##

**Measuring Progress: Nature and the SDGs**

### **Introduction**

In September 2015, the United Nations Sustainable Development Summit adopted an international framework to guide development efforts, entitled ‘Transforming our world: the 2030 Agenda for sustainable development’. The Agenda is built around 17 Sustainable Development Goals (SDGs), divided into 169 targets, which are informed by 244 Indicators. The importance of improving the availability of and access to data and statistics related to the environment was recognized through the adoption of a wide range of environmental SDG targets and indicators.

UN Environment agreed on a list of 93 SDGs indicators that are of specific relevance to the environment dimension of the 2030 Agenda. This list was presented by the United Nations Environment Programme (UN Environment) Secretariat to the UN Environment Assembly Committee of Permanent Representatives at the sub-committee meeting on 20 September 2018.

In March 2019, UN Environment launched a report called *‘Measuring Progress Towards monitoring the environmental dimension of the SDGs*’, which analysed the state of the environmental dimension of sustainable development based on the SDG indicators, including the availability of statistical and spatial data.

### **Background**

The Sustainable Development Goals (SDGs) have elevated the profile of the environmental dimension of development – and how we monitor this dimension. For 68 per cent of the environment-related SDGs indicators, there is currently not enough data to assess progress. However, there have been improvements in reclassifying data from Tier III to Tier II or I between the original classification in 2016 and May 2019– with the percent of environment-related Tier III indicators dropping from 50% to 28% (UN, 2016). It is expected that the efforts to measure the SDGs will improve data availability for the SDG indicators, which will allow better analysis of the global progress toward specific SDG targets and indicators

The second version of the Measuring Progress publication will aim to align with the next UN Environment Assembly in February 2021. The publication will focus on the relationship between the SDGs and nature based actions. For this a broad definition of Nature-based Solutions (NbS) will be used. This definition is defined as actions to protect, sustainably manage and restore ecosystems in a way which produces well-being and biodiversity benefits. This publication will aim to demonstrate the relationship between protection, management and restoration and well-being and biodiversity, using the SDG indicators as the basis. The SDG indicator framework includes indicators related to protection (e.g. SDG 14.5.1, 15.1.2 and 15.4.1), management (e.g. SDG 14.2.1, 15.2.1 and 6.5.1), restoration (e.g. 6.6.1, 15.1.1 and 15.3.1); as well as indicators related to well-being (including human health, food security, disasters and climate change and economic and social development) and to biodiversity (including endangered species and air, fresh water and marine water quality).

A third version of Measuring Progress will be published before the Stockholm+50 Conference in 2022. The third version will focus on strong sustainability and will build upon the findings of the first two. Although, the second publication will not have delve into the topic of Strong Sustainability, it will provide set the stage for the third publication.

### **Expert Consultation**

UNEP (Jian Liu and Jillian Campbell), UCL (Paul Ekins, Alison Fairbrass and Aidan O’Sullivan) and the Chinese Academy of Science (Huadong Guo and Xiaosong Li) will lead the production of the second edition of Measuring Progress[[1]](#footnote-1). We are looking for experts to contribute to the providing their views on the methodological approach and draft outline. Additionally, we are hoping that these experts can lend their expertise by serving as an author for specific sections of the report.

An initial expert consultation on the methodology and report outline will be held on 21 and 22 April from 2-5pm (East African Time). A second expert consultation will be held (in-person) in Q3 2020.

The agenda for the first meeting will be as follows:

**Day 1: 21 April: Methodology**

* Brief opening remarks (Huadong Guo, Jian Liu and Paul Ekins)
* Overview of the methodological approach, definitions, timeline and expectations (Jillian Campbell)
* Methodology and initial results (Alison Fairbrass)
* Flash presentations of similar and related initiatives, including but not limited to the following:
	+ Sustainability Gap approach (UCL, Paul Ekins)
	+ Multi-dimensional Biodiversity Index (UNEP-WCMC)
	+ Defining Nature based solutions (Oxford University)
	+ Using new data streams for the SDGs (CAS)
	+ Global Environment Outlook and other major assessments (UNEP)
* Discussion on the methodological approach:
	+ Are we going in the right direction?
	+ Do you agree with the indicator selection and definition?
	+ Are we missing indicators related to nature which you think should be included?
	+ Etc.

**Day 2: 22 April: Report outline**

* Summary of the discussion from 21 April (Alison Fairbrass)
* Presentation of the report outline (Jillian Campbell)
* Discussion on the way forward:
	+ Who can help draft which sections? (Jillian will also be communicating with experts prior to the meeting on this topic.)
	+ What is missing in the outline?
	+ Agreement on a timeline.

### **Structure of the report**

**Chapter 1: An Overview of Nature in the SDGs**

This chapter would include how we have defined nature in the context of the SDGs and how this definition links to nature-based solutions and strong sustainability. Strong sustainability is an approach for ensuring that the planet is kept within planetary boundaries in order to define sustainability as not something linked to process or policy, but to the actual long-term sustainability of nature. Nature-based Solutions (NbS) are actions that involve working with and enhancing natural habitats for societal good, for example through restoration, management and protection.

This chapter would also set the scope of SDG indicators which align with the definition of Nature-based Solutions and nature more broadly. The idea behind this analysis is to identify where nature-based interventions have simultaneously provided environmental benefits as well as social and economic benefits [1]. Their potential to tackle climate change, and the human well-being benefits of this, have been recognized at the international level, with the majority of Paris Agreement Signatories including NbS in their Nationally Defined Contributions (NDC) [2]. Their utility for tackling biodiversity loss as a co-benefit has also been acknowledged by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) [3].

This chapter would also include a description of the socio-economic indicators that we will include in the analysis- as the analysis will aim to look for correlation between nature and socio-economic indicators.

**Chapter 2: Methodology**

This chapter will highlight the analytical approach that was used in the analysis. This chapter would include some initial discussion related to data availability and how using data availability as a criterion for indicator selection may result in some bias. Additionally, this chapter will describe the definition of nature that has been used and why.

Nature-based Solutions are defined as actions related to habitat creation, ecosystem restoration, environmental management, protection and other actions which include a combination of approaches or a mixed approach for promotion of created and non-created habitats. The effectiveness of these actions and interventions may have varying success. The impact of these actions on ecosystem extent, ecosystem health and biodiversity are the expected primary effects. The positive or negative impacts on socio-economic development and other secondary effects are often unclear. The methodology for this study will aim to identify correlation between action, primary effect (nature/strong sustainability outcomes) and secondary effect (socio-economic outcomes). An initial mapping of this is presented in Annex 1.

**Chapter 3: The State of Nature**

This chapter will outline the general state of nature using the nature-related SDGs as a basis. This will include a summary of where the world is headed in terms of habitat creation, ecosystem restoration, environmental management, protection and other actions. It will also include a summary of the biodiversity and environmental condition, including pollution. This will follow a similar structure to the executive summary included in the UNEP Measuring Progress: Towards Achieving the Environmental Dimension of the SDGs [5]. It will also include a short summary for each regional grouping.

**Chapter 4:**  **Trends between Nature-based Solutions and environmental progress**

This chapter will discuss how well SDGs related to Nature-based Solutions (environmental policy, protected areas, investment in ecosystem restoration) correlate with changes in environmental condition. It will discuss what is working and what would be needed to make the necessary progress to achieve strong environmental sustainability. This chapter will include sub-sections which discuss particular types of interventions, including protected areas, environmental spatial planning/management and financing for the environment.

**Chapter 5:**  **Trends between nature and socio-economic development in the SDGs**

This chapter will discuss the link between nature and socio-economic development by looking at correlation between environmental and socio-economic outcomes. This chapter will aim to look at the link between nature and the following topics (the list of topics is open for discussion):

* Poverty and inequality
* Pollution and human health
* Food security
* Green economy, jobs and growth
* Climate change and disaster vulnerability
* Gender equality

**Chapter 6:**  **Case studies and examples**

This chapter will aim to identify 2-3 countries (or sub-national areas) where there has been particular success in terms of achieving both environmental and socio-economic objectives. This chapter will examine the conditions which led to success. This chapter will also include a discussion on why some countries face additional challenges in terms of achieving success.

**Chapter 7: Data gaps and opportunities**

This chapter will look at which aspects of nature we are able to measure versus which aspects currently lack the information needed to understand the current global situation. This chapter will look at how these gaps can be filled using new technologies and techniques. This chapter will also highlight gaps in coverage of the SDG indicators in terms of NbS, the state of environment and socio-economic development and discuss opportunities for filling these gaps with additional indicators.

**Chapter 8: Conclusions**

How do we upscale positive examples? How do we create positive examples in countries that face additional challenges in terms of climate change vulnerability (like small islands)? Why do policies work in some places but not in others? How do we better measure sustainability in a way that people can understand? How do we get the world on track toward sustainability?

# References

1. Cohen-Shacham, E., et al., *Nature-Based Solutions to Address Global Societal Challenges,* 2016, IUCN: Gland, Switzerland, [Accessed: 23/12/2019], Available: <https://doi.org/10.2305/IUCN.CH.2016.13.en>

2. Nature-based Solutions Initiative. *Nature-based Solutions Evidence Platform*. 2019 [Accessed: 23/12/2019]; Available: <https://www.naturebasedsolutionsevidence.info/evidence-tool/>.

3. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), *The global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services,* 2019, IPBES Secretariat: Bonn, Germany, [Accessed: 23/12/2019], Available: <https://ipbes.net/global-assessment-report-biodiversity-ecosystem-services>

4. United Nations Statistics Division. *SDG Indicators Database*. 2019 [Accessed: 23/12/2019]; Available: <https://unstats.un.org/sdgs/indicators/database/>.

5. UN Environment Programme, *Measuring Progress: Towards Achieving the Environmental Dimension of the SDGs,* 2019, UN Environment Programme: Nairobi, Kenya, [Accessed: 01/12/2019], Available: <https://www.unenvironment.org/resources/report/measuring-progress-towards-achieving-environmental-dimension-sdgs>

Annex 1. Evidence of outcomes of nature-based solutions based on evidence reported by scientific literature compiled in the Nature-based Solutions Evidence Platform1.

|  |  |  |  |
| --- | --- | --- | --- |
| **Intervention type** |  | **Ecosystem benefits (primary effects)** | **Societal benefits (secondary effects)** |
| **Created habitats** | **Positive effect** | Water quality1; Support wildlife1; Vegetation cover2, 3; Local soil fertility4; Groundwater recharge6  | Recreation and health2; Farmer livelihood stability3; Farmer living conditions3; Farmer production risk4; Frequency of windborne sand events5; Artisanal fish production6; Flood protection2; Climate change mitigation7; Crop production7 |
| **Negative effect** | Ecological restoration2; Diversity of vegetation species2; Landscape biodiversity2; Pest control2; Soil erosion2; Water loss2; Water consumption4; Desertification4; Downstream forest loss4; Non-native tree species abundance4; Biodiversity4 | Cultural ecosystem services5; Social inequality5; Water availability8 |
| **Mixed effect** | Plantation tree species survival2 | Regulating ecosystem services5; Dust and sand impacts on health5; Unemployment and permanent jobs5 |
| **Unclear or no effect** | Watershed services2; Local climate2; Vegetation regeneration2; Catchment hydrology8 | Farmer income3; Intensity and duration of windborne sand events5; Social coherence5; Water availability9; Flood risk10 |
| **Restoration** | **Positive effect** | Macrobenthic biomass9; Macrobenthic diversity9; Macrobenthic evenness9; Water quality10, 13; Bird diversity10; Protected bird species conservation10; Rare bird species conservation10; Climate regulation10; Supporting ecosystem services12; Herbaceous and woody biomass production12; Vegetative soil cover12; Native vegetation establishment13; Wildlife recovery13; Coral reef recovery17; Mangrove vegetation15; Mangrove area15; Biodiversity16; Coastal erosion16; Marine nursery habitat16 | Tourism value11; Culture and scientific research value11; Nature-based recreation12; Grazing12; Flood protection12; Greenhouse gas emissions12; Management costs12; Regulating ecosystem services13; Water flow regulation13; Peak flow from hillsides13; Erosion protection13; Groundwater recharge13; Flood mitigation14; Climate change resilience15; Employment16 |
| **Negative effect** |  | Arable production12; Access to grazing land13; Social inequality13, 15; Access to land15; Conflict over access to land15 |
| **Mixed effect** | Evapotranspiration12 | Accessible feed biomass13 |
| **Unclear or no effect** | Macrobenthic density9; Trophic structure9; Coastal erosion15; Coastal salt water intrusion15; Ecosystem resilience9 | Climate change adaptation17; Fish catches16; Fish farm mortality10 |
| **Management** | **Positive effect** | Supporting ecosystem services12; Vegetative soil cover12; Soil quality18; Forest condition19; Surface water quality19 | Regulating ecosystem services13; Livestock water productivity 13 Biomass production13; Water use efficiency13; Asset ownership18; Forest resource exploitation19 |
| **Negative effect** |  | Equality of benefit sharing18; Social inequality18 |
| **Mixed effect** | Wetland area20; Evapotranspiration12 | Climate change adaptation18; Food security18; Income18 |
| **Unclear or no effect** |  | Flood risk20 |
| **Protection** | **Positive effect** | Climate sensitivity36; Vegetation restoration43 | Cyclone damage mitigation39 |
| **Negative effect** |  |  |
| **Mixed effect** |  | Social adaptive capacity30 |
| **Unclear or no effect** | Recovery potential36, Ecological resilience36; Coral reef health40 | Conflict over fishery resources32 |
| **Other: combination actions or action related to mixed created and non-created habitats** | **Positive effect** | Climate sensitivity36; Supporting ecosystem services12; Vegetative soil cover12; Plant diversity28; Vegetation structure28; Abundance of shrub/tree and tree species28; Aboveground biomass and carbon28; Restoring degraded ecosystems28, 29; Indigenous tree species regenerated28, 29; Habitat fragmentation27, 30; Species richness25, 27; Regeneration of woody species25; Livestock disturbance7, 25; Soil erosion43; Water quality43; Resilience of coastal ecosystem31; Forest carbon stocks26; Coastal erosion37; Tree abundance22; Vegetation cover29; Presence of wildlife and birds27, 29, 38; Seasonal flooding regime27; Wetland capacity for water purification and flood retention27; Fish migration27; Water pollution27; Aquatic and/or riparian vegetation21, 27; River flows21; Biomass cover41, 42; Coastal erosion41; Soil erosion42; Vegetation diversity42 | Regulating ecosystem services12; Livestock water productivity12; Biomass production12; Water use efficiency12, 21; Water flow regulation12; Peak flow from hillsides12; Erosion protection12; Groundwater recharge12, 22; Income diversification7, 21-25; Income stability22-2430; Income21, 26, 27; Revenues from aboveground carbon sequestration and crop production28, 29; Fodder production28; Livestock productivity21, 28; Gullies rehabilitated28; Drought and climate risk21, 30; Grazing30; Access to financial markets24, 25; Access to credit22; Infrastructure22, 25; Disaster vulnerability22, 25; Dust levels7; Capacity building22, 31, 32; Knowledge exchange31; Social resilience22, 26, 31, 33; Disaster recovery33; Climate change adaptation26; Access to food26; Income from non-timber forest products22; Gender equality22, 34; Flooding, erosion and siltation of farmland29, 35; Fruit availability29; Fishery productivity27; Drinking water availability27; Sustainable aquaculture27; Flood risk35; Water availability21, 34; Respiratory diseases and eye infections caused by smoke from fuelwood34; Agricultural productivity21; Livelihood and income diversification41; Food security41; Adaptive capacity of communities41; Climatic risks41; Land access and ownership41; Agricultural production41; Infrastructure42; Employment42; Income42 |
| **Negative effect** |  | Fuel wood availability28; Pastoralist mobility30; Conflict over access to land24; Access to grazing land7; Illegal activities7, 37; Equality of benefit sharing7; Income37; Financial vulnerability37; Rural-urban migration37; ‘Leakage’ of deforestation37 |
| **Mixed effect** | Evapotranspiration12; Vegetation species evenness28; Land degradation24, 28; Biodiversity7; Soil erosion7 | Social adaptive capacity36; Drought coping and risk mitigation23, 24; Crop production28; Equality of benefit sharing28, 30; Livestock productivity30; Livestock management30; Access to grazing land24; Social equality24, 25; Human-wildlife conflict25; Farmer income7; Household vulnerability to climate change37; Income diversification37; Success of reforestation22 |
| **Unclear or no effect** | Recovery potential36; Ecological resilience36 | Adaptive capacity to climate change23; Impacts on cultural norms30; Illegal grazing30; Settlement redistribution30; Climate change impacts on women30; Flood vulnerability27; Flooding38 |

References

1. Liquete C, Udias A, Conte G, et al. Integrated valuation of a nature-based solution for water pollution control. Highlighting hidden benefits. *Ecosystem Services* 2016; 22: 392-401. DOI: <https://doi.org/10.1016/j.ecoser.2016.09.011>.

2. Qu M, Liu G, Lin Y, et al. Experts’ perceptions of the sloping land conversion program in the Loess Plateau, China. *Land Use Policy* 2017; 69: 204-210. DOI: <https://doi.org/10.1016/j.landusepol.2017.09.021>.

3. Lei Y, Zhang H, Chen F, et al. How rural land use management facilitates drought risk adaptation in a changing climate — A case study in arid northern China. *Science of The Total Environment* 2016; 550: 192-199. DOI: <https://doi.org/10.1016/j.scitotenv.2016.01.098>.

4. Missall S, Abliz A, Halik Ü, et al. Trading Natural Riparian Forests for Urban Shelterbelt Plantations—A Sustainability Assessment of the Kökyar Protection Forest in NW China. *Water* 2018; 10: 343.

5. Effiong M and Ogbonna C. Ecosystem Perception among Artisanal Fishermen: A Case Study of Akpabuyo and Bakassi Coastal Fishing Communities in Cross River State, Nigeria. *Annual Research & Review in Biology* 2017; 19: 1-11. DOI: 10.9734/ARRB/2017/37431.

6. Gujja B, Dalai S, Shaik H, et al. Adapting to climate change in the Godavari River basin of India by restoring traditional water storage systems. *Climate and Development* 2009; 1: 229-240. DOI: 10.3763/cdev.2009.0020.

7. Sjögersten S, Atkin C, Clarke ML, et al. Responses to climate change and farming policies by rural communities in northern China: A report on field observation and farmers’ perception in dryland north Shaanxi and Ningxia. *Land Use Policy* 2013; 32: 125-133. DOI: <https://doi.org/10.1016/j.landusepol.2012.09.014>.

8. Rangan H, Kull CA and Alexander L. Forest plantations, water availability, and regional climate change: controversies surrounding Acacia mearnsii plantations in the upper Palnis Hills, southern India. *Regional Environmental Change* 2010; 10: 103-117. DOI: 10.1007/s10113-009-0098-4.

9. Cardoso PG, Raffaelli D, Lillebø AI, et al. The impact of extreme flooding events and anthropogenic stressors on the macrobenthic communities’ dynamics. *Estuarine, Coastal and Shelf Science* 2008; 76: 553-565. DOI: <https://doi.org/10.1016/j.ecss.2007.07.026>.

10. Xiong Y and Wang K. Eco-compensation effects of the wetland recovery in Dongting Lake area. *Journal of Geographical Sciences* 2010; 20: 389-405. DOI: 10.1007/s11442-010-0389-1.

11. Peh KS-H, Balmford A, Field RH, et al. Benefits and costs of ecological restoration: Rapid assessment of changing ecosystem service values at a U.K. wetland. *Ecology and Evolution* 2014; 4: 3875-3886. DOI: 10.1002/ece3.1248.

12. Descheemaeker K, Mapedza E, Amede T, et al. Effects of integrated watershed management on livestock water productivity in water scarce areas in Ethiopia. *Physics and Chemistry of the Earth, Parts A/B/C* 2010; 35: 723-729. DOI: <https://doi.org/10.1016/j.pce.2010.06.006>.

13. Gerla PJ, Cornett MW, Ekstein JD, et al. Talking Big: Lessons Learned from a 9000 Hectare Restoration in the Northern Tallgrass Prairie. *Sustainability* 2012; 4: 3066-3087.

14. Wairore JN, Mureithi SM, Wasonga OV, et al. Benefits Derived from Rehabilitating a Degraded Semi-Arid Rangeland in Private Enclosures in West Pokot County, Kenya. *Land Degradation & Development* 2016; 27: 532-541. DOI: 10.1002/ldr.2420.

15. Rao Raghavendra G. Climate change mitigation through reforestation in Godavari mangroves in India. *International Journal of Climate Change Strategies and Management* 2009; 1: 340-355. DOI: 10.1108/17568690911002870.

16. Walton MEM, Samonte-Tan GPB, Primavera JH, et al. Are mangroves worth replanting? The direct economic benefits of a community-based reforestation project. *Environmental Conservation* 2006; 33: 335-343. 2006/10/12. DOI: 10.1017/S0376892906003341.

17. Mycoo M. Sustainable tourism, climate change and sea level rise adaptation policies in Barbados. *Natural Resources Forum* 2014; 38: 47-57. DOI: 10.1111/1477-8947.12033.

18. Wood BT, Quinn CH, Stringer LC, et al. Investigating climate compatible development outcomes and their implications for distributive justice: Evidence from Malawi. *Environmental management* 2017; 60: 436-453. DOI: <https://doi.org/10.1007/s00267-017-0890-8>.

19. Strauch AM, Rurai MT and Almedom AM. Influence of forest management systems on natural resource use and provision of ecosystem services in Tanzania. *Journal of Environmental Management* 2016; 180: 35-44. DOI: <https://doi.org/10.1016/j.jenvman.2016.05.004>.

20. Twilley RR, Bentley SJ, Chen Q, et al. Co-evolution of wetland landscapes, flooding, and human settlement in the Mississippi River Delta Plain. *Sustainability Science* 2016; 11: 711-731. DOI: 10.1007/s11625-016-0374-4.

21. Kashaigili JJ, Rajabu K and Masolwa P. Freshwater management and climate change adaptation: Experiences from the Great Ruaha River catchment in Tanzania. *Climate and Development* 2009; 1: 220-228. DOI: 10.3763/cdev.2009.0025.

22. Kaushal KK, Melkani VK and Kala JC. Sustainable poverty alleviation through a forestry project in Tamilnadu State of India. *International Journal of Sustainable Development & World Ecology* 2005; 12: 347-352. DOI: 10.1080/13504500509469644.

23. Osano Philip M. Pastoralism and ecosystem‐based adaptation in Kenyan Masailand. *International Journal of Climate Change Strategies and Management* 2013; 5: 198-214. DOI: 10.1108/17568691311327596.

24. Osano PM, Said MY, de Leeuw J, et al. Why keep lions instead of livestock? Assessing wildlife tourism-based payment for ecosystem services involving herders in the Maasai Mara, Kenya. *Natural Resources Forum* 2013; 37: 242-256. DOI: 10.1111/1477-8947.12027.

25. Ogutu ZA. The impact of ecotourism on livelihood and natural resource management in Eselenkei, Amboseli Ecosystem, Kenya. *Land Degradation & Development* 2002; 13: 251-256. DOI: 10.1002/ldr.502.

26. Pandey SS, Cockfield G and Maraseni TN. Assessing the roles of community forestry in climate change mitigation and adaptation: A case study from Nepal. *Forest Ecology and Management* 2016; 360: 400-407. DOI: <https://doi.org/10.1016/j.foreco.2015.09.040>.

27. Yu X, Jiang L, Li L, et al. Freshwater management and climate change adaptation: Experiences from the central Yangtze in China. *Climate and Development* 2009; 1: 241-248. DOI: 10.3763/cdev.2009.0023.

28. Mekuria W, Langan S, Johnston R, et al. Restoring aboveground carbon and biodiversity: a case study from the Nile basin, Ethiopia. *Forest Science and Technology* 2015; 11: 86-96. DOI: 10.1080/21580103.2014.966862.

29. Brown DR, Dettmann P, Rinaudo T, et al. Poverty Alleviation and Environmental Restoration Using the Clean Development Mechanism: A Case Study from Humbo, Ethiopia. *Environmental Management* 2011; 48: 322-333. journal article. DOI: 10.1007/s00267-010-9590-3.

30. Bedelian C and Ogutu JO. Trade-offs for climate-resilient pastoral livelihoods in wildlife conservancies in the Mara ecosystem, Kenya. *Pastoralism* 2017; 7: 10. DOI: 10.1186/s13570-017-0085-1.

31. Carro I. Building capacity on ecosystem-based adaptation strategy to cope with extreme events and sea-level rise on the Uruguayan coast. *International Journal of Climate Change Strategies and Management* 2018; 10: 504-522. DOI: 10.1108/IJCCSM-07-2017-0149.

32. Hani N, Regato P, Colomer R, et al. Adaptive forest landscape restoration as a contribution to more resilient ecosys-tems in the Shouf Biosphere Reserve (Lebanon). *Plant Sociology* 2017; 54: 111-118. DOI: 10.7338/pls2017541S1/14.

33. Eriksson H, Albert J, Albert S, et al. The role of fish and fisheries in recovering from natural hazards: Lessons learned from Vanuatu. *Environmental Science & Policy* 2017; 76: 50-58. DOI: <https://doi.org/10.1016/j.envsci.2017.06.012>.

34. Chigwada J. Case Study 6: Zimbabwe Climate Proofing Infrastructure and Diversifying Livelihoods in Zimbabwe. *IDS Bulletin* 2005; 36: 103-116. DOI: 10.1111/j.1759-5436.2005.tb00237.x.

35. Evans R and Boardman J. Curtailment of muddy floods in the Sompting catchment, South Downs, West Sussex, southern England. *Soil Use and Management* 2003; 19: 223-231. DOI: 10.1111/j.1475-2743.2003.tb00308.x.

36. Cinner JE, Huchery C, Darling ES, et al. Evaluating Social and Ecological Vulnerability of Coral Reef Fisheries to Climate Change. *PLOS ONE* 2013; 8: e74321. DOI: 10.1371/journal.pone.0074321.

37. McElwee P, Nguyen T, Hai V, et al. Using REDD+ policy to facilitate climate adaptation at the local level: synergies and challenges in Vietnam. *Forests* 2017; 8: 11. DOI: <https://doi.org/10.3390/f8010011>.

38. Fisher B, Bradbury RB, Andrews JE, et al. Impacts of species-led conservation on ecosystem services of wetlands: understanding co-benefits and tradeoffs. *Biodiversity and Conservation* 2011; 20: 2461-2481. journal article. DOI: 10.1007/s10531-011-9998-y.

39. Badola R and Hussain SA. Valuing ecosystem functions: an empirical study on the storm protection function of Bhitarkanika mangrove ecosystem, India. *Environmental Conservation* 2005; 32: 85-92. 2005/04/25. DOI: 10.1017/S0376892905001967.

40. Camargo C, Maldonado JH, Alvarado E, et al. Community involvement in management for maintaining coral reef resilience and biodiversity in southern Caribbean marine protected areas. *Biodiversity and Conservation* 2009; 18: 935-956. DOI: 10.1007/s10531-008-9555-5.

41. Ahammad R, Nandy P and Husnain P. Unlocking ecosystem based adaptation opportunities in coastal Bangladesh. *Journal of Coastal Conservation* 2013; 17: 833-840. DOI: 10.1007/s11852-013-0284-x.

42. Cao S, Zhong B, Yue H, et al. Development and testing of a sustainable environmental restoration policy on eradicating the poverty trap in China's Changting County. *Proceedings of the National Academy of Sciences* 2009; 106: 10712-10716. DOI: 10.1073/pnas.0900197106.

43. Liu G, Liu P, Warrington DN, et al. Resolving ecological and economic challenges: An application of sustainable ecological agriculture on the Chinese Loess Plateau. *Journal of Food, Agriculture & Environment* 2011; 9: 575-582.

1. This publication is being supported with funding from the Government of Norway and AFD, France. [↑](#footnote-ref-1)