported. The model used in the report does not provide future estimates of job losses or displacements due to a shift to NbS (including with a just transition scenario); alternative models could be explored to provide such estimates.

The two approaches are complementary. As improved data become available from the first approach, this would strengthen the results from the modelling used in the second approach and provide greater insights regarding job quality.

² See Appendix 1

The steps outlined in this report to adopt a measurement framework and indicators for measuring employment, unpaid forms of work and decent jobs in NbS, should be initiated in the near term in order to pave the way for establishing a more comprehensive system of measurement in the medium to long term that is integrated with existing economic, environmental and labour statistics frameworks such as the United Nations' System of National Accounts (SNA), UN System of Environmental-Economic Accounting (SEEA) and International Conference of Labour Statisticians (ICLS) standards.

NbS work is highly concentrated in certain sectors and geographies.

Of the estimated 75 million people currently working in NbS activities, the vast majority (96 per cent) are in Asia and the Pacific and lower-middle income countries. This is despite most of NbS expenditure occurring in the regions of higher income levels. In low income and lower-middle income regions, nearly all NbS work (98 per cent and 99 per cent, respectively) is in the agriculture and forestry sectors. This share falls to 42 per cent for upper-middle income and to 25 per cent in high income countries. Findings suggest that the majority of NbS work and expenditure in Asia Pacific and Africa are in, or relate to, the agricultural sector. This points to the crucial contribution of nature to agricultural productivity (through soil health, irrigation, biodiversity). It also shows the potential of NbS as a focus of government policy to achieve multiple objectives: to create jobs and increase agriculture output and food security, while also growing natural capital, environmental and human health benefits. This would contribute to employment creation in rural areas and to climate change adaptation.

In industrialized countries, where agricultural productivity is high, NbS spending is concentrated in ecosystem restoration and natural resource management. Public services contribute the largest share of NbS work in high income countries (37 per cent), with construction also representing a fair share (14 per cent). Induced and indirect effects on employment in distribution, retail, hotel and catering are also observed.

PEPs and PES are two important vehicles that enable many people to work in sustainable resource management. Around 80 per cent of this estimated employment (as measured in FTEs) in NbS is generated through PEPs, in particular through the Mahatma Gandhi National Rural Employment Guarantee Act in India, which spends about 65 per cent of its resources on natural resource management activities. While the employment generated by such programmes is well recorded, there are uncertainties about the extent to which these jobs can be considered NbS actions, as most were not designed

for this purpose and may not take biodiversity benefits sufficiently into account. They offer mostly low-skilled work at basic wages and would need to be strengthened to improve both their NbS and decent work outcomes.

NbS are especially prevalent in rural areas, where workers are twice as likely to be engaged in informal employment than their urban counterparts. The potential of increased use of NbS for work can be transformative in helping to overcome deficits in employment opportunities, adequate pay, stability and security of work, safety at work, social protection, and social dialogue. The potential role of NbS for employment in urban areas is also significant, and many NbS-related activities in rural areas are conducted to serve urban needs, such as food provision for city residents and watershed management for urban water supplies. The impacts of NbS on employment in urban areas are likely to be concentrated in specific sectors and activities with a strong link to NbS, such as water and flood management, development of urban public spaces, green buildings, and use of natural and hybrid infrastructure.

In addition to employment, volunteering is also an important source of labour for NbS, with an estimated 16 million people engaged in various types of NbS working as volunteers. However, this estimate is based on a limited dataset that covers only 61 countries, with very few data points within those countries. The nature of the work and how to best ensure it is decent work requires further research and must be analysed based on specific contexts.

Again, the above figures must be considered partial for the aforementioned reasons.

Increasing investment in NbS in synergy with a just transition framework can leverage their potential as a driver for green jobs and decent work.

Of the estimated additional 20 million jobs (16 million FTEs) potentially created by a tripling of investment in NbS by 2030, about 12.6 million are likely to be generated in Asia and 5.7 million in Africa. Around 14 million, or 70 per cent of these will be created in the agriculture and forestry sector. While this is a more than five-fold increase of current non-PEP NbS employment, this is still likely an underestimate of the employment potential of NbS, because additional financing called for in the State of Finance for Nature 2021 report does not include increased investment in NbS for responding to climate change adaptation, disaster risk-reduction, food security or other social and economic challenges.

This tripling of investment/expenditure translates into just under US\$400 billion annual expenditure in NbS activities worldwide in 2030. The majority of additional future NbS expenditure is expected to occur in Asia and the Pacific, the Americas and Europe and Central Asia.

In scaling up NbS, it will be necessary ensure high standards of NbS, including of any employment created. Social dialogue contributes to risk mitigation and inclusive policymaking by providing a platform for participatory processes and dialogue between governments, trade unions and the business community. Decision-making to promote decent work in NbS requires building on social dialogue mechanisms to establish a broad stakeholder constituency. Participatory and gender-responsive decision-making are critical for the implementation of NbS, as well as to ensure that potential risks arising from the use of NbS are mitigated. The ILO Just Transition Guidelines, UNEA Resolution, and IUCN Global Standard all stress the importance of following participatory approaches, and these three frameworks are complementary in this regard. It is particularly critical to engage local men and women and indigenous peoples.

Active labour market measures can support enterprises, workers and unemployed persons facing challenges stemming from transitions to a sustainable economy. As noted above, PEPs are relevant policy instruments to complement private sector job creation as they can respond to unemployment and underemployment challenges while simultaneously offering an avenue for public investment in natural capital via NbS. Moreover, NbS linked to employment guarantee schemes can help people bridge the gap while transitioning to new sectors or formal jobs.

Enterprise policies can facilitate, accelerate and incentivize more resilient and sustainable businesses in NbS through regulatory frameworks and institutions, coupled with economic policies and incentives. Measures to support formalization of enterprises and support to small- and medium-sized enterprises (SMEs) will be essential. An enabling environment for sustainable enterprise development is needed to support business as the demand for NbS from both public and private investment grows. It also requires national governments to stop prioritizing and subsidizing sectors and related enterprises that can deliver high economic growth in the short-term but deplete natural resources and damage the environment.

Investing in education, re-skilling and up-skilling through just transition **skills policies** may help prepare for jobs and build long-term capacity to improve employability in NbS, enhance productivity, improve gender equality and promote a better gender balance in transition-affected occupations, increase professionalization and help overcome decent work deficits. Increased investment will increase demand for a range of specialized jobs in design,

engineering, project management and monitoring. In rural areas, new farming skills will be needed to support shifts to more sustainable NbS-related food systems.

The role of the private sector in delivering NbS involves three potential roles of particular interest: adoption and incorporation of NbS into production processes and supply chains where possible; enabling private investors in NbS to drive the creation of decent jobs by accounting that demonstrates how NbS benefits can cover the cost of labour and offer returns; and harnessing private sector capacity to scale up implementation of NbS, dependent on further investigation of the opportunities and risks and constraints for private sector actors in this area.

Comprehensive and sustainable social protection systems and institutions can provide unemployment protection and re-skilling programmes towards NbS activities for laid-off workers and support women's participation in NbS through access to day care services, maternity and paternity leave protection, and healthcare. Occupational safety and health standards and capacity building are also critical components for upholding decent work in NbS, given the risks and potentially hazardous working conditions in some NbS activities.

International labour standards provide guidance for the greening of economies and may be used to encourage NbS activities to uphold the Fundamental Principles and Rights at Work while minimizing potential risks for workers. Many standards cover specific industries or groups of workers, offering a social pillar to strengthen the ability for NbS to deliver decent work. International labour standards can also guide an inclusive policymaking process in NbS. The Indigenous and Tribal Peoples Convention, 1989 (No. 169) is a highly relevant platform for indigenous peoples' participation in formulating, implementing, monitoring, and evaluating climate- and biodiversity-related policies and plans.

Finally, the importance and potential of NbS for decent work also needs to be incorporated more visibly into global initiatives such as the UN Decade for Ecosystem Restoration and Climate Action for Jobs. The international institutions engaged in these initiatives as lead agencies and partners should consider closer collaboration and partnership initiatives that specifically promote decent work in NbS and a just transition approach to promoting NbS should be better integrated into National Biodiversity Strategy and Action Plans (NBSAPs), National Adaptation Plans (NAPs), and Nationally Determined Contributions (NDCs), including more concrete, evidence-based NbS targets.

CHAPTER
TWO
ONE



Key messages

- Nature-based Solutions (NbS) are increasingly seen as a way to meet the objectives of several global agreements and can be central to a just transition – if the right mix of just transition policies are implemented. But there is currently no guarantee that NbS will generate decent work or green jobs.
- Transitions to a green economy will affect the world of work in different ways: some employment and (unpaid) work activities will be eliminated, some will be substituted or re-defined, and new employment and work activities will be created.
- Recognizing the potential long-term nature of work in NbS may require a shift in approach – acknowledging that employment generation can be a targeted outcome and a benefit from NbS implementation rather than a project cost.
- There is presently no systematic, long-term effort to measure, track, analyse, model and forecast the quantity, longevity and decent work dimension of work generated by investments in NbS. A better understanding of the role that NbS can and do play in creating employment, especially for the poorest and most vulnerable people, is needed.
- This report is the first in a global biennial report series that aims to fill these knowledge and advocacy gaps.

Chapter 1

Introduction



This report aims to improve the understanding of the role and importance of Nature-based Solutions (NbS) in work, especially in decent work creation, supported by a Just Transition towards environmentally sustainable economies and societies for all. While there has been independent work on these important issues, this report represents the first major collaborative effort that takes a cross-cutting approach, bringing learning together from each of these areas to ultimately inform and drive better outcomes for people and nature.

Given their potential to deliver a wide range of socio-economic benefits and services while also combatting climate change and addressing biodiversity loss, NbS have attracted increasing international attention in recent years. The term emerged in the late 2000s and was promoted by the International Union for Conservation of Nature (IUCN) at the United Nations Framework Convention on Climate Change (UNFCCC) in 2009. The term was first defined, along with proposed NbS principles, in an IUCN resolution adopted at the World Conservation Congress in 2016 (Cohen-Shacham et al. 2016; IUCN 2016). The movement of NbS into mainstream policymaking has further accelerated in recent years. These developments include the 2021 G7 and 2020 G20 meetings, where NbS was highlighted in the communiqués, and the UN Environment Assembly (UNEA) in March 2022, where NbS became the subject of one of 14 resolutions passed (UNEP 2022a).

NbS have gained notable traction in the context of the UNFCCC because of the potential key role nature can play in mitigating climate change and helping people adapt to its impacts (also known as Ecosystem-based Adaptation (EbA)). However, NbS can address challenges beyond climate change, including the need for economic and social development, biodiversity

loss, ecosystem collapse/degradation, food insecurity, disaster risk, water insecurity and human health concerns. As such, NbS cut across all three Rio Conventions and are increasingly recognized as important for achieving the Sustainable Development Goals (SDGs) and commitments under other global agreements such as the Sendai Framework for Disaster Risk Reduction (Commonwealth Secretariat 2021).

The value of nature is also acknowledged in a just transition approach, which aims to ensure that workers and enterprises affected by the transformation to sustainable economies and societies are adequately supported, and that direct, indirect and induced (see box 1.1) opportunities for the creation of decent work are maximized. As NbS are a key component of such an approach, labour market impacts associated with a shift to NbS need to be well understood. This includes a solid understanding of the employment and decent work implications of enhanced NbS and the just transition policies required to support them.

BOX 1.1

Direct, indirect and induced employment opportunities from NbS

Direct employment creation in NbS occurs when there is increased demand and investment in NbS services and products, as well as in the equipment and infrastructure to produce them. Indirect employment opportunities from NbS result from benefits to other parts of the economy that supply inputs to expanding NbS industries and enterprises. Induced employment creation occurs when income generated by this additional economic activity is redistributed by spending on additional consumption and investment across the economy,

and when the environment improves because of NbS, hence driving additional work outcomes. Induced employment opportunities also emerge due to secondary environmental effects.

Framing employment creation opportunities as direct, indirect and induced in this way provides one route to understanding and measuring the socio-economic multiplier benefits of NbS that have long been acknowledged but have proved challenging to quantify.

Poor and vulnerable people are often highly dependent on natural resources for their lives and livelihoods, especially in rural areas. They also depend disproportionately on income from formal and informal work (as opposed to investments, savings, inheritances, the state or other sources of household income) to support their families. Informal work is particularly important for poor and vulnerable groups. To date, the socio-economic benefits of NbS

have been largely described using qualitative measures related to livelihoods and well-being rather than quantified measures related to employment and formal or informal work. A better understanding of the role that NbS do and can play in creating employment, especially for the poorest and most vulnerable people, is needed.

Increased investment in NbS will have sizable employment implications for workers and enterprises engaged in NbS. However, natural resource management interventions promoted by environment or development organizations seldom articulate the employment implications of the interventions, in part due to a lack of capacity to assess impacts (see, for example, Reid et al. 2019). The potential for long-term employment growth in NbS is significant. Thus, decision-makers who prioritize social and economic outcomes over those related to the environment – rather than prioritizing all three types of outcomes in an integrated and coherent manner – miss out on sustainable development outcomes with benefits for people *and the planet*.

Interest in the topic of employment in NbS is growing among scientists and international organizations. The Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES 2019) stresses the importance of nature in the context of employment creation. The latest Intergovernmental Panel on Climate Change report (IPCC 2022) states that “the literature is generally positive about the ability of NbS to support climate risk reduction and deliver multiple other benefits ... such as green job opportunities” but argues for more research to evaluate the conditions and contexts in which these potential benefits are realized, as well as how they can be mainstreamed into policy.

Recent studies include Lieuw-Kie-Song and Pérez-Cirera (2020), O’Callaghan and Murdock (2021), and World Economic Forum (2020a). However, there is presently no systematic, long-term effort to measure, track, analyse, model and forecast the quantity, longevity and decent-work dimension of work generated by investments in NbS. A more comprehensive understanding of the role of NbS in decent work creation could improve understanding of the employment potential of different activities, as well as of differences, where they exist, between countries, biomes, types of NbS, and management approaches. It could also increase understanding of trade-offs – social, ecological, economic, cultural or other – between different forms of employment in NbS. Over time, better knowledge could help make the case for increased public and private investment in NbS-aligned enterprises and employment-creation programmes, and in the policies and incentive structures that support them.

This report is the first in a global biennial report series that aims to fill these knowledge and advocacy gaps. The International Labour Organization (ILO), the United Nations Environment Programme (UNEP) and the International Union for Conservation of Nature (IUCN) are leading the production of this series. This novel and exciting collaboration brings together the backgrounds and expert knowledge of these three institutions to address the cross-cutting topic of decent work in NbS. The report series will gradually increase in depth and scope over time as better data become available. Future reports will address a range of topics not addressed in this first report.

1.1 What are NbS?

The recent UN Environment Assembly (UNEA) definition of NbS (contained in a resolution on NbS adopted at UNEA in March 2022) defines NbS 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 well-being, ecosystem services and resilience and biodiversity benefits” (UNEP 2022a, para. 7). Understanding about what this definition means in practice is still evolving, and the term has not been applied consistently to date (IUCN 2016). For example, this report treats any conservation action as a form of NbS, primarily because biodiversity loss is an important societal and environmental challenge and conservation actions typically contribute multiple benefits; however, there is not yet consensus on this view.

The UNEA definition builds on an earlier definition of NbS developed by IUCN and adopted at the World Conservation Congress in 2016 (Cohen-Shacham et al. 2016). IUCN also led the development of a Global Standard for NbS (IUCN 2020a; 2020b), which detailed an operational framework for designing, verifying, improving and scaling up NbS. This was promoted at the 2020 World Conservation Congress (IUCN World Conservation Congress 2020). This framework has eight criteria that can be considered good practice for NbS implementation (see box 1.2).

BOX 1.2

Best practices for NbS implementation, according to the IUCN Global Standard for NbS

1. NbS effectively address societal challenges
2. Design of NbS is informed by scale
3. NbS result in a net gain to biodiversity and ecosystem integrity
4. NbS are economically viable
5. NbS are based on inclusive, transparent and empowering governance processes
6. NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits
7. NbS are managed adaptively, based on evidence
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context

SOURCE: IUCN 2020a

NbS address various challenges and have gained particular momentum in the context of addressing climate change (see box 1.3). The Global Commission on Adaptation promotes harnessing NbS as one of its key ‘action tracks’ for tackling both climate change adaptation and mitigation (GCA 2019). NbS can also provide a significant proportion of the mitigation needed to limit global heating (UNEP and IUCN 2021).¹

¹ IUCN’s Restoration Intervention Typology for Terrestrial Ecosystems describes various approaches to restoration in terrestrial ecosystems: <https://restorationbarometer.org/knowledge-hub/iucn-restoration-intervention-typology-for-terrestrial-ecosystems/>

BOX 1.3

Practical examples of NbS and the challenges they address

- regenerative agriculture and/or agroecological approaches (including agroforestry) for food security, health and sustainable livelihoods, and potentially including the use of environmentally friendly natural agrochemicals
- using native vegetation rather than concrete structures to control soil erosion and reduce water run-off along road embankments
- landscape-scale watershed restoration to improve regional water quality and availability
- green spaces and trees in cities to moderate the impacts of heatwaves, manage storm water and abate pollution
- protecting or restoring coastal ecosystems (mangroves, reefs and salt marshes) to protect communities and infrastructure from storm surges and erosion

IUCN's Global Standard for NbS stresses the need to understand existing power imbalances, reduce inequality and avoid further marginalization of people who are already poor and vulnerable. It emphasises the importance of mutual respect and equality, regardless of gender, age or social or disability status, and upholds the right of indigenous peoples to Free, Prior and Informed Consent (IUCN 2020a; 2020b). Research has also shown that NbS that support climate adaptation – also known as EbA – can benefit the poorest, with strong community participation being key to success (CBD 2019b; Reid et al. 2019).

As part of efforts to alleviate poverty, NbS can address unemployment. The 2022 UNEA resolution on NbS recognizes that NbS has a central role in “effectively and efficiently addressing major social, economic and environmental challenges, such as ... unemployment” (UNEP 2022a). A joint report by ILO and WWF further recognizes that NbS can be harnessed to create employment while simultaneously protecting nature, making human societies safer, healthier and more resilient, and mitigating climate change (Lieuw-Kie-Song and Pérez-Cirera 2020). For-profit nature-based enterprises (NBEs) – defined as enterprises engaged in economic activity that use nature sustainably as a core component of their product/service offering (Kooijman et al. 2021) – play a key role in this employment creation (European Commission 2022). UNEP (2021a) also recommends prioritizing NbS in its International Good

Practice Principles for Sustainable Infrastructure, and states – jointly with United Nations Office for Disaster Risk Reduction (UNDRR) – that NbS should be integrated in national and local disaster risk reduction strategies (UNDRR 2021). IUCN’s Global Standard notes that NbS should be economically viable and that assessing economic viability must go beyond a narrow project-based assessment of returns on investment to include “contributions to markets and jobs” (IUCN 2020a, 12). This may require a shift in approach – that is, acknowledging that employment generation can be a targeted outcome and a benefit from NbS implementation rather than a project cost.

While the entry point for adopting NbS may be one specific challenge – such as climate change adaptation or mitigation – these approaches have repeatedly shown potential to deliver multiple benefits while simultaneously addressing several issues. The Secretariat of the Convention on Biological Diversity stresses the potential that EbA holds for employment creation (CBD 2019a). Mangrove restoration, for example, can protect coasts from extreme weather events, sea-level rise and tsunamis, sequester carbon, reduce risk from coastal erosion and flooding, filter out pollutants from water, and provide a multitude of livelihood and health benefits related to fisheries, tourism, timber and non-timber forest products (Reid et al. 2019).

1.2 What are decent work, green jobs and a just transition?

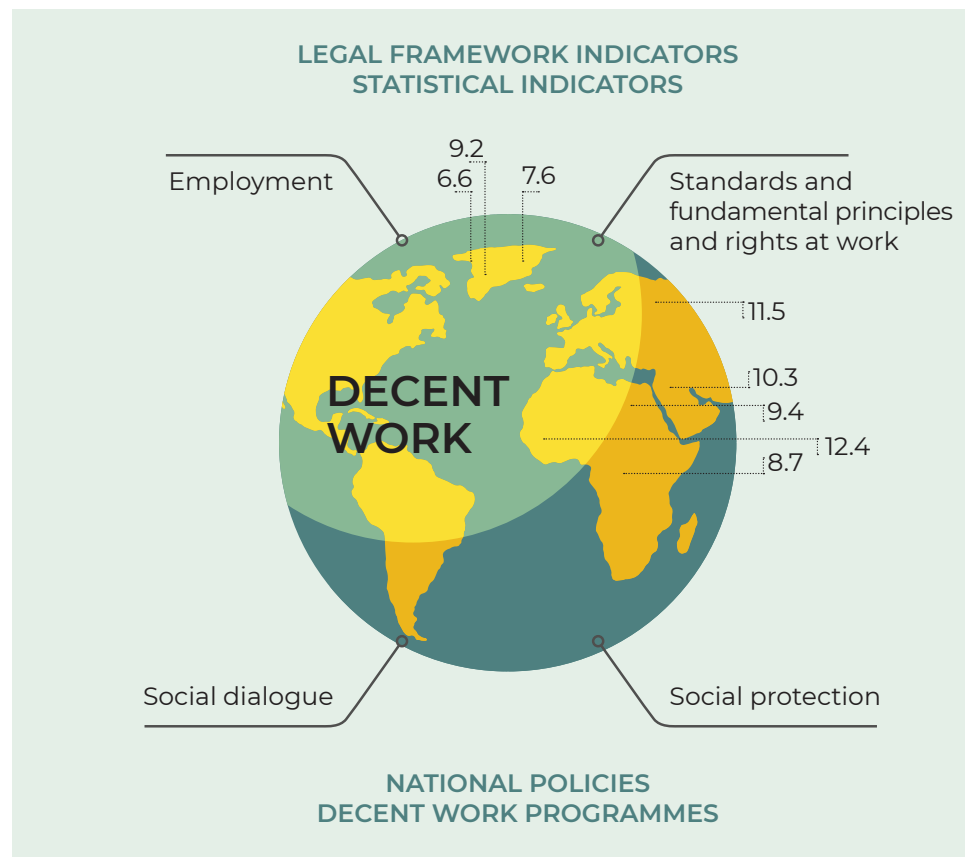
1.2.1 Work, decent work and green jobs

As detailed in chapter 4, work comprises any activity performed by persons of any sex and age (noting that the ILO does not promote child labour) to produce goods or to provide services for use by others or for own use. Work has two basic types: employment (that is jobs, or work for pay or profit) and unpaid forms of work (such as volunteering and unpaid training).

Decent work is a multidimensional aspirational concept that is central to achieving social justice. Recognized by the UN system and the broader international community, and incorporated in the Sustainable Development Goals, the concept of decent work aims to provide opportunities for work that is productive and delivers: a fair income; security in the workplace and social protection for families; better prospects for personal development and

social integration; freedom for people to express their concerns, organize and participate in the decisions that affect their lives; and equality of opportunity and treatment for all people (ILO 2013a). ILO’s Decent Work Agenda has four collective and interdependent pillars: employment creation, social protection, rights at work, and social dialogue (ILO n.d.(a); see figure 1.1).

Figure 1.1 ILO’s Decent Work Agenda



SOURCE: ILO n.d.(b).

The term “green jobs” has become popular in recent years with the growing interest in quality employment that supports the environment. Green jobs help preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in emerging green sectors such as renewable energy and energy efficiency (ILO 2016). Green jobs help improve energy and raw materials efficiency; limit greenhouse gas emissions; minimize waste and pollution; protect and restore ecosystems; and support

adaptation to the effects of climate change. According to an international statistical standard adopted in 2013, green jobs are defined as a subset of employment in the environmental sector that meet the requirements of decent work (see ILO 2013a).

Work in NbS is most often associated with employment, although some unpaid forms of work in NbS are also performed in NbS activities, such as volunteer work. Some but not all work in NbS can be considered decent work. Moreover, because not all NbS work is decent work, only part of all employment opportunities in NbS are truly green jobs.

1.2.2 Just Transition

The concept of “just transition” places social and economic changes in the context of climate change and response measures. It seeks to maximize the social and economic opportunities of environmental actions – including climate action and protecting biodiversity – while minimizing and carefully managing any challenges related to impacts of these actions on the world of work (ILO 2015). It aims to support workers, enterprises and communities negatively impacted by shifts away from certain sectors and seeks to ensure that no one is left behind. The goal is decent work for all in an environmentally sustainable society.

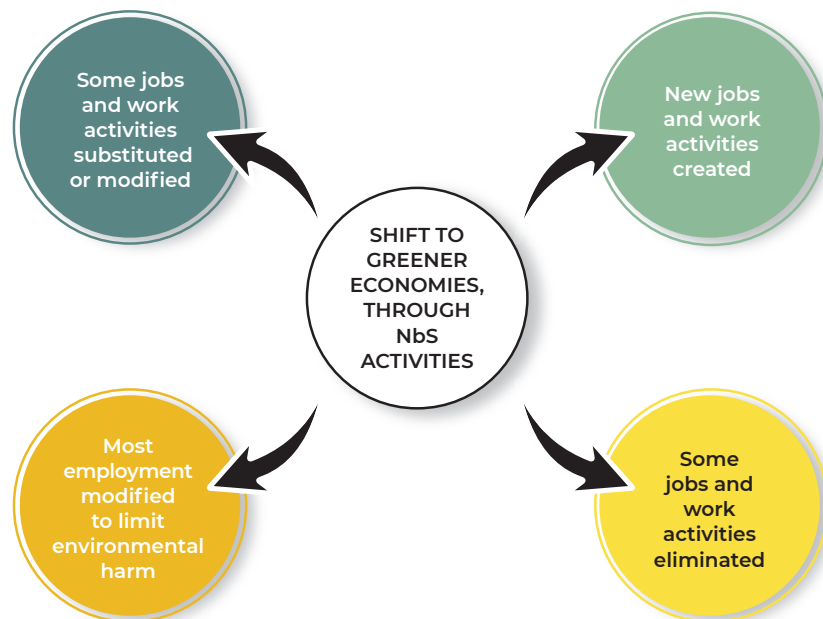
NbS play an important role in the transition to greener economies. They can help create employment, protect biodiversity and contribute to the sustainable management of natural and cultural resources. NBEs are central to this because they generate new employment and increase demand for new worker skills, innovations, and wider economic impacts, while respecting the needs of the environment and communities (European Commission 2022).² By applying the right mix of just transition policies – for example relating to continuous improvement in the social, economic and environmental sustainability of sectors – employment created through NbS can be decent. Transitions relevant to NbS will be particularly important in the agricultural sector (and its value chains), which accounts for around 80 per cent of employment opportunities that rely on ecosystem services and plays a key role in terms of food security. In many developing countries, agriculture is the main source of employment and income (ILO 2018a).

² Note that NBEs are not equivalent to enterprises that deliver NbS; not all NBEs deliver NbS, and NbS can be delivered by enterprises that are not nature-based.

Transitions to a green economy will affect the world of work in different ways (see figure 1.2):

- Some employment and (unpaid) work activities will be eliminated due to shifts away from sectors which are no longer viable or sustainable, such those reliant on large-scale fossil fuel extraction.
- Some employment and work activities will be substituted, or modified, either within or between sectors (for example, by shifting from intensive agriculture to more sustainable and productive practices such as agroforestry or conservation/regenerative agriculture).
- New employment and work activities will be created. For example, investment in NbS can drive enterprise development and create new employment.
- Most employment will be changed to include tasks and workplace practices that limit harm to the environment, reduce waste, improve energy efficiency, and lower emissions (for example, using natural fabrics in garments, making or managing green roofs, harvesting rainwater, and recycling of wastewater in housing, along with other NbS).

Figure 1.2 Shift to greener economies targeting NbS: Impacts on jobs and unpaid work activities



SOURCE: ILO Green Jobs Programme.

1.2.3 The ILO Just Transition Guidelines

Governments, employers, and workers share the responsibility for developing innovative ways of working that safeguard the environment, eradicate poverty, and advance social justice (ILO 2021a). Coherent public policies are a driving force in this process. The ILO Just Transition Guidelines³ are intended to offer practical orientation on formulating, implementing, and monitoring policies and strategies for a just transition. They are designed as both a policy framework and a practical tool to assist countries in managing the transition to greener economies fairly and inclusively, according to national circumstances and priorities.

A tripartite consensus between governments, employers and workers' organizations was achieved at the 2013 International Labour Conference (ILO n.d.(c)), which considered evidence from country-level policies and strategies. Based on this consensus, the subsequent Just Transition Guidelines, adopted in 2015, identify nine mutually reinforcing policy areas⁴ seen as fundamental to simultaneously addressing environmental, economic and social sustainability in the shift to a green economy. Applying these guidelines can unlock many opportunities for decent work in NbS. The Guidelines also promote reaching social consensus, engagement in social dialogue, and inclusivity – all important contributors to effective NbS. They address issues relating to equity, fairness, and the need to help those most vulnerable to multiple environmental challenges (that is, those who, in the case of climate change, have contributed least to the crisis).

Institutional and policy coherence, the full integration of gender, diversity and inclusion dimensions, and the principles of no “one size fits all” and “leave no one behind”, are central elements of the Just Transition Guidelines (ILO 2021a; see figure 1.3). The framework is intended to assist countries in developing and implementing strategies and policies that are coherent with, and may be introduced into, their National Adaptation Plans (NAPs), National Biodiversity Strategies and Action Plans (NBSAPs), Nationally Determined Contributions (NDCs) and the implementation of the SDGs at the national level.

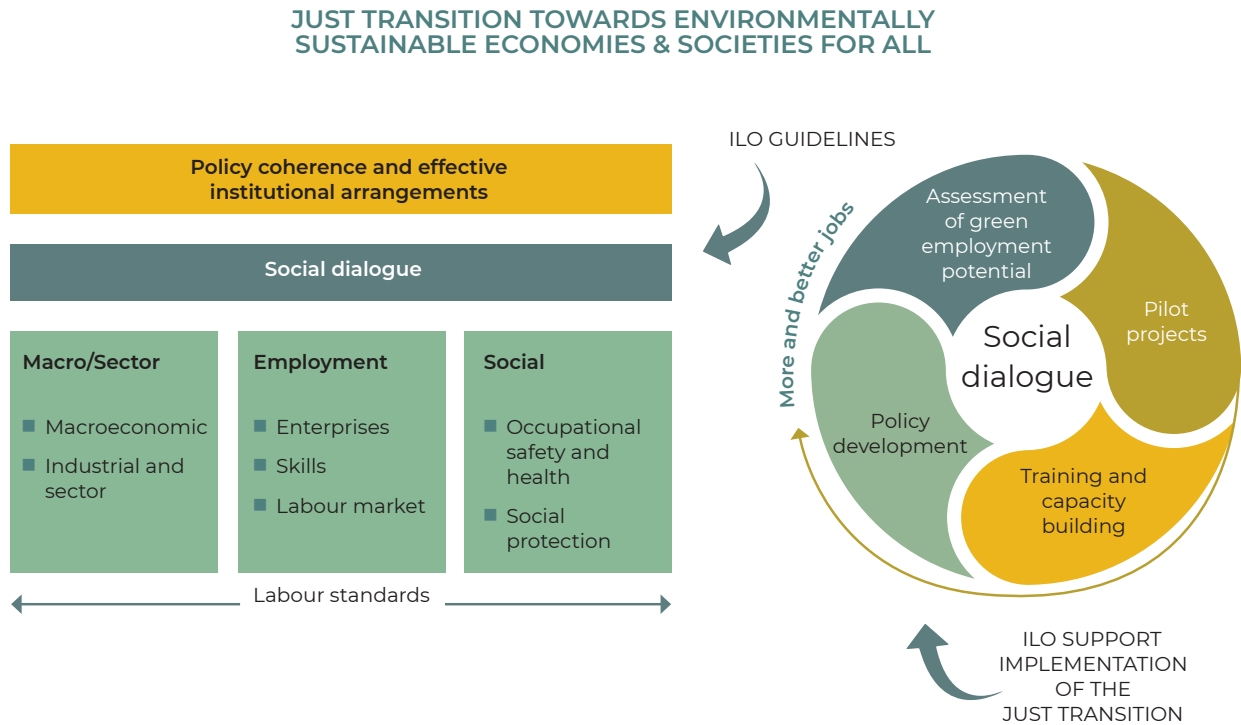
Strong social consensus on the just transition pathway is considered vital (ILO 2021a). Deliberations are intended to encompass all sectors of society, as well

³ Much of the information in this chapter draws on the ILO Just Transition Guidelines (ILO 2015).

⁴ These 9 policy areas are: macroeconomic and growth policies; industrial and sectoral policies; enterprise policies; skills development; occupational safety and health; social protection; active labour market policies; rights; and, social dialogue and tripartism. See also chapter 2, section 2.1.

as the natural environment, that can be affected by the triple planetary crisis of climate change, nature loss and pollution (Stavis, Krause, and Morena 2019; 2021). They aim to connect stakeholders and perspectives related both to the equity and justice dimensions of climate change (JTRC 2018) and biodiversity. Social dialogue allows for the meaningful participation of workers' and employers' organizations and other key agents of change, such as indigenous peoples (ILO 2017a) and women (ILO 2017b; 2022a).

Figure 1.3 The ILO Just Transition Guidelines and intervention model.



SOURCE: ILO 2015.

Considering that NbS can support job creation, countries could apply the just transition policy framework in promoting NbS, for instance in sectoral policies, and biodiversity and climate action, with the aim of supporting decent work. This in turn could improve the sustainability and broader uptake of NbS.

1.2.4 International labour standards

International labour standards are legal instruments that set out basic principles and rights at work. They are incorporated into the just transition guidelines under policy area 8 on rights. They are either Conventions (or Protocols), which are legally binding international treaties that may be ratified by member states, or Recommendations, which serve as non-binding guidelines (ILO n.d.(d)). Many of these standards are not directly related to NbS itself, but their primary aim is to protect basic worker rights, enhance workers' employment security, and improve their terms of employment – thus they are important for decent work creation in NbS. Member States of the ILO are required to abide by basic human rights in the world of work, and this is incorporated in the ILO Just Transition Guidelines. The ILO Declaration on Fundamental Principles and Rights at Work, for example, adopted in 1998 and amended in 2022, is an expression of commitment by governments, employers' and workers' organizations to uphold basic human values (ILO 2022b).

Some international labour standards are more directly relevant to NbS. For example: the Employment and Decent Work for Peace and Resilience Recommendation, 2017 (No. 205) refers to the importance of identifying risks to the environment and seeking environmentally sustainable solutions; the Indigenous and Tribal Peoples Convention, 1989 (No. 169) supports the rights of the peoples concerned to the natural resources on their lands; and, Safety and Health in Agriculture Convention, 2001 (No. 184) stresses the importance of eliminating or minimizing risks to the environment.

1.3 Opportunities for employment and decent work in NbS

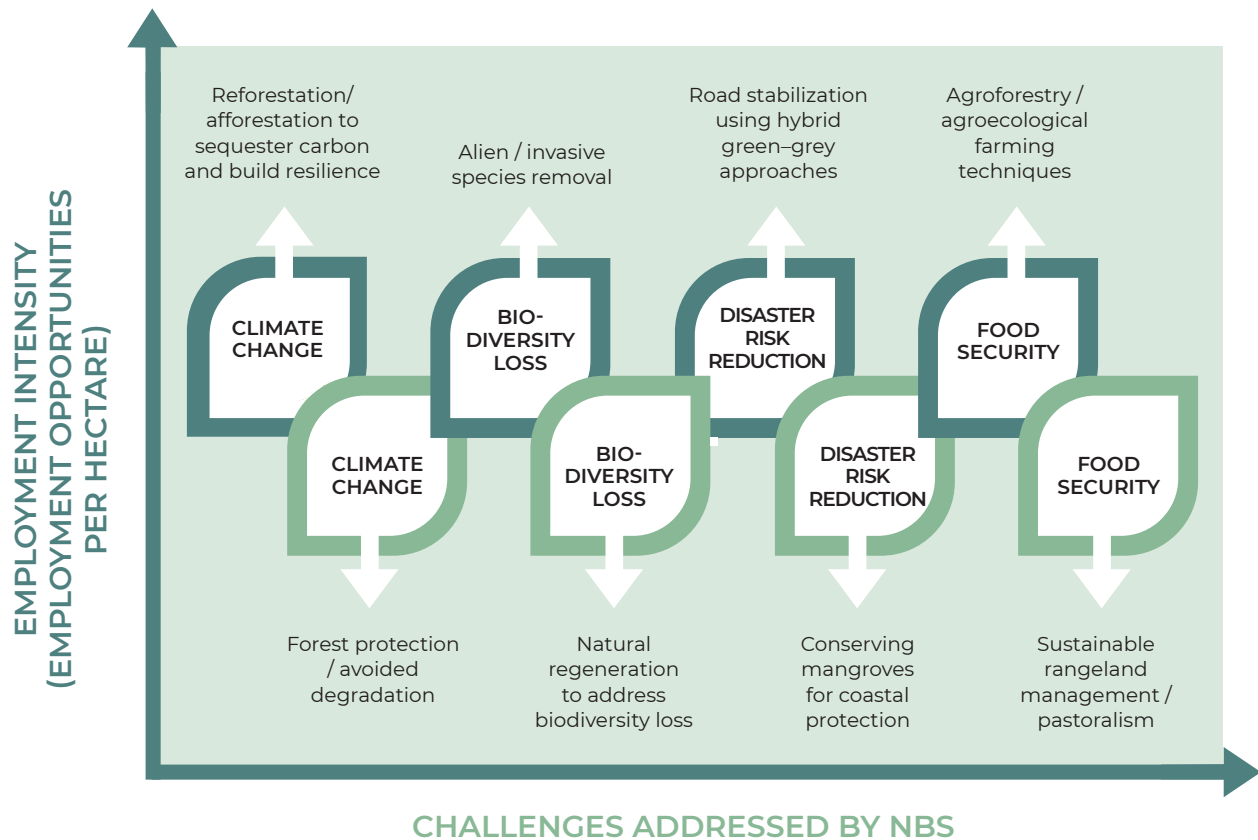
NbS have a key role to play in creating employment and decent work, as well as in improving the productivity and sustainability of existing employment in various sectors. Promoting private investment in NBEs and nature-based entrepreneurship is important because most employment in NbS is created by private sector enterprises (Kooijman et al. 2021). Some 1.2 billion employment opportunities globally – particularly those dependent on farming, fishing and forestry – currently rely directly on the effective management and sustainability of a healthy environment. These employment opportunities account for 40 per cent of total world employment, with this percentage

being much higher in poorer nations (ILO 2018a). While these employment opportunities are not all in NbS, these figures provide an indication of the current and potential scale of employment that NbS could help secure. Much of this employment is not part of formalized labour markets or supply chains (for example many indigenous peoples and local communities sell goods resulting from sustainable land management for local consumption). Much is in rural areas.

NbS work requires a wide range of skills and is not limited to rural economies. NbS are important in sectors such as education and research, communications and journalism, construction and sustainable infrastructure, real estate, tourism, and government and community services. Professional and skilled work in NbS includes employment as scientists, programme managers, agronomists, fishers and foresters. Work opportunities related to NbS can include paid and unpaid forms of work in research, planning, management, coordination and monitoring, as well as in implementation.

There is large variation in the per-hectare employment generation potential of NbS. For example, NbS for reducing disaster risk or climate change mitigation that involve protecting natural environments, 're-wilding' and allowing nature to regenerate undisturbed could provide fewer direct short-term opportunities for generating employment than managed ecosystem restoration (see figure 1.4). In some instances, however, biodiversity protection or conservation-related activities can deliver high employment intensity with longer-term prospects than short-term restoration contracts might provide (for example work in eco-tourism or resulting from mangrove conservation). These activities are also particularly important for indigenous peoples and local communities, and irrespective of employment potential, they can provide important benefits across multiple key areas. More evidence is needed, but early indications suggest that activities such as reforestation, ecosystem or watershed rehabilitation and restoration, restoration involving invasive species management or removal, and the use of agroecological approaches in food production are particularly employment-intensive, providing high levels of employment per hectare (Lieuw-Kie-Song and Pérez-Cirera 2020; ILO 2011; Payen and Lieuw-Kie-Song 2020).

Figure 1.4 Variation in employment intensity resulting from selected Nature-based Solutions



SOURCE: Authors' compilation.

Investment in NbS can create employment, and this can be at scale – but there is currently no guarantee that this will be decent work. Applying the Just Transition Guidelines can help ensure that employment in NbS is decent. For NbS, this is particularly important in sectors such as farming, fishing and forestry, where decent work deficits are generally the largest. Nature can also play an important role in facilitating the shift to decent work conditions for vulnerable people in the context of climate change. For example, with more intense and frequent heat waves, urban parks and street trees will provide relief to workers without air conditioning, and in rural areas trees will provide shade for herders and farmers.

Opportunities for decent work in NbS are particularly important for the poorest and most vulnerable, who often depend heavily on natural resources for their lives and livelihoods. Public Employment Programmes (PEPs) like India's

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Payment for Ecosystem Services programmes that integrate economic, social and restoration objectives such as China's Sloping Land Conversion Programme are critical (Norton et al. 2020; Liu et al. 2020; Györi et al. 2021). Their role is discussed in more detail in Chapter 3.

Historically, unpaid work, such as volunteer work, has been central to the success of some of the best examples of NbS. For example, the Isiolo County Climate Change Fund in Kenya supported a range of successful NbS projects, primarily addressing sustainable land and water management for pastoralism between 2013 and 2016. By 2014 these had engaged the services of 430 people, provided 152 new employment opportunities, and directly and indirectly supported approximately 950,000 people in coping with effects of climate change. Extensive stakeholder participation and unpaid work in management and decision-making was a key success factor (Reid and Orindi 2018).⁵ Such participatory processes are central to successful NbS, which are ideally “based on inclusive, transparent and empowering governance processes” (IUCN 2020a). As this example illustrates, unpaid work can be important for NbS initiative success. Nonetheless, it should not be a substitute for attaining the broader goal of achieving paid decent work over the longer term, wherever possible.

1.4 Global policy context

While NbS and employment are sometimes still considered under separate environment and development agendas, overall the number of global organizations, policy initiatives and statements addressing NbS (or related concepts) and employment is increasing. Only some of these refer specifically to decent work. Box 1.4 describes some of the key global policy processes, and initiatives emerging from them, relevant to NbS and employment.

⁵ Activities included multiple community consultations and planning workshops, and extensive involvement of the Ward Climate Change Planning Committee and Dedha (Boran traditional resource management institution).

BOX 1.4

Key global policy processes relevant to NbS and employment

- **The Fifth session of the United Nations Environment Assembly** in March 2022 called on UNEP to support the implementation of NbS, recognizing the role of NbS in addressing unemployment (UNEP 2022a).
- The **European Green Deal** aims to provide “future-proof jobs and skills for the transition” as part of efforts to be the first climate-neutral continent, delivering this in part by “working with nature to protect our planet and health” (European Commission n.d.; Breil et al. 2021).
- **SDGs 8** on ‘Decent Work and Economic Growth’, 15 on ‘Life on Land’ and 14 on ‘Life below Water’ under the **2030 Agenda for Sustainable Development** directly address employment and NbS. Other SDGs addressing poverty, hunger, gender equality, clean water and sanitation, resilient infrastructure and climate change are also relevant (UN n.d.).
- The **Convention on Biological Diversity** (CBD) Strategic Plan for Biodiversity 2011–2020 includes Aichi Biodiversity Targets with clear links to NbS (CBD n.d.(a)). Many targets also had work-related components, such as on sustainable management of biodiversity. Decision XII/5 encouraged Parties to create “opportunities for employment and decent work for all” (CBD 2014). National Biodiversity Strategy and Action Plans (NBSAPs) supported planning and implementation at country level. Attention is now on the goals and targets of the **post-2020 Global Biodiversity Framework**, which will likely be adopted in late 2022 (CBD n.d.(b)).
- Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs) and other national climate change strategies and plans under the **United Nations Framework Convention on Climate Change** (UNFCCC) increasingly emphasize NbS (Seddon et al. 2019; 2020; CBD 2019b; UNDP 2019). The Paris Agreement highlights the importance of a just transition and decent work (UN 2015). UNFCCC (2016) provides guidance on this for climate change mitigation, and Reid et al. (2021) stress the importance of decent work in NbS for climate adaptation. A just transition was also included in the Glasgow Climate Pact (UNFCCC 2021a).
- At the **2019 UN Climate Action Summit**, 46 countries committed to placing employment at the heart of ambitious climate action and to promote a just transition. At the Summit, the UN Secretary-General launched the **UN Climate Action for Jobs Initiative**.¹ The initiative brings together governments, workers’ and employers’ organizations, international institutions, academia, and civil society to deliver concrete actions on climate action with decent employment and social justice, to support countries in a just transition founded on broad-based support, and to facilitate an

¹ See <https://www.climateaction4jobs.org/>

inclusive recovery from COVID-19.

- A toolbox (UNCCD n.d.) commissioned under the **UN Convention to Combat Desertification** (UNCCD) process collates many NbS-related work opportunities to boost the resilience of people and ecosystems. The UNCCD also supports the Great Green Wall Initiative, which brings together 22 Sahelian countries to restore 100 million hectares of degraded land, sequester 250 million tons of carbon and create 10 million employment opportunities by 2030.²
- The **Sendai Framework for Disaster Risk Reduction** (UNDRR)³ and associated guidance (UNDRR 2021) acknowledges the importance of sustainable use and management of ecosystems, and NbS, for reducing disaster and climate risk. The Framework also acknowledges that investment in disaster risk prevention and reduction can drive employment creation, and it prioritizes associated workforce training and decent work creation (UNDRR 2020).
- **UN Decade Initiatives** such as the **UN Decade on Ecosystem Restoration** (2020–2030)⁴ and the (aforementioned) UN Climate Action for Jobs Initiative (CA4JI) 2020–2030 emphasize the importance of concepts closely aligned with NbS and decent work as key themes within the overarching sustainable development agenda.⁵ The former builds on the **Bonn Challenge**, which aims to restore 350 million hectares of degraded and deforested landscapes by 2030⁶ using the approach of ‘forest landscape restoration’ – a purpose-built NbS. To reinforce the CA4JI, in 2021 the UN Secretary-General called for a **Global Accelerator for Jobs and Social Protection** that would create at least 400 million employment opportunities (ILO 2021a; UN 2021a). Planning for the **UN Decade on Ocean Science** (2021–2030) also mentions NbS and jobs in the marine sector (IOC 2019).
- The **UN World Water Development Report, Nature-based Solutions for Water**, was launched in 2018 and demonstrates how NbS can help address global water challenges while delivering additional sustainable development benefits, including decent work (WWAP 2018).

2 See <https://www.unccd.int/our-work/ggwi>

3 See <https://www.undrr.org/implementing-sendai-framework/what-sendai-framework>

4 See <https://www.decadeonrestoration.org/>

5 For example, CA4JI anticipates “a job-rich transition to environmental sustainability” (see www.climateaction4jobs.org/initiative) and the UN Decade on Ecosystem Restoration’s strategy acknowledges that youth will benefit most “from the creation of sustainable jobs based on a restoration economy” and promotes “education to provide skills for sustainable jobs” (see www.decadeonrestoration.org/strategy).

6 See www.bonnchallenge.org. A 2019 analysis of progress towards meeting Bonn Challenge goals found that nearly 44 million hectares of land was under restoration in 13 countries in 2018, with co-benefits including the creation of 354,000 employment opportunities reported (IISD 2019; see <https://sdg.iisd.org/news/second-bonn-challenge-barometer-report-highlights-forest-restoration-co-benefits-lessons-learned>).

1.5 Structure of the report

This first report presents insights about decent work in NbS based on various tools and methods. These include a stakeholder survey, expert interviews and literature reviews, case studies, and economic modelling, all of which have been used for the purpose of providing a better understanding of decent work in NbS. The conceptual scope covers direct, indirect, induced, and secondary-effects employment,⁶ as well as unpaid forms of work, including volunteer work.

Chapter 2 describes just transition policies and pathways for promoting decent work creation through NbS. Chapter 3 provides a picture of the range and diversity of work likely to be involved in NbS. Chapter 4 proposes a conceptual framework for linking decent work outcomes with NbS. Chapter 5 provides concepts and definitions to support a measurement framework on decent work and NbS. Chapter 6 presents a modelling exercise and estimates of the potential of increased investment in NbS to drive future employment creation. Chapter 7 presents conclusions and recommendations regarding promoting decent work in NbS and proposes areas for future research, including those highlighted in a recent stakeholder survey on decent work in NbS (see Appendix 1).

⁶ Direct employment creation in NbS occurs when there is increased demand and investment in NbS services and products, as well as in the equipment and infrastructure to produce them. Indirect employment opportunities from NbS result from benefits to other parts of the economy that supply inputs to expanding NbS industries and enterprises. Induced employment creation occurs when income generated by this additional economic activity is redistributed by spending on additional consumption and investment across the economy, and when the environment improves because of NbS hence driving additional work outcomes. Induced employment opportunities also emerge due to secondary environmental effects. Framing employment creation opportunities as direct, indirect and induced in this way provides one route to understanding and measuring the socio-economic multiplier benefits of NbS that have long been acknowledged but have proved challenging to quantify.

Case study

Improving coastal resilience and livelihoods in Kenya

Along the Kenyan coastline, 71 per cent of the population live in poverty, and communities are highly reliant on natural resources. The coastal ecosystem has both major ecological importance and enormous potential to support local communities through sustainable and resilient livelihoods. However, in recent years the degradation of mangrove forests and overfishing have become prevalent as means of short-term income for the coastal communities. This undermines the ecological balance of the local ecosystem and negatively impacts the future economic security of these communities, while making them more vulnerable to the effects of climate change such as storm surges and flash floods.

Coping with the situation is difficult for families. The condition has been worsening with increased food insecurity and other economic challenges, as well as poverty, climate and weather extremes, the emergence of diseases, and the lack of social protection mechanisms.

With the goal of improving well-being of households in Kwale County, the Coastal Resilient Livelihood Project has been working with communities to promote alternative and supplemental environmentally sustainable income-generating opportunities, as well as to promote community-led environmental protection and management and increase awareness of environmental issues and climate change. Specifically, the project has engaged eight communities in mangrove forest restoration, creating income opportunities for 476 community members (232 female and 244 male). It established 472,500 seedlings in nurseries (51,216 transplanted), which were sold to public and private firms. Communities also hold several

plots of seaweed farms which are now producing hundreds of tonnes of seaweed and employing 514 community members (342 female and 172 male). Seaweed farming has provided a viable and non-seasonal source of income, supplementing other incomes. Moreover, to date, three beach management units (BMUs), community-based organizations originally set up to ensure the sustainable use and management of local fishery



Women participating in mangrove planting exercise at Kibuyuni BMU
© Andrew Nyamu, project coordinator



Mwazaro BMU members participating in mangrove regeneration drive during the world environment day.
© Andrew Nyamu, Project Coordinator.



Members working on a mangrove nursery at Chete cha Kale self-help group
© Swalehe Nzao, Project Assistant.

resources, are collecting solid waste and selling it to recycling companies for income.

The project has contributed to improving the restoration of local mangrove forests and enhancing the fish population while rehabilitating degraded sites. Women have benefited by entering the labour market in greater numbers and actively participating in income-generating activities, giving them voice in decision-making. Finally, the project has improved community members' understanding of the nexus between mangrove conservation and fish farming, among other ecological benefits, leading to the practice of sound environmental stewardship.

Key success areas include not only women's participation but also community engagement and leadership in mangrove forest restoration and waste management – which is contributing to successful environmental management in the project locations – and school-based activities, which are promoting environmental education and best practices at home.

NOTE: See Appendix 3 for complete details on this case study.

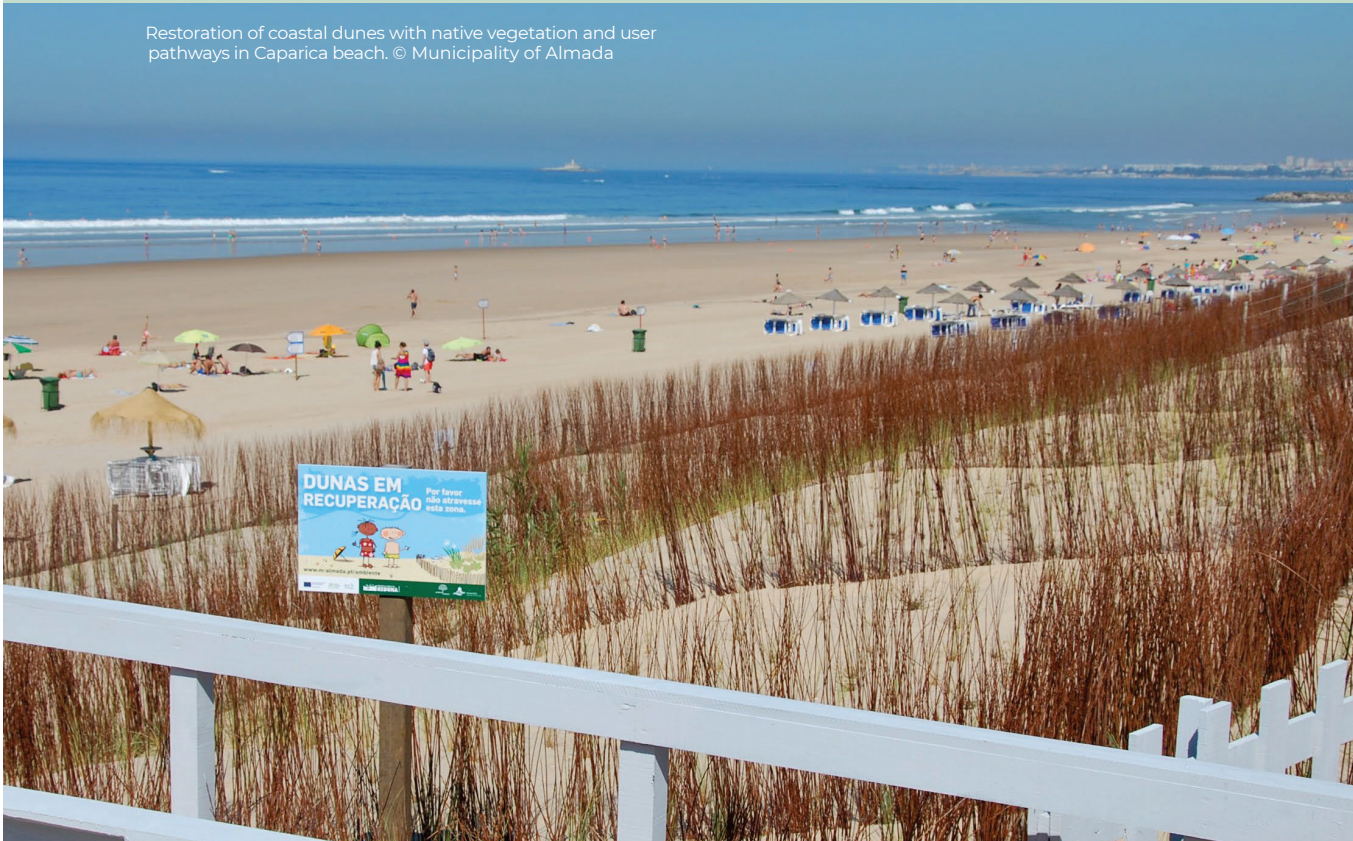


Plan staff with community members participating in mangrove restoration drive at Majoreni BMU. © Stephen Baraka, Plan driver.

Case study

Coastal dune restoration in Portugal

Restoration of coastal dunes with native vegetation and user pathways in Caparica beach. © Municipality of Almada



Every summer, millions of tourists visit Almada, a Portuguese city with 13 kilometres of Atlantic coastline characterized by dunes and beaches. These coastal dune ecosystems are priority conservation habitats, but they are threatened by climate-related hazards such as erosion and washovers (sediment deposited by waves washing over dunes during storm surges). Combined with sea level rise, this threatens not only houses but also several types of infrastructure such as industries, roads, power plants, and freshwater aquifers.

In 2014, a destructive storm triggered a turning point in the city's coastal erosion management. The beach was damaged and water surged over the dunes, causing inland flooding. In response, the ReDuna project was launched that same year to help restore the ecosystem, while also building resilience to sea-level rise and storms. Over a period of six months, the dune profile was restored along 1 kilometre of coastline using willow sand fences and 100,000 plants



Activities after the restoration activities in Caparica beach © Municipality of Almada.



Informative panels about the restoration of coastal dunes in Caparica beach © Municipality of Almada.

of native dune species. Pathways and fences were also built to reduce the human impacts, and communications aimed to raise awareness among visitors. In March 2018, the restored dunes provided an effective response to Storm Emma.

The project has created 104 NbS jobs, of which 64 are related to the restoration, construction and maintenance of the ecosystem. Twelve jobs are considered permanent. Each year, the project hires 27 consultants from disciplines such as biology and geology, including both university students and young professionals. For implementation, the project employed 22 workers for the initial 2–3 months to assist with planting and installing sediment traps and pathways. There are an average of 10 drivers, and more than 30 cooking and cleaning staff. After each summer and storm season, maintenance crew work to restore the willow fences, replace vegetation and renovate walking paths to adapt these measures to new pressures. In addition, more than 1,040 volunteers have supported the project through work on restoration, maintenance and clearing of invasive non-indigenous plants.

The project has now been scaled up to similar coastal areas in Portugal, and there are Regional Coastal Management Plans all over the country. One clear lesson from the project is that ecosystem restoration that is properly designed and implemented can become invisible to the public as many of the changes, such as improved biodiversity, may be subtle. Therefore it is important to engage people in learning about the value of the ecosystem and the importance of restoring and maintaining by emphasizing different aspects of restoration such as its aesthetic design.

NOTE: See Appendix 3 for complete details on this case study.

Case study

A strategy for urban forests in Melbourne, Australia

The City of Melbourne is renowned for its historical parks, gardens and boulevards, often referred to as its urban forest. These contribute greatly to the city's character and are integral to its social and cultural life. For the city council, it is important that this urban forest flourishes in the future to sustain the essential characteristics that Melburnians love. The urban forest is also home to diverse animal species including the powerful owl, kookaburra, kingfisher, possum, grey-headed flying fox, a variety of frogs, and microbats, among other species.

However, many of Melbourne's landscapes were created over 100 years ago, and the forest's aging tree stock and landscapes – already under immense stress from more than a decade of drought, severe water restrictions and periods of extreme heat – are struggling to adapt to a changing climate. Climate change and urban sprawl are placing additional pressure on the urban forest. To address these challenges, the City of Melbourne put in place the Urban Forest Strategy to increase the resilience of the urban forest, while also preserving Melbourne's unique character and the forest's contribution to the well-being of inhabitants.

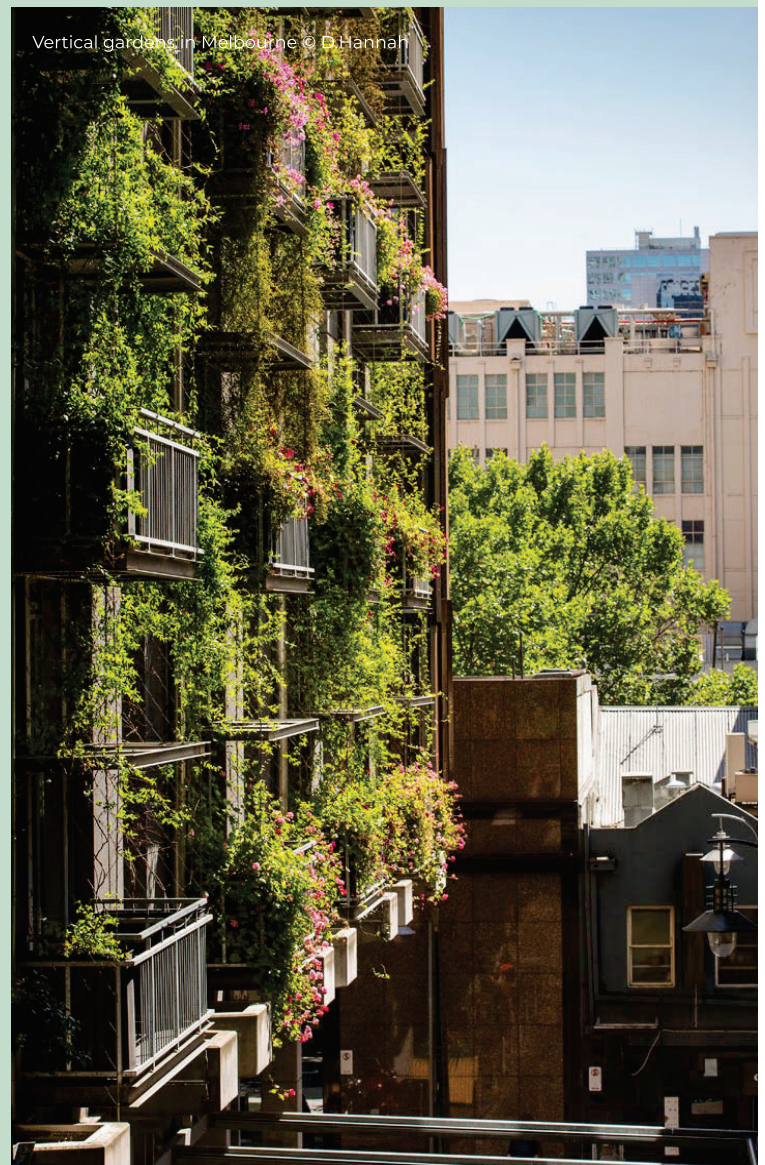


Currently, the urban forest comprises around 70,000 trees in streets and parks, as well as around 20,000 trees located on private land. Green roofs and walls are also growing in number across the municipality. The Strategy aims to expand the forest by increasing canopy coverage from 22% to 40% by 2040, as well as to boost the forest's resilience to the effects of climate change by increasing the diversity of tree species, which will also provide a habitat for various animal species while improving soil moisture.

To implement this Strategy the Council employs eleven professionals and specialists including ecologists, urban foresters and arborists, as well as volunteer coordinators and managers. In their work they are supported by over 700 volunteer Citizen Foresters who carry out essential planting, advocacy, monitoring and research tasks. Between 2012 and 2021, 34,950 trees were planted in the city.

Another key successful factor of the strategy has been the involvement of city developers and business partners to also support the implementation of the strategy.

NOTE: See Appendix 3 for complete details on this case study.



CHAPTER
TWO




Key messages

- The right mix of just transition policies can contribute to greening the economy in a way that promotes decent work outcomes and benefit jobs and enterprises that implement NbS.
- The ILO Just Transition Guidelines provide a framework to leverage opportunities for decent work and green jobs in NbS while providing a platform to enable the full participation of social partners, women, and indigenous peoples.
- A small but growing number of cases illustrate successful country-level strategies and implementation anchored in an intentional just transition policy approach. This chapter presents interventions along the nine policy areas of the Just Transition Guidelines that could be considered to support NbS activities for decent work outcomes.
- The IUCN Global Standard for NbS and the ILO Just Transition Guidelines share common themes and objectives that can be leveraged to support decent work in NbS: evidence-based decision-making, inclusive and meaningful stakeholder engagement, policy coherence and tools across portfolios to maximize opportunities and mitigate risks, and upholding of rights and fostering empowerment.
- NbS are emerging as a key building block for achieving the global development, climate and biodiversity goals. Implementing NbS in synergy with a just transition framework can leverage their potential as a driver for decent work, enhancing resilience and supporting countries in achieving their national targets. A just transition approach to promoting NbS should be better integrated into NBSAPs, NAPs and NDCs, including more concrete, evidence-based NbS targets.

Chapter 2

Just transition policies and pathways



Global unemployment has risen over the past years. For 2022, the ILO estimates the level at 207 million people, compared to 186 million in 2019 (ILO 2022c). In a recent study, the ILO estimated that in 41 countries alone, 1.2 billion workers face decent work deficits (Aleksynska et al. 2019). The COVID-19 pandemic worsened working conditions and affected previous gains among workers. Women, youth and migrant workers have been particularly hard hit (ILO 2022c; 2022d). This scenario is aggravated by climate change, the environmental crisis, biodiversity loss and pollution (ILO and WWF 2020), which adversely impact the world of work.¹ As 40 per cent of the labour force worldwide is dependent on ecosystem services, their incomes are at direct risk due to environmental degradation (ILO 2018a). Enterprises also face increased uncertainties that deter investment and job creation (ILO 2022d), affecting their financial, economic, environmental and social performance (Stenek et al 2010). Most at-risk groups (for example, indigenous peoples, ethnic minorities, and low-income households) are disproportionately affected by this triple planetary crisis (IPCC 2014), which reinforces and entrenches existing inequities (IPCC 2022). Also, climate change and non-inclusive climate policies exacerbate existing gender inequalities in the world of work (ILO 2022a).

The shift to environmentally sustainable economies and societies implies transitions of various sorts, which may occur in rural and urban areas, and at different scales (national, regional or local level). Countries may need to reorient productive activity to new sectors or change production processes within sectors,

¹ The expression “world of work” is used by the ILO to refer to a wide range of issues and aspects that relate to work and enterprise activities (e.g., employment, own-use production, social dialogue, social protection, enterprise policies).

while supporting enterprises and workers – particularly the most vulnerable. Implementing NbS itself as part of climate action may negatively affect jobs, unpaid work activities and productivity, including through transformations in the livelihoods of those who live in areas that need restoration.

Clearly, planning and implementing a transition in the context of NbS brings unique challenges. The right mix of policies can contribute to greening the economy² in a way that promotes decent work outcomes, green jobs and enterprises that implement NbS. Potential trade-offs in the transition should be adequately managed, with the aim of reducing existing deficits in decent work.

A just transition aims at greening the economy in a way that is as fair and inclusive to all concerned by creating decent work and green job opportunities, managing risks associated with the transition, and leaving no one behind. The just transition concept seeks to maximize the social and economic opportunities of environmental actions – including climate action and protecting biodiversity – while minimizing and carefully managing the negative impact on actors in the world of work. It aims to support workers, enterprises and communities affected by economic shifts away from certain sectors and regions, and seeks to ensure that no one is left behind in the transition. The goal of the transition is to have decent work for all in a low-emissions, climate-resilient society.

This chapter presents challenges and opportunities in the transition and discusses how various just transition policy measures and strategies can be linked to NbS and the creation of decent work for all. In addition to using key ILO, UNEP and IUCN documents on the topic of decent work and NbS – including the Just Transition Guidelines, the UNEA resolution on NbS and the IUCN Global Standard for NbS – the chapter draws upon literature from various sources,³ including academia, international and civil society organizations, complemented by nine key informant interviews (box 2.1).

The chapter is structured around three sections. Section 2.1 presents some of the challenges and opportunities when applying a Just Transition approach to NbS. Section 2.2 discusses the complementarities between the IUCN Global Standard for NbS and the Just Transition Guidelines for achieving decent work in NbS. Finally, Section 2.3 explores how just transition and NbS can be combined as drivers for decent work in national policies.

² The expression “greening the economy” is used in the Just Transition Guidelines to refer to the process of making economies and societies more environmentally sustainable for all, in the context of sustainable development and poverty eradication. NbS are a vital strategy for greening economies, complementing other actions. While NbS are a key part of this process, they should not be understood as a synonym of “greening the economy”.

³ This chapter does not present statistical data analysis.

BOX 2.1**List of key informants**

Key informant interviews were conducted in July 2022.

STAKEHOLDER	ORGANIZATION	NAME	POSITION
Social partners	International Organisation of Employers (IOE)	Robert Marinkovic	Adviser
	International Trade Union Confederation (ITUC)	Bert de Wel	Climate Policy Officer
	Cabinet of the Third Vice President and Minister of Ecological Transition and Demographic Challenge, Spain	Ana Belén Sánchez	Just Transition Advisor
	Ministry of Environment, South Africa	Guy Preston	Former Deputy-Director General in the Department of Environment, Forestry and Fisheries
	Ministry of Labour, Chile	Giorgio Boccardo	Undersecretary of Labour
NbS practitioner	International Union for Conservation of Nature (IUCN)	Stewart Maginnis	Deputy Director General, former Global Director of IUCN Nature-based Solutions Group
Indigenous peoples' organization	Indigenous Peoples' Rights International (IPRI)	Joan Carling	Global Director at IPRI; former convenor of the Indigenous Peoples' Major Group for SDGs
	Forest Peoples' Programme (FPP)	Helen Tugendhat	Programme Coordinator at FPP and Vice-Chair, Rights, Governance and Equity at IUCN World Commission on Protected Areas
Women's organization	Women Engage for a Common Future (WECF)	Sascha Gabizon	Executive Director, Women Engage for a Common Future (WECF) International; Women & Gender Constituency to the UNFCCC

2.1 Challenges and opportunities

The direct effects of climate change and the decarbonization of economies are affecting sectors, enterprises and workers in different ways. Regions and population groups vulnerable to droughts, floods and erratic weather patterns will be hardest hit. Economic restructuring as part of climate action will likely result in the downsizing and closing of enterprises in carbon-intensive sectors and regions to support emission reduction goals. Displacement of workers along with higher energy and commodity prices could adversely impact the incomes of poor households (ILO 2015).

The shift to environmentally sustainable activities such as NbS may lead to substituting, eliminating as well as creating some jobs and work activities, while changing tasks and workplace practices in many others (see figure 1.2 in Chapter 2). ILO estimates show that greening the economy is expected to result in net job creation globally, despite important job losses in some sectors (for example, fossil fuels and utilities) and regions, under the assumption that their economic structure does not divert from the historical trend (for instance, the Middle East and Africa) (ILO 2018a). These impacts can lead to temporal misalignments, for example where the creation of new jobs does not necessarily occur at the same time as the loss of employment. They can also involve *spatial misalignments* in which new jobs are not necessarily created in the same communities, regions, or countries where jobs were lost. Moreover, they can generate *structural misalignments* in which some sectors are severely impacted, and workers and enterprises affected do not have the skills or structure to enter positively affected sectors.

The transition may entail considerable risks for workers if fundamental labour rights are not guaranteed when implementing NbS. Existing and new green jobs in NbS⁴ and other green sectors are not decent by default. Without freedom of association, equality, skills, enterprise, and social protection policies, transitions risk being poorly managed, with potentially adverse outcomes. For example, without adequate social protection systems and skills training – specifically also for women and girls – occupational gender stereotypes are likely to be reproduced in the new jobs (ILO 2022a).

Social dialogue can be instrumental for the successful implementation of NbS if it succeeds in engaging trade unions, the business community and other key stakeholders such as indigenous peoples.⁵ The IUCN global standard is relevant in this respect (IUCN 2020a). Also, if indigenous peoples are not involved in

⁴ Bert de Wel, during interview.

⁵ Ana Belén Sanchez, during interview.

the design and implementation process of NbS, their cultural links with local ecosystems (Seddon et al. 2021) may be ignored (ILO 1989), restricting their access to resources that are essential to their livelihoods and traditional occupations.^{6,7} This can lead to opposition against NbS – and climate/transition policies overall – from local communities and conservation practitioners (Seddon et al. 2021), as well as failure to account for intersecting inequalities (JTRC, Rosa-Luxemburg-Stiftung, and UNRISD 2019; FPP and IPRI 2022; Tugendhat 2021; FOEI 2021). A related concern refers to the possible unintended consequences of offsetting carbon emissions (Tugendhat 2021; FPP and IPRI 2022; FOEI 2021; WEDO, Africa Women's Development and Communication Network, and FOS Feminista 2022) since, if not carefully managed, it may benefit some people at the expense of others (Seddon et al. 2021; Reid et al. 2019).

Besides affecting the local environment and natural resource availability, a poorly managed transition⁸ can generate socio-economic setbacks for those whose jobs were discontinued and for the people and communities affected by related policies and measures, leaving some individuals and communities behind and thus exacerbating existing inequalities. The following quote by Chile's Undersecretary of Labour illustrates these risks well:

This may not only lead to economic and social gaps between the groups that benefit from the transition and the groups that are left behind, but this type of process, if not accompanied by the framework provided by the just transition, can generate polarizing situations that ultimately affect the foundations of any democratic society. Any socio-environmental transition of the productivity structure requires significant social legitimacy.⁹

Applying the Just Transition Guidelines does not remove or prevent the trade-offs inherent to the transition to sustainable economies and societies, including related to implementation of NbS. Instead, it provides a framework to manage choices and priorities in a fairer manner. The Guidelines are intended to consider options for coherent policymaking to leverage decent work opportunities in NbS and to mitigate risks through a more inclusive policymaking process.

There is a small but growing number of cases that illustrate successful country-

⁶ Joan Carling, during interview.

⁷ It is challenging to precisely define traditional occupations. The term is used to refer to the range of activities that together meet the subsistence needs of an indigenous people (ILO 2000).

⁸ In the Just Transition Guidelines, the expression “manage the transition” is used to refer to using dialogue mechanisms among stakeholders to ensure coherent and inclusive strategies to tackle transitions.

⁹ Giorgio Boccardo, during interview. The original citation has been translated from Spanish to English.

level strategies and implementation anchored in an intentional just transition policy approach. This section presents interventions along the nine policy areas¹⁰ of the Just Transition Guidelines that could be considered to support NbS activities for decent work outcomes, with examples when available.

2.1.1 Macroeconomic and growth policies

The promotion of NbS as part of a just transition approach could be integrated into macroeconomic and growth policies that offer incentives and direct investments to sectors and programmes that produce positive biodiversity and social outcomes – especially if such policies explicitly draw on the Global Standard for NbS.¹¹ This could be applied, for example, by reforming agricultural incentives to make adopting NbS practices more attractive for investors. Macroeconomic policies may also foster economies that recognize and address the informal character of many NbS-related jobs. For instance, public procurement could incentivize the acquisition of products from agroecological farming (ILO and WWF 2020), which simultaneously promotes greener agricultural practices, decent work, and food security (Timmermann and Félix 2015). Importantly, public investment can also be used to “rehabilitate and conserve natural resources and prioritize resilience” (ILO 2015).

2.1.2 Industrial and sectoral policies

Developing specific industrial and sectoral policies that encourage NbS could support their operationalization and scaling up of decent work outcomes.¹² Cross-sectoral collaboration in implementing NbS is needed, considering their interdisciplinary nature (ILO and WWF 2020) and the fact that some NbS require work across entire landscapes, which often include different land uses and may be relevant for various sectors.¹³ Efforts could focus on sectors most relevant to NbS and job creation in national economies, such as agriculture, water management and sanitation, forestry, fisheries, green infrastructure, and urban planning. Just transition sectoral policies may be relevant in the case of certain climate-mitigation-related actions, for example when NbS can provide alternative employment opportunities in areas transitioning away from coal production. As some actors still perceive NbS as

¹⁰ These nine policy areas are: macroeconomic and growth policies; industrial and sectoral policies; enterprise policies; skills development; occupational safety and health; social protection; active labour market policies; rights; and, social dialogue and tripartism.

¹¹ Sascha Gabizon, during interview.

¹² Helen Tugendhat, during interview.

¹³ Stewart Magginis, during interview.

a niche area, targeted policy guidance by sector or industry could clarify and strengthen the broader linkages between enterprise activities, NbS and the just transition.¹⁴

2.1.3 Enterprise policies

Enabling policies could support NbS implementation¹⁵ on the scale needed to contribute to human well-being¹⁶ by fostering enterprises with decent work. Nature-based Enterprises (NBEs) are particularly relevant here, as they operate in sectors such as forestry, tourism, nature conservation and restoration, agriculture and food production (McQuaid et al. 2021), and could also contribute to research and education. Enterprise policies can facilitate, accelerate and incentivize more resilient and sustainable businesses.¹⁷ Regulatory frameworks and institutions, coupled with economic policies and incentives, can promote entrepreneurship and innovation in NbS, support business to shift to more become sustainable practices, and encourage both the adoption of NbS by enterprises and investment in up-skilling and re-skilling their workforce (IOE 2020). For instance, policies may incentivize companies to hire more workers in NbS and foster training and knowledge-sharing on NbS between enterprises.¹⁸

2.1.4 Skills development

Appropriate skills development could support workers and businesses in adopting and implementing NbS. It could support the creation of productive jobs that provide fair compensation (see box 2.2). Aligning enterprise and skills development policies – as well as investing in them – could support the economic viability of NbS as a policy option that results in the creation of decent work and green jobs. Investing in education, re-skilling and up-skilling through just transition skills policies may help prepare for jobs and build long-term capacity for improving employability in NbS, including for higher-skilled jobs in technical and professional occupations. Equipped with appropriate data and tools, governments can anticipate skills needs for emerging jobs and support training policies relevant to the territories and sectors where NbS are being implemented, considering their productive, economic and cultural characteristics.¹⁹ Including

¹⁴ Robert Marinkovic, during interview.

¹⁵ Helen Tugendhat and Robert Marinkovic, during interviews.

¹⁶ McQuaid et al. 2021.

¹⁷ International Organisation of Employers (IOE) 2022.

¹⁸ Robert Marinkovic, during interview.

¹⁹ Giorgio Boccardo, during interview.

gender considerations in the skills policy response and targeted training measures can enhance equal opportunity and treatment in the emerging NbS jobs and promote a better gender balance in transition-affected occupations (ILO 2019a; ILO and WWF 2020), thereby reducing the risk of reproducing occupational gender stereotypes.²⁰

BOX 2.2.

Some characteristics of the new jobs created through Nature-based Solutions

NbS can offer important opportunities for job creation as they are often labour intensive.¹ NbS jobs encompass activities in different sectors, such as agriculture, forestry, fishing, eco-tourism, nature-based infrastructure, city landscape planning,² policymaking, education and research. They can involve varying skill levels, from manual labourers in certain forestry work to highly specialized jobs in urban planning or biology or forestry-related jobs. Others sectors might also require more advanced skills, for example those related to circular and bio-economy, energy production, and biodiversity and ecosystem functioning. Different transitions may involve varied skills development needs,

and the new jobs may have varying durations depending on the type of NbS concerned. For example, some jobs created for the restoration natural areas affected by coal mining in Spain are estimated to end once the restoration of the sites is completed.³ In other cases, NbS may generate longer-lasting opportunities, as in the case of the Working for Water programme in South Africa, which since 1995 has removed invasive alien species that threaten the country's biodiversity and water security and require continuous removal (South Africa, Department of Forest, Fisheries and the Environment n.d.).

¹ Bert de Wel, during interview.

² Helen Tugendhat, during interview.

³ Ibid

²⁰ Sascha Gabizon, during interview.

2.1.5 Occupational safety and health

Occupational safety and health standards and capacity building are critical components for upholding decent work in NbS, given the risks and potentially hazardous working conditions in some NbS activities. National occupational safety and health authorities are encouraged to provide specific regulations and guidance regarding these activities. Adopting NbS practices in some cases may contribute to attaining occupational safety and health objectives. For instance, agroecological techniques can reduce workers' exposure to agrochemical hazards (ILO 2000) that could threaten their health, particularly that of pregnant and lactating women (ILO 2022e).

2.1.6 Social protection

Comprehensive and sustainable social protection systems and institutions can support NbS implementation in adopting a just transition approach.²¹ Policy measures could include, for example, unemployment protection and re-skilling programmes towards NbS activities for laid-off workers. NbS may provide new opportunities in regions negatively affected by transitions, reducing the need to migrate for those that lose their jobs. More generally, enabling labour mobility to access jobs in NbS through regular pathways within and among countries can meet labour market demands in both contracting and expanding regions. Moreover, NbS activities themselves may contribute to the income security of people who depend on ecosystem services, considering that better protected, restored and sustainably managed natural resources are crucial for their livelihood activities. Robust social protection systems can support women's participation in NbS through access to day care services, maternity and paternity leave protection, and healthcare.²²

2.1.7 Active labour market policies

A just transition can be enhanced significantly through targeted active labour market measures that support enterprises, workers and unemployed persons facing challenges stemming from the transition. Notably, Public Employment Programmes (PEPs)²³ are relevant policy instruments to complement private sector job creation. PEPs offer a policy option to respond

²¹ Giorgio Boccardo, during interview.

²² Sascha Gabizon, during interview.

²³ PEPs are referenced in more detail in Chapter 3.

to unemployment and underemployment challenges while simultaneously offering an avenue for public investment in natural capital via NbS. Also, NbS linked to employment guarantee schemes can help people bridge the gap between losing their jobs and transitioning to new sectors or formal jobs. Active labour market policies can be supported by data on unmet needs among enterprises for employing workers and matching with enterprise development needs in terms of qualifications and competence of its personnel.

2.1.8 Rights

International labour standards provide guidance for the greening of economies and may be used to encourage NbS activities to uphold the Fundamental Principles and Rights at Work²⁴ while minimizing potential risks for workers. Many standards cover specific industries or groups of workers, offering a social pillar to strengthen the ability for NbS to deliver decent work (ILO 2019a). International labour standards can also guide an inclusive policymaking process in NbS. The Indigenous and Tribal Peoples Convention, 1989 (No. 169) is a highly relevant platform for indigenous peoples' participation in formulating, implementing, monitoring, and evaluating climate- and biodiversity-related policies and plans. It provides authoritative guidance for both ratifying and non-ratifying countries²⁵ to set up the required institutions, mechanisms, and legal frameworks for building trust and ensuring that public policies address existing inequalities and reflect indigenous peoples' perspectives and aspirations (ILO 2013b; ILO 2020). Box 2.3 details the key ways indigenous peoples can contribute to NbS.

²⁴ Namely (a) freedom of association and the effective recognition of the right to collective bargaining; (b) the elimination of all forms of forced or compulsory labour; (c) the effective abolition of child labour; (d) the elimination of discrimination in respect of employment and occupation; and (e) a safe and healthy working environment.

²⁵ To date, 24 countries have ratified ILO Convention no. 169, namely Argentina, the Plurinational State of Bolivia, Brazil, Central African Republic, Chile, Colombia, Costa Rica, Denmark, Dominica, Ecuador, Fiji, Germany, Guatemala, Honduras, Luxembourg, Mexico, Nepal, Netherlands, Nicaragua, Norway, Paraguay, Peru, Spain, and the Bolivarian Republic of Venezuela.

BOX 2.3***Indigenous peoples' participation in Nature-based Solutions: Vital for biodiversity conservation, climate action and a just transition for all***

Indigenous peoples' territories comprise high percentages of the world's biodiversity and play a vital role in storing carbon (Noon et al. 2022; IPCC 2022; World Bank 2008; UNEP 2017). Indigenous peoples engage in occupations in sectors such as agriculture, forestry and fishing that rely on their traditional knowledge. The role of indigenous peoples in environmental sustainability, climate change adaptation, sustainable management and biodiversity conservation is increasingly recognized (Ahearn, Oelz and Kumar 2019; Chianese 2016; IPCC 2022; 2014).

According to Joan Carling, the Global Director of a non-profit global indigenous peoples' organization, "the recognition and protection of indigenous peoples' rights are at the core of NbS, (...) indigenous peoples

life ways and traditional occupations are NbS".¹

To secure indigenous peoples' contributions to NbS and create an enabling environment where they can exercise their role as agents of change for a just transition for all (ILO 2017a), indigenous peoples' collective rights to land, territories, and resources must be upheld; their knowledge and related traditional occupations should be promoted, including customary resource governance (Riamit and Esteban 2022); and their participation in decision-making and equitable benefit-sharing should be ensured.²

Investing in community-led programmes may result in sustainable outcomes for indigenous peoples and the environment.³

¹ Joan Carling, during interview.

² Joan Carling, during interview.

³ Helen Tugendhat and Joan Carling, during interviews.

2.1.9 Social dialogue

Social dialogue contributes to risk mitigation and inclusive policymaking. It provides a platform for participatory processes and facilitates dialogue between governments, trade unions and the business community, who are key stakeholders whenever NbS intersects with the world of work. Yet in rural areas, where many NbS sectors are located, the presence of representative organizations is low and the related social dialogue is not practiced. This poses a significant challenge for designing and implementing a just transition.

The institutional resilience provided by social dialogue can assist companies in preparing for transitions while supporting the pursuit of decent work (Ferrer Márquez, Maria-Tomé Gil, and Maeztu 2019; ILO 2021b; ILO 2022f; ITUC 2021).

Social dialogue refers to negotiations, consultations, or exchange of information between representatives of governments, employers and workers' organizations (Engin 2018). Decision-making to promote decent work in NbS requires building on social dialogue mechanisms to establish a broad stakeholder constituency. Meaningful and inclusive social dialogue with all the social partners involved, as well as broader stakeholder consensus with environmental and other civil society organizations (including academia), is central to balanced climate and environmental decisions (Engin 2018; ILO 2022a) – including decisions regarding NbS (see box 2.4). Social dialogue should also involve inter-institutional dialogue spanning different scales (national, regional, municipal and local levels). Consultation with indigenous peoples is essential for effective and meaningful social dialogue, mutual understanding, and legal clarity (ILO 2019b). For example, in Chile, just transition committees adopt a broader form of social dialogue that involves social partners, local communities, environmental organizations, specific productive sectors and indigenous peoples.²⁶

BOX 2.4

Meaningful and inclusive social dialogue in Spain: A key driver for decent work creation through Nature-based Solutions

In 2019, Spain adopted a Just Transition Strategy to support the transition of coal-dependent communities and signed an agreement with mining workers and companies to provide social and reactivation measures for affected workers

and mining areas. A total of 336 mining workers were entitled to early retirement benefits. Others received voluntary severance payments and the opportunity to enrol in the programme Bolsa de Trabajo, which facilitates access to training

²⁶ Giorgio Boccardo, during interview.

and orientation towards new jobs, mainly resulting from the energy transition. In 2022, 426 workers were registered in this job bank (Instituto para la Transición Justa 2022). Most of them are employed in NbS to undertake the restoration of mining sites through a plan funded with €150 million from the Recovery, Transformation and Resilience Plan (PRTR), generating 350 direct jobs.¹ These job opportunities last approximately three years and are directed at rehabilitating over 2,000 hectares of natural space, including recovering land and bodies of water, removing hazardous waste, ensuring soil stability, and restoring

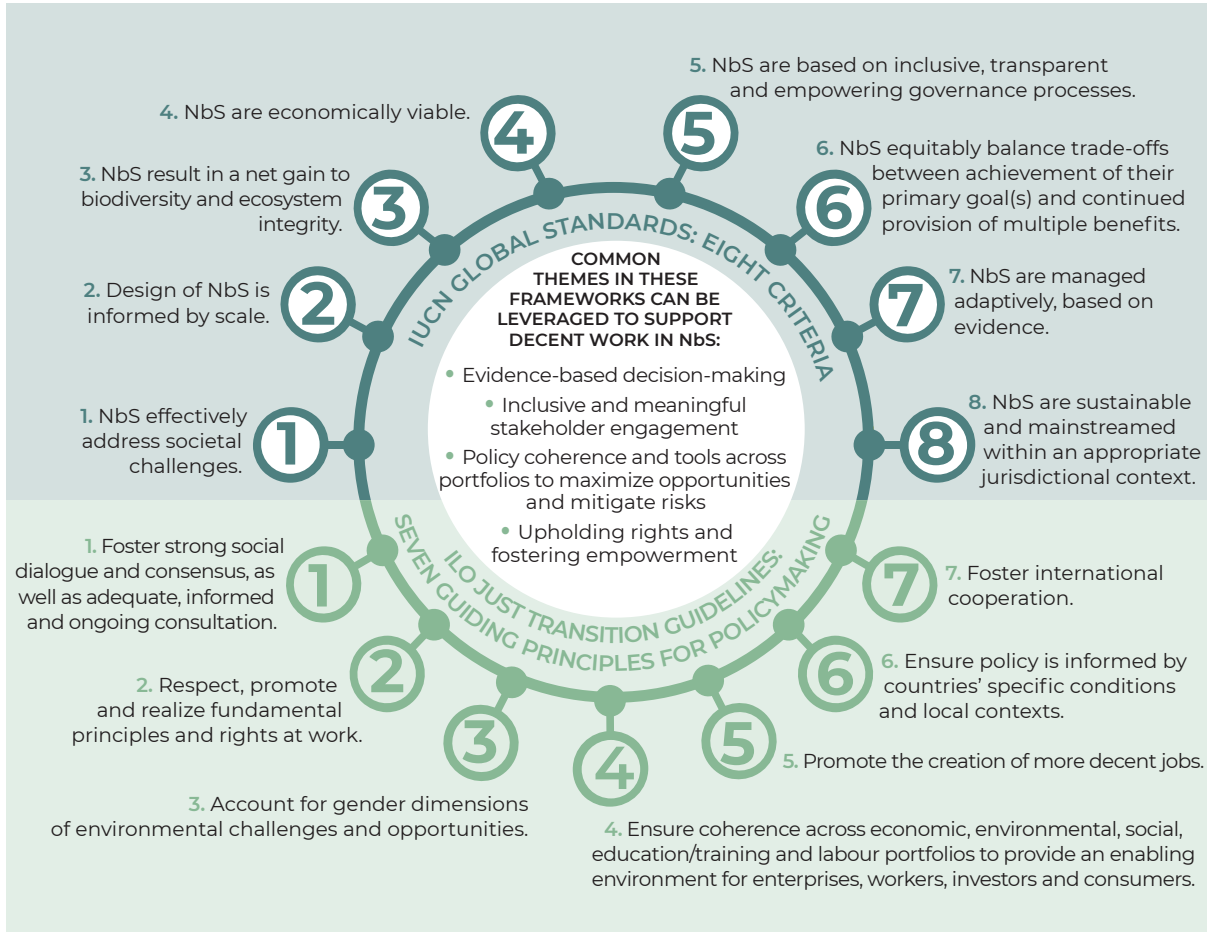
vegetation coverage (Spain, Ministerio para la Transición Ecológica y el reto demográfico 2021). NbS was identified by affected communities as a viable strategy to restore mining areas in so-called Just Transition Agreements, a tool for reactivating regions where transitions may cause difficulties for the maintenance and creation of businesses and employment (Government of Spain 2020). The process to develop such agreements involved negotiations between all government levels, social partners, academia, environmental NGOs, and other interested or affected parties.

¹ Ana Belén Sánchez, during interview.

2.2 Commonalities between IUCN Global Standard for NbS and ILO Just Transition Guidelines

Recognizing the challenges as well as the opportunities involved, NbS and just transition policies, strategies and plans can be integrated and aligned to support decent work and green jobs outcomes, contributing to social justice. The IUCN Global Standard for NbS (IUCN 2020a) and the ILO Just Transition Guidelines share some common ground with regard to NbS planning, implementation, monitoring and evaluation. The set of eight criteria established by the IUCN Global Standard for NbS and the seven guiding principles for policymaking highlighted in the ILO Just Transition Guidelines are presented in figure 2.1, noting some common themes between them.

Figure 2.1 IUCN global standard for Nature-based Solutions and ILO Just Transition Guidelines: Common themes



SOURCE: Authors' illustration.

There are also some similar features found in the UNEA resolution on NbS, including through its statement that NbS “respect social and environmental safeguards”, as well as its call to Member States “to follow a country-driven, gender-responsive, participatory and fully transparent approach when designing, implementing and monitoring nature-based solutions”. Importantly, the intergovernmental consultations, which are requested in the resolution, are required to “assess existing and discuss potential new proposals, criteria, standards and guidelines to address divergences, with a view to achieving a common understanding among Member States”.

2.3 Just transition through NbS as driver for decent work

NbS are emerging as a key component of the global effort to achieve the goals of the Rio Conventions, the Aichi Biodiversity Targets, the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, and the SDGs. NbS implementation in synergy with a just transition framework can leverage their potential as a driver for decent work, creating tangible value added, enhancing resilience, and supporting countries in achieving their national targets.²⁷

Some countries may develop a just transition strategy that includes NbS to leverage decent work outcomes before securing the funds to implement it.²⁸ In the case of Spain, having a clear just transition policy enabled decent work and NbS considerations to be an integral part of the country's COVID-19 pandemic response.²⁹

Notwithstanding some improvement in recent years, a just transition approach to promoting NbS should be better integrated into NBSAPs, NAPs and NDCs (UNFCCC 2021b; ILO 2022a). An increasing number of countries are including objectives to work with ecosystems as part of their mitigation and adaptation strategies in NDCs (Reid et al. 2019), but more concrete, evidence-based NbS targets are still needed. At the same time, more countries provided information on their consideration of just transition in updated NDCs (UNFCCC 2021b), but the connections between the two areas need much more strengthening. NAP processes can strategically raise the profile of NbS approaches, providing a framework for implementation at scale (NAP Global Network n.d.). For instance, Timor Leste (Qi 2021) and Fiji (Terton, Ledwell, and Kumar 2021) use their NAPs to scale up Ecosystem-based Adaptation (EbA). Both added social inclusion objectives and emphasized the role of EbA for socio-economic development in their NAPs, but neither included just transition strategies or plans per se. NBSAPs also provide an opportunity to promote NbS, decent work and green jobs. Uganda's NBSAP promotes protected areas as core drivers for nature-based tourism development in the local economy. The strategy links NbS and regional economic development, but it does not include further details on avenues for decent work creation (Republic of Uganda 2016).

²⁷ Stewart Maginnis, during interview.

²⁸ Ana Belén Sanchez, during interview.

²⁹ Ana Belén Sanchez, during interview.

Countries are thus encouraged to include actions to promote decent work and adopt a just transition approach towards NbS in NBSAPs, NAPs, NDCs, long-term low greenhouse gas emission development strategies and, more broadly, in national development plans and employment and social protection policies. NbS action can complement and support plans to strengthen positive biodiversity outcomes and human well-being.

Policy coherence is needed globally and nationally, ensuring communication and collaboration between relevant stakeholders to enhance NbS implementation in synergy with the Decent Work Agenda, following a just transition approach.³⁰ Multi-stakeholder support in formulating NDCs, NAPs and NBSAPs that include NbS can serve as an essential component of broader national development plans (Government of Chile 2020). Data production supporting just transition and NbS policies at the national level is needed, and, when available, should inform NBSAPs, NAPs and NDCs.

In conclusion, coherent NbS and just transition policies are relevant instruments to support countries in achieving environmentally sustainable economies and social justice. Inaction in developing and implementing such integrated policies could mean that countries will fail to respond to the triple planetary crisis or will manage transitions poorly – which can result in accelerated environmental degradation and biodiversity loss, missed opportunities for businesses and decent work, a deepening of existing inequalities, reduced productivity, and rising social discontent. The Just Transition Guidelines provide a framework to leverage decent work and green jobs opportunities in NbS and to manage risks in the transition process. They do not nullify the trade-offs inherent to transitions, including those related to NbS, but rather provide guidance on how to manage them in a fairer and more inclusive way. As climate change unfolds and response policies are framed continuously, new challenges will arise. Structured, inclusive and gender-responsive monitoring and evaluation mechanisms can help identify and address such challenges.

³⁰ Joan Carling, Robert Marinkovic and Stewart Maginnis, during interview.

The Guidelines also emphasize the importance of creating and using a social dialogue platform to enable the full participation of social partners, women and indigenous peoples, empowering them as agents of change. Aiming at decent work outcomes can support the sustainability of NbS through enterprise development, job creation, skills development, safe and healthy working conditions, and social protection. Industrial and sectoral policies are particularly relevant for individual sectors and cross-sectoral collaboration for the promotion and implementation of NbS that result in decent work and green jobs. In turn, NbS contribute to the safeguarding of, and improvements in, the natural environment that are essential for the long-term productivity, income security and sustainability of jobs and livelihoods in relevant sectors.

CHAPTER


THREE



Key messages

- **NbS address diverse social, economic and environmental challenges** and can be essential for creating, sustaining and enabling decent jobs in sectors that are dependent on nature.
- It can be **difficult to estimate** the prevalence and nature of work in NbS, as it is often integrated into economic activities and programmes that may not use work-related terminology. Identifying jobs and work activities that incorporate protecting, conserving, restoring and sustainably using and managing ecosystems can serve as a proxy for NbS-related work.
- Sustainable **agricultural** practices such as traditional indigenous practices, organic farming, and regenerative agriculture offer reasonable proxy for determining the scope of NbS work, as well as its contribution to enhancing resilience and improving food security. However, transitioning to more sustainable agricultural approaches entails labour-related implications, making it important to ensure that just transition principles and guidelines are applied.
- **Nature-based enterprises** can generate NbS-related work, whether permanent, temporary or seasonal, in both industrialized and developing countries. However, not everything these enterprises do qualifies as NbS, and employment data are limited.
- **Infrastructure development** that integrates NbS (such as ‘grey-green’ infrastructure) can address various challenges and plays a particularly important role in climate change adaptation. Increased use of NbS will likely lead to the development of specialized skills and the evolution of distinct occupations and specialized (nature-based) enterprises.

- **Public Employment Programmes (PEP) and Payment for Ecosystem Services (PES)** are two important vehicles that enable many people to work in sustainable resource management. A key challenge for these programmes is to manage multiple objectives in ways that do not compromise either their social or environmental objectives.
- NbS are especially prevalent in **rural areas**, where it can be transformative in helping to overcome deficits in employment opportunities, adequate pay, stability and security of work, safety at work, social protection, and social dialogue.
- The potential role of NbS for employment in **urban areas** is also significant, and impacts are likely to be concentrated in specific sectors and activities with a strong link to NbS such as water and flood management, development of urban public spaces, green buildings, and use of natural and hybrid infrastructure.
- Increased use of NbS can pose important short to medium-term **risks to jobs and livelihoods**, particularly in areas where existing employment and livelihoods are linked to the unsustainable use of nature. Measures to mitigate such impacts can include jobs placement services, re-employment training, early retirement, ensuring access to unemployment benefits, and the use of and payment for ecosystem services programmes.



Chapter 3

An overview of current work in NbS

The UNEA resolution on NbS (UNEP 2022a) provides an extensive list of social, economic and environmental challenges that NbS can help address: It also mentions that NbS offers benefits that contribute to social development, sustainable economic development and human health. Further, the IUCN Global Standard (IUCN 2020b) emphasizes the effective use of NbS and recommends that these challenges should be clearly understood and documented, that challenges for rights-holders and beneficiaries should be prioritized, and that the human well-being outcomes of NbS should be monitored. Others, such as the Nature-based Solutions Initiative (2022), also emphasize various co-benefits of NbS, including livelihoods enhancement, coastal protection, cultural values, increased social capital, and cooling and shading.

NbS address these diverse challenges through people working on *protecting, conserving, restoring and sustainably using and managing ecosystems*. Figure 3.1 illustrates this dimension of NbS. Work in NbS also includes the necessary enabling activities for the effective application of NbS such as planning, design, consultation, management, finance and research. Although out of scope of this chapter, it is important to note that nature-based solutions can be essential for creating, sustaining and enabling decent jobs in not only primary sectors, but also many secondary and tertiary sectors, which are dependent on nature. For example, the majority of the supply chains of chemicals and materials; aviation, travel and tourism; real estate; mining and metals; logistics and transport; and retail, consumer goods and lifestyle sectors are all highly of moderately dependent on nature (Herwijer et al. 2020).

Figure 3.1 How Nature-based Solutions involve people working with nature



SOURCE: Authors' compilation

It is important to lay out the main difficulties in trying to assess what constitutes NbS-related work across various sectors. Primarily, while the protection, restoration, conservation and sustainable use and management of nature are core to NbS, the corollary – that all activities that involve this type of work can be considered NbS – is not true. For example, determining whether a specific farm is implementing NbS would require an assessment at the local level. As this is not being done in a systematic way either locally or globally, identifying related activities remains the only vehicle for assessing potential NbS work or similar work. Second, many existing initiatives that are

implementing NbS do not necessarily identify their activities as such. Finally, it is likely that a large amount of NbS work remains hidden due to a lack of data or general awareness. In particular, the prevalence of NbS work at local levels through both local government and private actors (enterprises, communities and households) is an area in which data and understanding are limited. Yet these could be very large, both in terms of value and labour input,¹ and could grow in the foreseeable future as more NbS are implemented.

The approach taken in this chapter is to identify a set of jobs and work activities that incorporate protecting, conserving, restoring and sustainably using and managing ecosystems, and use these as a proxy for NbS. This enables the identification and characterization of potential work in NbS without the need to determine whether such activities meet the strict definition of NbS. While this exercise covers many key areas that incorporate NbS work, it is not meant to be exhaustive. Rather, this chapter aims to provide an overview of the range and diversity of work likely to be involved in NbS.

The following sections examine the potential for NbS work in a variety of fields, including agriculture (section 3.1), nature-based enterprises (section 3.2), infrastructure development (section 3.3), Payments for Ecosystem Services (section 3.4), Public Employment Programmes (section 3.5), and volunteering (section 3.6). Section 3.7 summarizes conclusions and considerations.

3.1 Agriculture and work in NbS

Agriculture is the main form of employment for almost 900 million people globally and is particularly important in rural areas of lower and middle-income countries (ILO 2022c). Enhancing the resilience and productivity of agriculture is important for improving food security, and NbS can play an important role in this. Examples of agriculture that aim to sustainably use and manage natural resources can thus provide a reasonable proxy for determining the scope of NbS work in this area.

Various NbS practices contribute to making agriculture more sustainable

¹ See, for example, Eskander et al. (2022) who estimate that rural women in Bangladesh collectively invest more than USD 1.6 billion annually into adaptation activities. While these are activities not necessarily NbS, it raises the question of the amount of collective investment in NbS by local actors.

and thus to enhanced food security.² For example, NbS can contribute to improving soil fertility and water availability, improving resilience to pests, or reducing soil erosion. Many practices that aim to achieve these outcomes are incorporated into various agricultural production systems. However, the extent to which different approaches to agriculture can be considered NbS is still the subject of debate. Oberč and Arroyo Schnell (2020, 5) discuss 14 ‘sustainable agricultural approaches’ that adopt the principle of “conserving, protecting and enhancing natural ecosystems” and use some practices that could be considered NbS practices.³ However, the combinations of NbS and non-NbS practices that could constitute “NbS agriculture approaches” is not clear. Even for these 14 approaches, there are generally no agreed global definitions.

Given the lack of consensus on which agricultural practices could be considered NbS,⁴ there are no data available on how widely NbS are used in agriculture and thus how many people may be working in NbS in agriculture. However, since various sustainable approaches do use a variety of NbS practices, some of them can be used as proxies to illustrate the prevalence of, and implications for, NbS work in agriculture. The basic understanding of these agricultural practices is that they should generate a positive change in biodiversity and ecosystem services.

Traditional indigenous practices⁵ have been used sustainably for generations, if not millennia, in many regions of the world. Such practices are an integral part of how indigenous and tribal people care for and manage the land they are custodians of. However, information is scant on how widely these practices continue to be applied globally. In 2019, the ILO estimated that of the approximately 477 million indigenous and tribal peoples around the world, 55 per cent are engaged in agriculture as their main form of employment (ILO 2019b). However, the proportion of those practising traditional approaches is not known.

2 Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. (FAO 2002)

3 The IUCN Restoration Intervention Typology for Terrestrial Ecosystems (RITTE) provides an overview of restoration practices on agricultural lands in line with sustainable agricultural approaches. (IUCN 2022b)

4 RITTE was developed by multiple stakeholders, with a general consensus on the activities listed there.

5 This refers to traditional practices of indigenous and tribal peoples still practiced in selected regions of the world. Whether they could be considered NbS would depend both on the actual method, as well as whether this method is still sustainable in the current context.

Organic agriculture includes some practices that could be considered NbS or NbS practices. The Codex Alimentarius Commission, a joint initiative of FAO and the World Health Organization (WHO), defines 'organic agriculture' as:

[A] holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system. (FAO/WHO Codex Alimentarius Commission, 1999)⁶

Because of the certification requirements and associated regulatory framework, extensive data on the prevalence of organic farming are available; however these are still not likely to be comprehensive, as some countries lack certification schemes and some producers may not be certified. Table 3.1 shows that in 2020 there were about 3.4 million certified organic producers globally. Notable is the variation in average farm size across continents, implying important differences in the number of employees per producer. On smaller farms, some farmers could be categorized as own-account workers (such as self-employed workers) who could also rely on family members to contribute work; however, in general most producers would also employ long-term, seasonal and casual wage workers (Mueller 2021; Lieuw-Kie-Song et al. 2020).⁷ While there are no data available for the number of employees per producer, total employment in organic agriculture is likely to be much higher than the number of certified producers, especially if non-certified organic farmers are also included. Many of these workers will do some work in NbS or NbS-related activities.

⁶ However, the legal definition of organic varies by legislative region, with for instance differences in how it is defined in the EU, UK and USA.

⁷ 153 Especially in developing countries, the importance and prevalence of wage work in agriculture is often underestimated. Even small-scale farmers make wide use of wage labour during peak periods and for some specialized tasks.

Table 3.1 Certified organic agricultural land and producers worldwide (2020)

REGION	AREA (HA)	NUMBER OF PRODUCERS	AVERAGE AREA (HA)/ PRODUCER
Africa	2 086.859	833 986	2.50
Asia	6 146.235	1 808.464	3.40
Europe	17 098.134	417 977	40.91
Latin America and the Caribbean	9 949.461	270 472	36.79
North America	3 744.163	22 448	166.79
Oceania	35 908.876	15 930	2254.17
World*	74 926.006	3 368.254	22.24

*Includes correction value for French overseas departments

SOURCE: Willer et al. (2022) and authors' calculations

'Regenerative' agricultural practices aim to regenerate soil, reducing but not necessarily eliminating synthetic pesticides and fertilizers. They go beyond the reduction of negative effects and ensure that agriculture has a positive effect on the environment.⁸ Regenerative agriculture is a more recent sustainable agriculture approach. Information about how widely it is practiced on a global scale is still scarce. The Africa Regenerative Agriculture Study Group (2021) estimates that about 100,000 farmers in Africa have adopted these practices, but they do not provide any figures of how many people these farmers employ nor how many household members are involved in farm work. Many of these farmers could also be certified as organic, which could lead to double counting.

⁸ Again, this is not a universal definition.

Transitioning to more sustainable agricultural approaches has several labour-related implications, making it important to ensure that just transition principles and guidelines are applied. “Protecting and improving rural livelihoods and social well-being” (Oberč and Arroyo Schnell 2020, 5), is seen as a principle of sustainable agricultural approaches, which implies that wider adoption of such approaches would need to be accompanied by improved working conditions in agriculture, more generally. However, some issues related to adopting more sustainable practices warrant further attention.

For example, the length of time needed for NbS practices to deliver concrete benefits is important to consider when switching to more sustainable practices and increasing use of NbS. Ajayi et al. (2009), found that agroforestry-based soil fertility practices take longer to produce benefits than using conventional fertilizer. The Africa Regenerative Agriculture Study Group (2021, 61) draws similar conclusions: “implementing new practices takes time and knowledge, and benefits are not always immediate. Responsive and timely access to training, investment incentives and capital is therefore critical for success”. This raises important questions regarding the type of just transition policies required to enable farmers to adopt sustainable farming approaches and NbS practices that support decent work outcomes.

Another tangible and potentially positive impact is on the occupational health and safety of agriculture workers. It is very likely that increased use of NbS practices, in relation to weed and pest control, will reduce workers’ exposure to chemicals and thus contribute to reducing the large number of associated negative acute and long-term health impacts for millions of agricultural workers.^{9,10}

Along with questions regarding the influence of sustainable practices on yields, input costs and farmer incomes, one important employment-related issue relates to whether such practices are more labour-intensive. While all these factors will influence the adoption of such practices, this chapter focuses on labour intensity, which will directly affect the amount of labour required. The evidence on this is mixed. For example, Ajayi et al. (2009) conclude that growing maize in Zambia using agroforestry-based soil fertilization – often considered NbS along with other agroforestry practices – is not more labour-

⁹ For example, Boedeker et al. (2020) estimate that about 385 million cases of unintended acute pesticide poisonings occur annually worldwide, including around 11,000 fatalities. Inserm (2022) confirms the strong presumption of a link between pesticide exposure and six pathologies: non-Hodgkins lymphoma, multiple myeloma, prostate cancer, Parkinson’s disease, cognitive disorders, and certain respiratory illnesses such as chronic obstructive pulmonary disease and chronic bronchitis.

¹⁰ The occupational health and safety concerns of these workers resulted in the International Labour Standards Safety and Health in Agriculture Convention 184 (ILO 2001a) and Recommendation 192 (ILO 2001b).

intensive when compared to fertilized and non-fertilized conventional methods.¹¹ Armengot et al. (2016) compared production of cocoa and banana/plantains using organic agroforestry, non-organic agroforestry, organic, and conventional methods in Bolivia and found that using agroforestry was more labour-intensive. For organic agriculture, findings again are mixed. Orsini et al. (2018) conclude that existing studies show variable results in Europe and do not confirm that organic farming always requires more labour than conventional methods. They point out that differences in labour inputs are not only determined by farm type (such as horticulture, dairy or meat) but are also heavily influenced by farm management practices such as weed and pest control, fertility building, tillage, and livestock management. These not only influence labour intensity but may also in turn affect labour productivity. For example, workers on organic farms might be engaged in low productive practices, such as controlling weeds manually. However, Finley et al. (2018) found that in California and Washington, organic farms employed more workers per acre, and their results also suggested increased labour requirements.

Sustainable agricultural practices may require a different approach to mechanization, which will affect on-farm employment. Mechanization tends to reduce labour intensity (reducing total direct employment) but increase labour productivity (increasing wages). Approaches to mechanization are heavily influenced not only by farm size but also by the combination of crops, with monocultures being mechanized most commonly. Sustainable agricultural practices, which tend to vary between land uses and crop mix (Oberč and Arroyo 2020) and are more widely practiced on smaller farms, require smaller and more versatile equipment; thus there are different implications for labour intensity and productivity compared to larger-scale equipment. Mechanization, even at a smaller scale, remains critical to enhancing labour productivity and incomes, and to reducing drudgery of certain types of farm work, thereby contributing to decent work outcomes; however, it is not incompatible with sustainable agriculture or NbS.

¹¹ Note that this comparison was done over a five-year cycle; the authors did note a temporal shift in labour inputs, with agroforestry requiring a higher labour input in the first and third years, but lower labour inputs in the other years. Thus, an assessment done over a one-year cycle would have yielded contrary conclusions.

3.2 Nature-based enterprises

Another manner through which NbS can be implemented and jobs created is through enterprises that engage in some or all of the core NbS activities (protection, conservation, restoration and sustainably using and managing ecosystems), or in work on enabling these activities through, for example, finance or research. While many farms can also be considered enterprises, this section examines non-farm enterprises.

Kooijman et al. propose to define a nature-based enterprise (NBE) as “an enterprise, engaged in economic activity, that uses nature sustainably as a core element of their product/service offering” (2021, 2). These 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 not everything these enterprises do qualifies as NbS. Table 3.2 provides examples of the type of activities these enterprises can engage in.

Table 3.2 Examples of activities undertaken by nature-based enterprises

		ECONOMIC ACTIVITIES	NBS ACTIVITIES AND NBS-LIKE ACTIVITIES
1		Ecosystem restoration and management	Ecological and landscape restoration Ecosystem conservation and management Biodiversity conservation Reforestation Marine and freshwater ecosystem conservation and management
2		Green buildings	Construction of some living green roofs and façades, and some living green walls indoors and outdoors
3		Public and urban spaces	Development and maintenance of green areas, parks, and gardens Construction and maintenance of green infrastructure Green space management Urban forestry management Urban regeneration
4	Direct use of NbS	Water management and treatment	Natural flood and surface water management Construction and maintenance of urban green and blue infrastructure Urban water management Wastewater management
5		Sustainable agriculture and food production	Agroecology including some types of agroforestry Some types of organic farming Beekeeping Soil improvement and conservation Regenerative farming
6		Sustainable forestry and biomaterials	Sustainable forest management Production of biomaterials for construction or for food preservation Management and fighting of forest fires
7		Sustainable tourism and health and well-being	NbS for health and well-being Agritourism Eco-tourism and nature-based tourism Forestry tourism

		REMEDICATION	IMPLEMENTATION OF NATURAL ATTENUATION AND ASSISTED NATURAL REMEDIATION
8		Advisory services	Biodiversity and ecosystems Urban greening design and planning Landscape architecture Water management Community engagement for NbS
9	Activities enabling the use of NbS	Education, research and innovation activities	Ecological research Environmental awareness and education Research and innovation projects Vocational and skills training
10		Financial services	Carbon offsetting Investment for biodiversity and conservation Natural capital accounting
11		Smart technology, monitoring and assessment of NbS	Smart technology solutions for NbS Environmental monitoring and certification Development Spatial tools for environmental planning

SOURCE: Adapted from Kooijman et al. (2021)

Findings from a survey of such enterprises found that in the EU, 76 per cent can be considered microenterprises and 21 per cent fall into the ‘small enterprises’ category (European Commission 2022).¹² Some 40 per cent of enterprises surveyed considered themselves for-profit, 44 per cent ‘hybrid’ and 16 per cent non-profit. There are no estimates of how many of such firms are currently active and how many persons they employ.

NBEs are also present in developing countries. In China, the large-scale restoration of forests and grasslands has resulted in the development of more than 23,000 restoration cooperatives that implement restoration contracts and provide employment opportunities to 1.6 million people, mostly in rural areas (see on China in Chapter 2). In Brazil, a recent survey of the restoration economy found that nearly 60 per cent of all restoration jobs were generated

¹² According to the definition of the European Commission (2022): micro enterprises have <10 full-time employees and an annual turnover of <2 million Euro, small enterprises have <50 full-time employees and an annual turnover of <10 million Euro, and medium-sized enterprises have <250 full-time employees and an annual turnover of <50 million Euro.

by NBEs that specialize in restoration, mainly from the non-profit (48 per cent) and private (37 per cent) sectors (Brancaion et al. 2022). The same survey found that of these restoration jobs, 43 per cent could be considered permanent, and that the remaining jobs were generally temporary and seasonal.

Other enterprises may carry out certain activities which can be considered spin-offs from NbS-related practices, much in the same way as agriculture could be considered a spin-off from the main NbS activity. Examples, some of which are described in the case studies in this report, include enterprises involved in eco-charcoal, tree nurseries, beekeeping and seaweed harvesting (see case study on Kenya in Chapter 2, South Africa in Chapter 3 and The Gambia in Chapter 6). Many of these enterprises are small and predominantly offer part-time and informal employment.

3.3 Infrastructure development

Another important avenue of potential NbS implementation is through the development of natural and hybrid (also referred to as ‘grey-green’) infrastructure. A separate UNEA resolution on sustainable and resilient infrastructure, also adopted in 2022, recalls a previous resolution to: “promote nature-based solutions as key components of systems-level strategic approaches to infrastructure planning and development”, and encourages member states to “promote investment in natural infrastructure and nature-based solutions for delivering essential services and improving ecosystem services, creating employment and accelerating the achievement of the Sustainable Development Goals” (UNEP 2022b). Infrastructure that integrates NbS can contribute to most of the challenges identified in the UNEA resolution on NbS, but is likely to play a particularly important role in climate change adaptation where certain types of infrastructure investment are essential. An excellent example of this is the Living Breakwaters Project in New York City, where new oyster reefs are being constructed as means of restoring damage caused by Hurricane Sandy and protecting parts of the city from wave erosion and coastal inundation, while at the same time generating co-benefits for local biodiversity and recreation opportunities (GOSR 2022).

The types of employment encountered are likely to mirror what is common in the construction sector: a mix with a share of temporary employment opportunities for workers who move from project to project, along with

permanent workers who form the core technical staff of contracting and specialized subcontracting enterprises. Increased use of NbS will likely mean that a subset of workers will develop specialized skills, and this will evolve into the development of distinct occupations¹³ and specialized (nature-based) enterprises (see box 3.1). Across this whole sector, for many workers the use of NbS primarily involves learning how to use a new technology or product. The quality of employment is again likely to mirror the rest of the sector for similar projects. Thus, in countries where similar projects have a high share of casual and informal workers, this is also likely to be the case for NbS projects.

When it comes to developing natural infrastructure, a lot of related work involves restoration of strategic ecosystems, for example the restoration of wetlands in and around urban areas as a part of a flood control strategy. Kelmenson, BenDor and Lester (2016) reviewed the employment outcomes of such restoration work in the United States. They reported that nearly 90 percent of the direct employment generated is in the architectural, engineering and related services, and in environmental and other technical consulting services sectors, in addition to construction, agriculture, and forestry. The same study reports evidence that ecological restoration work provides a mix of high-income (such as planning, design, engineering, architectural) and low-income (such as moving earth and site construction) employment, without many jobs in the middle; it also found that, overall, restoration jobs are well paid compared to average wages in the country.

Edwards et al. (2013) provide an overview of job types (occupations) involved in habitat restoration. Apart from construction workers and equipment operators, these include a range of professional occupations including geologists, engineers, biotechnologists, lawyers, environmental consultants, accountants and project managers.

¹³ For example, environmental engineering evolved as a subdiscipline of civil engineering, and one could foresee a further specialization among environmental engineers to 'NbS engineers'.

BOX 3.1 *NbS and the engineering profession*

The engineering profession has traditionally delivered 'grey' infrastructure solutions – those that create value and services through the construction of facilities and other built assets. However, while providing diverse employment opportunities and other benefits, such solutions often consume scarce natural resources and can bring about negative environmental impacts. In the context of increased interdisciplinary work and awareness of the triple planetary crisis of climate change, nature loss and pollution, the engineering community is embracing NbS and harnessing their potential for creating jobs across the skills spectrum.

For example, the Green-Gray Community of Practice, led by Conservation International (2022), is mainstreaming NbS into engineering through global training and exchange activities. The organization is combining nature-based approaches with technical, engineering and science-based expertise to address the triple planetary crisis.

Such approaches have resonated with engineering firms and contractors. Members of the International Federation of Consulting Engineers (FIDIC), for example, are increasingly deploying NbS to complement or replace grey infrastructure,

thereby creating opportunities for professional development and decent jobs.

A senior consultant at the infrastructure consulting firm AECOM noted that the firm expects the mainstreaming of NbS in infrastructure design and planning to result in an increase in NbS-related work for engineers. For example, considerable interventions are already needed to protect infrastructure and people living near coastlines from the impacts of climate change; AECOM expects the amount of work related to river restoration and naturalization, reforestation, coastal realignment, mangrove restoration and seagrass meadow creation to increase substantially over the next few years (AECOM 2022).

These activities require not only manual tasks at scale, which provide valuable opportunities for communities. They also need professional and skilled men and women for rigorous data collection, modelling, mapping, assessment and long-term monitoring to deliver sustainable infrastructure services. By combining local knowledge with research and management tools from engineering and natural/social sciences, NbS can generate significant decent work opportunities.

AUTHORS: Rowan Palmer and Joseph Price.

3.4 Payment for Ecosystem Services

Payment for Ecosystem Services (PES) are an important avenue for financing restoration, reforestation, and soil and water conservation activities in several countries. They can also potentially address other challenges, such as climate change, land degradation, desertification and food insecurity, but the extent to which they create jobs is not straightforward to establish. PES¹⁴ are results-based payment programmes that provide a form of payment or transfer to individuals, households, enterprises or communities who ensure the maintenance or enhancement of ecosystem service provision through sustainable landscape management. Agriculture, forestry and fisheries are the most common sectors for PES, and a major aim of these programmes is to support a transition to more sustainable practices in these sectors. While not NbS by definition, PES often include similar activities. As incentive schemes, PES do not hire people to implement activities but provide payments based on agreements for a series of activities or outputs, which in turn require people to perform work. This section provides a brief overview of PES with the aim of shedding light on potential work under similar incentive schemes focused on implementing and maintaining NbS.

In addition to environmental objectives, PES schemes often also have social protection and sectoral goals. They may include specific targets regarding rural poor or vulnerable households and aim to provide a form of income support. There are often two rationales behind including these groups. First, those receiving payments are often highly dependent on nature and the ecosystem services nature provides, and therefore a system that incentivizes them to protect and restore ecosystems is an investment in their livelihoods as well as in the maintenance and enhancement of natural capital more broadly. Second, these programmes offer a type of compensation to beneficiaries due to a (temporary) loss of income caused by the implementation of the PES, such as income loss during the transition to more sustainable agricultural practices or to conservation activities instead of establishing new agricultural plots (Uchida, Xu and Rozelle 2005).

There exist a wide variety of PES schemes, ranging from cash transfers with what can be considered 'soft conditionalities', to strict PES programmes with

¹⁴ Different definitions of PES exist. Muradian et al. define PES as “a transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources” (2010). Wunder defines PES as “voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services” (2015).

specific and measurable contractual outputs attached to payments. These different programmes operate at scales ranging from the level of a single municipality to the national scale. Participants in these programmes are referred to in different ways, for example as providers of ecosystem services or as beneficiaries. The use of the term ‘beneficiaries’ may reflect the social protection objectives of these programmes; however this makes it unclear whether beneficiaries’ activities can be considered paid work,¹⁵ although in order to receive the incentives it is expected that participants will carry out certain activities related to, for example, conservation or restoration. The way these programmes describe their participants can vary. For example, the Sembrando Vida programme in Mexico simultaneously refers to those in the programme as beneficiaries and persons in permanent employment,¹⁶ whereas the Socio Bosque programme in Ecuador calls individuals or communities that participate ‘partners’ and ‘programme beneficiaries’ (Gobierno de la República del Ecuador 2022). Finally, while the Grain for Green programme in China does not refer to members of participating households as being employed, the labour inputs each participating household typically provides is between 30 and 60 days a year, implying a significant amount of part-time work for the millions of households engaged in the programme (see China case study in Chapter 2).

While it is clear that because of these schemes people are engaged in NbS-related work, they generally also create a transition from one form of work to another. Typically, they reduce time working on certain farming practices and partially re-allocate this time to sustainable land management practices. Therefore, while this has several implications for work, these programmes may not result in additional direct work creation within a target group. PES schemes, however, do generate employment through jobs in the management, technical support, and monitoring of programmes (for example, in government institutions, NGOs providing support to local implementation, or research institutions). Further, some incentives can be used to hire labour, for example to support the protection of conservation areas or to plant trees for incentives related to reforestation or agroforestry

¹⁵ The ambiguity as to whether the work performed under these programmes can be considered as paid work and thus employment also stems from the 19th ICLS resolution, which states that the following groups are excluded from employment: “persons who are required to perform work as a condition of continued receipt of a government social benefit such as unemployment insurance” (ILO 2013c, 7). If this and similar programmes were thus considered a social benefit, then work related to PES would not be considered employment.

¹⁶ In the official programme document (Reglas de Operacion) of Sembrando Vida, the Diario Oficial from 31 December 2021, the terms beneficiarios is consistently used and they are never referred to as employees of the programme. However, on the website of the programme, it states that one of the benefits of the programme is permanent jobs (empleos permanentes), with a monthly salary of MXP 5000, which is the level of the benefit received by the beneficiaries in the programme. All accessed on Mexico, Secretaría de Bienestar (2020).

systems. Finally, there are also likely to be some induced and indirect effects (Porras et al. 2013).

It is important to emphasize that the payment may in some circumstances also require beneficiaries to work less. For example, they may be compensated for halting fishing activities to allow fish stocks to recover, with no requirement to take on other work. The payment provides a combination of both compensation for loss of income, as well as a reward for NbS work implemented. Table 3.3 gives an overview of several national PES or similar scheme to illustrate the size and type of activities for which payments are received. Further, two case studies from China and Costa Rica provide more in-depth analysis of how programmes function and their implications for work and employment. There are, however, many more such programmes in operation at the global level, often at a more local scale.

Table 3.3 Selected national PES or PES-like schemes

PROGRAMME	COUNTRY	NUMBER OF BENEFICIARIES	NBS ACTIVITIES
Grain for Green (see case study)	China	41 million households	Land restoration, primarily forest and grasslands
Payment for Environmental Services Programme (See Costa Rica case study)	Costa Rica	10 379 PES contracts issued since 2010. (175 with indigenous territories, 5 092 individual contracts ^a and 5 112 legal entities) who in turn employ workers to implement some of the activities	forest protection; protection of water resources; reforestation; natural regeneration; agroforestry systems; post-harvest protection
Sembrando Vida ^b	Mexico	455 749 small-scale farmers, 69% male, 31% female ^b	Supports small-scale farmers to shift to agroforestry
PROBOSQUE	Guatemala	In 2022: 59 700 beneficiaries, and 2 718.705 labour days	forestry plantations; management of natural forests for protection and provision of environmental services; management of natural forests for production purposes; restoration of degraded forest lands; agroforestry systems

PROGRAMME	COUNTRY	NUMBER OF BENEFICIARIES	NBS ACTIVITIES
PINPEP ^c	Guatemala	In 2020: 2 845,960 labour days. Direct beneficiaries: 32,233 men, 24 243 women. Indirect beneficiaries: 64 924 men, 69 198 women.	forest management of natural forest for production or protection purposes; forestry plantations; agroforestry systems
Programa Sociobosque	Ecuador	173,000 beneficiaries since 2008	conservation of forest, mangroves and paramos
Payment for forest ecosystem services	Viet Nam	Collective payments for communities with collective forest land title; organized kin and clan groups managing forests; and communities without land titles providing collective patrols for protection of state forest lands on 377,259 hectares	forest protection

NOTES:

a Of the individual contracts, 30 per cent were with women.

b The beneficiaries for Sembrando Vida (Mexico) were included in the global employment estimates in Chapter 6 because they are also specifically referred to as being employed.

c Incentive program for holders of small tracts of land with forestry or agroforestry vocation.

SOURCE: Mexico, Secretaría de Bienestar (2020); FONAFIFO (2022); SIFGUA (n.d.(a), n.d.(b)); Gobierno de la República del Ecuador (2022); McElwee et al. (2022).

Similar programmes are implemented in Australia, the USA and Europe. Many of these focus on agricultural land, such as the USA Conservation Reserve Program, or the EU Agri-environment schemes. For example, the Irish Green Low-Carbon Agri-Environment Scheme had 48,551 active participants in April 2020. Finally, there exists a wide range of carbon credit schemes focusing on land use management. These payments do not constitute direct employment, but they can create a shift in work towards NBS (or NBS-related) activities, with employment effects. While employment in PES is not straightforward, it is in Public Employment Programmes.

3.5 Public Employment Programmes

Public Employment Programmes (PEP), also known as public works programmes, have a history in conservation dating back at least to the Civilian Conservation Corps in the USA, which employed between 300,000 and 500,000 men each month from 1933 to 1943. While their primary objective tends to be the creation of employment for target groups such as the unemployed or underemployed, they are also an important instrument for enabling governments to invest in a wide range of public goods and services. These include conservation and ecosystem restoration for both improved ecosystem services and disaster risk reduction (Lieuw-Kie-Song 2009; Costella et al. 2021). To optimize their employment impact, they may include what the ILO refers to as 'Green Works': activities that are both employment-intensive and have a strong environmental or climate change adaptation focus (ILO 2020). Currently there are several programmes around the world that include NbS-related work; the largest ones are found in rural areas of developing countries.¹⁷

Box 3.2 gives an overview of the world's largest PEP scheme.

BOX 3.2 Mahatma Gandhi National Rural Guarantee Scheme (MGNREGS)

MGNREGS is the world's largest Public Employment Programme (PEP). Its accompanying act, which was passed in 2005, legally guarantees any rural household in India up to 100 days of employment per year. Employment is provided upon demand from each household and is paid at the agricultural minimum wage. To be able to demand employment, households need to register and receive a job card. To date, over 156

million households are registered and have received a card. Around 104 million people were employed by the scheme in 2020–21, of which 53 per cent were women. This total was about 30 per cent more than the average over previous years, primarily due to the COVID pandemic during which many workers residing in urban areas returned to rural areas and requested work through the scheme. The scheme is primarily financed by the central government

¹⁷ None of the programmes explicitly claim to be using NbS, but it is assumed that the activities are generally aligned to NbS.

with limited contributions by the states.

The types of work and exact projects are decided in consultation through local government structures (Panchayati Raj institutions). The scheme engages in four types of work: (a) natural resource management; (b) community or individual assets for vulnerable households; (c) community infrastructure including for self-help groups; and (d) rural infrastructure. About 65 per cent of work

is done in natural resource management and includes water conservation, watershed management, micro-irrigation, renovation of traditional water bodies, and afforestation. This resulted in 68.7 million persons working the equivalent of 10 million FTEs on these types of activities. As a result, it is by far the largest source of NbS-related employment in the world.

SOURCE: MGNREGA n.d.

Other countries with nature-focused national PEPs include New Zealand, Pakistan (see case study), South Africa (see case study), Rwanda, and Ethiopia. In addition, there also exist local or regional programmes, for example in Colorado (Morrison 2021). Some of these smaller projects and programmes are also referred to as ‘cash for work’ projects; however, these are often limited both in terms of scale and period of implementation. While they can engage in specific NbS-related activities, it is more difficult for them to align with long-term NbS strategies or operate at the landscape scale.

Table 3.4 provides an overview of a selection of national PEPs. Collectively, these programmes provide paid NbS-related work to more than 70 million people per year. They typically provide work to complement income from other (often farming) activities. The work is usually manual labour, and salaries are typically at or around the minimum wage. An important dimension of many of these large programmes is that, for many participants, there is an ongoing relationship with the programme whereby it provides part-time work during certain periods of the year. Given their size, the programmes are also able to operate at landscape scale – an important aim of NbS. The quality of the employment offered needs to be understood as part of the labour market context in which they operate. While temporary jobs at minimum wage may not seem like a quality employment option, for workers whose alternative is often casual informal work at below minimum wage and under worse conditions, these programmes often represent an attractive alternative, especially during seasons when few other income sources are available. In addition, through the introduction of elements of formal work these programmes can contribute to the realization of decent work.¹⁸

¹⁸ See Lieuw-Kie-Song (2011) for a more extensive discussion on this.

Table 3.4 Selected Public Employment Programmes and associated NbS-related employment

PROGRAMME	COUNTRY	NUMBER OF PERSONS IN PAID NBS WORK PER ANNUM ^a	FTE	NBS ACTIVITIES
Mahatma Gandhi National Rural Employment Guarantee Act ^b	India	68.7 million	10.2 million	referred to as 'natural resources management work' in the programmes and includes soil and water conservation, and integrated watershed development
Productive Safety Net Program	Ethiopia	1.53 million	350 000	soil and water conservation; ecosystem restoration
Ten Billion Tree Tsunami ^c (See case study)	Pakistan	355 000		ecosystem restoration; coastal protection
Expanded Public Works Programme (Environmental Sector)	South Africa	67 780	22 039	control of invasive species; fire management; restoration of wetlands
Jobs for Nature	New Zealand	5 586	1 576	protection and conservation of species

NOTES:

a The figures, which are based on reported employment by these programmes, have been included in the global estimates in Chapter 6 as direct employment in NbS.

b The report for 2021–2022 financial year also shows that 64.7 per cent of MNREGA expenditure was on natural resource management activities (India, Ministry of Rural Development 2022).

c The annual figure is one fourth of the total employment reported over the four years since the programme was started.

SOURCES: World Bank (2022); Expanded Public Works Programme Head Office (2018); New Zealand, Ministry for the Environment (2022).

While these programmes clearly have great potential with regard to ecosystem restoration, Norton et al. (2020) argue that for them to fully realize their potential for sustainable and equitable ecosystem stewardship, two weaknesses need to be addressed. The first is the poor design and maintenance of local public works outputs that is still common to many schemes; the second is that, as social assistance schemes, they may be overburdened with too many objectives that may compromise their effectiveness as a social protection measure.

Some of these PEPs, like in South Africa, use private sector entities, typically specialized small- and medium-sized enterprises to execute this work, with the requirement that these enterprises hire workers from the specified target group.

3.6 Volunteer work

Volunteer work in NbS is widespread, but only limited evidence is available.¹⁹ For example, the US National Park Service reports that it has 300,000 volunteers annually (US National Park Service 2022) and the Australian Landcare programme has reported having 140,000 volunteers (Landcare Australia 2021). There are other volunteer activities, such as firefighting, which may not be considered NbS, but whose role in forest management is becoming increasingly important as forest fires become more frequent and intense. The ten countries with the most volunteer firefighters collectively have 12.8 million volunteer firefighters (Cull 2020), and in many of these countries preventing and fighting forest fires has become an increasingly important activity.

Volunteering is also common in implementation of NbS in urban areas (see case studies on Portugal and Australia). The Urban Nature Atlas, a database containing approximately 1,000 urban NbS examples from Europe, includes 277 project examples involving volunteer work. In terms of the types of NbS, projects involving voluntary work were more likely to focus on ecological restoration of degraded ecosystems (44 projects), protection of natural ecosystems (36 projects), and transformation of previously degraded areas (70 projects).²⁰

¹⁹ Volunteers includes any person of working age who engages in unpaid, non-compulsory work for others, for at least one hour in a four week or one month reference period as defined in the 19th ICLS resolution concerning statistics of work, employment and labour underutilization (ILO 2013c)

²⁰ Analysis provided by Sara Maia and Dora Almassy (Central European University), Coordinators of the Urban Nature Atlas.

There is also some evidence of volunteering in developing countries related to NbS (see case studies for Kenya in Chapter 1, Peru in Chapter 3, and The Gambia in Chapter 6). However, among poor and more vulnerable segments of society, the modalities and motivation for volunteering can often be different. These groups tend to be more exposed to the risks associated with a deteriorating environment and dependent on nature for their livelihoods. Because of this, their willingness to volunteer is also motivated by the expectation, or hope, that the NbS volunteer work will reduce these threats (Hagedoorn et al. 2021) or help to improve their livelihoods. In these contexts, projects or institutions that organize the volunteering may offer material rewards for certain activities. In Peru, as illustrated in the case study, the participation in traditional communal forms of volunteering called *faenas*, is closely linked to access to various communal benefits. In The Gambia case study, community members were only paid half the minimum wage for doing restoration work, based on the notion that they were also beneficiaries of this work, and thus half of their time could be considered volunteering and the other half as paid. A project in Kenya involving the restoration of indigenous vegetation to reverse land degradation engaged many volunteers for various activities. Some were rewarded for part of their effort with extension services, free grazing days and, sometimes, cash payments. Many also directly benefited through pasture-related income-generated activities and through dietary improvements from milk (Mureithi et al. 2014). This illustrates not only how NbS volunteer work can be intertwined with livelihoods, but also the multiple livelihood strategies that fluidly combine paid and unpaid work activities.

Official labour data on volunteering remain limited;²¹ volunteer data are available for only 61 countries. Data on volunteering related specifically to protecting or preserving nature²² are currently available for the eight countries presented in Table 3.5.

²¹ In 2017, the ILO and UN Volunteers initiated a programme to improve monitoring and data collection on volunteering, and a systematic effort was made to compile existing data on volunteering. An important advance in this regard was that it introduced a new measurement guide for volunteering whereby nature is listed as one of the possible beneficiaries. However, this new framework has not yet been adopted widely.

²² This does not strictly align with the definition of NbS, but it is reasonable to assume there is a large degree of overlap.

Table 3.5 Volunteering on protecting or preserving nature in countries where data are available

COUNTRY	YEAR	REFERENCE PERIOD	PERSONS WHO WORKED ON PROTECTING/ PRESERVING NATURE AS VOLUNTEERS				TOTAL VOLUNTEER RATE, % OF TOTAL POPULATION	TOTAL VOLUNTEERS, THOUSAND PERSONS
			% OF POPULATION AGED 15 YEARS OR MORE	% OF ALL VOLUNTEERS	THOUSAND PERSONS	HOURS/ WEEK WORKED		
Australia	2020	12 months	1.3	5.0	251.3		25	5 025
Canada	2018	12 months	2.1	5.0	632.8	1.8	41.1	12 656
Hungary	2019	4 weeks	1.3	3.8	91.8	3.1	33.2	2 386
Italy	2013	4 weeks	0.4	3.4	221.8		12.6	6524
New Zealand	2016	4 weeks	1.9	6.9	73.0	2.5	28.2	1 058
Portugal	2018	4 weeks	0.2	3.8	21.7		6.4	569
Singapore	2021	12 months	1.1	5.0	56.8		22	1 136
Ukraine	2021	4 weeks	1.0	14.1	365.5	1.75	7.1	2 595

SOURCE: ILO Harmonized Microdata <https://ilostat.ilo.org/>

These data support the notion that volunteering is a common source of labour in conservation and restoration activities in these countries. For example, in Australia, Canada and Singapore, which use a 12-month reference period, it was found that on average 1.5 per cent of the population above 15 years old volunteered on protecting or preserving the environment.²³ In the countries using a four-week reference period, the average was 1.0 per cent of the population above 15. For Canada, where data on the number of hours volunteered per week are also available, the work done by these volunteers amounts to almost 30,000 FTEs. The US National Park Service reports that its 300,000 volunteers work about 6.5 million hours annually, which amounts to an average of almost 22 hours per volunteer per year. Yet this still amounts to almost 20 per cent of all work done by Park Service employees.²⁴

For some low-income countries, general volunteer data are available, but there is no breakdown on volunteering to protect or preserve nature. For these countries, the volunteer rate varies widely from as high as 20.2 per cent in Sierra Leone and 17.5 per cent in Bangladesh, to 0.3 per cent in Kenya and 2.1 per cent in Costa Rica (ILO Harmonized Microdata).

A final point worth noting regarding volunteering and NbS is the evidence on the positive mental and physical health impacts of nature-based volunteering in high-income countries. Almost half of participants in Australia's Landcare restoration-focused programme report improvements in their mental well-being, and 93 per cent reported stronger connection to the natural environment, with 19 per cent reporting a reduced use of physical health services (KPMG 2021). The Urban Nature Atlas also includes 20 projects where vulnerable groups like pensioners, unemployed people and migrants, are engaged specifically to support mental and physical health rehabilitation.²⁵

²³ This amounts to approximately 940,000 people for these three countries (Singapore, Australia and Canada).

²⁴ The US National Park Service also reports having about 20,000 employees. If it is assumed that these are all full time, then the work done by volunteers is equivalent to about 18 per cent of work done by paid employees.

²⁵ Analysis provided by Sara Maia and Dora Almassy (Central European University), Coordinators of the Urban Nature Atlas.

3.7 Conclusions

PEP and PES are two important vehicles that enable many people to work in sustainable resource management. In the case of PES programmes, the exact nature of the relationship between the programme and workers is not always clear and thus neither is their impact on employment. Many rely on results-based contracts, but how these contracts are managed and create local jobs, under what conditions, is not always clear. For this reason, the employment generated through PES schemes is difficult to assess accurately.

A large number of people are currently employed through PEPs, in particular through the National Rural Employment Guarantee scheme in India, which spends about 65 per cent of its resources on natural resource management activities. These programmes are also important for poverty alleviation, responding to underemployment and unemployment, and particularly supporting rural incomes in developing countries. At the same time, they offer mostly manual labour at basic wages and may need to be complemented to improve both their NbS and decent work outcomes.

The discussion and examples in this chapter point to the prevalence and importance of NbS work in rural areas. It also provides insights regarding the transformative potential of increasing the use of NbS for work in rural areas, especially in low- and middle-income countries. Rural areas are where decent work deficits are still most prevalent and persistent, with important deficits in employment opportunities, adequate pay, stability and security of work, safety at work, social protection, and social dialogue (Weller, Reinecke and Lupica 2016; ILO 2022e). Workers in rural areas are still twice as likely to do informal work than their urban counterparts (ILO 2021c). Increased investment in NbS can contribute to addressing these issues in several ways. Because the productivity of much of the employment in rural areas is directly dependent on ecosystem services,²⁶ NbS can improve the productivity of these jobs when it enhances ecosystem services. Further, there is generally more scope for implementing NbS in rural areas, and thus a large share of increased investment in NbS will be directed to rural or semi-urban areas, where it can potentially drive the creation of more and better jobs if the right policies are applied.

²⁶ Of the 1.2 billion jobs relying on ecosystem services as estimated by the ILO (2018) more than 1.1 billion are in rural areas.

Finally, because the same amount of investment tends to have a larger employment impact in rural areas, the marginal employment impact of investing in rural NbS is likely to be larger than in urban areas.²⁷

The potential role of NbS for employment in urban areas is also significant, and many NbS-related activities in rural areas are conducted to service urban needs (such as food provision for city residents, or watershed management for urban water supplies). However, given the much wider range of economic activities, the impacts of NbS on employment in urban areas are likely to be concentrated in specific sectors and activities with a strong link to NbS, such as water and flood management, development of urban public spaces, green buildings, and the use of natural and hybrid infrastructure.

In rural areas in particular, increased use of NbS can pose important short- to medium-term risks to jobs and livelihoods. This is especially likely in areas where existing employment and livelihoods are linked to the unsustainable use of nature. Adopting NbS can limit this use, even if only in the short term, to allow ecosystems to recover or new sustainable forms of natural resource management to become economically viable. In such cases, it would be important to incorporate a just transition framework to deal with negative consequences. Measures to mitigate such impacts can include jobs placement services, re-employment training, early retirement, ensuring access to unemployment benefits, and the use of PES programmes, which provide alternative forms of work and income to those negatively impacted, while also supporting the wider adoption of NbS.

A large share of current work and employment in NbS takes place in labour markets with high levels of informality. This is especially the case in rural sectors in developing countries. As a result, this employment in NbS has decent work deficits (informal work, low wages, casual or temporary work, low productivity), and this is a critical consideration when scaling up NbS, in that improvements in these areas are required to ensure that these decent work deficits are not similarly scaled up. This will require investments in the workforce and labour markets to improve skills, enhance productivity, improve representation, increase professionalization, and improve the quality of employment in NbS to make it more attractive.

Programmes like PEPs and PES provide important avenues to engage in large-scale restoration, while at the same time responding to important poverty-related challenges. A key challenge for these programmes is to manage

²⁷ Employment multipliers indicate the number of jobs created associated with a unit of investment; while wages in rural areas tend to be lower, the same value of investment tends to generate a much higher level of job creation. See, for example, Boulanger et al. (2019), who find that for Ethiopia, sectoral employment multipliers in rural areas tend to be 3 to 4 times higher as compared to urban areas.

these multiple objectives in ways that do not compromise either their social or environmental objectives. Related national level policy support in sectors such as forestry, biodiversity, fisheries, marine issues and water regulation will be needed, alongside coordination with climate change responses such as Nationally Determined Contributions and National Action Plans, and biodiversity actions such as National Biodiversity Strategy and Action Plans. Applying employment-intensive approaches will be important, particularly in regions with high levels of unemployment and underemployment.

As demand for NbS from both public and private investment grows, this will provide important opportunities for enterprises to implement NbS. This will involve opportunities in both specialized NbS-related services such as finance, design, planning, management and monitoring, as well as contractors or implementors to execute activities. This requires the establishment of an enabling environment for sustainable enterprise development, including access to credit, procurement systems that support small- and medium-sized enterprises (SMEs) engagement, support for cooperatives and community structures, and incentives for formalization. It also requires national governments to cease prioritizing and subsidizing sectors and related enterprises that can deliver high economic growth in the short term but deplete natural resources and damage the environment.

A lot of work in NbS will continue to be skilled and elementary. Increased investment will also increase demand for a range of specialized jobs in design, engineering, project management and monitoring. New specialized jobs and occupations are already emerging, such as jobs brokering debt-for nature deals with biodiversity-rich countries. In rural areas, new farming skills will be needed to support shifts to more sustainable NbS-related food systems. Agricultural extension workers, for example, could be trained in farming techniques such as regenerative agriculture or agroforestry.

In scaling up NbS, it will be necessary ensure high standards of NbS, including of any employment created. This scaling up will need to be accompanied by suitable labour market and enterprise measures, education and skills development, formalization, and support to SMEs to enable effective and productive implementation of NbS. Scaling up volunteering could require the mobilization of more volunteers, or of current volunteers to dedicate more time. Regional or continent-wide coordination may also be needed to scale up NbS, for example to restore shared ecosystems and transboundary catchment areas.

Measuring and collecting data on both NbS activities and work remains challenging. Significant effort is needed to do this on a systematic and comprehensive basis, and this is the topic of the chapters that follow.

Case Study

Payment for Environmental Services in Costa Rica

Costa Rica had one of the highest deforestation rates in the world in the 1970s and 1980s. But in 1997, the country began to turn this around, initiating a series of efforts such as the Payment for Environmental Services Program (PESP) that featured innovative financial mechanisms based on raising awareness of the benefits from environmental services. As a result, the Costa Rica is the only tropical country in the world to have reversed deforestation¹, with 52.4% of its territory now covered by forest.

²Relevant policy measures to support the recovery of the country's forest cover were included in the 1996 Forest Law No. 7575. These included the prohibition of changes in land use, the concept of environmental services, the creation of the National Forest Financing Fund (FONAFIFO) as the executing entity of the Payment for Environmental Services Program (PESP). FONAFIFO issues payments to small- and medium-size producers for their efforts to plant trees and restore forests, thereby generating critical environmental services. The programme is financed through a portion of the single tax on fossil fuels collected under the "polluter pays" principle.

Throughout its 25 years of operation, the PESP has signed 19,184 contracts of between 5 and 10 years with small- and medium-sized farm owners, supporting the protection of 1.3 million hectares of forests. The participation of women and indigenous peoples has been important to the achievement of these results. The programme has led to the creation of 3,500–4,000 direct



jobs each year generated by the demand for labour to implement and manage its activities. In particular, the introduction agroforestry contracts significantly incentivized small-scale farmers (with less than 10 hectares) to participate in the PESP, resulting 4.4 million trees being planted between 2003 and 2013. The PESP is also a major source of

¹ <https://www.worldbank.org/en/country/costarica/overview>

² National Forest Inventory 2015.



Pepper agroforestry system © Gilmar Navarrete Chacón



Sign indicating area under PES © Gilmar Navarrete Chacón

income for many indigenous communities and has improved the quality of life for families.^{3,4} However, there is little detailed information available about the nature of these jobs; thus this warrants further monitoring.

Among the main strengths of the PESP is the degree of professionalism of its human capital, which has enabled it to maintain and improve the programme through innovation in creating and exploring new schemes and sources of financing. Another success factor is represented by the capacity to develop business opportunities with companies – both public and private, and national and international – with the institutional objective of benefiting the owners of forests, forest plantations and the country's forestry and environmental sector in general.

NOTE: See Appendix 3 for complete details on this case study.



Sign indicating area under PES © Gilmar Navarrete Chacón

³ Porras, I., Barton, D. N., Miranda, M., & Chacón-Cascante, A. (2013). Learning from 20 years of payments for ecosystem services in Costa Rica. International Institute for Environment and Development. <https://www.iied.org/16514iied>

⁴ [Payments for Environmental Services Program | Costa Rica | UNFCCC](#)

Case study

Scaling up Ecosystem-based Adaptation through faenas in Peru

Located in the central Andes of Peru, the Nor Yauyos Cochis Landscape Reserve (NYCLR) features high altitude Andean grasslands (70% of its area) and a complex hydrological system of glaciers, waterfalls and 485 lagoons. Currently home to 15,000 people, and for millennia anthropogenic activities have shaped the Reserve's landscapes with pre-Hispanic technologies such as terraces and canals. Access to water and healthy pastures are essential for the well-being of the local communities. But local agropastoral livelihoods are now threatened by changing climatic conditions and other drivers of change.

The project “Scaling up Mountain Ecosystem-based Adaptation” in Peru was implemented in NYCLR by Instituto de Montaña, IUCN, the National Service of Natural Protected Areas and the communities of Miraflores, Canchayllo, Tomas and Tanta, in close coordination with national, regional and local authorities. It focused on improving water, grasslands and livestock management through strengthening of local capacities and knowledge, intercultural dialogue between stakeholders, strengthening of institutional and community organization, and restoration of ancestral and natural infrastructure, such as ancient water systems, wetlands and grasslands.

A total of 105 people worked on the project. Of these, 89 are indigenous peoples who work through a traditional form of communal unpaid work called faenas. The rest hail from diverse backgrounds – from to experts in their field to early career professionals – and work on planning,

project management and facilitation of stakeholders.

Faenas date back to pre-Hispanic times. On specific days, community members work collectively to address agreed local concerns. Organized through community meetings in which tasks are allocated to specific community members, faenas may be carried out to help specific neighbours (for example, to cultivate the land or build a house) or for community



Communal Faena for the maintenance of the EbA measure in Chacara-Jutupuquio, Canchayllo. © Instituto de Montaña



A team of water users, park rangers and members of Instituto de Montaña visit the Chacara and Yanaututo sectors. © Instituto de Montaña

infrastructure (road repairs, water storage, communal farm, among others). Now they are used to implement various Ecosystem-based Adaptation (EbA) activities.

While work in faenas is unpaid, they are often accompanied by traditional food and festivities that provide an immediate benefit to workers, as well as reinforcing social ties and local identity. There is an expectation that all members of the community contribute to faenas, as they are an integral way to obtain community benefits such as access to land or benefits from communal herds.

The project also supported the formulation of projects implemented through the Ecosystem Services Compensation Mechanism, which aims to increase water retention in the watershed, both for the community and the downstream cities.

The project contributed to Peru's National Action Plans (NAPs) and Nationally Determined Contributions (NDCs), as well as to SDGs 1 and 15. Outcomes show that most communities have achieved stronger communal organizations with more sustainable water and grassland management and positive effects on ecosystem health and local economies.

One key success factor was co-designing, implementing and monitoring the EbA measures together with the local population.

NOTE: See Appendix 3 for complete details on this case study.



Community Faena for the construction of a vicuña fence in the community of Tomas. © Instituto de Montaña

Case study

Landscapes for Livelihoods in Umzimvubu Catchment, South Africa

In South Africa, rangeland habitats cover approximately 80 per cent of the country and raising cattle is an important part of many local cultural identities. However, today, overgrazing and unsustainable farming practices, bush encroachment and exotic plant invasions are degrading grasslands, including those in the Umzimvubu catchment. For this reason, a key focus of Landscapes for Livelihoods project is to restore these grasslands and protect the natural biodiversity while increasing resilience to climate change in Umzimvubu areas. Through these actions, it aims to provide a sustainable source of food for livestock of local grazing associations and play a central role in sustaining rural communities with resources such as firewood, wild foods, medicinal plants and water.



Understanding river health and ecosystem drivers is a key part of catchment monitoring, including youth involvement. © Nicky McLeod

The Umzimvubu Catchment Partnership (UCP) was established in May 2013 in Matatiele by a voluntary alliance of over 35 state and civil society partners including Environmental Rural Services (ERS), WWF SA, Conservation International SA, among others. Together with local government and traditional (tribal) authorities, they developed a common vision of working together to restore the natural resources and ecological functions of the watershed. Actions under way in the area are often performed by youth and include rangeland restoration and management, removal of exotic invasive plant species, rotational grazing, wetland rehabilitation, and erosion control.

The project has generated a wide range of local jobs. So far, the UCP has employed more than 35 permanent staff from different organizations. The number of temporary jobs provided by the organizations varies from one to another. For example, ERS has employed 95 youth interns on various short-term contracts since 2019. Additionally, it has employed over 340 local village beneficiaries

since 2017 in various short-term projects mainly related to exotic plant removal. These beneficiaries are composed of 60 per cent women and 55 per cent youth. The organization Yes4Youth, for its part, employs 976 people, of whom 607 are young people. The project has also spawned other actions that complement the NbS activities, such as 5 small Forest Stewardship Council (FSC) certified eco-charcoal production enterprises that currently employ 26 youths.

An innovative component of the program is the hiring of “Ecochamps”, who have no tertiary qualifications, but provide short, hands-on trainings in service learning on topics such as pasture management, livestock husbandry, waste and fire management, water safety and spring protection, data collection linked to research projects using smartphone apps, and general awareness sharing. There are currently 11 local Ecochamps hired annually, all are under 30 years and 40 per cent are women.

The partnership has also enabled livelihood diversification with emerging traditional opportunities in rangeland restoration and planning and positively impacted the livelihoods of 2,269 sheep farmers shearing wool for sale and 806 Rangeland Association Members who raise cattle for the market by ensuring access to sustainable grazing.

NOTE: See Appendix 3 for complete details on this case study.



Local farmers monitoring livestock in mountains on horseback. © Nicky McLeod

Case study

Ten Billion Tree Tsunami Programme in Pakistan

Pakistan is the fifth most populated country in the world and the seventh most vulnerable country to climate change. The country is currently facing a fiscal crisis and high rates of unemployment. Pakistan also suffers from widespread environmental deterioration, as the fast-growing population expands agriculture into forested areas. This has resulted in the loss of ecosystem goods and services and associated socio-economic impacts.

The Ten Billion Tree Tsunami Programme (TBTP) was launched in 2019 with the goal of supporting Pakistan's transition towards climate resilience by mainstreaming climate change adaptation and mitigation through ecologically targeted initiatives. The four-year programme aims to plant 3.3 billion trees by 2023, with an initial budget of nearly 125.2 billion Pakistani rupees (PKR, equivalent to around US\$562 million). The TBTP was designed to address rising temperatures, floods, droughts and other extreme weather events, while simultaneously providing jobs to people who were impacted by the COVID-19 pandemic.

The TBTP is a nationwide programme implemented by the Ministry of Climate Change (MoCC) in partnership with its four provinces and two independent territories. A consortium including IUCN, FAO and WWF-Pakistan, carries out independent third party monitoring and evaluation (TPM&E) at the request of MoCC.

To date, the programme has created approximately 1,420,962 jobs for both men and women across Pakistan. About 800,000 of these are long-term jobs, while the remaining are short-term.



Preparing tree saplings. © Asim Jamal IUCN Pakistan

Through its support for climate change mitigation and adaptation, the programme will also indirectly benefit the country's population of more than 230 million people

The key outcomes of the TBTP thus far are enhanced forest cover and generation of local jobs. The programme achieves its goals through the development of tree nurseries, natural forest



Seedlings in the nursery. © Asim Jamal (IUCN Pakistan)

rehabilitation, afforestation, watershed management, rangeland management, protected area conservation, and strengthening of the relevant institutions. The management of protected areas, including biosphere reserves and national parks, with a special focus on ecotourism, will enhance wildlife protection and generate benefits for local communities.

One major success factor for the TBTP has been the continuity of the programme irrespective of changes in political leadership. Others include the crucial role of TPM&E, the use of native trees in afforestation, enhanced women's participation and the creation of green jobs. Key lessons include ensuring better Assisted Natural Regeneration (ANR) selection and promote the use of native species in ecosystem restoration programmes.

NOTE: See Appendix 3 for complete details on this case study.



Measuring the plantation plot. © Asim Jamal (IUCN Pakistan)

Case study

Restoring strategic ecosystems for watershed protection and conservation in Colombia

Colombia is well known for its biodiversity, with vast natural forests covering over 60 million hectares of its, as well as glaciers, moorlands, wetlands and dry forests. But erosion and deforestation have become two of the main causes of water scarcity in the country. According to the Colombian Ministry of Environment, 40% of the national territory has some degree of erosion, 3% is severely eroded, over 158,000 hectares have been deforested, and 56% of the country's regions are highly threatened by climate change.

Since 2016, Grupo Argos and its business partners have been working since 2016 to restore strategic ecosystems – including mangroves, tropical dry forests and Andean forests – to contribute the fight against climate change and improve water protection and security in the Colombian territories where the group has its operations. The programme also aims to contribute to the conservation of biological corridors, the protection of endangered species and the generation of green jobs.

Taking a holistic approach to water protection and conservation, the programme comprises four main activities: restoration and investigation, community participation and creation of green jobs, environmental education and participatory monitoring process of species, and alternative solutions to access safe water.



Community planting: El Dovio, Valle del Cauca, Colombia
© ReverdeC Program, ReverdeC Foundation.

The initiative has generated over 7,211 jobs in these rural areas in restoration, planting maintenance, and strengthening of community nurseries. About two thirds of the jobs created are direct, and a third are indirect. Additionally, 79% of the people employed are men, and 21% are women.

Over 9,530 hectares have been restored, and 11,4 million native trees have been planted through conservation and sustainable production agreements

with small-scale farmers and landowners. To date, 68,000 students have participated in the environmental educational programme, and 9,716 people have access to safe water solutions.

The initiative also includes activities for social and community-based organizations in the territories, as they receive technical and financial assistance to carry out environmental and productive projects according to their needs. This generates local development and new sources of income.

One of the key success factors of the programme is its inclusive approach, with leaders and community organizations co-designing the initiative with Grupo Argos. This process not only drew on communities' deep understanding of the economic, environmental, and social impacts of restoration at the local level – it also allowed Grupo Argos and its business partners to adapt the programme to the needs of each territory.

Establishing appropriate methodologies to evaluate the success of the reforestation activities and their impact through key partnerships with the academy and research entities would be a further improvement.

Establishing appropriate methodologies to evaluate the success of the reforestation activities and their impact through key partnerships with the academy and research entities would be a further improvement.

NOTE: See Appendix 3 for complete details on this case study.



Planting area. El Dovio, Valle del Cauca, Colombia
© ReverdeC Program, ReverdeC Foundation.



Community Planting. Isla de Barú, Bólvivar, Colombia.
© Sembrando Futuro Program, Grupo Argos.



Planting process. Támesis, Antioquia, Colombia.
© Sembrando Futuro Program, Grupo Argos.

Case study

Creating jobs and combatting desertification through local technologies in Burkina Faso

The Sahel is faced with increasing desertification and land degradation, due to erosion and anthropogenic pressure. Addressing this requires a multitude of strategies and approaches, one of which is the wider use of indigenous restoration techniques as part of the Great Green Wall (GGW) initiative. These traditional techniques are well-known in the northern regions of Burkina Faso and the Sahel in general. But as desertification moves southward, these techniques are also becoming relevant in southern Burkina Faso, where they are less commonly applied.

Furthermore, due to conflict, poverty, and intense use of the land and migration, local populations are not able to apply these techniques at the scale required. For this reason, the ILO's Employment Intensive Investment Programme initiated a project in Burkina Faso to demonstrate, document, and analyse traditional restoration techniques to capture the necessary data on costs, inputs and labour productivity needed for planning and implementation at a larger and more systematic scale. Techniques included the demi-lune (half-moon), zai, diguette en pierres (stone dike), diguette en terre (earthen dike) and digue filtrante (filter dike), all of which can help retain nutrients and rainfall, thus restoring the degraded land. The project aims to draw lessons from their application to enable a wider adoption of these techniques.



Demi-lunes (half-moons) in Songodin, Burkiba, Burkina Faso. © OIT-Filinfo

The project was implemented in three villages of Burkina Faso in 2022. On the sites, previously barren land has been successfully restored and is once again available for cultivation. Through the construction of green works, the project has created job opportunities for 300 people, most of whom were women (70%), youth or internally displaced persons (IDPs). The already visible improvements are also supportive of the aim to improve land productivity by about 0.400t/ha (from the current 0.6t/ha to 0.9 or 1t/ha) for crops such as white sorghum and small millet. Beyond the project sites, villagers began



Women creating a *digue* en terre (earth dike) in Samtenga, Burkina Faso © OIT-Filinfo



Human-powered pump for drinking water in Songodin, Burkina Faso © OIT-Filinfo

to apply the techniques learned or optimized in their family plantations in order to increase yields. At the same time, the technical elements, costs, inputs and employment effects of the restoration techniques were documented and analysed, which will benefit the techniques' future application at a larger scale.

“See for yourselves, the result is visible through our millet fields,” said Mrs Noélie Ouedraogo, a local worker. “We worked on this site and also replicated in our own fields.”

Key lessons from implementation to date include the importance of measuring several social indicators at the outset of the project to gain a better understanding of group dynamics and social cohesion. It is also essential to ensure the schedule activities reflects the availability of labour, that safety considerations are integrated into planning (especially in areas with volatile security), that key materials are planned for and that workers have access to drinking water an area for women to rest and care for young children.

NOTE: See Appendix 3 for complete details on this case study.



Zai in Bogoya, Burkina Faso © OIT-Filinfo

CHAPTER
FOUR




Key messages

- The multidimensional characteristics of NbS, work and decent work require a clear understanding of the complex **interlinkages between NbS, work, and decent work** in the context of the possible policy, programme, and project-level interventions that can be made related to the implementation of NbS and the pursuit of decent work outcomes in a given context.
- Understanding the **risks and benefits** of the potential options requires the definition and monitoring of different work outcomes associated with NbS actions.
- The **conceptual framework** presented in this report can help inform stakeholders and decision-makers involved in NbS planning and implementation to support the integration of relevant policies, while also encouraging dialogue between specialists towards better understanding across the different policy areas of NbS and decent work. It serves as the foundation for developing the **measurement framework** that in turn supports evidence-based decision making concerning NbS for decent work outcomes.

Chapter 4

Conceptual framework for linking NbS with work and decent work outcomes



In any given geographic context, there are a wide range of possible policy-, programme-, and project-level interventions that can be made related to the implementation of NbS and the pursuit of decent work outcomes. Understanding the risks and benefits of potential options requires the definition and monitoring of different work outcomes – including decent work outcomes – associated with NbS actions. Measuring these impacts, in turn, requires a clear understanding of the complex interlinkages between NbS, work and decent work.

The multidimensional characteristics of NbS, work and decent work require making such linkages across economic, social and environmental domains. Well-established concepts, definitions and terminologies already exist that can support a rich understanding of each domain, and interdisciplinary knowledge can be applied to make the connections more tangible.

This chapter presents a conceptual framework that describes the linkages between NbS, work and decent work, underpinning measurement and policy goals concerning NbS for decent work outcomes. The framework is intended as a tool that integrates a set of key concepts concerning NbS, work and decent work and describes their relationships based on established definitions. It presents the pathways of interaction between the concepts through an economic lens, highlighting differentiated work effects as a result of NbS actions.

The framework is supported and refined by insights of a recently conducted global stakeholder survey on decent work in NbS (Appendix 1). These insights have provided guidance on the framework's scope and on establishing the relative importance of related topics for user policy and data needs.

The concept of NbS is relatively new to the policy discussion, and the decent-work-related development targets were established as part of a global development policy framework – in particular, under SDG 8 – as recently as 2015. Consequently, further refinements and developments of these concepts are likely, especially as measurement practice expands and evidence from the application of these concepts grows. Thus, it is expected that through the development of further national experience, shared practice and discussion, the conceptual framework presented here could be further refined.

Five features define the role of the conceptual framework for NbS, work and decent work. The framework should:

1. identify the key concepts and provide a structure to organize them, in effect providing a scoping for the relationships among the concepts;
2. support a clear description of the types of relationships and connections among the concepts to allow users to describe the relationships in a consistent way, including the development of narratives to communicate the relationships;
3. promote a common language and use of terms to limit confusion among different users whenever possible and to facilitate exchanges of experience and knowledge across the environment–labour spectrum concerning NbS, work and decent work;
4. support the definition of consistent and coherent measurement boundaries through its identification of concepts and terms;
5. building on all of these features, it should provide a means to clearly connect measurement and policy objectives, establishing an evidence base directly connected to the target concepts that will underpin the design of policy responses and the evaluation of outcomes.

Following this introductory section, section 4.1 provides the background in constructing the conceptual framework, building on the discussion in previous chapters. Sections 4.2 and 4.3 present the concept scope and design of the conceptual framework, respectively. Finally, section 4.4 shares considerations in the use of the conceptual framework and section 4.5 offers conclusions.

4.1 Construction of the framework

The conceptual framework inherently recognizes the complementarities between the UNEA resolution on NbS, the IUCN Global Standard for NbS and the Just Transition Guidelines described in Chapter 2. It takes into account the types of jobs and unpaid work activities (such as volunteer work) that are closely related to NbS, as identified and discussed in Chapter 3. It also draws on a stakeholder survey on decent work in NbS (Appendix 1), which was conducted in the early development phase of this report with the objective of gaining insights from stakeholders on the most relevant policy topics and data needs concerning employment, decent work, and enterprise development in NbS. Box 4.1 provides a short summary of the findings of the survey. A broad finding was that the stakeholders had knowledge and experience of either NbS or decent work, but usually not both. This suggests that the conceptual framework has an important role to play in clarifying the structure and pathways through which key concepts can be connected and the effects related to increased investments identified, as well as in facilitating an understanding of the connections between concepts.

The design of the conceptual framework also draws on literature from disciplines that consider the linkages between relevant elements across economic, environmental and social domains that relate to the topic of decent work in NbS. While it is beyond the scope of this report to provide such a review, it is worth highlighting that this literature reflects the general idea that different systems across economic, environmental and social domains can be connected and that different pathway effects can be achieved through investment and policy measures. Thus, in the context of NbS, work and decent work, it can be recognized that, in any given location, work and the environment are not distinct areas of policy but rather present important linkages, with different policy or investment scenarios presenting differentiated work, enterprise and environmental outcomes. The examples presented in Chapter 3 illustrate various direct effects concerning 'closely related types of work in NbS', but the conceptual scope of the connections and effects on work and decent work in and from NbS goes beyond direct effects, as will be established in this chapter. Recognition of the ways people depend on the environment and of the impacts that economic activity (and work) have on it can be used to shape an integrated policy approach supporting decent work in NbS.

BOX 4.1

Stakeholder survey on decent work in Nature-based Solutions

For the first time, stakeholders representing different types of institutions and mandates in different world regions – but nonetheless aligned in their engagement or interest in the topic of decent work in NbS – participated in a global survey regarding policy priorities and information needs on this topic. The survey was conducted in three languages (English, French, and Spanish) during the period May–June 2022. The objective was to help understand key policy questions and types of information that could be used for policy research, planning, implementation and monitoring of employment, decent work, and enterprise development in NbS and resulting from NbS activities.

Most of the respondents were senior managers in policy design and implementation, research, or project delivery, working mainly in a national government agency, research or educational institution, or NGO with an environmental focus. Environmental management, restoration and conservation, including NbS and government and community services, were a key focus of the work carried out by these respondents, who hailed from different world regions. The most-cited policy areas or frameworks that best reflect the main entry point to the issues related to decent work in NbS for respondents' organizations were the SDGs and sustainable development, climate change mitigation and adaptation, NbS, just

transition and green jobs, and decent work.

Respondents' organizations reported moderate to moderately high involvement in both decent work and just transition policy matters, as well as in NbS policy issues. In addition, there was relatively high interest in all topics related to decent work and just transition policy matters, with the most-cited topics being employment creation, skills development, and social dialogue. In the case of NbS, the highest interest was expressed for topics on community and stakeholder engagement; NbS and employment, income, and livelihoods; and NbS by ecosystem type. Most respondents' organizations were primarily engaged at the country level, as opposed to at subnational or project-site levels.

The most common uses of data and information among the respondents were communicating trends and performance to external stakeholders, internal reporting and key performance indicators, and scenario analysis and projections. This is useful to understand the purpose of a related measurement system. Not surprisingly, employment (that is, work for pay or profit) was most important to the stakeholders for data needs among paid and unpaid forms of work; however, both broad categories of work were still seen as quite relevant for data needs among nearly a third of the stakeholders. This suggests that both paid and unpaid forms of work should be

included in the conceptual framework linking NbS with work outcomes. Decent work categories of most relevance for data needs included employment opportunities, adequate earnings and productive work, safe work environment, and equal opportunity and treatment in employment – suggesting broad interest across decent work topics. Wages and salaries, as well as household income and consumption, were selected as topics of interest, which corroborates the concern for decent work and poverty-reduction outcomes.

Regarding economic production, productivity and value added were reported among the most relevant for data needs, while the topics of sustainable enterprise development, enterprise development in NbS, and occupational employment and skills needs were particularly relevant topics among enterprise data needs. These findings confirm the need for a conceptual and measurement framework that includes not only work outcomes but also enterprise outcomes.

Considering the topic of ‘environmental outcomes and sustainability of outcomes’, the environmental, social and economic sustainability of outcomes of policy interventions and investments was the most relevant topic in terms of data needs. Among environmental activities, the most relevant topics for data needs were expenditure on environmental protection and restoration, and distributional impacts related to costs and benefits of environmental activities. Regarding the topics of social data, including gender, indigenous and youth statistics, gender

statistics were highly relevant, as were data on population, income inequality and education. Among governance-related data topics, legislative measures were the most relevant. Such information topics could be incorporated in a measurement framework linking NbS and work outcomes.

The most important types of information concerning finance and investment in support of decent work and NbS included categories of NbS financing ecosystem actors (including regulators and capital providers); demand, supply and use of funds (for example, available investment options and according to type of NbS-aligned activity, green finance availability, activities financed, and geographical distribution); the cost of funds (cost of action and inaction); financing conditions; and impacts of the funds and the efficiency of their use in addressing decent work deficits and other sustainable development goals.

The relatively high response rate (34 per cent) among the 201 survey recipients was considered quite favourable and suggests there is serious interest in the topic among stakeholders across world regions. The survey results provided valuable insights into the policy priorities and data needs of stakeholders with respect to decent work and NbS. The results have been useful not only as a key input to the development of this report (including the conceptual framework), but they also should serve to provide future guidance regarding priority topics in the global biennial report series on decent work in NbS.

See Appendix 1 for the full survey report.

4.2 Concept scope and direct linkages

Recognizing the relationships between work and the environment paves the way for establishing specific and targeted conceptual connections of interest that can support integrated policy and measurement objectives. In this section, key concepts and linkages in the conceptual framework are discussed, with a focus on understanding their scope and direct linkages.

4.2.1 Definitions

There are three concepts at the heart of this discussion, namely NbS, work, and decent work. In addition, the concept of productive units that engage workers to produce goods and services – including those produced from NbS activities – is also important here. The definition and scope of these concepts is presented below, highlighting key characteristics and conceptual linkages.

As introduced in Chapter 1, NbS were defined by the UN Environment Assembly in March 2022 as follows:

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 and resilience and biodiversity benefits. (UNEP 2022a)

Key elements of the definition relate to: (a) actions to protect, conserve, restore, sustainably use and manage ecosystems; (b) the need to address social, economic and environmental challenges; and (c) provision of human well-being, ecosystem services and resilience and biodiversity benefits. This definition allows us to consider examples of NbS actions, recognizing that the definitional criteria should be met in order for it to be considered NbS. Some examples, as identified in the IUCN Global Standard for NbS (IUCN 2020a) include:

- integrated catchment management
- ecosystem-based adaptation and mitigation (e.g. for climate change or disaster risk)
- sustainable land and landscape management
- regenerative farming solutions / climate-smart agriculture
- blue, green and hybrid infrastructure development

Work was defined in 2013 by the International Conference of Labour Statisticians as follows:

Work comprises 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. (ILO 2013c)

The concept of work is thus recognized as the productive activity of persons for the purpose of producing goods or services within a given economic system. Work is divided into two broad categories that are key to establishing the conceptual framework, namely employment – defined as work for pay or profit – and unpaid forms of work, or forms of work that do not receive remuneration in cash or in kind for the work performed (for example, subsistence workers, unpaid trainees, and volunteer workers).

Decent work is understood as a concept closely related to the concept of work and is concerned with the living conditions of workers and their families, who should have access to at least minimum levels of social protection. It is a multidimensional concept, the scope of which goes beyond productive work and the workplace. Decent work has been defined by the International Labour Organization as follows:

Decent work provides opportunities for work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men (ILO 2013a).

Key elements of this definition are (a) opportunities of productive work with a fair income, (b) equal opportunity and treatment in productive work for all women and men, (c) social protection and security of work for all, and (d) freedom of association and social dialogue in the world of work.¹

Within the pillar of employment opportunities, decent work tends to focus on persons in employment (that is workers who receive pay or profit for the work they perform) as a target population group. Nonetheless, persons in unpaid forms of work – such as volunteers and unpaid apprentices – may be covered by decent work objectives if supported for example by appropriate working time arrangements and prospects for personal development and social

¹ While the emphasis in this concept definition is on employment (as suggested by the reference to “productive work with a fair income”), the decent work concept could in theory extend to unpaid forms of work, provided that key decent work aspects are observed, including for example, non-use of child labour or forced labour, decent working conditions (e.g. decent working time), and non-discrimination of workers.

integration, including facilitating employment opportunities with decent work outcomes.

Decent work expresses a concern for the improvement of the conditions of the most vulnerable workers, including those in unacceptable forms of work such as child labour or forced labour, as well as those in unstable forms of work such as informal workers, seasonal workers, and casual workers. Decent work seeks to ensure equal opportunity and treatment in work for all women and men, and strives to eliminate all forms of intersectional discrimination of potentially at-risk groups such as youth, rural workers, migrant workers, and indigenous peoples. These aspects regarding working conditions and vulnerable workers in NbS are not addressed in the conceptual framework itself but are key elements of the measurement framework discussed in Chapter 5.

The importance of enterprise development in NbS for environmental and decent work outcomes was revealed in the stakeholder survey, highlighting the importance of enterprises in the conceptual framework (including private businesses such as NBEs and cooperatives). The concept of the **productive unit**, in which the economic activity is carried out, is thus incorporated into the conceptual framework, given its central role in creating decent work opportunities. The concept of a productive unit is used in a broader sense in this chapter than the concept of an enterprise as considered in this report, as it refers to a wide scope of economic units that produce goods and services, can engage in a range of transactions, and are capable of owning assets and incurring liabilities on their own behalf. They include corporations, government, households (for example, household enterprises) and non-profit institutions that produce goods and services. Productive units may include microenterprises as well as formal and informal enterprises.

It is the relationship between the concepts of NbS, work, decent work, and the productive units that engage workers which is the focus of the conceptual framework presented in this chapter. A related topic concerns green jobs involving decent work in environmental activities. Box 4.2 presents international definitions of the **green jobs** concept and its connections with decent jobs in NbS.

BOX 4.2

Green jobs concept and linkages with decent jobs in NbS

With the objective of optimizing its programme services delivery among ILO constituents and stakeholders with regard to technical support on just transition and related decent work and green jobs outcomes, the ILO developed a working policy definition of “green jobs”:

Green jobs are 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 improve energy and raw materials efficiency, limit greenhouse gas emissions, minimize waste and pollution, protect and restore ecosystems, 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).

This international policy concept definition of green jobs is complemented and supported by the international statistical standard definition of green jobs adopted in 2013 by the 19th International Conference of Labour Statisticians (ICLS) in the Guidelines concerning a statistical definition of employment in the environmental sector. According to this international standard, the term “green jobs” refers to “a subset of employment in the environmental sector that meets the requirements of decent work that is, adequate wages, safe conditions, workers’ rights, social dialogue and social protection” (ILO 2013d). These guidelines and the statistical concepts they establish are further discussed in Chapter 5.

What these international concept definitions make clear is that green jobs are decent jobs and thus represent a subcategory of decent work. The focus here is on work for pay or profit, since the term “jobs” refers to the tasks and duties carried out in the context of employment. (The concept of decent jobs thus excludes unpaid work activities such as volunteer work or unpaid apprentices.) The green jobs concept definition suggests that some types of green jobs could also be considered jobs in NbS, assuming the job is engaged in an NbS activity and

decent job characteristics are observed. This could include for example, decent jobs in soil conservation or monitoring services, or providing education and training related to NbS practices (such as mangrove or forest restoration). On the other hand, some types of green jobs

would not be classified as decent jobs in NbS, including for example, decent jobs engaged in the production of energy-efficient manufacturing equipment and electrical appliances, or electric vehicles, as they are not concerned with improving ecosystems.

4.2.2 Scoping the NbS/work relationship

There is a wide range of societal challenges that may be addressed by NbS including climate change, food security, biodiversity loss and disaster risk reduction. For each challenge, different NbS actions may be undertaken and, depending on the design of the response, different levels of work will be required and different decent work outcomes will emerge. Thus, for example, in response to the challenge of climate change, the NbS actions of reforestation and forest protection can be seen as more work-intensive and less work-intensive, respectively.

Responses to economic, social and environmental challenges using NbS actions can be undertaken by all types of productive units as described above, and can involve productive units in all industries from agriculture and forestry to finance and transport. Since NbS will involve specific types of economic activity, it will generally be the case that no given productive unit will undertake solely NbS-related activities. For example, a livestock manager could undertake some NbS activities (for example, planting windbreaks to improve pasture growth) but will also undertake non-NbS activities such as shearing sheep or vaccinating cattle. The same will be true about employment and work within a productive unit and even for individuals – that is, NbS activities will most commonly not be the only activity in which they are involved. With this framing in mind, it is then useful to recognize that the different NbS actions, for instance, involving protection, restoration, conservation and sustainable management of ecosystems, will each involve contributions from different economic industries (such as agriculture, forestry, fisheries, finance, public administration, among others) and will involve a variety of economic activities.

The key message is that NbS-related activities can occur across many industries. To provide an appropriate scope of NbS activities it is necessary to

consider relevant activities by productive units across all industries (including activities undertaken governments and households). Since each industry will also undertake a range of non-NbS activities, it will be necessary to identify within each industry which activities are relevant, as well as the levels of work associated with NbS and non-NbS activities within a productive unit or industry. This identification and measurement task presents a key challenge to determining the precise scope of NbS and is considered in more detail in Chapter 5.

The potential breadth of NbS activities will incorporate not only the implementation phases wherein direct intervention or activity associated with ecosystems is undertaken, but also the planning, monitoring and evaluation phases. By recognizing these four phases, the breadth of types of work involved with NbS will also increase to incorporate management, finance, measurement and other roles. The different types of work in NbS are discussed further in section 4.4.

While the breadth of NbS activities seems evident, the precise boundaries are yet to be determined. Thus, for the purpose of measurement and analysis of NbS in practice, it will be necessary to adapt existing data and measurement guidance, while at the same time working collectively to establish more detailed measurement boundaries and standards to support robust and comparable analysis. These issues are discussed in Chapter 5.

4.2.3 Direct linkages between NbS activities, productive units and work in NbS

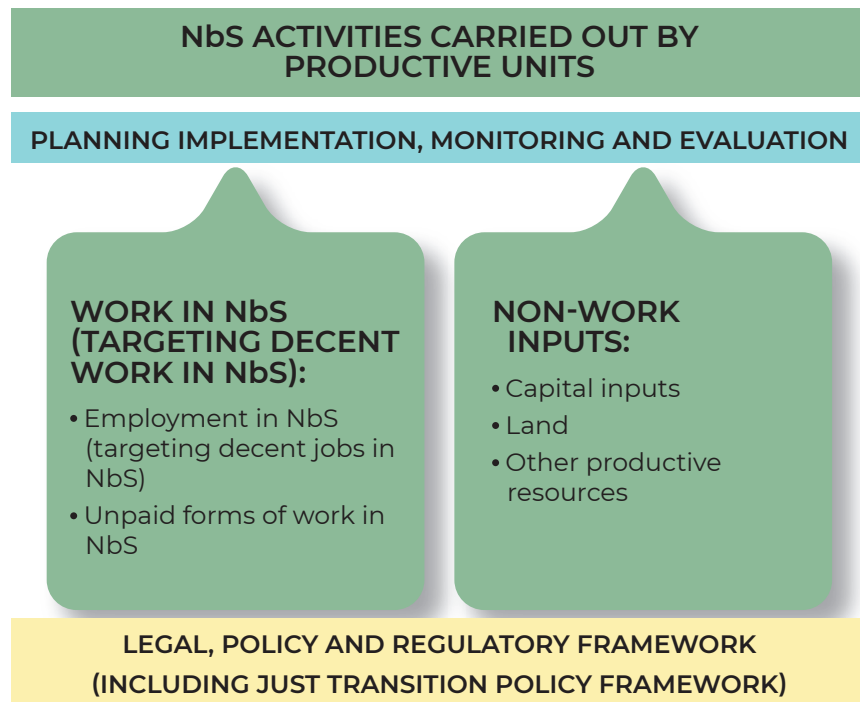
NbS actions generate NbS economic activities that produce a set of goods and services. The direct connection between NbS activities and work involves productive units engaging workers to produce goods and services for NbS.² The work involved in producing goods and services may be work for pay or profit (namely, employment) or unpaid forms of work such as volunteer workers.

As shown in figure 4.1, the economic activities of NbS include planning, implementation, monitoring and evaluation processes. Such processes are seen as an integral part of NbS activities and are supported by workers who bring knowledge and use various skills to perform a range of tasks and duties required for the work. Moreover, like other economic activities, NbS activities

² Note that the term “engage” is used in a broad sense to include, for example, a microenterprise comprising a single worker.

will involve different non-work productive inputs. Depending on the type and scale of an NbS activity, these may be a minimal set of inputs or could be more extensive in a larger operation, and could include, for example, financial capital, land, machinery, building space, equipment and tools, office materials, and seeds and planting stock. NbS activities are generally carried out within the context of the national policy, legal and regulatory frameworks, (including national just transition strategies and plans), recognizing that they may be implemented at both subnational (for example, landscape) and regional scales.

Figure 4.1 Direct linkages between NbS activities, work, decent work and non-work inputs in NbS



SOURCE: Authors' illustration.

In terms of the potential scope of the conceptual framework, it is important to highlight that decent work can and should be a key outcome secured through NbS through an appropriate set of decent work policies – including just transition policies – that accompany the NbS activities. The scope of the conceptual framework is thus focused on linkages between NbS activities and work outcomes, with the understanding that decent work outcomes related to such activities are the ultimate goal.

4.3 Conceptual framework

4.3.1 Direct, indirect, induced and secondary effects

The conceptual framework aims to contextualize the concepts of NbS and work and ensure that the full range of connections and effects on work and decent work derived from investing in NbS activities are reflected and described in a thorough and consistent way. Many of the relationships reflected in the framework are the same as would be expected for any type of economic activity, producing a range of work-related effects – including indirect and induced effects – beyond the direct effects described in the previous section. As these indirect and induced effects on work are features that are also relevant in the case of NbS activities, they are incorporated in the conceptual framework described here.

More uniquely, the framework recognizes secondary effects that arise from NbS, as the activities themselves are expected to result in improvements in ecosystem health and conditions – which in turn could be expected to drive positive work and decent work effects. These secondary effects are best conceptualized as resulting from an investment in nature and may be most apparent in relation to effects on the agriculture, forestry and fisheries industries, since these are commonly the economic activities that depend most on nature in terms of income and livelihoods. The recent Dasgupta Review (Dasgupta 2021) has reinforced the importance of understanding our economic dependence on nature and securing long-term benefits from investments in our natural capital. In practice, secondary effects may be harder to identify and will certainly tend to emerge sometime after an NbS activity has taken place, but they are an important component of the framework and provide an added rationale for investing in NbS, relative to other solutions.

The broad context for the conceptual framework is that NbS activities, work and decent work outcomes occur within a defined spatial area comprising environmental, social, and economic domains that collectively generate a level of well-being for people. The spatial area for considering the connections may be best considered as concerning a relatively targeted area, for example, a rural or coastal landscape and associated communities, a water catchment, or an urban setting.

From this starting point, the core components of the conceptual framework are as follows:

1. The connections can be described in relation to the various features that are present – that is, its environmental context and characteristics (healthy or poor condition, levels of biodiversity, and size and configuration of ecosystems); its economic structure (mix of economic activities, enterprises, industries, and types of ownership); its social context (demographics, health, education, income disparity, and employment) and the level of well-being that is generated for people, which will include the extent to which they enjoy decent work. Thus, NbS, work – especially employment – and the productive units in which the workers are engaged in NbS activities are all key features that will be connected to other features, and the connections will vary depending on the context.
2. Within the set of all economic activities that take place within the system, certain activities will contribute to NbS actions that meet societal challenges and have a focus on protecting, conserving, restoring, sustainably using and managing ecosystems, consistent with the breadth of economic activities described above. NbS activities may be classified in different ways including according to type of industry undertaking the activity (for example, agriculture, construction, energy, or government services); the type of ecosystem that is the focus of the activity; the type of intervention (for example, protection, conservation, or restoration); or the type of societal challenge to which the NbS responds (for example, food security, biodiversity loss, or climate change).
3. People will be engaged in NbS activities carried out by different types of productive units (including businesses, households and government). In NbS activities, labour provided by individual workers is essential for the productive tasks of planning, implementation, management, monitoring and evaluation. Employment and unpaid forms of work concepts are included in the conceptual framework. However, as decent work emphasizes employment opportunities, employment (namely, work for pay or profit) is a far more relevant concept and outcome. The stakeholder survey results also highlight the particular importance of employment. This is important, since the labour income received by employed persons can support poverty-reduction goals as well as household spending, which can support new job creation. Supported by the right set of incentives and policies, outcomes from NbS activities could be expected to include well-being, poverty reduction, employment opportunities and decent work, as well as various positive environmental, social and economic outcomes.

The positive effects of NbS activities on productive work outcomes will emerge through one of four different channels, summarized as follows:

1. **Direct effects** of NbS activities. Here, it is understood that NbS activities will be undertaken by productive units such as NBEs and will require, to varying degrees, employed persons to carry out the planning, implementation, monitoring and evaluation of NbS activities “on the ground”. Such employment can be referred to as direct employment in NbS. In some instances, unpaid workers will be engaged, such as direct volunteers. The direct effects play a particularly vital role in the conceptual framework, as they are the most visible work-related outcome of NbS activities and perhaps the easiest to directly monitor. Just transition policies are available to assist the decision-making process concerning investments in NbS, thereby supporting decent job outcomes in NbS while mitigating risks of potential job displacements.
2. **Indirect (supply chain/input)** effects of NbS activities. Here, it is understood that NbS activities will require, to varying degrees, inputs from other productive units (for example, the manufacture of fencing materials used in restoration activities). The indirect beneficiaries in this pathway scenario thus include certain productive units (in essence supply chain units, such as a fencing manufacturer) as well as the workers who will produce the productive inputs (such as fencing materials) to be used by the unit carrying out the NbS activity. Employment generated through this process can be referred to as indirect employment from NbS.³ Decent work outcomes may be supported in these supply chains through the appropriate set of policies and incentives.
3. **Induced (consumption) effects** of NbS activities. Here, it is understood that when the labour income accruing to employed workers directly involved in NbS activities generates additional consumption in the economy via household expenditures, this will drive additional production that will in turn have associated effects (multiplier effects) on demand for employment. In this pathway effect, new or expanded productive units that produce the goods and services purchased by households of NbS-employed workers create job opportunities for new workers. Employment generated through such NbS-related household consumption can be referred

³ It should be noted that indirect effects from NbS may lead to new or expanded productive units (enterprises) in either NbS or non-NbS activities. In the example provided, a non-NbS activity (that is, fencing manufacturer) is given.

to as induced employment from NbS.⁴ Here too, with appropriate policies, decent work outcomes may be generated in different activities, including in additional NbS activities.

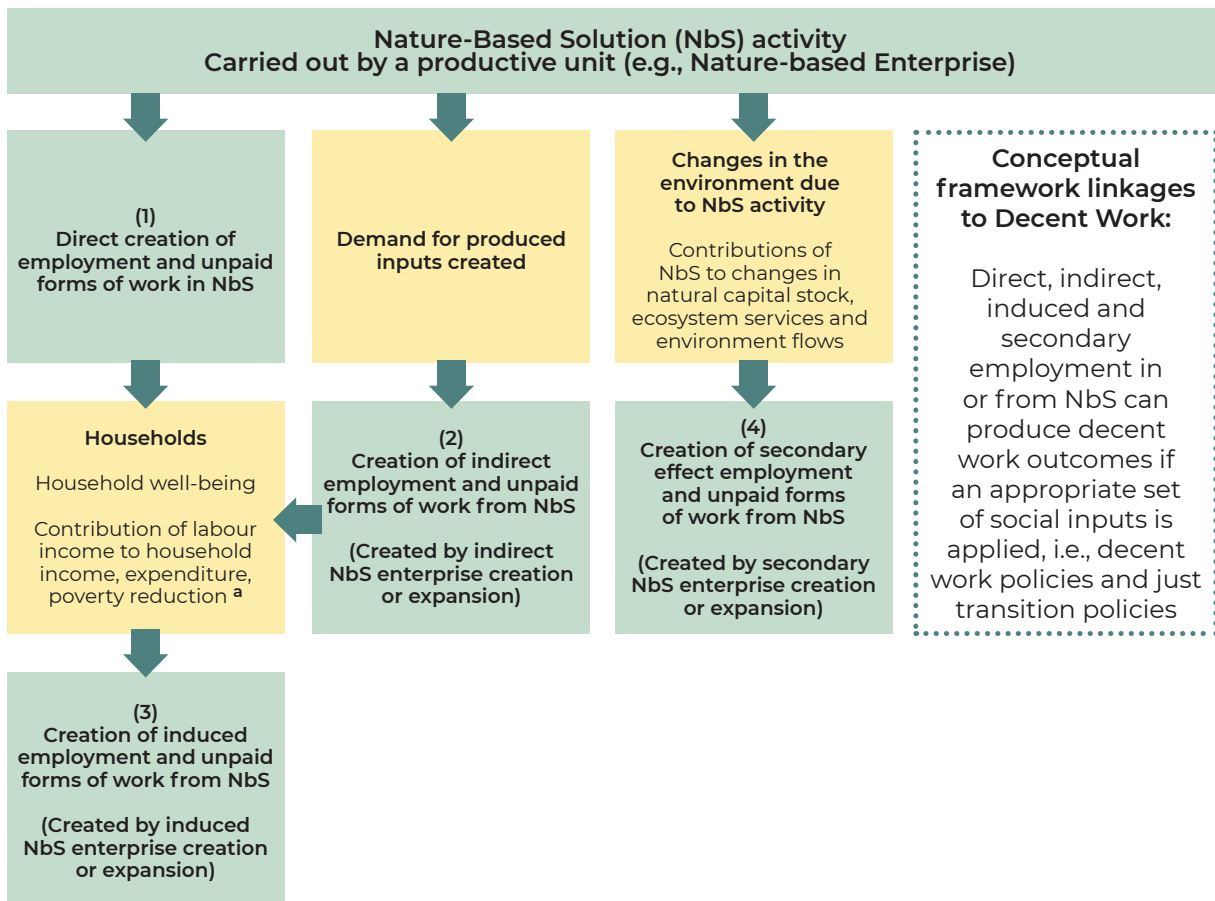
4. **Secondary effects** of NbS activities. In this pathway effect, it is understood that NbS activities, by definition, will aim to generate improvements in the environment. As a result of these improvements in the environmental context within which the NbS activity takes place, there are likely to be a set of wider and longer-term effects (for example, improved labour productivity from enhanced soil quality for crops, improved population health as a result of improved water quality.) Some of these secondary effects may lead to the creation or expansion of productive units (in NbS and/or non-NbS activities) and support employment opportunities, potentially generating decent work outcomes with the right mix of policies.

While the pathway effects above present some positive potential effects for productive units, work and decent work engaged in NbS or benefiting from NbS activities, it is worth recalling the challenges and risks of implementing NbS discussed in Chapter 2. In particular, undertaking NbS activities in a given country or geographical space may require full or partial displacement of existing activities and lead to associated job losses. This displacement may be evident across the various types of effects listed above. Policy frameworks such as just transition and the Global Standard for NbS may help minimize the impacts of these transitions for local businesses and workers, supported by social dialogue, inclusive stakeholder engagement and implementation of NbS best practices in all stages of planning, monitoring, evaluation and implementation.

With these various components and effects in mind, the conceptual framework connecting NbS with employment and unpaid forms of work created through productive units is conceived as shown in Figure 4.2. The starting point in the framework is an NbS activity, carried out by a productive unit, which requires work performed mainly by employed persons (and potentially also other workers such as unpaid volunteers) to support the production of NbS goods and services. The work performed is supported by other productive inputs (not shown but presented in Figure 4.1). The conceptual framework thus highlights the essential connections between the NbS activity, productive units, and work through the distinct pathway effects of direct, indirect, induced and secondary effects.

⁴ As in the case of indirect effects from NbS, induced effects from NbS may lead to new or expanded productive units (enterprises) in either NbS or non-NbS activities.

Figure 4.2 Conceptual framework linking an NbS activity with employment and unpaid forms of work created by productive units (enterprises) through direct, indirect, induced and secondary effects



SOURCE: Authors' illustration.

NOTE: In order to simplify the visual depiction of the framework, only direct, indirect, induced and secondary effect NbS enterprise creation or expansion and corresponding employment and unpaid forms of work impacts are shown. There would be expected indirect, induced and secondary effects on non-NbS enterprises and corresponding impacts on non-NbS employment and unpaid forms of work that are not shown here.

a Only labour income accruing from direct employment effects of NbS activity will contribute to household labour income to produce induced household consumption effects, as unpaid work will not generate labour income.

4.3.2 Some considerations

The conceptual framework may be considered relatively straightforward in that it is designed from the perspective of a selected NbS activity for a given, spatially constrained space. Yet, for optimal understanding and use by policymakers and other users, a few key additional aspects need to be considered.

First, to the extent that the conceptual framework applies for a single NbS activity then in principle it also applies to many NbS activities that might take place within a given spatial area, and thus the total or aggregate effects can be determined by summing over the effects for individual NbS activities. However, where there are multiple activities in a single location, it may prove more difficult to isolate the effects of individual activities on employment and unpaid work outcomes – but this is a measurement challenge rather than a conceptual one.

Second, the effects of a single NbS activity will span both time and physical space. Thus, not all direct and indirect effects of an NbS activity will be evident within the target spatial area, predominantly at a landscape scale. For example, indirect employment inputs generated initially by an NbS activity may be supplied by productive units and workers located in other locations, something that may be particularly evident in the planning phases of NbS activities. Further, the induced effects may arise from increases in consumption outside of the target spatial area, creating employment opportunities elsewhere. Finally, environmental changes resulting from NbS activities may arise in places beyond the target ecosystems, thus driving secondary NbS effects in other locations. This will be most evident in the case of improvements in upstream ecosystems leading to benefits to downstream communities.

Moreover, direct, indirect, induced and secondary effects on work and decent work will not all occur at the same time, and there may be considerable time lags between different effects. It might be expected that direct and indirect effects from a single NbS activity would arise in a shorter time frame (depending on the length of the supply chain), but induced effects produced via increased household consumption are more likely to arise over longer time frames, depending on factors such as baseline poverty and household income levels, consumer prices, and availability of goods and services. For secondary NbS effects reliant on changes in environmental outcomes, the time frames and orders of magnitude may also be longer and quite varied.

Third, it is important to recall that beyond the immediate linkages between NbS activities and work, the ultimate goal is to describe connections

between NbS and decent work. In this respect, while the dynamics between NbS activities and work may be connected relatively directly (for example, in terms of hours of work on a given NbS activity), the characteristics of decent work will require further interventions in the form of just transition policies, including legal framework measures to ensure rights-based working environments. For example, legislative changes on workplace safety may be required to generate occupational safety and health outcomes in support of decent work, as these are not likely to be implemented solely because of NbS activities. Fundamentally, the rule of law will need to be upheld when implementing NbS activities that engage workers, ensuring fundamental principles and rights at work.

Finally, while the focus of this report is on decent work outcomes it must not be forgotten that NbS involves investing in the environment to secure economic, social and environmental outcomes. It is critical therefore that the assessment of decent work outcomes be understood within the economic, social and environmental context in which those outcomes take place. This becomes most relevant when considering the large differences in environmental context faced by people in different parts of the world. For places where there is a very high dependency on the environment to secure livelihoods, (for example in countries with high shares of agriculture, forestry and fisheries in GDP and employment), the opportunities for, and potential benefit from, the implementation of NbS activities could be higher than for places where there is much lower direct dependence on the environment, especially if an appropriate mix of policies and tax incentives to support NbS are implemented. In relation to the conceptual framework, this implies that, while the focus remains on decent work outcomes, information on environmental context and the effects of NbS actions on the environment must remain prominent.

4.4 Applying the framework

The conceptual framework is intended to highlight the pathway effects concerning NbS activities, work and decent work outcomes. However, there is a wide range of contexts in which the framework might be applied. This section provides a discussion of additional aspects or dimensions to consider regarding the framework, allowing users to understand the potential applications. These features are a core focus of measurement, which is discussed in more detail in Chapter 5.

4.4.1 Types of work in NbS and skills needs

Although a common perception is that NbS involve “simply” planting trees or similar activities, in fact the range of tasks and required skill sets relevant in NbS activities are quite diverse. This is evident across the planning, monitoring evaluation and implementation phases of NbS, with all of these steps involving inclusive, gender-responsive meaningful social dialogue with stakeholders. Importantly, NbS need to be designed from the start with decent work goals at the centre, supported by a just transition approach to maximize opportunities and minimize risks for enterprises and workers.

Planning involves a number of steps, including defining the challenges, selecting stakeholders, clarifying the problem that NbS can solve, determining options and assessing feasibility⁵. It is required to ensure appropriate choices are made on the projects and actions to be undertaken.⁶

Implementation covers the actions that are highlighted in the NbS definition in terms of protecting, conserving, restoring, sustainably using, and managing ecosystems. NbS activities may involve the deliberate choice to leave an ecosystem untouched or otherwise ensure that human intervention is very limited. Nonetheless, while not involving actual on-site implementation tasks, this NbS action does require ongoing management.

Monitoring activities involve assessment of NbS actions based on the progress of the planned activities, while evaluation activities involve a review of the relevance, effectiveness, efficiency and impact of NbS activities vis-à-vis the stated objectives. Since NbS are commonly long-term processes, a high level of importance should be placed on robust monitoring and evaluation.

Thus, the range of tasks and required skill sets that will be relevant in NbS activities will be large and varied, especially considering the degree to which the informal economy is present across countries and regions. While recognizing such differences, examples of the types of tasks undertaken by NbS workers include:

- Managing and coordinating NbS processes
- Coordinating community outreach and communications

⁵ See for example the processes described by Howard et al. (2021).

⁶ Ibid.

- Ensuring active participation from stakeholders throughout the NbS process, including from leaders in government, business, and worker organizations as well as at-risk groups such as women, youth and indigenous peoples
- Participating in stakeholder meetings
- Undertaking research, assessment and feasibility
- Designing NbS solutions
- Securing finance
- Monitoring of NbS implementation and adaptive management
- Ensuring regulatory and legal requirements are met
- Working on site in ecosystems to protect, conserve, restore, sustainably use and manage ecosystems
- Evaluating NbS processes and outcomes
- Documentation and mainstreaming (e.g. sharing lessons learned)

Within these different types of engagement by workers, there will also be a range of different skill sets that will be required, including hands-on trade and land management skills; professional finance, legal, management and engineering skills; and social engagement and communication skills. Workers with different skill sets will be required to work on site to implement NbS activities including, for example planting tree seedlings, removing invasive plant species, or restoring mangroves. Since the combination of types of engagement and skills required will vary across different NbS activities, it may be necessary to assess occupational or skills needs for different NbS activities. The range of skills and roles involved across planning, implementation, monitoring and evaluation aspects of NbS also points to the potential of technology to be applied to manage and improve the delivery of NbS activities.

4.4.2 Distributional effects of NbS by demographic and other characteristics

The conceptual framework describes only the higher level, aggregate connections and pathway effects between NbS, productive units, and work. However, decent work outcomes need to be considered in relation to the characteristics of the people affected. The results of the stakeholder survey

suggested that social data to support gender equality objectives related to NbS are highly relevant, as are data on population, income inequality and education. Relevant population characteristics thus may include sex, age, ethnicity, education and income levels. Linking to the discussion on the potential scope of NbS activities, characteristics such as industry, occupation and status in employment are also likely to be relevant. Further, the distribution of outcomes may be usefully characterized between urban and rural worker populations and between small and large businesses. Thus, in applying the framework and analysing the various direct, indirect, induced and secondary effects of NbS activities on work and decent work, it will be essential to consider outcomes for different population groups.

4.4.3 Aggregating across NbS activities and multiple jobholders in NbS

The conceptual framework is described in relation to an individual NbS activity taking place in a specific location within a country. While the consideration of the connection between individual NbS projects and work outcomes is a useful starting point, more commonly (as evidenced in the stakeholder survey) there is interest in understanding how a larger number of NbS activities and projects – for example at national level – will influence work outcomes for a given period of time at the aggregated level. The conceptual framework can be readily extended to encompass multiple NbS activities or projects taking place across a country, counting the jobs and unpaid work activities created, as well as the number of people engaged in the individual jobs and work activities and their characteristics across the different activities. Just as people can hold multiple jobs simultaneously in the broader labour market, some people could be employed in multiple NbS activities, which could be taken into consideration in measurement.

4.4.4 Potential locations for NbS activities

In applying the framework, a relevant objective may be to identify potential locations where NbS activities would be of significant benefit. For this purpose, the framework can be used to support the description of scenarios in which the most significant benefits are likely to be obtained, including those most likely to encourage positive decent work outcomes. Two factors are of particular relevance in this respect. First, and as noted above, there will be locations where there are relatively high levels of dependency on the environment for livelihoods. In these locations, investment in the environment is likely to generate more opportunities for positive outcomes, including

with respect to decent work. Second, there will be locations where the local environment is under considerable stress (for example due to overharvesting, climate change, or population growth) and is reaching critical thresholds in terms of its ecological integrity and capacity to supply ecosystem services. In these locations as well, investment in the environment through NbS actions is likely to be of high relevance. More generally, in the design of scenarios and identification of investment locations, the conceptual framework describes the most relevant elements to be considered, and the linkages and pathway effects between them.

4.5 Conclusions

The conceptual framework presented in this chapter describes the different connections between NbS, work and decent work in order to support measurement, policy objectives and targeted interventions at the national and subnational level involving NbS actions for decent work outcomes. This framework can help inform stakeholders and decision-makers involved in NbS planning and implementation to support the integration of relevant policies, while also encouraging dialogue between specialists towards better understanding across the different policy areas of NbS and decent work. In its role as a tool that integrates a set of key concepts concerning NbS, work and decent work based on existing definitions, the conceptual framework supports an understanding of the linkages between the concepts in terms of direct, indirect, induced and secondary effects that are essential for planning, design, implementation, monitoring and evaluation of NbS. It serves as the foundation for developing the measurement framework that in turn supports evidence-based decision-making concerning NbS for decent work outcomes.

Case study

Restoration Barometer – Methodologies and units used to estimate work in Forest Landscape Restoration

The growing global movement to restore degraded landscapes, embodied in the Bonn Challenge launched in 2011 and the UN Decade on Ecosystem Restoration 2021–2030, has created a need to report and monitor on progress on restoration targets and the impacts of restoration actions. Increasingly, impact assessment goes beyond indicators such as area restored or carbon sequestered to include other socio-economic and environmental indicators. Job creation (past, current and future) is such an indicator; it includes both direct job creation and indirect and even induced effects.

Different methods to assess job creation from restoration initiatives have been applied in academic research, in the online restoration progress reporting tool referred to as the Restoration Barometer, as well as for FAO's Restoration Flagship nominations. Estimation sources and methodologies that have been applied include surveys, economic models and existing government databases, as well as literature review sources and expert opinions. As the definition of what job creation implies is given a broad interpretation, the units used to report on this indicator are diverse. A review of the scientific literature, the Restoration Barometer, and a survey among Flagship nominations found that the terms “full-time equivalent (FTE)”, “number of jobs”, “number of persons employed”, “working days”, “number of positions”, “number of people benefited” or “person-day in a year” were often applied. Jobs can be of different durations (e.g. short-term, or medium- to long-term), as well as seasonal, with different interpretations of what constitutes for example a short-term job (3 months versus a maximum 12-month duration). In order to better standardize such measurement and reporting, there is a need for methodological guidance and units that make comparisons of different jobs possible.

See Appendix 3 for complete details on this case study.

CHAPTER
FIFTEEN




Key messages

- Despite calls from related global initiatives for the application of a general approach towards integrated measurement, the coherent integration of data across environmental, economic and social domains remains a work in progress. Decent work in NbS represents a key topic for which comprehensive, coherent and accessible data are not yet available.
- Coherent measurement of employment, unpaid forms of work, and decent work in NbS over the long term has a range of benefits; until comprehensive data are available, this can be done through the integration of various datasets relevant to both decent work and NbS by applying and adapting existing statistical standards and methodological guidance.
- Improvements in the statistical measurement of employment in NbS – supported by specific statistical standards – could not only help produce reliable estimates on levels and trends of selected indicators related to decent work in NbS in a given country, but would also serve as inputs for improved regional and global estimation of work in NbS using different modelling techniques. With appropriate investment, country support and technical assistance, results for a very small set of countries could be feasible by 2030.
- This chapter proposes a set of indicators of employment, decent work and unpaid forms of work in NbS that can support discussion of decent work in NbS.

Chapter 5

Measurement framework concerning decent work in NbS



Operational and strategic decision-making requires the use of robust data and evidence. International statistical standards are intended to support the development of coherent information sets designed to support decision-making and analysis in key policy areas such as the economy, the labour market and the environment. The establishment of the Sustainable Development Goals (SDGs) in 2015 has further encouraged the development of harmonized and accessible datasets for policy across countries, with a focus on global economic, social and environmental goals and statistical indicators. The implementation of the SDGs and related global initiatives call for the application of a general approach towards integrated measurement.

Yet despite progress in specific policy areas, advancement in the coherent integration of data across environmental, economic and social domains remains a work in progress. Decent work in NbS represents a key topic for which comprehensive, coherent and accessible data are not yet available. Thus, this chapter discusses the way in which existing statistical standards and methodological guidance can be integrated to underpin the design of policy-relevant information sets concerning decent work in NbS. In particular, it presents a potential set of key indicators on these topics.

Integrating various datasets relevant to both decent work and NbS through the application and adaptation of existing statistical standards and methodological guidance has a range of benefits. Specifically, it could reduce ad hoc data collection and support coordinated investment in data collection; improve the comparability and reuse of data; support engagement and alignment across economic, social and environmental domains; reduce costs through the use of more consistent and replicable tools and methods; and

increase the potential to scale up measurement well beyond initial research activities.

The discussion in this chapter highlights the potential for the long-term measurement of employment, unpaid forms of work, and decent work in NbS. It focuses primarily on the measurement of the direct effects of NbS activities, although some discussion of indirect and induced effects is also covered.

Following this introduction, section 5.1 presents an overview of the proposed measurement system and key indicators. Section 5.2 discusses the measurement of NbS activities, forms of work, decent work and green jobs, linking the relevant international statistical standards to measuring decent work in NbS. Section 5.3 considers various measurement challenges and current limitations that will need to be addressed as the measurement process is taken forward. Finally, section 5.4 discusses future areas of research that can support the measurement framework concerning decent work in NbS.

5.1 Overview of the measurement framework and key indicators

The starting point in a measurement framework targeting work and decent work in NbS is the UNEA definition of NbS (see sections 1.1 and 4.2.1). Thus, within scope of the measurement system is the measurement of the types of social, economic and environmental challenges to be addressed through NbS; the identification and classification of NbS activities that concern protecting, conserving, restoring, sustainably using and managing different types of ecosystems; the allocation of jobs and employed persons to various NbS activities; and the description of the types of benefits to human well-being (especially employment and decent work, as concerns this report), including ecosystem services, resilience and biodiversity derived from NbS activities.

Internationally agreed UN standards and measurement guidance is lacking with regard to the societal challenges addressed by NbS and the types of benefits from NbS. These topics present challenges in terms of developing typologies that can be applied in a standardized way across countries and at different scales. IUCN (2020b) has made progress here, for example with

regard to developing a useful typology on the challenges of NbS.¹ The issue of an international typology of NbS activities also presents challenges and is addressed further.

The data gaps concerning employment and decent work in NbS are apparent. Respondents of the stakeholder survey on decent work in NbS (Appendix 1) expressed their need for data for purposes of communicating trends and performance to external stakeholders, internal reporting and key performance indicators, and scenario analysis and projections concerning decent work and NbS. All topic areas presented in the survey were found to be relevant for the data needs of the majority of the respondents.

In terms of the topics for which survey respondents reported having data gaps, environmental outcomes and sustainability of outcomes ranked highest. In addition, more than half of the respondents reported data and indicator gaps on decent work and NbS related to social data, including gender, indigenous and youth statistics. The topic of employment was considered a highly relevant topic for the data needs of 60 per cent of survey respondents, while close to a third noted that all forms of work – including unpaid forms – are relevant for their information needs. The most relevant data needs in terms of decent work corresponded to the substantive elements of employment opportunities, adequate earnings and productive work, safe work environment, and equal opportunity and treatment in employment.

The stakeholder survey results suggest, moreover, that in the context of measuring decent work in NbS, it is insufficient to have information available separately on these topics. What is required is a coherent information set that organizes and presents the relevant data in an integrated way. Such a system facilitates the calculation of various indicators and supports more detailed analysis.

This section shows how a measurement framework can be formed from currently available statistical standards and methodological guidance, and then applied to establish a coherent and integrated information set on the topic of employment and decent work in NbS. Although current data limitations do not yet allow for compilation of a comprehensive and integrated information set, the measurement framework described here is not constrained by such limitations, and thereby provides direction for future data collection and analysis that can strengthen evidence-based policy making. This section also proposes a set of indicators that can support

¹ According to IUCN, there are seven societal challenges addressed by NbS: (1) climate change mitigation and adaptation, (2) disaster risk reduction, (3) economic and social development, (4) human health, (5) food security, (6) water security, and (7) environmental degradation and biodiversity loss.

discussion of decent work in NbS and which help to provide a clear focus for the design of the measurement framework itself.

5.1.1 Measurement framework

Respondents to the stakeholder survey reported that all ten data topic areas concerning decent work in NbS were important for their data needs. However, for the purposes of laying the foundation of the measurement framework on decent work in NbS, the scope is limited slightly to eight key information components that cover most of the survey data topics, which together create a coherent information set for NbS and decent work. Other topic areas covered by the survey that are not contained in this set may be included, for example, through complementary classification systems. (Such is the case in the case of gender, indigenous and youth statistics.) The eight components of the measurement framework are:

- Economic activities
- Environmental and NbS activities
- Environmental physical flows
- Ecosystem assets and their services
- Working age population and employment
- Forms of work, including employment and unpaid forms of work
- Decent work²
- Employment in the environmental sector and green jobs

For each of these components, there are existing measurement standards and methodological guidance that can serve as the starting point for designing the measurement framework. Moreover, the conceptual framework described in Chapter 4 provides a basis for identifying the connections among these components. Integrating these components allows for measurement of employment, unpaid forms of work, and decent work in NbS.

The discussion here is presented in terms of establishing a national-level dataset concerning NbS and decent work. However, the same considerations will apply at any defined subnational level, such as administrative areas (state,

² Decent work measurement seeks to support evidence-based decision-making related to the Decent Work Agenda, thus focusing on topics such as employment opportunities, adequate wages, safe work conditions, workers' rights, social dialogue and social protection. Decent work focuses on employment as the target reference population. The concept of 'decent jobs' refers to a subcategory of decent work, focusing specifically on the set of tasks and duties performed, or meant to be performed, by one person for a single economic unit, carried out in the context of employment (i.e. work for pay or profit).

province), rural/urban areas, or geophysical areas such as a catchment. Some variations will be necessary when considering the information set relevant at the level of an individual project due to the difference in scale, although the general concepts are the same.

To provide a general scope for measurement and to describe the connections between the different components in general terms, the following logic from the conceptual framework in Chapter 4 is applied:

1. Within the set of all productive activities that take place within a given geography, certain activities will satisfy the definition of NbS activities having a focus on protecting, conserving, restoring, sustainably using, and managing ecosystems, consistent with the breadth of activities that is possible.
2. In NbS activities, labour provided by individual workers is essential for the productive tasks of planning, implementation, monitoring and evaluation.
3. Conceptually certain persons of working age within a country can be classified as employed if they performed work for pay or profit for at least one hour during a particular reference week. Such persons can be classified as employed in NbS if the activity of employment meets the definition of NbS. Persons of working age may also be classified as being in forms of unpaid work in NbS, including as volunteers, unpaid trainees or own-use producers of goods (such as subsistence farmers) in a given reference period.³ Each person in a given form of work may be classified by various demographic characteristics such as age and sex and the jobs of employed persons may be classified, for example, by industry, occupation, or status in employment. Employed persons may be classified according to geographic location, such as rural or urban area (ILO 2018c).
4. The work undertaken by persons can be measured not only in terms of quantity, but also in terms of quality, and a set of decent work measures has been developed to cover the different dimensions of decent work (ILO 2013a). As decent work measures focus on the reference concept of employment, the focus is on measuring decent jobs and various demographic characteristics of the persons holding those jobs.

³ It is worth noting that while different forms of work are mutually exclusive, individual persons may be classified in one or more forms of work over a specific reference period. For example, an employed person may have also carried out volunteer work in each reference period.

These four steps frame the core information required to describe the relationship between NbS and decent work, with the primary targets of measurement being (a) the persons of working age engaged in NbS activities, both employed and in unpaid forms of work; and (b) the subset of those employed in NbS who are engaged in decent jobs. The measurement scope – which is established to align with the eight key components of the measurement framework – is mapped out in Table 5.1.

Table 5.1 Topics and selected measures on forms of work and decent work in NbS and related economic measures and ecosystem effects, by environmental sector and non-environmental sector

TOPICS	MEASURES	PRODUCTIVE ACTIVITIES WITHIN THE SYSTEM OF NATURAL ACCOUNTS (SNA) PRODUCTION BOUNDARY				
		ENVIRONMENTAL SECTOR		NON-ENVIRONMENTAL SECTOR		TOTAL
		NBS	NON-NBS	NBS	NON-NBS	
Population	Total working age population					
	Total working age population by sex; by age (youth/adults); by geographic region (rural/urban)					
Forms of work and decent work	Employment					
	Employment by industry; by occupation; by status in employment; by sex; by age (youth/adults); by geographic region (rural/urban)					
	Decent work^a					
	Decent work measures (as appropriate) by industry; by occupation; by status in employment; by sex; by age (youth/adults); by geographic region (rural/urban)	Green jobs	Green jobs			
	Volunteer work^b					
	Volunteer work by industry; by sex; by age (youth/adults); by geographic region (rural/urban)	Green work	Green work			
	Own-use production work of goods (includes subsistence food producers)					
	Own-use production work of goods by industry; by sex; by age (youth/adults); by geographic region (rural/urban)	Green work	Green work			
Unpaid trainee work						
Unpaid trainee work by industry; by sex; by age (youth/adults); by geographic region (rural/urban)	Green work	Green work				

TOPICS	MEASURES	PRODUCTIVE ACTIVITIES WITHIN THE SYSTEM OF NATURAL ACCOUNTS (SNA) PRODUCTION BOUNDARY				
		ENVIRONMENTAL SECTOR		NON-ENVIRONMENTAL SECTOR		TOTAL
		NBS	NON-NBS	NBS	NON-NBS	
Economic measures	Enterprises					
	Number of enterprises by size; by industry; by institutional sector; by forma/informal; by geographic region (rural/urban)					
	Output by industry					
	Labour productivity by industry					
	Value added by industry					
Ecosystem effects	Extent					
	Condition					
	Ecosystem services					
	Ecosystem asset value					

SOURCE: Authors.

NOTE: Cells in green are particularly relevant for measuring employment, unpaid work and decent work in NbS. Cells in grey may be relevant for some types of work or activity in NbS. Cells in orange provide supporting information that helps to place NbS activities in context. Cells in yellow are not measured.

- a** Decent work measures focus on employment as the reference population. It is a concept that is concerned with employment opportunities, adequate wages, decent working time, safe working conditions, rights at work, social dialogue and social protection.
- b** Volunteer work is limited to productive activities within the System of National Accounts production boundary, i.e. volunteer work in market and non-market units and in households producing goods.

The focus of the measurement framework is on the direct effects of NbS activities on forms of work and decent work. In terms of describing the direct effects of NbS activities more completely, it will also be relevant to measure employed persons not engaged in decent jobs in NbS, as well as measures of economic activity (for example, number of businesses, output, and value added) and measures of flows either into or resulting from those activities (for example, water use, energy use and GHG emissions).

To go beyond these direct effects of NbS activities on paid and unpaid forms of work and decent work, and hence to consider the indirect, induced and secondary effects of these activities, additional components need to be measured:

- To consider indirect effects that encompass supply chain effects from increased NbS activity, data on forms of work, decent jobs, and economic measures are extended to cover non-NbS environmental sector activities and non-environmental sector activities.
- To consider induced effects arising from potential increased household spending due to increases in NbS-related labour income, additional NbS connections could be measured. Measures for changes in household income, consumption and health have not been incorporated into the table above but could potentially be incorporated by linking to the types of households and persons of working age.
- To consider secondary effects of NbS that derive from positive changes to the environment due to NbS activity, the starting point is to assess the changes in ecosystem extent, condition, services and asset value arising from the NbS activity – topics that are covered further in section 5.2. Based on that information, it could be possible to estimate subsequent effects on employment and work, economic measures, household income, consumption and health.

5.1.2 Key indicators

Table 5.2 presents a set of key indicators for NbS and work intended to convey to stakeholders the key messages about the current levels and trends in NbS activities and the connection to employment and decent work. The focus of the indicators is on direct effects of NbS activities; as noted above, additional components would need to be estimated in order to develop indicators of indirect, induced and secondary effects.

Three of the indicators align with indicators included in the SDGs under Goal 8, which seeks to promote sustained, inclusive and sustainable economic

growth, full and productive employment and decent work for all. These are the context indicator on *labour productivity in NbS*, the employment-related indicator on *average hourly wages of employed persons in NbS*, and the indicators on decent work in NbS concerning *informal employment in NbS*.

Employment in NbS, expressed in absolute numbers and as a percentage of total employment in the environmental sector and as a share of total employment, can be a leading indicator of the contribution of NbS towards a sustainable economy. It would be beneficial to monitor employment by type of NbS activity, including ecosystem type and restoration hierarchy, building on existing classifications of NbS such as those related to societal challenges (IUCN 2020a), ecosystems,⁴ and implementation activities.⁵

4 Possible categories concerning ecosystems include farmlands, forests, freshwater, grasslands, shrublands and savannahs; mountains, oceans and coasts; peatlands; and urban areas which were used by UNEP (2021b). In the longer term, categories should align with the IUCN Global Ecosystem Typology as referenced in the SEEA.

5 A classification on implementation activities could consider employment for activities related to (1) protection, (2) conservation, (3) restoration, and (4) sustainable use and management.

Table 5.2. Proposed key indicators of employment, decent work and unpaid forms of work in NbS

INDICATORS ON EMPLOYMENT IN NbS			
<p>Employment in NbS:</p> <ul style="list-style-type: none"> ■ Headcount, total and by sex, in rural/urban areas ■ NbS employment in rural areas as a share of total rural employment 	<p>Shares of NbS employment, by sex and:</p> <ul style="list-style-type: none"> ■ Ecosystem type ■ Type of NbS activity (e.g. protection, conservation, restoration, etc.) ■ Societal challenge 	<p>Shares of NbS employment, by sex and:</p> <ul style="list-style-type: none"> ■ Industry ■ Institutional sector ■ Occupation ■ Status in employment 	<p>Wages and working time, by sex:</p> <ul style="list-style-type: none"> ■ Average hourly wages of employed persons in NbS ■ Average weekly working time of employed persons in NbS
INDICATORS OF DECENT WORK IN NbS ^a			
<p>Employment opportunities:</p> <ul style="list-style-type: none"> ■ Informal employment in NbS: <ul style="list-style-type: none"> • Headcount • Share of total informal employment 	<p>Adequate wages:</p> <ul style="list-style-type: none"> ■ Adequate wages in NbS (i.e. wages which are above 2/3 of median wages) <p>Decent working time:</p> <ul style="list-style-type: none"> ■ Time-related underemployment in NbS 	<p>Social security coverage:</p> <ul style="list-style-type: none"> ■ Total population ■ NbS workers <p>Social dialogue:</p> <ul style="list-style-type: none"> ■ Indicator of inclusive social dialogue involving stakeholders at relevant NbS scale^b 	<p>Safe work environment:</p> <ul style="list-style-type: none"> ■ Occupational injuries in NbS <p>Equal opportunity and treatment in employment</p> <ul style="list-style-type: none"> ■ Gender wage gap in NbS
INDICATORS OF UNPAID FORMS OF WORK IN NbS (AS RELEVANT)			
<p>Total own-use producers of goods in NbS:</p> <ul style="list-style-type: none"> ■ Headcount (by industry and by sex) ■ Working time measure, by sex 	<p>Total volunteer workers in NbS^c</p> <ul style="list-style-type: none"> ■ Headcount (by industry and by sex) ■ Working time measure, by sex 	<p>Total unpaid apprentices or trainees in NbS:</p> <ul style="list-style-type: none"> ■ Headcount (by industry and by sex) ■ Working time measure, by sex 	

CONTEXT INDICATORS:		
NbS output as a share of: <ul style="list-style-type: none"> ■ Total environmental output ■ Total economic output 	Total NbS output per employed person in NbS (i.e. labour productivity in NbS)	Environmental dependency ^d <ul style="list-style-type: none"> ■ Share of gross value added in industries highly or very highly dependent on the environment ■ Share of total employment in industries highly or very highly dependent on the environment
<p>SOURCE: Authors.</p> <p>NOTES:</p> <p>a The main reference population used to measure decent work is employment. Units of measure thus most often refer to persons in employment or decent jobs.</p> <p>b This indicator is yet to be developed.</p> <p>c Volunteer work is measured within the System of National Accounts production boundary. For more information see ILO 2013c.</p> <p>d As determined by the extent to which ecosystem services are direct inputs to production.</p>		

The scope of labour market indicators is restricted to employment and certain unpaid forms of work, thus excluding unemployment, in order to allow linkages to work in NbS. Monitoring the core set of industries that characterize employment, decent jobs and, where relevant, unpaid forms of work in NbS, will be critical for assessing the importance of such economic activities for decent work outcomes as part of the green economy. Sectors that depend on natural resources – such as agriculture, forestry and fisheries – can provide opportunities for economic development and environmental sustainability through NbS, supporting businesses and workers. Certain types of construction and infrastructure development are also goods-producing activities that could yield decent work opportunities in NbS. Economic services activities in government, community services, education and research may provide decent work opportunities in more skilled work in NbS.

Data on employment by occupation and by level of education are important for analysing the type and level of skill required in NbS activities. Analysis of such information will provide the qualification profile of NbS workers and the potential of NbS activities to provide jobs or work activities for workers with similar levels of education or for persons in unemployment.

Data on wages and working time of employed persons in NbS can shed light on the quality of such employment. Moreover, to adequately inform NbS policies as well as labour market, social and economic policies, it is necessary to provide statistics that would reflect key decent work dimensions of the jobs in NbS. Relevant indicators selected from ILO guidance on decent work indicators – including, for

example, indicators related to adequate wages, social security coverage, gender pay gap, and informal employment rate – may be considered in this regard.

It is essential that the set of indicators allow for analysis by sex, age and any other relevant demographic characteristics to facilitate monitoring decent work outcomes of potentially at-risk groups such as women and youth. Moreover, it is recommended that employment in NbS be analysed at the subnational geographic level, for example by rural and urban areas or by administrative area, as permitted by the data. Such analysis will shed light on the geographic areas associated with NbS activities and whether the geographic distribution can be linked to any indirect or induced economic activities and work outcomes or to particular environmental characteristics of the area (for example, arable land, forest, coastal areas or the sea).

Conceptually, the statistical concepts and treatment described here can also be applied at an individual project level. However, given the different requirements for reporting on projects compared to national level, much consideration would be involved in designing linkages from micro to macro settings to inform coherent policy across those scales. The measurement framework and proposed indicators are supported by existing measurement standards and guidance, which are discussed in the next sections.

5.2 Measurement of NbS activities, forms of work, decent work and green jobs

5.2.1 Relevant statistical guidance

At present, there is no statistical standard that specifically focuses on measuring NbS activities. However, there is a range of existing statistical standards that can be tailored for this purpose and which, collectively, can underpin the derivation of the indicators proposed in section 5.1. The relevant standards are:

- United Nations' System of National Accounts (SNA)⁶ – for the measurement of economic activities

⁶ The UN System of National Accounts (SNA) 2008 is the current international standard, available at: <https://unstats.un.org/unsd/nationalaccount/sna2008.asp>

- UN System of Environmental-Economic Accounting (SEEA)⁷ – for the measurement of the environment and its relationship to the economy
- International Conference of Labour Statisticians (ICLS)⁸ standards and related guidance – for the measurement of work (including employment and unpaid forms of work), decent work and green jobs.

The focus in this section is introducing how the current statistical standards can be applied to support measurement of NbS activities and related work effects.

5.2.2 Defining environmental activities and the links to NbS activities

The SEEA provides a useful starting point for measuring NbS activities through the use of the definition environmental activities as “those activities whose primary purpose⁹ is the prevention, reduction and elimination of pollution and other forms of degradation of the environment; and those activities whose primary purpose is preserving and maintaining the stock of natural resources and hence safeguarding against depletion” (United Nations et al. 2014).

The aggregate of all environmental activities undertaken within a country is commonly referred to as the “environmental sector”. This can lead to the impression that there is a distinct, stand-alone set of economic units that undertake environmental activities. However, this is not the intention in the definition or the practice in its application. Thus, in applying the SEEA’s definition of environmental activities, it is accepted that these activities can be undertaken by all types of economic units and across all types of industries. Consequently, the full set of environmental activities should not be seen as being undertaken by a single set of economic units, but rather as individual activities focused on the environment that are a subset of the range of activities undertaken by a single enterprise.

From the perspective of making connections between NbS, work and decent work, the SEEA’s definition of environmental activities is also useful as it

⁷ The UN System of Environmental Economic Accounting (SEEA) is available at: <https://seea.un.org/>

⁸ The International Conference of Labour Statisticians (ICLS) is the international standard-setting body on labour statistics. Established in 1923, the ICLS is a tripartite body comprised of UN member state representatives from government, employers’ organizations and workers’ organizations that establish Resolutions and Guidelines on a range of topics to support evidence-based policy making in the world of work. Information on standards adopted by the International Labour Conference (ILC) and the ICLS is available at: <https://ilostat.ilo.org/about/standards>.

⁹ Note that the term “primary purpose” does not imply sole purpose. Commonly, environmental activities will have a range of purposes or objectives.

underpins the ILO's definition of green jobs established in 2013. As explained further below, green jobs are those jobs that perform environmental activities as defined in the SEEA and which are also decent jobs. The use of the SEEA's definition of environmental activities provides a reasonable starting point for measuring NbS activities by providing an initial measurement boundary. However, it is necessary to recognize the very real practical challenge of identifying individual environmental and NbS activities being undertaken by economic units. Further discussion about the precise measurement boundaries and data collection methods will be required.

Assuming NbS activities can be identified, it is relevant to consider possible typologies or groupings of NbS activities that can be used to focus data collection efforts and to support the presentation of data. The following groupings have been identified as most relevant (recognizing the need for further research and discussion on these groupings and their implementation in practice):

- **Type of societal challenge:** As an initial point of reference, the IUCN has identified seven major societal challenges, namely: climate change mitigation and adaptation; disaster risk reduction, economic and social development; human health; food security; water security and reversing environmental degradation and biodiversity loss (IUCN 2020a).
- **Type of NbS action:** These could follow, for example, the four types of action in the UNEA definition: protection, conservation, restoration, sustainable use and management; typologies concerning restoration (such as Gann); or the IUCN broad categories of NbS actions.
- **Ecosystem type:** The NbS definition highlights that activities can be carried out in relation to a wide range of ecosystem types across terrestrial, freshwater and marine realms. Since there are many potential ecosystem typologies, the recommendation here is to use the biome level of the IUCN Global Ecosystem Typology (see Keith, Ferrer-Paris and Nicholson 2020).
- **Industry class:** It is likely to be very useful to collect data about the industry of the economic units conducting NbS activities. The International Standard Industrial Classification of All Economic Activities (UN 2008) consists of a coherent classification structure of economic activities based on internationally agreed concepts, definitions, principles and classification rules. It includes industry classes related to agriculture, forestry, fishing, construction, education, research, and others that may be relevant to NbS activities.

5.2.3 Measuring economic effects

The measurement of economic effects has been a focus for many decades using the concepts and definitions of the SNA and other related standards for economic statistics. Among many indicators, the SNA defines the well-known economic measure of gross domestic product (GDP), but also measures of household consumption, industry output and value added and government expenditures.

5.2.4 Measuring environmental effects

The use of statistical standards to measure environmental effects is relatively recent compared to the standard measurement of economic effects. However, the SEEA provides a way forward from a statistical perspective. The most recent release is the SEEA Ecosystem Accounting which was adopted in 2021 as the standard for recording information on ecosystems and biodiversity and their link to the economy and society (UN 2021b).

For the purpose of measuring the environmental outcomes arising from NbS activities, the SEEA Ecosystem Accounting provides concepts, definitions and classifications that record information on the following:

- Ecosystem extent or area to monitor changes such as deforestation and desertification, as well as positive effects of restoration in different ecosystem types, such as mangroves and wetlands.
- Ecosystem condition concerning measures of the quality and integrity of ecosystems and how this is changing over time. This can incorporate measures of species diversity and can be linked to measures of environmental pressures such as pollution, over-harvesting and land use change.
- Ecosystem services supplied by ecosystem assets and used by different economic units including businesses, governments and households. The concept of ecosystem services aims to capture the wide variety of connections between people and the environment, including both market and non-market goods and services.
- The valuation of ecosystem services and ecosystem assets in monetary terms to support certain analyses of the connection between the economy and the environment, for example extended input-output modelling.

Measurement of environmental effects, particularly as they concern ecosystems and biodiversity, is a challenging task, especially if the ambition

is to encompass the measurement of ecosystem dynamics and to reflect concepts of resilience and capacity of ecosystems. Further research and testing will be required; however, building on many current efforts – including the IUCN Red List of Ecosystems – there are already sufficient data available to make a solid start in the measurement of environmental effects. Over 40 countries now have programmes of work on the implementation of ecosystem accounting.

5.2.5 Measuring employment, work and forms of work

Adopted in 2013, the 19th ICLS resolution concerning statistics of work, employment and labour underutilization (ILO 2013c) presents the first statistical standard definition of the concept of work and the forms of work framework, linking to the SNA. It establishes the forms of work framework, which identifies five forms of work – including employment, the key reference concept – distinguished by the intended destination of the production (for own final use; or for use by other economic units) and the nature of the transaction (namely, monetary or non-monetary transactions, and transfers).

The forms of work include: (a) own-use production work comprising production of goods and services for own final use; (b) employment comprising work performed for others in exchange for pay or profit; (c) unpaid trainee work comprising work performed for others without pay to acquire workplace experience or skills; (d) volunteer work comprising non-compulsory work performed for others without pay; and (e) other work.

As regards work in NbS activities, the relevant forms of work are those that correspond to own-use production of goods (including subsistence food producers), employment, unpaid trainee work, volunteer work in market and non-market units, and volunteer work in households producing goods.

5.2.6 Measuring decent work

The ILO Decent Work Measurement Framework (DWMF)¹⁰ was developed with the objective of assisting stakeholders to assess progress towards decent work and to offer comparable information for analysis and policy development in support of decent work. The framework serves as a model of

¹⁰ The ILO Decent Work Measurement Framework was initiated by the International Labour Office based on worldwide consultations with technical experts. A Tripartite Meeting of Experts (TME) was conducted in 2008 to discuss the framework (ILO 2008a), and later the same year the TME's recommendations were reported to the ILO Governing Body and presented to the International Conference of Labour Statisticians. See also ILO 2013a.

international relevance that permits the adaptation to national circumstances and priorities.

The DWMF covers ten substantive elements: (1) employment opportunities; (2) adequate earnings and productive work; (3) decent working time; (4) combining work, family and personal life; (5) work that should be abolished; (6) stability and security of work; (7) equal opportunity and treatment in employment; (8) safe work environment; (9) social security; and (10) social dialogue, employers' and workers' representation.

Together these elements represent the structural dimensions of the framework under which the decent work indicators are organized. There is an additional substantive element on the economic and social context for decent work. The DWMF contains a set of quantitative (statistical) and qualitative (legal framework) indicators which are mutually reinforcing.

Some of the DWMF statistical indicators could be adapted and applied at national level to support measurement and monitoring of decent jobs in NbS. Statistical indicators whose scope falls under employment opportunities, adequate earnings, decent working time and social security are a particularly good starting point for developing indicators concerning decent jobs in NbS, and this is reflected in the set of proposed indicators in this chapter, including three indicators that align with SDG 8 indicators (see box 5.1).

BOX 5.1 Sustainable Development Goal 8: Relevance of selected indicators for measuring decent work in NbS

Adopted by the United Nations in 2015, the Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated and recognize that development must balance social, economic and environmental sustainability.

SDG 8 seeks to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Three indicators

supporting targets under this goal align closely with indicators in the ILO Decent Work Measurement Framework that could be adapted to support measuring (or providing context for) decent work in NbS. The relevant SDG 8 targets and indicators are:

- *Target 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors. Progress is measured*

through SDG indicator 8.2.1: Annual growth rate of real GDP per employed person. The indicator aligns with the context indicator on labour productivity in the DWMF. It could be a relevant NbS-related indicator targeting measurement of the annual growth rate of output in NbS per employed person in NbS. Specifically, the indicator can allow data users to assess NbS output-to-labour input levels and growth rates over time, thus providing general information about the efficiency and quality of human capital in the production process for a set of NbS activities in a particular social context, including other complementary inputs and innovations used in NbS.

- *Target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.* Progress is measured through SDG indicator 8.3.1: Proportion of informal employment in total employment, by sector and sex. This indicator is also included in the DWMF under “Employment opportunities”. Assuming there is sufficient NbS activity taking place in a country where informal employment is measured, a related indicator could be constructed targeting informal employment in NbS as a share of total informal employment. The indicator would provide insights

regarding the share of total informal workers that are either working in informal NbS enterprises or whose employee jobs in NbS activities are informal, lacking social protections (for example, access to paid annual leave).

- *Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.* Progress is measured through SDG indicator 8.5.1: Average hourly earnings of employees, by sex, age, occupation and persons with disabilities. The indicator is included in the DWMF under “Adequate earnings and productive work” and could be relevant in the context of NbS activities, where the average hourly earnings of employees engaged in NbS would be measured by demographic group. Such a measure is relevant when there are sufficient numbers of employees in NbS. If a large share of workers in NbS are independent workers such as own-account workers, the indicator may not adequately reflect average wages. The measurement framework proposed in this chapter suggests two indicators concerning wages, namely: (1) average hourly wages of employed persons in NbS and (2) adequate wages in NbS, considering wages in NbS above the two-thirds of median wages as adequate.

5.2.7 Measuring employment in the environmental sector, green jobs and decent jobs in NbS

Some of the key policy questions that arise in the transition to a green economy – including a shift to NbS activities away from environmentally harmful activities – concern job creation and loss, changes in occupational and skills needs, sectoral and enterprise restructuring and decent work. The measurement of employment in the environmental sector and green jobs can help inform policy decisions related to such transitions, and this relates to the quantity and quality of employment carried out in the environmental sector, including NbS activities. Information is presented here that is relevant for measurement of employment in the environmental sector, green jobs and decent jobs in NbS to support a deeper understanding of the proposed indicators discussed previously in the chapter.

According to the 19th ICLS Guidelines on employment in the environmental sector, the concept of employment in the environmental sector is defined as all persons who, during a particular reference period, were employed¹¹ in the production of environmental goods and services. It includes workers whose duties involve making their economic unit's production processes more environmentally friendly or making more efficient use of natural resources. In this report, the concept of employment in NbS allows for both employment in the environmental sector and in the non-environmental sector. Further research is needed to determine the precise boundaries of NbS activities such that the link between employment in NbS and employment in the environmental sector is better understood.

According to the 19th ICLS Guidelines, “green jobs” refers to a subset of employment in the environmental sector that meets the requirements of decent work (namely, 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 2013a). (Moreover, according to these standards green work refers to all work involved in production of environmental goods and services. It includes employment, voluntary work and own-use production work to produce environmental goods and services.)

Since a clear definition and typology of NbS activities is still lacking, it is not possible at this time to provide a clear measurement boundary for employment

¹¹ Refers to the 19th ICLS resolution concept of employment, defined as “work performed for others in exchange for pay or profit” (ILO 2013c).

in NbS. Nonetheless, given that employment in NbS likely corresponds partly to a subset of employment in the environmental sector, and green jobs are defined as decent jobs in the environmental sector, it is expected that many decent jobs in NbS correspond to certain types of green jobs.¹² At the same time, as some employment in NbS may correspond to activity outside the environmental sector, the corresponding jobs may be decent jobs, while others may not. The conceptualization of these relationships is provided in Figure 5.1.

Figure 5.1 Relationship between total employment, jobs in the environmental sector, jobs in NbS, decent jobs and green jobs



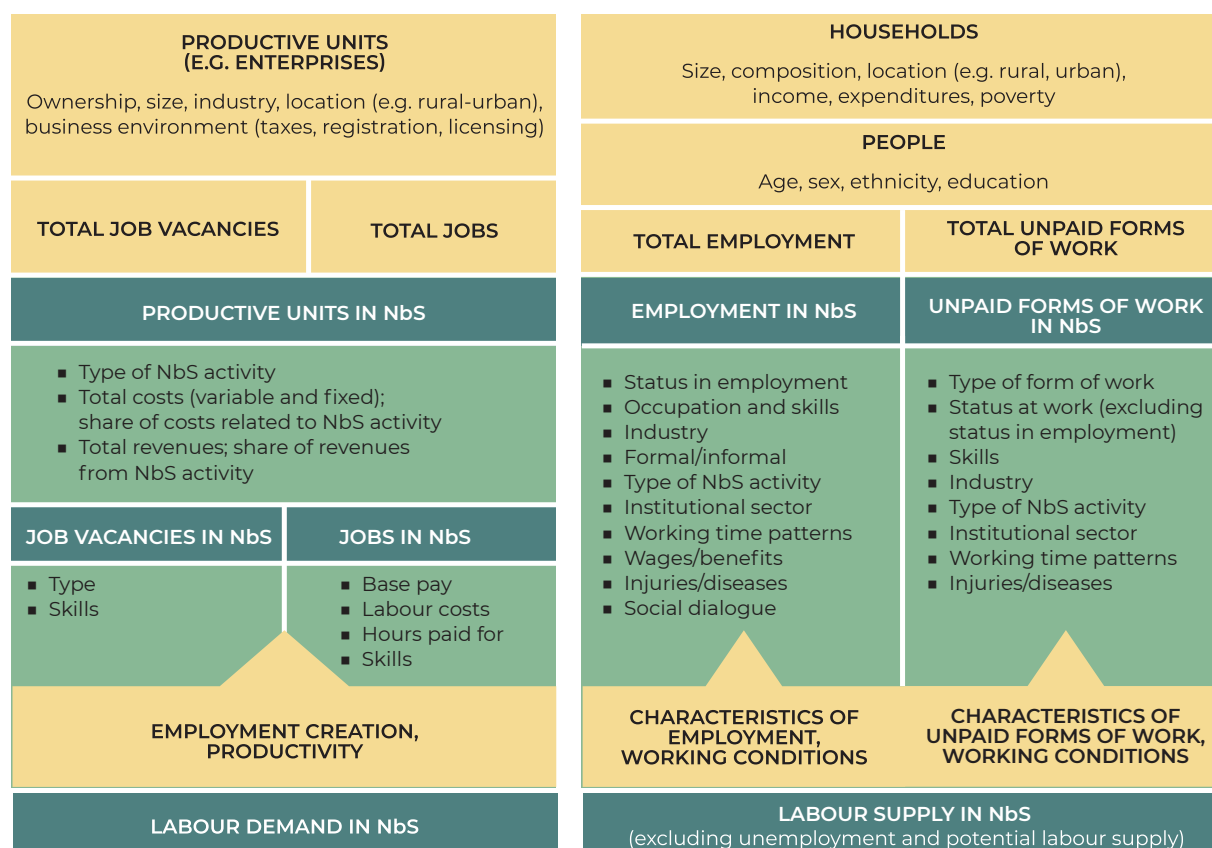
SOURCE: Authors' illustration.

¹² See box 4.2 in Chapter 4 concerning the green jobs concept and linkages with decent jobs in NbS.

5.2.8 Direct labour demand and supply

Regarding direct job creation in NbS, a useful means to organize data is to consider both the supply and demand for jobs in NbS, as depicted in Figure 5.2. From the labour demand side, producing units can provide data on the creation of jobs and enhancement of productivity in NbS activities, as well as key information on the characteristics of the producing units in NbS by type of activity, job vacancies in NbS, and filled jobs in NbS. On the labour supply side, households can provide data regarding income and expenditures (allowing poverty estimation), demographic characteristics of household members as well as information about employed persons engaged in NbS activities and unpaid forms of work in NbS according to key characteristics and working conditions.

Figure 5.2 Direct labour demand and labour supply in Nature-based Solutions (excluding unemployment and potential labour supply)



SOURCE: Authors' illustration adapted from a figure by the ILO Department of Statistics.

5.3 Key measurement challenges

5.3.1 Developing data collection methods

The international statistical standards on the data topic areas described in the preceding sections provide guidance on sources and methods for measurement. It is outside the scope of this chapter to provide a summary of this guidance beyond the general observation that a wide range of data sources and collection vehicles will be relevant. This will include data from labour force and other household surveys; population censuses; business surveys and economic censuses; administrative registers; and project-level documents and reports. Nonetheless, while all these collection instruments may be used and there exists separate guidance on each of the data topics described in the sections above, specific guidance on the measurement of the relationship between NbS, work and decent work has not yet been developed. It is expected that this report will provide a starting point for the development and testing of appropriate sources and methods to support the compilation of the targeted integrated datasets and associated indicators. An initial review suggests that a blend of targeted household and business surveys will be required to effectively identify both NbS activities and the characteristics of the work applied in them.¹³

More broadly, the suggestions in the chapter point to the potential for statistical measurement to fill the significant data gaps that currently exist concerning NbS. While it is possible to develop estimates of the significance of NbS activities using models and assumptions, as shown in Chapter 6, at present these estimates are limited by the lack of underlying source data. The application of existing standards and guidance to establish common definitions and methods for measuring NbS will likely be the most cost-effective approach to resolving the measurement gap.

5.3.2 Classifications

To underpin the integration of NbS, work and decent work data proposed in this chapter, a key aspect will be the consistent application of classifications across different datasets. In effect, classifications are the glue that facilitates the organization, integration and analysis of data within specific domains,

¹³ An excellent starting point for the development of methods is the the ILO's 2017 GAIN Training Guidebook (ILO 2017c).

providing needed granularity for targeted evidence-based policy making. The following existing classifications are considered most relevant to the organization of data on employment and decent jobs in NbS:

- Occupation¹⁴
- Status in employment¹⁵
- Economic activity (industry)¹⁶
- Institutional sector¹⁷
- Gender
- Age (e.g. youth 15–24, adults 25+)
- Ethnicity (e.g. indigenous populations)
- Education¹⁸
- Geographic area (e.g. rural-urban area)¹⁹
- Type of NbS activity²⁰
- Societal challenges²¹
- Ecosystem type²²
- Ecosystem services²³
- Restoration typology²⁴

¹⁴ The ILO [International Standard Classification of Occupations \(ISCO\)](#) allows classification of jobs into occupational groups according to the tasks and duties undertaken in the job (ILO 2010).

¹⁵ For more information, see (ILO 2018b).

¹⁶ For more information, see (UN 2022).

¹⁷ For more information, see the UN [System of National Accounts, Classification of Institutional Sectors](#)

¹⁸ For more information, see UNESCO and UNESCO Institute for Statistics (2012).

¹⁹ For more information, see (ILO 2018c) and (European Union et al. 2021).

²⁰ This could consider implementation of NbS activities related to (1) protection, (2) conservation, (3) restoration, and (4) sustainable use and management.

²¹ See section 5.2.2 for the seven challenges addressed by NbS (IUCN 2020b).

²² Possible categories concerning ecosystems could include farmlands, forests, freshwater, grasslands, shrublands and savannahs; mountains, oceans and coasts; peatlands; and urban areas, as used in UNEP (2021b).

²³ The [SEEA Ecosystem Accounting](#) uses three broad categories of ecosystem services: (1) provisioning services, representing the contributions to benefits that are extracted or harvested from ecosystems; (2) regulating and maintenance services, resulting from the ability of ecosystems to regulate biological processes and to influence climate, hydrological and biochemical cycles, and thereby maintain environmental conditions beneficial to individuals and society, and (3) cultural services, the experiential and intangible services related to the perceived or actual qualities of ecosystems whose existence and functioning contributes to a range of cultural benefits (UN 2021b).

²⁴ See, for example, IUCN (2022).

Regarding geographical areas of NbS activities, it is important to apply consistent concept definitions and methods. This will be relatively straightforward at national level; however, developing agreed spatial scales and associated boundaries is also needed for the organization of data at subnational levels including, for example, for rural-urban areas.

As concerns the integration of data across the different topics, it is worth noting that the same classifications can be applied in different contexts. For example, classification by industry will be relevant for data concerning employment and work, occupation, type of NbS activity, and ecosystem services. Consistent use of classifications is particularly important for measuring indirect and induced effects.

Some of the classifications are relatively new and may require further testing and development, including, for example, ecosystem services and type of NbS activity. Moreover, statistical classifications are not static and should be reviewed and updated as necessary to ensure that the classes identify separately those NbS-related data that are of importance to decision-making.

5.4 Future areas of research

As highlighted throughout this chapter, the proposed organization of data to understand and analyse the relationship between NbS activities, work and decent work is new – even if there is a wide array of existing statistical standards and methodological guidance to build from. Consequently, there is a range of areas in which measurement can be improved. Proposed areas for future research include:

- documenting key data gaps and ensuring alignment to the developing policy context;
- developing, testing and refining the proposed set of indicators aligning with policy objectives, including, as relevant, disaggregations by sex and age (for example, developing methods to measure informal and atypical working arrangements in NbS among women and men);
- development of governance-related information, including legislative measures that are most relevant for decent work in NbS;
- linking and coordinating the collection and organization of data at different scales from project to national scale;

- developing datasets that support supply chain analysis, the measurement of indirect effects, and the assessment of secondary production of NbS by businesses whose primary focus is not environmental;
- designing and estimating scenarios and measuring induced effects that allows linking NbS activities with changes in environmental outcomes and flows through to economic and social benefits; and
- developing information sources and methods concerning finance and investment for decent work in NbS related to demand, supply and use of funds; types of NbS activities financed, geographical distribution; the cost of funds; financing conditions; and impacts of the funds.

Going forward, improvements in statistical measurement of employment in NbS supported by specific statistical standards could not only help produce reliable estimates on levels and trends of selected indicators related to decent work in NbS in a given country, but would also serve as inputs for improved regional and global estimation of work in NbS using different modelling techniques. With appropriate investment, country support and technical assistance aimed at developing and pilot testing methods to produce reliable estimates of employment in NbS, results for a very small set of countries could be feasible by 2030. This could include investigating concepts, sources and methods for the compilation of data in selected country contexts. The report series on decent work in NbS initiated by this report provides an excellent opportunity for coordinating such pilot studies and presenting the findings. With additional investment, a more substantial set of results across countries would not be anticipated until after 2030.


CHAPTER
SIX
SIXTEEN



Key messages

- Modelling shows that currently, nearly **75 million people** are estimated to be working in NbS activities, doing NbS-related work, work created from NbS, or NbS-induced work. The vast majority (96 per cent) of this work occurs in Asia and the Pacific, and in lower-middle-income countries.
- Assuming a threefold increase in NbS expenditure levels compared to current levels, and alongside other activities associated with limiting global warming to 1.5°C, nearly **20 million further jobs** could be created in NbS work in 2030 – representing 21 per cent of all jobs created in the transition to a low-carbon world.
- In Asia and the Pacific region, **Public Employment Programmes and Payments for Ecosystem Services programmes** offer important opportunities for paid work in NbS for some of the poorest and most vulnerable global communities, although these are mostly part-time and project-based.
- The majority of NbS work and expenditure in Asia and the Pacific and Africa are in the **agricultural sector**, pointing to the potential of NbS to help both increase food security and create, thereby contributing to a just transition and human-centred climate adaptation in rural areas.

- **Direct work in NbS can be labour-intensive**, creating much-needed additional opportunities for income and employment in rural areas. NbS investments and implementation models can address the low productivity, low-wage and informal nature of this work through measures to increase productivity, compliance with labour legislation and skill development.
- While many NbS jobs require elementary levels of skills, NbS work also offers opportunities for more **skilled and specialized work**. Workers who want to migrate from jobs that require fewer skills need to be equipped to take advantage of these opportunities.
- A share of NbS work is currently done either by **volunteer or casual labour**. The nature of the work and how to best ensure it is decent work requires further research and must be analysed based on specific contexts.



Chapter 6 Estimating current and future employment in NbS

A clear understanding of the number of people working on, or whose work contributes to, NbS is important not only to monitoring the state-of-play in NbS work, but also to inform and improve decision-making in policy development. Understanding the potential for job creation (and loss) from greater use of NbS will be of key concern to policymakers as global economies attempt to address societal problems such as climate change and biodiversity loss. The resulting estimates of potential employment opportunities will help inform policy decisions related to green transitions.

This chapter introduces a modelling exercise used to estimate – to the extent possible – how many people are currently involved in NbS work worldwide. To the best of the authors' knowledge, this the first such attempt to model NbS employment by region and by country income group, and to envision what the potential for future employment in NbS might look like. Given the limitations and challenges encountered (discussed below), the results must be treated with caution. It is the intention, however, that this first attempt will pave the way for further and more comprehensive work in future reports.

The estimates include not just those employed doing wage and non-wage paid work, but also those doing volunteer work in NbS. They also cover both NbS and NbS-related work (namely, direct impacts of NbS expenditure), work from NbS (namely, indirect impacts of NbS expenditure) and NbS-induced work (namely, further induced employment impacts as a result of NbS expenditure). In this chapter, the term “NbS work” refers to all these terms collectively.

Following this introduction, Section 6.1 outlines the challenges and limitations in generating a partial global estimate of NbS work. Section 6.2 details the

estimates of the current state-of-play in NbS work, and section 6.3 provides estimates of the future potential for NbS-related employment. Section 6.4 presents the scenario design, and section 6.5 presents the results of the scenario modelling. Finally, section 6.5 discusses these results and their implications.

For a more in-depth description of the methodology of the modelling exercise, including detailed assumptions, see Appendix 2.

6.1 A partial global estimate

6.1.1 Challenges

There are currently many challenges faced when attempting to estimate the number of current jobs or total employment in NbS,¹ or that could be created through further expenditure on NbS. As discussed in Chapter 5, there is lack of comprehensive, coherent and accessible data on current employment associated with NbS, and this poses a challenge for modelling. While activities associated with NbS are likely to be captured in standard measures of economic activity that follow the guidance of the System of National Accounts (SNA), data on such activities cannot easily be identified or separated from other economic activities that do not contribute to NbS. For example, an engineer who designs or implements nature-based infrastructure may also design or implement traditional “grey” infrastructure. Activities in NbS will be spread across a wide range of industries and sectors, and those activities specifically associated with NbS are not currently well defined in publicly available statistics. Assumptions must be made about the output of standard sectors, as well as associated employment, that can be attributable to NbS.

In the absence of standard statistics measuring NbS activities, standard economic data must instead be used. Assumptions are thus required about the sectors (according to standard industrial classifications) in which NbS activities are likely to be implemented. For example, whereas the activity and employment associated with the restoration of a woodland is mainly attributable to the forestry sector within standard industry classifications, it cannot be assumed that the activities of the forestry sector itself are exclusively

¹ There are various ways to measure work in general and jobs and employment. In this chapter, the term “jobs” refers to the number of people working in NbS, independent of full- or part-time status. Full-Time Equivalents are based on total number of hours worked divided by the number of working hours per year.

classified as NbS. Making such assumptions is challenging, not least because there are difficulties in defining NbS activities and how associated supply chains map to standard industry classifications. Assumptions about the proportion of output or employment in a standard industry that can be reasonably attributed to NbS must be drawn from the literature (UNEP 2021c).

There are clear benefits to be gained from a consistent approach to collecting data about NbS activities and associated expenditures and employment. Such information can be derived from existing data, such as total output of the environmental goods and services sector or total economic output, but with NbS activity explicitly defined so that assumptions are not required. Within employment statistics, shares of employment associated with NbS by both NbS activity (such as ecosystem type and/or restoration hierarchy) and by industry and occupation would allow for a more detailed and accurate estimate of job creation. A consistent approach to producing such information would support engagement in NbS from national governments and help inform evidence-based policymaking. In the specific context of decent work, detailed statistics on NbS could inform the design of complementary environmental and labour market policies to support the generation of decent work in NbS through a just transition.

6.1.2 Estimating the current state-of-play in NbS work

The estimates presented in the following section have been derived from a macroeconomic modelling exercise using the global E3ME model, a computer-based macroeconomic model of the world's economic and energy systems and their relationship to the environment.²

While land use models can be used to estimate the potential for implementing NbS worldwide, a global economic model is needed to estimate the economic benefits of implementing such activities. E3ME is an advanced econometric model with two-way linkages between the economy, society, and the environment and is thus well placed to carry out an analysis of the employment and other economic benefits generated by NbS expenditure. E3ME is widely used for policy assessment, forecasting, and research purposes, and its strengths lie in its empirical basis for analysis and its lack of restrictive assumptions. It includes a detailed treatment of the labour market, and its key dimensions encompass 71 global regions, including all G20 and EU Member States as individual countries, as well as a set of regions to complete

² See model manual for a detailed description and outline of the equation sets: <https://www.e3me.com/wp-content/uploads/sites/3/2019/09/E3ME-Technical-Manual-v6.1-onlineSML.pdf>

the global totals, with 43 economic sectors in each region.³ This allows for a detailed estimation of the current state-of-play in NbS employment.

The modelling exercise estimated the net employment impacts of the expenditure, capturing direct, indirect and induced employment effects, and reported results disaggregated by economic sector and geographical region, with a distinction made between paid and volunteer work. A partial estimate of current global expenditure in NbS was used as the key input to the E3ME model, to determine the employment impacts of this expenditure, thus allowing a partial and initial understanding of the state-of-play in NbS employment. The NbS expenditure figures were drawn from various sources, including:

- the State of Finance for Nature report (UNEP 2021c);⁴
- the IUCN Restoration Barometer (IUCN 2022a); and
- selected Public Employment Programmes (PEPs) and payments for ecosystem services (PES) programmes for which employment data were available (see tables 3.3 and 3.4 in Chapter 3).

Due to the above-mentioned data limitations, it should be stressed that the dataset compiled from these sources for the modelling exercise is incomplete and can be considered a likely underestimate⁵ of the true value of all NbS expenditure globally. Section 6.1.3 describes these limitations in greater detail.

In the case of data obtained from the Restoration Barometer, PEPs and PES, in many cases the employment impact of the project or programme is known as well as the expenditure data. In this case, the employment data are factored into the modelling to capture the true direct employment impact of the project or programme. The expenditure data are then used as a modelling input to determine further indirect and induced impacts.

For this modelling exercise, NbS expenditure is estimated at a total of US\$166 billion annually worldwide.⁶ For all expenditure data other than the Restoration Barometer, PEPs and PES data, expenditure is first split between

³ See <https://www.e3me.com/features/dimensions/>

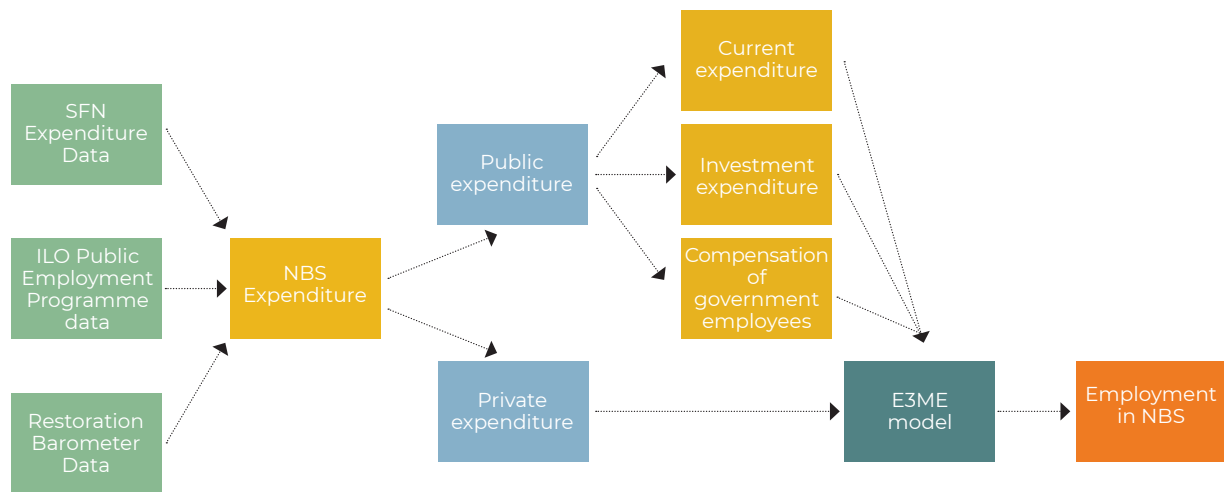
⁴ All references to 'the State of Finance for Nature report' in this chapter refer to UNEP (2021c).

⁵ Due to the lack of comprehensive data on NbS expenditure, in particular for developing countries, the true expenditure value is likely higher. The projected expenditure data in the State of Finance for Nature report is also limited and does not include, for example, the increased NbS investment needed for climate change adaptation.

⁶ This figure is arrived at by combining data from UNEP 2021c with data provided by the IUCN Restoration Barometer (IUCN 2022b), as well as expenditure data related to a selection of global PEPs and PES.

public and private expenditure according to the ratio described in the State of Finance for Nature report (86 per cent of expenditure is public, while 14 per cent is private). Public expenditure is then divided into three categories of spending: current expenditure, investment expenditure, and government employee wages (see figure 6.1), with each category of spending generating unique impacts within the model. The investment expenditure, in modelling terms, refers to Gross Fixed Capital Formation (GFCF),⁷ and can be thought of as the fixed tangible and non-tangible assets that may be needed to implement a new NbS development or expand an existing one (similar to CAPEX⁸). The current expenditure, on the other hand, captures the goods and services used in maintaining existing NbS solution (similar to OPEX⁹). As NbS programmes are public, it is assumed that some government employees would be involved in the management and operation of these programmes, and these employees would be paid a wage. This wage is what is referred to as compensation of government employees (that is, wages and salaries including employers' social security contributions, where applicable).

Figure 6.1 Mapping of data sources to estimate NbS employment



NOTE: SFN = State of Finance for Nature report (UNEP 2021c)

SOURCE: Authors' compilation.

⁷ See <https://databank.worldbank.org/metadataglossary/world-development-indicators/series/NE.GDI.FTOT.ZS>

⁸ See <https://www.accountingtools.com/articles/what-is-capex.html>

⁹ See <https://marketbusinessnews.com/financial-glossary/opex-definition-meaning/>

Table 6.1 provides further details of how non-PEP and PES public expenditure data were split between the categories of employee wages, current expenditure, and investment. Current expenditure accounts for the largest share, 54 per cent, of all expenditure, while spending on wages and investment represent smaller shares (24 per cent and 23 per cent, respectively). In the model, the expenditure types need to be allocated to sectors and regions. As mentioned above, the wage component is explicitly linked to government expenditure; therefore, no further assumption about sectoral allocation is required, and thus the values in the wage column represent the wage expenditure by region, which comprises 24 per cent of total public NbS expenditure data. For both the investment and direct expenditure data, further assumptions have been made to allocate them to sectors within the model. Table 6.1 highlights the assumed sectoral and regional distribution.

Table 6.1 Expenditure allocation on Nature-based Solutions, excluding Public Employment Programmes and Payments for Ecosystem Services programmes (million USD, 2020 prices)

	WAGES		INVESTMENT (CAPEX)			
Share of total NbS expenditure	24%		23%			
WAGES BY REGION						
Sector	Construction		Electronics	Construction	Machinery, equipment N.E.C.	Computer services
Africa	584	89	265	322	17	71
Americas	11 407	1 286	1 126	1 409	71	300
Arab States	1	0	0	0	0	0
Asia and the Pacific	10 717	2 981	5 895	9 346	607	978
Europe and Central Asia	7 750	858	3 929	3 805	161	1 004

	WAGES	DIRECT EXPENDITURE (OPEX)			INVESTMENT (CAPEX)
Share of total NbS expenditure	24%	54%			23%
	WAGES BY REGION	DIRECT AND INVESTMENT EXPENDITURE ALLOCATION BY SECTOR AND REGION			
Sector		Crop production / Agriculture, fishing, & hunting	Forestry	R&D/ Professional services / Architect & engineering/	Sewerage & waste / Misc. Services
Africa	584	299	299	220	127
Americas	11 407	9 759	9 759	6 136	2 456
Arab States	1	0	0	0	0
Asia and the Pacific	10 717	5 621	5 621	5 330	4 632
Europe and Central Asia	7 750	4 076	4 076	3 266	2 826

NOTE: PEP = Public Employment Programme; PES = Payments for Ecosystem Services

6.1.3 Limitations of the approach

Estimating jobs using a macroeconomic model like E3ME presents various difficulties aligned with the above-mentioned challenges, namely, the lack of available data and the uncertainty regarding the sectors that NbS activities map to. The major input to the modelling exercise was investment data compiled for the State of Finance for Nature report; however, these data are subject to a high level of uncertainty because capital flows into NbS are not reported consistently, and the dataset was instead compiled from domestic public expenditure in NbS-relevant sectors and expenditure targeted at global environmental objectives for Official Development Assistance. The methodology used to compile the dataset relies on assumptions about what proportion of public and private investment can reasonably be attributed to NbS expenditure, with these assumptions being drawn from literature. While, for this modelling exercise, the State of Finance

for Nature report dataset was supplemented by additional NbS-specific data compiled from the Restoration Barometer and PEPs, there is the risk of double-counting of expenditures, despite detailed cross-referencing and checking of the various data sources used to compile the dataset.

In general, the sources used to compile the dataset for the modelling exercise do not provide a good coverage of NbS use in agricultural production, infrastructure related to NbS, and urban NbS. There are further limitations specific to each source of data used that have consequences for the 'completeness' of the data used for the modelling exercise. First, the figures reported in the State of Finance for Nature report represent a midpoint estimate of NbS investment derived from estimates about which proportion of capital expenditure can be assumed to be NbS expenditure. The current investment reported by the State of Finance for Nature report also focuses predominantly on biodiversity and landscape protection, and thus other NbS activities, such as in urban areas, are not well covered. Second, the Restoration Barometer data covers only a selection of countries, and within these countries only expenditures related to projects classified as ecosystem restoration are included. Finally, expenditure related to PEPs and PES also includes data from a selection of countries where expenditure data related to these programmes are known. It also should be noted that the geographical coverage of the final expenditure dataset is limited to 181 countries, and there is variation in the level of detail and accuracy of the data within this subset.

The various challenges and limitations related to the coverage of the data suggest that the final expenditure dataset used as the input to this modelling exercise is likely an underestimate of the true value of all NbS expenditure globally. Thus, the employment estimated based on this input is also likely to be lower than current NbS-related employment.

In the absence of information about which economic sectors NbS expenditure occurs in, assumptions are also made about how NbS expenditure maps to conventional sectors within the E3ME model, which includes 43 sectors following ISIC 2-digit sector classifications.¹⁰ Within the data reported in the State of Finance for Nature report, individual NbS activities are grouped into broader classifications of activities, which were then mapped to standard economic sectors. The mapping of NbS activities to ISIC 2-digit sectors was informed by supply chains identified in the US federal government expenditure on environmental activities.¹¹

¹⁰ See <https://ilostat ilo.org/resources/concepts-and-definitions/classification-economic-activities/>

¹¹ <https://www.usaspending.gov/>

Further key assumptions were made to determine the proportion of direct NbS employment that may be classified as volunteer work. In the absence of data on current numbers of volunteers in specific NbS activities, in NbS in general, or by economic sector, national-level ILO statistics on numbers of volunteers were complemented by an average share of volunteers working on NbS (see table 6.3), allowing for a calculation of the proportion of total volunteers who were NbS volunteers.

The uncertainties described in this section translate into uncertainties associated with the employment estimates resulting from the modelling exercise, and therefore the results should be approached with an appropriate degree of caution.

For a more detailed description of the methodology of the modelling exercise, including detailed assumptions, see Appendix 2.

6.2 Estimates of the current state-of-play in NbS work

This section presents estimates of current levels of NbS-related work. The employment results include both NbS and NbS-related work (namely, direct impacts of NbS expenditure), work from NbS (namely, indirect impacts of NbS expenditure) and NbS-induced work (namely, further induced employment impacts as a result of NbS expenditure). As noted in section 6.1, the employment results should be considered a portion (and most likely an underestimate) of the true number of global jobs in NbS activities, because of the limitations and uncertainties of the expenditure data driving the employment impacts. Employment numbers are presented as both number of persons and full-time equivalents (FTEs). Lastly an interpretation of the results is provided, exploring differences in NbS employment between regions and sectors. Box 6.1 presents definitions of the most commonly used variables in the modelling.

BOX 6.1

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 these definitions. 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 UNEP 2021c), in thousand persons, where employment in persons considers all persons engaged in productive activities

Employment 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.

Section 6.2.1 presents the results of the modelling exercise to estimate the current level of work in NbS, focusing first on the level of expenditure in NbS activities at global level and by region. Section 6.2.2 then provides estimates of NbS work based on the partial expenditure data, also looking at global and regional levels and work within different sectors.

6.2.1 Spending in NbS activities

Table 6.2 shows the total contribution of NbS activity to GDP globally, as well as by geographical region and country income group. The table summarizes how expenditure on NbS impacts the economy, leading to changes in demand for goods and services in various sectors. For example, part of the NbS expenditure is directed to paying the wages and salaries of government employees working on NbS projects. These wages and salaries are then

reflected in their disposable incomes, which would then be used to purchase goods and services. The majority of current public and private spending in NbS activities occurs in Asia and the Pacific, the Americas, and Europe and Central Asia.¹² These regions contribute 40 per cent, 29 per cent and 28 per cent of global expenditure in NbS activities, respectively. NbS spending takes place to very a limited extent in Africa (2 per cent) and even less in Arab States; it is possible that NbS activities in Africa and Arab States are more prevalent, but data are lacking.¹³

The majority (91 per cent) of current total NbS expenditure takes place in high- and upper-middle-income countries, with only 7 per cent attributable to lower-middle-income countries. However, again, the spending on NbS activities in low-income countries could be an underestimation, due to lack of data.

global level and within most of the regions, government spending in NbS activities contributes the largest direct impact on total GDP, followed by investment expenditure. In Arab States and in lower-middle-income countries, investment spending accounts for a larger contribution to overall GDP impacts than government spending. Induced impacts of the investments and government spending in NbS lead to higher consumer expenditure.

Table 6.2 shows the share of expenditure in NbS activities in GDP and its components. At global level, total NbS expenditure contributes to 0.16 per cent of GDP, with notable differences across regions. In Asia and the Pacific, NbS expenditure contributes the most to GDP relative to other geographic regions. In Arab States, the share is negligible.

¹² This is in line with the State of Finance for Nature report, which shows annual NbS investments in mostly Asia, North America and Europe (UNEP 2021c).

¹³ In the original source data for NbS investment, only a few Arab countries are included. In terms of public sector NbS spending, the State of Finance for Nature report states that some large countries, including Saudi Arabia, “are likely spending large sums but do not report internationally comparable data” (UNEP 2021c, 21)

Table 6.2 NbS expenditure contribution to GDP and its components by region (by percentage of total and million USD, 2020 prices)

ILO REGION	TOTAL NBS CONTRIBUTION TO GDP		TOTAL CONSUMER EXPENDITURE		TOTAL INVESTMENT		TOTAL GOVERNMENT FINAL CONSUMPTION	
	%	USD	%	USD	%	USD	%	USD
Africa	0.1	3 485	0.04	779	0.14	929	0.28	1 545
Americas	0.15	49 446	0.03	6 118	0.1	6 780	0.68	36 615
Arab States	0.03	625	0.06	636	0.01	32	0	9
Asia and the Pacific	0.18	68 928	0.08	13 664	0.19	24 773	0.56	32 853
Europe and Central Asia	0.16	47 867	0.1	16 309	0.21	16 311	0.34	21 277
High income	0.17	108 845	0.06	23 388	0.19	28 771	0.5	62 697
Upper-middle income	0.15	48 667	0.04	6 575	0.16	17 062	0.56	27 598
Lower-middle income	0.12	11 866	0.12	7 196	0.09	2 723	0.14	1 610
Low income	0.24	973	0.14	347	0.34	270	0.51	394
World	0.16	172 533	0.06	37 758	0.17	49 119	0.49	92 861

NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

The share of GDP attributable to NbS activities is largest in low-income countries, which might be the result of Official Development Assistance via government expenditure. However, the second-largest contribution to GDP from NbS expenditure is seen in high-income countries, while middle-income regions are in between.

Through induced effects, NbS activities lead to higher consumer expenditure across all regions, via higher disposable income from the greater number of jobs available. The increased economic activity generated by the NbS expenditure is expected to result in additional employment, which in turn means higher wage payments and thus disposable incomes, leading to an increase in consumer expenditure.

6.2.2 NbS work

Table 6.3 presents the estimates of current NbS work at global level and by geographical and income region. The number of people working in NbS includes employed people as well as volunteers. It should be noted that the results capture the employment effects of current investment in NbS activities. This implies that, when considering the longer-term impacts of the investments, employment effects likely increase over time, as current job creation will, over time, lead to increased disposable income and thus further growth in employment in the form of induced effects. In the long term, it is also likely that NbS activities will lead to secondary effects, whereby improvements in ecosystem health and conditions in turn could be expected to drive positive work and decent work effects.

The modelling exercise suggests that currently, nearly 75 million people are estimated to be working in NbS activities, doing NbS-related work, work created from NbS or NbS-induced work. This figure could represent around 2 per cent of the global employment projections for 2022 produced by the ILO World Employment and Social Outlook (ILO 2022c). This estimate should be considered a partial estimate of the true number of global jobs created through NbS expenditure, because of (a) the limitations and uncertainties of the expenditure data driving the employment estimate, and (b) the types of employment not captured by the model.

The vast majority of global NbS work is in Asia and the Pacific (96 per cent, or 72 million people). This is mainly attributable to one specific Public Employment Programme (PEP) in India, the Mahatma Gandhi National Rural Guarantee Scheme, which generates the majority of NbS work in terms of the number of people employed. However, the impact in terms of in FTEs is smaller, as

the programme offers part-time work only.¹⁴ China is another country in the region where a large share of global NbS work is found.¹⁵ Many people who work in NbS in the Asia and the Pacific region likely work on a part-time or project-based level basis, as indicated by the lower number of FTEs in NbS work. In the other regions, the extent of people working in NbS on a part-time basis is likely more limited, as FTE numbers are only slightly lower than total employment figures. On average, in terms of both number of persons and FTEs, most current NbS work is found in lower-middle-income countries, despite most of NbS expenditure occurring in regions with higher income levels.

The majority of NbS work is generated by PEPs and PES. In total, 95 per cent of current global NbS workers (in thousand persons) and 80 per cent of FTE employment is attributed to PEPs and PES. Much of this is driven by PEP and PES in Asia and the Pacific, where 97 per cent of NbS employment is generated from PEPs and PES. However, the share of PEPs and PES in NbS employment is also considerable in other regions, representing 83 per cent in Africa and 60 per cent in the Americas.

The number of volunteers working in NbS globally is estimated to be over 16 million.¹⁶ Most NbS volunteer work occurs in high-income countries and, by geographical region, in Europe and Central Asia, the Americas, and to a lesser extent in Asia and the Pacific. However, the estimated number of volunteers is unclear because of very sparse available data, particularly in lower-income countries/ regions. However, participation in initiatives such as World Ocean Day and UNESCO's International Day for the Conservation of the Mangrove Ecosystem promote volunteering in these regions. Although it was not possible to explicitly capture the NbS work generated through such initiatives, it is likely they make an important contribution to the number of people working in NbS.

¹⁴ This is an employment guarantee scheme in which any rural household in India is entitled to demand up to 100 days of paid work per employment year. This explains in part the massive scale of this programme. See also Chapter 3.

¹⁵ The Grain for Green programme in China involves 41 million households and supported an estimated 36 million FTEs between 1999 and 2019 (see case study in Chapter 3)

¹⁶ The volunteer figures include only those countries for which ILO data on volunteer work was available.

Table 6.3 Employment and volunteers in NbS by region (thousand persons)

ILO REGION	TOTAL EMPLOYMENT (THOUSAND PERSONS)	PEP AND PES (THOUSAND PERSONS)	EMPLOYED OUTSIDE PEP AND PES (THOUSAND PERSONS)	SHARE OF 15-29 IN EMPLOYED OUTSIDE PEP AND PES (%)	SHARE OF WOMEN IN EMPLOYED OUTSIDE PEP AND PES (%)	VOLUNTEERS ^a (THOUSAND PERSONS)
Africa	1 919	1 598	322	29	36	166
Americas	756	456	300	19	38	5 460
Arab States	34	0	34	25	11	84
Asia and the Pacific	71 693	69 324	2 369	14	38	2 435
Europe and Central Asia	420	0	420	15	37	7 971
High income	610	6	604	15	37	13 056
Upper-middle income	2 195	524	1 672	10	44	1 079
Lower-middle income	70 398	69 318	1 080	25	27	1 952
Low income	1 618	1 530	88	35	38	29 ^b
World	74 875	71 393	3 482	16	37	16 116

NOTES: See Appendix 4 for region classification.

a Volunteer numbers are estimated by taking the average percentage share of NbS volunteers in total volunteers (see Table 3.5 in Chapter 3) and applying it to the total number of volunteers in a country (ILO data). The data include 61 countries (China is excluded due to lack of data). ILO volunteer definition: "The number of volunteers represents the number of persons of working age, who are classified as having done volunteer work for 1 or more hours, in a given reference period"¹⁷. This implies that the number of volunteers can be expected to be relatively high, while the actual activity (hours) of volunteer work is likely much lower.

b This category includes only one country (Sierra Leone), as no volunteer data were available for other countries which could be included in this category.

SOURCE: Cambridge Econometrics E3ME model. ILOstat.

¹⁷ Variable description under <https://ilostat.ilo.org/topics/volunteer-work/>

Table 6.4 shows the number of FTEs in current NbS work, and figure 6.2 shows both the share and number of NbS workers (persons) by regions and sectors.

Table 6.4 Employment in NbS by region (thousand FTEs)

ILO REGION	TOTAL EMPLOYMENT (THOUSAND FTES)	PEP AND PES (THOUSAND FTES)	EMPLOYED OUTSIDE PEP AND PES (THOUSAND FTES)
Africa	631	372	259
Americas	681	456	225
Arab States	34	0	34
Asia and the Pacific	12 817	10 826	1 991
Europe and Central Asia	343	0	343
High income	462	2	460
Upper-middle income	1 820	478	1 342
Lower-middle income	11 803	10 824	979
Low income	421	350	71
World	14 552	11 670	2 882

NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

At global level, the results indicate that nearly all NbS work is estimated to be in activities that can in some way be linked to the agriculture and forestry sector. More than 72 million people work in NbS activities in this sector, which is equivalent to 97 per cent of total NbS employment globally. This share is also considerable when looking at different regions. In Asia and the Pacific

and in Africa, the agricultural sector contributes 98 per cent and 89 per cent of NbS employment, respectively. Most NbS activities considered in the estimate occur at least partially in the agriculture and forestry sector. This explains the large share of the sector in net NbS employment. Considering the dominance of NbS work in activities linked to the agriculture and forestry sector, it can be inferred that most people working in NbS are located in rural areas, while urban NbS work is likely small. Generally, rural areas have a larger scope for NbS compared to urban areas, partly because livelihoods of people in rural areas are more dependent on well-functioning ecosystems and partly because areas that can be considered in the scope of NbS tend to be rural. Employment effects of investment in NbS are generally higher in rural areas compared to urban areas. This explains the large share of NbS employment in rural areas indicated by the modelling results.

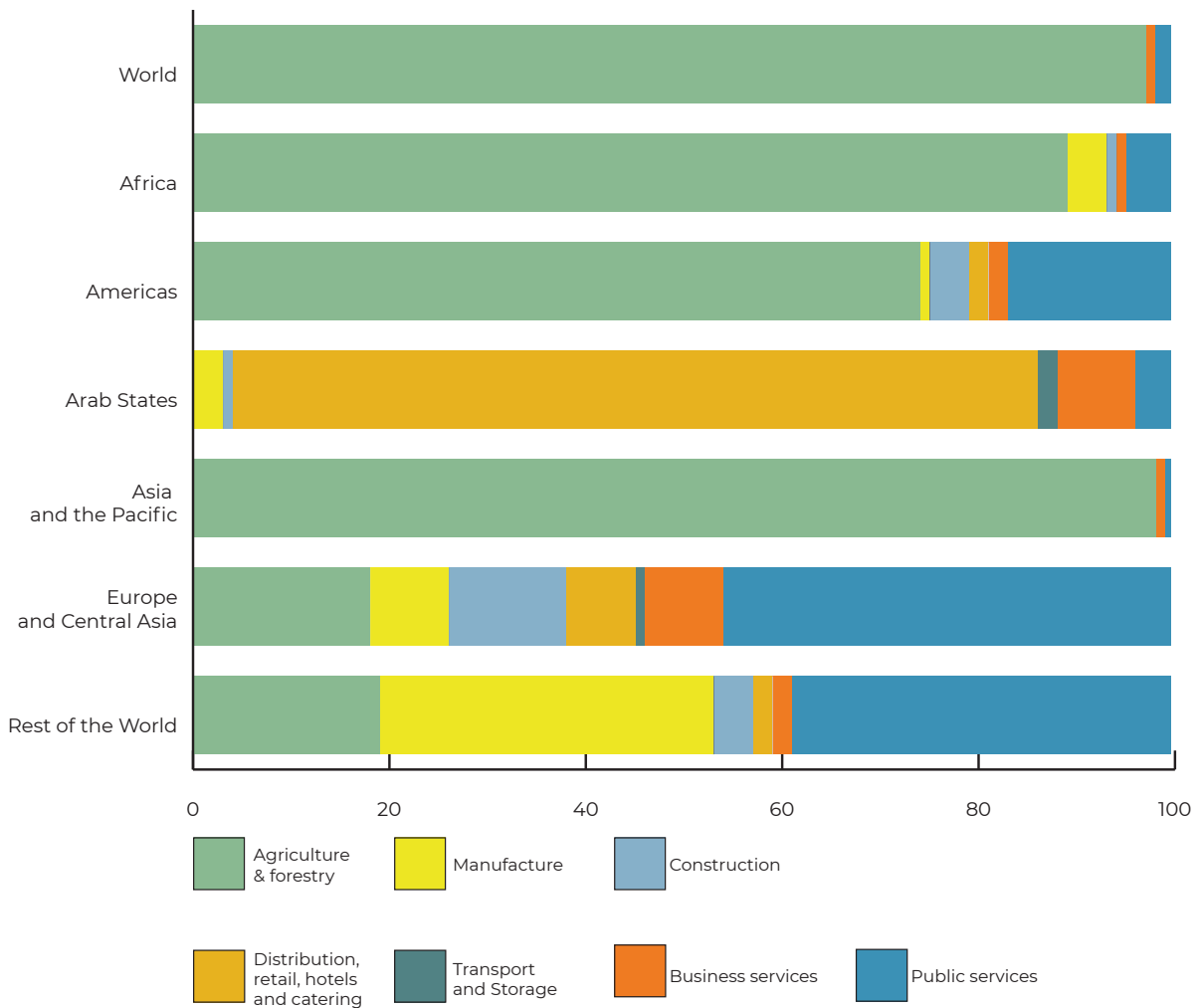
The share of agriculture in NbS employment is much lower in Europe and Central Asia, however, where only 18 per cent of NbS work is attributed to the agriculture and forestry sector. The sector employing most people working in NbS in Europe and Central Asia is public services,¹⁸ which represents 46 per cent of current NbS work in the region. The construction sector accounts for 12 per cent of NbS employment. In the business services sector (8 per cent), NbS activities likely creates employment through indirect or induced effects along the supply-chain, as well as through induced jobs created as a result of increased disposable income.

In the Americas, public services represent a considerable share of current regional NbS employment, at 17 per cent, while agriculture and forestry contributes most of NbS employment there (74 per cent). This is linked to the government spending, which in part creates jobs in public administration sectors. In Arab States, employment in NbS activities is low and mostly found in the distribution, retail, hotel and catering sectors. These are likely induced jobs.

Looking at regions by different income levels, in low-income and lower-middle-income regions, nearly all NbS work (98 per cent and 99 per cent) is in the agriculture and forestry sector. This share falls to 42 per cent for upper-middle-income and to 25 per cent in high-income countries. Public services contribute the largest share of NbS work in high-income countries (37 per cent), with construction also representing a fair share (14 per cent). Induced and indirect effects on employment in distribution, retail, hotels and catering are also observed.

¹⁸ In ISIC Rev 4 classification this sector is: O Public administration and defence; compulsory social security.

Figure 6.2 NbS employment across geographic region by sector (percentage of sectoral NbS employment)



NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

The results from the modelling exercise that were used to estimate the number of FTEs created by NbS spending (table 6.5) are within the expected range when compared to findings from existing studies. While comprehensive evidence of the impact of NbS investment on job creation is lacking, a review of conducted analyses in this area indicates much higher employment multipliers for NbS investments in developing countries relative to developed countries.

Nair and Rutt (2009) and Payen and Lieuw-Kie-Song (2020) assessed job returns of various NbS activities and investments, primarily for developing countries. Their findings indicate that the number of direct FTEs created from US\$1 million invested ranges between 166 and 750, depending on the NbS activity. The authors acknowledge that such employment multipliers can be expected to be much lower in high-income countries, where labour intensity of activities is generally lower and labour productivity is higher. Various studies have assessed the employment effect of investments in NbS activities in the United States (Edwards, Sutton-Grier and Coyle 2013; Thomas et al. 2016; Garrett-Peltier 2017). The findings illustrate direct job creation from US\$1 million invested to be in the range of between 5 and 28 FTEs, with variation related to the differences between NbS activities.

In line with these findings, the results presented in table 6.5 show significantly higher job creation numbers per unit of investment in lower-middle- and low-income countries compared to upper-middle- and high-income countries.

Table 6.5 Jobs (FTEs) created by NbS investment/expenditure

ILO REGION	"FTES PER INVESTMENT (MILLION USD) MODEL RESULTS"	"FTES PER INVESTMENT (MILLION USD) FROM LITERATURE"
Africa	228	
Americas	15	"5–28 (United States)"
Arab States	12 452	
Asia and the Pacific	154	
Europe and Central Asia	11	"24–250 (Germany)"
High income	5	
Upper-middle income	41	
Lower-middle income	348	"275–625 (developing countries)"
Low income	533	
World	88	

NOTES: See Appendix 2 for region classification. Estimates from the literature are provided where these are available. For Arab States, the figure has been excluded because the modelled NbS expenditure in the region is negligible and most of the employment effects are indirect/induced from increased economic activity, which leads to a highly inflated multiplier effect. United States: activities in the areas of "Marine debris removal, dam removal for fish migration, hydrologic reconnections, invasive species removal" Germany: activities in the areas of "Creation of urban green spaces" Developing countries: activities in the area of "Afforestation, reforestation, and desertification control"

SOURCES: Cambridge Econometrics E3ME model; Edwards, Sutton-Grier and Coyle (2013); Lieuw-Kie-Song and Perez-Cirera (2020).

6.3 Future potential for NbS-related employment

To meet future targets related to climate, biodiversity and land degradation, at least a three-fold increase in annual NbS expenditure is needed by 2030 compared to current rates, as stated in the State of Finance for Nature report. The investments made will inevitably impact employment, particularly via direct impacts from NbS activities. Other employment impacts will come from indirect effects along supply chains, via induced effects due to higher disposable income translating into further job creation and, in the longer term, via secondary effects whereby improvements in ecosystem health and conditions in turn could be expected to drive positive work and decent work effects.

The employment potential of scaling up NbS expenditure could be large, as some NbS activities are relatively labour intensive. Investment in certain NbS – such as ecosystem restoration – leads to higher job creation than investments in various unsustainable sectors such as coal, oil and gas, and even outperforms job creation from investment in renewable industries, such as solar and wind (Edwards, Sutton-Grier and Coyle 2013). In addition, certain NbS-related work does not require high-level skills or extensive training, thus providing quick job opportunities in the short term (Jaeger et al. 2021). By 2030, ecosystem restoration and related activities may create 11 million jobs globally (World Economic Forum 2020b). While NbS activities differ in terms of labour intensity and job creation, on average, NbS deliver higher job numbers per million USD invested in the first year than alternative climate- and non-climate-related interventions, such as in mining, housing, or transport infrastructure. However, job creation by NbS interventions after one year generally falls below the job creation level of alternative interventions (Vivid Economics 2021). Restoration of forests and wetlands requires less ongoing maintenance than, for example, electric vehicle infrastructure or retrofitting of buildings. However, some NbS activities will support jobs over the longer term, such as agroforestry, which requires continued cultivation of the land. Moreover, the multiplier effects inherent to some NbS types can be high, resulting in many indirect jobs created along supply chains (Jaeger et al. 2021)

Induced effects of increased job creation through NbS may not merely stem from the higher disposable income of NbS worker – long-term employment effects may also occur through improved ecosystem health benefiting agricultural employment, as job losses among people whose income depends on nature are mitigated (Brasser and Ferwerda 2015).

The following section examines the future potential of NbS to drive job creation, specifically in light of future NbS expenditure needs. The modelling exercise presents a scenario assessment that compares a situation in which annual NbS expenditure remains at the current level with a situation in which expenditure rises to levels needed to meet the targets. This allows the potential GDP and employment effects of this ‘additional’ expenditure to be isolated.

6.3.1 Estimating the future potential of work in NbS

The global macroeconomic E3ME model was used to estimate the future employment potential of increased NbS expenditure.

To estimate the future potential for job creation, a scenario analysis approach was applied in this modelling exercise. A scenario approach allows a hypothetical future to be explored, while also acknowledging that uncertainties exist. The results can therefore be interpreted as possibilities rather than predictions. E3ME is most often used for scenario analysis to evaluate the impacts of an input shock to a baseline/business-as-usual scenario. An input shock may be either a change in policy, a change in economic assumptions, or a change to another model variable. In this modelling exercise, the input shock is an increased level of NbS expenditure based on the State of Finance for Nature report. It should be noted that the estimated expenditure needs are only partial, as the expenditure is based on what is deemed necessary to enable future climate, biodiversity and land degradation targets to be met; the potential impacts of NbS expenditure used to meet other societal challenges were not estimated.

6.4 Scenario design

6.4.1 Baseline scenario

The standard E3ME baseline scenario is constructed from official projections published by the economic and energy sectors. The baseline is further enhanced by the inclusion of NbS expenditure that remains at the same level as current expenditure until 2030 – that is, the annual expenditure figures analysed in the preceding section on the current state-of-play in NbS.

6.4.2 Future NbS expenditure

In this modelling exercise the input shock that is central to the Future NbS expenditure scenario is a threefold increase in future NbS annual expenditure in 2030, in line with the State of Finance for Nature report, which concludes that “investment in NbS ought to at least triple in real terms by 2030 and increase four-fold by 2050 if the world is to meet its climate change, biodiversity and land degradation targets” (UNEP 2021c, 6). This tripling of investment/expenditure translates into just under US\$400 billion per year in NbS activities worldwide in 2030. The future expenditure need is based upon the estimated costs of switching from a business-as-usual trajectory to one that is aligned with global targets for climate change, biodiversity and land degradation. Expenditure is described across four different NbS activities – reforestation, mangrove restoration, peatland restoration and silvopasture – chosen because they are expected to make the largest contribution to these objectives in the future. The largest share of this spending is directed to reforestation (50 per cent) and silvopasture (48 per cent) (UNEP 2021c).

As noted earlier in this report, NbS can address societal challenges beyond climate change mitigation (carbon fixing and sequestration), loss of ecosystems and biodiversity, and environmental degradation. Therefore, the future potential expenditure assumed in this modelling exercise is likely to be an underestimate of the true scope of future spending on NbS.

By comparing the outcomes of the future expenditure scenario against those in a ‘business-as-usual’ baseline scenario, it is possible to assess the economic impacts in 2030 of this increased NbS spending.

The modelling approach applied to estimate the future employment impact of increased NbS expenditure uses the same underlying assumptions as those described in section 6.2, which described how partial estimates of current global employment in NbS are modelled. The results of the modelling exercise are therefore subject to the same limitations described in section 6.1.3 and should thus be interpreted as a partial estimate – and most likely an underestimate – of the future potential of employment in NbS.

6.5 Results of the scenario modelling

This section presents the estimated effects of the three-fold increase in global NbS expenditure compared to current levels. Alongside estimates of potential future NbS employment in 2030, the potential macroeconomic and emissions effects of elevated NbS expenditure are also considered. The estimates should be treated as partial estimates. This is because of various limitations to the expenditure data driving the results:

- The expenditure data are a modelled estimate based on various assumptions.
- The expenditure data focus on specific types of NbS, thus excluding other activities and expenditures that may be present in 2030.

6.5.1 Macroeconomic effects

Table 6.6 shows the total contribution to GDP (over and above current levels) of future additional NbS expenditure in 2030, both globally and by region. The majority of additional future NbS expenditure is expected to occur in Asia and the Pacific, the Americas, and Europe and Central Asia. These regions respectively contribute 52 per cent, 19 per cent, and 16 per cent of future additional global expenditure in NbS activities. Africa accounts for a slightly smaller share of future NbS expenditure (11 per cent), but it is notable that this is higher than the 2 per cent share of current NbS expenditure (see section 6.2.1). A very limited amount of expenditure takes place in Arab States, however this may be due to a lack of data on NbS activities.

According to the State of Finance for Nature report, the majority (73 per cent) of additional future NbS expenditure is estimated to take place in high-income and upper-middle-income countries, with 25 per cent attributable to lower-middle-income countries. This implies that in 2030, the increase in NbS expenditure is expected to be more evenly distributed across different income regions compared to current levels of NbS expenditure, of which 91 per cent is estimated to be concentrated in high and upper-middle-income countries (see section 6.2.1). The spending on NbS activities in low-income countries might be underestimated due to lack of data.

At global level and within all income regions except high-income countries, additional investment spending in NbS activities contributes the largest direct impact to total GDP in 2030, followed by government spending. Globally, 63 per cent of the GDP impacts of elevated NbS expenditure in

2030 is a result of investment spending, while 31 per cent is attributable to government spending. This is in contrast to the GDP impact of current estimated expenditure in NbS, which suggests government spending has a larger role to play (see section 6.2). Induced impacts of the investments and government spending in NbS lead to higher consumer expenditure across all regions.

Table 6.6 Additional NbS expenditure contribution to GDP in 2030 by region (percentage and million USD, 2020 prices)

	TOTAL NBS CONTRIBUTION TO GDP		TOTAL CONSUMER EXPENDITURE		TOTAL INVESTMENT SPENDING		TOTAL GOVERNMENT FINAL CONSUMPTION	
	%	USD	%	USD	%	USD	%	USD
Africa	1	42 379	0.2	5 028	2	16 846	3.1	21 205
Americas	0.2	71 176	0.1	15 873	0.5	36 161	0.4	23 712
Arab States	0.1	2 253	0.1	1 034	0	136	0.03	185
Asia and the Pacific	0.4	194 715	0.1	12 212	1	173 899	0.5	34 626
Europe and Central Asia	0.2	60 541	0.1	22 600	0.1	9 648	0.5	35 623
High income	0.1	88 736	0.1	28 117	0.1	18 422	0.3	41 073
Upper middle income	0.4	185 352	0.1	21 611	1	142 744	0.7	40 226
Lower middle income	0.7	94 029	0.1	5 857	1.8	74 613	2.4	33 517
Low income	0.5	2 946	0.3	1 163	0.8	913	0.6	534
World	0.3	375 385	0.1	56 882	0.7	237 330	0.5	116 298

NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

Table 6.6 also shows the percentage difference in GDP and its components compared to the baseline scenario. These results demonstrate the impact of a threefold increase compared to a baseline scenario in NbS expenditure. The GDP impacts across all regions are small but there are some differences across regions. The highest GDP impact compared to the baseline is observed in Africa, followed by Asia and the Pacific. The GDP impact is expected to be highest in lower middle-income countries and the lowest in high-income countries.

6.5.2 Employment effects

This section presents employment estimates of future NbS expenditure. Alongside the global results, the estimates are disaggregated by geographic and income regions, and by economic sector. The employment estimates include both NbS and NbS-related work (namely, direct impacts of NbS expenditure), as well as work from NbS (namely, indirect impacts of NbS expenditure) and NbS-induced work (namely, further induced employment impacts as a result of NbS expenditure). The estimates should be considered a partial (and most likely an underestimate) of the true number of global jobs future NbS expenditure might create, because of the limitations and uncertainties of the expenditure data driving the employment estimate. Finally, employment numbers are presented as number of persons and in full-time equivalents (FTEs)¹⁹ to allow for comparisons.

Table 6.7 presents the estimates of future NbS work at global level as well as by geographical and income region, in terms of both the total number of people and total FTEs.

By 2030, almost 20 million people above current levels could be either working in NbS activities or doing NbS-related work, work created from NbS, or NbS-induced work, if future expenditure levels are increased. Total employment could therefore be as high as 95 million people working in NbS or NbS-related or induced work in 2030. This is a more than five-fold increase as compared to current levels, if employment in PEP programmes are not taken into account. The estimated future potential for employment does not take into account future PEP programmes, since it is difficult to make projections on the extent to which such programmes will be used. Further, MGNREGA in India, which accounts for such a large share of current employment, is unlikely to expand given its already high coverage of India's rural population. While PES programmes are likely to form part of increased NbS implementation, the

¹⁹ Full-Time Equivalents are based on total number of hours worked and then divided by the number of working hours per year.

variations in the way they are implemented and generate direct employment pose a challenge to modelling future estimates. If future PEP and PES programmes could be taken into account, it is likely that the above estimate of future employment from NbS would be much higher.

The majority of future NbS work is estimated to be in Asia and the Pacific, and Africa (accounting for 64 per cent of all additional people involved in NbS-related work, work from NbS or NbS-induced activities). The majority (70 per cent) of additional people working in NbS in 2030 will be concentrated in lower-middle-income regions. A key driver behind the high numbers of people expected to be working in NbS or doing work from NbS or NbS-induced work in low-income countries and in regions such as Africa is the prevalence of low-wage and high-labour activities. Other drivers might be the working hours and lack of other gainful employment. Comparing the total number of people working in NbS with the number of FTEs, the results suggest that, depending on the region in question, between 13 and 28 per cent of workers are on a part-time or project-based level, as indicated by the lower number of FTEs in NbS work.²⁰ From a geographic region perspective, the highest proportion of part-time work occurs in Africa (28 per cent), while from an income region perspective, the highest proportion of part-time work occurs in low-income countries (23 per cent). Interestingly, it is in low-income countries that the share of women working in NbS is expected to be highest. The share of youth in NbS work is expected to be highest in Africa and more generally in low-income countries; this might be due to the high proportion of youth working in these sectors. Moreover, the share of women in NbS work is highest in those regions as well, although across regions classified by income the difference is less pronounced.

²⁰ Excluding Arab States, in which only 6 per cent of people are estimated to work less than full time in NbS work.

Table 6.7 Additional employment by 2030 in NbS by region

ILO REGION	TOTAL EMPLOYMENT (THOUSAND PERSONS)	SHARE OF 15–29 (%)	SHARE OF WOMEN (%)	TOTAL EMPLOYMENT
(thousand FTEs)				
Africa	5,727	26	36	4,287
Americas	803	23	28	645
Arab States	41	25	12	40
Asia and the Pacific	12,661	18	33	10,569
Europe and Central Asia	525	15	36	446
High income	417	14	33	350
Upper-middle income	4,950	10	39	3,731
Lower-middle income	13,923	23	32	11,548
Low income	466	37	45	360
World (total)	19,823	20	34	16,040 ()

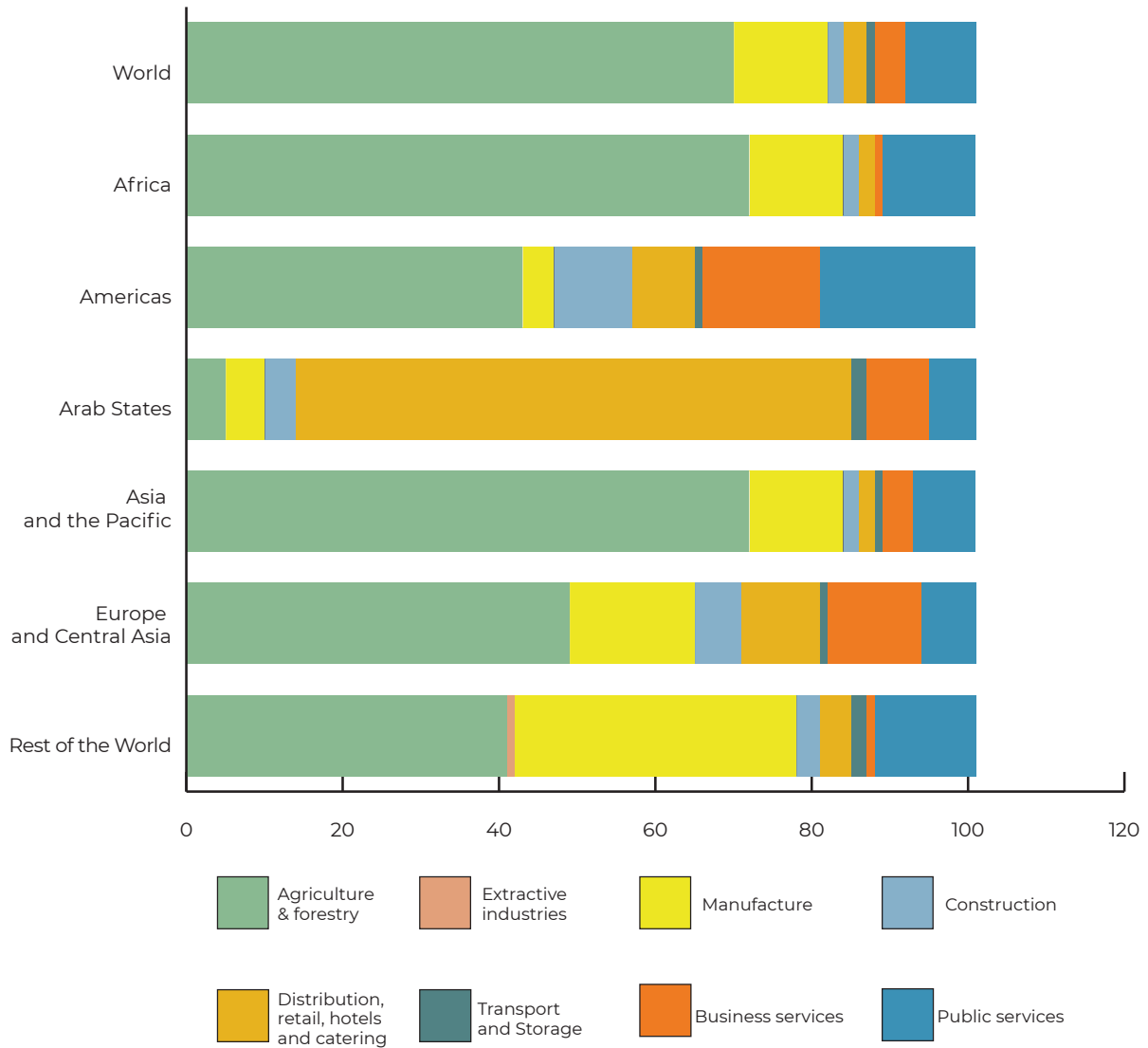
NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

Figure 6.3 and Table 6.8 present the employment estimates by economic sector and by geographic and income region, respectively.

At global level, the results indicate that the vast majority of future NbS work is estimated to be in activities that are in some way linked to the agriculture and forestry sector, as is the case for current NbS work. Of the total 20 million additional jobs created by the increased NbS spending, around 14 million (70 per cent) of these will be created in the agriculture and forestry sector. The sectoral distribution of jobs is more varied in 2030 compared to current estimates of NbS work, which suggest that 97 per cent of all jobs occur in the agriculture and forestry sector (see section 6.2.2). The sectoral distribution of work in or related to NbS is expected to vary across regions. For example, in Africa and Asia and the Pacific, 72 per cent of NbS work will be concentrated in the agricultural sector, while in all 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 sector, explaining the large share of work estimated to be directly created in the field of agriculture and forestry as a result of this expenditure. Considering the dominance of NbS work in activities linked to the agriculture and forestry sector, it can be inferred that most people working in NbS are located in rural areas, while urban NbS work is likely much less. As many NbS are targeted at enhancing ecosystem resilience, it makes sense to expect a higher share of NbS work – and consequently higher employment – in rural parts than in urban areas, which are less dependent on ecosystems. In the Americas and Europe, the share of all people involved in NbS-related work, work from NbS and NbS-induced working in the construction sector is higher than in Africa. This may reflect the varying nature of the kind of NbS activities and expenditure expected to take place in 2030.

Figure 6.3 NbS employment (thousands) across geographic regions by sector (percentage of regional NbS employment)



NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

Table 6.8 Employment in NbS by sector and income region, absolute difference from baseline

	HIGH INCOME		UPPER MIDDLE INCOME		LOWER MIDDLE INCOME		LOW INCOME		WORLD	
	THOUSAND PERSONS	FTEs	THOUSAND PERSONS	FTEs	THOUSAND PERSONS	FTEs	THOUSAND PERSONS	FTEs	THOUSAND PERSONS	FTEs
Agriculture & forestry	245	214	2 904	1 915	10 342	8 280	386	285	13 904	10 715
Extractive industries	1	1	21	22	3	2	0	0	25	25
Manufacture	37	30	658	643	1 699	1 580	18	21	2 436	2 293
Energy & utilities	1	1	2	2	2	2	0	0	5	5
Construction	31	24	116	104	309	278	15	13	472	420
Distribution, retail, hotels and catering	44	35	170	149	291	285	21	19	528	490
Transport and Storage	8	6	42	42	105	102	5	4	161	156
Business services	37	29	530	442	162	148	1	1	731	620
Public services	14	11	506	411	1 011	870	20	16	1 560	1 315
Total	418	351	4 949	3 730	13 924	11 547	466	359	19 822	16 039

NOTE: See Appendix 4 for region classification.

SOURCE: Cambridge Econometrics E3ME model.

It is worth noting that the jobs to be created in the business services sector globally are likely to stem from indirect/induced effects (that is, these jobs can be considered work from NbS), whereas 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 work.

Looking at regions by different income levels, the majority of NbS work (83 per cent and 74 per cent) is in the agriculture and forestry sector in low-income and lower-middle-income regions. This share falls to 59 per cent for high- and upper-middle-income countries. The high share of jobs in distribution, retail, hotels and catering in high-income countries suggests the induced effects on employment are highest in this income region.

6.5.3 Results within the context of global climate goals

The mitigation potential of scaled up expenditure in NbS is considered within the context of a “1.5°C scenario”, which is also modelled in E3ME. The scenario includes carbon pricing alongside a range of supporting policies that are implemented worldwide, including regulations, subsidies, energy efficiency investment and support for new technologies. Combined, these policies aim to reduce emissions in line with targets required to limit global warming to 1.5°C above pre-industrial levels by 2050, as recommended by the Intergovernmental Panel on Climate Change (IPCC 2018). According to the E3ME 1.5°C scenario, the total employment effect of global efforts across all sectors of economies to reach the target of limiting global warming to 1.5°C above pre-industrial levels by 2050 is estimated to be just over 80 million jobs worldwide in 2030. If NbS expenditure is scaled up threefold by 2030, NbS activities could play a bigger role in this global effort. The expenditure levels recommended by the State of Finance for Nature report would suggest that, alongside other activities associated with limiting global warming to 1.5°C, just over 21 million jobs further jobs could be created in NbS work in 2030, over and above current levels of jobs in NbS work. This could represent 21 per cent of all jobs created in the transition to a low-carbon world. This figure is slightly higher than the estimate of total NbS-related work presented in the preceding section, since when combined with additional measures to achieve a 1.5°C target, there are some multiplier effects at play (such as induced effects) which provide a further boost to job creation. The estimated future potential for employment does not take into account future PEPs and PES programmes, since expenditure is difficult to estimate without applying very uncertain assumptions. If future PEPs and PES programmes could be taken into account, it is likely that this estimate of future employment would be much higher.

Boxes 6.2 and 6.3 illustrate a “deep dive” of this approach in Guatemala and France, respectively.

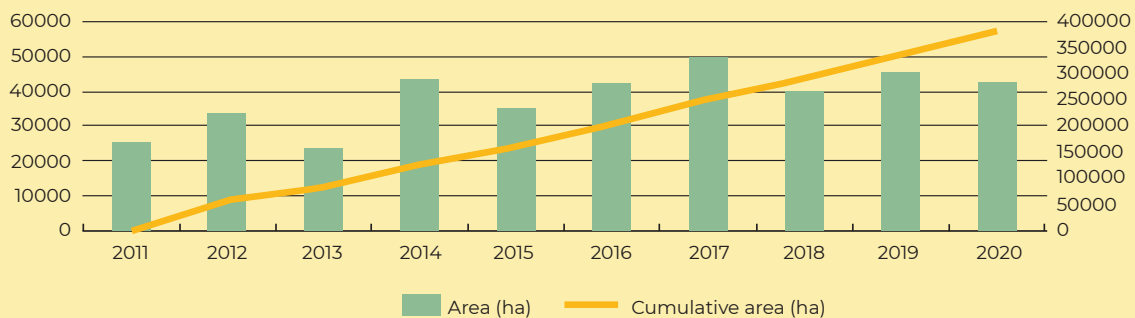
BOX 6.2 Guatemala “deep dive”

Nature-based Solutions (NbS) and, as a subset of NbS, Forest Landscape Restoration (FLR) activities, play a critical role in Guatemala’s response to socioeconomic and environmental challenges. The country has experienced substantial deforestation rates in the past 20 years (Mongabay n.d.) and is suffering from extreme weather events, which contribute to issues of climate vulnerability and poverty. In its National Development Plan: K’atun, Our Guatemala 2032 (Segeplán 2014), the Government of Guatemala recognizes the value of natural resources for the economy and food security. To advance FLR in the country, Guatemala pledged to restore 1.2 million hectares under the Bonn Challenge.¹ Guatemala has implemented several programmes to advance restoration, the largest of which are the incentive programmes PROBOSQUE and PINPEP managed by the National Forest Institute (INAB), which provide annual

payments for up to 10 years for different restoration actions.²

To report on progress in restoring degraded landscapes in Guatemala for the period 2011–20, IUCN implemented the Restoration Barometer³ with the support from key government institutions – namely INAB, the Ministry of Agriculture and Livestock (MAGA) and the National Council for Protected Areas (CONAP) – and through the National FLR Roundtable with private institutions and NGOs. Between 2011 and 2020, around 380,000 hectares were reported to have been restored (Nello et al. 2020). The main FLR interventions implemented were (following IUCN’s restoration categories⁴): silviculture (67.3 per cent of total area), planted forests and woodlots (22.6 per cent) and agroforestry (7.5 per cent). INAB contributed, through the different incentive programmes, to 87.1 per cent of the total restored hectares.

Annual and cumulative area restored, as reported for the Restoration Barometer



SOURCE: Nello et al. 2022

Data from the Restoration Barometer shows that between 2011 and 2020, an average of US\$35.3 million was invested annually in FLR activities in Guatemala (Nello et al. 2022). The majority of the identified financial resources that were mobilized corresponds to public funding from investment in forest incentives managed by INAB⁵ and, to a lesser extent, from MAGA (MAGA 2016).⁶ These investments may have resulted in annual national GDP increases of as much as US\$68.5 million.⁷

Between 2011 and 2020, investments in

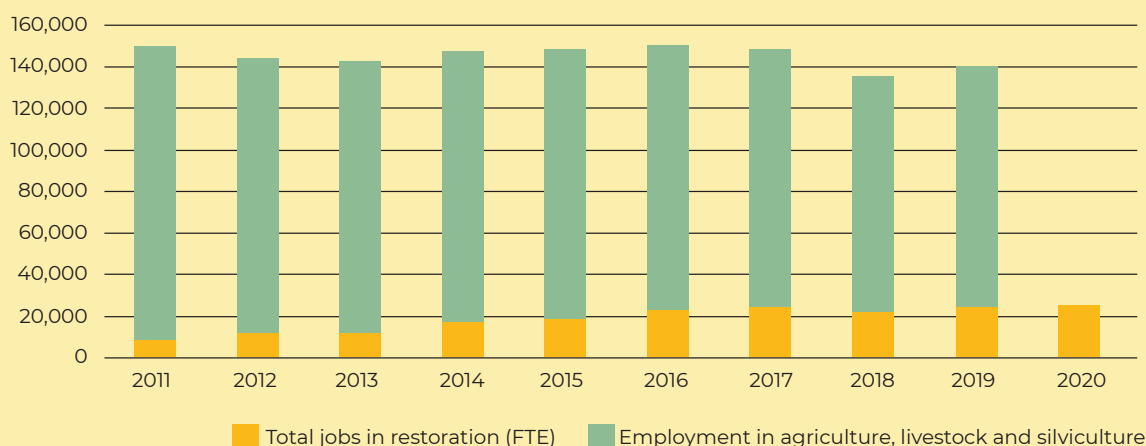
restoration created on average 18,400 direct jobs (expressed in FTE annually), according to estimates carried out by Nello et al. (2022). Of these, around 10,000 FTE/year were generated during the implementation phases (short-term jobs) and 8,400 FTE/year during maintenance (medium- to long-term jobs, for at least two years). The table below shows that the number of short-term jobs created per US\$1 million invested is largest for actions related to improved fallow, watershed protection, silviculture, and planted forests and woodlots.

FLR INTERVENTION TYPE	ACCUMULATED INVESTMENT (MILLION USD) (2011-20)	TOTAL NUMBER OF SHORT-TERM JOBS, MAX. 1 YEAR (FTE) (2011-20)	SHORT-TERM JOBS (FT) PER MILLION USD INVESTED
Improved fallow	0.01	5	500
Mangrove restoration	0.47	35	74
Agroforestry	30.30	1,631	54
Watershed protection and Erosion control	4.17	1,851	444
Natural regeneration	28.81	2,375	82
Silviculture	77.03	30,161	392
Planted forest and woodlots	212.07	53,628	253

SOURCE: Nello et al. (2022) for the Restoration Barometer

The figure below shows the estimated total number of annual jobs (FTE) from restoration, as well as total employment in agriculture, livestock and silviculture.

The share in total agriculture employment represented by the restoration jobs was as high as 17 per cent in 2019 and has increased steadily over the last decade.



	2011	2012	2013	2014	2015	2016	2017	2018	2019
Employment in restoration as part of total employment in agriculture (%)	5.6	7.7	8.1	11.7	12.2	15.2	16.1	16.4	16.9

SOURCE: Nello et al. (2022), based on their own estimates, and Banco de Guatemala⁹

Indirect effects along supply chains and induced effects due to higher disposable income likely led to further job creation related to investments in restoration that is not captured by the data reported for the Restoration Barometer. These effects could potentially lead to the creation of around 1,300 additional jobs,⁹ likely in the transport and storage, distribution and retail, and extractive industry sectors.

According to Nello et al. (2022), around 65 per cent of direct restoration jobs of 2011–20 were performed by men, while 35 per

cent of them were performed by women. Considering that men make up close to 90 per cent of total employment in agriculture and forestry in Guatemala (ILO. n.d.(e)), the gender distribution of FLR initiatives can have a gender balancing effect on employment. While information on the age of people in FLR employment is lacking, around 70 per cent of those employed in agriculture and forestry are above 25 years old. It can thus be assumed that most people benefiting from these interventions are over 25 years old.

- 1 The Bonn Challenge is a voluntary action launched in 2011 by IUCN and the Government of Germany, as a global effort to support and join countries committed to landscape restoration. At the time of launching, the goal was to restore 150 million hectares of deforested and degraded land by 2020. The goal was raised to 350 million restored hectares by 2030 under the UN Declaration on Forests during the UN Climate Summit in 2014 (IUCN 2021).
 - 2 See PINPEP: <https://www.inab.gob.gt/index.php/component/content/article/112-servicios/183-pinpep?Itemid=437> and PROBOSQUE: http://portal.inab.gob.gt/images/centro_descargas/formatos_probosque/probosque/Resolucion_JD.01.36.2019_Actualizacion_de_Montos_PROBOSQUE.pdf
 - 3 See <https://restorationbarometer.org/>
 - 4 The broad categories can be found at: https://infoflr.org/what-flr/types-flr;_the_complete_IUCN_Restoration_Intervention_Typology_for_Terrestrial_Ecosystems can be accessed at: https://restorationbarometer.org/wp-content/uploads/2022/02/iucn_restoration_intervention_typology.pdf
 - 5 INAB work report examined for the 2011–20 period.
 - 6 2016–20 work report examined, given the Sustainable Development Programme 12 began in 2016. Memoria de labores 2016-BAJA-(maga.gob.gt)
 - 7 Based on the relationship between NbS expenditure and GDP change obtained from the E3ME model results for the Latin America region.
 - 8 See <https://banguat.gob.gt/page/empleo>
 - 9 Based on the assumed sectors that benefit primarily from direct effects of NbS investment, and on the estimated ratio between direct jobs and indirect and induced jobs obtained from the E3ME model results for the Latin America region.
- SOURCE:** Compilation by Cambridge Econometrics, IUCN and ILO

BOX 6.3

France “deep dive”

France is one of 196 countries that have pledged to become net zero by 2050 under the Paris Agreement. NbS are key to reducing the country’s risk of climate-change-related impact. The French National Strategy for Adaptation to Climate Change will “prioritize nature-based solutions where possible” in a bid to “protect people and property from climate risks and prepare economic sectors from expected change” (France, Ministère de la Transition écologique et solidaire 2018, XX).

Based on the sources outlined in section 6.1.2, annual public NbS expenditure in France is estimated to be US\$3.9 billion

(2020). The modelling exercise estimates that this expenditure contributes US\$6.6 billion (2020) to French GDP each year, while creating over 30,000 jobs in a variety of industries and occupations.

This expenditure is directed towards various NbS. Key NbS activities in France are focused on mitigating and adapting to climate risks; flood risk management through restoration of wetlands and marshes; combatting urban heat islands through innovative urban planning; improving the resilience of the environment through revegetation of urban areas; and development of the agricultural sector in

the new climate context (Ministère de la Transition écologique et solidaire 2018).

One NbS project, the Functional Restoration of the Valley of Saint Ruph-Glière-Eau Mort, aims to promote both climate change risk mitigation and adaption (France, Office international de l'eau 2020). In 2015, a flood in the region impacted homes and agricultural activities. Under the project, restoration of the Mercier plain and its reconnection to the Giez marsh resulted in increased water infiltration. In 2018, when another flood of similar intensity struck the area, downstream activities were unaffected. Another NbS action is the adaptive restoration of a former salt works in Camargue (Tour du Valat, Research Institute for the Conservation of Mediterranean Wetlands 2022). Restoration of ecosystem characteristics and hydrological functioning, along with reconnection to surrounding water bodies has resulted in increased protection of coastal areas from flooding, the creation of a breeding site for birds, and improved migration passages for several

fish species, as well as opportunities for eco-tourism as aesthetics of the area have improved. Both of these projects have supported the creation of direct jobs in, for example, construction and operational support (such as project management, diagnostics and administration).

The following table shows jobs created in France by NbS expenditure and the likely demographic profile of those who will fill the jobs. Overall, 58 per cent of the jobs created in France by NbS investment/expenditure are filled by males, this is because many of the sectors in which jobs are created are heavily dominated by men, such as construction, agriculture and forestry, and manufacturing (République Française 2021). The French public services and business services sectors, on the other hand, employ a higher proportion of women than any other sector (61 per cent of the workforce). Consequently, 76.9 per cent of the roles created by NbS investment/expenditure filled by women will be in these sectors.

Employment created through current NbS expenditure in France

SECTOR	EMPLOYMENT EFFECT (THOUSANDS)	MEN (THOUSANDS)	WOMEN (THOUSANDS)	AGE 15–24 YEARS (THOUSANDS)
Agriculture and forestry	3.4	2.4	1.0	0.3
Manufacturing	2.5	1.7	0.7	0.2
Construction	7.5	6.5	0.9	0.8

SECTOR	EMPLOYMENT EFFECT (THOUSANDS)	MEN (THOUSANDS)	WOMEN (THOUSANDS)	AGE 15–24 YEARS (THOUSANDS)
Distribution, retail, hotels and catering	0.3	0.2	0.1	0.0
Transportation and storage	0.8	0.6	0.2	0.0
Business services, Public services	16.4	6.4	10.0	1.1
Total	30.7	17.7	13.0	2.5

SOURCE: CE, E3ME model.

The public services and business services sectors in France consist of a notably small percentage of young people – only 6.8 per cent of the sector is between 15 and 24 years old. This is in contrast to sectors such as construction and agriculture and forestry, in which this group represents 10.2 per cent and 10.0 per cent of workers, respectively. The construction sector is attractive to young workers because jobs often require entry-level skills and offer opportunities for on-the-job training.

NbS-related construction jobs are likely to be mostly short term, and only a small proportion may remain secure once the initial stage of work is complete. However, longer-term operation and maintenance jobs will exist, and these will draw workers from other sectors. Yet it is likely that there will be more short-term employment opportunities created by NbS actions than long-term ones.

The expenditure and investment in NbS creates jobs through direct and indirect effects, as well as induced effects (such as in the distribution, retail, hotels and catering sector; see also table 6.7).

According to modelling results for France, NbS leads to job creation in all skill areas: 39 per cent of new jobs are likely to be in high-skilled non-manual occupations such as professionals and technicians and associates; 18 per cent are in skilled manual occupations such as clerical support workers; 33 per cent are in skilled non-manual occupations such as craft and related trades; and 10 per cent are in elementary occupations. One report on NbS in France found that, within NbS-specific sectors such as agroforestry, 62 per cent of jobs are found in high-skilled occupations such as research, diagnostics and design and 55 per cent of jobs are found in similar occupations in the water resource management sector.

6.6 Conclusions

Currently, based on this partial estimate, nearly 75 million people are estimated to be working in NbS activities, doing NbS-related work, work created from NbS or NbS-induced work, with the vast majority (96 per cent) of this work occurring in Asia and the Pacific, and in lower-middle-income countries, despite most of NbS expenditure occurring in the regions of higher income levels.

In Asia and the Pacific region, most of the work officially documented are created through public employment programmes (PEPs). Those jobs created through PEPs are mostly part-time and project-based. However, despite the low likelihood of offering full time work, PEPs and PES offer important opportunities for paid work in NbS for some of the poorest and most vulnerable global communities who depend heavily on natural resources for their lives and livelihoods. In other global regions, the extent of people working in NbS on a part-time basis is likely more limited, since FTE numbers are estimated to be only slightly lower than total employment figures.

Importantly, our findings point out that the majority of NbS work and expenditure in Asia and the Pacific and Africa are in the agricultural sector. This points to the crucial contribution of nature and investments into nature to increase agricultural productivity (for example, through soil health, irrigation and biodiversity). It shows the potential of NbS as a government policy to achieve a double dividend: to increase agriculture output, food security and create jobs while growing natural capital and environmental and human health benefits. Significantly, this would contribute to a just transition in rural areas and human-centred climate adaptation.

A share of NbS work is currently done either by volunteer or casual labour, the latter being reflected in the translation in FTEs of the estimated number of people working in NbS. The nature of the work and how to best ensure it is decent work requires further research and must be analysed based on specific contexts.

The literature shows that direct work in NbS can be labour-intensive, especially in the case of the activities considered within the NbS expenditure modelled in this exercise, namely reforestation, silvopasture, peatland and mangrove restoration; this implies that increased NbS expenditure offers the potential for significant job creation. Further, a high proportion of NbS jobs exist in rural areas, creating much needed additional opportunities for income and employment, as well as longer term NbS benefits which also benefit rural workers. However, much of this work is often also low productivity, low wages and informal. It is important that investments and the implementation

models chosen for NbS take this into account and include measures to address these concerns. These include attention to increase productivity, as well as compliance with labour legislation, including minimum wages and investment in capacity development.

Many NbS jobs, such as agricultural labour, require elementary skills. However, NbS work also offers opportunities for more skilled and specialized work, particularly in the 'planning and design, monitoring and evaluation of NbS measures' stages of work. Workers with elementary skills who want to take advantage of these more specialized work opportunities need to be equipped with additional skills to migrate from other jobs (particularly from sectors which may be in decline in the context of the green transition). The case studies in this report offer an indication of the variety of skills required, including technical skills, management, facilitation and consultation, community organizing, advocacy and training.

Assuming a threefold increase in NbS expenditure levels in 2030 compared to current levels, an additional 20 additional million people above current levels could be working in NbS activities. The geographical spread of work in NbS is expected to remain fairly consistent with today's estimates, with a large majority of work concentrated in Asia and the Pacific and Africa, and in low-middle-income regions, reflecting both the expected patterns of future expenditure and the wage and productivity characteristics of countries.

As documented in this chapter, attempts to estimate the number of current jobs or total employment in NbS – or that could be created through further expenditure in NbS – face several challenges. First, the various limitations related to the coverage of the data suggest that the final expenditure datasets used as the inputs to the modelling exercise are likely an underestimate of the true value of all current and future NbS expenditure globally. Thus, the associated estimates of current and future employment are also likely to be underestimates. Second, the modelling does not capture several types of employment that are likely to result from NbS activities, namely some forms of unpaid employment, as well as secondary effects that are likely to emerge over the long term from improvements to the environment generated by NbS activities. It also does not capture employment related to NbS that is not driven by increased investment, for example through households, farmers or enterprises incorporating NbS into their existing production methods. Third, it is difficult to separate the net effects, as NbS activities might lead to decreases in economic activity in some sectors because of stricter rules (such as environmental protection) or the lack of resources (such as labour and/or skills) in countries where there may be shortages.

Further research and data collection efforts are required to understand these positive additional employment impacts of NbS activities in order to improve the accuracy of future employment estimates. While modelled estimates can provide some insights into potential current and future employment opportunities created by NbS expenditure, there are clear benefits to be gained from a consistent approach to collecting data about NbS activities and their associated expenditure and employment. A consistent approach to producing such information would support engagement in NbS from national governments and help inform evidence-based policymaking. In the specific context of decent work, detailed statistics on NbS could inform the design of complementary environmental and labour market policies to support the creation of decent work in NbS through a just transition.

Case study

Smart coasts in Mesoamerica

The Mesoamerican Reef System is the largest transboundary reef system in the world, extending across more than 1,000 kilometres of Caribbean coastline in Mexico, Belize, Guatemala and Honduras. This ecosystem is a biodiversity hotspot and is home to endangered marine turtles, more than 60 types of corals and more than 500 fish species. Coastal and marine resources in this region provide essential ecosystem services, sustain key economic sectors, support the livelihoods of more than two million people and contribute to the protection of coastal communities against adverse effects of climate change. However, these coasts are among

Photo taken near Cayos Cochinos, Honduras. Artisanal fisherman. Many people in the Mesoamerican Reef region depend on fishing as a source of income. © Antonio Busiello/WWF



the regions in the world most vulnerable to the impacts of climate change, and current management plans do not yet adequately take into account adaptation principles and options.

The World Wildlife Fund (WWF), with the support of the International Climate Initiative (IKI), is implementing the Smart Coasts project, which aims to incorporate Nature-based Solutions (NbS) principles into the management of protected areas, with special emphasis on marine protected areas and coastal development policies in the countries bordering the Mesoamerican Reef. The objective is to improve the capacity of targeted coastal communities to adapt to climate-related risks such as erosion, sea level rise and storm surge flooding. The adaptation strategies are integrated into higher-level policy instruments, such as coastal development plans and management plans for protected areas, as well as into local adaptation measures to be implemented in selected communities.

The project also provides benefits to ecosystems such as the protection of key species, supports community



Photo taken near Cayos Cochinos, Honduras. Artisanal fisherman. Many people in the Mesoamerican Reef region depend on fishing as a source of income. © Antonio Busiello/WWF

appropriation of natural resources and has contributed to the creation, support or enhancement of 79 NbS jobs, of which 55% are held by women and 12% by youth. These jobs have NbS specializations such as programme coordination, ecosystem restoration, environmental education, data and information gathering, legal or policy advisory services, geospatial analysis, and management of participatory and inclusive processes. One interesting aspect of the project is that the main coordination positions are held by women.

These positions also allowed for innovative forms of engagement with local and national government authorities and local community members that have been key to the success of the project, even during the COVID-19 pandemic. To re-engage local community participants, the project reoriented its communication strategy to develop a 10-episode radio series, which was later transformed into a podcast and animated videos that were shared widely via local radio stations and social media. Their production took into account local languages and language variations, which were well received, reaching over 60,000 individuals.

NOTE: See Appendix 3 for complete details on this case study.



Participatory workshop in Chiquilá with local community members. © Alejandra Calzad, Chiquila, Mexico.

Case study

Large-scale Ecosystem-based Adaptation in The Gambia

The consequences of climate change in The Gambia are stark: increased temperatures and more frequent and intensified storms, coastal erosion, salt intrusion, erratic rainfall, droughts and floods are threatening the rainfall-dependent agricultural sector, which employs 44% of the country's workforce and provides two-thirds of household income. Sea-level rise and salt intrusion into freshwater wetlands have all but eliminated rice production in the western half of the country, resulting in “hunger seasons” between July and September.

The UN Environment Programme is supporting the largest adaptation project in the country. Funded by the Green Climate Fund, the aim of this large-scale Ecosystem-based Adaptation (EbA) intervention is to build climate resilience over large areas, promote climate-resilient sustainable development, and develop a sustainable natural resource-based economy. The project involves three main components: (i) restoring 15,788 hectares of degraded forests, mangroves, savannahs, wildlife areas, and farmlands with climate-resilient plant species that provide goods for consumption or sale; (ii) facilitating the establishment of 176 commercially viable natural resource-based businesses managed by local communities and involving activities such as beekeeping, furniture manufacturing and food processing; and (iii) providing strategic recommendations and technical support to strengthen policies on participatory management and benefit sharing.

To date, 60 beekeeping businesses have been established, employing 398 people (121 women) mostly part-time. Ultimately, more than 500 are expected to be generated from the target 176 natural resource-based businesses. In addition, ecosystem restoration activities are creating work opportunities in tree nurseries, as well as in planting and maintenance. These jobs are





paid at less than minimum wage on the grounds that the employees/ volunteers also benefit from this work. In the first two years, 10 million mangrove propagules were planted, which protect coastal villages from storm surges while providing habitat for many fish species.

This project illustrates the potential of NbS to generate significant numbers of jobs in rural communities. More detailed record-keeping of both part- and full-time jobs created by the project will enable a better understanding of the potential of NbS to generate work.

NOTE: See Appendix 3 for complete details on this case study.



Case study

Boosting urban resilience in Freetown, Sierra Leone

Sierra Leone's urban population is growing rapidly, with over 40% of the population now living in urban areas. Freetown is experiencing rapid peri-urban expansion into the heavily forested mountains surrounding the city. As a result, the total canopy area has decreased by 12 percent annually between 2011 and 2018, directly affecting local watersheds and water supplies, and exacerbating disaster and climate risks such as urban heat stress, landslides, flooding, drought and coastal erosion.

The Resilient Urban Sierra Leone Project is supporting the national government, the Freetown City Council, and other local partners to achieve their "Transform Freetown Strategy" through restoring and reforesting the city and surrounding areas. The project operates with co-financing from the World Bank and the Global Environment Facility under the Sustainable Cities Impact Program, and with technical assistance from the Global Facility for Disaster Reduction and Recovery.

Through community-based reforestation, the project aims to improve integrated urban management, service delivery, and emergency disaster management in the country by mitigating the risks of landslides and flash-flooding, as well as rising urban heat stress. Planting of native trees such as mangrove species and local fast-growing, non-invasive fruit tree species aims to increase biodiversity. The TreeTracker app, which is locally available on smartphones, incentivizes tree planters to become 'growers' by monitoring tree growth, for which they receive

periodic micropayments for keeping trees alive.

In Freetown, the project consists of two phases and has so far generated 898 jobs of which 99% are young workers. Twenty-two workers were employed in both phases. Many of the jobs provided are considered innovative green jobs, such as 'grower' (responsible for growing the trees), employing 372 youth, and nursery technical staff, employing 290 youth. The





project has also conducted training and engagement of local community members as tree planting team leaders, tree stewards, tree planters and growers, short-term daily tree planting and growing support workers, community climate action ambassadors, tree and plant nursery suppliers. Other expected social and economic benefits include improved air quality, reduced noise pollution, and increased property values.

Tree species selection proved to be a challenge, due to lack of knowledge on native tree characteristics, growth rates, suitable growing conditions, and a lack of nurseries propagating native tree seedlings among other factors. However, factors linked to the project's greatest successes included widespread engagement and capacity-building of individuals across the city and within each community, and the Tree Tracker App and a micropayment incentive model, which led to a very high tree survival rate.

NOTE: See Appendix 3 for complete details on this case study.



Case study

Grain for Green (aka Sloping Land Conversion Program) in China

In the 1990s, extensive land clearing led to increased soil erosion, frequent droughts and floods, and ecosystem degradation in many areas in China. After severe floods in 1998 claimed over 3,000 people's lives, the Chinese government recognized nature as a critical solution for disaster risk management, economic and social development, and ecosystem degradation. In 1999, it launched the Grain for Green (GfG) programme, one of the largest restoration programmes in the world.¹¹ Still ongoing, GfG seeks to reduce soil erosion, enhance biodiversity, and conserve natural resources by converting steep-sloped land, degraded cropland and barren land into forest and grassland (Lieuw-Kie-Song and Pérez-Cirera 2020). The programme also aims to accelerate the economy's transition towards sustainability while improving farmers' incomes.

GfG incentivizes farmers to stop activities that cause ecosystem degradation and instead plant trees or grass to restore ecosystems. This is mainly implemented in ecologically important or vulnerable area, or those with serious soil erosion, desertification, or low and unstable yields. Participating households receive a subsidy if their restoration efforts meet government requirements for specific trees species, plantation density, and survival rates, among others. The labour needed to meet these requirements is an estimated 30–60 person-days per household per year, on average.

Between 1999 and 2019, 41 million households participated in the programme. Each participating household received a total of 9,000 yuan (CNY, about US\$1,300) on average

(NFGA 2020). In return, these households collectively provided over 36 million full-time equivalent years of labour input over this period. As payments are made in three tranches over the five-year period, many farmers formed cooperatives to implement



Protected heritage tree in afforestation site, Red Earth Township, Dongquan County, Yunnan Province, China. © Louis Putzel/CIFOR

¹¹ Ecosystem restoration means preventing, halting and reversing the degradation of ecosystems worldwide to regain their ecological functionality and improve productivity and capacity to meet the needs of society. (BMUV and IUCN n.d.; see also the Restoration Barometer case in this appendix).



the restoration work, so as to receive more frequent payments. By 2021, China had 23,000 forestation cooperatives in 22 provinces, creating job opportunities for 1.6 million poor people and increasing their annual per capita income by more than CNY3,000 (US\$435).

Between 1999 and 2019, 34.3 million hectares of farmland was converted to forest or grassland, greatly benefitting the ecosystem by reducing soil erosion, conserving water, sequestering carbon, and preventing desertification. The annual total ecological benefit is estimated at CNY1.48 trillion (US\$220 billion).

Key to the success of GfG are the subsidies and other policy supports to incentivize local governments and farmers to participate in restoration. However, long-term measures are needed to ensure farmers' livelihoods after the subsidy period through the creation of green jobs and capacity building. Planting of 'ecological' indigenous trees rather than the 'commercial' species preferred by farmers would ensure the programme followed NbS standards more closely.

NOTE: See Appendix 3 for complete details on this case study.



CHAPTER
SEVEN





Chapter 7

Realizing the full potential of decent work in NbS

For NbS to be scaled up and contribute to achieving national and global climate and biodiversity goals, it is vital to understand their socioeconomic dimensions, including the full range of benefits they can deliver – as well as the potential risks if NbS are not implemented appropriately. Without such an understanding it will not be possible to put in place the right policy frameworks, ensure the necessary finance is available, and win broad support. One critical element in building this understanding is to recognize the significance of the quantity and quality of work and jobs in NbS, both currently and in the future. A just transition is important in this context, as it can help maximize the social and economic opportunities associated with NbS while minimizing any transition risks for workers, enterprises and communities. The main aim of this first report on decent work in NbS is to initiate a systematic engagement on this topic, paving the way for continued and in-depth work going forward. Future biennial editions of this report will take up this work.

7.1 Measuring the quantity and quality of work in NbS

Assessing the quantity and quality of work in NbS requires both clear concepts of ‘work’ and activities in ‘Nature-based Solutions’, and the ability to connect the former to the latter following international statistical standards and guidance as well as best practice in estimation. An international statistical standard definition exists for the concept of work, covering different forms of work, such as employment (or work for pay or profit) and unpaid forms of work (such as volunteer work), both of which are commonly encountered in NbS. Full-time and part-time working arrangements exist in NbS, and it is possible to produce work estimates by full-time and part-time status, using working time estimates in NbS activities. Similarly, both formal and informal work are commonly found in NbS activities, and international statistical standards concerning the measurement of informal employment – currently being updated – could help support measurement and indicator development of informal work in NbS in the future. In addition to such direct work creation in NbS, there is work generated via NbS through supply chain (indirect) effects, consumption (induced) effects, and secondary effects due to improvements in the environment. The conceptual framework describes these links and serves as a tool for analysing and building a better understanding of these relationships.

There is also a good understanding of the concept of NbS. The adoption of a multilaterally agreed definition of NbS in the UNEA resolution (UNEP 2022a), consistent with the earlier IUCN definition that draws not only from governments but also from the civil society, is an important step in this regard. However, the application of the concept can be challenging. Determining whether the concept applies to a particular activity is not always straightforward, which is a theme that cuts across this report. This is primarily because NbS, as defined, are required to provide ‘human well-being’ and ‘biodiversity’ benefits. Ascertaining whether these requirements are met requires careful assessments almost on a case-by-case basis. Thus, particular activities in sectors such as agriculture or forestry may or may not qualify as NbS. The need for careful assessments does not disappear even when the focus is on more specific activities, such as regenerative agriculture or agroforestry. Further complications arise in those instances where NbS are combined with other approaches, as in the use of NbS to provide infrastructure-related services. While nature does provide infrastructure-related services on its own, in many cases, nature-based infrastructure solutions are integrated into the design and operation of conventional ‘built’ infrastructure – a combination

often called ‘green-grey’ infrastructure – and are implemented together, making it difficult to separate the NbS activities from other activities.

This ‘application problem’, as it may be termed, makes it far from straightforward to determine whether a specific kind of work is an instance of work in NbS. This, in turn, creates difficulties in estimating the numbers of people working in NbS, whether currently or in the future. So, while the concepts of work and NbS may be relatively clear, the application problem that exists for the second concept makes assessments of the quantity and quality of work in NbS challenging.

This report explores two approaches to assessing the quantity and quality of work in NbS. The first approach (set out in Chapter 5) is to propose a longer-term effort to build on the SEEA framework (SEEA n.d.) and other existing statistical standards and guidance, and to then apply and adapt these for the measurement of NbS and associated ecosystem and work outcomes. Such an approach would deliver information about work in NbS at the national level that could then be aggregated to regional or global levels, if sufficient countries participated. However, it faces two difficulties. First, the delivery of results is dependent the number of countries committing to the approach, as well as the provision of sufficient resources to allow them to do so. This means we are unlikely to see a set of global results before 2030. Second, it is not yet clear that this approach would be able to overcome the inherent difficulties of the application problem.

The second approach, explored in Chapter 6, makes use of existing data sources and modelling tools, and tries to find ways around the application problem by focusing on sectors where it is easier to determine whether work is likely to count as NbS, combined with a readiness to make assumptions where information is incomplete. Thus this approach is able to generate estimates about the quantity of work in NbS, both currently and in the future. However, its limitations are that the picture is inevitably partial (because of the focus on particular sectors and the reliance on currently scarce available data) and uncertain (because the underlying assumptions are weakly supported). The model used in Chapter 6 does not provide future estimates of job losses or displacements due to a shift to NbS, including with a just transition scenario. Alternative models could be explored to provide such estimates.

The two approaches are complementary. As improved data become available from the first approach, this will strengthen the results of the modelling used in the second approach.

7.2 Quantity of employment in NbS

The application of the second approach provided some partial estimates, summarized below along with their limitations.

- Based on modelling public and private investments in NbS combined with administrative records for PEPs, it is estimated that almost 75 million people globally are employed directly or indirectly through NbS. Much of this employment is part-time, and total employment is around 14.5 million FTEs. This figure is partial due to previously-mentioned data limitations and the method used, which may not capture existing NbS work not linked to reported expenditure figures (for example, employment on farms that have switched to regenerative farming or the employment of indigenous peoples in food production). Complementary approaches may be required to develop a more complete picture of all NbS-related employment, including issues relating to gender parity.
- Around 80 per cent of the estimated employment (in FTEs) in NbS is generated through PEPs, in particular through India's Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA; see box 3.2 in Chapter 3), which spends about 65 per cent of its resources on natural resource management activities. While the employment generated by PEPs is well recorded, there are uncertainties on the extent to which these jobs can be considered NbS actions, as most were not designed for this purpose, including responding to societal challenges. They offer mostly jobs requiring elementary skills and offering basic wages, and this would need to be strengthened to improve both their NbS and decent work outcomes.
- There are strong indications that volunteering is also an important source of work in NbS. In addition to those employed in paid jobs in NbS, it is estimated around 16 million people engage in various types of NbS work as volunteers. However, this estimate is based on a limited data set that covers only 61 countries, with very few estimates within those countries.
- Tripling investment in NbS by 2030 to achieve climate change mitigation, biodiversity and land restoration goals – as called for in the State of Finance for Nature report (UNEP 2021c) – can generate an estimated additional 20 million jobs (16 million FTEs). About 12.6 million of these jobs are likely to be generated in Asia, with 5.7 million

in Africa. While this is a more than five-fold increase of current non-PEP NbS employment, this is still likely an underestimate of the employment potential of NbS, because additional financing called for in the State of Finance for Nature 2021 report does not include increased investment in NbS for responding to climate change adaptation, disaster risk reduction, food security or other social and economic challenges.

The findings suggest that the majority of NbS work and expenditure in Asia Pacific and Africa are in, or relate to, the agricultural sector. This points to the crucial contribution of nature to agricultural productivity (through, for example, soil health, irrigation and biodiversity). It also shows the potential of NbS as a government policy to achieve multiple dividends: to increase agriculture output, food security and create jobs while growing natural capital, environmental and human health benefits. The application of just transition policy measures in rural areas is a means to support rural workers and enterprises in a transition to NbS activities, including minimizing risks and maximizing opportunities of environmental actions such as climate change mitigation and adaptation.

Most of the called-for increased investment that was modelled is in restoration of forests and silvopasture and, as a result, most of these jobs would be created in rural areas. This additional employment in rural areas, if decent, could have important impacts given the prevalence of poverty and deficits of decent work in these areas. The projected spending does not include NbS for adaptation or grey-green infrastructure, which will tend to have a much stronger urban focus, and so the employment generation potential of this investment is excluded as well. As this is likely to be substantial in scale, this topic warrants more in-depth exploration.

7.3 Quality of work in NbS

The analysis of the quantity of work in NbS was not able to shed much light on the quality of current and future work in NbS. In particular, it revealed little about which proportion of such work qualifies as decent work or how a just transition policy scenario could affect decent work outcomes through the increased use of NbS. Yet these are critically important issues. While some current work in NbS may qualify as decent work, there are significant decent work deficits in this area. Thus, it will be necessary to apply the Decent Work

Agenda (ILO n.d.(a)) and Just Transition Framework (ILO 2015) to ensure that quality of work in NbS and work generated from NbS is improved in the future.

NbS are particularly important and potentially transformational for improving the quality of work in rural areas. As employment, productivity and livelihoods in rural areas are highly dependent on ecosystem services, investments in NbS can represent a driver for development, for improving jobs and potentially for improving job quality. Much of the work related to implementing NbS is generated through PEPs and PES (which often contract households rather than individuals), as well as through volunteering and own-account work in agriculture. This often results in unconventional or informal employment and carries risks related to, among others, occupational safety and health, child labour, and social security; it also hampers the introduction of measures to enhance productivity and skills. There is a risk that in scaling up NbS without a just transition approach and targeting decent work outcomes, these deficits may also increase.

Increased adoption of NbS brings with it necessary transitions, in particular in the manner in which land and marine resources are used, and with it challenges and risks for certain groups and segments of the workforce. It is important that these are managed through specific just transition policy measures to support workers and enterprises in the transition, including, for example, policies and programmes on social protection, skills development, enterprise development, and active labour market policies. Here, policies to support such transitions are vital – both to compensate for any losses and to provide incentives to transition. The ILO Just Transition Guidelines (ILO 2015) are a valuable resource to help address risks for the workforce and enterprises that are connected to a scaling up of NbS, while also seizing emerging opportunities for these groups.

Participatory and gender-responsive decision-making – including meaningful and inclusive social dialogue that includes workers' organizations, employers' organizations and governments at different administrative levels – are critical for decision-making and the implementation of NbS, as well as to ensure that potential risks arising from the use of NbS are mitigated. The UNEA resolution (UNEP 2022a), IUCN Global Standard (IUCN 2020a) and the ILO Just Transition Guidelines (ILO 2015) all stress the importance of following participatory approaches, and the three frameworks are complementary in this regard. Such approaches should be promoted and mainstreamed, not only to mobilize broad support for NbS and effective implementation of NbS, but also to ensure that any negative economic and social effects are identified and measures are put in place to mitigate them. It is particularly critical to engage local men and women and indigenous peoples, who may own and/or manage land and natural resources, as well as poor people in the affected areas, who often depend directly on natural resources for their employment and livelihoods.

7.4 Way forward

Various topic areas emerge as priorities in this report and help define a way forward regarding decent work in NbS. These relate to specific policy and programme topic priorities as well as data gaps, measurement, and assessment-related priorities.

The report highlights that implementing NbS along with the right mix of just transition policies can contribute to decent work outcomes. It highlights in particular the relevance of the ILO Just Transition Guidelines as a framework to leverage opportunities and mitigate risks for decent work and green jobs in NbS, while also providing a platform to enable the full participation of social partners, women, and indigenous peoples. Going forward it will be important monitor and learn how countries are implementing the Just Transition Guidelines to support NbS actions for decent work.

Further work is also needed to understand better how the common themes identified between the IUCN Global Standard for NbS and the ILO Just Transition Guidelines can be leveraged to support decent work in NbS. These identified themes include evidence-based decision-making, inclusive and meaningful stakeholder engagement, policy coherence to maximize opportunities and mitigate risks, and upholding rights and fostering empowerment. Future reports could highlight some specific examples of synergies focusing on these themes that could perhaps be scaled up or replicated in other countries and regions.

The estimates of required spending on NbS used in this report are driven primarily by targets for climate change mitigation and reversing land degradation. However, the potential of NbS goes well beyond these challenges. In particular, the potential of NbS for climate change adaptation, disaster risk reduction and enhancing food security are likely to have important implications for employment and should be investigated in more detail in future reports. Examining how NbS can most effectively contribute to biodiversity objectives, along with jobs and other goals, is another key challenge to address when scaling it up.

The role and opportunities of enterprises and the private sector in delivering NbS also calls for various avenues for further investigation. Three potential roles would be of particular interest. First, NbS can be adopted and incorporated into production processes and supply chains where possible. Second, private investors in NbS can be important players in increasing investment and the creation of decent jobs. One issue that requires further investigation is how to account for the multiple benefits of NbS so that they can cover the cost of labour and also offer returns to investors. Third, private

sector capacity is also likely to be important for scaling up the implementation of NbS. This requires further investigation of the opportunities, risks and constraints for private sector actors in this area.

Going forward, it is recommended that the measurement framework and indicators for measuring employment, unpaid forms of work, and decent jobs in NbS – as outlined in this report – be developed and piloted in a few countries in the near term. This would pave the way for establishing a more comprehensive system of measurement in the medium to long term that is integrated with existing international economic, environmental and labour statistics frameworks such as the SNA, SEEA and ICLS standards.

Without such a comprehensive system, the ability to measure jobs in NbS, including quality jobs by sex and age, remains limited. This represents a barrier to a thorough understanding of the links between decent work and NbS, including gender-related impacts and outcomes, thus limiting the effectiveness of policymaking on how to best manage the risks and opportunities arising from increased investment in NbS. Addressing this information gap is perhaps most urgent for current restoration schemes and PES activities. While there are indications that these initiatives can generate substantial amounts of paid work – while also empowering poor populations, women and other at-risk groups through results-based contracts – few of them monitor or measure employment generation or the quality of jobs.

Although NbS has economic impacts that go beyond job creation, macroeconomic planning and monitoring frameworks built around the SNA still do not measure or systematically incorporate natural capital and the value of ecosystem services. This limits how the returns of NbS investments are measured, and thus undervalues NbS. This manifests itself not only in insufficient investment in NbS, but also in the relative prevalence of volunteering and low-wage work in NbS. Going forward, developing methodologies to estimate the longer-term impacts of NbS on ecosystem services and the potential linkages with job creation should also be prioritized.

Another area of interest is a further investigation of the skill requirements and anticipated demands for scaling up NbS. Especially in cases requiring specialized skills and expertise, this could become an opportunity for the creation of new decent jobs or, on the other hand, a potential bottleneck for increasing investment in NbS.

Where investment in NbS can help build natural capital and enhance ecosystem services, NbS is likely to have important secondary effects on employment in sectors that depend on these services. Here it also

has potential to prevent job losses by making employment sustainable, increasing productivity and potentially leading to increased overall employment. Further investigation is needed on the long-term secondary impacts of NbS on employment, as they could be highly significant.

In subsequent editions of this report we expect to pursue many of these issues.

Glossary

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 (CBD 1992, para. 1)

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 Definitions)

Blue economy

A marine and coastal analogue to the green economy. The blue economy supports specific measures to broaden the definition of ocean resources – to acknowledge the fundamental, life-supporting benefits and services that are provided by marine and coastal ecosystems. (UNEP)

Blue jobs

A subset of green jobs, aligning with the definition of blue economy. (Note: there is no official ILO definition of 'Blue jobs', but the concept is understood by ILO officials as stated above).

Decent work

Defined by the International Labour Organization 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

The Decent Work Indicator Framework (alternatively, the Decent Work Measurement Framework) refers to a framework of statistical and legal indicators intended to support measurement and monitoring of decent work at the country level. The framework was prepared by a tripartite Meeting of Experts and endorsed by the 18th International Conference of Labour Statisticians. The framework covers ten substantive elements corresponding to the four strategic pillars of the Decent Work Agenda (full and productive employment, rights at work, social protection and the promotion of social dialogue), as follows:

1. employment opportunities
2. adequate earnings and productive work
3. decent working time
4. combining work, family and personal life
5. work that should be abolished
6. stability and security of work
7. equal opportunity and treatment in employment
8. safe work environment
9. social security
10. social dialogue, employers' and workers' representation

(ILO. n.d.(f); 2013a)

Earnings

Remuneration in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together with remuneration for time not worked, such as for annual vacation, other paid leave or holidays. Earnings exclude employers' contributions in respect of their employees paid to social security and pension schemes and also the benefits received by employees under these schemes. Earnings also exclude severance and termination pay. (ILO 1973)

Ecosystem

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

Ecosystem approach

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

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 (CBD 2009)

Employment

Persons in employment are defined as all 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; (b) employed persons “not at work” due to temporary absence from a job, or to working-time arrangements (such as shift work, flexitime 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 2013c)

Employment in the environmental sector (or Environmental goods and services sector, EGSS)

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 2013d)

Employment in production of environmental outputs

Defined as employment in the production of environmental goods and services for consumption outside the producing unit. It may exist in specialist or in non-specialist economic units. (ILO 2013d)

Employment in environmental processes

Defined as employment in the production of environmental goods and services for consumption within the producing unit. It may exist in specialist economic units and in economic units that are not environmental in nature (i.e. non-specialist or own-account producers). These are jobs in which workers’ duties include production of environmental goods and services for use within the economic unit, but also the use of methods, procedures, practices, or technologies that make their economic unit’s production processes more environmentally sustainable. This includes methods, procedures, practices,

or technologies that, for example reduce or eliminate pollution, reduce consumption of water and energy, minimize waste, or protect and restore ecosystems. This type of employment also includes jobs in which workers are employed to research, develop, maintain, or use technologies and practices to reduce the environmental impact of their economic unit, or to train the unit's workers or contractors in these technologies and practices. (ILO 2013d)

Employment-related income

Payments, in cash, in kind or in services, received by individuals, for themselves or in respect of their family members, as a result of their current or former involvement in paid or self-employment jobs. Employment-related income excludes income derived from other sources such as property, social assistance, transfers, etc., not related to employment. (ILO 1998)

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 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 2013c)

Green economy

An economy that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive. In a green economy, growth in income and employment should be driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. These investments need to be catalysed and supported by targeted public expenditure, policy reforms and regulation changes. The development path should maintain, enhance and, where necessary, rebuild natural capital as a critical economic asset and as a source of public benefits, especially for poor people whose livelihoods and security depend on nature. (UNEP 2011)

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: (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 n.d.(g))

Green jobs (statistical definition)

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 2013a, ILO 2013d)

Green work

All work (as defined below) involved in production of environmental goods and services. It includes employment, voluntary work and own-use production work to produce environmental goods and services. (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 Infrastructure

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

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 2013c)

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 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 2013c)

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.

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. (UNEP 2022b)

Nature-based enterprise

“An enterprise, engaged in economic activity, that uses nature sustainably as a core element of their 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 nature-based solutions. However it is not the expectation that everything these enterprises would qualify as NbS.

Nature-based Solutions

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. (UNEP 2022b)

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 2010)

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 2008)

Shades of green

Refers to the different degrees to which technologies, products, businesses, and business practices can be said to be green, ranging from reactive and remedial measures on the one hand to proactive measures on the other. The table below gives an indication of this graduation from more limited to more transformative approaches for selected segments of the economy. It could be beneficial to develop this concept further to support a more refined a policy analysis related to green jobs.

Shades of Green: Pro-ENVIRONMENTAL MEASURES IN MAJOR SEGMENTS OF THE ECONOMY

SEGMENT OF THE ECONOMY	PRO-ENVIRONMENT MEASURES
Energy Supply	<ul style="list-style-type: none"> Integrated gasification/carbon sequestration Co-generation (combined heat and power) Renewables (wind, solar, biofuels, geothermal, small-scale hydro); fuel cells
Transport	<ul style="list-style-type: none"> More fuel-efficient vehicles Hybrid-electric, electric, and fuel-cell vehicles Car sharing Public transit Non-motorized transport (biking, walking), and changes in land-use policies and settlement

SEGMENT OF THE ECONOMY	PRO-ENVIRONMENT MEASURES
Manufacturing	<ul style="list-style-type: none"> Pollution control (scrubbers and other tailpipe technologies) Energy and materials efficiency Clean production techniques (toxics avoidance) Cradle-to-cradle (closed-loop systems)
Building	<ul style="list-style-type: none"> Lighting, energy-efficient appliances and office equipment Solar heating/cooling, solar panels Retrofitting Green building (energy-efficient windows, insulation, building material, HVAC)
Materials Management	<ul style="list-style-type: none"> Recycling Extended producer responsibility/product take-back and remanufacturing De-materialization Durability and repairability of products
Retail	<ul style="list-style-type: none"> Promotion of efficient product/eco -labels Store locations closer to residential areas Minimization of shipping distances (from origin of products to store location) New service economy (selling services, not products)
Agriculture	<ul style="list-style-type: none"> Soil conservation Water efficiency Organic growing methods Reducing farm-to-market distance
Forestry	<ul style="list-style-type: none"> Reforestation and afforestation projects Agroforestry Sustainable forestry management and certification schemes Halting deforestation

(ILO, UNEP, ITUC, IOE, 2008)

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, UNEP, ITUC, IOE, 2008)

Skills development

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

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 2019c)

Subsistence foodstuff producers (or 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 production of "goods" (within the 2008 System of National Accounts 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 2013c)

Sustainable Infrastructure

Infrastructure systems and assets 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. (CBD 1992)

Unemployment

Persons in unemployment are defined as all those of working age who were not in employment (defined above), carried out activities to seek employment during a specified recent period and were currently available to take up employment given a job opportunity. (ILO 2013c)

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 2013c)

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 2008b)

References

- Africa Regenerative Agriculture Study Group. 2021. Regenerative Agriculture: An opportunity for businesses and society to restore degraded land in Africa.
- Ahearn, Ariell., Martin Oelz, and Rishabh Kumar Dhir. 2019. "Seeing Like the Herder: Climate Change and Pastoralists' Knowledge: Insights from Turkana Herders in Northern Kenya" In Indigenous Peoples and Climate Change: Emerging Research on Traditional Knowledge and Livelihoods. Geneva: ILO.
- Ajayi, Olu Clifford, Festus K. Akinnifesi, G. Sileshi, and W. Kanjipite. 2009. "Labour Inputs and Financial Profitability of Conventional and Agroforestry-Based Soil Fertility Management Practices in Zambia". *Agrekon* 48, no. 3 (2009): 276-292.
- Aleksynska, Mariya, Janine Berg, David Foden, Hannah Johnston, Agnès Parent-Thirion, and Julie Vanderleyden. 2019. Working Conditions in a Global Perspective. European Foundation for the Improvement of Living and Working Conditions (Eurofound).
- Armengot, Laura, Pietro Barbieri, Christian Andres, Joachim Milz, and Monika Schneider. 2016. "Cacao Agroforestry Systems Have Higher Return on Labor Compared to Full-Sun Monocultures". *Agronomy for Sustainable Development* 36, no. 4 (2016): 1-10.
- Banco de Guatemala. 2019. "Employment". <https://www.banguat.gob.gt/es/page/empleo>
- Boedeker, Wolfgang, Meriel Watts, Peter Clausing, and Emily Marquez. 2020. "The Global Distribution of Acute Unintentional Pesticide Poisoning: Estimations Based on a Systematic Review ". *BMC public health* 20, no. 1 (2020): 1-19.
- Boulanger, Pierre, Emanuele Ferrari, Alfredo Mainar Causapé, Martina Sartori, Mohammed Beshir, Kidanemariam Berhe Hailu, and Solomon Tsehay. 2019. Policy Options to Support the Rural Job Opportunity Creation Strategy in Ethiopia. Publications Office of the European Union, 2019.
- Brançalion, Pedro HS, Ludmila Pugliese de Siqueira, Nino T. Amazonas, Mayte B. Rizek, Alex F. Mendes, Edson L. Santiami, Ricardo Ribeiro Rodrigues et al. 2022. "Ecosystem Restoration Job Creation Potential in Brazil." *People and Nature*, 00, 1– 9.
- Breil, Margaretha, Marianne Zandersen, Petya Pishmisheva, Anders Branth Pedersen, Linda Romanovska, Ingrid Coninx, Magdalena Rogger, and Katie Johnson. 2021. 'Leaving No One Behind' in Climate Resilience

- Policy and Practice in Europe. Overview of knowledge and Practice for Just Resilience. European Topic Centre on Climate Change impacts, Vulnerability and Adaptation (ETC/CCA), Bologna.
- CBD (United Nations Convention on Biological Diversity). 1992. Article 2. Use of Terms.
- . 2014. Decision Adopted by the Conference of the Parties to the Convention on Biological Diversity. COP 12 Decision XII/5 Biodiversity for poverty eradication and sustainable development.
- . 2019a. Outreach into Sectors. Integrating Ecosystem-Based Approaches to Climate Change Adaptation and Disaster Risk Reduction. Secretariat of the Convention on Biological Diversity, Montreal.
- . 2019b. Voluntary Guidelines for the Design and Effective Implementation of Ecosystem-Based Approaches to Climate Change Adaptation and Disaster Risk Reduction and Supplementary Information. Technical Series No. 93. Montreal.
- . n.d.(a). "Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets". <https://www.cbd.int/sp/>
- . n.d.(b). "Preparations for the Post-2020 Biodiversity Framework". <https://www.cbd.int/conferences/post2020>
- Chianese, Francesca. 2016. The Traditional Knowledge Advantage: Indigenous Peoples' Knowledge in Climate Change Adaptation and Mitigation Strategies. IFAD Advantage Series. Rome: IFAD.
- Cohen-Shacham, Emmanuelle, Gretchen Walters, Christine Janzen, and Stewart Maginnis, eds. 2016. Nature-Based Solutions to Address Global Societal Challenges. Gland: IUCN.
- Commonwealth Secretariat. 2021. Accelerating Financing for Nature-based Solutions to Support Action Across the Rio Conventions. Commonwealth Secretariat, London.
- Conservation International. 2022. Global Green-Gray Community of Practice.
- Costella, Cecilia, Anna McCord, Maarten van Aalst, Rebecca Holmes, Jonathan Ammoun, and Valentina Barca. 2021. "Social Protection and Climate Change: Scaling up Ambition." Social Protection Approaches to COVID-19 Expert Advice Service (SPACE), DAI Global UK Ltd, United Kingdom.
- Cull, Michelle. 2020. "Value Beyond Money: Australia's Special Dependence on Volunteer Firefighters, the Conversation". The Conversation. 22 January 2020.
- Dasgupta, Partha. 2021. The Economics of Biodiversity: The Dasgupta Review. London: HM Treasury.
- Edwards, Peter, Ariana Sutton-Grier, and G.E. Coyle. 2013. "Investing in Nature: Restoring Coastal Habitat Blue Infrastructure and Green Job Creation", Marine Policy, Volume 38, 2013, Pages 65–71, ISSN 0308-597X. <https://doi.org/10.1016/j.marpol.2012.05.020>
- Engin, E. Murat. 2018. Bipartite, Tripartite, Tripartite-Plus Social Dialogue

- Mechanisms and Best Practices in the EU Member States. ILO.
- Eskander, Shaikh, Paul Steele, Mamunur Rashid, Nuzhat Imam, and Sirazoom Munira. 2022. "Still Bearing the Burden: How Poor Rural Women in Bangladesh Are Paying Most for Climate Risks". IIED Working Paper, IIED, London.
- European Commission. 2022. The Vital Role of Nature-Based Solutions in a Nature Positive Economy. European Commission.
- European Commission. n.d. "A European Green Deal". https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
- European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. 2017. User Guide to the SME Definition. Publications Office.
- European Commission, Directorate-General for Research and Innovation. 2022. The vital role of Nature-Based Solutions in a Nature Positive Economy. European Commission, Brussels.
- European Union. 2013. European System of Accounts: ESA 2010. Luxembourg: Publications Office of the European Union.
- European Union, FAO, UN-Habitat, ILO, OECD, and World Bank. 2021. Applying the Degree of Urbanisation: A Methodological Manual to Define Cities, Towns and Rural Areas for International Comparisons (2021 Edition).
- Eurostat. 2022. "Employees by Sex, Age and Economic Activity (From 2008 Onwards, NACE Rev. 2)", Eurostat database. Accessed 30 November 2022.
- Expanded Public Works Programme Head Office. 2018. Expanded Public Works Programme, South Africa.
- Inserm (French National Institute for Health and Medical Research). 2022. Effects of pesticides on health: New data. Summary. Collection Expertise collective. Montrouge: EDP Sciences.
- FAO (Food and Agriculture Organization of the United Nations). 2002. The State of Food Insecurity in the World 2001. Rome.
- FAO/WHO Codex Alimentarius Commission. 1999. Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods.
- Ferrer Márquez, Antonio, Begoña Maria-Tomé Gil, and Olga López Maeztu. 2019. The Contribution of Social Dialogue to the 2030 Agenda - Promoting a Just Transition Towards Sustainable Economies and Societies for All. Research Paper 2019 1. TUDCN.
- Finley, Lynn, M. Jahi Chappell, Paul Thiers, and James Roy Moore. 2018. "Does Organic Farming Present Greater Opportunities for Employment and Community Development Than Conventional Farming? A Survey-Based Investigation in California and Washington". *Agroecology and Sustainable Food Systems*, 42:5, 552-572
- FONAFIFO (Fondo Nacional de Financiamiento Forestal). 2022. Estadísticas de PSA. <https://www.fonafifo.go.cr/es/servicios/estadisticas-de-psa>

- FPP (Forest Peoples Programme) and IPRI (Indigenous Peoples' Rights International). 2022. Taking Stock: A Rapid Review and Critical Analysis of UNFCCC COP26 Outcomes and Potential Implications for Indigenous Peoples' Rights. FPP and IPRI.
- France, Ministère de la Transition écologique et solidaire. 2018. Le plan national d'adaptation au changement climatique (PNACC-2).
- France, Office international de l'eau. 2020. 'Restauration fonctionnelle de la vallée de Saint Ruph-Glière-Eau Morte (74)'.
- Friends of the Earth International (FOEI). 2021. Nature Based Solutions: A Wolf in Sheep's Clothing. FOEI.
- Gann, George D., Tein McDonald, Bethanie Walder, James Aronson, Cara R. Nelson, Justin Jonson, James G. Hallett et al. 2019. "International Principles and Standards for the Practice of Ecological Restoration". *Restoration Ecology*. 27 (S1): S1-S46. 27, no. S1 (2019): S1-S46.
- Garrett-Peltier, Heidi. 2017. "Green Versus Brown: Comparing the Employment Impacts of Energy Efficiency, Renewable Energy, and Fossil Fuels Using an Input-Output Model". *Economic Modelling* 61 (2017): 439-447.
- GCA (Global Commission on Adaptation). 2019. *Adapt Now: A Global Call for Leadership on Climate Resilience*. Rotterdam.
- Gobierno de la República del Ecuador. 2022. Socio Bosque. <https://sociobosque.ambiente.gob.ec/>
- Government of Spain. 2020. *Just Transition Strategy*.
- Györi, Mario, Katharina Diekmann, and Elena Kühne. 2021. *The Importance of Social Protection for Climate Change Mitigation in LMICS: Success Stories and Opportunities for the Future*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Bonn.
- Hagedoorn, Liselotte C., Mark J. Koetse, Pieter JH van Beukering, and Luke M. Brander. 2021. "Reducing the Finance Gap for Nature-Based Solutions With Time Contributions". *Ecosystem Services*, 52, p. 101371.
- Herweijer, Celine, Will Evison, Samra Mariam, Akanksha Khatri, Marco Albani, Alexia Semov, Euan Long. 2020. *Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy*. New Nature Economy series, World Economic Forum.
- Howard, Pippa, Tom Stevens, Nicky Jenner, José Rubio, Thomas Maddox, Robin Smale, and James Newland. 2021. *Forest-Smart Mining: Guidance to Applying Nature-Based Solutions in the Large-Scale Mining Sector* (English). 171290. Washington, D.C.: World Bank Group.
- IISD (International Institute for Sustainable Development). 2019. "Second Bonn Challenge Barometer Report Highlights Forest Restoration Co-benefits, Lessons Learned". 23 July 2019. *SDG Knowledge Hub – A project by IISD*.

- ILO (International Labour Organization). 1989. Indigenous and Tribal Peoples Convention. No. 169.
- . 1949. C095 – Protection of Wages Convention, 1949 (No. 95).
- . 1973. Resolution concerning an integrated system of wages statistics. 12th International Conference of Labour Statisticians.
- . 1998. Resolution concerning the measurement of employment-related income. 16th International Conference of Labour Statisticians.
- . 1999. Report of the Director-General: Decent Work. Geneva: International Labour Conference.
- . 2000. Safety and health in agriculture.
- . 2001a. Convention C184 – Safety and Health in Agriculture Convention.
- . 2001b. Recommendation R192 – Safety and Health in Agriculture Recommendation.
- . 2008a. “Measurement of Decent Work: Discussion Paper for the Tripartite Meeting of Experts on the Measurement of Decent Work”.
- . 2008b. Resolution concerning the measurement of working time. 18th International Conference of Labour Statisticians.
- . 2010. International Standard Classification of Occupations. <https://www.ilo.org/public/english/bureau/stat/isco/>
- . 2011. Local Investments for Climate Change Adaptation: Green Jobs Through Green Works. ILO Regional Office for Asia and the Pacific, Bangkok.
- . 2013a. Decent work indicators: guidelines for producers and users of statistical and legal framework indicators.
- . 2013b. Understanding the Indigenous and Tribal People Convention, 1989 (No. 169): handbook for ILO Tripartite constituents.
- . 2013c. Resolution concerning statistics of work, employment and labour underutilization. 19th International Conference of Labour Statisticians.
- . 2013d. Guidelines concerning a statistical definition of employment in the environmental sector.
- . 2013e. Proposals for the statistical definition and measurement of green jobs. 19th International Conference of Labour Statisticians.
- . 2013f. Resolution concerning sustainable development, decent work and green jobs. General Conference of the International Labour Organization at its 102nd session.
- . 2015. Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for all.
- . 2016. “What Is a Green Job?”. http://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm
- . 2017a. Green Initiative Policy Brief: Indigenous Peoples and Climate Change: From Victims to Agents of Change through Decent Work.
- . 2017b. “Gender, Labour and a Just Transition Towards Environmentally Sustainable Economies and Societies for All”.

- https://www.ilo.org/global/topics/equality-and-discrimination/publications/WCMS_592348/lang--en/index.htm
- . 2017c. How to Measure and Model Social and Employment Outcomes of Climate and Sustainable Development Policies. Greening with jobs the Green Jobs Programme. GAIN (Green Jobs Assessment Institutions Network) Training guidebook.
- . 2018a. World Employment and Social Outlook 2018: Greening with jobs.
- . 2018b. Resolution concerning statistics on work relationships.
- . 2018c. Rural-urban labour statistics.
- . 2019a. Skills for a Greener Future: A Global View.
- . 2019b. Report of the Committee of Experts on the Application of Conventions and Recommendations. International Labour Conference 108th session, report 3, part A (2019).
- . 2019c. Skills for a Greener Future: A Global View.
- . 2021a. “Press release: UN Secretary-General calls for accelerated action on jobs and social protection”. 28 September 2021. https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_821167/lang--en/index.htm
- . 2021b. The Contribution of Social Dialogue to Gender Equality. The Global Deal for Decent Work and Inclusive Growth Thematic Brief.
- . 2021c. World Employment and Social Outlook: Trends 2021.
- . 2022a. Just Transition: An Essential Pathway to Achieving Gender Equality and Social Justice. UNFCCC Submission in Response to Mandate Table 4, D.5, Annex to 3/CP.25. ILO.
- . 2022b. ILO 1998 Declaration on Fundamental Principles and Rights at Work and its Follow-up. ILO. 2022. A safe and healthy working environment is a fundamental principle and right at work. Brochure.
- . 2022c. World Employment and Social Outlook: Trends 2022. Report.
- . 2022d. ILO Monitor on the World of Work. Ninth edition.
- . 2022e. Decent Work Deficits Among Rural Workers.
- . 2022c. Social Dialogue Report 2022: Collective Bargaining for an Inclusive, Sustainable and Resilient Recovery. Report.
- . n.d.(a) “Decent work”. <https://www.ilo.org/global/topics/decent-work/lang--en/index.htm>
- . n.d.(b). Final conference on the ILO-EU project “Monitoring and Assessing Progress on Decent Work”. https://www.ilo.org/brussels/meetings-and-events/WCMS_227487/lang--en/index.htm
- . n.d.(c). “Informal Economy”. <https://www.ilo.org/global/topics/dw4sd/themes/informal-economy/lang--en/index.htm>
- . n.d.(d). “Conventions and Recommendations”. <https://www.ilo.org/global/standards/introduction-to-international-labour-standards/conventions-and-recommendations/lang--en/index.htm>
- . n.d.(e) “Employment by sex and economic activity – ISIC level 2 (thousands) | Annual”, ILOSTAT database. Accessed 30 November 2022.

- . n.d.(f). “18th International Conference of Labour Statisticians, 2008”. <https://ilostat.ilo.org/about/standards/icls/icls-documents/#icls18>
- . n.d.(g). “What is a green job?”. https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm
- ILO, UNEP, ITUC, IOE. 2008. Green Jobs: Towards decent work in a sustainable, low-carbon world.
- India, Ministry of Rural Development. 2022. Employment Generated during the year 2021–2022. https://mnregaweb4.nic.in/netnrega/citizen_html/demregister.aspx?lflag=eng&fin_year=2021-2022&source=national&labels=labels&Digest=HNrisV4bhHnb7Gve3mAKYQ
- Instituto para la Transición Justa. 2022. Spain, towards a just energy transition. Executive report.
- IOC (Intergovernmental Oceanographic Commission). 2019. United Nations Decade of Ocean Science for Sustainable Development (2021–2030): Update on Preparations, Call for a Review of Draft Implementation Plan and for Joining the Global Ocean Decade Alliance. IOC Circular Letter. IOC/CL-2798.
- IOE (International Organisation of Employers). 2020. “Make transitions work: climate change and employment”. Policy Paper.
- . 2022. Guidance report on climate change, employment and just transition.
- IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services). 2019. Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. 1148 pages.
- IPCC (Intergovernmental Panel on Climate Change). 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability.
- . 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability.
- . 2018: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.
- ITUC (International Trade Union Confederation). 2021. “Social Justice Enables Climate Ambition: Unions Set Course for COP 26”. COP26 Frontline Briefing.
- IUCN (International Union for Conservation of Nature). 2016. “World Conservation Congress resolution 069, Defining Nature-based

- Solutions". WCC-2016-Res-069-EN.
- . 2020. Guidance for using the IUCN Global Standard for Nature-based Solutions: A user-friendly framework for the verification, design and scaling up of Nature-based Solutions. First edition. Gland, Switzerland: IUCN. ISBN: 978–2-8317–2061-6.
- . 2020a. IUCN Global Standard for Nature-based solutions. Gland, Switzerland. <https://doi.org/10.2305/IUCN.CH.2020.08.en>
- . 2020b. Guidance for using the IUCN Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of Nature-based Solutions. First edition. IUCN, Gland, Switzerland. <https://doi.org/10.2305/IUCN.CH.2020.09.en>
- . 2020. "Restoration Pledges". https://www.bonnchallenge.org/pledges?field_related_regions_target_id=11
- . 2021. Restoration Barometer Progress Tracking Protocol.
- . 2022a. "The Restoration Barometer". <https://www.iucn.org/resources/conservation-tool/restoration-barometer>
- . 2022b. IUCN Restoration Intervention Typology for Terrestrial Ecosystems. IUCN.
- IUCN World Conservation Congress. 2020. 073 - Promotion of the IUCN Global Standard for Nature-based Solutions.
- Jaeger, Joel, Ginette Walls, Ella Clarke, Juan-Carlos Altamirano, Arya Harsono, Helen Mountford, Sharan Burrow, Samantha Smith, and Alison Tate. 2021. "The Green Jobs Advantage: How Climate Friendly Investments are Better Job Creators". Working Paper. Washington, DC.
- JTRC (Just Transition Research Collaborative). 2018. Mapping Just Transition(s) to a Low-Carbon World. Geneva, Switzerland: UNRISD.
- JTRC (Just Transition Research Collaborative), Rosa-Luxemburg-Stiftung, and UNRISD (United Nations Research Institute for Social Development), eds. 2019. Climate Justice from Below: Local Struggles for Just Transition(s). Research Report. Erscheinungsort nicht ermittelbar: s.n.
- Keith, David A., Jose R. Ferrer-Paris, Emily Nicholson, and Richard Kingsford. 2020. IUCN Global Ecosystem Typology 2.0: Descriptive Profiles for Biomes and Ecosystem Functional Groups. Gland, Switzerland: IUCN.
- Kelmenson, Sophie, Todd BenDor, and T. William Lester. 2016. "The Economic Impacts of the US Ecological Restoration Sector". Federal Reserve Bank of Boston.
- Kooijman, Esmee D., Siobhan McQuaid, Mary-Lee Rhodes, Marcus J. Collier, and Francesco Pilla. 2021. "Innovating with Nature: From Nature-Based Solutions to Nature-Based Enterprises". Sustainability (13): 1263.
- KPMG, 2021. Building Resilience in Local Communities: The Well-Being Benefits of Participating in Landcare.
- Landcare Australia. 2021. Annual Report 2020/2021.
- Lieuw-Kie-Song, Maikel. 2009. "Green Jobs for the Poor, A public Employment Approach". Discussion Paper, United Nations

- Development Programme, New York.
- Lieuw-Kie-Song, Maikel. 2011. "Integrating Public Works and Cash Transfers in Ethiopia: Implications for Social Protection, Employment and Decent Work". Working Paper, International Policy Centre for Inclusive Growth (IPC-IG).
- Lieuw-Kie-Song, Maikel, and Vanessa Pérez-Cirera. 2020. Nature Hires: How Nature-Based Solutions Can Power a Green Jobs Recovery. Joint ILO WWF Publication, Gland Switzerland.
- Lieuw-Kie-Song, Maikel, Patricia Richter, Monica Marino and Fernando Messineo Libano. 2020. Employment Effects in Impact Investments: Key Insights Emerging Across Studies in Tanzania and in Zimbabwe. AATIF Employment Effect Studies, ILO Geneva.
- Liu, Zhen, Qiuming Li, Jing Lan, and Assem Abu Hatab. 2020. "Does participation in the sloping land conversion program reduce the sensitivity of Chinese farmers to climate change?". *Land Use Policy* 99 (2020): 105021.
- McElwee, Pamela, Hue Thi Van Le, Tuyen Nghiem, and Huong Thi Dieu Vu. 2022. "The Challenges of Collective PES: Insights from Three Community-Based Models in Vietnam". *Ecosystem Services* 56 (2022): 101438.
- McQuaid, Siobhan, Esmee D. Kooijman, Mary-Lee Rhodes, and Sheila M. Cannon. 2021. "Innovating with Nature: Factors Influencing the Success of Nature-Based Enterprises". *Sustainability* 13 (22). Multidisciplinary Digital Publishing Institute: 12488.
- MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act). n.d. Mahatma Gandhi National Rural Employment Guarantee Act 2005. https://nrega.nic.in/Nregahome/MGNREGA_new/Nrega_home.aspx
- Mexico, Secretaría de Bienestar. 2020. Programa Sembrando Vida. <http://www.gob.mx/bienestar/acciones-y-programas/programa-sembrando-vida>
- Mongabay. n.d. "Deforestation statistics for Guatemala". <https://rainforests.mongabay.com/deforestation/archive/Guatemala.htm>
- Morrison. 2021. "Joe Biden wants to revive FDR's Conservation Corps". *The Economist*.
- Mueller, Bernd. 2021, "Rural Youth Employment in Sub-Saharan Africa: Moving Away From Urban Myths and Towards Structural Policy Solutions". in *Is the Future Ready for Youth? Youth Employment Policies for Evolving Labour Markets*, Juan Chacaltana and Sukti Dasgupta Eds. 2021, ILO.
- Muradian, Roldan, Esteve Corbera, Unai Pascual, Nicolás Kosoy, and Peter H. May. 2010. "Reconciling Theory and Practice: An Alternative Conceptual Framework for Understanding Payments for Environmental Services". *Ecological Economics*, 69(6), 1202-1208.
- Mureithi, Stephen M., Ann Verdoodt, Jesse T. Njoka, Charles KK Gachene,

- and Eric Van Ranst. 2014. "Benefits Derived from Rehabilitating a Degraded Semi-Arid Rangeland in Communal Enclosures, Kenya". *Land Degradation & Development* 27, no. 8 (2016): 1853-1862.
- Nair, C.T.S. and Rebecca Rutt. 2009. "Creating Forestry Jobs to Boost the Economy and Build a Green Future". FAO.
- NAP Global Network. n.d. "Nature-based Solutions". <https://napglobalnetwork.org/themes/nature-based-solutions/>
- Nature-Based Solutions Initiative. 2022. "What are Nature-based Solutions?". <https://www.naturebasedsolutionsinitiative.org/what-are-nature-based-solutions>
- NDC Partnership. n.d. "About Us | NDC Partnership". <https://ndcpartnership.org/about-us>
- Nello, T., C. Enriquez and G. Putzeys. 2022. Restoration Barometer Measuring Progress in Guatemala. IUCN-ORMACC, San Jose, Costa Rica.
- New York State, Governors Office of Storm Recovery (GOSR). 2022. Living Breakwaters Project Background and Design.
- New Zealand, Ministry for the Environment. 2022. About Mahi mō te Taiao – Jobs for Nature, Ministry for the Environment.
- Noon, Monica L., Allie Goldstein, Juan Carlos Ledezma, Patrick R. Roehrdanz, Susan C. Cook-Patton, Seth A. Spawn-Lee, Timothy Maxwell Wright, et al. 2022. "Mapping the Irrecoverable Carbon in Earth's Ecosystems". *Nature Sustainability* 5 (1). Nature Publishing Group: 37–46.
- Norton, Andrew, Nathalie Seddon, Arun Agrawal, Clare Shakya, Nanki Kaur, and Ina Porras. 2020. "Harnessing Employment-Based Social Assistance Programmes to Scale Up Nature-Based Climate Action". *Philosophical Transactions of the Royal Society B*, Vol. 375, Issue 1794.
- O'Callaghan, Brian J., and Em Murdock. 2021. "Are We Building Back Better? Evidence from 2020 and Pathways for Inclusive Green Recovery Spending." UNEP.
- Oberč, B. P., and A. Arroyo Schnell. 2020. "Approaches to Sustainable Agriculture". Exploring the pathways towards the future of farming. Brussels, Belgium: IUCN EURO.
- Orsini, Stefano, Susanne Padel, and Nic Lampkin. 2018. "Labour use on organic farms: a review of research since 2000." *Organic farming* 4, no. 1 (2018): 7-15. DOI: 10.12924/of2018.04010007, ISSN: 2297-6485.
- Payen, J., and Maikel Lieuw-Kie-Song. 2020. "Desk Review Study on Employment Impact Assessment (EmplA) Potential of Natural Resource Management (NRM) Investments on Employment Creation." ILO Working Paper.
- Porras, Ina T, David N Barton, Miriam Miranda, and Adriana Chacón-Cascante. 2013. Learning from 20 Years of Payments for Ecosystem Services in Costa Rica. IIED.
- Qi, Jeffrey. 2021. How Timor-Leste Is Using the National Adaptation Plan (NAP) Process to Scale Up Ecosystem-Based Adaptation (EbA). IIED. Regional Observatory on Planning for Development in Latin America and

- the Caribbean. 2014. Plan Nacional de Desarrollo: K'atun Nuestra Guatemala 2032.
- Reid, Hannah, and Maikel Lieuw-Kie-Song. 2022. "Green Works to Support a Just Transition". ILO Publications, Geneva.
- Reid, Hannah, and Victor Orindi. 2018. Ecosystem-based approaches to adaptation: strengthening the evidence and informing policy. Research results from the Supporting Counties in Kenya to Mainstream Climate Change in Development and Access Climate Finance project, Kenya. Project report. IIED, London.
- Reid, Hannah, Emanuele Brancati, Monica Castillo, Moustapha Kamal Gueye, Marek Harsdorff, Jean-Louis Lambeau, Maikel Lieuw-Kie-Song, and Mito Tsukamoto. 2021. 'Jobs' in State and Trends in Adaptation Report 2021: How Adaptation can make Africa Safer, Greener and more Prosperous in a Warming World. Global Center on Adaptation, Rotterdam.
- Reid, Hannah, Xiaoting Hou-Jones, Ina Porras, Charlotte Hicks, Sylvia Wicander, Nathalie Seddon, Val Kapos, Ali Raza Rizvi, and Dilys Roe. 2019. Is ecosystem-based adaptation effective? Perceptions and lessons learned from 13 project sites. IIED Research Report. London: IIED.
- Republic of Uganda. 2016. National Biodiversity Strategy and Action Plan II (2015–2025).
- République Française. 2021. Offre des solutions d'adaptation fondées sur la Nature (SafN).
- Riamit, Kimaren Ole, and Doris Borna Mae Esteban. 2022. Nature-based Solutions: A Synopsis of Indigenous Peoples' Experiences, Gaps in Practice and Potential for Action. Lessons from case studies: Africa, Latin America and Asia. Tebtebba; ELATIA.
- Seddon, Nathalie, Sandeep Sengupta, María García-Espinosa, Irina Hauler, Dorothée Herr, and Ali Raza Rizvi. 2019. Nature-Based Solutions in Nationally Determined Contributions: Synthesis and Recommendations for Enhancing Climate Ambition and Action by 2020. Gland, Switzerland and Oxford, UK: IUCN and University of Oxford.
- Seddon, Nathalie, Elizabeth Daniels, Rowan Davis, Alexandre Chausson, Rian Harris, Xiaoting Hou-Jones, Saleemul Huq et al. 2020. "Global recognition of the importance of nature-based solutions to the impacts of climate change." *Global Sustainability* 3 (2020).
- Seddon, Nathalie, Alexandre Chausson, Pam Berry, Cécile A. J. Girardin, Alison Smith, and Beth Turner. 2020. "Understanding the Value and Limits of Nature-Based Solutions to Climate Change and Other Global Challenges". *Philosophical Transactions of the Royal Society B: Biological Sciences* 375 (1794). Royal Society: 20190120.
- Seddon, Nathalie, Alison Smith, Pete Smith, Isabel Key, Alexandre Chausson, Cécile Girardin, Jo House, Shilpi Srivastava, and Beth Turner. 2021.

- “Getting the Message Right on Nature-Based Solutions to Climate Change”. *Global Change Biology* 27 (8): 1518–1546.
- SEEA (United Nations System of Environmental Economic Accounting). n.d. <https://seea.un.org>
- Segeplán. 2014. Plan Nacional de Desarrollo. Plan Nacional de Desarrollo K’atun: nuestra Guatemala 2032. Secretaría de Planificación y Programación de la Presidencia, Guatemala City, Guatemala.
- SIFGUA (Sistema de información general de Guatemala). n.d.(a) PROBOSQUE. <https://www.sifgua.org.gt/SIFGUADData/PaginasEstadisticas/Recursos-forestales/probosque.aspx> Accessed 30 November 2022.
- . n.d.(b) PINPEP. <https://www.sifgua.org.gt/SIFGUADData/PaginasEstadisticas/Recursos-forestales/pinpep.aspx>. Accessed 30 November 2022
- South Africa, Department Forest, Fisheries and the Environment. n.d. Working for Water (WfW) programme | Department of Environmental Affairs.
- Spain, Ministerio para la Transición Ecológica y el reto demográfico. 2021. El Gobierno destina 144 millones a la restauración ambiental de zonas con minas de carbón en Asturias y Castilla y León. <https://www.miteco.gob.es/es/prensa/ultimas-noticias/el-gobierno-destina-144-millones-a-la-restauracion-ambiental-de-zonas-con-minas-de-carbon-en-asturias-y-castilla-y-leon/tcm:30-530253>
- Stenek, Vladimir, Richenda Connell, John Firth, and Michelle Colley. 2010. *Climate Risk and Business: Practical Methods for Assessing Risk*. IFC (International Finance Corporation).
- Stavis, Dimitris, Dunja Krause, and Edouard Morena. 2019. "Reclaiming the Role of Labour Environmentalism in Just Transitions". *International Union Rights* 26, no. 4 (2019): 3-4.
- . 2021. "Towards a Just Transition for All: Lessons from the Pandemic". *International Journal of Labour Research* 10 (1–2): 52-64.
- Terton, Anika, Christian Ledwell, and Shivanal Kumar. 2021. "How Fiji Is Using the National Adaptation Plan (NAP) Process to Scale Up Ecosystem-Based Adaptation (EbA)". Country Brief. NAP Global Network.
- Thomas, Catherine Cullinane, Christopher Huber, Kristin Skrabis, and Joshua Sidon. 2016. *Estimating the Economic Impacts of Ecosystem Restoration: Methods and Case Studies*. US Department of the Interior, US Geological Survey.
- Timmermann, Cristian, and Georges F. Félix. 2015. "Agroecology as a Vehicle for Contributive Justice". *Agriculture and Human Values* 32 (3): 523–538.
- Tour du Valat, Research Institute for the Conservation of Mediterranean Wetlands. 2022. *Adaptive Restoration of the Former Saltworks in Camargue, Southern France – English*. Case Study.
- Tugendhat, Helen. 2021. *Re-thinking nature-based solutions: seeking transformative change through culture and rights: A briefing for the*

- post-2020 Global Biodiversity Framework.
- Uchida, E., Xu, J., Rozelle, S. 2005. Grain for Green: Cost-Effectiveness and Sustainability of China's Conservation Set-Aside Program. *Land Economics* vol. 81, issue 2, 247-264 <https://doi.org/10.3368/le.81.2.247>
- UNDP (United Nations Development Programme). 2019. Pathway for Increasing Nature-based Solutions in NDCs: A Seven-Step Approach for Enhancing Nationally Determined Contributions through Nature-based Solutions. UNDP, New York.
- UNDP. n.d. Our Donors and Partners. UNDP Climate Promise. <https://climatepromise.undp.org/what-we-do/our-donors-and-partners>
- UNDRR (United Nations Office for Disaster Risk Reduction). 2020. Progress Report on the Implementation of the UN Plan of Action on DRR for Resilience. UNDRR, Geneva.
- . 2021. Nature-based Solutions for Disaster Risk Reduction: Words into Action. UNDRR, Geneva.
- UNEP (United Nations Environment Programme). 2011. Towards a Green Economy Pathways to Sustainable Development and Poverty Eradication.
- . 2017. "Indigenous Peoples: The Unsung Heroes of Conservation". UNEP.
- . 2021a. International Good Practice Principles for Sustainable Infrastructure. UNEP, Nairobi.
- . 2021b. Becoming #GenerationRestoration: Ecosystem Restoration for People, Nature and Climate. Nairobi.
- . 2021c. State of Finance for Nature 2021. Nairobi.
- . 2021d. International Good Practice Principles for Sustainable Infrastructure.
- . 2022a. Nature-Based Solutions for Supporting Sustainable Development. UNEP/EA.5/Res.5. Resolution adopted by the United Nations Environment Assembly on 2 March 2022.
- . 2022b. Sustainable and Resilient Infrastructure. UNEP/EA.5/Res.9. Resolution adopted by the United Nations Environment Assembly on 2 March 2022.
- UNEP and IUCN (International Union for Conservation of Nature). 2021. Nature-based Solutions for Climate Change Mitigation. Nairobi and Gland.
- UNESCO and UNESCO Institute for Statistics. 2012. International Standard Classification of Education (ISCED) 2011. Montreal, Quebec.
- UNFCCC (United Nations Framework Convention on Climate Change). 2016. Just Transition of the Workforce, and the Creation of Decent Work and Quality Jobs. Technical paper. UNFCCC, Bonn.
- . 2021a. Glasgow Climate Pact. Draft decision -/CMA.3. FCCC/PA/CMA/2021/L.16.
- . 2021b. Nationally Determined Contributions Under the Paris Agreement. FCCC/PA/CMA/2021/8/Rev.1. Revised synthesis report by

- the secretariat.
- UN (United Nations). 1997. Glossary of Environment Statistics, Studies in Methods. Series F, No. 67. New York: United Nations.
- . 2008. International Standard Industrial Classification of All Economic Activities (ISIC), Rev.4. United Nations. New York.
- . 2015. Paris Agreement.
- . 2021a. Secretary-General's Policy Brief: Investing in Jobs and Social Protection for Poverty Eradication and a Sustainable Recovery. United Nations.
- . 2021b. System of Environmental-Economic Accounting: Ecosystem Accounting, white cover version prior to official editing. United Nations.
- . 2022. Introduction to ISIC. <https://unstats.un.org/unsd/classifications/Econ/isis>
- . n.d. "The 17 Goals". <https://sdgs.un.org/goals>
- United Nations, European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, and The World Bank. 2014. System of Environmental-Economic Accounting 2012: Central Framework.
- US National Park Service. 2022. National Volunteer Week (U.S. National Park Service). <https://www.nps.gov/getinvolved/national-volunteer-week.htm>
- Veit, Peter and Katie Reytar. 2017. "By the Numbers: Indigenous and Community Land Rights". World Resources Institute (WRI). 20 March 2017.
- Vivid Economics. 2021. Fund Nature, Fund the Future. London.
- WEDO (Asia Pacific Forum on Women, Law and Development, Women's Environment and Development Organization), The Africa Women's Development and Communication Network, and FOS Feminista. 2022. Toward a Gender-Transformative Agenda for Climate and Environmental Action.
- World Economic Forum. 2020a. The Future of Nature and Business, Geneva. Available at: [WEF_The_Future_Of_Nature_And_Business_2020.pdf](https://www.weforum.org/reports/the-future-of-nature-and-business-2020) (weforum.org)
- . 2020b. New Nature Economy Report II: The Future Of Nature And Business. World Economic Forum.
- Weller, Jürgen, Gerhard Reinecke, and Carina Lupica. 2016. Recent Improvements and Persistent Gaps in Rural Employment. Santiago: United Nations.
- Wetlands International. 2009. The Global Peatland CO2 Picture. Draft.
- Willer, Helga, Jan Trávníček, Claudia Meier, and Bernhard Schlatter. 2022. The World of Organic Agriculture: Statistics and Emerging Trends 2022. Bonn: Research Institute of Organic Agriculture (FiBL), Frick, and IFOAM – Organics International.

- World Bank. 2008. Social Dimensions of Climate Change. Workshop report 2018.
- . 2022. Ethiopia Rural Productive Safety Net Project. World Bank. <https://projects.worldbank.org/en/projects-operations/project-detail/P163438>.
- Wunder, Sven. 2015. "Revisiting the Concept of Payments for Environmental Services". *Ecological economics* 117 (2015): 234-243.
- WWAP (United Nations World Water Assessment Programme)/UN-Water. 2018. The United Nations World Water Development Report 2018: Nature-Based Solutions for Water. Paris, UNESCO.

AP

PEN

DI

CES



Appendix 1

Report of key findings from the stakeholder survey on decent work in Nature-based Solutions

Summary

The UN Secretary-General's Climate Action Summit in 2019 and most recently the United Nations Framework Convention on Climate Change (UNFCCC) have placed decent work and Nature-based Solutions (NbS)¹ at the forefront of sustainable development ambitions. NbS cut across the three Rio Conventions and are central to achieving the Sustainable Development Goals (SDGs). In addition, implementing NbS presents important challenges and opportunities for certain sectors of the economy. A shift to environmentally sustainable economies will involve transition for workers and enterprises in these sectors, emphasizing the importance of ensuring a just transition.

Recognizing that shift and the resulting transition for workers and enterprises, the ILO adopted the [Guidelines for a Just Transition](#) in 2015. They are both a policy framework and a practical tool to help countries at all levels of development manage the transition to environmentally sustainable economies; the Guidelines can also help countries achieve their Nationally Determined Contributions (NDC), National Adaptation Plans and the 2030 SDGs.

¹ The UN Definition of NbS (contained in a resolution on NbS passed at the UN environment Assembly in March 2022) defines NbS 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 well-being, ecosystem services and resilience and biodiversity benefits”.

Despite existing literature on the subject of jobs in NbS, there is presently no systematic, long-term effort to analyse, model, forecast and track the quantity and decent work dimension of jobs generated by investments in NbS or to monitor unpaid forms of work in NbS. The International Labour Organization (ILO), the United Nations Environment Programme (UNEP) and International Union for Conservation of Nature (IUCN) are co-leading the publication of a global biennial report series on decent work in NbS, in collaboration with other partners, with the aim to fill this knowledge and advocacy gap.

The first ILO-UNEP-IUCN report on decent work in NbS contains a chapter (Chapter 4) that seeks to propose a conceptual framework for defining and measuring decent work outcomes of NbS. To support the development of the framework, a survey of stakeholders was carried out during the period May–June 2022. The objective of the survey was to help understand key policy questions and concerns, as well as types of information and statistical data that could be used for policy research as well as planning, implementation, and monitoring of employment, decent work and enterprise development in NbS resulting from NbS activities in terms of direct, indirect and induced employment and decent work creation.

This report presents the key findings from the survey according to the three main sections of the survey: (1) information about the respondent and their organization, (2) policy priorities and interests, and (3) information and data needs. Some of the report highlights are presented here.

Most of the respondents are senior managers or those working in policy design and implementation, research or project delivery. They usually work either in a national government department or agency, research or educational institution, or an environmental non-governmental organization (NGO). The focus of the respondents' organizations is mostly on environmental management, restoration and conservation, including NbS and government and community services with a regional focus on Sub-Saharan Africa or Western Europe, Eastern and Central Europe, USA, Canada, Australia, and New Zealand. The most-cited policy areas or frameworks that best reflect the main entry points to the issues related to decent work in NbS are the SDGs and sustainable development, climate change mitigation and adaptation, NbS, just transition and green jobs, and decent work.

The majority of the respondents' organizations have either moderately high or moderate involvement in both decent work and just transition policy matters, and NbS policy issues. In addition, there is relatively high interest overall in all topics related to decent work and just transition policy matters, with the most-cited topics being employment creation, skills development, and social dialogue. Similarly, for NbS topics, there is relatively high interest in

all listed topics, with the highest being in: NbS community and stakeholder engagement; NbS and employment, income, and livelihoods; and NbS by ecosystem type. The geographical scope of the work of the respondents' organizations is mostly at the country level.

The most common uses of data and information among the respondents are communicating trends and performance to external stakeholders, internal reporting and key performance indicators, and scenario analysis and projections. Overall, all ten topic areas presented related to decent work and/or Nature-based Solutions surveyed are of relevance for the data needs of the vast majority of the respondents.

The most relevant category related to **“Employment/Forms of work”** for the data needs of the respondents is employment. Regarding data needs related to **“Decent work”**, respondents mostly selected employment opportunities; adequate earnings and productive work, safe work environment; and equal opportunity and treatment in employment. On the topic of **“Income and livelihoods”**, the preferred category is wages and salaries, followed by household income and consumption.

Regarding the topic of **“Economic production”**, the categories of productivity and value-added are among the most relevant for the data needs of the respondents. The most-cited data needs in relation to **“Enterprise development”** are on the topics of sustainable enterprise development and/or enterprise development in NbS, followed by occupational employment and skills needs.

Considering the topic of **“Environmental outcomes and sustainability of outcomes”**, environmental, social and economic sustainability of outcomes of policy interventions, investments, etc. are the most relevant in terms of data needs. Among the listed topics related to **“Environmental activities”**, the most relevant for the respondents' data needs are expenditure on environmental protection and restoration, and distributional impacts related to costs and benefits of environmental activities.

Regarding the topic of **“Social data, including gender, Indigenous and youth statistics”**, women and gender statistics are highly relevant, as are population data, followed by data on income inequality and education. Among the **“Governance-related data”** topics, “legislative measures” is the most relevant.

Broad, non-exhaustive categories of the types of data or information concerning **“Finance and investment”** in support of decent work and Nature-based Solutions of most importance to respondents provided valuable insights. These included categories of NbS financing ecosystem actors (including regulators and capital providers); demand, supply and use of funds (e.g.

available investment options and according to type of NbS-aligned activity, green finance availability, activities financed, and geographical distribution); the cost of funds (cost of action and inaction); financing conditions; and impacts of the funds and the efficiency of their use in addressing decent work deficits and other sustainable development goals.

Furthermore, all ten of the above-mentioned key information topics related to decent work and/or NbS are characterized as having data or indicator gaps according to the survey respondents. The topic of environmental outcomes and sustainability of outcomes was the highest ranked. More than half of the respondents find data and indicators gaps related to social data, including gender, Indigenous and youth statistics, and governance-related data. Slightly less than half of the respondents reported data gaps in employment/forms of work, decent work, finance and investments. The least cited topic is economic production.

Contents

Summary	266
Acknowledgements	271
Introduction	272
Survey objectives and scope	273
Methodology	274
Questionnaire development	275
Survey participant selection/sample development.....	276
Data collection and analysis.....	277
Limitations and challenges.....	278
Survey results.....	278
Summary of survey results.....	278
1. Information about the respondent and their organization	279
2. Policy priorities and interests.....	279
3. Information and data needs.....	280
Detailed analysis of survey results.....	282
1. Information about the respondent and their organization.....	282
2. Policy priorities and interests.....	287
3. Information and data needs.....	293
Conclusion	311
Annex A.1 Number of survey participants by country	312
Annex A.2 Links to relevant reports and information on decent work and/or Nature-based Solutions.....	313

Acknowledgements

We wish to gratefully acknowledge the survey participants from different world regions who provided insightful survey responses based on their unique perspectives as selected stakeholders engaged in – or with an interest in – decent work and/or Nature-based Solutions.

The global ILO-UNEP-IUCN stakeholder survey on decent work in Nature-based Solutions survey was organized and coordinated by Monica Castillo, Senior Green Jobs Technical Specialist, Green Jobs Programme, International Labour Organization (ILO), with the support of different collaborators whose valuable contributions are duly recognized.

This report of key findings on the stakeholder survey on decent work in Nature-based Solutions was prepared and reviewed by a small team. Devora Levakova (Researcher and Data Analyst, ILO consultant) prepared sections of the methodology section on data collection and analysis and limitations and challenges as well as the main body of the report containing the survey results of the survey respondents. Monica Castillo supervised the preparation of the report and prepared report sections on survey objectives and scope, and sections on the methodology (questionnaire and survey participant selection/sample development) and co-authored the introduction with Maikel Lieuw-Kie-Song (Expert in Employment-intensive Investments, DEVINVEST, ILO). Leander Raes (Economist, International Union for Conservation of Nature) and Dominic MacCormack (Sustainable Infrastructure Investment Team, Economic and Trade Policy Unit, UN Environment Programme, UNEP) provided inputs for the analysis of responses to the question regarding NbS topics/areas of most interest to the respondent's organization. Ekaterina Chubarova (ILO Green Jobs Programme) analysed the responses related to the question concerning finance and investment for decent work in NbS.

Carl Obst, Director of the Institute for Development of Environmental-Economic Accounting (IDEEA Group), prepared the survey questionnaire and provided valuable inputs to the survey report. The questionnaire received inputs from members of the core report team of the *Decent work in Nature-based Solutions report*, including Monica Castillo (ILO), Juha Siikamäki (Chief Economist, International Union for Conservation of Nature), Maikel Lieuw-Kie-Song (ILO), and Rowan Palmer (Lead, Sustainable Infrastructure Investment Team, Economic and Trade Policy Unit, UN Environment Programme). Valentina Poggio (Translator, ILO consultant) provided translation services on the questionnaire from English to Spanish, while Brigitte Macé (Translator, ILO) translated the questionnaire to French.

The organization of the survey sample received support from various core report team members and other officials, including Maikel Lieuw-Kie-Song (ILO) and Dominic MacCormack (UNEP). Devora Levakova (ILO) was responsible for uploading and formatting the surveys in three languages in SurveyMonkey, as well as monitoring data collection.

Introduction

Nature-based Solutions (NbS)² have gained international attention since the UN Secretary-General's Climate Action Summit in 2019 and most recently in the context of the United Nations Framework Convention on Climate Change (UNFCCC). They cut across the three Rio Conventions and are central to achieving the Sustainable Development Goals (SDGs). Increased investment in NbS will have important implications for certain sectors of the economy, notably among workers and enterprises in those sectors.

Recognizing that a shift to environmentally sustainable economies will involve a transition for workers and enterprises, the ILO adopted the [Guidelines for a Just Transition](#) in 2015. They are both a policy framework and a practical tool to help countries at all levels of development manage the transition to environmentally sustainable economies, and they can also help them achieve their Nationally Determined Contributions (NDCs), National Adaptation Plans and the Sustainable Development Goals (SDGs). The Paris Agreement on climate change, adopted later in 2015, notes the imperatives of a just transition, with the objectives of ensuring that workers and firms affected by the transformation to carbon-neutral and resilient economies are adequately supported, and that opportunities for the creation of decent and green jobs are fully captured. NbS will form an integral part of such a transition, and it is therefore essential that employment implications are better understood and captured.

ILO, the United Nations Environment Programme (UNEP) and the International Union for Conservation of Nature (IUCN) are co-leading the publication of a global biennial report series on decent jobs and work in NbS,

² The UN Definition of NbS (contained in a resolution on NbS passed at the UN Environment Assembly in March 2022) defines NbS 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 well-being, ecosystem services and resilience and biodiversity benefits”.

in close collaboration with other partners, including the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), the UN Decade on Ecosystem Restoration Finance Task Force (led by the World Bank), and the Green Jobs Assessment Institutions Network (GAIN). This biennial report will address the knowledge gap regarding how investments in NbS can create decent work in support of a Just Transition towards environmentally sustainable economies and societies for all.

Much has already been published on the subject of jobs in NbS, including by ILO and the World Wildlife Fund (WWF), (e.g. [Nature Hires](#) in 2020), UNEP ([Green Recovery](#), 2021), and the [World Economic Forum \(2020\)](#). However, there is presently no systematic, long-term effort to analyse, model, forecast and track the quantity and decent work dimension of jobs generated by investments in NbS or to monitor unpaid forms of work in NbS. This report series aims to fill this knowledge and advocacy gap. In doing so, the series will gradually increase in depth and scope over time, as better data become available. Another gap is that most existing studies are focused on NbS across terrestrial ecosystems, while a systematic stock-take of green job opportunities in freshwater, marine and coastal ecosystems is lacking. This report aims to address this gap.

Survey objectives and scope

The ILO-UNEP-IUCN report on decent work in NbS contains a chapter (Chapter 4) that proposes a conceptual framework for defining and measuring decent work outcomes of NbS. To support the development of the framework as well as inform the development of the report, a survey of stakeholders was carried out during the period May–June 2022. The objective of the survey was to help understand key policy questions/concerns and types of information or data that could be used for policy research as well as planning, implementation, and monitoring of employment, decent work and enterprise development in NbS resulting from NbS activities in terms of direct, indirect and induced employment and decent work creation.

The survey targeted key NbS stakeholders, representing different world regions and population groups. The scope of the survey considered how the data collected on the basis of the conceptual framework are to be used (e.g., for reporting purposes, designing NbS, stakeholder engagement, investment prioritization, etc.) and what scale data will be required (e.g., project level, landscape scale,

national scale). There was an explicit intention to obtain information from stakeholders regarding the policy and information needs concerning potential at-risk population groups such as women, youth, and Indigenous populations, and to include such groups in the survey sampling frame. There was also the intention to cover a range of policy topics on decent work, just transition and NbS and related data/information topics that could appeal to different stakeholders and allow survey respondents the freedom to add additional information.

This report presents and analyses the results of the survey to inform the development of the conceptual framework in the ILO-UNEP-IUCN report on decent work in NbS, as well as to support the overall drafting of the report by providing a summary of the policy priorities and data needs of selected stakeholders with respect to decent work and NbS.

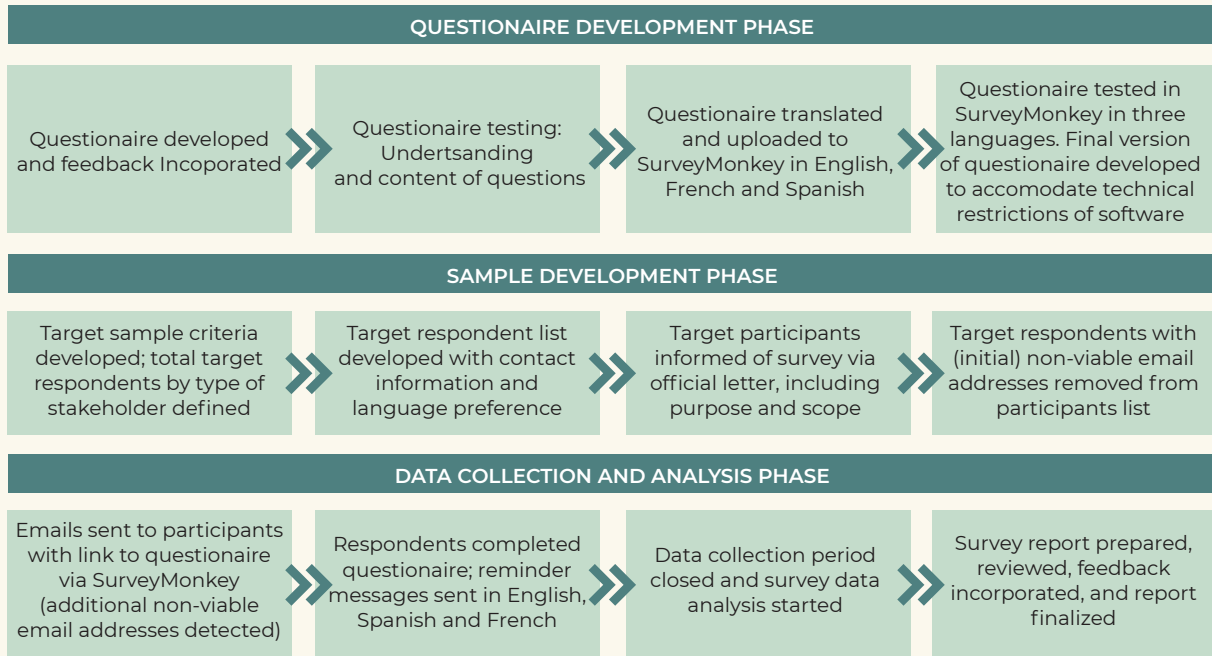
The report first presents the methodology used including the questionnaire design, survey participants sample selection, data collection and limitations/challenges faced. The survey results are then presented according to the three main sections of the survey: (1) information about the respondent and their organization, (2) policy priorities and interests, (3) information and data needs.

Methodology

The survey planning, implementation and analysis was carried out during the period May–June 2022. The survey was conducted in three languages (English, Spanish and French) using SurveyMonkey as the data collection software tool. This software facilitated the sending of questionnaires to selected survey participants via email and provided initial summary tabulations and graphs of responses for each survey question (jointly for the three languages) which had been formulated using both predefined and open-ended response categories.

The methodology consisted of three main phases as follows: (1) questionnaire development, (2) sample development, and (3) data collection and analysis. The overall survey development process is depicted in Figure 1.

Figure 1. Survey development process



Source: ILO

Questionnaire development

The questionnaire was developed according to the scope and objectives of the survey, as outlined in the section above. The survey's global coverage and broad range of stakeholders of different professional or work-related backgrounds within the realm of decent work and Nature-based Solutions was an equally important consideration in the development of the survey.

The introductory section of the questionnaire provided information regarding the responsible institutions (ILO, UNEP and IUCN) and the objectives of the survey, and explained why the respondent had been selected to participate. It contained definitions of three key reference concepts used in the survey, namely, decent work, Just Transition, and Nature-based Solutions. It provided information about the three main sections of the questionnaire, as follows:

1. *Information about the respondent* and their organization: seeking summary information about the respondent and their organization.
2. *Policy priorities and interests*: seeking to understand the respondent organization's entry point into the discussion of decent

work and Nature-based Solutions, its level of involvement with the policy issues, and its main priorities and areas of focus.

3. *Information and data needs*: seeking to identify the types of information and data about decent work and Nature-based Solutions that the respondent requires in their current role.

Respondents were given information about the types of question responses – that is, options from a predefined list and short written responses.

The survey contained a total of 27 questions and took each respondent on average 25 minutes to complete. The sets of predefined response categories were developed, wherever possible, according to international standard categories, for example, based on classifications used in policy or indicator frameworks (e.g., Just Transition, decent work and Nature-based Solutions) or abridged international statistical standard classifications (e.g., the International Standard Industrial Classification of All Economic Activities, ISIC). Open-ended response options allowed respondents to provide short written responses in their own words.

The questionnaire was cognitively tested, and the feedback was incorporated to improve the question formulation and the content. The questionnaire was then translated from English into Spanish and French and uploaded to the SurveyMonkey software. All three language versions were tested in the SurveyMonkey software to address any technical issues.

Survey participant selection/sample development

The sampling method involved a network sampling approach. Specifically, developing the list of target survey participants involved identifying the types of target groups of stakeholders whose contact details could be provided via professional networks of the core ILO-UNEP-IUCN team coordinating the report on decent work in Nature-based Solutions.

The types of target stakeholders included the following groups³:

- Workers' organizations
- Employers' organizations
- Ministries of Labour
- Ministries of Environment
- Ministries of Agriculture, Forestry and Fisheries
- Research community (including climate adaptation, green jobs assessment)
- Construction/infrastructure/public works
- Representatives of NbS engagement (including at national, subnational level, urban/rural and project/site level)
- Indigenous Peoples stakeholders
- Women stakeholders
- Volunteer workers
- Youth workers

A key objective of the sampling approach was to obtain contact and language information for a set of potential participants (including potential at-risk populations) from a range of countries in different world regions, particularly from developing countries.

Members of the core ILO-UNEP-IUCN team used professional networks to obtain contact information (email addresses) and language preferences (English, Spanish or French) for the targeted number of 200 potential survey participants. An official invitation letter was sent to the potential survey participants informing them that they had been selected to participate in the survey, of the survey's purpose, and confidentiality of the responses. The participants' contact information was uploaded to the SurveyMonkey software along with language preferences in order to receive the questionnaire in English, Spanish or French.

Data collection and analysis

The data collection took place in the period 12 May – 8 June 2022. It was administered via the online survey tool SurveyMonkey. In total, three reminders for the completion of the survey were sent to the English-speaking participants

³ While this was the target sampling population, the team was unable to obtain contact information for some of these groups which were, therefore, excluded from the final survey sample. Among those not explicitly included in the sample were representatives from Ministries of Agriculture, Forestry and Fisheries; volunteer workers; and youth workers. The results suggest that some of the topics represented by these groups (for example, agriculture, forestry and fishing or youth) were nonetheless of interest to actual survey respondents included in the survey sample.

who represented the biggest proportion of the respondents (70%). The Spanish (19%) and French-speaking (11%) respondents received two reminders due to technical issues that delayed sending the survey in these languages.

The survey was closed on the 8th of June and the analysis of the results and report writing took place in the period 9–23 June.

Limitations and challenges

Certain limitations/features of the Survey Monkey software imposed a slight adaptation of the original questionnaire, specifically questions 13–23, which were originally conceived as one multiple-choice question but had to be split into separate questions.

Similarly, given the specificities of the upload of the French and Spanish translations, the timeline for sending out these questionnaires had to be adjusted which slightly limited the time allotted to the French and Spanish speaking respondents. Nonetheless, response rates were quite good among these language groups as can be observed in the next section.

Survey results

The survey was sent to a total of 201 eligible survey participants⁴, and in total, 69 respondents fully or partially completed the survey, thus, yielding a response rate of 34%. These included 47 English-speaking participants (out of 141 eligible, or 33% response rate), 11 Spanish-speaking participants (out of 38 eligible, or 29% response rate), and 11 French-speaking (out of 22 eligible, or 50% response rate).

Summary of survey results

A summary of the survey results is presented below according to the three main sections of the survey: (1) Information about the respondent and their organization, (2) Policy priorities and interests, (3) Information and data needs.

⁴ Eligible survey participants refer here to those from the selected survey sample with a valid email address.

1. Information about the respondent and their organization

Just over half of the respondents are male. Most of the respondents are senior managers, followed by respondents working in policy design and implementation, research or project delivery. Most respondents work either in a national government department or agency, research or educational institution, or NGO with an environmental focus. A small proportion of the respondents represent workers' organizations/trade unions, Indigenous/First Nations group, local community, or gender equality/women's organizations. In terms of the sector the respondents' organization focuses on, the main ones are environmental management, restoration, and conservation, including NbS, and government and community services, while about a fifth of the respondents indicated that their organization focuses on all sectors. Most of the survey respondents' organizations' regional focus is on Sub-Saharan Africa or Western Europe, Eastern and Central Europe, USA, Canada, Australia, and New Zealand. Ten percent of the respondents represent an organization that focuses on all regions.

2. Policy priorities and interests

The most cited policy areas/frameworks best reflecting the respondents' organizations' main entry point to the issues related to decent work in NbS are the SDGs and sustainable development, climate change mitigation and adaptation, NbS, just transition and green jobs, and decent work. There is high focus also on ecosystem and landscape restoration, biodiversity conservation, sustainable enterprise development, and women/gender. Indigenous Peoples and First Nations, and humanitarian work represented the least cited policy topic entry points among the survey respondents.

The majority of the respondents' organizations have either moderately high or moderate involvement in decent work and just transition policy matters. In addition, there is overall relatively high interest in all topics related to decent work and just transition policy matters with the most cited topics being employment creation and skills development, and social dialogue. These are topics that were also reinforced by respondents when asked to provide additional details at the end of the survey.

Similar to decent work and just transition policy matters, most of the respondents' organizations have either moderately high or moderate involvement in Nature-based Solutions (NbS) policy issues. Likewise, when examining the NbS topics or areas of highest interest among the respondents' organizations, there is relatively

high interest in all listed topics with the highest being in NbS community and stakeholder engagement; NbS and employment, income, and livelihoods; and NbS by ecosystem type, followed by NbS policy influencing, and NbS-related activities (e.g., restoration) including costs and expenditures.

Regarding the geographical scale of greatest interest, the vast majority of the respondents' organizations focus on country level. This is followed by sub-national administrative areas (e.g., provincial, city-level); urban and rural areas; community/village level; regional (multiple country) level; and coastal and marine areas.

3. Information and data needs

The most common uses of data and information among the respondents are: communicating trends and performance to external stakeholders; internal reporting / key performance indicators; and scenario analysis and projections, with a relatively high proportion also using data for risk assessments. The least common use is for investment decision and trade-off assessment.

The most relevant category related to **“Employment/Forms of work”** for the data needs of the respondents is employment, reported by the vast majority of the respondents. Slightly more than a quarter of respondents consider all categories equally relevant for their data needs. The least relevant among the listed categories is unpaid trainee work.

The most relevant categories related to **“Decent work”** for the data needs of the respondents are: employment opportunities; adequate earnings and productive work; safe work environment; and equal opportunity and treatment in employment. Slightly more than a third of the respondents consider all categories equally relevant for their data needs. The least relevant category for the data needs among the survey respondents is work that should be abolished.

When considering the topic of **“Income and livelihoods”**, slightly less than half of the respondents indicated that all categories are of high relevance for their data needs. Among the preferred categories on this topic, wages and salaries ranked highest, followed by household income and consumption. Consumer prices are the least relevant.

Regarding the topic of **“Economic production”**, the categories of productivity and value added are among the most relevant for the data needs of the respondents, while asset ownership represents a topic of somewhat lesser importance. About a third of all respondents consider all topics as most relevant for their data needs.

Regarding **“Enterprise development”**, nearly half of the respondents consider sustainable enterprise development and/or enterprise development in NbS among the most relevant topics for their data needs, with slightly less than half

considering occupational employment and skills needs as among the most relevant. A quarter of respondents find all topics to be relevant for their data needs.

Considering the topic of **“Environmental outcomes and sustainability of outcomes”**, slightly less than half of the respondents find all topics presented relevant for their data needs. An equal proportion indicated environmental, social and economic sustainability of outcomes of policy interventions, investments, etc. as highly relevant.

All listed topics related to **“Environmental activities”** are considered relevant for the data needs of slightly less than half of the respondents. Among the listed topics, the most relevant for the respondents’ data needs are expenditure on environmental protection and restoration, and distributional impacts related to costs and benefits of environmental activities.

Regarding the topic of **“Social data, including gender, Indigenous and youth statistics”**, women and gender statistics are highly relevant for half of the respondents. Nearly half find population data among the most relevant, followed by data on income inequality and education. More than a third consider all listed social data to be among the most relevant for their data needs.

Among the **“Governance-related data”** topics, legislative measures are among the most relevant, as indicated by more than half of the respondents. More than a third of the respondents consider all topics to be relevant for their data needs. Results were similar for property rights, land tenure and ownership data.

Broad, non-exhaustive categories of the types of data or information concerning **“Finance and investment”** in support of decent work and Nature-based Solutions of most importance to respondents provided valuable insights. These included categories of NbS financing ecosystem actors (including regulators and capital providers), demand, supply and use of funds (e.g. available investment options and according to type of NbS-aligned activity, green finance availability, activities financed, and geographical distribution) the cost of funds (cost of action and inaction), financing conditions, and impacts of the funds and the efficiency of their use in addressing decent work deficits and other sustainable development goals.

Overall, all topics related to decent work and/or Nature-based Solutions surveyed are of relevance for the data needs for the vast majority of the respondents. Furthermore, all ten of the above-described key information topics related to decent work and/or NbS are characterized as having data or indicator gaps according to the survey respondents. The topic of environmental outcomes and sustainability of outcomes was the highest ranked in this regard. More than half of the respondents report data and indicators gaps related to social data, including gender, Indigenous and youth statistics, and governance-related data.

Slightly less than half of the respondents reported data gaps in employment/forms of work, decent work, finance and investments. The least cited topic was economic production.

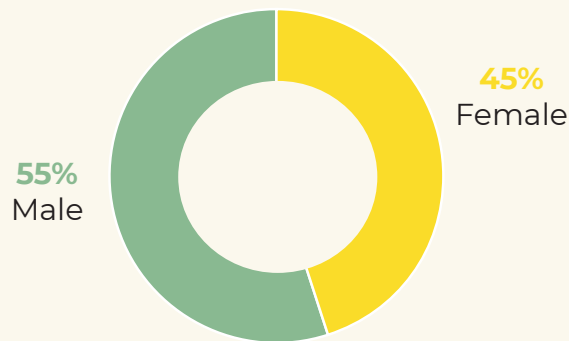
Detailed analysis of survey results

This section presents more detailed analysis of the survey results for the three main sections of the survey: (1) information about the respondent and their organization, (2) policy priorities and interests, (3) information and data needs. Within each of these sections, question numbers and corresponding questions are presented with the results of each question.

1. Information about the respondent and their organization

Question 1. What is your sex?

(Percent of total responses)

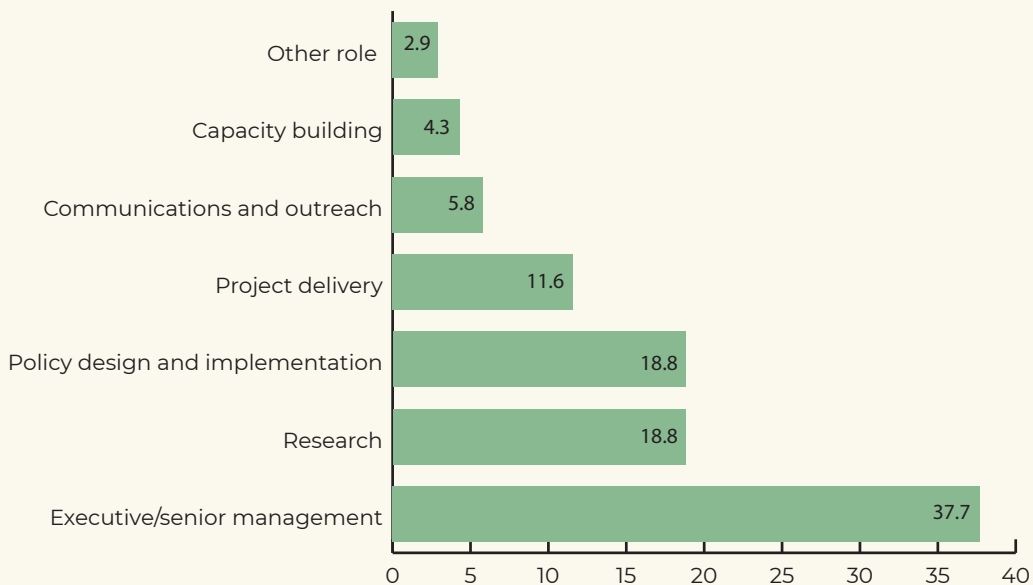


Total responses: 69 out of 69

There is a 10-percentage-point difference in the disaggregation by sex among the respondents, with just over half being male respondents and just under half female.

Question 2. What is your main role within your organization?

(Percent of total responses)

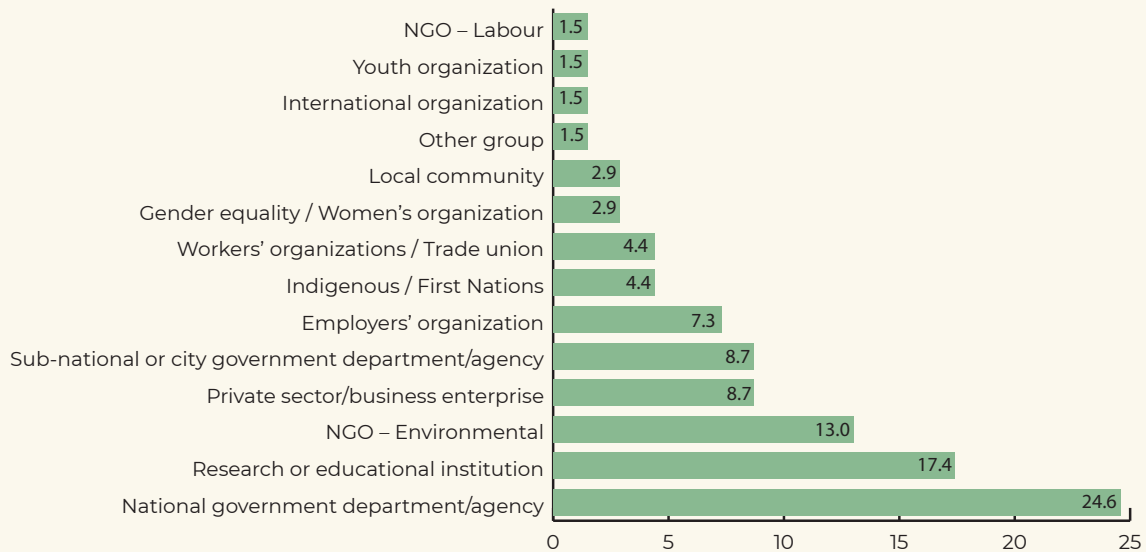


Total responses: 69 out of 69

Most of the respondents are senior managers (38%), followed by respondents working in policy design and implementation (19%), research (19%) and project delivery (12%). About 6% indicated their role is in communications and outreach, and 4% are engaged in capacity building. It should be noted that research included the associated role of “statistics”, which was noted among the survey responses. Among the text responses provided in “other role”, one of the roles highlighted is in planning of NbS projects, which needs to be distinguished from project delivery. None of the respondents selected the role option of “community and stakeholder engagement”.

Question 3. Which group does your organization or workplace best fit into?

(Percent of total responses)

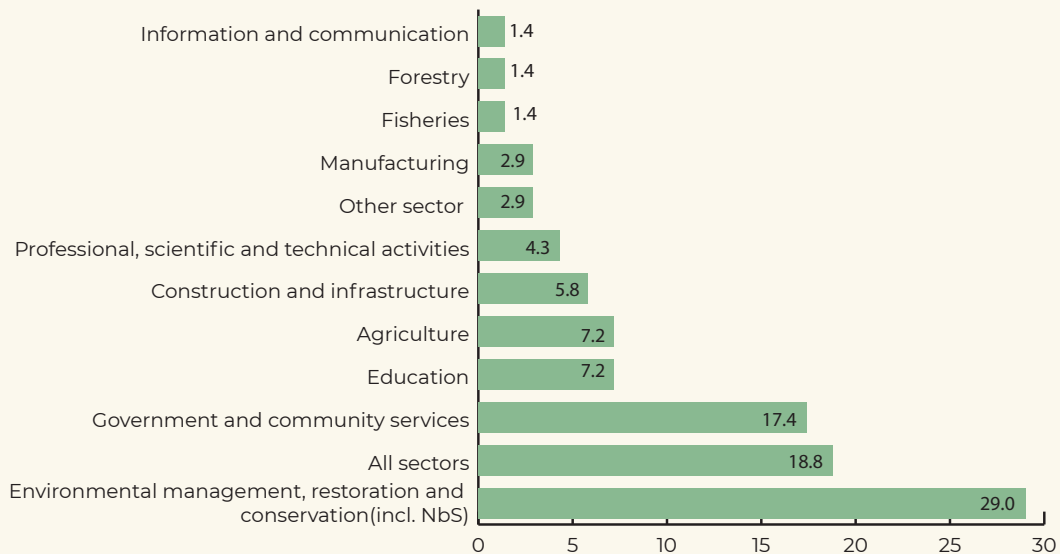


Total responses: 69 out of 69

Most respondents work either in a national government department or agency (25%), research or educational institution (17%) or NGO with an environmental focus (13%). About 9% are in a subnational or city government, and an equal proportion are in the private sector. About 7% of all respondents represent employers' organizations, while 4% represent workers' organizations/trade unions, and an equal share (4%) are representatives of an Indigenous/First Nations group. About 3% are affiliated with the local community, and an equal proportion are involved in gender equality/women's organizations. The remaining 6% of the respondents are equally split among representatives of youth organizations, international organizations, NGOs with a labour focus or other roles, e.g., an NGO associated with the private sector. There were no representatives of volunteer organizations or representatives of landowner's associations among the respondents.

Question 4. Which sector is the primary focus of your organizations' activities?

(Percent of total responses)

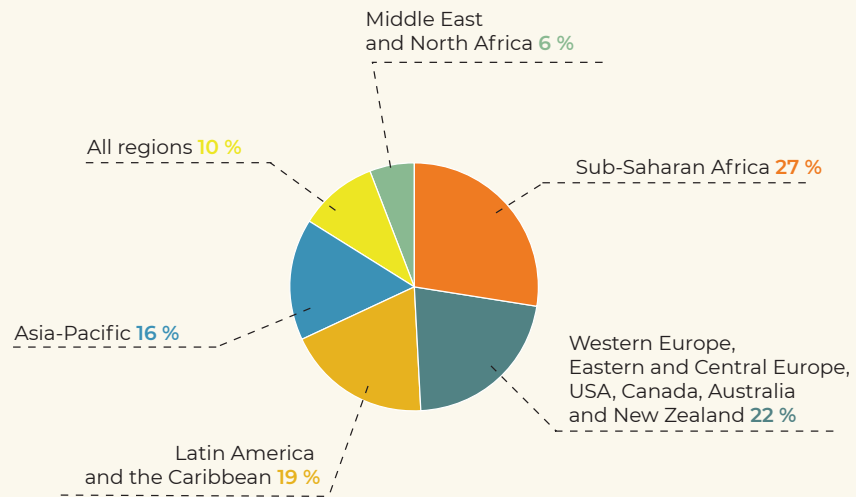


Total responses: 69 out of 69

Environmental management, restoration, and conservation, including NbS (29%), and government and community services (17%) are among the main sectors in which the work of the respondents' organizations is focused. About 19% of respondents indicated that their organizations focus on all sectors. Education and agriculture are each the focus of 7% of the respondents' organizations. About 6% have a primary focus on construction and infrastructure, while 4% are focused on professional, scientific and technical activities. The least represented sectors are manufacturing (3%), forestry, fisheries, and information and communication (1% each). None of the represented organizations has a primary focus on water supply, waste management and remediation activities, financial and insurance activities, or real estate. Among the other sectors identified by the respondents, it is important to highlight the energy sector.

Question 5. Which region is the primary focus of your organizations' activities?

(Percent of total responses)



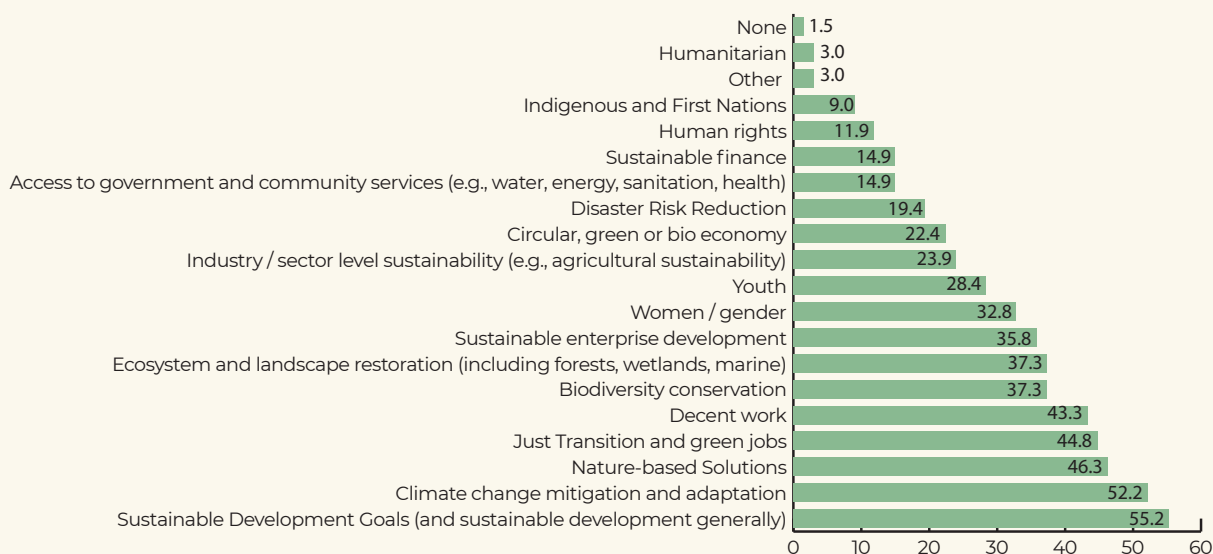
Total responses: 69 out of 69

Most of the survey respondents' organizations' regional focus is on Sub-Saharan Africa (27%); Western Europe, Eastern and Central Europe, USA, Canada, Australia, and New Zealand (22%); followed by Latin America and the Caribbean (19%); and Asia-Pacific (16%). 10% of the respondents represent an organization that focuses on all regions, while only 6% of the survey participants work in an organization with a regional focus on the Middle East and North Africa.

2. Policy priorities and interests

Question 6. In your understanding, which of the following policy areas/frameworks best reflect your organization’s entry point to the issues associated with decent work in Nature-based Solutions?

(Multiple choice question, percent of responses per answer option out of total responses)

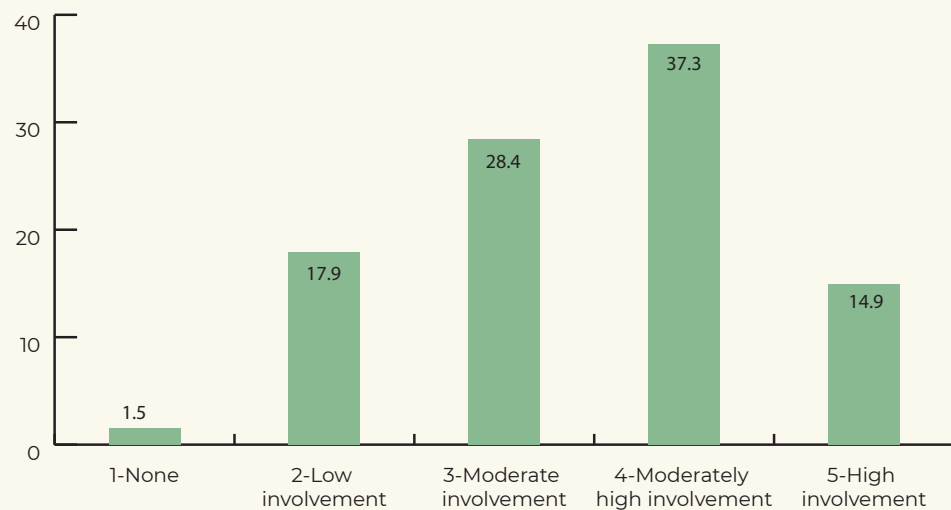


Total responses: 67 out of 69

The most cited policy areas/frameworks best reflecting the respondents’ organizations’ main entry point to the issues related to decent work in NbS are the SDGs and sustainable development more generally (55%), climate change mitigation and adaptation (52%), NbS (46%), just transition and green jobs (45%), as well as decent work (43%). There is also a high focus on biodiversity conservation (37%), ecosystem and landscape restoration (37%), sustainable enterprise development (36%) and women/gender (33%). In the middle range are the policy areas related to youth (28%), industry/sector level sustainability (24%), circular, green or bio-economy (22%) and disaster or risk reduction (19%). Access to government and community services (15%), sustainable finance (15%), and human rights (12%) are cited somewhat less frequently as entry points, while Indigenous Peoples and First Nations (9%) and humanitarian work (3%) represented the least cited policy entry points for issues related to decent work in NbS among respondents’ organizations.

Question 7. In your understanding, what is your organization’s level of involvement in decent work and just transition policy matters?

(Percent of total responses)

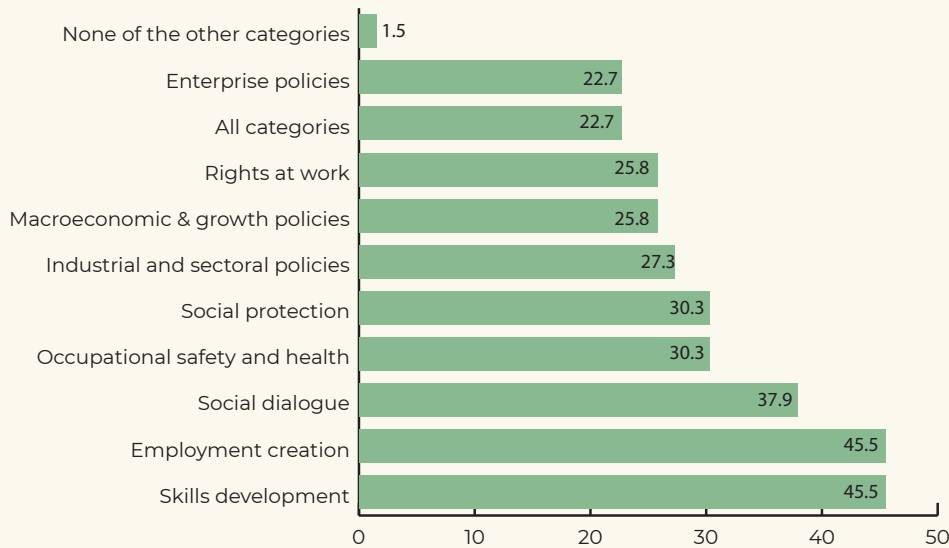


Total responses: 67 out of 69

The majority of the respondents’ organizations have either moderately high (37%) or moderate involvement (28%) in decent work and just transition policy matters. 15% of the respondents indicated high involvement of their organizations. About a fifth of the respondents’ organizations has either low or no involvement.

Question 8. Please indicate the decent work and just transition policy topics of most interest to your organization.

(Multiple choice question, percent of responses per answer option out of total responses)

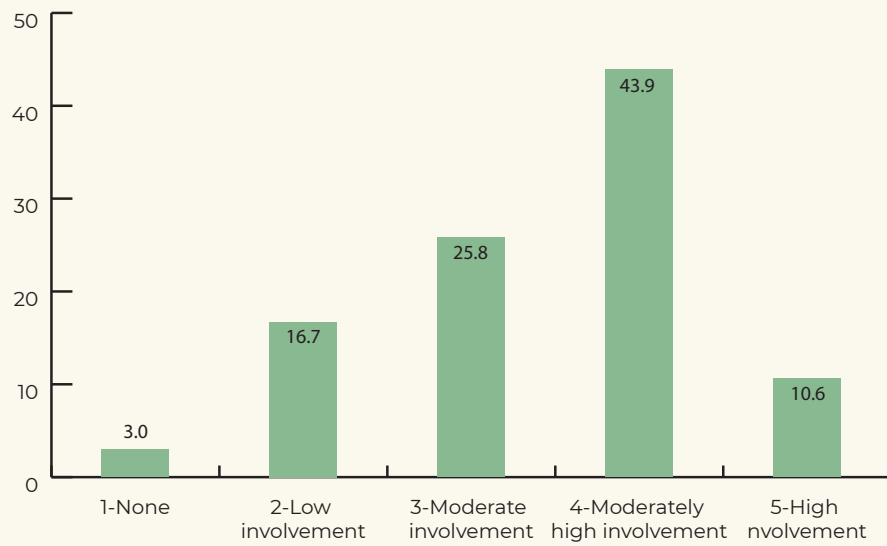


Total responses: 66 out of 69

The decent work and just transition policy topics of greatest interest to the respondents' organizations were employment creation and skills development (each 46%), followed by social dialogue (38%). The responses indicate a somewhat more moderate level of interest when it comes to social protection and occupational safety and health (each 30%), industrial and sectoral policies (27%), and rights at work, and macroeconomic and growth policies (each 26%). Enterprise policies corresponded to a slightly lower level of interest (23%). Similarly, 23% of the respondents indicated all the listed decent work and just transition policy topics to be of interest to their organizations.

Question 9. In your understanding, what is your organization's level of involvement in Nature-based Solutions (NbS) policy issues?

(Percent of total responses)

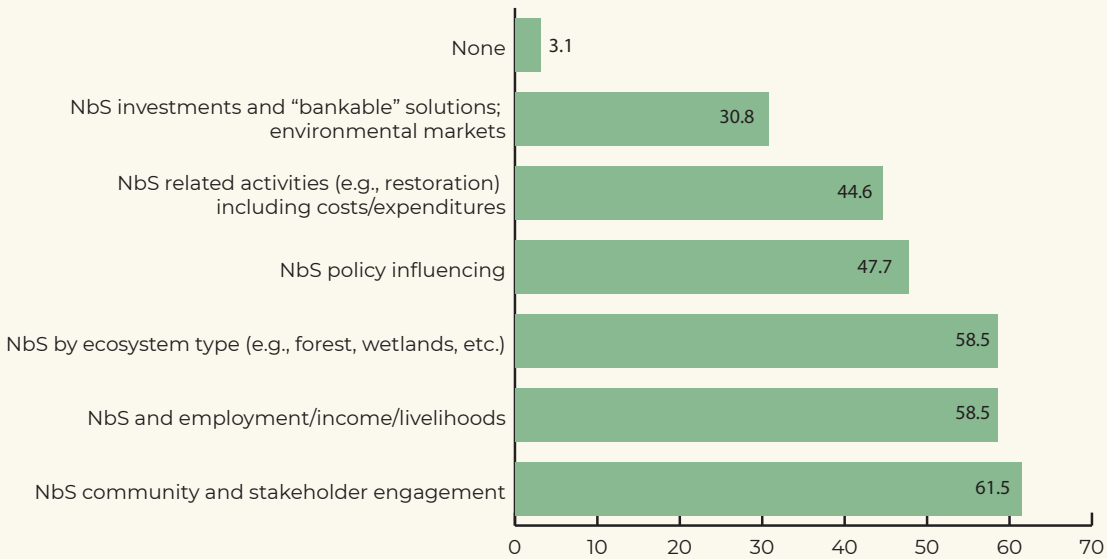


Total responses: 66 out of 69

About 11% of the represented organizations have high involvement in NbS policy issues, while most of the organizations have moderately high (44%) or moderate involvement (26%). About 17% have low involvement and 3% have no involvement.

Question 10. Please indicate the NbS topics/areas of most interest to your organization.

(Multiple choice question, percent of responses per answer option out of total responses)

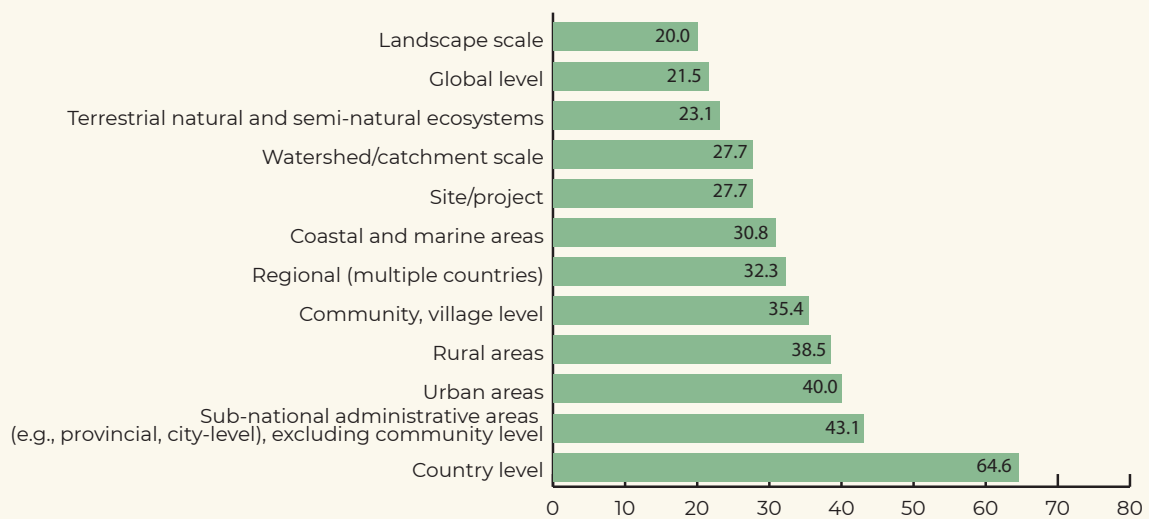


Total responses: 65 out of 69

The NbS topics or areas of highest interest among the respondents’ organizations is in NbS community and stakeholder engagement (62%); NbS and employment, income, and livelihoods (59%); and NbS by ecosystem type (59%). Among 48% of the respondents’ organizations, the topic of NbS policy influencing is also of high interest and among 45%, the topic of NbS-related activities (e.g., restoration) including costs and expenditures is of highest interest. Thirty-one percent of the respondents indicated that their organization’s interest lies in NbS investments and “bankable” solutions and/or environmental markets. Only 3% indicated their organization has no interest in NbS topics corresponding to the proportion of respondents indicating no involvement in NbS in the previous question.

Question 11. In your understanding, what geographical scale/ area does your organization's interest primarily relate to?

(Multiple choice question, percent of responses per answer option out of total responses)



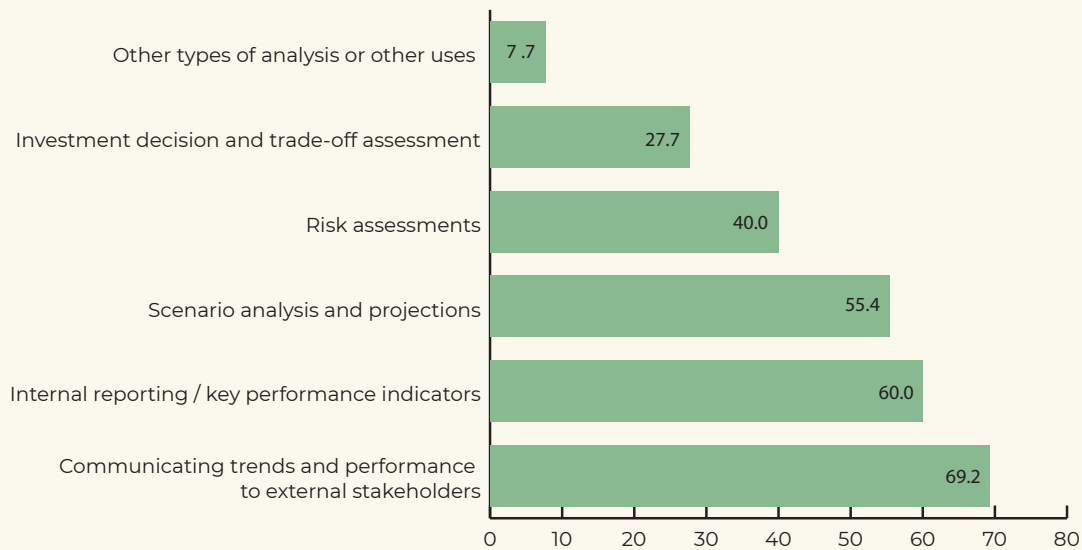
Total responses: 65 out of 69

Regarding the geographical scale of greatest interest, the vast majority of the respondents' organizations (65%) focus on the country level. 43% have primary interest in sub-national administrative areas (e.g., provincial, city-level), 40% in urban areas, 39% in rural areas, 35% in community, village level, 32% on regional (multiple country) level and 31% in coastal and marine areas. About 28% express interest in both site/project level and watershed/catchment scale. Landscape scale (20%) and global level (22%) represent the geographical scale or areas of relatively least interest for the organizations of the surveyed participants.

3. Information and data needs

Question 12. In your current professional role, what do you most commonly use data and information for?

(Multiple choice question, percent of responses per answer option out of total responses)

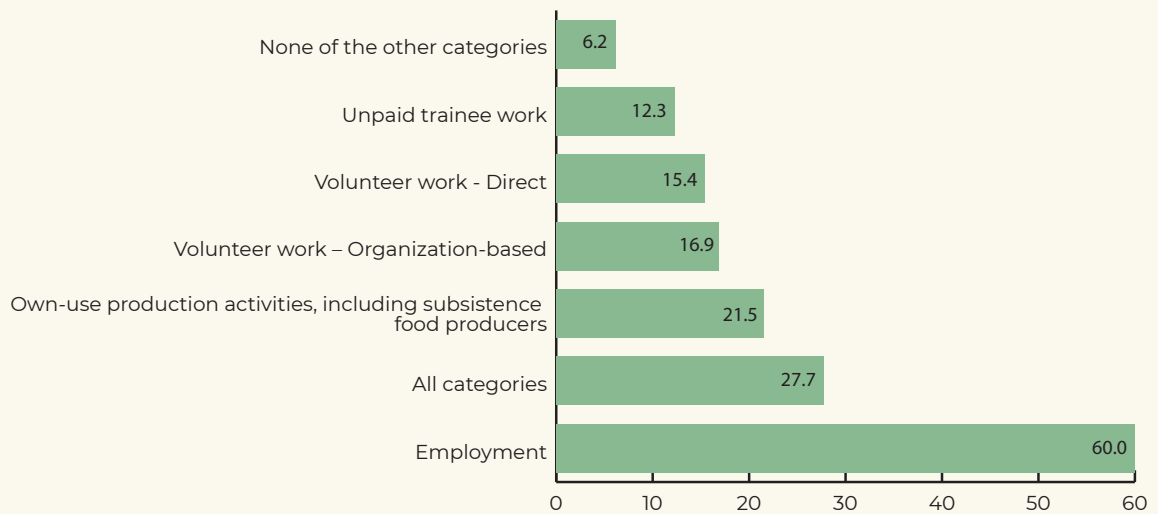


Total responses: 65 out of 69

The most common uses of data and information among the respondents are communicating trends and performance to external stakeholders (69%), internal reporting / key performance indicators (60%), and scenario analysis and projections (55%). A relatively high proportion (40%) also use data for risk assessments. The least common use is for investment decision and trade-off assessment (28%). Eight percent of the respondents indicated other uses of data or types of analysis, such as impact assessment and monitoring to inform decision making and data-driven decision making; academic research and teaching; and research publications to improve the state of the art.

Question 13. Please select the categories below related to “Employment / Forms of work (including unpaid forms of work)” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)



Total responses: 65 out of 69

The most relevant category related to “Employment/Forms of work” for the data needs of the respondents is employment, indicated by 60% of the respondents. About 28% consider all categories equally relevant for their data needs. Twenty-two percent indicated own-use production activities as most relevant, while volunteer work – whether organization-based or direct – is considered relevant by 17% and 15% respectively. The least relevant among the listed categories is unpaid trainee work (12%). Six percent of the respondents consider that none of the categories is relevant for their data needs.

Question 14. Please select the categories below related to “Decent work” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

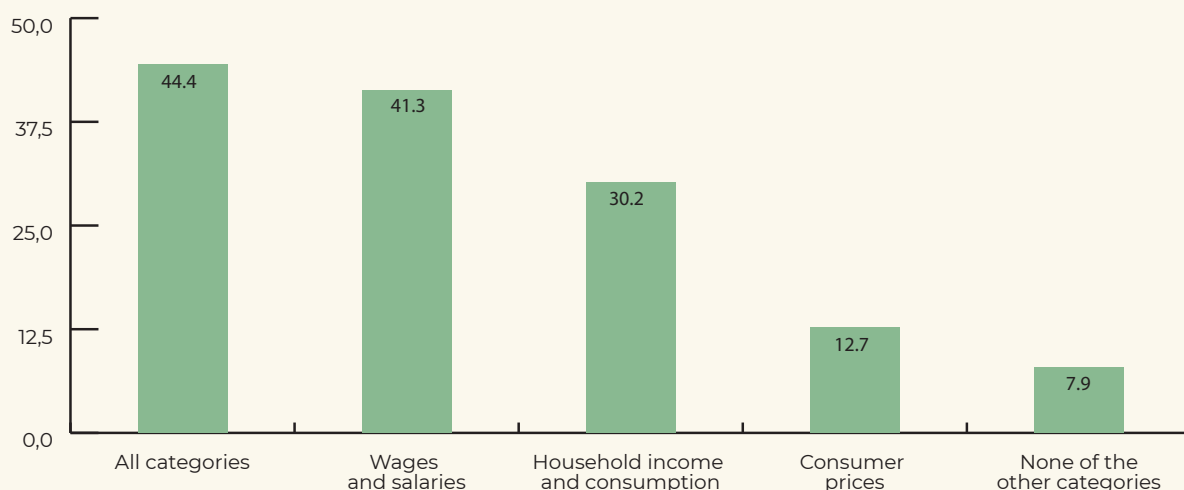


Total responses: 65 out of 69

The most relevant categories related to “Decent work” for the data needs of the respondents are employment opportunities, as indicated by 48% of the respondents, adequate earnings and productive work (39%), safe work environment (36%), and equal opportunity and treatment in employment (36%). Thirty-six percent of respondents consider all categories equally relevant for their data needs. Moderately relevant categories among respondents are stability and security of work, social security, and social dialogue, ranging between 28% and 33%. The least relevant category for data needs among survey respondents is work that should be abolished (6%). Only 3% of the respondents consider that none of the categories is relevant for their data needs.

Question 15. Please select the categories below related to “Incomes and livelihoods” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

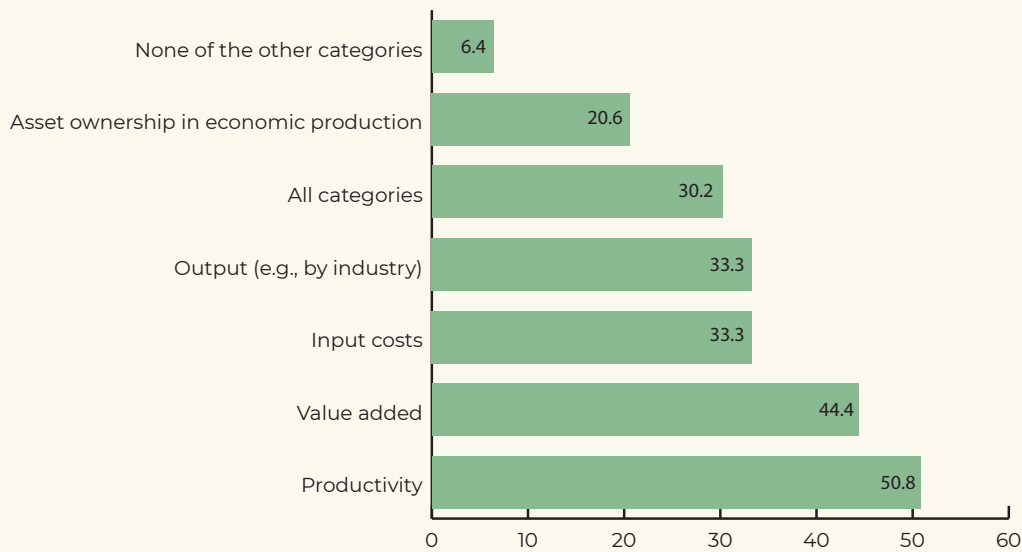


Total responses: 65 out of 69

When considering the topic of “Income and livelihoods”, 44% of the respondents indicated that all categories are of high relevance for their data needs. For respondents that preferred selected categories on this topic, wages and salaries ranked highest (41%) followed by household income and consumption (30%). Consumer prices are the least relevant, selected by 13% of the survey participants. About 8% consider none of the listed categories relevant for their data needs.

Question 16. Please select the categories below related to “Economic Production” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

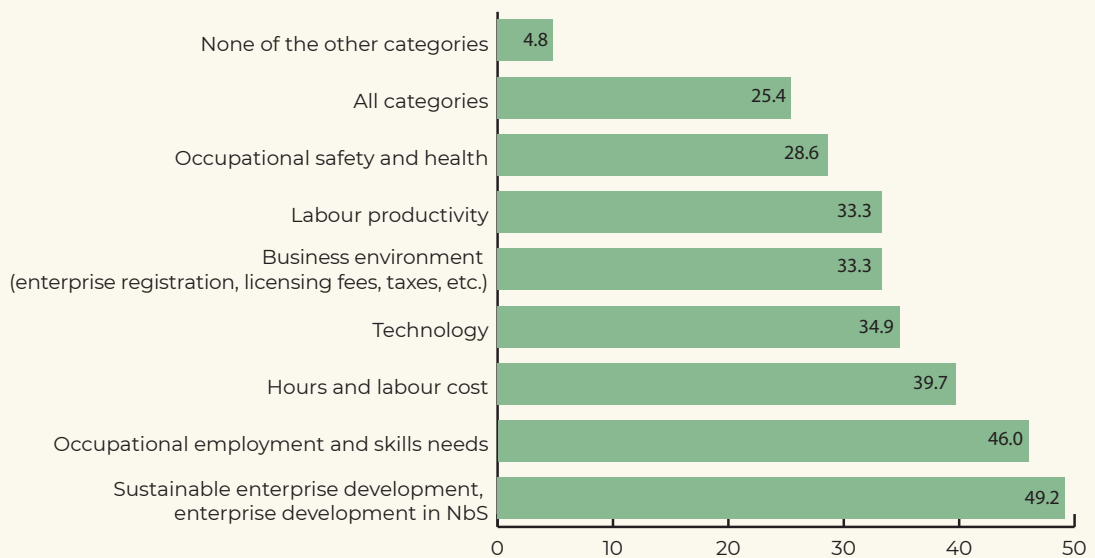


Total responses: 63 out of 69

Regarding the topic of “Economic production”, the categories of productivity (51%) and value added (44%) are among the most relevant for the data needs of the respondents. Output (including output by industry) and input costs are of equal relevance among the respondents (33%). Asset ownership represents a topic of somewhat lesser importance (21%). Thirty percent of all respondents consider all topics as most relevant for their data needs, while 6% find no relevance in any of these topics.

Question 17. Please select the categories below related to “Enterprise development” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

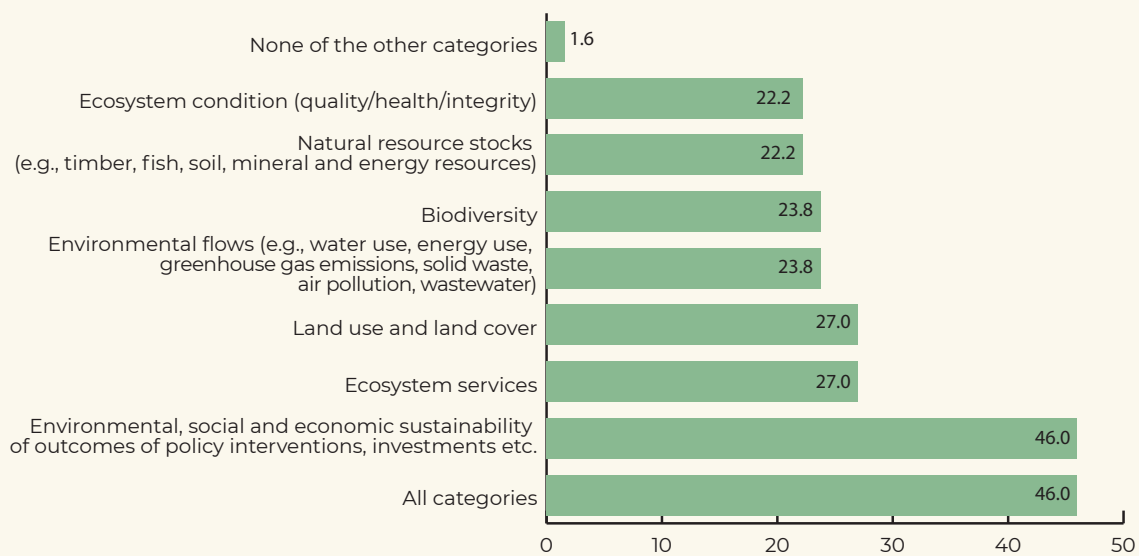


Total responses: 63 out of 69

Regarding “Enterprise development”, nearly half of the respondents (49%) consider sustainable enterprise development and/or enterprise development in NbS the most relevant topic for their data needs. Second highest in relevance is occupational employment and skills needs (46%), while 40% of the respondents expressed interest in hours and labour cost and 35% in technology. Business environment and labour productivity are considered equally relevant by 33% of the respondents. Occupational safety and health was considered relevant among 29% of respondents. A quarter of the respondents find all topics to be relevant for their data needs, while about 5% indicated that none of the topics is relevant for them.

Question 18. Please select the categories below related to “Environmental outcomes and sustainability of outcomes” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

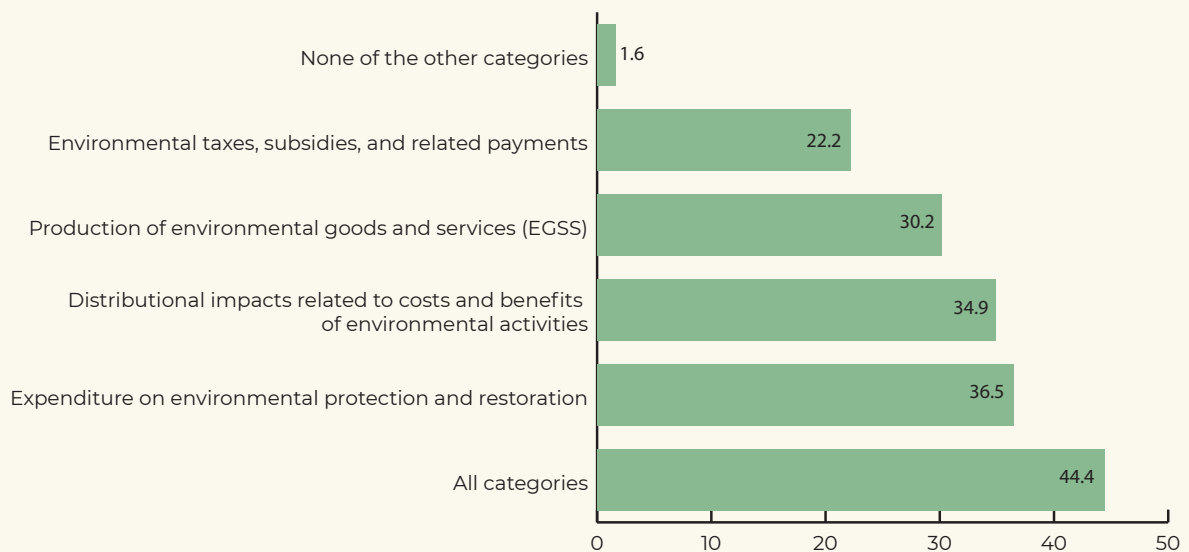


Total responses: 63 out of 69

Considering the topic of “Environmental outcomes and sustainability of outcomes”, 46% of the respondents find all topics presented relevant for their data needs. An equal proportion indicated environmental, social and economic sustainability of outcomes of policy interventions, investments, etc. as highly relevant. Ecosystem services as well as land use and land cover are relevant for the data needs of 27% of the respondents, while environmental flows and biodiversity are relevant for 24%, and ecosystem condition and natural resource stocks, among 22% each. About 2% indicated no relevance in these topics for their data needs.

Question 19. Please select the categories below related to “Environmental activities” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

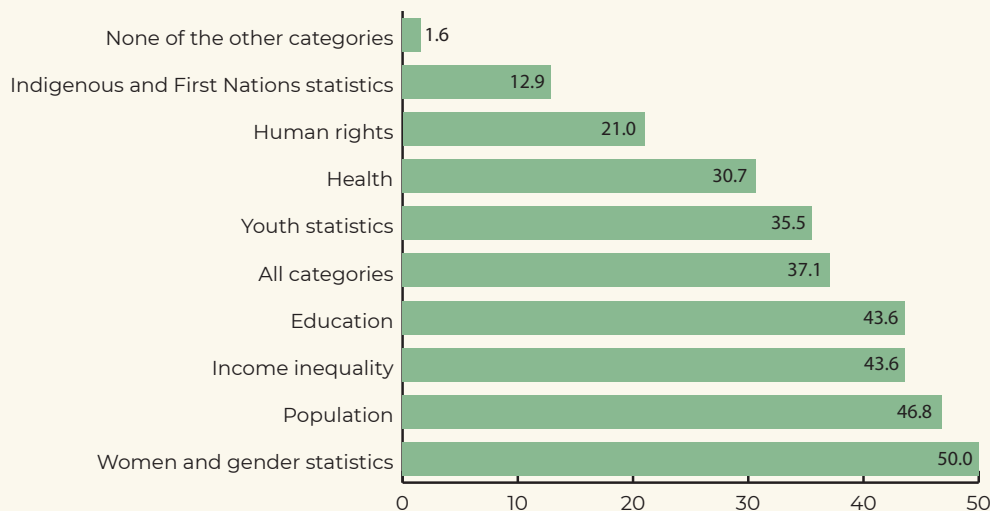


Total responses: 63 out of 69

All listed topics related to “Environmental activities” are considered relevant for the data needs of 44% of the respondents. Thirty-seven percent identify expenditure on environmental protection and restoration as highly relevant, and 35% note the importance of distributional impacts related to costs and benefits of environmental activities. Production of environmental goods and services (EGSS) is of data relevance for 30% of the respondents, while slightly more than a fifth indicate the topic of environmental taxes, subsidies and related payments as most relevant. About 2% find no relevance to these topics for their data needs.

Question 20. Please select the categories below related to “Social data, including gender, Indigenous and youth statistics” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)

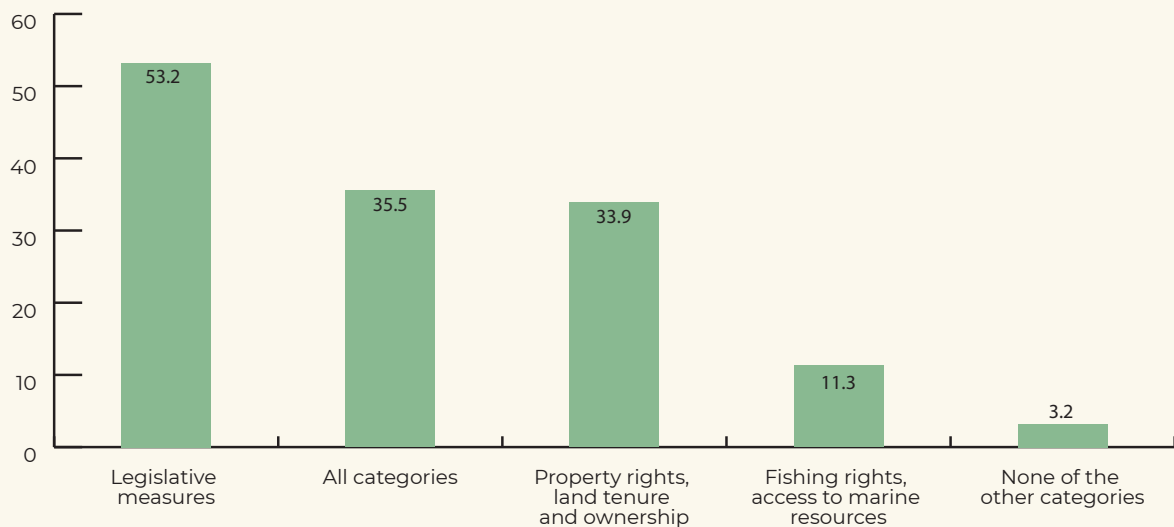


Total responses: 63 out of 69

Regarding the topic of “Social data, including gender, Indigenous and youth statistics”, women and gender statistics are highly relevant for half of the respondents. Nearly half (47%) find population data most relevant, followed by data on income inequality and education (44%). Thirty-seven percent consider all listed social data to be most relevant for their data needs. Youth statistics are most relevant for 36% of the respondents, while 31% considered health data most relevant. From the set of categories presented, Indigenous Peoples and First Nations statistics are the least relevant for the data needs of the respondents. None of the categories related to social data are of relevance for the data needs of about 2% of the respondents.

Question 21. Please select the categories below related to “Governance-related data” most relevant for your data needs.

(Multiple choice question, percent of responses per answer option out of total responses)



Total responses: 62 out of 69

Among the “Governance-related data” topics, legislative measures are the most relevant, as indicated by more than half of the respondents (53%). Thirty-six percent consider all topics to be relevant for their data needs. Property rights, land tenure and ownership data are highly relevant for 34% of the respondents. Only 11% find relevance in fishing rights and access to marine resources. Three percent of the respondents consider none of the governance-related data topics as relevant for their data needs.

Question 22. In your current professional or working role, what are the specific data or information categories concerning “Finance and investment” in support of decent work and Nature-based Solutions of most importance?

The respondents referred to the following types of data or information categories concerning “Finance and investment” in support of decent work and Nature-based Solutions of most importance to them:

- **NbS financing ecosystem actors**
 - * Regulators
 - * Sources of finance
- **Demand for funds/investment needs and/or actual use of funds**
 - * Investment options available
 - * By activity financed
 - * By geography
- **Supply of funds**
 - * Green finance availability and the share it represents in global investment
 - * Geographical distribution
- **Cost of funds**
 - * Cost of action (costs to finance NbS-driven projects)
 - * Cost of inaction
 - Costs of ecosystem services that should be included in project budgets
 - Benefits from the NbS that should be included in project budgets
- **Financing conditions**
 - * Financing mechanisms
 - * Levels of financing
 - * Application
- **Indicators related to impact produced**
 - * Problems to address and vulnerable/target populations
 - * Impact/efficiency of use of funds
 - Social cohesion, health and wellbeing, environment
 - Particular indicators related to decent work (e.g. quantity and quality of jobs and other decent work parameters)
- **Other**
 - * NbS business models

This classification of responses highlights the diverse set of answers to this open-ended question, reflecting the diverse set of respondents. A total of 28 responses were received to this question, and as such the categories should not be seen as exhaustive.

The category of **NbS financing ecosystem actors** refers to regulators and different types of capital providers. Responses focused on actors representing the sources of funds, quoting in particular public sources (e.g., government budgets, international finance institutions, climate funds). Respondents did not refer to private sector actors (e.g. companies, private sector financial institutions, or philanthropy).

The **demand, supply and use of funds** is another set of categories noted by respondents. Demand for funds included responses regarding available investment options and according to type of NbS-aligned activity. Supply of funds responses identified green finance availability and its share in global investments, as well as the geographical distribution (e.g., country/region/international/emerging or developed economy). Use of funds responses considered the activities financed, as well as the geographic disaggregation; for example, level and type of investment by country/region in different sectors of nature-based economic activity (green buildings, ecosystem restoration, regenerative agriculture, etc). While not specifically noted by respondents, these activities could be further classified, for example by the type of the recipient.

Respondents referred to the **cost of funds**, both in terms of cost of action (to finance the NbS-driven projects) and the cost of inaction (biodiversity loss costs, carbon costs) that should be included in project design so that the project adequately reflects the associated costs and benefits for efficient financial decision making, as well as to address any negative externalities of the project. In order to better capture the costs of funds landscape, the classification could have included the categories by activity, geography, source of funds, or type of financial instruments; however, such responses were not captured in the survey.

Financing conditions were noted, relating to the levels and sources of financing, financing mechanisms, and application criteria and processes.

Data and information needs further include indicators concerning the **impacts of the funds and the efficiency of their use** in addressing decent work deficits and other sustainable development goals. They included reference to identification of vulnerable/target populations, as well as the impact of the projects financed on quantity and quality of jobs and other decent work parameters.

Finally, NbS business models were mentioned among responses for information needs, suggesting a need to know more about the existing, viable and investable business models in this area.

Question 23. In your current professional or working role, please describe any other data and information topics related to decent work and Nature-based Solutions (not listed above) which are relevant for your current or future needs.

The respondents pointed out the following other data and information topics related to decent work and Nature-based Solutions that are not listed in the previous questions (13–22) that are relevant to their current or future needs. These are categorized according to their thematic relevance as pertaining to employment/decent work or environment/NbS, or, when relating to both thematic areas, as crosscutting/contextual. They are additionally disaggregated according to whether they are not at all covered in the categories listed in the previous questions (13–22) or have some level of overlap with certain categories.

■ **Employment/Decent work**

* **New (not listed previously):**

- Green jobs assessment modelling
- Green jobs skills training

* **Existing (overlap with listed categories):**

- Informal sectors (waste particularly)
- Self-employment in rural areas
- Job creation
- Sustainable work life
- Youth employment
- Skills deficits
- Number of green jobs and pay scale as compared to other sectors

■ **Environment/NbS**

* **New (not listed previously):**

- Agricultural diversification based on ancestral knowledge
- Use of natural resources by the local and Indigenous population to improve their lives
- NbS categories in the environmental sector
- Influence from conservation bodies
- Elitism in conservation work
- Meteorological and Climate Data

*** Existing (overlap with listed categories):**

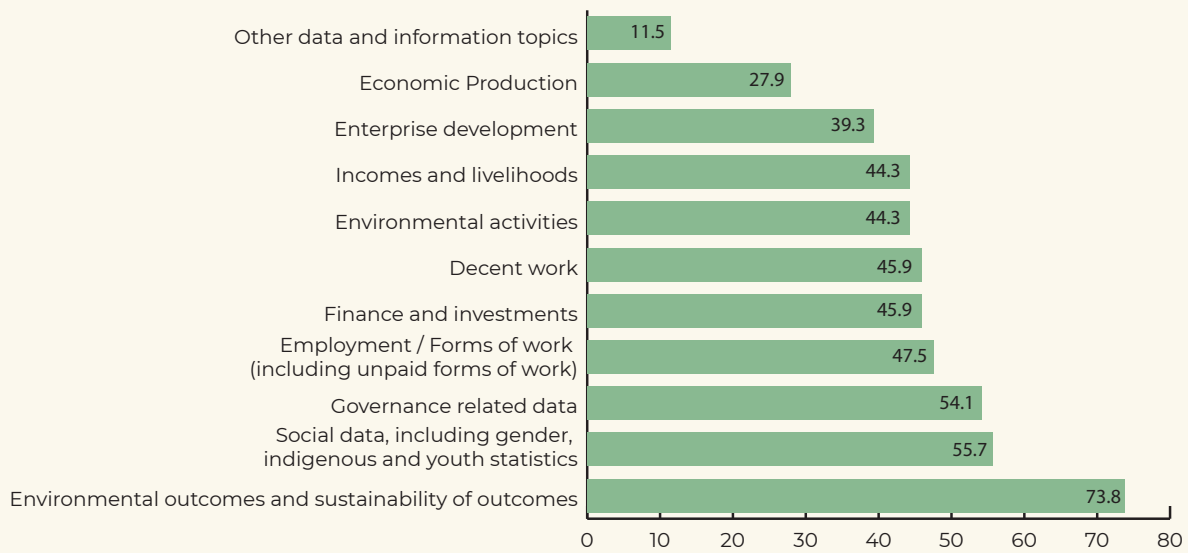
- Reforestation

■ Crosscutting/Context

- Legal security on the lands of the communities
- Sustainable markets
- Health and wellbeing data – cause and effect
- Movement tracking/migration by gender and age
- Contribution of Nature-based Solutions to GDP
- Household data at subnational level
- Cooperation between private, public sector and civil society (e.g., youth groups)
- Industry specific data on nature-based activities (e.g., numbers employed by city, region, country, in the EU, in different sectors of nature-based economic activity such as green buildings, ecosystem restoration, regenerative agriculture)
- Institutions/workers not relaying information to communities (lack of transparency)
- Job creation or loss by Nature-based Solutions, by type of solutions, by country/location, by time
- National accounts
- Digital economy measures
- Political factors and political stability
- Legal issues (not following set policies)
- Inflation
- Climate-smart value chain for NbS in decent work
- Small- and medium-sized enterprises (SMEs)'s interest in and contribution to maintaining NbS
- NbS contribution to boosting local economies (SMEs)
- Value of ecosystem services for the payment of environmental services, including the monetary costs and benefits related to work benefiting from ecosystem services
- Sharing of existing methodologies across countries on tarifa hidrica to support risk management
- Reporting on agriculture inspection reports (local by law)

Question 24. For the 10 broad data topics listed in the previous set of questions (13–23), please identify those topics for which you have identified data or indicator gaps.

(Multiple choice question, percent of responses per answer option out of total responses)



Total responses: 61 out of 69

According to the survey respondents, all ten of the key information topics related to decent work and NbS are characterized as having data or indicator gaps. The topic of environmental outcomes and sustainability of outcomes was identified by 74% of the respondents. More than half of the respondents find data and indicators gaps related to social data, including gender, Indigenous and youth statistics (56%) and governance-related data (54%). Slightly less than half of the respondents reported data gaps in employment / forms of work (48%), decent work (46%), and finance and investments (46%). Data or indicator gaps were identified for the topics of environmental activities (44%), incomes and livelihoods (44%), and enterprise development (40%). The least cited topic is economic production, identified by 28% of the respondents.

Question 25. If you wish, please provide additional details about data and indicator gaps on the topics you have identified in the previous set of questions (13 to 23). Otherwise, proceed to the next question.

The respondents provided some additional details about data and indicator gaps on the topics from the previous set of questions (13–23), categorized by their thematic relevance or generally in terms of data quality or availability, listed below:

■ **Thematic data or indicator gaps**

* **Employment/Decent work**

- **New (not listed previously):**

- Licensing and registration of HBB and medium and small enterprises (MSMEs)
- Specific vocational training and curricula

- **Existing (overlap with listed categories):**

- Local SMEs
- Number of persons in self-employment and MSMEs

* **Environment/NbS**

- **New (not listed previously):**

- Choice of technology and the use of natural resources for development
- Data on the linkages between ecosystem restoration and climate change adaptation and mitigation
- Benefits of NbS (impact, benefits translated in financial terms)

- **Existing (overlap with listed categories):**

- Environmental Accounting details in National Accounts
- Natural capital accounting and economic value of ecosystem
- Data gaps identified in EC expert publication on vital role of NBS in nature-positive economy
- Environmental services that households and the industrial sector consume

* **Crosscutting/Context**

- Decentralization and community organizations

- Evaluation of climate-related activities that involve multiple stakeholders and youth
- Human resource development
- Implementation costs
- Food security, food production strategies
- Ecosystem and livelihood resilience
- Food production strategies, including decision making and capacity by producers

■ **Overarching data quality/availability gaps**

- Data linkages
- Data coordination among stakeholders
- Spatial data (GIS)
- Current data
- Lack of access to data
- Transparency
- High cost of existing data not produced by NSO
- Nationally appropriate social indicators and priorities
- Country and institutional objectives and operational outcomes related to SDGs

Question 26. To support our project and to ensure we have identified as much relevant material as possible, we invite you to share links to relevant reports and information on decent work and/or Nature-based Solutions (up to 10 links).

In total, 32 links were shared, most of which are research/articles/reports in the areas of NbS/environment with a few focused on decent work. Links to tools, platforms, organizations/institutions, and handbooks/guidance were also shared. For more information and the links provided, please refer to Appendix 5.

Question 27. If you wish, please share any additional comments or observations that you may have concerning decent work in Nature-based Solutions. Otherwise, proceed to the end of the survey.

This question allowed respondents to add any observations they may have in relation to decent work in Nature-based Solutions, in addition to what is captured in the questionnaire.

The importance of certain priorities outlined in the questionnaire was reinforced by the respondents to this section, such as social dialogue, social protection, dignity at work and social integration. Employment and macroeconomic impact from Nature-based Solutions was also identified as a central priority.

The need for and importance of data was also reinforced, especially when linking it to the environment. For example, it was suggested that information on "Social data, including gender, Indigenous and youth statistics" is essential for NbS projects. However, implementation of such projects requires information from the other topic areas, in which there are many data gaps that require standardized information that is transparent and reliable.

Furthermore, information about the skills necessary for policymakers, employees and employers to implement NbS is essential.

Observations around NbS include:

- NbS is not just about environment preservation; it is also about the synergy between people and the ecosystem for a better and more sustainable life.
- NbS are adaptation measures that allow for sustainable development.
- NbS is dynamic and changes alongside environmental challenges, therefore it requires ongoing research and analysis.

Regarding decent work, the importance of ensuring decent jobs when creating a green economy was emphasized. It was suggested that NGOs are at the forefront working in this area and, given their limited funding for such activities, it is a challenge for them to offer job security and good wages to their employees despite existing labour laws protecting the rights of the employees. This results in a lot of volunteering, which, despite offering the opportunity for those passionate about the topic to contribute to it, is not a sustainable career option.

Conclusion

For the first time, stakeholders representing different types of institutions and mandates in different world regions – but nonetheless aligned in their engagement or interest in the topic of decent work in Nature-based Solutions (NbS) – participated in a global survey regarding policy priorities and information needs on this topic. The survey was conducted in three languages (English, Spanish and French) during the period May–June 2022. The overall survey response rate (34%) among the 201 survey recipients was considered quite favourable, especially considering the 25-minute average completion time; this suggests there is a serious interest in the topic among stakeholders across world regions. The survey results provided valuable insights into the policy priorities and data needs of stakeholders with respect to decent work and NbS. It will be useful not only as a key input to the development of the first ILO-UNEP-IUCN report on decent work in NbS, including the conceptual framework, but also should serve to provide future guidance regarding priority topics in the global biennial report series on decent work in NbS.

Annex A.1 Number of survey participants by country

COUNTRY	NO. RESPONDENTS	COUNTRY	NO. RESPONDENTS
Bangladesh	2	Mali	1
Belgium	1	Mauritius	1
Bhutan	1	Mexico	1
Brazil	2	Namibia	1
Bulgaria	1	Nepal	1
Burkina Faso	1	Nicaragua	2
Cambodia	1	Nigeria	1
Cameroon	1	Pakistan	1
Canada	3	Panama	1
Chile	1	Paraguay	1
Costa Rica	1	Peru	1
Cyprus	1	Philippines	1
Egypt	2	Scotland	1
Eswatini	1	Senegal	2
Finland	1	Singapore	1
France	2	South Africa	2
Ghana	1	Spain	3
Greece	1	Switzerland	1
Hong Kong	1	Trinidad and Tobago	2
Ireland	1	Tunisia	1
Italy	2	Uganda	1
Ivory Coast	2	Ukraine	1
Japan	3	United States	3
Jordan	1	Zimbabwe	1
Kenya	3	Total respondents	69

Annex A.2

Question 26: Links to relevant reports and information on decent work and/or Nature-based Solutions

CATEGORY	TOPIC	RESPONSES
Tool	NbS/ Environmental	https://co-impact.app/
Project	NbS/ Environmental	https://connectingnature.eu/
Handbook/ guidance	NbS/ Environmental	https://ec.europa.eu/info/news/evaluating-impact-nature-based-solutions-handbook-practitioners-2021-may-06_en
Platform	NbS/ Environmental	https://treesasinfrastructure.com/#/
Organization	NbS/ Environmental	https://www.ukgbc.org/ukgbc-work/the-value-of-urban-nature-based-solutions/
Platform	NbS/ Environmental	https://www.naturebasedenterprise.eu/page/about-us
Research/ report	NbS/ Environmental	https://open.uct.ac.za/handle/11427/30334?show=full
Handbook/ guidance	NbS/ Environmental	https://www.elgaronline.com/view/edcoll/9781786430717/9781786430717.00016.xml
Research/ report	Decent work	https://www.greengrowthknowledge.org/research/green-jobs-assessment-mauritius
Platform	Decent work	https://www.greengrowthknowledge.org/

APPENDIX 1 REPORT OF KEY FINDINGS FROM THE STAKEHOLDER SURVEY ON DECENT WORK IN NATURE-BASED SOLUTIONS

CATEGORY	TOPIC	RESPONSES
Research/ report	NbS/ Environmental	https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/85aeb571-c69c-11ec-b6f4-01aa75ed71a1
Research/ report	NbS/ Environmental	https://networknature.eu/sites/default/files/images/NBE%20White%20Paper%20final%20.pdf
Research/ report	NbS/ Environmental	https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0120
Research/ report	Crosscutting	https://www.panda.org/wwf_news/?943816/Nature-based-solutions-jobs-report
Research/ report	NbS/ Environmental	https://council.science/wp-content/uploads/2020/06/Nature-Based-Solutions-Green-Economy.pdf
Organization	NbS/ Environmental	https://www.undrr.org/words-action-nature-based-solutions-disaster-risk-reduction
Research/ report	NbS/ Environmental	https://www.frontiersin.org/articles/10.3389/fclim.2022.855803/full
Organization	Crosscutting	https://www.inec.go.cr/content/01-como-se-obtiene-informacion-nivel-de-barrios-caserios-comunidades
Organization	Crosscutting	https://snitcr.go.cr/
Platform	NbS/ Environmental	http://www.sinamecc.go.cr/
Organization	Crosscutting	https://sajjil.gov.jo/
Organization	Crosscutting	https://hemayeh.jo/
Organization	Decent work	http://mol.gov.jo/Default/En

APPENDIX 1 REPORT OF KEY FINDINGS FROM THE STAKEHOLDER SURVEY ON DECENT WORK IN NATURE-BASED SOLUTIONS

CATEGORY	TOPIC	RESPONSES
Organization	Crosscutting	http://dosweb.dos.gov.jo/
Research/ report	Decent work	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKewjVmOTc-eP3AhVDiIwKHQGzD7oQFnoECAQQAQ&url=http%3A%2F%2Fwww.ilo.org%2Fwcmssp5%2Fgroups%2Fpublic%2F---ed_mas%2F---program%2Fdocuments%2Fgenericdocument%2Fwcm_s_561070.pdf&usg=AOvVaw296NRRNjhHfRg5z5kxmBSpU
Platform	Decent work	https://www.ug.undp.org/content/uganda/en/home/sustainable-development-goals/goal-8-decent-work-and-economic-growth.html
Tool	Decent work	https://wageindicator.org/documents/decentworkcheck/africa/uganda-english.pdf
Research/ report	Decent work	https://eprcug.org/eprc-highlights/new-study-to-explore-creation-of-decent-work-for-youth-women/
Research/ report	NbS/ Environmental	https://www.wbcsd.org/Programs/Food-and-Nature/Nature/Nature-Action/Resources/Accelerating-business-solutions-for-climate-and-nature-Report-I-Mapping-nature-based-solutions-and-natural-climate-solutions
Research/ report	NbS/ Environmental	https://www.britishexpertise.org/reports/climate-change-nature-based-solutions
Research/ report	NbS/ Environmental	www.sciencedirect.com/science/article/pii/S2212041616303370
Research/ report	NbS/ Environmental	https://www.journals.elsevier.com/nature-based-solutions?_gl=1*1m15d5x*_ga*NzKzMzE5MzcLjE2NTUxOTM2NDc*_ga_4R527DM8F7*MTY1NTE5MzY0Ni4xLjEuMTY1NTE5MzY1OC4w

Appendix 2

Methodology for Estimating current and future employment in NbS (Chapter 6)

Cambridge Econometrics' global E3ME model provides an economic framework with which to evaluate the effects of a wide range of policies. Behavioural relationships in the model are estimated using econometric time-series techniques applied to a database that covers the period from 1970 onwards, on an annual basis. A core feature of the model is its treatment of technology, which will be key to meeting many of the world's policy challenges. E3ME extends its treatment of the economy to cover physical measures of energy, food and material consumption. The main data sources for European countries are Eurostat and the International Energy Agency (IEA), supplemented by the Organisation for Economic Co-operation and Development (OECD) STAN database and other sources where appropriate. For regions outside of Europe, additional sources for data include the United Nations, OECD, World Bank, International Monetary Fund (IMF), ILO and national statistics. Gaps in the data are estimated using custom software algorithms.

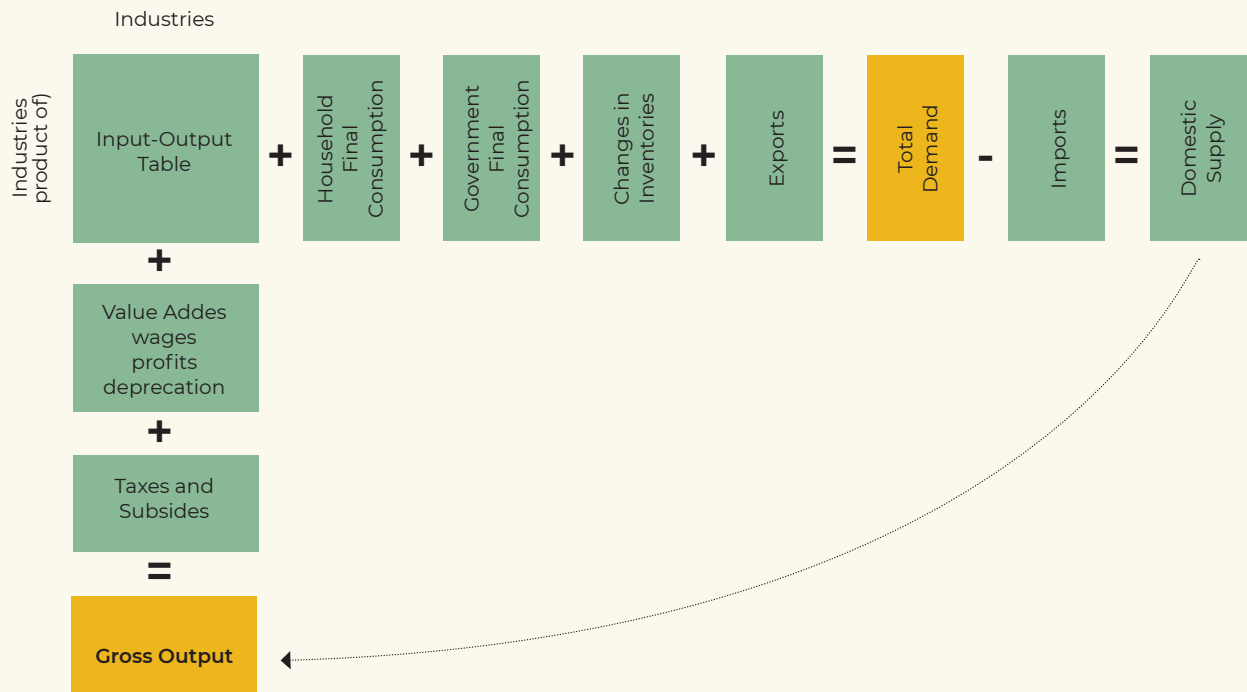
E3ME's theoretical underpinning is that economic activity undertaken by persons, households, firms and other groups in society has effects on other groups (possibly after a time lag), and the effects may persist into future generations. But there are many actors, and the effects – both beneficial and damaging – accumulate in economic and physical stocks.

The effects are transmitted through the environment, through the economy and the price and money system (via markets for labour and commodities), and through global transport and information networks. The markets transmit effects in three main ways: through the level of activity creating demand for inputs of materials, fuels and labour; through wages and prices affecting incomes; and through incomes leading in turn to further demands for goods and services. In E3ME the determination of output comes from a post-Keynesian

demand-driven accounting framework, and it is possible to have spare capacity in the economy (Figure A.1). It is not assumed that prices always adjust to market clearing levels, with the behaviour estimated based on historical data. For each region and sector, a set of behavioural equations are estimated. E3ME uses a system of error correction, allowing short-term dynamic (or transition) outcomes, moving towards a long-term trend. The dynamic specification is important when considering short and medium-term analysis (e.g. up to 2025) and rebound effects, which are included as standard in the model's results.

Figure A.1 Economic structure of E3ME

The Demand-Driven Structure of E3ME



SOURCE: Cambridge Econometrics.

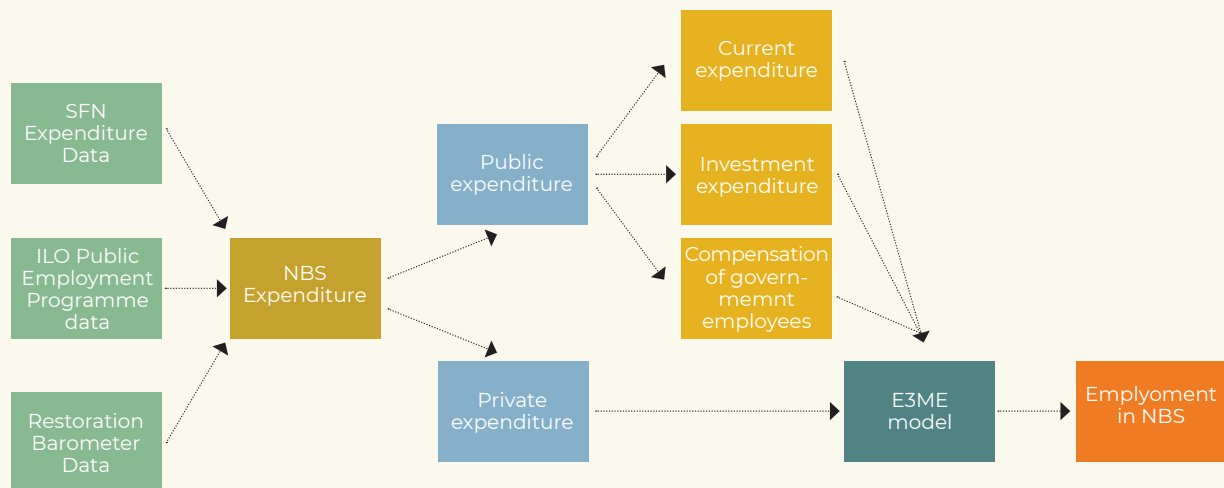
This annex sets out the main assumptions used in estimating the employment in NbS. The sections that follow set out, in turn, the assumptions that entered the E3ME model: data sources, assumptions related to public expenditure, treatment of direct employment from ILO Public Employment Programmes (PEPs), employment results, and voluntary employment.

Current employment estimation is not linked to any particular year. The dynamics in E3ME mean that it takes time for the full impact of sustained NbS expenditure to be realized. The E3ME econometric equations estimate a short-run and a long-run equation with an error-correction mechanism. Under this specification, the direct response of employment to change in

gross output is likely to be different in the short-run and the long-run. The induced impacts of NbS expenditure also take time to be fully realized in E3ME, given the short-run and long-run dynamics of, for example, change household consumption expenditure to real income changes.

The methodological approach is summarized in Figure A.2 Summary of the methodological approach.

Figure A.2 Summary of the methodological approach



SOURCE: Cambridge Econometrics.

Data sources for NbS expenditure

There are three main data sources used in the estimation of current employment in NbS: the State of Finance for Nature (SFN) report; the IUCN Restoration Barometer; and ILO PEP data. These three sources collectively give the annual expenditure on NbS.

From the SFN data, six series of data are used: IMF Classification of the Functions of Government (COFOG) from 2016, OECD COFOG from 2018, OECD ODA from 2018, CBD Financial Reporting Framework analysis from 2018 (China data), USA Spending Budget Functions from 2018, and private expenditure. Data from the IMF in 2016 is compiled with the other public spending flows from 2018; this is because the latest data from IMF is from 2016 and, in order to get a comprehensive figure for 2018 NbS spending, it

is assumed that this annual spending data remained constant through to 2018. Public spending flows are disaggregated by region, and therefore are easily mapped to E3ME regions. However, the SFN database does not provide equivalent disaggregation for private expenditure, so the percentage of public expenditure in each region is used as a proxy for private expenditure regional disaggregation. The ODA data had different sectoral disaggregation to the COFOG data; thus the ODA sectors were mapped to COFOG sectors to allow the data to be compiled. The expenditure data is deflated using the 2010 USD World Bank data on consumer prices before it is used in the modelling. Table A.1 summarizes the mapping.

Table A.1 Mapping ODA sectors to COFOG sectors

SECTOR	ODA SECTOR
Agriculture, forestry, fishing and hunting	<ul style="list-style-type: none"> Agricultural development Agricultural land resources Agricultural water resources Forestry development Forest industries
Wastewater management	<ul style="list-style-type: none"> Water sector policy and administrative management Water resources conservation (including data collection)
Pollution abatement	<ul style="list-style-type: none"> Forestry policy and administrative management Agricultural policy and administrative management
Protection of biodiversity and landscape	<ul style="list-style-type: none"> River basins development Biosphere protection Biodiversity Site preservation
Environmental protection n.e.c.	<ul style="list-style-type: none"> Environmental education/training Environmental research

The SFN database did not provide sectoral disaggregation for private

expenditure. For certain private expenditures, these could be mapped to a specific NbS archetype. For remaining categories, public expenditure shares by NbS archetype are used as a proxy to allocate private expenditures to each NbS.

Table A.2 details the private expenditure categories used; “General” indicates where no archetype is inferred and the proxy shares are used.

Table A.2 Mapping private expenditure categories to NbS archetype

PRIVATE EXPENDITURE CATEGORY	NBS ARCHETYPE (COFOG SECTOR)
Biodiversity offsets	Protection of biodiversity and landscape
Water quality trading and offsets	Wastewater management
PES (watersheds)	Wastewater management
Conservation non-governmental organizations	General
Equity impact investing	General
Philanthropy	General
Private finance mobilized by DAC	General
Private finance leveraged by GEF	General
Private finance leveraged by GCF	General

The SFN data is supplemented with data from the Restoration Barometer and from ILO PEP data. These expenditure data are used additionally, or in place of SFN data, where expenditure values are higher than those reported in the SFN dataset.

Modelling current NbS expenditure

The public expenditure is split across three modelling pathways for current expenditure, investment expenditure, and compensation of government employees. The share of public expenditure for each of them is based on OECD COFOG data (for the United States it is based on US Spending data¹). Where data are not available for a country in the OECD COFOG data, then the average for the euro area countries is used.

For investment and current expenditure, assumptions for the NbS supply chain for each of the five NbS archetypes were developed across current and investment expenditure. Table A.3 details the assumptions by NbS archetype and indicates the E3ME sector that expenditure on each NbS archetype is directed to across current and investment expenditure categories.

Table A.3 NbS archetype supply chain assumptions

EUROPEAN				
NbS archetype	Expenditure	E3ME sector		
Agriculture, forestry, fishing and hunting	Current	Crop production (0.4)	Forestry (0.4)	R&D activities (0.2)
	Investment	Electronics (0.5)	Construction (0.5)	
Wastewater management	Current	Sewerage and waste (0.4)	Construction (0.4)	Architecture and engineering (0.2)
	Investment	Construction (0.84)	Machinery, equipment n.e.c. (0.09)	Electronics (0.07)
Pollution abatement	Current	Sewerage and waste (0.8)	Other professional services (0.2)	
	Investment	Electronics (0.75)	Construction (0.13)	Computer services (0.12)

¹ USAspending. n.d. <https://www.usaspending.gov/>

Protection of biodiversity and landscape	Current	Crop production (0.4)	Forestry (0.4)	R&D activities (0.2)
	Investment	Electronics (0.5)	Construction (0.3)	Computer services (0.2)
Environmental protection n.e.c.	Current	Construction (0.5)	R&D activities (0.5)	
	Investment	Construction (0.8)	Electronics (0.11)	Machinery, equipment n.e.c. (0.09)
NON-EUROPEAN DEVELOPED				
NbS archetype	Expenditure	E3ME sector		
Agriculture, forestry, fishing and hunting	Current	Agriculture, fishing and hunting (0.4)	Forestry (0.4)	Professional services (0.2)
	Investment	Electronics (0.5)	Construction (0.5)	
Wastewater management	Current	Miscellaneous services (0.4)	Construction (0.4)	Professional services (0.2)
	Investment	Construction (0.84)	Mechanical engineering (0.09)	Electronics (0.07)
Pollution abatement	Current	Miscellaneous services (0.8)	Professional services (0.2)	
	Investment	Electronics (0.75)	Construction (0.13)	Computer services (0.12)
Protection of biodiversity and landscape	Current	Agriculture, fishing and hunting (0.4)	Forestry (0.4)	Professional services (0.2)
	Investment	Electronics (0.5)	Construction (0.3)	Computer services (0.2)
Environmental protection n.e.c.	Current	Construction (0.5)	Professional services (0.5)	
	Investment	Construction (0.8)	Electronics (0.11)	Mechanical engineering (0.09)

NON-EUROPEAN DEVELOPING				
NbS archetype	Expenditure	E3ME sector		
Agriculture, forestry, fishing and hunting	Current	Agriculture, fishing and hunting and Forestry (0.22)	Chemicals (0.24); Wood and paper (0.13)	Professional services (0.41) for private expenditure Or Public administration and defence (0.41)
	Investment	Chemicals (0.55)	Forestry (0.25);	Wood and paper (0.17) Metal products (0.04) Professional services or Public administration and defence (0.04)
Wastewater management	Current	Miscellaneous services (0.4)	Construction (0.4)	Professional services (0.2)
	Investment	Construction (0.84)	Mechanical engineering (0.09)	Electronics (0.07)
Pollution abatement	Current	Miscellaneous services (0.8)	Professional services (0.2)	
	Investment	Agriculture, fishing and hunting and Forestry (0.22)	Chemicals (0.24); Wood and paper (0.13)	Professional services (0.41) for private expenditure Or Public administration and defence (0.41)
Protection of biodiversity and landscape	Current	Chemicals (0.55)	Forestry (0.25);	Wood and paper (0.17) Metal products (0.03) Professional services or Public administration and defence (0.04)
	Investment	Electronics (0.5)	Construction (0.3)	Computer services (0.2)
Environmental protection n.e.c.	Current	Construction (0.5)	Professional services (0.5)	
	Investment	Construction (0.8)	Electronics (0.11)	Mechanical engineering (0.09)

NOTE: Values in parentheses indicate share of the NbS expenditure/investment allocated to the sector. Numbers in bold are provided by ILO and are based on forestry NbS project expenditure.

To model government expenditure on compensation of employees, employment is added exogenously to the public administration sector (ISIC Code O). The number of jobs created is calculated using E3ME data for employment cost (average wage and employer social security contributions) in the public administration sector.

In GDP accounting in the modelling:

1. Government current expenditure on compensation of employees contributes directly to GDP.
2. Government current expenditure on NbS contributes directly to GDP.
3. Investment expenditure on NbS – both private and public – contributes directly to GDP.
4. Current expenditure by the private sector does not contribute directly to GDP. This is intermediate consumption.

The modelling methodology does not account for the source of private expenditure; the cost of intermediate consumption is not attributed to any sector. There are no impacts on production costs, and therefore on sectoral prices. This dynamic is appropriate where private finance is sourced from philanthropy or spent by conservation non-governmental organizations. Where private expenditure should be accounted as a cost to production, the methodology does not model the cost and price implications of NbS expenditure.

Public Employment Programmes (PEPs)

The direct employment under PEPs is not modelled within E3ME, so the figures reported in Chapter 3 are added exogenously. The induced impacts of the PEPs expenditure are included within the E3ME modelling, generating further employment in the economy. The expenditure within the PEP is included in household income; that is, modelled as a transfer to households. Where financial data are missing for programmes, the methodology underestimates induced impacts of PEPs.

Modelling future NbS expenditure

Future NbS expenditure was available by type of project: forestry, silvopasture, peatlands and mangroves. Slightly different treatments have been applied to each project category, based on data available in the assumption file.

Forestry NbS allocation

Forestry NbS expenditure information was available in the assumption file by expenditure type (CAPEX/ OPEX) and MagPie region. CAPEX expenditure was treated as investment expenditure in the E3ME model, OPEX expenditure was assumed to be current expenditure. The expenditure allocation by MagPie region (Table A.4) was further disaggregated to E3ME regions using current activity shares in Forestry.

Table A.4 MagPie Regions

MAGPIE REGIONS	
Canada, Australia and New Zealand	China
European Union	Global
India	Japan
Latin America	Middle East and North Africa
Non-EU Member States	Other Asian
Reforming countries (i.e. Russia, Ukraine, Belarus and FSU countries in central Asia)	Sub-Saharan Africa
US	

The CAPEX and OPEX Forestry expenditure was further allocated to E3ME sectors as follows:

1. For EU regions, and non-EU developed regions, the sectoral allocation is **consistent** with that presented for Agriculture, forestry, fishing and hunting in Table A.3.
2. For non-Eu developing regions the allocation is consistent with the numbers provided by ILO and presented in Table A.5.

Table A.5 Sectoral allocation for Forestry CAPEX and OPEX

SOURCES: Nello et al. (2019); Raes et al. (2022); Najera et al. (forthcoming).

	CAPEX	OPEX
Public administration and defence	4%	41%
Forestry	25%	22%
Metal products	4%	0%
Chemicals	50%	24%
Wood and paper	17%	13%

Silvopasture NbS expenditure allocation

Silvopasture NbS expenditure was only available for CAPEX/OPEX at global level. The allocation to E3ME regions of the expenditure is done using the regional shares from the Forestry expenditure, as described by the E3ME model. For EU and non-EU developed countries, the sectoral allocation of expenditure is in line with Table A.3 above for Agriculture, forestry, fishing and hunting, while for developing countries the allocation in Table A.6 was used, with the added assumption that 15% of the Forestry expenditure would be reallocated to Agriculture, forestry, fishing and hunting.

Table A.6 Silvopasture sectoral shares for developing countries

	CAPEX	OPEX
Forestry	29%	25%
Metal products	35%	0%
Wood and paper	16%	0%
11 Chemicals n.e.s.	14%	22%
Public administration and defence	6%	53%

SOURCES: Nello et al. (2019); Nello et al. (2017); Raes et al. (2017); Togo, Ministère de l'Environnement, du Développement Durable et de la Protection de l'Environnement (2021).

Peatlands NbS expenditure allocation

Peatlands NbS expenditure was also only available at global level for CAPEX and OPEX. The allocation of the expenditure to E3ME regions was done using information on peatland area in global total (UNFCCC 2009), that is, countries with the largest peatland are also had the largest proportion of the expenditure.

The sectoral allocation follows the one presented in Table A.3 for Agriculture, forestry, fishing, and hunting, with non-EU developing countries having the same allocation as non-EU developed countries.

Mangroves NbS expenditure allocation

Mangroves NbS expenditure was also only available at global level for CAPEX and OPEX. The allocation of the expenditure to E3ME regions was done using information on mangrove area in 2020, as given by FAOSTAT. For sectoral allocation, the EU and non-EU developed countries follow the same allocation as presented in Table A.3 above for Agriculture, forestry, fishing and hunting, with non-EU developing countries following the allocation in Table A.7. Developing countries mangrove expenditure sectoral allocation below, as

given by ILO.

Table A.7 Developing countries mangrove expenditure

	CAPEX	OPEX
Public administration and defence	18%	17%
Forestry	82%	83%

sectoral allocation

SOURCE: Kusmana (2017).

Modelling employment

The direct employment in NbS presented in Chapter 6 is a result of:

- Direct employment exogenously added from PEPs.
- Government employees in NbS work or administering NbS work.
- E3ME estimation from government and private current and investment expenditure on NbS.

The indirect employment effects result from the private and public expenditure on NbS. Induced effects accrue through income effects from direct and indirect employment.

Voluntary employment

Voluntary employment in NbS is calculated using the ILO volunteer employment database and an average share of volunteers who worked on protecting/preserving nature. In most of the databases used for employment data in E3ME, voluntary employment is not captured. In the case of Eurostat data, the National Accounts employment data includes “unpaid voluntary

workers [...] if their volunteer activities result in goods; [...]. But if their volunteer activities result in services, for example caretaking or cleaning without payment, they are not included under employment, because those volunteer services are excluded from production” (EU 2013). Thus, in the case of European countries, voluntary employment in NbS is considered as part of the E3ME employment results. For all other countries, it is added additionally to the E3ME employment results.

References

- EU. 2013. European system of accounts: ESA 2010. Luxembourg: Publications Office of the European Union.
- Kusmana, Cecep. 2017. “Lessons Learned from Mangrove Rehabilitation Program In Indonesia”. *Jurnal Pengelolaan Sumberdaya Alam dan Lingkungan* 7 (1): 89–97.
- Najera, M., L. Raes, A. Imbach, G. Putzeys, T. Nello. forthcoming. “ROAM Application in Belize: The Path to a National Restoration Commitment”. San José, Costa Rica: IUCN-ORMACC.
- Nello, T., L. Raes, A. Wong, Ó. Chacón, A. Sanchún. 2019. *Análisis económico de acciones para la restauración de paisajes productivos en Honduras*. San José, Costa Rica: IUCN-ORMACC.
- Nello, T., F. Fonseca, L. Raes, A. Sanchún, A. Saborío, and Ó. Chacón. *Guía técnica para la restauración en El Salvador*. 2017. *Sistemas silvopastoril y agrosilvopastoril*. San José, Costa Rica: IUCN-ORMACC.
- Raes, L., A. Ndoli., E. Imanirareba, C. Karangwa, J. Njue. 2022. “Forest Landscape Restoration. Technical Packages for Rwanda”. Kigali: IUCN Rwanda.
- Raes, L., T. Nello, M. Nájera, O. Chacón, K. Meza Prado, A. Sanchún. 2017. *Análisis económico de acciones para la restauración de paisajes productivos en El Salvador*. Gland: IUCN.
- Togo, Ministère de l’Environnement, du Développement Durable et de la Protection de l’Environnement. 2021. *Evaluation des Opportunités de Restauration du Paysage: Préfecture de la Binah, Togo*. Ministère de l’Environnement et des Ressources Forestières – BMZ – GIZ – IUCN – AFR100.
- UNFCCC (United Nations Framework Convention on Climate Change). 2009. *The Global Peatland CO2 Picture: Peatland status and emissions in all countries of the world*. Draft report.

Appendix 3

Classification of countries included in the modelling results (Chapter 6)

Classification by region

REGION	COUNTRIES	REGION	COUNTRIES	
Africa	Democratic Republic of the Congo	Europe and Central Asia	Austria	
	Egypt		North Macedonia	
	Kenya		Belarus	Norway
	Nigeria		Belgium	Poland
	South Africa		Bulgaria	Portugal
Americas	Argentina		Croatia	Romania
	Brazil		Cyprus	Russian Federation
	Canada		Czechia	Slovakia
	Colombia		Denmark	Slovenia
	Mexico		Estonia	Spain
	United States of America		Finland	Sweden
Arab States	Saudi Arabia		France	Switzerland
	United Arab Emirates		Germany	Turkey
Asia and the Pacific	Australia		Greece	Ukraine
	China		Hungary	United Kingdom
	India		Iceland	
	Indonesia		Ireland	
	Japan		Italy	
	Korea		Kazakhstan	
	Malaysia		Latvia	
	New Zealand	Lithuania		
	Taiwan	Luxembourg		
		Malta		
	Netherlands			

Classification by income level

INCOME LEVEL	COUNTRIES	
High income	Australia	Lithuania
	Austria	Luxembourg
	Belgium	Malta
	Canada	Netherlands
	Cyprus	New Zealand
	Czechia	Norway
	Denmark	Poland
	Estonia	Portugal
	Finland	Saudi Arabia
	France	Slovakia
	Germany	Slovenia
	Greece	Spain
	Hungary	Sweden
	Iceland	Switzerland
	Ireland	Taiwan
	Italy	United Arab Emirates
	Japan	United Kingdom
Korea	United States of America	
Latvia		
Upper-middle income	Argentina	Malaysia
	Belarus	Mexico
	Brazil	North Macedonia
	Bulgaria	Romania
	China	Russian Federation
	Colombia	South Africa
	Croatia	Turkey
	Kazakhstan	
Lower-middle income	Egypt	Kenya
	India	Nigeria
	Indonesia	Ukraine
Low income	Democratic Republic of the Congo	

Appendix 4

Detailed case studies

List of case studies

A strategy for urban forests in Melbourne, Australia.....	333
Creating jobs and combatting desertification through local technologies in Burkina Faso.....	341
Grain for Green (aka Sloping Land Conversion Program) in China.....	347
Restoring strategic ecosystems for watershed protection and conservation in Colombia.....	356
Payment for Environmental Services in Costa Rica.....	363
Improving coastal resilience and livelihoods in Kenya.....	370
Smart coasts in Mesoamerica.....	377
Ten Billion Tree Tsunami Programme in Pakistan.....	384
Scaling up Ecosystem-based Adaptation through faenas in Peru.....	390
Coastal dune restoration in Portugal.....	400
Boosting urban resilience in Freetown, Sierra Leone.....	406
Landscapes for Livelihoods in Umzimvubu Catchment, South Africa.....	414
Large-scale Ecosystem-based Adaptation in The Gambia.....	422
Methodologies and units used to estimate work in Forest Landscape Restoration.....	426

A strategy for urban forests in Melbourne, Australia

At a glance

Activity description and type of NbS	Urban and peri-urban forestry to restore, sustainably manage and protect ecosystems in cities
Societal challenge(s)	Climate change Human health Water security Biodiversity loss and ecosystem degradation
Partners (identifying main implementers and partners, if any)	City of Melbourne Council Several business partners
Financing (source, amount)	The public sector, developers, businesses and wider community play a key role in financing tree maintenance in the city.
Time frame	2012–2032
Geographical focus	The strategy is focused on the city of Melbourne, Australia.
Biodiversity and ecosystem benefits	Create and connect ecosystems within the city and outside Promote urban biodiversity
Employment effects	Job creation Funds/grant opportunities
Target beneficiaries (# people reached) – employment beneficiaries	11 people are employed as part of this strategy. At least 700 citizens have volunteered to carry out essential advocacy, monitoring and research tasks.
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	Residents, visitors and workers who live within or visit the City of Melbourne
Alignment with public policies	The Tree Policy.

Description of context and rationale for interventions

After more than a decade of drought, severe water restrictions and periods of extreme heat, combined with an aging tree stock, Melbourne's city trees are under immense stress, and many are now in accelerated decline. Several of Melbourne's landscapes were created over 100 years ago in a different climatic and social environment. A significant number of trees are nearing the end of their lives and landscapes are struggling to adapt to a changing climate. Combined with these problems, Melbourne's urban forest faces significant future challenges: climate change and urban sprawl.

The City of Melbourne's Urban Forest Strategy aims to address these issues and protect against future vulnerability by providing a robust strategic framework for the evolution and longevity of Melbourne's urban forest. In developing this strategy, the city recognizes the importance of a holistic "whole forest" approach to understanding and managing this invaluable resource.

The strategy also focuses on designing and planting the 'forest of the future' in a way that respects Melbourne's unique character, responds to climate change and urban sprawl, and supports the health, and well-being of the city's residents and the city's liveability in general.

Specifically, the strategy aims to support:

- **Human health:** Urban forests in the city are creating inclusive and walkable places that support citizens with cultural ecosystem services such as aesthetic design, space for recreation, and improved health through lower air pollution and stress reduction.
- **Climate change adaptation:** Climate change projections for Melbourne forecast an increasingly warm and dry climate that is liable to flooding and more frequent extremes of heat, including an increase in the urban heat island effect. One of the important functions of the urban forest is to provide shade and cooling. Canopy coverage throughout the city has increased to 25% since it began and it is minimizing the urban heat island effect by improving street-level comfort.
- **Climate change mitigation:** The benefits of the trees and the structural values of the urban forest have been calculated using a tool called i-Tree Eco to measure aspects such as air pollution control, carbon storage and sequestration, and energy savings.
- **Water security:** Drought and water restrictions can trigger irreversible decline for many trees. The city is addressing these changes directly by examining ways to keep existing trees alive while also planning the

urban forest of the future through smart species selection, improving soil moisture retention, reducing stormwater flows, improving water quality and re-use, increasing shade and canopy cover, and reducing conflicts over infrastructure.

- **Biodiversity and ecosystem restoration:** A 2009 study by the Victorian Environmental Assessment Council identified ten major threats to biodiversity in Melbourne, including fragmented landscapes, connectivity loss due to major roads, pollution, human impacts (e.g. rubbish and trampling), predation from cats and dogs, and competition from introduced species. With the potential for urban areas to encroach on brown- and greenfield sites, the likely loss of biodiversity from these threats becomes even greater. Urban ecosystems can provide opportunities for protecting and enhancing vulnerable species, as they give rise to new habitat types such as green roofs and walls, gardens, reserves and parks.

Objective

The overall objective is to make the urban forest more resilient, healthy and diverse, while also contributing to the health and well-being of the community. Its motto is to create a city within a forest rather than a forest within a city.

The strategy has set the following objectives:

- Increase the canopy cover from 22% to 40% by 2040. This would require planting an average of 3,000 trees per year (Jaluzot 2018)
- Increase forest diversity so that the urban forest population will be composed of no more than 5% of one tree species, 10% of one genus, and 20% of one family
- Improve the health of tree populations by 90% by 2040
- Improve soil moisture
- Improve biodiversity
- Inform and consult with the community

Description of intervention/activities

The main activity is urban forestry, which includes actions to restore, sustainably manage and protect urban ecosystems in the city. Priority implementation actions include:

- Review and update tree precinct plans
- Develop boulevard master plans
- Implement urban forest diversity guidelines
- Assess the value of the urban forest (see below)
- Develop a 'growing green' guide for Melbourne
- Develop community engagement programmes
- Maintain and develop a register of exceptional trees

Outcomes achieved

- The city developed a scientific formula for calculating the amenity value of trees, based on factors such as tree condition, species type and growth rate, aesthetic value and locality values. A rough estimate of the city's urban forest amenity value is around \$700 million.
- The value of environmental benefits of 982 trees in selected parks around the city were calculated through a tool called i-Tree Eco, as follows:
 - * Removal of 0.5 metric tonnes of air pollution per year, at a benefit of \$3,820
 - * Sequestration of 838 metric tonnes of carbon, at a dollar value of \$19,100
 - * Sequestration of 24 metric tonnes of carbon each year, at a value of \$548 per year
 - * Savings of \$6,370 in energy costs each year through shading of buildings in summer and provision of solar access in winter
 - * Avoided carbon emissions through a reduction in energy use by \$114 per year
- Extrapolating these numbers to the entire population of 70,000 trees gives a clear indication of the high value of the urban forest.
- Based on extensive community consultation between 2012 and 2015, each of the 10 precinct plans designed a planting schedule for each street up to 2024. Streets with a high density of vulnerable people are prioritized in the plan.
- Between 2012 and 2021, 34,950 trees were planted in the city.

ROLE TITLE	RESPONSIBILITIES	NUMBER OF EMPLOYEES
Manager	<ul style="list-style-type: none"> ■ Coordination and leadership of the Urban Forest and Ecology team ■ Connection with networks and industry ■ Setting strategic direction ■ Urban Forest and Ecology advocacy 	1
Senior Urban Forester	<ul style="list-style-type: none"> ■ Implementation of the Urban Forest Strategy ■ Management of the tree planting programme ■ Implement the Urban Forest Precinct Plans ■ Manage tree protection and planting for major projects ■ Coordinate programmes such as Urban Forest Fund ■ Tracking of urban forest targets through regular coordination of data collection such as canopy mapping ■ Development of new programmes, strategic plans and initiatives ■ Tree risk management 	4
Urban Forester	<ul style="list-style-type: none"> ■ Review of planning applications and implement tree protection conditions ■ Tree valuations and tree protection bonds 	1
Arborist	<ul style="list-style-type: none"> ■ Implementation of Tree Policy to ensure protection of trees 	1
Senior Ecologist	<ul style="list-style-type: none"> ■ Implementation of the Nature in the City strategy and coordination of targets ■ Project management for capital works ■ Stakeholder engagement 	1
Volunteer Coordinator	<ul style="list-style-type: none"> ■ Management of volunteer programs and citizen science (including Gardens for Wildlife and Citizen Forester programmes) 	1
Project Officer	<ul style="list-style-type: none"> ■ Delivery of projects to assist in the implementation of the Urban Forest Strategy and Nature in the City Strategy ■ Administration tasks ■ Addressing of customer service requests 	2

Employment effects

Eleven NbS jobs were created as part of this strategy, including both coordination (a manager, two project officers, and a volunteer coordinator) and technical positions (urban foresters, arborists and ecologists). Volunteer opportunities were also created through the strategy, notably through the Citizen Forester programme and the Gardens for Wildlife programme.

Biodiversity and ecosystem benefits

The city's urban forest comprises around 70,000 trees in streets and parks as well as approximately 20,000 trees located on private premises, in addition to a growing number of green roofs and walls across the municipality. There are over 388 different species of trees in the city.

The urban forest is also home to diverse animal species including the powerful owl, tawny frogmouth, kookaburra, kingfisher, possum, White's skink, grey-headed flying fox, striped legless lizard and blue-tongued lizard, Eltham Copper butterfly, and a variety of frogs and microbats. Waterways across the municipality are used by birds for nesting and habitat.

Description of co-benefits

- Capacity was developed among local stakeholders, including community members, local authorities, and local organizations.
- Combining grey infrastructure and NbS reduces the cost of grey infrastructure expenditure and improves the quality of the urban environment.
- Urban forests and associated ecosystem services will also yield benefits by attracting more people to live and work in, and visit, Melbourne.
- Urban forest benefits that can be quantified in monetary terms span a range of industries and disciplines including health, engineering, planning, sustainability, geology and real estate. These include:
 - * Reducing energy costs (increasing tree cover by 10% – or strategically planting about three shade trees per building lot – saves annual heating and cooling costs by an estimated \$50 to \$90 per dwelling.)
 - * Increase in property values
 - * Avoided costs of infrastructure damage and renewal
 - * Decrease in health costs
 - * Support for tourism, which is growing in importance for many cities, through increased green space

Key success factors and lessons learned

In assessing the progress achieved so far through the strategy, some historical and context-specific aspects of the city must be taken into account. These include the Millennium drought as well as current and future challenges that urban forests in the city will face, such as aging tree population, diminishing availability of water, climate change, urban heat island effect, and urban intensification.

Other key factors to consider when planning urban forest include pressures such as population growth, economic growth, expansion of urban boundaries, and densification to ensure that cities remain liveable.

The development of the urban forest is an area of public planning that the government need not address without support. Developers seeking a marketing edge for their properties understand that building green means not just structural design, but the entire development site and its relationship to its surroundings. Business partners were also powerful contributors to the expansion and success of urban forestry through financial support, planting and maintenance of trees on commercial property, and support of civic organizations involved in forestry. Over 700 residents have volunteered as Citizen Foresters to help with various activities including tree planting and nature promotion events – receiving specific training for each activity – and this contributed greatly to the programme’s success (City of Melbourne n.d.).¹ For instance, over 120 Citizen Foresters helped collect data on tree hollows in parks and streets from 2016 to 2022 to help inform the management of trees (City of Melbourne 2021).

Achieving funding stability ultimately depends on on-going public support to ensure the city remains committed to the programme. Much of this support hinges on communicating and disseminating information about the benefits of Melbourne’s urban forest in terms of reduced stormwater pollution, electricity saved, carbon and water savings from lower energy use in buildings, lower demands on power plants, biodiversity benefits, and temperature reductions in the city as a whole – not to mention the aesthetic enhancement and wide-ranging social and economic advantages.

¹ See also <https://participate.melbourne.vic.gov.au/citizenforester/data-collection-complete-itree-urban-forest-assessment-project>, <https://participate.melbourne.vic.gov.au/citizenforester/citizen-foresters-create-habitat-oasis>

Alignment with public policies

The Tree Policy (City of Melbourne 2021) became operational in 2021 and recognize that all public trees covered by this policy are: (a) protected from any activity, including development, events or other activity that impacts their health and/or longevity; (b) protected from infrastructure conflict; and (c) give a priority status when the city is considering an application that has the potential to impact a tree, prior to the approval of any permit wherever reasonably practical.

The policy has been used as the basis of advocating for our urban forest. It allowed five grant projects to be accepted under the Urban Forest Fund. The fund provides matched financial support for new greening projects in the private realm, including new green spaces, tree planting, biodiversity projects, vertical greening and green roofs.

References

- Jaluzot A. 2018. "Melbourne's coordinated approach to streetscape projects to double canopy". City of Melbourne. <https://www.tdag.org.uk/casestudies/melbournes-coordinated-approach-to-streetscape-projects-to-double-canopy>
- City of Melbourne. N.d. "Participate Melbourne". <https://participate.melbourne.vic.gov.au/citizenforester/habitat-tree-inventory>
- City of Melbourne. 2021. Tree Policy 2021. <https://www.melbourne.vic.gov.au/SiteCollectionDocuments/tree-policy-2021.pdf>
- City of Melbourne. 2014. Urban Forest Strategy: Making a great city greener 2012–2032. <https://www.melbourne.vic.gov.au/SiteCollectionDocuments/urban-forest-strategy.pdf>

Authors

Kelly Hertzog (City of Melbourne), Giuliana Leslie (City of Melbourne) and Diego Portugal Del Pino

Creating jobs and combatting desertification through local technologies in Burkina Faso

At a glance

Activity description and type of NbS	Restoration of degraded lands through applying traditional restoration techniques
Societal challenge(s)	Insufficient arable land Continuous land degradation due to erosion and anthropogenic pressure Youth unemployment Lack of security in some localities
Partners (identifying main implementers and partners, if any)	International Labour Organization (ILO) Alliance Technique D'Assistance Au Développement (ATAD) Fédération nationale des groupements Naam (FNGN) Bureau d'études CGS
Financing (source, amount)	81,090,500 West African CFA franc (US\$125,293) Financed by Sweden
Time frame	May–October 2022
Geographical focus	Burkina Faso: the localities of Kaya in the Centre-Nord Region, Fada N'gourma in the Est Region, and Ouahigouya in the Nord Region
Biodiversity and ecosystem benefits	Regeneration and acceleration of vegetation cover regrowth and limitation of land erosion
Employment effects	Creation of 3 000 person-days of paid work for the local population
Target beneficiaries (# people reached) – employment beneficiaries	The project hired 300 local workers

Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	The project ultimately aims to benefit the entire population of the three localities (319,757 people; 2019 census) and support stakeholders carrying out restoration with information to facilitate planning and budgeting.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	SDGs: 1, 8, 13, 15

Description of context and rationale for interventions

The Sahel is one of the regions most impacted by desertification in the world. To combat desertification and restore degraded landscapes in the Sahel, the Great Green Wall (GGW) initiative was launched in 2007 by the African Union and is being implemented across 22 African countries.²

The restoration efforts require a multitude of strategies and approaches, one of which is the wider use of indigenous restoration techniques. While these techniques have been used in the region for many years, as land degrades faster due to climate change and other factors, they now need to be used much more widely, and in regions where they were traditionally not relevant. Also, due to conflict, poverty, and intense use of the land, local populations are not able to apply these techniques autonomously at the scale required.

To support the wider use of these techniques as part of the GGW initiative, the ILO's Employment Intensive Investment Programme initiated a project in Burkina Faso to demonstrate, document, and analyse traditional restoration techniques. The project has been implemented in two areas the localities of Kaya in the Centre-Nord Region, and Ouahigouya in the Northern Region. Both regions in the project face similar environmental and socio-economic challenges.

Like those in the rest of the country, the three regions' soils are subject to strong erosion caused by human activities, wind, and water run-off. There is not enough arable land for the population, and climate change is exacerbating land degradation. All these factors have led to a decline in soil fertility, and thus there is a need to restore the soil's productive potential.

² See <https://www.unccd.int/our-work/ggwi>

What is more, these areas are faced with security challenges and large influxes of internally displaced people (IDPs) in some communities. Many people have poor control of production techniques and difficulty accessing land and credit. The population in the three regions is mainly composed of young people, but due to the lack of employment opportunities and policies for development, youth unemployment has become an important issue. There is also a progressive disinterest among the youth in agro-silvo-pastoral activities.

In response to these challenges, the project is implementing traditional restoration techniques, including the demi-lune (half-moon), zai, diguette en pierres (stone dike), diguette en terre (earthen dike) and digue filtrante (filter dike). Through the construction of small-scale infrastructure works in sectors with high economic potential, which follows a labour-based and environment-friendly approach, the project can support youth employment and access to social services. The lessons drawn from the demonstration project will also help identify feasible approaches to a large-scale application of the techniques.

Objective

By creating local jobs through the application of local technologies to combat desertification in the Sahel, the project can support the GGW initiative and broader regional initiatives to combat desertification. Specifically, by demonstrating, documenting and analysing the implementation of these traditional restoration techniques, the project aims to draw lessons and to enable a wider application of these techniques in global initiatives.

On a local level, the project aims to:

- Create employment opportunities for youth and internally displaced persons (IDPs).
- Restore 42 ha of degraded land and increase exploitable areas in three localities.
- Stabilize the development and cohesion processes for/by communities living in the Sahel.

Description of intervention/activities

The project planned to use traditional techniques to restore 42 hectares of degraded land in Burkina Faso, as a demonstration for more widespread use of these techniques and their benefits. So far, the project has been

successfully implemented in Songodin, a village in the Centre-Nord Region, and Sambtenga and Bogoya, two villages in the Northern Region. The execution of the work is entrusted to Alliance Technique D'Assistance Au Développement (ATAD) and Fédération nationale des groupements Naam (FNGN), two locally established civil society organizations (CSO) with proven experience in green development.

The zai and demi lune techniques are both rainwater harvesting techniques used in the three villages (Partey et al. 2018). A zai is a miniature circular basin used to collect rainwater. Using a pickaxe, workers drill holes 25–30 cm in diameter and about 10–15 cm deep. They are staggered to better capture runoff. A demi lune is a semi-circular basin used to collect rainwater. The excavated material is placed downstream behind the semicircle. By making holes in the land and filling them with compost, the techniques can help retain nutrients and rainfall, thus making degraded land available again for cultivation. The project also planted 900 tree seedlings inside the zai.

The traditional techniques of diguette en pierres, diguette en terre and digue filtrante are also applied in the project, especially in Bogoya. These techniques aim to slow water run-off, replenish groundwater and reduce soil erosion. The labour productivity for the various activities was measured, and improvements in the planning and sequencing of activities were identified so as to optimize productivity.

Measures have been put in place to improve the working environment, including personal protective equipment (PPE), small-scale equipment, and boreholes at each site to provide drinking water and latrines.

Outcomes achieved

- The project has completed the construction of
 - 1,580 demi-lunes on 5 ha in Songodin
 - 215,910 zai on 16 ha in Songodin and Bogoya
 - 1500 trees planted in Bogoya and Sambtenga
 - 900 trees planted in Songodin
 - 3 digues filtrantes (24 m long), 3 diguettes en pierres (200 m) and 4 diguettes en terre (500 m) in Sambtenga

The demonstration project also documented the key data in the application of five indigenous restoration techniques to fight desertification as a basis for a more extensive use of the techniques as part of the GGW initiative.

Employment effects

This demonstration project in Songodin, Sambtenga and Bogoya provided temporary job opportunities for local people and internally displaced persons (IDPs). They were paid on a task basis, according to the agreed output achieved on the sites' development sites. Before the start of each project, the workers received training to strengthen their technical capacities for carrying out the work. The project in the three localities is expected to create employment of 3,000 person-days in total.

So far, 300 workers were recruited for the work in two localities, of which:

- 210 were female
- 64 were IDPs
- 71 were young people (age between 18 and 30)

The employment effects of the restoration techniques were also documented and analysed.

Biodiversity and ecosystem benefits

The traditional techniques of demi-lunes, zai, stone bunds, earth bunds, and permeable rock dams can help restore fertility and conserve water in the soil. As indigenous land conservation methods, they are expected to reduce soil erosion and vegetation loss, thus enhancing the ecosystems. They can reactivate biological activities in the soil, and thus improve the soil structure. The restoration will also make more arable land available, helping relieve human pressure on the environment and halt degradation.

Description of co-benefits

Farmers will benefit from capacity-building opportunities on land restoration techniques to continue improving land productivity and better incomes. Beyond the sites dedicated to the project, participants began to apply the techniques learned or optimized in their family plantation.

As the degraded land is restored and becomes available for cultivation, the anthropogenic pressure on land will be better addressed.

The demonstration and analysis of traditional restoration techniques can facilitate their application on a large scale, as part of the GGW.

Moreover, restoration can help increase yields, benefiting the local people. In the village of Pintiagou in the Est Region, the project's construction of zai and diguettes en pierres is expected to improve land productivity by about 0.400t/ha (from the current 0.6t/ha to 0.9 or 1t/ha) for crops such as white sorghum and small millet.

Key success factors and lessons learned

Lessons learned:

- The schedule of activities needs to be adjusted based on availability of labour.
- A monitoring strategy that integrates safety aspects for the project team, beneficiaries, and service providers is needed, especially in areas with volatile security.
- A preparatory phase of the project that integrates the production of compost based on organic manure is essential to ensure its availability.
- Workers' productivity improved with the availability of drinking water and a rest area for women to care for young children.
- It is important to measure several social indicators at the beginning of the project, for a better understanding of group dynamics and social cohesion.

Reference

Partey, Samuel, Robert Zougmore, Mathieu Ouedraogo, Bruce Morgan Campbell. 2018. Developing climate-smart agriculture to face climate variability in West Africa: Challenges and lessons learned. *Journal of Cleaner Production* 187

Authors

Yuli Chen (ILO), Frédéric Bandon Mboyong (ILO)

Grain for Green (aka Sloping Land Conversion Program) in China

Summary: Grain for Green (aka Sloping Land Conversion Program) in China

In the 1990s, extensive land clearing led to increased soil erosion, frequent droughts and floods, and ecosystem degradation in many areas in China. After severe floods in 1998 claimed over 3,000 people's lives, the Chinese government recognized nature as a critical solution for disaster risk management, economic and social development, and ecosystem degradation. In 1999, it launched the Grain for Green (GfG) programme, one of the largest restoration programmes in the world.¹ Still ongoing, GfG seeks to reduce soil erosion, enhance biodiversity, and conserve natural resources by converting steep-sloped land, degraded cropland and barren land into forest and grassland (Lieuw-Kie-Song and Pérez-Cirera 2020). The programme also aims to accelerate the economy's transition towards sustainability while improving farmers' incomes.

GfG incentivizes farmers to stop activities that cause ecosystem degradation and instead plant trees or grass to restore ecosystems. This is mainly implemented in ecologically important or vulnerable area, or those with serious soil erosion, desertification, or low and unstable yields. Participating households receive a subsidy if their restoration efforts meet government requirements for specific trees species, plantation density, and survival rates, among others. The labour needed to meet these requirements is an estimated 30–60 person-days per household per year, on average.

Between 1999 and 2019, 41 million households participated in the programme. Each participating household received a total of 9,000 yuan (CNY, about US\$1,300) on average (NFGA 2020). In return, these households collectively provided over 36 million full-time equivalent years of labour input over this period. As payments are made in three tranches over the five-year period,

¹ Ecosystem restoration means preventing, halting and reversing the degradation of ecosystems worldwide to regain their ecological functionality and improve productivity and capacity to meet the needs of society. (BMUV and IUCN n.d.; see also the Restoration Barometer case in Part B of this appendix).

many farmers formed cooperatives to implement the restoration work, so as to receive more frequent payments. By 2021, China had 23,000 forestation cooperatives in 22 provinces, creating job opportunities for 1.6 million poor people and increasing their annual per capita income by more than CNY3,000 (US\$435).

Between 1999 and 2019, 34.3 million hectares of farmland was converted to forest or grassland, greatly benefitting the ecosystem by reducing soil erosion, conserving water, sequestering carbon, and preventing desertification. The annual total ecological benefit is estimated at CNY1.48 trillion (US\$220 billion).

Key to the success of GfG are the subsidies and other policy supports to incentivize local governments and farmers to participate in restoration. However, long-term measures are needed to ensure farmers' livelihoods after the subsidy period through the creation of green jobs and capacity building. Planting of 'ecological' indigenous trees rather than the 'commercial' species preferred by farmers would ensure the programme followed NbS standards more closely.

At a glance

Activity description and type of NbS	restoration; conversion of farmland to forest and grassland; sustainable forest management
Societal challenge(s)	Reduce the risks of disasters caused by vegetation loss and soil erosion, especially floods. Transition the rural economy towards sustainability and increase farmers' incomes.
Partners (identifying main implementers and partners, if any)	National Forestry and Grassland Administration National Development and Reform Commission Ministry of Finance Ministry of Agriculture Ministry of Land and Resources Provincial, city-level, and county-level governments
Financing (source, amount)	The central government invested CNY517.4 billion (US\$76.57 billion) in the programme from 1999 to 2019.
Timeframe	1999–present
Geographical focus	China. Areas with serious soil erosion, desertification, low and unstable yield, and ecologically important or vulnerable (including deep sloping land)

Biodiversity & ecosystem benefits	<p>From 1999 to the end of 2019, 515 million mu (34.3 million hectares) of farmland were restored to forest and grassland.</p> <p>Each year, the programme helps conserve 38.523 billion cubic metres of water, fix 634 million tonnes of soil, sequester 49 million tonnes of carbon, release 117 million tonnes of oxygen, absorb 3.1483 million tonnes of pollutants, retain 476 million tonnes of soil, and prevent wind and sand erosion. The annual total ecological benefit is estimated at CNY1.48 trillion (220 billion USD).</p>
Employment effects	Creation of job opportunities, especially in forestry
Target beneficiaries (# people reached) – employment beneficiaries	By the end of 2019, 41 million farming households with 158 million people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	<p>China's National Plan on Implementation of the 2030 Agenda for Sustainable Development, under the action plan for SDG 15 Life on Land (Ministry of Foreign Affairs of the People's Republic of China 2016)</p> <p>NDCs: By 2030, China promised to increase forest stock volume by 6 billion cubic meters from the 2005 level (China 2021)</p> <p>China's National Biodiversity Conservation Strategy and Action Plan (2011–2030) (Ministry of Environmental Protection 2011)</p>

Description of context and rationale for interventions

China has a large agricultural sector. Population pressures and agricultural development have resulted in many forests, grasslands and wetlands being converted to other uses, notably farmlands. **Extensive land clearing has led to increased soil erosion, frequent droughts and floods, and ecosystem degradation.** In the late 1990s, 37.1% of the country's land area was affected by soil erosion. Two billion tons of silt were lost annually from the watersheds of the Yangtze and Yellow Rivers alone (National Forestry and Grassland Administration (NFGA) 2020).

Environmental degradation made the land more vulnerable to disasters. In 1998, a series of floods in the Yangtze River and other rivers in China claimed the lives of over 3,000 people and caused an economic loss of 255 billion yuan (CNY, around US\$31 billion) (NFGA 2020). In light of the widespread devastation, the Chinese government recognized **nature as a critical solution** for disaster risk management, economic and social development, and ecosystem degradation. To restore the forests and watersheds, China banned logging several regions. To support the forestry workers laid off due

to the ban and restriction, China implemented a series of social protection measures.

The support measures for other rural households affected by the restoration were incorporated in the Grain for Green (GfG) programme. The GfG programme is also called the “Returning of Farmland to Forest and Grassland” or “Sloping Lands Conversion Programme”.

Since 1999, the programme has evolved to have a stronger bottom-up approach, taking farmers' willingness as a precondition for implementation. It has also shifted focus to a long-term rural economic transition, rather than short-term compensations for income loss (Forestry administration of Guangdong Province 2014).

Objective

The programme seeks to reduce soil erosion, enhance biodiversity, and conserve natural resources by converting steep-sloped land, degraded cropland, and barren land into forest and grassland (Lieuw-Kie-Song and Pérez-Cirera 2020). In the long term, the programme also aims to facilitate the transition in the agricultural economy towards sustainability, while also improving farmers' incomes (Xu and Cao 2002).

Description of Intervention / activities

The main intervention is **to plant trees or grass on the land to restore vegetation while halting agricultural activities that might lead to ecosystem degradation**. The programme is mainly implemented in areas with serious soil erosion, desertification, low and unstable yields, and of ecological importance or vulnerability (including deep sloping land). Households participating in the conversion of farmland to forest or grassland can receive a subsidy.

The subsidy was originally in the form of grain, which explains the name of the programme. This was changed into a cash subsidy in 2004. To get the subsidy, participating farmers on behalf of the household must sign a **contract** with the county-level government, specifying: (1) the scope and location of the farmland to convert; (2) the method of conversion; (3) the expected survival rate and preserving rate of the forest; and (4) other management work. Only when farmers' work on reforestation meets the conditions specified in the contract can they receive the subsidies.

It is noteworthy that the GfG has made an important shift in 2014. At the programme's beginning, at least 80% of the afforested land had to be planted with ecological trees (trees with a primary purpose of restoring environmental

functions, particularly controlling soil erosion and desertification). Only 20% of the afforested land could be planted with commercial trees that provide marketable products, such as walnut (Zinda et al. 2017). In 2014, however, these restrictions were lifted. Currently the specialists assigned by the county-level forestry authorities decide on tree species and other technical requirements for the land to be converted, based on economic feasibility, ecological conditions, and farmers' input (NFGA 2013). This is partly because commercial trees are considered to have similar environmental value as ecological ones (Zhou 2014).

Farmers **can farm in the areas converted to forest or grassland**, on the condition of not damaging vegetation or causing new soil erosion. For instance, participating farmers can plant dwarf crops such as beans, peanuts and vegetables, to develop a non-timber forest-based economy. After the farmers receive all their subsidies from the government, they are also allowed to harvest timber from the forest with government approval. Farmers can use the grass as feed for livestock, but grazing is prohibited.

At present, the national standard of conversion from farmland to forest is CNY1,600 (US\$237) in total per mu (a Chinese unit of area, equal to 1/15 of a hectare or 667 square meters). This includes a cash subsidy of CNY1,200 (US\$177) and a seedling subsidy of CNY400 (US\$59). The CNY1,200 subsidy will be distributed after five years: CNY500 per mu in the first year, CNY300 yuan per mu in the third year, and CNY400 per mu in the fifth year. The seedling planting subsidy should be used for seedling procurement and plantation management. The subsidy for conversion from farmland to grassland is CNY1,000 (US\$148) per mu. Each province can add more subsidies based on the national standard. For example, Shanxi province started in 2016 to provide an extra subsidy of CNY800 (US\$117) per mu for households participating in the reforestation in poor counties, and CNY500 (US\$73) per mu for those in other counties (Fan and Jing 2016).

The subsidies are also meant to cover the labour input provided by households. On average the total labour needed for a farmer to meet the requirements of the GfG programme in forestation ranges from 12 to 25 working days per mu over 5 years. Thus, the average farming household (having 12.5 mu of land) in the programme can expect to work about 30–63 days a year on restoration activities. The CNY1,200 cash payment per mu equates to about CNY48–100 per day (US\$6.2–13.8) (Institute of Urban Environment, Chinese Academy of Social Sciences 2010).² This compares well with the daily wages of CNY80–150

² On average, forestation (including land clearing, preparation, planting, and nurturing, excluding maintenance) of land per hectare requires 103.5 days (6.9 days/mu) of work by one

per day (US\$11.6 to 21.8) (Hu and Qiao 2018), given that the work is done close to home and at the household's convenience.

Since 2016, the GfG programme has focused more on poor counties and households (Ministry of Finance et al. 2016). Notably, Shanxi province developed a "Poverty Reduction and Forestation Cooperative" model. The cooperatives create job opportunities for members by undertaking the GfG and other forest management projects. In this way, members can receive regular wage payments, rather than only three payments over the five-year period. In some successful cooperatives, the forestation workers' annual wages can be over CNY15,000 (US\$2,175) per person (Shi 2019). The cooperatives prioritize members' labour incomes, as labour costs must account for more than 45% of the total project budget (General Office of the People's Government of Shanxi Province 2017). By 2021, there were 23,000 forestation cooperatives in 22 provinces, creating job opportunities for 1.6 million poor people and increasing their annual per capita income by more than CNY3,000 (US\$435). Most of the cooperative forestation workers are over 50 years old.

Outcomes achieved

The GfG programme helped restore degraded ecosystems by increasing vegetation cover. The 25 provinces participating in the programme have increased their forest cover by 4% on average, effectively halting the desertification in the north and southwest. Soil erosion around the Yangtze River, Yellow River and other major rivers was also significantly reduced.

Employment effects

Employment:

- By the end of 2019, 41 million households participated in the GfG program nationwide (NFGA 2020).
- The program is estimated to have generated 9,528 million days of work, equalling 38 million FTEs, for land clearing, preparation, planting, nurturing and maintenance (NFGA 2021).

person. The maintenance within five years after the forestation requires 80 to 270 working days per hectare (5.3 – 18 days/mu).

Income:

- Each participating household received on average a total of CNY9,000 (US\$1,313.72) from 1999 to 2019 (NFGA 2020).
- The programme diversified participating households' income sources.

Biodiversity and ecosystem benefits

From 1999 to the end of 2019, 515 million mu (34.3 million hectares) of farmland were converted to forest and grassland (NFGA 2020).

Each year, the programme helps conserve 38.52 billion cubic metres of water, fix 634 million tonnes of soil, sequester 49 million tonnes of carbon, release 117 million tonnes of oxygen, absorb 3.1483 million tonnes of pollutants, and retain 476 million tonnes of soil. These ecological benefits are estimated to be worth CNY1.48 trillion (US\$220 billion) per year, equalling 2.7 times of the total investment of 20 years (1999 to 2019) in the programme (NFGA 2021a). In addition to these benefits, the programme also contributed to biodiversity by restoring habitats.

Key success factors and lessons learned

- Subsidies and other policy support have greatly incentivized local governments and farmers to participate in restoration, as the subsidy standard is in accordance with the average forestation wages and the labour needed for restoration.
- The programme seeks to balance both economic and ecological aspects by allowing both local governments and farmers to select the trees/grass and methods used in the conversion.
- Long-term measures to ensure farmers' livelihoods after the subsidy period are necessary. It is important to develop sustainable forest management, create green jobs and build capacity among farmers for such opportunities.
- There is a divergence of interests between the ecological and economic sides, notably in the type of trees used in the conversion. Farmers tend to plant 'commercial trees' such as walnut, which provide marketable products, instead of 'ecological trees' without such output. This change reduces the extent to which the programme follows NbS standards if only non-indigenous trees are planted.

References

- BMUV (German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection) and IUCN (International Union for Conservation of Nature). n.d. Restoration Barometer: A guide for governments. https://restorationbarometer.org/wp-content/uploads/2022/02/Barometer_Guide-Doc_16.pdf
- China. 2021. "China's Achievements, New Goals and New Measures for Nationally Determined Contributions." <https://unfccc.int/sites/default/files/NDC/2022-06/China%E2%80%99s%20Achievements%2C%20New%20Goals%20and%20New%20Measures%20for%20Nationally%20Determined%20Contributions.pdf>
- Fan, Zhen, and Shenhao Jing. 2016. "山西省提前启动新一轮退耕还林还草工作." The State Council, the People's Republic of China. 2016. http://www.gov.cn/xinwen/2016-10/28/content_5125398.htm
- Forestry administration of Guangdong Province. 2014. "新一轮退耕还林启动 全面深化改革又一重大突破." 2014. http://lj.gd.gov.cn/news/dynamic/content/post_2180655.html
- General Office of the People's Government of Shanxi Province. 2017. "山西省人民政府办公厅关于发展和规范扶贫攻坚造林专业合作社的意见." 2017. http://www.law-lib.com/Law/law_view.asp?id=599245
- Hu, Jian, and Dong Qiao. 2018. "一个贫困县的生态扶贫探索." 2018. <http://rmfp.people.com.cn/n1/2018/0601/c406725-30027195.html>
- Institute of Urban Environment, Chinese Academy of Social Sciences. 2010. "中国低碳发展与绿色就业研究." http://www.ilo.org/beijing/what-we-do/publications/WCMS_155414/lang--zh/index.htm
- Lieuw-Kie-Song, Maikel, and Vanessa Perez-Cirera. 2020. "NATURE HIRES: How Nature-Based Solutions Can Power a Green Jobs Recovery." Publication. http://Www.Ilo.Org/Employment/Units/Eminvest/Rural-Urban-Jobcreation/WCMS_757823/Lang--En/Index.Htm
- Ministry of Environmental Protection. 2011. China National Biodiversity Conservation Strategy and Action Plan (2011-2030). China Environmental Science Press Beijing. <https://www.cbd.int/doc/world/cn/cn-nbsap-v2-en.pdf>
- Ministry of Finance, National Development and Reform Commission, State forestry administration, Ministry of Land and Resources, Ministry of Agriculture, Ministry of Water Resources, Ministry of Environmental Protection, and State Council Leading Group Office of Poverty Alleviation and Development. 2016. "财政部等八部门关于扩大新一轮退耕还林还草规模的通知." 2016. http://www.gov.cn/xinwen/2016-02/05/content_5039662.htm

- Ministry of Foreign Affairs of the People's Republic of China. 2016. "China's National Plan on Implementation of the 2030 Agenda for Sustainable Development." Ministry of Foreign Affairs of the People's Republic of China Beijing, China.
[http://www.chinadaily.com.cn/specials/China%27sNationalPlanonimplementationofagenda\(EN\).pdf](http://www.chinadaily.com.cn/specials/China%27sNationalPlanonimplementationofagenda(EN).pdf)
- National Forestry and Grassland Administration (NFGA). 2013. "退耕还林工程作业设计技术规定."
<http://www.forestry.gov.cn/main/5925/20200414/090421587771575.html>
- . 2020. "中国退耕还林还草二十年（1999—2019）。”
<https://www.forestry.gov.cn/stzx/4/20220208/212603458957812.html>
- . 2021a. "退耕还林还草综合效益不断释放。” 2021.
<http://www.forestry.gov.cn/main/435/20210710/193027814721555.html>
- . 2021b. "重点区域生态保护和修复工程建设投资估算指南（试行）。”
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewixi7n6ub_7AhXhy7sIHVihCalQFnoECBYQAO&url=https%3A%2F%2Ffgw.hunan.gov.cn%2Ffgw%2Fxxgk_70899%2Ftzgg%2F202112%2F21323498%2Ffiles%2Fa1a921d598584f029618155d49b343b0.docx&usq=AOvVaw3WPEIPRvBSINvHN93fZUoA
- Shi, Changyi. 2019. "山西：荒山增绿 群众增收——扶贫造林合作社的山西样本。”
 The National Rural Revitalization Administration. 2019.
http://www.nrra.gov.cn/art/2019/1/16/art_5_93183.html
- Xu, Jintao, and Yiyang Cao. 2002. "退耕还林还草的可持续发展问题。”
 International Economic Review, no. 9: 5 (56-60).
<http://dx.chinadoi.cn/10.3969/j.issn.1007-0947.2002.02.014>
- Zhou, Xiangji. 2014. "四川启动新一轮退耕还林：尊重农民意愿成亮点。” 2014.
http://www.gov.cn/xinwen/2014-12/11/content_2789842.htm
- Zinda, John Aloysius, Christine J. Trac, Deli Zhai, and Stevan Harrell. 2017. "Dual-Function Forests in the Returning Farmland to Forest Program and the Flexibility of Environmental Policy in China.” *Geoforum* 78: 119–32.

Author

Yuli Chen (ILO)

Restoring strategic ecosystems for watershed protection and conservation in Colombia

At a glance

Activity description and type of NbS	Ecosystem restoration
Societal challenge(s)	<p>Erosion and deforestation are two of the main causes of water scarcity in the country.</p> <p>Goal is to contribute to water protection and security in the territories where Grupo Argos (GA) and its strategy businesses (Cementos Argos, Celsia, Odinsa) has presence.</p>
Partners (identifying main implementers and partners, if any)	<p>Colombian Ministry of Environment</p> <p>States and local governments</p> <p>States and regional environmental authorities (Cornare, Corantioquia, CVC, Cortolima)</p> <p>NGOs (Fundación Natura, Wildlife Conservation Society Fundación Guayacanal, Instituto Von Humboldt, Proantioquia, among others.)</p> <p>Community social boards</p> <p>Local communities</p>
Financing (source, amount)	Total funding US\$9,966,360, with US\$2 947.560 provided by Grupo Argos Foundation and US\$7 018.800 provided by Celsia.
Time frame	2016–2021. The programme goals are established until 2030.
Geographical focus	Colombia, in the states of Antioquia, Bolívar, Córdoba Sucre, Tolima and Valle del Cauca
Biodiversity and ecosystem benefits	<p>9 537 hectares restored and conserved</p> <p>11 412.393 native trees planted</p>
Employment effects	7 211 jobs (66% direct and 34% indirect)

Target beneficiaries (# people reached) – employment beneficiaries	7 211 people (71% men and 29% women)
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	77 837 people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	<p>SDGs: 1 No poverty, 5 Gender equality, 6 Clean water and sanitation, 13 Climate action, 14 Life below water, 15 Life on land, and 17 Partnerships for the goals.</p> <p>Colombia Long -term Climate Strategy E2050 – Goal 2 Integral Management of Biodiversity and Ecosystem Services.</p> <p>Nationally Determined Contribution: The initiative contributes to the national goals established in the Colombian NDC, especially to increase the area under ecological restoration by 18,000 ha, the recovery of protected areas and vulnerable zones, and to launch six initiatives on climate adaptation and sustainable management of mangroves (Colombia, Ministry of Environment and Sustainable Development 2020)</p> <p>It also contributes to the goal of the Colombian Government to plant 180 million trees (native species).</p>

Description of context and rationale for interventions

Colombia is well known for its biodiversity. It has a land area of 1,141,748 km²; of these, natural forests cover 60,025,731 hectares (ha). Among its strategic ecosystems are glaciers (36.7 km²), moorlands (2,254,444 ha), wetlands (30,781,149 ha) and dry forests (330,545 ha) (Colombia, Ministry of Environment and Sustainable Development 2020).

According to the Colombian Ministry of Environment, 40% of the national territory has some degree of erosion, 3% is severely eroded, 158.894 hectares have been deforested, and 56% of the regions are highly threatened by climate change. Consequently, erosion and deforestation have become two of the main causes of water scarcity in the country.

Since 2016, Grupo Argos and its business partners have been working since 2016 to restore strategic ecosystems – including mangroves, tropical dry forests and Andean forests – to contribute the fight against climate change and improve water protection and security in the Colombian territories where the group has its operations.

Grupo Argos, as a business group, seeks to protect water from its source in the mountains to where it flows into the sea using a systemic analysis

methodology with a social and ecological approach, that considers water, biodiversity and social impact as the main variables.

Specifically, the initiative takes place in states of Colombia (Antioquia, Bolívar, Córdoba, Sucre, Tolima, and Valle del Cauca) and covers strategic ecosystems such as mangroves, tropical dry forests, and Andean forests.

Objective

This programme aims to help restore, protect and conserve key strategic ecosystems for the country's water regulation and to contribute to the fight against climate change through the conservation of biological corridors, the protection of endangered species and the generation of green jobs.

Description of intervention/activities

Four components have been considered for the implementation of the program, in which actions are developed for conservation and social transformation to protect water resources and the health of the ecosystems, and to improve the quality of life for communities.

- Component 1: Ecological and forest restoration and investigation.
 - * Identification of lands according to the importance of water resources
 - * Tree planting process and formation of community nurseries
 - * Signing of restoration agreements with landowners
 - * Follow-up and maintenance of trees planting
 - * Definition of species and monitoring of indicators
- Component 2: Community participation and creation of green jobs
 - * Open calls to landowners to participate in the restoration process
 - * Capacity-building with local communities and landowners in ecosystem restoration and conservation techniques, as well as in the protection of water resources.
 - * Strengthening of community nurseries with technical support
 - * Generation of local employment
 - * Partnerships with public and private organizations to promote the programme

- Component 3: Environmental education and participatory monitoring process
 - * Development of an environmental education programme in rural schools to improve environmental good practices
 - * Participatory research and monitoring of species with communities
- Component 4: Alternative solutions to access to safe water for communities
 - * Donation of alternative solutions to access to safe water to families and schools
 - * Monitoring of water quality
 - * Identification of innovative solutions to access to safe water

Outcomes achieved

By taking a holistic approach in its water conservation and protection strategy, the initiative has improved the well-being of communities while contributing to the restoration of ecosystems. The protection of watersheds brings benefits in every aspect to community livelihoods. A good supply of water also improves areas such as health, education and farming productivity, among others.

In this way, the programme has achieved not only the ecological restoration of the prioritized areas but has also assured that beneficiaries can improve their agricultural and livestock practices, their access to environmental education and access to drinking water; in addition communities were able to participate in monitoring of wildlife species and the creation of new green businesses. For example, community nurseries became part of the restoration supply chain by selling plants to the foundation and its partners.

Three community associations of the Colombian Caribbean Coast established their own nurseries, employing more than 30 people. These organizations received technical training and financial support from Grupo Argos Foundation to improve their knowledge on the protection, management, and restoration of mangrove ecosystems. Currently, they supply seeds, plants and services such as the planting and maintenance of these trees to environmental authorities, companies, and foundations. To date, they have planted more than 270,000 mangrove trees, receiving around US\$184,000 in payments. In this way, organizations have received economic, social and environmental benefits from the restoration programmes in their territories.

Outcomes:

- 9,537 hectares restored and conserved
- 11,412.393 native trees planted
- 121 conservation agreements signed with landowners and smallholder farmers
- 68,000 students trained through the environmental programme
- 9,716 people benefiting from safe water solutions

Employment effects

The programme generated direct and indirect jobs for 7,211 people in different activities, such as the restoration, protection and management of forests and strengthening of local nurseries. Most of the people are from rural areas of six Colombian states (Valle del Cauca, Tolima, Antioquia, Córdoba, Sucre, and Bolívar). The programme also promoted environmental projects from the communities that aim to develop their territories and generate income for families.

Monitoring of the number of both direct and indirect jobs created by the programme began in 2021, as shown in the table. Of the total number of jobs created, 66% were direct (hired by GA and its companies) and 34% were indirect jobs (i.e., relating to supplementary activities to the programme). In terms of gender balance, 79% of those employed were men and 21% were women. The number of jobs generated per year are described in the table.

YEAR	NO. JOBS	DIRECT	INDIRECT	MEN	WOMEN
2016	419	-	-	-	-
2017	976	-	-	-	-
2018	1 020	-	-	814	206
2019	1 175	-	-	938	237
2020	1 058	-	-	845	213
2021	2 563	1 681	882	2 006	557
Total	7 211				

Biodiversity and ecosystem benefits

The initiative has relevant results for the conservation of biodiversity. The most tangible is the number of hectares restored (9,537 ha) and the number of native trees planted (11,412,393).

In addition, the results of the participatory monitoring process of species in 2021 resulted in 2,393 wildlife records identified by camera traps. These activities have also contributed to harmonizing the relationship of communities with threatened umbrella species, such as the Andean Bear, as they encouraged the protection of the species' habitats through conservation agreements with landowners and smallholders.

Description of co-benefits

- Agricultural producers in the territories received technical assistance to develop more sustainable practices (for example, technical training in regenerative livestock), which has increased productivity.
- The increase in the participation of vulnerable communities, such as women and youth, in the participatory monitoring of species and environmental education activities has generated new community initiatives (e.g., the creation of community tree nurseries).
- Technical and financial support to community organizations for the implementation of environmental and agricultural projects have contributed to the reduction of economic and environmental vulnerability in the territories.
- The creation of a special brand of coffee, Andean Bear Coffee, enabled the community to allocate part of its profits to the conservation of this species' habitat.
- The environmental education programme enabled teachers and students to understand the ecosystems where they live and to create new practices to protect them.

Key success factors and lessons learned

One of the key success factors of the programme is the work done with the communities. Since the beginning, the initiative was co-designed with the community leaders and organizations, as they understand the impact of the restoration programme at all levels (economic, environmental and social). This has allowed Grupo Argos and its businesses to identify the needs of each territory and to adapt the programme accordingly.

One of the lessons learned is the need to establish appropriate methodologies to evaluate the success of the reforestation activities and assess their impact. Creating partnerships with the academia and research entities is key to this part of the process.

References

Colombia, Ministry of Environment and Sustainable Development. 2020.
NDC de Colombia: Actualización 2020.

Payment for Environmental Services in Costa Rica

At a glance

Activity description and type of NbS	Protection, restoration and sustainable management of forests
Societal challenge(s)	High deforestation rates, with associated land degradation and biodiversity loss
Partners (identifying main implementers and partners, if any)	National Forest Financing Fund (FONAFIFO)
Financing (source, amount)	Government funding: more than US\$565 million from 1997 to 2021 Other sources of funding include the private sector, international banks and bilateral agencies (Porras et al. 2013).
Timeframe	1997–present
Geographical focus	Private land (Porras et al. 2013)
Biodiversity and ecosystem benefits	Contributed to the recovery and maintenance of forest cover, as well as restoration of ecosystems (333 000 ha managed annually)
Employment effects	Approximately 3 500–4 000 direct jobs/year generated
Target beneficiaries (# people reached) – employment beneficiaries	19,184 contracts signed with small- and medium-sized farm owners
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	SDGs: 8 – Decent work and economic growth, 12 – Responsible consumption and production, 13 – Climate Action, and 15 – Life on Land. Costa Rica National Biodiversity Strategy and Action Plan (2017)

Description of the context and justification of the interventions

During the 1970s and 1980s, Costa Rica experienced one of the highest deforestation rates in the world. By 1995, forests covered only 25% of the national territory. To address this problem, the country viewed natural resources as a path to development and developed a robust and innovative regulatory framework that incorporates the recognition of environmental services provided by forests and forest plantations for the benefit of Costa Rican society. As a result, Costa Rica is the only tropical country in the world to have reversed deforestation (World Bank 2022), with 52.4% of its territory now covered by forest.

The Forest Law No. 7575 of 1996 included relevant measures to support the recovery of the country's forest cover. These included the prohibition of changes in land use, the concept of environmental services, the creation of the National Forest Financing Fund (FONAFIFO) as the executing entity of the Payment for Environmental Services Program (PESP). It also established the programme's source of financing, which is based on a percentage of the single tax on fossil fuels collected under the “polluter pays” principle.

The PESP scheme consists of four pillars (FONAFIFO. n.d) that have enabled its development and operation, as well as its capacity to adapt to changes over time: (a) a defined legal framework; (b) permanent financing from national sources; (c) governance of the programme with responsibilities and competencies defined for the actors involved; and (d) a monitoring and follow-up system for the execution of actions on the ground. These pillars have contributed to the proper management of public funds and the successful implementation of the programme throughout changes in government.

The development and implementation of financial mechanisms for the conservation of forests generated initiatives such as Ecomercados I and II with the World Bank, the Huetar Norte Forestry Project supported by the Government of Germany, and the project for the sale of Certified Emission Reduction (CER) credits under the Clean Development Mechanism of the United Nations Framework Convention on Climate Change (UNFCCC). These programmes have been pivotal for the country's National Strategy on REDD+ (reducing emissions from deforestation and forest degradation, and enhancement of forest carbon stocks) and the positioning of Costa Rica as a global environmental leader, as well as to promote commercial agreements with the Green Climate Fund, the Forest Carbon Partnership Facility (FCPF) of the World Bank and, more recently, negotiations with the Lowering Emissions by Accelerating Forest finance (LEAF) Coalition.

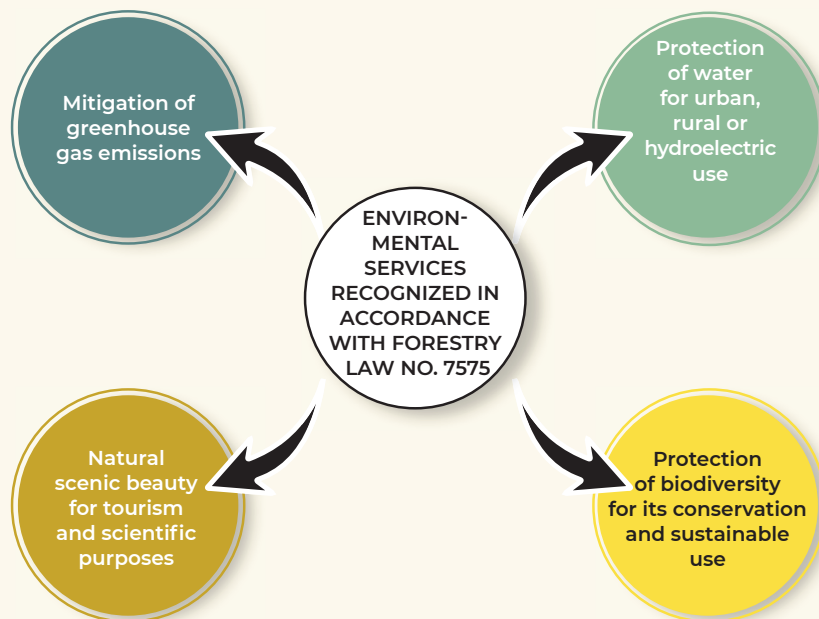
Global recognition of Costa Rica's efforts materialized with the designation of the PESP in 2020 by the United Nations as a Global Climate Action. In 2021, the country was awarded the first Earthshot Prize in the category of Protection and Restoration of Nature for the actions of the PESP and the country's National System of Conservation Areas.

Goal

The PESP recognizes, through a payment to small- and medium-size producers, the environmental services provided by forests and forest plantations.

The PESP aims to ensure the provision of four main ecosystem services: capturing and storing atmospheric carbon, protecting water sources, and conserving biodiversity and scenic beauty (see figure) (Porrás et al. 2013).

Figure: Environmental services recognized within the PESP



Source: FONAFIFO

Description of the intervention/activities

The financing of the PESP through taxation represented a way for Costa Rican society to support the recovery and maintenance of forests on private land, while complementing the actions of the State concentrated in Protected Wildlife Areas. Any private landowner with a property title or possession rights for a minimum of one hectare can access the PESP. The four main categories of participants are: individuals, legal entities (including micro-enterprises, family businesses, small- and medium-sized enterprises, and large companies and their subsidiaries), development or conservation cooperatives, and Indigenous communities (Porrás et al. 2013).

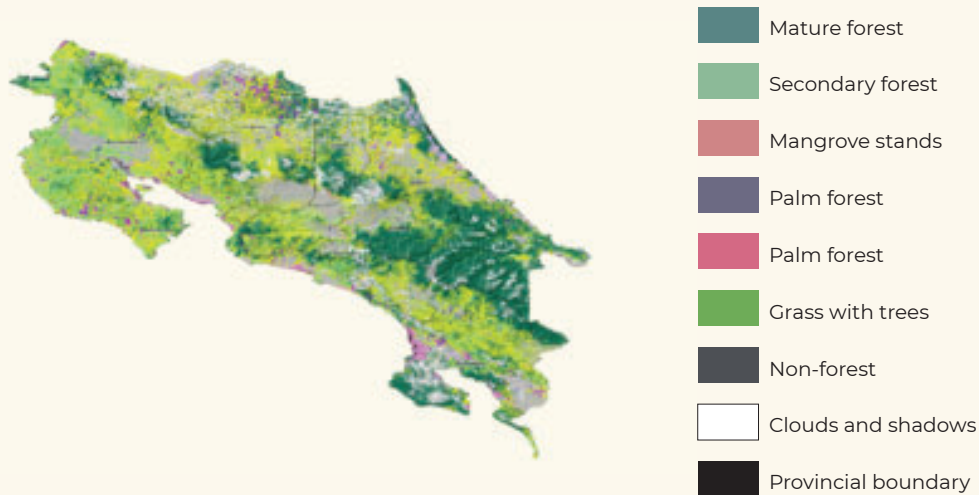
This mechanism consists of payments to the owners of private farms for the environmental services generated by their work in maintaining forest coverage (including protection of water resources and post-harvest protection) and restoring forests (including reforestation, regeneration and agroforestry systems).

In particular, the introduction agroforestry contracts significantly incentivized small-scale farmers (with less than 10 hectares) to participate in the PESP. The contracts, which are based on the number of trees rather than hectares, resulted in 4.4 million trees being planted between 2003 and 2013 (Porrás et al. 2013). Beneficiaries must meet a series of general and specific requirements (a minimum and maximum limit of hectares and trees, depending on the activity). The duration of the contract varies from 5 to 10 years, during which time implementation and maintenance work is carried out by both the farmers and hired labour (i.e., earning agricultural wages). Aside from direct payments, private forest owners who manage the forests through PESP are exempt from property taxes (Porrás et al. 2013).

Outcomes achieved

This financial mechanism, together with other initiatives and public policies, has contributed to the doubling of the country's forest area from 25% in 1995 to 52.4% in 2015 (see figure of map).

Figure: Map of Costa Rica forest cover



Source: National Forest Inventory 2015.

Effects on employment

Between 1997 and 2021, the Costa Rican Government invested more than US\$565 million in rural areas of the country through the PESP (including more than US\$40 million in Indigenous territories), thus supporting income generation, employment and conservation on private farms, as well as supporting policies of the Ministry of Environment and Energy (MINA E) on establishing biological corridors, biodiversity and protection of water resources. The PESP is a major source of income for many Indigenous communities and has improved quality of life for families (Porrás et al. 2013; UNFCCC n.d.).

Throughout its 25 years of operation, the PESP has signed 19,184 contracts of between 5 and 10 years with small- and medium-sized farm owners, supporting the protection of 1.3 million hectares of forests. The participation of women and Indigenous peoples has been central to the achievement of these results. The programme has led to the creation of 3,500–4,000 direct jobs each year generated by the demand for labour to implement and manage its activities. According to a 2003 survey, job creation under the PEST is variable, mostly resulting in occasional work (once a year for 2–4 weeks). Apart from the forestry activities carried out by family members and/or farm

workers, the PESP also directly created technical and professional posts such as forest engineers, geographers, and biologists in related organizations (Miranda, Porras and Moreno 2003).

However, while legal entities are the most prominent group receiving distributions of payment for reforestation, their right to anonymity makes it difficult to measure the employment effects they generate in any detail. The PESP might also have potential negative impacts on jobs, if forest protection leads to the abandonment of agricultural lands (Porras et al. 2013).

Benefits for biodiversity and ecosystems

PESP has contributed to the recovery and maintenance of forest cover and to the restoration of ecosystems throughout the country, with 333,000 hectares managed annually, thereby improving the provision of environmental services.

Success factors and lessons learned

Among the main strengths of the PESP is the degree of professionalism of its human capital, which has enabled it to maintain and improve the programme through innovation in creating and exploring new schemes and sources of financing. Another success factor is represented by the capacity to develop business opportunities with companies – both public and private, and national and international – with the institutional objective of benefiting the owners of forests, forest plantations and the country's forestry and environmental sector in general. Actions by private forestry professionals and the contributions of grassroots organizations that provide technical and administrative advice to farm owners, along with international cooperation, have led to proactive efforts to identify alternatives that would financially strengthen the PESP.

There is a need for the PESP to evolve in order to respond to emerging needs and urgent priorities. Current discussions are focusing on the implementation of a new programme called "PES 2.0", which will aim to address actions beyond the country's forestry sector.

References

- FONAFIFO. n.d. "Payment for Environmental Services". <https://www.fonafifo.go.cr/es/services/payment-for-environmental-services/##pillars>
- Miranda, M., I.T. Porras, and M.L. Moreno. 2003. The social impacts of payments for environmental services in Costa Rica: A quantitative field survey and analysis of the Virilla watershed (No. 1). International Institute for Environment and Development.
- Peru. 2015. National Forest Inventory.
- Porras, I., D.N. Barton, M. Miranda, and A. Chacón-Cascante. 2013. Learning from 20 years of payments for ecosystem services in Costa Rica. International Institute for Environment and Development.
- UNFCCC. n.d. "Payments for Environmental Services Program: Costa Rica". <https://unfccc.int/climate-action/momentum-for-change/financing-for-climate-friendly-investment/payments-for-environmental-services-program>
- World Bank. 2022. "Costa Rica Overview". <https://www.worldbank.org/en/country/costarica/overview>

Authors

Gilmar Navarrete Chacón, Director of Environmental Services, FONAFIFO

Acknowledgements

Pavel Rivera, Economics Specialist, IUCN-ORMACC

Improving coastal resilience and livelihoods in Kenya

At a glance

<p>Activity description and type of NbS</p>	<p>Restoration:</p> <p>Mangrove forest restoration, creating natural carbon sinks for climate change mitigation, and protecting shorelines from coastal erosion and loss of marine biodiversity</p> <p>Promotion of sustainable environmental practices and effective waste management with the aim to reduce the amount of plastic waste along the Kenyan coastline, which impacts negatively on coastal and marine biodiversity and sustainable livelihoods</p> <p>Protection:</p> <p>Enhancement of sustainable mangrove conservation</p> <p>Sustainable management:</p> <p>Women's economic empowerment through training and support of coastal communities in female-led sustainable seaweed farming cooperatives</p>
<p>Societal challenge(s)</p>	<p>poverty</p> <p>gender inequality and gender-based violence</p> <p>climate-related risks</p>
<p>Partners (identifying main implementers and partners, if any)</p>	<p>NGO: Plan International Kenya and Plan International UK</p> <p>Government: Kenya Marine and Fisheries Research Institute (KMFRI); Kenya Forest Service (KFS)</p> <p>Community-based organizations: Beach Management Units; Pwani University</p>
<p>Financing (source, amount)</p>	<p>£320k; Moondance Foundation</p>
<p>Timeframe</p>	<p>3 years (2020–2023)</p>
<p>Geographical focus</p>	<p>coastal Kwale county, Kenya</p>
<p>Biodiversity and ecosystem benefits</p>	<p>The project has contributed to improving the restoration of local mangrove forests and enhancing fish populations through the conservation of existing mangroves, while also rehabilitating degraded sites.</p>

Employment effects	The project has contributed to job creation through the establishment of seaweed farming groups and community mangrove restoration groups, which are also involved in the establishment of a commercial mangrove seedling mangrove nursery.
Target beneficiaries (# people reached) – employment beneficiaries	3 780 adults and children living in 5 coastal communities
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	7 500 more people benefitted indirectly
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	Kenya's Updated Nationally Determined Contributions submitted on 24 December 2020: progress towards achieving a tree cover of at least 10% of the land area of Kenya; scaling up NbS for mitigation (Kenya Ministry of the Environment and Forestry 2020). <i>NATIONAL CLIMATE CHANGE ACTION PLAN (NCCAP) 2018–2022</i> – Strategic Objective 3: Enhance the resilience of the Blue Economy and Water sector; Action 6: Improve resilience of coastal communities – Rehabilitating and restoring mangrove forests; and Strategic Objective 4: Increase forest/tree cover to 10% of total land area; Action 1: Afforest and reforest degraded and deforested areas in Counties – Expansion and protection of mangrove forest cover (Kenya Climate Change Action Plan n.d.).

Description of context and rationale for interventions

Along the Kenyan coastline, 71 per cent of the population live in poverty, and communities are highly reliant on natural resources to survive. The coastal ecosystem, a diverse mix of mangroves, seaweed beds and coral reefs, is extremely important ecologically. It also has enormous potential to support local communities with sustainable and resilient livelihoods, if managed well.

However, in recent years the degradation of mangrove forests, primarily for firewood, as well as over-fishing have become prevalent as means of short-term income for the coastal communities. This undermines the ecological balance of the local ecosystem and impacts negatively on the future economic security of these communities, while making them more vulnerable to the effects of climate change such as storm surges and flash floods. Women and children are often the most vulnerable, as they generally have limited access to resources, services and information, and lack the mobility to act in anticipation of and response to climate and weather risks. This economic and social vulnerability has been further exacerbated by the COVID-19 pandemic,

as the lack of savings or social security contribute to coastal communities' concerns about their future earning potential in a potential economic crisis.

Additionally, Kwale County has experienced extended periods of drought, leading it to be included among the 18 counties in Kenya that rely on relief food and other humanitarian responses . The communities depend on rainfed agriculture and fishing as main sources of livelihood. However, the county has been experiencing a cycle of failed rains over the last three years. Overfishing, increased sea temperatures and environmental degradation has resulted in decreasing fish catch and limited alternative sources of livelihood. Families are finding it difficult to cope, and conditions have worsened with increased food insecurity and other economic challenges, poverty, climate and weather extremes, the spread of diseases and the lack of social protection mechanisms. Communities within the project sites were previously reliant on fish farming and subsistence crop farming for their daily needs, but as challenges compounded, they have become exposed to chronic food shortages leading to an increased risk of malnutrition, reductions in school enrolment and increase in gender-based violence.

The Coastal Resilient Livelihood Project has been working with communities to promote alternative and supplemental environmentally sustainable and climate resilient income-generating opportunities, primarily targeting women. The initiative aims to promote community-led environmental protection and management, while increasing awareness of environmental issues and climate change. In particular, the project aims to empower women and children to promote environmental stewardship by taking a leading role in mangrove forest restoration within their communities, leading to an increase in biodiversity and natural carbon sinks, as well as the promotion of breeding sites for fish and increased protection from storm surges and coastal floods. Seaweed farming provides an opportunity to increase the climate resilience of coastal communities, improve women's economic empowerment, food, energy and shelter for marine life, and promote carbon sequestration and coastal protection.

Objective

Objective: Improved well-being of target communities and households in coastal Kwale County, Kenya, through the sustainable management and conservation of natural resources. This is to be achieved through the realization of the following outcomes:

1. Community-led mangrove forest restoration
2. Community-led – particularly women-led – environmentally sustainable livelihoods
3. Improved solid waste management and environmental protection practices
4. Increased environmental and climate awareness action by schoolchildren and communities

Description of intervention/activities

1. Seaweed farming, including development of technical, financial and marketing skills and kit distribution
2. Mangrove forest restoration through the establishment of nurseries, tree planting and GIS monitoring
3. Waste management practices and sensitization, and awareness creation at the community level
4. School-based environmental and climate awareness and education through school clubs and activities

Outcomes achieved

Along the Kwale coast, eight communities are actively engaged in mangrove restoration through the establishment of tree nurseries by 476 community members (232 female and 244 male). The process began with a training session on appropriate mangrove species, nursery bed establishment, transplanting and the seasonality of mangrove planting. Through a partnership with local public university (Pwani University), the project mapped out 38 degraded sites with a total 500 hectares using GIS.

The community has now taken the initiative to establish nurseries and transplant mangrove seedlings to the degraded sites. To date 472,500 seedlings have been established in nurseries and 51,216 have been transplanted. To ensure sustainability, the community has registered a Community Forest

Association and are developing a Participatory Forest Management Plan to guide the reforestation, conservation and harnessing of forest resources.

The communities hold several parcels of seaweed farms, which are now producing hundreds of tonnes of seaweed. The farms have been planted by 514 community members (342 female and 172 male). The minimum amount they have earned from the produce is US\$10,000 in one year. Seaweed farming has provided a viable and non-seasonal income source to supplement other sources of income. Through seaweed farming, women have been empowered and are actively participating in income generation, giving them a voice in decision making at the household level. Through seaweed farming, communities have reported improved housing, improved access to health services, realize education opportunities for their children, and access capital to start small-scale businesses. Linkages with buyers has ensured that communities have a regular market for their produce.

Additionally, to date, three BMUs are collecting solid waste and selling it to recycling companies for income.

Employment impacts

Seaweed farming

The project has created jobs for participating community members, who earn from sales of seaweed. A total of 514 community members (342 women and 172 men) are participating at different stages, earning varying amounts depending on the crop cycle. Employment is mainly part time, with two people employed by Kibuyuni Seaweed Corporation on a permanent basis.

Income effects: Through seaweed farming, the participating community members are able to meet their daily dietary needs, access to health service and education opportunities for their children as well as purchase assets.

Mangrove forest restoration: The project has created 476 jobs (232 female and 244 male) for community members who are involved in the establishment of a commercial seedling nursery. Through formal group structures, the groups set up the nursery and sell seedlings to partners who are implementing mangrove restoration activities.

As of October 2022, 762,180 mangrove seedlings are in nurseries, and another 203,620 have been planted and 38,500 sold for a total of KES770,000. Once the seedlings have been sold, the group discusses how the income should be used.

Biodiversity and ecosystem benefits

The project has contributed to improving the restoration of local mangrove forests and enhancing the fish population through the conservation of existing mangroves, while also rehabilitating degraded sites.

Description of co-benefits

- More women have been recruited in job markets through their participation in seaweed farming and mangrove restoration.
- Improved, sound environmental stewardship is being practiced by participating community members, who have a better understanding of the nexus between mangrove conservation and fish farming, among other ecological benefits.
- Environmental education has improved through 4-K club (4-K stands for Kuungana, Kufanya, Kusaidia Kenya, loosely translated as “coming together, to act, in order to help Kenya”) participation in ecosystem conservation through water harvesting, tree planting and climate-resilient horticulture practices.
- Community cohesion has improved, along with a reduction in gender-based violence, as the project advocates for gender equity and inclusion, providing participating women the ability to earn income and participate actively in household-level decision making.

Key success factors and lessons learned

- Seaweed farming has provided women with an alternative supplemental income stream at the household and community level, promoting empowerment and agency.
- Community engagement and leadership in mangrove forest restoration and waste management is contributing to successful environmental management in the project locations.
- School-based environmental activities are promoting environmental best practices at home.

References

Kenya Climate Change Action Plan n.d. "National Climate Change Action Plan." https://www.kccap.info/index_option_content_view_article_id_31.html

Kenya, Ministry of the Environment and Forestry. 2020. Submission of Kenya's Updated Nationally Determined Contribution.

Authors

Chiara Ambrosino, Phanael Owiti

Acknowledgements

Harriet Osimbo (Plan International), Swalehe Nzao, Albert Mlamba (Plan International), Andrew Nyamu

Smart coasts in Mesoamerica

At a glance

Activity description and type of NbS	<p>Actions to restore: Restoration of coral reefs, watersheds and coastal dunes</p> <p>Actions to protect: Protection of mangroves and coral reefs</p>
Societal challenge(s)	<p>Climate change</p> <p>Disaster-risk reduction</p> <p>Associated threats to nature and the economy</p> <p>Biodiversity loss and ecosystem degradation</p>
Organization(s)	WWF Mexico, WWF Mesoamerica, WWF Germany, WWF US
Partners (identifying main implementers and partners, if any)	<ul style="list-style-type: none"> ■ Mexico: National Commission of Protected Areas; Yucatan State Secretariat of Sustainable Development; Pronatura Península de Yucatán; and Centro Mexicano de Derecho Ambiental ■ Belize: Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development; Division/Department: Coastal Zone Management Authority and Institute; Hol Chan Marine Reserve; Sarteneja Alliance for Conservation and Development; Southern Environmental Association; and Toledo Institute for Development and Environment ■ Honduras: Ministry of Energy, Natural Resources, Environment and Mines; Division/Department: Department of Protected Areas / National Institute of Forest Conservation and Development, Protected Areas and Wildlife; Centro de Estudios Marinos; and Asociación Cuerpos de Conservación de Omoa ■ Guatemala: Ministry of the Environment and Natural Resources and Fundación para el Ecodesarrollo y la Conservación
Financing (source, amount)	US\$5.1 million total funding (4.7 million from IKI/German Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection; 0.4 million by WWF)
Timeframe	June 2018 to May 2023
Geographical focus	Mesoamerican Reef Ecoregion (Mexico, Belize, Guatemala and Honduras)
Biodiversity and ecosystem benefits	<p>Protected and restored ecosystems serve as nurseries for marine species and as a microrefugia</p> <p>Habitat for species such as sea turtles, birds, and targeted fish species (parrot fish, snapper)</p>

Employment effects	<p>Job creation</p> <p>Livelihoods diversification</p> <p>Recreational activities (tourism)</p>
Target beneficiaries (# people reached) – employment beneficiaries	79 people employed
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	3 000 people
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	<ul style="list-style-type: none"> ■ Mexico's Climate Change Adaptation Strategy for Protected Areas ■ Belize's updated Integrated Coastal Zone Management Plan ■ Several protected area management plans in the four countries ■ The updated NDCs of three countries have targets based on the science-based analyses that the project has produced.

Geographical focus

The project is focused on the Mesoamerican Reef Ecoregion, which is home to watersheds, mangroves, seagrass, coastal dunes and coral reefs. The project engages local and Indigenous communities in the coastal zones of the ecoregion that depend on natural resources for their livelihoods and are thus vulnerable to climate change.

Description of context and rationale for interventions

The Mesoamerican Reef System is the largest transboundary reef system in the world and contains the world's second longest barrier reef. The system stretches across four countries: Mexico, Belize, Guatemala and Honduras, along more than 1,000 km of coastline and is a hotspot for biodiversity including endangered marine turtles, more than 60 types of corals and more than 500 fish species.

Coastal and marine resources in this region provide essential ecosystem services, sustain key economic sectors, support the livelihoods of more than two million people and contribute to the protection of coastal communities against adverse effects of climate change. These areas are also among the most vulnerable regions worldwide to climate change impacts. The

management of these resources does not yet adequately take into account adaptation principles and measures. There is a need to strengthen capacities in coastal communities and government institutions to integrate climate change scenarios and adaptation measures to inform management and development policies for protected areas and coastal zones.

Societal challenge

Climate change adaptation and disaster-risk reduction: The project areas are prone to climate hazards. Implementing ecosystem-based adaptation measures is expected to reduce the vulnerability of people to climate change in general and in particular to coastal hazards such as erosion, sea level rise, and flooding from storm surges.

Objective

The initiative seeks to incorporate climate change principles into the management of protected areas and coastal development policies, with the aim of improving the capacities of coastal communities to adapt to climate change. The adaptation strategies are integrated into higher-level policy instruments such as coastal development plans and management plans for protected areas and into locally based adaptation measures.

Description of intervention/activities

- **Belize:** Mangrove protection (300–500 hectares) and restoration (TBD), and coral restoration (0.5–1 ha)
- **Honduras:** Watershed restoration: restoration of agricultural land, implementation of improved agricultural practices to conserve soil, establishment of riparian forest within 30 m of rivers
- **Guatemala:** Mangrove protection: at least 230 ha
- **Mexico:** Coastal dune restoration: 2,550 m

Outcomes achieved

The project's expected outcome is to strengthen the adaptation capacity of coastal communities and protected areas of the countries that make up the Mesoamerican Reef region.

Smart Coasts built a technical base around the importance of the conservation and restoration of coastal habitats for the well-being of communities in the

MAR region, especially in the face of climate change. Since the start of the project, the project has informed over 15 policy documents across the project countries, including updates to Nationally Determined Contributions, coastal management plans, and climate change policy instruments.

Moreover, government authorities and other relevant stakeholders have been trained to use the spatial analysis tools developed so as to allow for replication of the project approach in other regions.

Finally, the project is informing and supporting implementation of ecosystem-based adaptation options on the ground, which has included community participation as a key pillar.

Employment effects

A total 79 NbS jobs have been created, supported or enhanced, of which 55 per cent are held by women and 12 per cent by youth. The project created a variety of emerging jobs with NbS specializations: programme coordination, ecosystem restoration, environmental education, data and information gathering, legal or policy advisory, geospatial analysis, and participatory and inclusive processes. (See table for full list of job types. The top positions both at regional and country level coordination are led by women.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Regional project coordinator	Coordinates project activities at regional level, and oversees project execution, decision making, and adaptive management.	1	-	1	-	Permanent	Upper education
Country Project coordinator	Country coordinators lead and supervise the project's implementation locally, engaging various stakeholders, translating scientific information, and providing technical assistance.	4	1	3	-	Temporary Fixed-Term Part-time Contracted	Upper education
Communication coordinator	Leads development and deployment of communication materials for various audiences.	1	-	1	-	Permanent	Upper education

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Monitoring and Evaluation specialist	Keeps track of progress against expected outcomes and outputs.	1	-	1	-	Permanent	
Project manager	Maintains relationships with donor, oversees overall project reporting to donor, and keeps the technical team informed about legal and administrative developments.	1	-	1	-	Permanent	Upper education
Scientific advisor	Engages with science partners and supports translation of technical information into actionable information.	1	1	-	-	Permanent	Upper education
Consultants	Support the project's work in specific areas of expertise, support project managers and complement their capacities. Consultants conduct both desktop and field work, depending on specific needs. Consultancy types include: communication, ecosystem restoration, environmental education, data and information gathering, legal or policy advice, geospatial analysis, and others.	44	24	19	10	Temporary Fixed-Term Part-time Contracted	Upper education
Park rangers	Park rangers work directly in the field, helping to manage protected areas and their resources. They conduct work such as monitoring and surveillance, but also engage with local community members.	1	1	-	-	Short-term employment	
Researchers	Researchers generally work in academic institutions and universities and have very specific and advanced expertise. They operate as project partners, generating technical/scientific information to support project implementation such as climate projections and ecosystem service models. Researchers can also support capacity building of other project members through training.	6	-	6	-	Temporary Fixed-Term Part-time Contracted	Upper education

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Daily workers	Daily workers are often community members who are hired to conduct field work in their own communities such as ecosystem restoration and nursery management. They are paid on a daily basis after completion of work. These community members also often engage in other activities, such as environmental education.	19	-	-	-	Short-term employment	

Biodiversity and ecosystem benefits

The project supports the protection of mangroves, coral reefs, seagrass beds and coastal dunes, as well as the protection and conservation of critical habitat for turtle, bird and fish species, and areas that serve as nurseries for marine species.

Description of co-benefits

- The project supports capacity building of local stakeholders, including community members, local authorities and local organizations.
- Coral reef and mangrove conservation and restoration are expected to increase tourism, bringing economic benefits to local communities.
- Coastal dune, mangrove, seagrass and coral reef conservation and restoration protect community livelihoods and infrastructure from coastal hazards.
- Coral reef and mangrove health is expected to increase fish populations, potentially increasing fisheries-related jobs.

Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)

The project's science-based analysis has contributed to various subnational and national policies, including Mexico's Climate Change Adaptation Strategy for Protected Areas, Belize's updated Integrated Coastal Zone Management Plan, and several protected area management plans in the four countries, as well as the Nationally Determined Contributions (NDCs) of Belize, Guatemala and Honduras.

As of June 2022, the project has worked with government representatives of 17 different agencies to integrate future climate analyses into a total of 27 policy instruments and plans in the four countries.

Key success factors and lessons learned

The hands-on approach and continued engagement of country coordinators was critical for positive engagement of local and national government authorities and other stakeholders. However, the COVID-19 pandemic severely affected the team's ability to connect and engage with stakeholders. For some stakeholders, digital communications proved a useful way to overcome this challenge, but limited internet connectivity in rural areas made connecting with local communities more difficult.

To re-engage local community participants, the project reoriented its communication strategy to develop a 10-episode educational radio series, which was later transformed into a podcast and animated videos that were shared widely via local radio stations and social media. Their production took into account local languages and language variations, which were well received, reaching over 60,000 individuals.

Authors

Alejandra Calzada Vázquez Vela (WWF), Diego Portugal Del Pino

Acknowledgements

María Amalia Porta (WWF), Pilar Velásquez (WWF), Mauricio Mejía (WWF), Lilian Márquez (WWF), Nadia Bood (WWF), Rosario Calderón (WWF), Janne Rohe (WWF)

Ten Billion Tree Tsunami Programme in Pakistan

At a glance

Activity description and type of NbS	<p>Restoration of forests and rangelands</p> <p>Conservation of wildlife and protected areas</p> <p>Sustainable management of watersheds and rangelands</p>
Societal challenge(s)	<p>climate change mitigation and adaptation</p> <p>large-scale environmental degradation</p> <p>extreme weather events including rising temperatures, flooding and droughts</p>
Partners (identifying main implementers and partners, if any)	<p>Ministry of Climate Change (MoCC)</p> <p>Governments of four provinces (Punjab, Sindh, Balochistan and Khyber Pakhtunkhwa) and two independent territories (Gilgit-Baltistan, and Azad Jammu and Kashmir)</p> <p>A consortium including IUCN, FAO and WWF-Pakistan, carries out independent third party monitoring and evaluation (TPM&E) to ensure transparency at the request of MoCC.</p>
Financing (source, amount)	<p>Local cost: Government of Pakistan</p> <p>Forestry Component: 109.38 billion Pakistani rupees (US\$491 million)</p> <p>Wildlife Component: 15.59 billion Pakistani rupees (US\$70 million)</p> <p>Liabilities of Green Pakistan Programme: 210 000.000 Pakistani rupees (US\$950 000)</p> <p>Total cost: 125 184 billion Pakistani rupees (US\$562 million; 50% Federal Public Sector Development Program and 50% Provincial Annual Development Plans)</p>
Timeframe	Phase 1: 2019–2023
Geographical focus	Pakistan
Biodiversity and ecosystem benefits	<p>Enhanced forest cover</p> <p>Reduction of plastic waste in protected areas.</p> <p>Better conservation of Critically Endangered habitats</p> <p>Stricter regulation on illegal wildlife trafficking</p>
Employment effects	<p>The programme employed 1 420.962 men and women across Pakistan.</p> <p>Through the co-benefits, the programme would contribute to job creation in the long term.</p>

Target beneficiaries (# people reached) – employment beneficiaries	1 420.962 jobs were created through the programme.
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	Pakistan's population of more than 230 million people.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	SDG 15 The updated NDC 2021 acknowledged the TBTP as a robust natural capital restoration effort for climate action.

Description of intervention

Pakistan is the fifth most populated country in the world and the seventh most vulnerable country to climate change. The country is facing a fiscal crisis and high rates of unemployment, and is currently being supported by an International Monetary Fund (IMF)-sponsored macroeconomic stabilization programme.

Pakistan also suffers from widespread environmental deterioration, with a forest cover of around 4.8 per cent. Large-scale deforestation resulting from land conversion to agriculture is the result of encroachment into forest areas by a fast-growing population. This has led to the loss of ecosystem goods and services and resulted in associated socio-economic impacts.

To address this, Pakistan's Ten Billion Tree Tsunami Programme (TBTP), inaugurated on 2 September 2018, aims to support the country's transition towards climate resilience by mainstreaming climate change adaptation and mitigation through ecologically targeted initiatives. With an initial budget of nearly 125.2 billion Pakistan rupees (US\$562 million), the programme set the ambitious goal of planting 3.3 billion trees between 2019 and 2023.

The TBTP is a nationwide programme implemented by the Ministry of Climate Change (MoCC) in partnership with its four provinces and two independent territories. A consortium including IUCN, FAO and WWF-Pakistan, carries out independent third party monitoring and evaluation (TPM&E) at the request of MoCC. The programme has several integrated and self-reinforcing components, one of which is to raise awareness of the programme and its intended outcomes among all stakeholders.

Workers support the collection and plantation of nursery seed stock to generate the saplings that are planted at designated sites. Natural forests are also being rehabilitated through assisted natural regeneration and the enrichment of soil through sowing. The programme used various afforestation approaches, including block plantation, linear plantation, mangrove plantation, riverine plantation, farm forestry, plantation of waterlogged and saline areas, and urban plantations.

Watershed management trainings and implementation helped to conserve soil and water in natural forests, strengthening their resilience. Plants were also given away for free or at subsidized rates for planting by landowners.

The programme developed participatory range management plans to support the restoration of rangelands and planted native fodder trees to improve their productivity.

Programme implementers have developed new national parks, biosphere reserves and management plans to strengthen their effective management. They are also working to promote ecotourism within new and existing parks and to strengthen waste management systems to reduce negative environmental impacts. The programme is promoting wildlife conservation and habitat improvement for biodiversity both within and outside protected areas.

TBTP is strengthening institutional capacity during activities with provincial forestry and wildlife departments, working with communities to support equitable natural resource management. The programme is also collaborating with multiple stakeholder groups, including universities and research institutions, to strengthen restoration and promote natural resource-based livelihoods. An endowment fund for forest and wildlife conservation has been established.

Objectives

The specific objectives of the programme are to enhance forest cover, conserve biodiversity, and strengthen national and local institutions.

Outcomes achieved

Enhanced forest cover: From April 2022 to July 2022, 261.36 million plants were planted, regenerated or distributed in the country by provincial and territorial forest departments (National Assembly of Pakistan 2022).

Institutional strengthening of ZSP: The Zoological Survey of Pakistan (ZSP) is the pioneer research organization for multidisciplinary zoological and wildlife-

related matters in the country. TBTP has supported the ZSP in its compilation of secondary data for mammals of Pakistan as well as in the development of taxon data sheets for the collection of sighting data for mammals of Pakistan. This will support the development of National Red Data Book for Pakistan's mammals. The country is also developing a biodiversity information portal for data collection (National Assembly of Pakistan 2022).

Employment effects

To date, the programme has created approximately 1,420,962 jobs for both men and women across Pakistan (see table). Through its support for climate change mitigation and adaptation, the programme will also indirectly benefit the country's population of more than 230 million people.

TYPES OF JOBS	GUARDIANS (NEGHABAN)	GUARDS (CHOWKIDAR)	DAILY WAGE WORKERS	SKILLED LABOURERS	TOTAL
Male	456 925	282 656	466 064	128 915	1 334.560
Female	73 898	1 944	5 463	5 098	86 402
Total	530 823	284 600	471 527	134 013	1 420.962

The programme created four types of jobs: guardians, guards, daily wage workers, and skilled labourers.

- Guardians (*neghaban*) act as custodians of a share in the forest under their protection. Local forest departments are responsible for hiring the guardians, who mainly earn monthly salaries fixed by the government.
- Guards (*chowkidar*) are employed to report on any damage or incidents in the forest authorities. The guards may not have a direct stake in the forest but are usually employed for longer periods.

Daily wage workers are paid according to standard government rates. Candidates who meet the eligibility criteria for digging pits and planting trees are recruited as temporary workers through communities or the local forest department. There is no guarantee that daily wage workers will be

re-employed. However, depending on the requirements of the task, preference is given to those who have already held the position.

Skilled labourers supervise the daily workers and are thus required to have specific skills in restoration or forestry.

Biodiversity and ecosystem benefits

TBTP has led to improved legislation and strengthened institutions throughout Pakistan, particularly focusing on enhanced management of protected areas such as biosphere reserves and national parks and on promoting eco-tourism based on international standards. The programme has also worked to reduce plastic waste in protected areas.

The programme has contributed to the revival of some critically endangered habitats. It has worked to curb illegal wildlife trafficking through the establishment of control desks in international and national airports, while also strengthening the partnership between the wildlife departments and national universities.

Description of co-benefits

A sub-initiative within the programme, the Billion Tree Honey Initiative, is expected to produce 70,000 metric tons of honey each year, which could generate an income of 25 billion Pakistani rupees (about US\$112 million) and provide 87,000 jobs. Similarly, protected area initiatives will provide job opportunities for 5,500 people.

Key success factors and lessons learned

One major success factor for the TBTP has been the continuity of the programme irrespective of changes in political leadership. Others include the crucial role of TPM&E, the use of native trees in afforestation, enhanced women's participation and the creation of green jobs. Key lessons include ensuring better selection of species for assisted natural regeneration and promoting the use of native species in ecosystem restoration programmes.

References

National Assembly of Pakistan. 2022. 45th session. "Questions for oral answers and their replies". 13 October 2022. https://na.gov.pk/uploads/documents/questions/6347e1def1809_765.pdf

Authors:

Asim Jamal (Third Party M&E Consortium for Ten Billion Tree Tsunami Programme, TBTP), IUCN Pakistan) and Mehmooda (IUCN Pakistan)

Scaling up Ecosystem-based Adaptation through faenas in Peru

At a glance

Location	Central Andes, Peru
Activity description and type of NbS	Wetland ecosystems and ancestral water technologies restoration Sustainable management and restoration of grassland ecosystems
Societal challenge(s)	Climate change adaptation and disaster-risk reduction Nature and economic benefits Food and water security Biodiversity loss and ecosystem degradation
Main partner	Instituto de Montaña (IdM)
Partners	International Union for Conservation of Nature (IUCN), the National Service of Natural Protected Areas (SERNANP), the Ministry of the Environment of Peru (MINAM), the communities of Miraflores, Canchayllo, Tomas and Tanta, and regional and local authorities.
Financing	International Climate Initiative (IKI) of the German Government (€562,070).
Time frame	July 2017 to June 2022
Biodiversity and ecosystem benefits	Protection of tropical high Andean hotspots in native ecosystems like wetlands and grasslands, including habitat for endangered species such as vicuña (Vicugna vicugna, a wild south American camel related with the llama)
Employment effects	Local jobs created Traditional volunteering opportunities Increased productivity of cattle and sheep
Target beneficiaries (# people reached) – employment beneficiaries	14 permanent and temporary jobs; 89 volunteering opportunities

Target beneficiaries (# people reached) – beneficiaries of services provided by the Nbs	<p>Direct beneficiaries include 1,646 local inhabitants of Miraflores, Tanta, Tomas and Canchayllo Communities.</p> <p>Indirect beneficiaries include 15,000 people living within the Reserve and 232,706 inhabitants of the Cañete province downstream who use the water of the Cañete river basin. The El Platanal hydropower (220 MW) plant also uses water from the river.</p>
Contributions to SDGs	DGs 1 (No poverty) and 15 (Life on land)

Geographical location

The Nor Yauyos Cochis Landscape Reserve (NYCLR) was created in 2001 and is located in the central Andes of Peru, in the regions of Lima and Junín. It spans an area of 221,268 hectares and its elevation ranges from 2,500 to 5,860 metres above sea level. The mountainous landscape of NYCLR encompasses a complex hydrological system of glaciers, waterfalls and 485 lagoons. It is also home to great floristic diversity, with 330 plant species catalogued to date (MINAM 2011). High Andean grasslands (including pajonal, puna grass, and bofedales) above 3800 m are the predominant vegetation, covering about 70 per cent of the Reserve's surface. The project works in four communities within the Reserve: Miraflores, Tanta and Tomas (located in Lima region), and Canchayllo (located in Junin region).

Context and rationale

The main reason for the creation of the NYCLR was to conserve the upper Cañete River basin and the Pachacayo River basin, important for water regulation, hydroelectric energy production, and other ecosystem services (INRENA 2006). Because of its status as a landscape reserve, the NYCLR allows the direct use of resources as established in the management plan (INRENA 2006).

The NYCLR is home to about 15,000 people (INRENA 2006). Anthropogenic activities have shaped the Reserve's landscapes for thousands of years, as evidenced by the distribution and characteristics of its flora and fauna and its wealth of intangible and material cultural values (INC 2009, INRENA 2006). Ancestral technologies such as terraces, agricultural and livestock practices, dams, canals and pre-Hispanic roads are still in use and reflect a profound knowledge of the environment and the development of very specific knowledge and skills.

Currently, the Reserve faces multiple pressures, such as changes in demographics and production patterns, overgrazing, and changes in rainfall patterns and extreme weather events such as frosts, droughts, floods, mudslides and landslides. Access to water and healthy pastures is essential for the well-being of local communities, who depend primarily on agropastoral activities for their livelihoods. In recent decades, there has been a general decline in agricultural production (especially of indigenous crops such as potatoes) associated with climatic uncertainty, lower agricultural prices, lack of labour due to migration, and increased livestock activities. The increase in cattle grazing, coupled with the weakening of communal organization, generates unsustainable management practices that are causing the degradation of the puna grassland ecosystems; the problem of overgrazing is widespread and urgently requires a change in the resource use system.³

There is a high level of uncertainty regarding future climate trends and scenarios in the Reserve.⁴ Temperatures have already increased by 0.21–0.32 °C per decade between 1950 and 2010, and a further increase of 0.61–1.12 °C is likely between 2011 and 2030. In addition, although total precipitation volume will remain fairly stable, distribution patterns will change significantly. Similarly, surface runoff is expected to decrease as the volume of water stored in glaciers and snowpack decreases. Future scenarios for the Reserve suggest changes that could affect pastures and water – vital resources for rural communities dependent on agricultural activities (FDA, 2013). The local population already perceives the impact of changing temperature, rainy season, and extreme events, confirming scientific findings (UNDP, UNEP, IUCN and IdM 2016).

Societal challenges and solutions

- Low income and lack of livelihood opportunities
 - * Strengthening and diversifying local livelihoods through the restoration of ecosystem services (i.e., fodder provision, water availability).
- Outbound migration
 - * Adapting ancestral technologies to current social context (i.e., using green-grey infrastructure that is less labour-intensive)

³ According to the inventory and evaluation of the reserve's natural heritage conducted by MINAM (2011)

⁴ According to the "Estudio de Vulnerabilidad e Impacto del Cambio Climático en la Reserva Paisajística Nor Yauyos-Cochas" (FDA 2013)

- Climate change and vulnerability to disasters:
 - * Addressing climate-related risks such as droughts, frosts, floods, mudslides and landslides.
- Food and water security
 - * Enhancing water storage and availability through sustainable and climate-smart ecosystem management.
- Biodiversity loss and ecosystem degradation
 - * Strengthening local social organization and knowledge to improve natural resources management (i.e., enhance livestock management and decrease overgrazing) in a context of climate variability and change.

Objective

The goal is to help local communities adapt to present and future climate change impacts. Currently, up to 70% of the local population depends on sheep and cattle grazing for their livelihoods. This makes them strongly dependent on healthy grassland ecosystems and a steady supply of water.

Description of intervention / activities

- **Actions to restore ecosystems and ecosystem services:** wetland and grassland ecosystems restoration, water storage and regulation.
- **Actions to sustainable manage:** water and grassland ecosystem management.

The project is implementing Ecosystem based Adaptation (EbA) measures focused on improving water storage and regulation and grasslands and livestock management in the three core areas: (a) strengthening local capacities and knowledge by promoting intercultural dialogue between scientists, practitioners and local community members (Zapata and Gleeson 2020); (b) institutional and community organization strengthening by co-developing the community grass and water management plan; and (c) improvement of natural infrastructure through the restoration of ancestral and modern water technologies for expansion and conservation of wetlands and for community management of native grasslands, as well as for improving the management and breeding of native vicuña (*Vicugna vicugna*, a wild south American camel related with the llama) (Zapata et al. 2020).

Outcome achieved

In three communities, organization strengthened and people have increased their capacities to adapt to climate change. In two communities, water availability has improved and water resources are now better distributed; grasslands are healthier and better managed, and livestock yields have increased due to these improvements. A household survey recently conducted in Miraflores (2022), showed that milk yields have doubled in average (from 4 to 8 liters per cow a day) compared to yields before the project; there is an increase of 41% in cheese production and an increase of 54% in cattle sale prices, improving family income⁵. Moreover, all surveyed community members have experienced significant improvements in their respective household economies. Regarding agricultural practices, nearly 90% of the community members surveyed adopted sustainable livestock practices with improved skills to better manage grazing after the project.

Employment effects

The project employs 14 people, covering diverse backgrounds from early career professionals to experts in the fields, as shown in the table. The project also integrates mainstream science with indigenous and local science, facilitating the development of NbS that take into account cultural and ancestral practices.

The majority of work is done through communal work or "faenas" – a traditional form of unpaid work for the improvement of communal infrastructure or for a service that provides a common good. This organizational practice can be found in most local communities around Peru. The faenas are usually contributions from community members, such as the reinforcement or raising of a dam that fills a lagoon in times of drought or other immediate infrastructure projects that are required within the community. In the Andes, there is a tradition of faenas or investment of labour for the common good that dates back to pre-Hispanic times. The number of tasks that all community members must contribute are agreed upon in the community's general assembly and are obligatory for all members. The contribution is generally in the form of unpaid labour. Those who do not comply are subject to a sanction, generally expressed through denial of the benefits that the community grants to its members (for example, distribution of benefits

⁵ According to the EbA measures effectiveness and impact assessments conducted by IdM (2022).

from the communal farm such as alpaca breeding, benefits granted by an agreement with a mining or hydroelectric company, or other benefits that come from the use of the territory).

In the context of this project, the community co-designed the EbA and supported the implementation through faenas. In 2019 (before the pandemic), the project carried out 14 faenas with an average of 20–40 people per faena. In 2022, the project resumed, having carried out 4 faenas, and 2 additional faenas are planned before end of September 2022.

The project has also contributed to the creation of full-time paid jobs for indigenous peoples and local communities (IPLCs), mainly facilitators, grasslands experts and interns.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Project officer	Team building, planning, implementation and follow-up of activities	1	-	1	-	Permanent	Higher education
Field assistant	Facilitation of participatory processes with communities	2	1	1	-	Permanent	Higher education
Knowledge management specialist	Support for various aspects of the project	1	-	1	-	Temporary Fixed-Term Part-time Contracted	Higher education
Consultants	Support for various aspects of the project	6	5	1	6	Permanent	Upper education
Interns	Support for various aspects of the project	4	1	3	4	Temporary Fixed-Term Part-time Contracted	Upper education
Volunteers	Support for various aspects of the project	3	-	3	3	Temporary Fixed-Term Part-time Contracted	Upper education

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Communal work or faenas (Design and implementation phases)	Refer to description of faenas in main text.	60	48++	12++	10+	Temporary for the duration of the project but permanent for the needs of the community	Low-skilled
Communal work or FAENAS (Consolidation phase)	Refer to description of faenas in main text.	29	15++	14++	7+	Temporary for the duration of the project but permanent for the needs of the community	Low-skilled

*No details available on age

**No details available on gender

Additionally, the project also increased productivity of cattle and sheep, strengthening local livelihoods.

The project has also been part of the “Plataforma de Buena Gobernanza” of the Cañete river basin, a platform to promote mechanisms for payment for ecosystem services commonly known in Peru as Mechanisms of Retribution for Ecosystem Services (MERESE). Retributions in Cañete river basin were given as materials and resources to implement projects that restore ecosystems and maintain water in the upper part of the river basin.

Description of co-benefits

- Attracting other donors and projects related to EbA measures due to improved community organization.
- Reduction in cattle mortality due to increasing grazing area and water availability.
- Strengthening of communal identity through faenas.
- Strengthening of local livelihoods through increased cattle sale prices due to better livestock management and increasing milk yields, cheese production and alpaca wool production.

Key success factors and lessons learned

An inclusive approach was a key success factor through the co-design, implementing and monitoring of the EbA measures together with the local population. A high quality local participation should be sought at all times, which contributes to build local ownership and project continuity and sustainability in the long run.

Local people learned how to manage their territory and resources based on ancestral knowledge. It is core to make this knowledge available and promote the dialogue and exchange with scientific knowledge on EbA measurement design and implementation.

Ancestral technologies and infrastructure for water management and other resources have been available in the field for centuries and many of them are still adopted, although the current social context tends to discontinue their use. Green-grey infrastructures represent good alternatives to keep them working.

A joint work with the Natural Protected Area team should be done by sharing approaches and building local capacities. This contributes to both continuity and replication of EbA measures. This is crucial as they will continue working in the zone after the project ends.

References

- FDA (Fundación para el Desarrollo Agrario). 2013. Evaluación del Impacto y Vulnerabilidad del Cambio Climático de la Reserva Paisajística Nor Yauyos Cochas y áreas de amortiguamiento. Document prepared within the framework of an inter-institutional collaboration among the CDC-FEP-Universidad Nacional Agraria La Molina, Escuela de Ingeniería de Antioquía and IRI-EICES-Columbia University. Lima: PNUMA.
- IdM (Instituto de Montaña). 2022. Effectiveness and Impact Assessment of Ecosystem based Adaptation Measures implemented by the Scaling Up Mountain EbA Project in Peru. (Forthcoming).
- INC (Instituto Nacional de Cultura). 2009. “Apu Pariacaca y El Alto Cañete: Estudio de Paisaje Cultural.” Lima: Programa Qhapaq Ñan.
- INRENA (Instituto Nacional de Recursos Naturales). 2006. Reserva Paisajística Nor Yauyos Cochas. Plan Maestro 2006 – 2011. Lima: SERNANP.
- MINAM (Ministerio del Ambiente del Perú). 2011. Inventario y evaluación del patrimonio natural en la Reserva Paisajística Nor Yauyos Cochas. Dirección General de Evaluación, Valoración y Financiamiento del Patrimonio Natural. Lima.
- UNDP (United Nations Development Programme), UNEP (United Nations Environment Programme), IUCN (International Union for Conservation of Nature) and IdM (Instituto de Montaña). 2016. El futuro ancestral: la adaptación basada en ecosistemas.
- Zapata, Florencia; Gallardo, Mirella; Segura, Elmer; y Recharte, Jorge. 2020. “Diálogos de saberes y cambio climático: Relevancia de los enfoques participativos para la Adaptación basada en Ecosistemas”. En Silvana Vargas Winstanley, Mireya Bravo Frey (Eds.) Perú: El problema agrario en debate. SEPIA xviii / Seminario Permanente de Investigación Agraria. Lima: SEPIA.
- Zapata, Florencia; and Gleeson, Erin. 2020. “Knowledge dialogues and climate change: integrating participatory approaches in the design of ecosystem-based adaptation measures in the Peruvian Andes.” En Leal Filho, W. et al (Eds) Climate Change, Natural Hazards and Adaptation Option: Handling the impacts of a changing climate. S. Springer.

Authors

Mirella Gallardo (Instituto de Montaña), Yadira Mori (Instituto de Montaña), Daniella Vargas- Machuca (Pontifical Catholic University of Peru), Florencia Zapata (Instituto de Montaña), Diego Portugal Del Pino

Coastal dune restoration in Portugal

At a glance

Activity description and type of NbS	Coastal dune restoration, management and monitoring
Societal challenge(s)	Climate change and risk of increased natural disasters Biodiversity loss and ecosystem degradation Associated threats to nature and the economy
Partners (identifying main implementers and partners, if any)	Municipality of Almada Portuguese Environmental Agency
Financing (source, amount)	The ReDuna project was financed by the EU Structural and Cohesion Funds for coastal protection through the National Environmental Agency of Portugal.
Time frame	The project started in 2014. It was inaugurated in April 2015 and it is expected to continue as long as the hazards exist.
Geographical focus	Almada, a coastal city in Portugal with a 13 km coastline on the Atlantic Ocean. Residential area with primary services (agriculture) and tertiary services (many tourism-related) Almada is an important biodiversity corridor between two the Tagus and Sado estuaries.
Biodiversity and ecosystem benefits	Restoration of the coastal dune ecosystem and its functions Improved connectivity and functionality of green and blue infrastructure Reduced habitat loss and increase biodiversity richness Increased biodiversity Increased cultural richness
Employment effects	Increase recreational activities such as tourism
Target beneficiaries (# people reached) – employment beneficiaries	104 NbS jobs created

Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	The population of Almada was 177,268 in 2021. The city also receives more than 8 million tourists every year.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	Dune restoration is recognized in the Regional Coastal Management Plan as coastal protection measures and actions. Alignment with SDGs 3,4, 6, 8, 11, 13, 14, 15 and 17

Description of context and rationale for interventions

The northern area of the coastal dunes in the City of Almada is experiencing increased erosion due to lack of sediment deposit and sea level rise. This makes this coastal area prone to erosion events and washovers (sediment deposited by waves washing over dunes during storm surges) and sea level rise, which have become more frequent since the late 1990s. Coastal protection a high priority in Almada, which receives millions of tourists every summer, as climate-related hazards pose a threat to tourism services and existing private infrastructure.

The ReDuna project started in 2014 in response to strong winter storms along the coast of Costa da Caparica that destroyed the dune system. The project replenished the beach sand and restored the dune profile along 1 km of coast using willow sand fences and 100,000 plants of native dune species. Pathways and fences were also built to reduce the human impacts, and communications aimed to raise awareness among visitors.

The restoration phase took 6 months, and monitoring and evolution of the project is ongoing to determine how the ecosystem responds to human and natural impacts. After each summer and storm season, maintenance crew work to restore the willow fences, replace vegetation and renovate walking paths to adapt these measures to new pressures.

Societal challenges

The project addresses:

- **Climate change adaptation and disaster-risk reduction:** Coastal dune restoration aims to foster resilience to storm effects and coastal erosion by ensuring a more stable sediment transfer and balance between the dunes, the beach and the ocean floor.

- **Biodiversity loss and ecosystem degradation:** This coastal dunes ecosystem includes several conservation priority habitats and species protected under the Habitats Directive of the European Commission (EC n.d.).
- **Associated threats to nature and the economy:** The area's current coastline regression threatens tourism and existing private infrastructure.

Objective

The project aims to restore the natural capacity of the Almada sand dune-beach ecosystem to respond to natural threats, while enhancing its resilience to sea-level rise and storms.

Description of intervention / activities

- **Actions to restore and protect:** Construction of willow sand fences and planting of 100,000 plants of native dune species.
- **Actions to sustainable manage:** Native species plantation and invasive alien species removal with the involvement of the local community.

Outcome achieved

Four years after the initial plantation, roots were more than 4 metres deep and in high density, forming a strong root network that stabilized the foredune (dune running parallel to the shore). In March 2018, the restored dunes provided an effective response to Storm Emma.

Geomorphological and ecological parameters were monitored at six-monthly intervals initially, and then yearly with indicators as geomorphological evolution, beach-dune sediment stock, biodiversity colonization (new plants and animals), vegetation survival, community structure evolution, impact of fences on survival, growing and establishment of plants, for example. To detect the site's geomorphological changes, a GPS-based monitoring of the transect was performed, creating a 3D-model of the dunes. Nowadays, photographic data can be easily obtained by drones, which is a non-intrusive method. The results obtained during the first two years of the project showed that 90% of the planted native species have survived, attracting 49 new wildlife species, which increased biodiversity and provided ecological resilience to the restored ecosystem.

Employment effects

The project has created 104 NbS jobs, of which 64 are related to the restoration, construction and maintenance of the ecosystem. Twelve jobs are considered permanent. Each year, the project hires 27 consultants from disciplines such as biology and geology, including both university students and young professionals. For implementation, the project employed 22 workers for the initial 2–3 months to assist with planting and installing sediment traps and pathways. There are an average of 10 drivers, and more than 30 cooking and cleaning staff.

The project has received the support of 1,040 volunteers (280 adults and 760 youth) since it began (around 200 per year before the COVID-19 pandemic, decreasing to around 40 during the pandemic).

Biodiversity and ecosystem benefits

- Restoration of ecosystems and their functions
- Improved connectivity and functionality of green and blue infrastructures
- Reduced habitat loss and increase in biodiversity richness
- Increased species diversity and genetic richness
- Improved ecosystem resilience
- Increased water infiltration and storage

Description of co-benefits

- Increased sense of ownership in the communities
- Increased well-being
- Increased willingness to invest in NbS
- Sustainable development of coastal regions

Policy alignment

The project is well aligned with regional/local strategies and policies. The typology of dune restoration is recognized in the Regional Coastal Management Plan as coastal protection measures and actions. The project aligns with SDGs 3, 4, 6, 8, 11, 13, 14, 15 and 17.

Key success factors and lessons learned

The project has observed many challenges, such as the economic valuation of ecosystem services, as there is an inherent uncertainty in attempting to quantify the economic value of non-marketed services. Moreover, the costs of the depletion of these services are rarely tracked in local economic accounts. Thus, the recognition of NbS as an effective solution for coastal defence is still not widely recognized. During the Portuguese coastal management plan revision, the main difficulty faced by the project was eligibility to apply for Structural and Cohesion Funds. Technicians and local government staff had to make the case for how NbS interventions and green infrastructure measures could effectively contribute to coastal management and foster disaster prevention.

The experience of Almada is an extremely useful case for all the Portuguese coastal dunes facing similar problems of erosion and coastal flooding. The ReDuna project is also a successful example of nature-based coastal dune management that can be applied more globally.

ReDuna has promoted strong involvement from community since the beginning, ensuring that stakeholders could understand and engage in the project's activities and that their experience was incorporated in the design of restored areas. The installation of facilities on the dune system, such as raised walkways and signage, encouraged local populations and tourists alike to interact with the ecosystem and become informed about its value and importance.

Owners of beach support structures were also able to gain economic revenue from the facilities throughout time, benefiting directly from the project through avoided damage and indirectly from increased tourism.

References

European Commission. n.d. "The Habitats Directive". https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm#:~:text=In%20a%20nutshell,conservation%20in%20their%20own%20right

Related links

Oppla. n.d. ReDuna – Restoration of S. João da Caparica Sand Dunes. Case study. <https://oppla.eu/casestudy/22495>

Regreen Project. n.d. The ReDuna Project in Almada. <https://www.regreen-project.eu/wp-content/uploads/THE-REDUNA-PROJECT-IN-ALMADA.pdf>

Authors

Patricia Pinto da Silva (Municipality of Almada), Diego Portugal Del Pino

Boosting urban resilience in Freetown, Sierra Leone

At a glance

Activity description and type of NbS	<p>Actions to restore: Reforestation of urban and peri-urban areas</p> <p>Actions to sustainably manage and protect: Monitoring and sustainable management of growth (such as in mangroves)</p> <p>Actions to protect: Roles for local community members include: team leaders, tree stewards, tree planters and growers, short-term daily tree planting and growing support workers, community climate action ambassadors, tree and plant nursery suppliers, among others.</p>
Societal challenge(s)	<p>Climate change</p> <p>Disaster-risk</p> <p>Biodiversity loss and ecosystem degradation</p>
Partners (identifying main implementers and partners, if any)	<p>The World Bank</p> <p>Freetown City Council (FCC) leads the project locally with the RUSLP PMU (Project Management Unit); Environmental Foundation for Africa (EFA) is the main implementer along with several community-based organizations and nurseries.</p>
Financing (source, amount)	<p>World Bank (grant financing), Global Environment Facility (GEF), and technical assistance and financing from the Global Facility for Disaster Reduction and Recovery (GFDRR)</p>
Time frame	<p>July 2021 – June 2025</p>
Geographical focus	<p>The RUSLP project has a country-wide focus, while the NbS urban forestry project Freetown the Tree Town Project focuses on Freetown, involving people within the city, in the surrounding watersheds, and other nearby communities.</p>
Biodiversity and ecosystem benefits	<p>Planting of local tree species that enhances the resilience and connectivity of ecosystems</p> <p>Halting deforestation and ecosystem degradation</p> <p>Protecting habitat</p>
Employment effects	<p>The project creates jobs and provides micropayments that support the diversification of livelihoods.</p>

Target beneficiaries (# people reached) – employment beneficiaries	The project has so far generated 898 jobs (326 in the first phase and 550 in the second), with 22 permanent jobs (employed in both phases)
Target beneficiaries (# people reached) – beneficiaries of services provided by the NbS	The project aims to serve the entire population of the city of Freetown and those residing in the surrounding water catchments.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	NDC target of reducing conditional emissions by 25% before 2050 SDG 1, 2 (with fruit trees), 3, 5, 6, 11, 13, 14 and 15. Local Conservation Management Plans (CMPs) and Community Action Plans (CAPs) which identify priority threats to conservation in each site and explore options to address them.

Description of context and rationale for interventions

Sierra Leone’s urban population has been rapidly growing in the past five decades, with over 40 percent of the population now living in urban areas (Statistics Sierra Leone 2016). Urbanization has continuously expanded into hilly and mountainous areas, increasing their overall vulnerability to natural catastrophes. Topography and high annual mean rainfall result in high exposure to a range of climate-related hazards, including recurrent flooding, landslides and droughts; coping with such hazards has been made harder by challenging socio-economic conditions. The country is ranked 24th in the world for overall natural-hazard risk, 8th in disaster vulnerability, and 6th in lack of adaptive capacities to natural shocks (Bündnis Entwicklung Hilft and IFHV 2018). In August 2017, Freetown heavy rainfall resulted in localized landslides and widespread flooding in the city, causing over 1,000 casualties and significant economic damage.

This project will contribute to the FCC’s goal of increasing tree and vegetation cover by 50 percent from 2018 levels by 2022, as a core component of the Resilience Pillar in the “Transform Freetown” agenda for 2019–2022, as well as to the Medium-Term National Development Plan’s tree planting and greening objectives.

Specifically, the project aims to:

- Restore degraded forests along the urban periphery, especially in upstream water catchment areas
- Green urban spaces
- Reforest, restore and prevent further degradation of estuarine mangrove forests
- Reduce landslide risks through planting trees, shrubs and grasses in strategic areas, including a former landslide zone
- Create nationwide awareness about the challenges society faces as a result of deforestation (through the Climate Youth Ambassadors programme)
- Build local capacities to plant and grow trees
- Build local forest and climate stewardship leadership skills, awareness and capacities
- Harness novel digital technology using low-cost local smartphones for tree tracking and growing

Societal challenges

- The project addresses:
- Climate change and disaster risk, specifically:
 - * Mitigating the risk of landslides through soil stabilization
 - * Surface and pluvial flood risks
 - * Water shortages through increased groundwater infiltration
- Biodiversity loss and ecosystem degradation by reducing deforestation through tree planting and extensive awareness-raising.

Objective

The overall aim of the project, as it relates to the “Freetown the Treetown” campaign, is to improve urban resilience, reduce disaster risks, increase liveability and provide green jobs.

Description of intervention/activities

- **Restoration:** Reforestation of urban and peri-urban areas
- **Protection:** Significant training and engagement of local community members as planting team leaders, tree stewards, tree planters and growers, short-term daily tree planting and growing support workers, community climate action ambassadors, tree and plant nursery suppliers and other jobs.
- **Sustainable management:** Installation of permanent pillars in the estuary areas to demarcate the boundaries for settlements from mangrove and river areas. All trees, shrubs and grasses planted and being grown are tracked and third-party verified using the TreeTracker app⁶ on locally available smartphones that create a unique geotagged ID for each new tree planted. To incentivize tree growing and not just tree planting, growers periodically receive micropayments via their smartphones for keeping trees alive.⁷

Outcomes achieved

Phase 1: 251,000 trees planted

Phase 2: 249,519 trees planted, including 66,000 mangrove trees from locally collected propagules, 44,635 shrubs and 20,000 grasses

Employment effects

The project generates two main types of employment: novel part-time tree growing jobs and other more conventional green jobs. The first employment method is atypical, as its income earning potential varies significantly based on the number of trees grown and the fact that mobile micropayments are made based on tree growth data verified through a third-party app. Growers are allocated a fixed number of trees, based on a few factors such as planting location, to ensure simplified maintenance, limited traveling distances, and enhanced local community stewardship, engagement, and ownership over tree survival. This employment option has attracted significant interest, especially among existing growers and community members interested in implementing similar activities beyond the existing project.

⁶ See <https://map.treetracker.org>

⁷ See the project blog: [Please add URL]

The project generated 22 jobs spanning both phases, as well as 326 temporary jobs during the first phase and 550 during the second. Both full-time and part-time fixed-term positions were created for the FCC, RUSLP PMU, EFA, and several CBOs and nurseries. Roles include establishing, conducting and/or supporting tree planting operations; growing tree seedlings; collecting, transporting and distributing trees from nurseries; assisting with or conducting tree planting; and watering and maintaining trees, among others. Emerging green jobs within the NbS sector for technical staff, for example, are also on the rise as new work is required to validate and monitor novel project approaches. The following table summarizes the different jobs generated.⁸

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Project Manager	Executive directors, project managers, coordinators, and officers	5	5	0	2	Permanent and fixed-term full time contract	Upper education
Administrative staff	Financial assistance	2	1	1	1	Fixed-Term Full Time Contract	Upper education
Technical staff	Data coordinators, monitoring and validation	9	5	4	9	Fixed-Term Full Time Contract	Min is national higher diploma, average is BSc.
Driver		1	1	0	1	Fixed-Term Full Time Contract	High school
Head of CBO		11	10	1	0	Permanent	-
CBOs administrative staff	Financial assistance	11	n.d.	3	3	Temporary Fixed-Term Part-time Contracted	Upper education
Growers	Responsible for growing and monitoring trees	372	n.d.	nd	372	Temporary Fixed-Term Part-time Contracted	-

⁸ Note that numbers may not tally as positions are summarized for phases 1 and 2 and, in some cases, the same person was employed in both phases.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Team leaders	Responsible for managing teams	35	n.d.	n.d.	35	Temporary Fixed-Term Part-time Contracted	-
Daily workers	Support tree planting, dig holes, transport trees from storage site to planting area, assist with tree planting	153	?	?	153	Short-term (3 months)	-
Tree nursery agrotechnicians	Responsible for technical aspects of tree growing. On average one agrotechnician per nursery (mostly men)	19	9	10	6	Mixed (permanent/temporal)	Bachelor's degree
Tree nursery staff	Responsible for growing trees, managing basic requirements in the nursery, etc. (mostly men)	290	?	?	190	Temporary	-

n.d.: No Data

Biodiversity and ecosystem benefits

Planting of native trees such as local mangrove trees propagules, fruit trees, and propagated seedlings from healthy local tree cuttings provides critical biodiversity benefits, especially for upstream locations. Further, the integrated planting of fast-growing non-invasive exotic species, ornamental trees, and suitable shrubs and grasses helped to rapidly enhance existing ecosystems. The programme aims to optimize local biodiversity, where feasible, through planting a variety of species within one planting location. It is hoped that this approach will enhance forests' resilience to pests, diseases and general environmental stresses; increased habitat provision for a wider variety of native insect, animal and other plant species; and a wider variety of environmental regulating services such as mitigating the risk of pluvial (extreme rainfall) flooding.

Description of co-benefits

Anticipated future co-benefits include: reduced heat stress, improved air quality, reduced noise pollution, increased property values for some areas, increased groundwater infiltration, and increased water retention and carbon sequestration.

Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)

The project supports carbon sequestration, thereby contributing to the country's NDC target of reducing conditional emissions by 25% before 2050 (UNDP 2022).

The project also directly supports SDGs 1, 2 (through fruit trees), 3, 5, 6, 11, 13, 14 (both through catchment and mangrove planting), and 15.

Key success factors and lessons learned

The factors linked to the greatest success have been engagement with individuals across the city and within each community, and building their capacities to become tree planters, growers and environmental stewards. The tree survival rate has been very high as a result of this engagement and the use of the Tree Tracker App, which allowed for systematic, cost-effective third party/virtual verification that trees were still alive and growing. Finally, a micropayment incentive model has contributed to keeping trees alive.

Tree species selection proved to be a challenge, due to lack of knowledge on native tree characteristics, growth rates, suitable growing conditions, and a lack of nurseries propagating native tree seedlings among other factors. This posed several challenges for the selection and integration of these species within the planting and growing strategy.

Finally, if a sufficient number of trees are planted and require growing, and if a longer-term financing mechanism is established, the part-time employment approach adopted for tree growers could potentially result in full-time employment. However, with a dispersed non-plantation type of planting regime, it can be more challenging and costly to provide full-time employment for growers as, maintaining and growing trees in spatially dispersed areas may require transport across long distances, leaving insufficient time to ensure all trees are properly managed.

References

Bündnis Entwicklung Hilft and IFHV (Institute for International Law of Peace and Armed Conflict, Ruhr University Bochum). 2018. World Risk Report 2018; Focus: Child Protection and Children's Rights. Berlin: Bündnis Entwicklung Hilft

World Bank. n.d. "Resilient Urban Sierra Leone Project (RUSLP)". <https://projects.worldbank.org/en/projects-operations/project-detail/P168608>

Statistics Sierra Leone. 2016. 2015 Population and Housing Census: Summary of Final Results. Census report, Stats SL, Freetown.

UNDP (United Nations Development Programme). 2022. "Sierra Leone". <https://climatepromise.undp.org/what-we-do/where-we-work/sierra-leone>

Authors

Larissa Jenelle Duma (World Bank), Diego Portugal Del Pino

Acknowledgements

Robert Reid (World Bank), Davison Muchadenyika (World Bank) and Brenden Jongman (World Bank)

Landscapes for Livelihoods in Umzimvubu Catchment, South Africa

At a glance

Activity description and type of NbS	<p>Actions to restore: Landscapes mountain restoration</p> <p>Actions to sustainably manage: Grassland management and protection, clearing invasive alien species</p>
Societal challenge(s)	<p>Climate change</p> <p>Water security</p> <p>Food security</p> <p>Disaster-risk reduction</p> <p>Nature and economic benefits</p> <p>Biodiversity loss and ecosystem degradation</p>
Partners (identifying main implementers and partners, if any)	<p>Umzimvubu Catchment Partnership (UCP), convened by Environmental and Rural Solutions (ERS)</p> <p>WWF South Africa (SA), Conservation International SA, LIMA Rural Development Foundation, SaveAct, Yes4Youth and Mahlathini Development.</p>
Financing (source, amount)	ERS funding is approximately US\$1 725 150 / R25 million.
Time frame	2013 - present
Geographical focus	South Africa, Eastern Cape Province, Alfred Nzo District, Matatiele Local Municipality. All communal tenure areas, inhabited and used by indigenous people. Focus is in six traditional authority areas in the upper Umzimvubu catchment.
Biodiversity and ecosystem benefits	natural regeneration of grasslands and watershed services.
Employment effects	<p>Creation of NbS jobs</p> <p>Livelihood diversification</p> <p>Youth skills development</p>
Target beneficiaries (# people reached) – employment beneficiaries	The UCP organizations employed 35 permanent staff plus additionally each partner organization has made different numbers of temporal and short-term contracts.

Target beneficiaries (# people reached) – beneficiaries of services provided by the Nbs	2 269 sheep farmers shearing wool for sale 806 Grazing Association members, 83 percent farming cattle for market while the other 17 percent are either traditional healers harvesting medicinal plants or youth engaging in eco-tourism.
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, other, etc.)	Biodiversity Act (Act 10 of 2004) National Water and Sanitation Master Plan

Description of context and rationale for interventions

Communal rural rangelands in the Eastern Cape of South Africa (SA) are recognized internationally as hotspots for conservation. Yet they are often overgrazed, eroded and infested by invasive alien plant species. Rangelands are defined as grasslands, savannah and shrublands which provide a source of food for livestock and play a critical role in sustaining rural communities. They also help provide resources such as water, firewood, wild foods and medicinal plants. Widespread habitat loss on rangelands, together with uncertain weather conditions have a direct impact on the people whose livelihoods are linked to rangelands, especially the rural poor.

The Umzimvubu Catchment Partnership (UCP) was established in May 2013 by a voluntary alliance of over 35 civil state and research partners, together with local authorities. It is based on a non-binding Memorandum of Understanding (MoU) which underpins a common vision of working together to restore the natural resources and ecological functions of the catchment to secure livelihoods and boost climate change resilience. The upper catchment spans two of the 22 national Strategic Water Source Areas, which together form less than 10 per cent of the country's land area and contribute almost 60 per cent of its freshwater supply. Although the focus has been in the upper watershed area of Matatiele, the UCP covers the entire length of the Umzimvubu basin down to Port St Johns, where it collaborates with coastal partners.

Another key focus is the protection of springs as year-round potable basic household supply. Most residents in the montane settlements have some form of dependence upon springs. These springs have been in use for decades but are now facing quality and quantity challenges from climate change as well as contamination from livestock access, waste and alien plants, resulting in disease and long queues for collection.

Societal challenges

The project supports:

- **Nature and economic benefits:** Local value chain opportunities, including red meat, wool, alien plant biomass, circular waste recycling, climate smart food production, etc .
- **Biodiversity and ecosystem restoration:** The restoration on grasslands leading to the proposed establishment of a 50 000 ha protected area, which will have managed grazing, reduced poaching and reduced wildfire incidents
- **Water security, and protection of grasslands as watershed services and spring protections** which will reduce the wide scale loss of groundcover and topsoil
- **Food and Health security** by considering and improving stewardship of wild foods and medicinal plants through awareness building on indigenous harvesting techniques to protect biodiversity and traditional healers livelihoods.
- **Climate change adaptation and disaster-risk reduction** by building nature climate resilient infrastructure such as grassland

Objective

UCP's mission statement is 'Together we do more for people and the environment in the Umzimvubu Catchment'. This implies collective action and strong partnerships to move towards its goal, which is for healthy resilient ecosystems to function in the Umzimvubu Catchment providing reliable services and benefiting local and downstream people.

Description of intervention/activities

- **Actions to restore:** Landscapes mountain restoration, rehabilitation of water tower
- **Actions to sustainable manage:** Grassland management and protection following principles of agroecology and clearing invasive alien species which include monitoring of grassland and water resources recovery (quality and quantity)

These activities are complemented by community awareness campaigns, livestock auctions as a tool to reduce pressure on the land while making

income for livestock owners, recognizable branding of local livestock, signing of conservation agreements and monitoring of their implementation.

Outcomes achieved

- Restored more than 5500 hectares of grazing, through reviving traditional governance practices and fire management through collaboration with Grazing Associations
- Generated almost R40 million (US\$2.3 million) through mobile cattle auctions for more than 600 farmers, 30 per cent of which are women
- Cleared over 2500 ha of alien plants, and thereby saved more than 5 billion litres of water which has increased the potential for water availability downstream and for ecological services
- Protected 30 springs for village water supply, through the training of local technicians and usage of local materials, supplying over 6000 households and more than 30 000 people with safe, daily water access
- Fostered more than 900 local youth in a variety of internship and work experience programmes
- Been recognized as the ‘first of its kind in Africa’ in terms of certification by the global standards FSC (Forest Stewardship Council) for its innovative biomass value chain, converting problematic alien trees into charcoal in a communally-owned landscape, with the first Payment for Ecosystem Services (PES) sale approved

Employment effects

The core local implementing NGOs have mobilized investments in excess of ZAR75 million (US\$4 million) into the Matatiele area in the last 3 years, employing more than 35 permanent staff. ERS, the local NGO leading the alliance, has employed 11 local staff (6 women, 5 men, 7 of whom are under 35 years old) on full-time contracts. In addition, it has created important part-time employment opportunities.

ERS has employed 95 youth interns on various short-term contracts since 2019, with funding from various supporters including WWF, the Presidential Employment Stimulus and First Rand Foundation (banking sector). ERS has also employed over 340 local village-based beneficiaries since 2017, in various short-term projects mainly related to alien plant clearing, as well as spring protection and as spring monitors. These beneficiaries are 60 per cent women

and 55 per cent youth. Lastly, ERS also provides part-time contracts to 11 local youth Ecochamps that are employed on annual contracts. These Ecochamps are all under 30 years old, and 40 per cent are women. They have no tertiary qualifications but are involved in providing short training and hands-on in service learning in themes related to NbS such as rangeland management while also data collection linked to research projects using smart phone apps, and general awareness sharing.

An interesting angle currently emerging is the involvement of traditional healers in rangeland restoration and planning. Their ‘industry’ or practice is completely dependent upon access to and protection of wild plants in the mountain rangelands. Lastly, The NbS activities are combined with other climate solutions such as the creation of five eco-charcoal production enterprises which are led by youth groups.

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEEDED
		TOTAL	MEN	WOMEN	YOUTH		
Restoration	Alien invasive clearing; water and spring rehabilitation; Livestock Farmer support	152	58	94	152	Fixed-Term Full Time Contract	Upper secondary
General worker	Wattle clearing in Ward 21 Mvenyane	429	270	159	429	Fixed-Term Full Time Contract	Post-secondary non-tertiary education
General workers and Supervisors	Wattle Clearing in Ward 21 Mvenyane and Supervise Team of wattle clearers	356	224	132		Fixed-Term Full Time Contract	Less than primary, primary and lower secondary
Supervisors	Supervise Team of YES youth doing restoration activities	7	4	3		Permanent contract	Upper secondary and post-secondary
Stewardship Officers	Rangeland management, livestock management, monitoring and evaluation	5	3	2		Fixed-Term Full Time Contract	Upper secondary and post-secondary

POSITION	DESCRIPTION	NUMBER OF JOBS				CONTRACT TYPE	MIN. QUALIFICATIONS NEE DED
		TOTAL	MEN	WOMEN	YOUTH		
Administrative Associate	Administration, YES and Jobs4Nature programme support	1		1		Fixed-Term Full Time Contract	Upper – level education - bachelor
ERS Youth interns		95	47	48		Temporary Fixed term contract	High school diploma
EcoChamps	The number of Ecochamps is variable and depends on available funding. Ecochamps whose main responsibilities rangeland management and monitoring, research and data capture are deployed close to the communities and report to ERS. Previously there were 40 between 2019 and 2020, 25 in 2020/21.	11	8	3	11	Temporary Fixed term contract	Lower level secondary High School Diploma
ERS director		2		2	0	Permanent contract	University degrees
ERS middle management		4	2	2	2	Permanent contract	University degree National Diploma
ERS supervisory/ coordinators		3	1	2	2	Permanent contract	University degree National diploma
ERS admin/HR		2	1	1	2	Permanent contract	National Diploma
Eco charcoal production	Conduct day to day labour activities in 5 Eco Char Producer Enterprises	26	16	10	26	Fixed-Term Full Time Contract	Upper secondary

Biodiversity and ecosystem benefits

Clearing invasive alien species allows natural regeneration of grasslands and watershed services. Water benefits have been calculated at approximately 2000 million litres of water replenished / saved through clearing of in excess of 2000 ha (all NGOs estimated total).

Description of co-benefits

- Enhancing inclusive gender-sensitive and youth empowered governance in communal landscapes.
- Involvement of youth in co-creating solutions beyond the NbS strategy to support local challenges such as the eco-charcoal enterprises from wattle trees.
- Adoption of traditional practices such as rotational resting, protection of indigenous medicinal plants for use by traditional healers, and indigenous knowledge systems.

Policy alignment

The policy is aligned with the National Environmental Management: Biodiversity Act (Act 10 of 2004) and the National Water and Sanitation Master Plan which recognize the importance of the restoration of strategic water source areas.

Key success factors and lessons learned

Youth internships in the environmental and water sector provide excellent opportunities for local youth, both school leavers as well as graduates, to obtain real work experience, in their home landscape, contributing to local development as well as retaining family integrity and reducing outflow of human capital from the area.

The youth engaged with eco-charcoal production needed assistance with aggregation of products to generate viable volumes for export. Small business development is a tough arena and it can be difficult to develop the right product and get sufficient volume to get access to markets. For example, the eco-charcoal teams had to go through a number of design iterations and had to meet the FSC strict global standards. Both cattle and eco-charcoal producers needed support for certification which rewarded sustainable production practices with preferential market access and prices.

Authors

Sissie Matela (ERS, Environmental and Rural Solutions), Nicky McLeod (ERS), Kgomotso Matthews (Conservation South Africa, CSA), Samir Rander-Rees (World Wildlife Fund, WWF), Diego Portugal Del Pino

Acknowledgements

Caroline Gelderbrom (WWF), Alice Barlow-Zambodla (CSA)

Large-scale Ecosystem-based Adaptation in The Gambia

At a glance

Activity description and type of NbS	Ecosystem-based adaptation
Societal challenge(s)	Climate-induced increased and intensified storms, coastal erosion, salt intrusion, erratic rainfall, droughts and floods leading to losses in agricultural and livestock productivity
Partners (identifying main implementers and partners, if any)	<p>Implementing entity: UN Environment Programme</p> <p>Executing entity: Ministry of Environment, Climate Change and Natural Resources (MECCNAR)</p> <p>Partners: Ministry of Environment, Climate Change, and Natural Resources (MECCNAR); Ministry of Finance and Economic Affairs (MoFEA); Department of Forestry (DoF); Department of Parks and Wildlife Management (DoPWM); Department of Agriculture (DoA); Social Development Fund (SDF); Gambia Chamber of Commerce and Industry (GCCl); Department of Community Development (DoCD); Department of Livestock Services (DLS) National Environment Agency (NEA)</p>
Financing (source, amount)	<p>Green Climate Fund grant: US\$20.5 million</p> <p>Co-finance: US\$4.97 million</p> <p>Total: US\$25.47 million</p>
Timeframe	2017–2023
Geographical focus	Four regions of The Gambia: Lower River Region; Upper River Region; Central River Region North; and Central River Region South
Biodiversity and ecosystem benefits	<p>10 million mangrove propagules planted, which will protect coastal villages from storm surges while providing habitat for many fish species</p> <p>Goal: to rehabilitate 12,788 ha of degraded forest, savanna, and mangroves, and an additional 3,000 ha of farmland</p>
Employment effects	<p>To date, 60 beekeeping businesses have been established, employing 398 people (121 women) mostly part time.</p> <p>Goal: Ultimately, more than 500 are expected to be generated from the target 176 natural resource-based businesses.</p>

Target beneficiaries (# people reached) – employment beneficiaries	<p>Goal: 8,376 households with an increased in cash income by at least USD330 per year</p> <p>Goal: 176 sustainable natural resource-based businesses established directly employing more than 500 people</p>
Contributions to national or international commitments (SDGs, NDCs, NBSAPs, others, etc.)	<p>Goal: A total of US\$13.5 million is projected to be raised over 20 years for the National Forest Fund through taxes and licensing fees.</p>

Description of context and rationale for interventions

The consequences of climate change in The Gambia are stark. Temperatures, storms, coastal erosion, salt intrusion, erratic rainfall, droughts, and floods have increased and intensified, resulting in reduced agricultural and livestock production and unsustainable extraction of resources from forest ecosystems by rural households. This is threatening the heavily rain-dependent agricultural sector, which employs 44% of the country's workforce and provides two-thirds of household income. Sea-level rise and salt intrusion into freshwater wetlands have all but eliminated rice production in the western half of the country, causing “hunger seasons” between July and September.

UNEP is supporting The Gambia's government with its largest adaptation project. Funded by the Green Climate Fund, the aim of this large-scale Ecosystem-based Adaptation (EbA) intervention is to build climate resilience over large areas, promote climate-resilient sustainable development, and develop a sustainable natural resource-based economy.

Objectives

The main objectives of this project are:

- Rehabilitating 12,788 ha of degraded forest, savanna, and mangroves, and an additional 3,000 ha of farmland.
- Increasing the cash income of 8,376 households by at least USD330 per year in a country where 60% of the population live below the overall poverty line, thanks to the adoption of diversified, climate-resilient livelihood options (including fisheries, agriculture, natural resource-based businesses), as well as the restored landscapes which are sources of raw materials that will be processed and traded by the NR-based enterprises

- Establishing 176 sustainable natural resource-based businesses with a cumulative gross cash return of US\$4,515,270 over 20 years. The businesses are likely to include: sustainable forest collections; beekeeping; ecotourism; furniture manufacturing; food processing; baobab bioprospecting; and tree nurseries.
- More than 500 people are expected to be directly employed by the enterprises and these businesses will provide almost US\$677,270 in annual contributions to the National Forest Fund (NFF), through taxes and licensing fees.
- A total of US\$13.5 million will be raised over 20 years for the National Forest Fund from taxes and licensing fees.
- Providing strategic recommendations and technical support to strengthen policies for the participatory management and benefit-sharing.

Description of intervention/activities

The project involves three main components:

5. restoring 15,788 hectares of degraded forests, mangroves, savannahs, wildlife areas, and farmlands with climate-resilient plant species that provide goods for consumption or sale
6. facilitating the establishment of 176 commercially viable natural resource-based businesses managed by local communities and involving activities such as beekeeping, furniture manufacturing and food processing
7. providing strategic recommendations and technical support to strengthen policies on participatory management and benefit sharing.

Outcomes achieved

Land rehabilitation: In the first two years, 10 million mangrove propagules were planted, which protect coastal villages from storm surges while providing habitat for many fish species.

Effects on work

To date, 60 beekeeping businesses have been established, employing 398 people (121 women), mostly part time. Ultimately, more than 500 are expected to be generated from the target 176 natural resource-based businesses. In addition, ecosystem restoration activities are creating work opportunities in tree nurseries, as well as in planting and maintenance. These jobs are paid at less than minimum wage on the grounds that the employees/ volunteers also benefit from this work.

Key success factors and lessons learned

This project illustrates the potential of NbS to generate significant numbers of jobs in rural communities. More detailed record-keeping of both part- and full-time jobs created by the project, as well as details on the quality of the work and the level of pay, will enable a better understanding of the potential of NbS to generate work. Both donor organizations and project implementers should be encouraged to provide this information.

Author

Oscar Ivanova

Acknowledgements

Daniel Pouakouyou (UNEP) Malanding S. Jaiteh (Ministry of Environment, Climate Change and Natural Resources, The Gambia), Barney Dickson (UNEP)

Methodologies and units used to estimate work in Forest Landscape Restoration

Key points

- Several academic studies on jobs in restoration have been published
- The Restoration Barometer is a tool that reports jobs created through restoration
- Different methodologies are applied to estimate jobs
- Different units are used to report job creation impact of restoration
- There is a need for further data collection on restoration and the development of models to support estimates of indirect and induced impacts at the global level.

Introduction

Globally, there is a variety of different commitments to restore degraded landscapes. The Bonn Challenge, launched by the Government of Germany and the International Union for Conservation of Nature (IUCN) in 2011, is a global effort to bring 150 million hectares of degraded and deforested landscapes into restoration by 2020, and 350 million hectares by 2030.⁹ The Bonn Challenge is aligned with several regional initiatives, specifically Initiative 20x20 in Latin America,¹⁰ the African Forest Landscape Restoration Initiative (AFR100),¹¹ and ECCA30 in Europe, the Caucasus and Central Asia.¹² The aim of these initiatives is to support countries in achieving their commitments to different multilateral agreements (UNFCCC, UNCCD and CBD) as well as to achieve the SDGs. The UN Decade of Restoration aims to strengthen global efforts to prevent, halt and restore the degradation of ecosystems.¹³

⁹ See <https://www.bonnchallenge.org/>

¹⁰ See <https://initiative20x20.org/>

¹¹ See <https://afr100.org/>

¹² See <https://infoflr.org/bonn-challenge/regional-initiatives/ecca30>

¹³ See <https://www.decadeonrestoration.org/>

Methodologies applied and units used to estimate the job impact of FLR

In order to align the growing efforts to restore degraded landscapes with other policy objectives, there is also an increasing effort by research institutes and organizations to provide impact estimates of the restoration actions implemented globally. Although the original focus was on estimating and reporting the number of hectares under restoration and the amount of carbon sequestration achieved, there has been an increase in the number of estimates of different social, financial and environmental impacts. This includes aiming to understand if FLR can create jobs and quantifying this potential.

Edwards and co-authors (2013) examined the economic impact of the expenditures from the American Recovery and Reinvestment Act (ARRA) of 2009, administered by the National Oceanic and Atmospheric Administration (NOAA) for coastal habitat restoration projects around the USA. They used an economic **input/output software** called IMPLAN (Impact Analyses and Planning) to estimate the overall jobs created and the economic impacts of these restoration projects. The software was used to generate estimates for the economic multiplier effects of expenditures and employment in “**full-time equivalent**” (FTE) job-years. The IMPLAN estimated jobs figures included direct, indirect and induced jobs.

BenDor et al. (2015) used a national **survey of businesses** that participate in restoration work to estimate the value of revenue and the **number of jobs** (full-time and part-time) directly associated with the restoration economy in the USA. In addition, they used the survey results as inputs into a national **input-output model** (using IMPLAN) in order to estimate the indirect and induced economic impacts of restoration activities, including jobs.

Finally, Brancalion et al., (2022) used the results of an online **survey**, led by the main restoration networks in Brazil, to understand and quantify the current and potential ecosystem restoration jobs in the country. They classified jobs as **temporary** (namely, seasonal jobs, in which people are only hired for part of the year) or **permanent**¹⁴ (namely, jobs in which people become part of the ongoing staff of a given organization).

¹⁴ In their study, Brancalion et al. (2022) defined temporary jobs as seasonal jobs, in which people are only hired for part of the year, and permanent jobs as jobs in which people become part of the ongoing staff of a given organization. The survey asked respondents to identify the number of temporary/seasonal workers and the number of fixed/permanent workers hired during a year.

In addition to its utility for research, the **Restoration Barometer** is a tool used by different countries around the world to track the progress of restoration targets across all terrestrial ecosystems, as well as coastal and inland waters. It records the size of the area being restored as well as the corresponding climate, biodiversity and socio-economic benefits.¹⁵ The Barometer has selected a single indicator for socio-economic impacts – namely, the number of jobs created – to monitor the socio-economic benefits that may flow from FLR. Given that data on employment is often broken down into distinct categories, the Barometer is flexible enough to designate jobs by their characteristics (e.g. job duration or job type, including maintenance versus implementation)¹⁶ and the demographic characteristics of workers (e.g. by sex).

For the current reporting period (2019–2022), different methodologies were applied in different countries and different units were then used to report on this indicator. In Mexico, to determine the number of jobs derived from restoration actions, Simonit et al. (2022) used the data on labour¹⁷ associated with restoration projects reported in public databases. When these data were not reported, the authors used national references for each reforestation action, as stipulated by the guidelines from the National Forestry Commission.¹⁸ Finally, for the restoration actions for which no average labour data were found in government databases and which were not considered in the official national references, literature was used to develop a standard conversion factor related to the areas restored. Results were reported as the number of labour days per year associated with the implementation of the different restoration actions. For Costa Rica, Nello et al. (2022a) used data from economic models, which expressed the labour days/ha needed for different types of restoration interventions. They expressed data in FTE/year, per type of restoration actions, and then used estimates from relevant literature to estimate how many of the jobs were created for women and for men. For the Barometer Report of Costa Rica, they made a distinction between short-term, and medium- and long-term employment. Short-term employment was related to the labour needed to implement restoration actions, typically

¹⁵ See <https://restorationbarometer.org/>

¹⁶ See <https://infoflr.org/bonn-challenge-barometer>

¹⁷ Average number of labourers/day, considering specialized and non-specialized labour (including when using equipment).

¹⁸ "Agreement by which the reference costs for reforestation or restoration and its maintenance for environmental compensation for land use change in forest land and the methodology for its estimation are issued" published in the Official Gazette of the Federation in 2006 and updated for 2014, as well as in the "Terms of reference of the support program for sustainable forest development 2018".

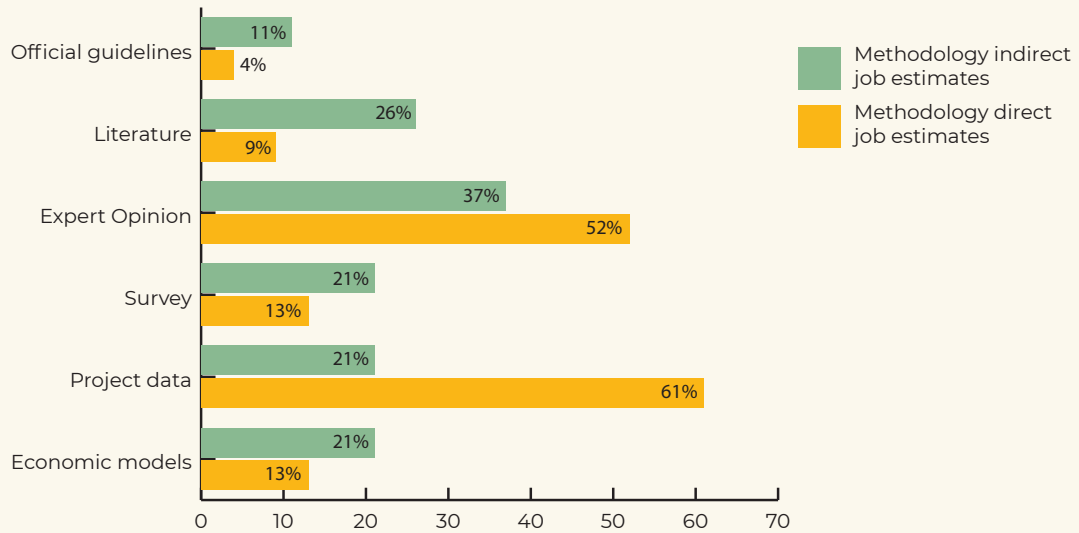
in the first year, while medium- and long-term employment is related to the maintenance of the restored areas. For Guatemala, Nello et al. (2022b) used both economic models and government data to estimate job creation. The available data in labour days/ha for each type of intervention were translated to FTE/year per intervention for the reporting years. Government statistics were used to estimate job creation by sex.

Two African countries that submitted data to the Barometer (Cameroon and Rwanda), used **project data** to estimate jobs created by FLR actions (IUCN-Rwanda 2021; Wayang et al. 2022). For example, in Rwanda 71 projects were identified for the period 2018–2021, and data from these projects was used to provide the **number of jobs** (IUCN-Rwanda, 2021). A key issue with project data is that not all projects will record job creation numbers. The number of direct jobs in restoration is thus often reported for a subset of total national restoration actions, including only projects in a given country that report on direct jobs created. Cameroon uses the project data to report the **number of jobs** created and distinguishes between short-term, long-term and seasonal employment. Ghana, on the other hand, uses an official government report (**literature**), as well as **project data** to report the number of people employed. In this report, a distinction is made between what is understood in the report as seasonal/casual jobs, short-term jobs (ranging from 1 to 48 months) and long-term (full-time) jobs.

The aim of the Restoration Barometer is to provide a reporting tool for impact of restoration actions already implemented. In addition, future job creation impacts have also been reported, for example as part of project proposals. In early 2022, FAO and UNEP, as co-leads for the UN Decade on Ecosystem Restoration, called for nominations for World Restoration Flagships under the UN Decade. As part of this process, 73 submissions for nominations were made to FAO by June 2022, of which 54 submitted estimates on the number of jobs expected to be created by 2030. A brief survey was carried out among a subset of those who submitted job creation data to get an overview of the methodologies applied to estimate direct and indirect jobs, as well as the units used.

The figure shows the percentage of respondents that applied a specific methodology to estimate direct and indirect jobs. Many respondents used more than one methodology. Project data and expert opinion were most often applied to estimate direct jobs, whereas expert opinion and literature were most commonly used to estimate indirect jobs.

Figure: Methodologies used to estimate direct and indirect jobs (percentage of respondents)



The table shows the different units used by the respondents to report job creation. Most respondents used only a single unit.

UNIT USED ²⁵	PERCENTAGE OF RESPONDENTS USING UNIT FOR:	
	DIRECT JOBS (%)	INDIRECT JOBS (%)
Number of persons employed ²⁶	47.8	31.6
FTE	21.7	15.8
Working days	17.4	31.6
Number of positions	8.7	10.5
Number of jobs	8.7	21.1
Number of people benefited	4.3	5.3
Person-days in a year	4.3	5.3

Final remarks

There is an increasing effort to understand and estimate job creation from landscape restoration. However, no standardized methodologies exist and, even when reporting tools exist, there is a wide variety of units used. This not only makes comparing actions and their job creation impact difficult, it also complicates the development of a global database of restoration actions and their (potential) contribution to job creation. Especially for project reporting, a set of standardized reporting options would facilitate this effort. In addition, there is a need for further data collection on restoration and the development of models to estimate indirect and induced impact on a global level.

²⁵ No definitions for these unit concepts were used. The survey focused merely on the terminology used by the respondent to report on job creation.

²⁶ One respondent differentiated between part-and full-time employment.

References

- BenDor, T., T.W. Lester, A. Livengood, A. Davis, and L. Yonavjak. 2015. "Estimating the Size and Impact of the Ecological Restoration Economy". PLoS ONE 10(6): e0128339.
- Brancalion, P.H.S. 2022. "Ecosystem restoration job creation potential in Brazil". *People and Nature* 00: 1–9.
- Edwards, P.E.T, A.E. Sutton-Grier, and G.E. Coyle. 2013. "Investing in nature: Restoring coastal habitat blue infrastructure and green job creation". *Marine Policy* 38: 65–71.
- IUCN (International Union for Conservation of Nature)-Rwanda. 2021. Bonn Challenge Barometer in Rwanda. Final Country Brief. IUCN-Rwanda, Kigali, Rwanda.
- Nello, T., P.Rivera, and G. Putzeys. 2022. Barómetro de la Restauración. Evaluación de avances de la restauración de ecosistemas en Costa Rica en la década 2011-2020. IUCN-ORMACC, San José, Costa Rica. San José, Costa Rica: IUCN-ORMACC.
- Nello, T., C. Enriquez and G. Putzeys 2022b. Restoration Barometer measuring progress in Guatemala. San José, Costa Rica: IUCN-ORMACC.
- Simonit, S., J. Hernández- Castán, J. Avendaño, E. Cuesta-Mejía, C. López, and T. Nello. 2022. Aplicación del Barómetro de la Restauración de ecosistemas en México. San José, Costa Rica: IUCN-ORMACC.
- Wayang, R., D. Payang, D. Endamana, A.C. Bitchick Bi Bitchick, G.B. Fopa Langouo, and B. Mezui Assoumou. 2022. Rapport de suivi du Baromètre de Restauration du Défi de Bonn au Cameroun. Dakar, Senegal: IUCN-PACO.

Author

Leander Raes (IUCN)

Acknowledgements

Tony Nello (IUCN Regional Office for Mexico, Central America and the Caribbean, ORMACC)



Restoration
Barometer



UKaid
from the British people



Ministry of the
Environment Finland



International
Labour
Organization



UN
environment
programme



IUCN



4 route des Morillons
CH-1211 Genève 22
Switzerland

United Nations Avenue,
Gigiri Nairobi, Kenya
PO Box 30552 00100

Rue Mauverney
1196 Gland,
Switzerland



9 789220 379714