



Food and Agriculture Organization
of the United Nations

LETTER OF AGREEMENT

Between
the Food and Agriculture Organization of the United Nations (FAO) and
Chamber of Forest Engineers (OMO)

on

**Developing Guidelines on the Implementation of Nature-Based Solutions (NbSs) to Combat
the Negative Impact of Climate Change on Forestry for the Sub-Region and Providing
Associated Training**

Milestone 2: Stocktaking Report

**Third Revision
Ankara, May 15, 2023**

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1. Summary

The Stocktaking Report under Milestone 2 reviews information on NbSs in the sub-region available online and follow-up with the sub-region countries to complement the online review.

The Stocktaking Report defines the NbS concept, summarizes broad NbS approaches, and provides examples of forestry-related NbSs.

The Stocktaking Report also briefly presented the list of the United Nations (UN) organizations promoting NbSs, and global mechanisms on NbSs, such as the UN Decade on Ecosystem Restoration, Forest and Landscape Restoration Mechanism, the Bonn Challenge, and the New York Declaration on Forests.

The Stocktaking Report presents the global platforms and initiatives, published scientific papers, and other documents from UN organizations.

Finally, the Stocktaking Report provides information on NbS examples from the world and sub-region. The information includes Nationally Determined Contributions (NDCs), projects, regional funds, coalitions, initiatives, and examples from the field.

2. Introduction

The Food and Agriculture Organization of the United Nations (FAO) and Chamber of Forest Engineers of Türkiye (OMO) signed a Letter of Agreement (LoA) on February 16, 2023, to develop "Guidelines on the Implementation of NbSs to Combat the Negative Impact of Climate Change on Forestry," including related Training on the Guidelines.

The overall aim is to enhance progress in reaching common development objectives shared by the FAO Members of the region. This includes providing FAO Members in the sub-region with NbS examples to enable them to collaborate to support common development objectives. The NbS examples will promote local, cost-effective, and proven solutions that can be helpful for the capacity development of FAO Members. Proposed solutions can also draw on experiences gained on the subject during the implementation of various related projects in the sub-region in the recent past. Further going goals expect that the impact of the results will lead to improved policies supporting achieving the Sustainable Development Goals (SDGs), outcomes will enhance progress in reaching common development objectives, and outputs will strengthen capacities of government officials in given technical areas on policy and strategy development.

3. Milestones, outputs, and leading activities

OMO will develop/compile the Guidelines and organize and implement the Training mentioned above. OMO will reflect on delivering all outputs in milestone reports (deliverables). Each milestone report will include information on the main activities specified in the LoA, including the submission date of the reports. In this sense, the Stock Taking Report under Milestone 2 includes the information on the following:

- Review information on NbSs in the sub-region available online
- Follow-up with the countries of the sub-region to complement the online review.

4. Methodology

OMO followed the below methodology to develop the Stocktaking Report.

- The establishment of a team of experts and nomination of resource persons from the countries,
- An online kick-off and consultation meeting with the team of experts (February 18, 2023),
- Online consultation meetings with the local forestry experts (March 8, 2023),
- Guidance meeting with FAO (March 9, 2023),
- Establishment of email communication with countries (forestry-related institutions) in the sub-region by emailing the relevant officials and country experts on the upcoming work (February 28, 2023-March 12, 2023),
- Online meeting/workshop with the participation of relevant persons from the countries, FAO, and OMO (March 23, 2023),
- Receive feedback from resource persons (local forestry experts).

Finally, a clarification email was sent to FAO on March 12, 2023, to seek guidance on developing the Guidelines. FAO replied to OMO's clarification request on March 13, 2023.

5. What is a nature-based solution?

Societal challenges (i.e., climate change, food security, water security, natural disasters, human health, and economic and social development) have increased significantly worldwide in recent decades (Cohen-Shacham et al., 2016), and new concepts have emerged to address these challenges.

NbS is one of these environmental and nature conservation concepts, which uses ecosystems and ecosystem services to address social, economic, and environmental challenges (Cohen-Shacham et al., 2016). Various international organizations focused on the NbS concept to develop the NbS definition for better understanding. However, multiple definitions of the NbS concept are available in the literature.

For example, **European Commission (2015)** defines NbS as the "actions inspired by, supported by or copied from nature; both using and enhancing existing solutions to challenges, as well as exploring more novel solutions".

The International Union for Conservation of Nature-IUCN (2016) defines the NbSs as the "actions to protect, sustainably manage, and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively to provide both human well-being and biodiversity benefits".

The UN Environment Assembly-UNEA (2022) defines the NbSs as the "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".

The concept of NbSs is presented in Figure 1.



Figure 1. The concept of NbSs (Adapted from IUCN 2020a)

The hierarchy of NbSs with examples is presented in Figure 2. The novel synthesis of Figure 2 presents a structured way of identifying NbSs, with examples relevant to climate change mitigation and adaptation (Parker et al., 2020).

Figure 2 categorizes and summarizes NbSs in a format that is accessible and informative for land managers, urban planners, and community stakeholders, as well as providing foundational information that will facilitate improved consistency in current and future NbS research, discussion and implementation (Parker et al., 2020).

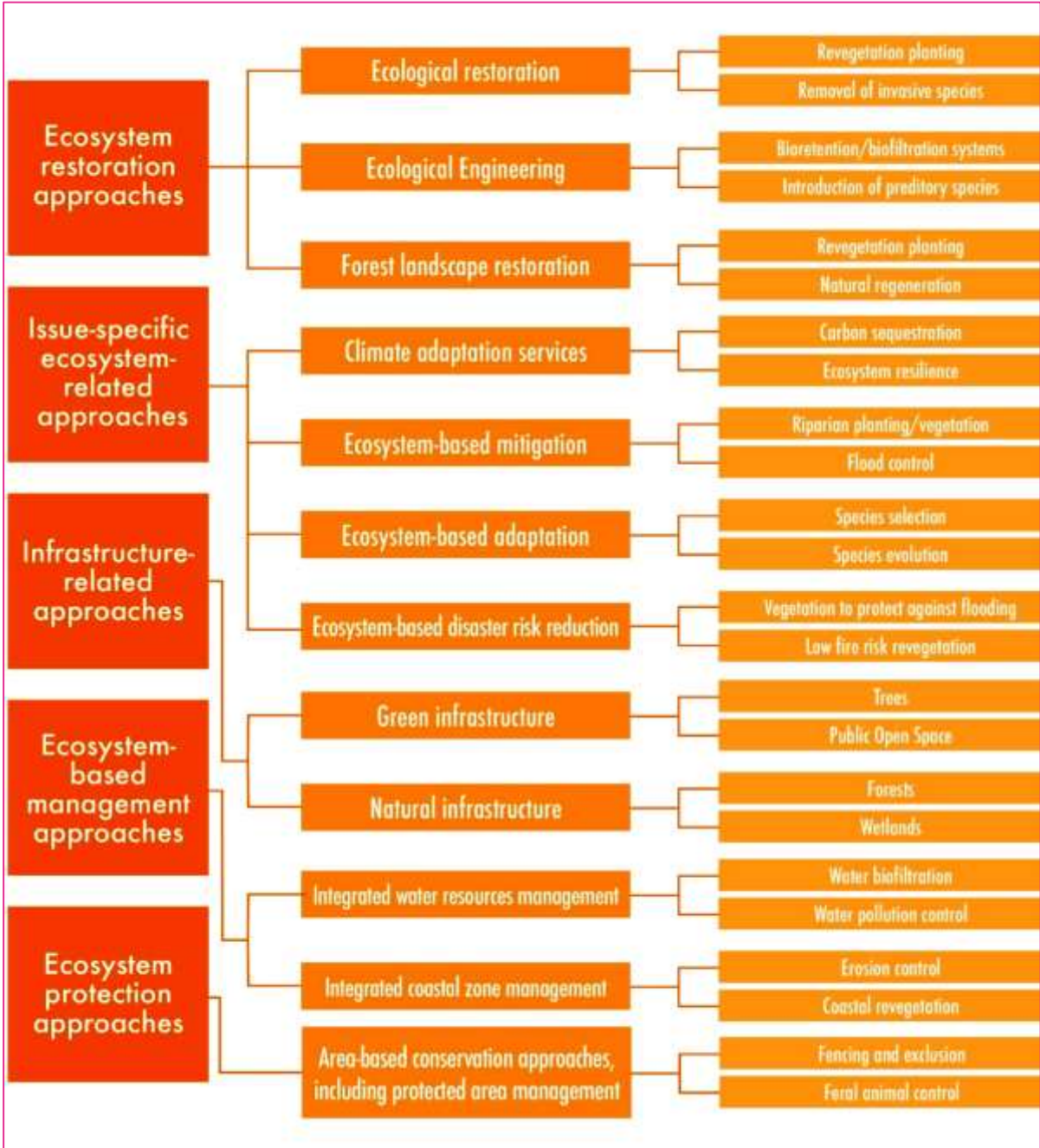


Figure 2. The hierarchy of NbSs with examples (Parker et al., 2020)

6. Stocktaking Report: Review information on NbSs in the sub-region available online

6.1. Parameters for the review

The stocktaking study was initiated by determining the parameters for the search to collect and review forestry and climate change-related NbS information available online. These parameters are listed below.

- Nature-based Solutions
- Central Asia, including the country names in the sub-region
- Forest-based solutions
- Natural climate solutions
- Nationally determined contributions

- Climate change
- Forest
- Forestry
- Sustainable forest management
- Climate-smart forestry
- Ecosystem restoration
- Integrated natural resource management
- Integrated land management
- Green space
- Nature-based forestry
- Ecosystem-based adaptation

Databases were searched to collect information on NbSs in the globe and Central Asia. These are the Google Scholar and Web of Science, Scopus, and ScienceDirect through George A. Smathers Libraries of the University of Florida. FAO, the World Bank, the International Union for Conservation of Nature (IUCN) web pages, and other initiatives were reviewed. In this regard, the Stocktaking Report depends mainly on scientific papers and other documents produced by countries in the sub-region, organizations, and initiatives focusing on directly implementing NbSs.

6.2. Global initiatives, mechanisms, and experiences on nature-based solutions

6.2.1. United Nations Organizations promoting nature-based solutions

UN organizations, conventions, and agreements promote the implementation of NbSs by making respective decisions on this matter. The list of UN organizations is presented below.

- United Nations Forum on Forests (UNFF)
- United Nations Framework Convention on Climate Change (UNFCCC)
- Paris Agreement
- United Nations Convention to Combat Desertification (UNCCD)
- Convention on Biological Diversity (CBD)
- The United Nations Human Settlements Programme (UN-Habitat)
- United Nations Economic Commission for Europe (UNECE)

The UN organizations and governments mentioned above developed the following strategic documents by setting measures for ecosystem protection/conservation, restoration, and sustainable ecosystem management.

- The Sendai Framework for Disaster Risk Reduction 2015–2030
- Land Degradation Neutrality (LDN) Target Setting Programme
- United Nations Strategic Plan for Forests 2030
- UNCCD 2018-2030 Strategic Framework
- Post-2020 Global Biodiversity Framework
- Glasgow Leaders' Declaration on Forests and Land Use

The Food and Agriculture Organization of the United Nations (FAO), including the Committee on Forestry (COFO), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), and Collaborative Partnership on Forests (CPF), are the implementing agencies to protect/conserves, restore, and sustainably manage natural ecosystems by implementing projects.

6.2.2. Global mechanisms on nature-based solutions

6.2.2.1. The United Nations Decade on Ecosystem Restoration¹

The UN General Assembly declared 2021–2030 as the **United Nations Decade on Ecosystem Restoration** to halt, prevent and reverse ecosystem degradation, and restore degraded terrestrial, freshwater, and marine ecosystems worldwide for the benefit of people and nature (UN, 2021). Its goal is to restore over 1 billion hectares of degraded land by 2030.

The objectives of the UN Decade on Ecosystem Restoration will be achieved by building political momentum for restoration and initiatives in the field to achieve a sustainable future (UN, 2021). An action plan has been developed to define targets and guide the implementation of future restoration activities together to achieve the goals of the UN Decade (FAO and UNEP, 2022). The UN Decade on Ecosystem Restoration could be an opportunity to scale up NbSs by sharing lessons learned and promoting best practices to maximize climate, biodiversity, and development benefits from forests.

¹ <https://www.decadeonrestoration.org/>

6.2.2.2. Forest and Landscape Restoration Mechanism²

Forest and Landscape Restoration (FLR) is a process that aims to regain ecological functionality, strengthen the resilience capacity of forest ecosystems, and enhance human well-being in deforested or degraded landscapes. The principles of the FLR mechanism are listed below:

- **Focus on landscapes** – FLR occurs within and across entire landscapes, not individual sites.
- **Engage stakeholders and support participatory governance.**
- **Restore multiple functions for multiple benefits** – FLR interventions aim to restore ecological, social, and economic functions across a landscape.
- **Maintain and enhance natural ecosystems within landscapes** – FLR does not lead to the conversion or destruction of natural forests or other ecosystems.
- **Tailor restoration to the local context using various approaches** – FLR draws on the latest science, best practices, and traditional and indigenous knowledge.
- **Manage adaptively for long-term resilience.**

6.2.2.3. The Bonn Challenge³

The Bonn Challenge was launched by the Government of Germany and the International Union for Conservation of Nature (IUCN) in 2011. The Bonn Challenge is a global effort to restore 350 million hectares of deforested and degraded land by 2030 through the FLR approach. The main objective of the Bonn Challenge is to restore ecological integrity and improve human well-being through multifunctional landscapes. In this context, achieving the 350 million ha goal will generate about USD 170 billion/year net benefits from watershed protection, improved crop yields, and forest products, including climate change mitigation co-benefits that restoration activities could sequester up to 1.7 gigatons of CO₂e per year. So far, 61 countries have pledged 210.12 million hectares (Bonn Challenge, 2023). In this sense, the pledges of sub-region countries are given in Table 1.

Table 1. Pledges by country till 2030

Country	Pledge (ha)
Azerbaijan	270,000
Kazakhstan	1,500,000
Kyrgyzstan	323,000
Tajikistan	66,000
Türkiye	2,300,000
Turkmenistan	-
Uzbekistan	500,000

6.2.2.4. The New York Declaration on Forests⁴

The New York Declaration on Forests (NYDF) is a voluntary and non-binding international declaration to act to halt global deforestation. It was first endorsed at the United Nations Climate Summit in September 2014. Refreshed in 2021, NYDF provides a renewed framework for forest action by considering climate change. NYDF aims to stop natural forest loss by 2030, restore 350 million hectares of degraded landscapes and forestlands, improve governance and the rights of forest communities, increase financial flows to forests, and reduce carbon emissions from deforestation and forest degradation to tackle the climate and biodiversity crises. Türkiye is an endorser of the NYDF from the sub-region.

6.3. Global platforms and initiatives

– Nature-based Solutions Policy Platform⁵

The Platform provides open-access information on global climate change adaptation planning by analyzing countries' adaptation components of NDCs under the Paris Agreement, highlights the prominence of NbSs to climate change impacts in global policy, and links pledges to the underlying evidence.

² <https://www.fao.org/in-action/forest-landscape-restoration-mechanism/en/>

³ <https://www.bonnchallenge.org/>

⁴ <https://forestdeclaration.org/about/new-york-declaration-on-forests/>

⁵ <https://www.nbspolicyplatform.org/>

– **Nature-based Solutions Evidence Platform⁶**

The Platform is an interactive map linking NbSs to climate change adaptation outcomes through a systematic review of the peer-reviewed literature to (i) explore evidence on how effective different nature-based interventions are to address the impacts of climate change, (ii) compare social, economic, and ecological effects of different nature-based interventions, (iii) filter by region, country, ecosystem type, intervention type, or type of outcome, (iv) generate maps, and graphs, and download data, (v) directly link from science to national climate policy.

– **The Nature-based Solutions Initiative⁷**

The Nature-based Solutions Initiative is an interdisciplinary program of research, education, and policy advice based in the Department of Biology at the University of Oxford. Its mission is to enhance understanding of the potential of NbSs to address multiple global challenges while supporting the health of ecosystems and respecting the rights of Indigenous Peoples and local communities.

– **The Global Program on Nature-Based Solutions⁸**

The Global Program on Nature-Based Solutions for Climate Resilience is a cross-sectoral effort at the World Bank Group to increase investments in solutions that integrate and strengthen natural systems across regions and sectors. The program involves many World Bank Global Practices, such as (i) urban, disaster risk management, resilience, and land, (ii) water, (iii) environment, natural resources, and the blue economy.

– **Nature-based Solutions for Adaptation⁹**

World Resources Institute (WRI) is working to support governments and multilateral institutions in understanding the value of nature for climate change adaptation, strengthening the impact of existing nature-based initiatives, identifying appropriate metrics and catalyzing investment in NbSs. WRI aims to accelerate the uptake of NbSs for climate change adaptation by countries and cities.

WRI assesses how existing platforms and initiatives that support NbSs have addressed adaptation and contributed to adaptation outcomes. WRI also identifies new opportunities for these platforms to support scaling up NbS for adaptation.

– **Nature-based Solutions¹⁰**

IUCN provides a platform for a better understanding of NbSs by topics. IUCN works to advance practical NbSs for climate mitigation and adaptation, centered on better conserving, managing, and restoring the world's ecosystems. IUCN supports the acceleration of financing for NbSs for climate change through multiple grant mechanisms, including the Global EbA Fund, the Blue Natural Capital Financing Facility, the Subnational Climate Finance initiative, and the Nature+ Accelerator Fund, which collectively represent USD 200 million in available funding for NbSs.

– **Nature-Based Solutions Investment¹¹**

Capital for Climate, in collaboration with the High-Level Champions and Race to Zero, developed the Nature-based Solutions Investment Platform. The Platform is designed to enable allocators to see the landscape of climate opportunity in one place - to inform strategy, navigate, source, and execute investments aligned with science-based net zero pathways.

– **Nature Based Solutions Institute¹²**

In 2020, Johan Östberg and Cecil Konijnendijk founded the Nature Based Solutions Institute (NBSI), resulting from a solid wish to support the greening of cities with the best available knowledge and practice. NBSI strives to be an internationally recognized institute for research, development, training, and policy advice in urban forestry and NbSs. NBSI introduced the 3-30-300 rule for developing urban forests and creating greener and healthier cities. This means that everybody should be able to see 3 trees

⁶ <https://www.naturebasedsolutionsevidence.info/>

⁷ <https://www.naturebasedsolutionsinitiative.org/>

⁸ <https://naturebasedsolutions.org/>

⁹ <https://www.wri.org/initiatives/nature-based-solutions-adaptation>

¹⁰ <https://www.iucn.org/our-work/nature-based-solutions>

¹¹ <https://nbs.capitalforclimate.com/>

¹² <https://nbsi.eu/>

from their home, live in a neighborhood with at least 30% tree canopy (or vegetation) cover, and be no more than 300 meters from the nearest green space that allows for multiple recreational activities.

6.4. Nature-based solutions applied successfully in other FAO global regions

6.4.1. Nature-based Solutions 2022 Project¹³

The objective of the NbS 2022 project is to develop an Asian component of urban NbSs in the Urban Nature Atlas, a global database of 1,100 urban NbSs from European cities and other cities worldwide. The project includes identifying and analyzing up to 100 NbSs in selected Asian countries, and examples from Central Asia are listed below. Selected NbSs are blue infrastructure, green areas for water management, and grey infrastructure featuring greens, parks, and urban forests.

- Eco Park project – Bishkek/Kyrgyzstan¹⁴
- River rehabilitation and creation of green corridor – Eskisehir/Türkiye¹⁵
- Green belt of Nur-Sultan city – Nur Sultan/Kazakhstan¹⁶
- Ecosystem-based adaptation planning Osh/Kyrgyzstan¹⁷

6.4.2. Critical Ecosystem Partnership Fund¹⁸

Climate change negatively impacts Central Asia's humans, natural ecosystems, and biodiversity. These impacts were addressed at the Climate Change in Central Asia Conference between 3 and 4 April 2019 in Tashkent, Uzbekistan.

In this regard, the Critical Ecosystem Partnership Fund (CEPF) plans to invest in the Mountains of Central Asia Biodiversity Hotspot to conserve wild lands and biodiversity to increase resilience and reduce the vulnerability of ecosystems and people to climate change. CEPF aims to achieve these goals through implementing ecosystem-based adaptation (EbA) to climate change that integrates the conservation and restoration of biodiversity and ecosystem services into broader climate change adaptation strategies. The EbA approach uses main NbSs such as conservation, restoration of ecosystems, and improved management to address social, economic, and environmental challenges and benefit humans, natural ecosystems, and biodiversity to adapt to climate variability.

The investment period is from 2019 to 2024, with a budget of USD 8 million. In this regard, in its conservation strategy, CEPF identified 25 biological corridors and 167 key biodiversity areas in the Mountains of Central Asia, of which five biological corridors and 28 key biodiversity areas have been identified as a priority for the CEPF investment. By doing so, CEPF will financially support seven countries of the Mountains of Central Asia Biodiversity Hotspot for increased and improved natural ecosystem management to avoid the negative impacts of climate change.

6.4.3. Issue-Based Coalition on Environment and Climate Change in Europe and Central Asia Region¹⁹

Terms of References²⁰ of Issue-Based Coalition on Environment and Climate Change in Europe and Central Asia defines the Coalition's main goals, objectives, roles, and responsibilities.

Martonakova (2021)²¹ provided recommendations to Europe and Central Asia countries for pathways for a more inclusive, environmentally sustainable, and resilient COVID-19 recovery. The study provided guidance and tools for assisting countries in integrating environmental and climate change issues into their COVID-19 recovery strategies and supporting a "building back better" approach – a green recovery. In this regard, measures 3 (Azerbaijan-biodiversity), 9 (Kazakhstan-waste management), 14 (Tajikistan-safe drinking water), 15 (Turkmenistan-waste management), and 17 (Kazakhstan-green technology and innovation) provide examples from Azerbaijan, Kazakhstan, Tajikistan, and Turkmenistan. Mainly, Measure Three aims to integrate biodiversity into the COVID-19 recovery plans in Azerbaijan through good practice examples to minimize risks of future pandemics, strengthen overall economic resilience, and support human and animal well-being (ECOserve program). Besides, Measure Eight acknowledges the role of forests for human health and well-being and integrates

¹³ <https://asef.org/projects/nature-based-solutions-2022/>

¹⁴ <https://una.city/nbs/bishkek/eco-park-project>

¹⁵ <https://una.city/nbs/eskisehir/river-rehabilitation-and-creation-green-corridor>

¹⁶ <https://una.city/nbs/nur-sultan/green-belt-nur-sultan-city>

¹⁷ <https://una.city/nbs/osh/ecosystem-based-adaptation-planning-osh>

¹⁸ <https://www.cepf.net/stories/biodiversity-part-central-asias-climate-solution>

¹⁹ <https://unece.org/issue-based-coalition-environment-and-climate-change>

²⁰ <https://unece.org/sites/default/files/2021-08/IBC%20Env%20and%20CC%20ToRs%202021%20rev.pdf>

²¹ <https://unece.org/sites/default/files/2021-02/IBC%20Env%20Green%20post-pandemic%20measures%2031.1.21.pdf>

the health and nutrition aspects in forest management planning (case studies: Inspiring fruit tree cultivation and use in Central Asia). Measure 13 offers to promote greener cities (including through nature-based solutions), urban air quality, and healthy urban lifestyles to build resilience to respiratory diseases and the health impacts of COVID-19 (case study: Barcelona resilience through nature-based solutions).

6.4.4. Trees in Cities Challenge²²

Cities are responsible for around 75% of global CO₂ emissions worldwide. However, they are also vulnerable to the negative impacts of climate change. Since 70% of humanity is projected to live in urban areas by 2050, as a low-cost NbS, urban forests and trees can help settlements reduce vulnerabilities and increase resilience to the impacts of climate change, including higher temperatures, pandemics, extreme weather events, and natural disasters. Urban forests and trees in and around settlements could also play a key role in achieving Sustainable Development Goals (SDGs) and provide co-benefits such as the provision of ecosystem services and conservation of biodiversity as well as improved public health and well-being, reduced temperatures, increased energy efficiency, green job creation, opportunities for urban food production and reduced risks of floods, landslides, and other natural hazards.

In this context, the United Nations Economic Commission for Europe (UNECE) launched the "Trees in Cities Challenge" in 2019. This initiative invites mayors and local governments worldwide to make a tree-planting pledge and set objectives to ensure cities are greener, more resilient, and more sustainable.

Over 70 cities have pledged, including Ashgabat, Balykchy, Batken, Cholpon-Ata, Jalal-Abad, Kadamjay, Karakol, Kara-Kul, Kara-Suu, Kyzyl-Kiya, Naryn, Osh, Razzakov, Sulukta, and Talas from the sub-region.

For example, Ashgabat, the capital of Turkmenistan, aims to address rapid urbanization in the project "Sustainable Cities in Turkmenistan: Integrated Green Urban Development in Ashgabat and Awaza" led by UNEP and UNDP in cooperation with the Ministry of Environment of Turkmenistan. The project will facilitate sustainable urban development in Ashgabat and the development of city-wide sustainability plans. Ashgabat pledged to plant 1.6 million new trees under the "Trees in Cities Challenge" in line with the "National Forest Program," which aims to plant 10 million trees nationwide.

UNECE also published the "Advancing Sustainable Urban and Peri-Urban Forestry" highlighting the role of sustainable urban and peri-urban forestry as an integrative and strategic NbS to develop healthier, more sustainable, and climate-resilient cities (UNECE, 2021). The study strongly advises increasing the forest cover in urban areas and emphasizes that sustainable long-term management objectives shall support afforestation and tree planting to optimize the benefits of urban forests and trees.

6.4.5. Other initiatives

Since the afforestation and reforestation programs are the pioneers in NbS implementation (Fargione *et al.*, 2018; Chausson *et al.*, 2020), remarkable examples of tree plantation programs are also available for forests and cities worldwide. These initiatives, listed below, provide excellent examples of NbS implementation under projects and funding opportunities through financial partners.

- Active Giving²³
- African Forest Landscape Restoration Initiative (AFR100)²⁴
- Arbor Day Foundation²⁵
- Asian Forest Cooperation Organization (AFoCO)²⁶
- Botanic Gardens Conservation International²⁷
- Brettacorp Inc.²⁸
- Cassinia Environmental²⁹
- Climate ADAPT³⁰
- Climate Impact Partners³¹
- COMMONLAND³²
- Conservation International³³
- Earth Day³⁴

²² <https://treesincities.unece.org/>

²³ <https://www.activegiving.de/>

²⁴ <https://afr100.org/>

²⁵ <https://www.arborday.org/>

²⁶ <https://afocosec.org/>

²⁷ <https://www.bgci.org/>

²⁸ <https://www.brettacorp.org.au/>

²⁹ <https://cassinia.com/>

³⁰ <https://climate-adapt.eea.europa.eu/>

³¹ <https://www.climateimpact.com/>

³² <https://commonland.com/>

³³ <https://www.conservation.org/home>

³⁴ <https://www.earthday.org/>

- Ecologi³⁵
- Ecosia³⁶
- EcoRestoration Alliance³⁷
- ENFORLAR³⁸
- Forest Information System for Europe³⁹
- Global EverGreening Alliance⁴⁰
- Global Forest Generation⁴¹
- Grain for Green Program (Xu *et al.*, 2022)
- Green Legacy Programme⁴²
- Green World⁴³
- Greening Commodities⁴⁴
- Initiative 20x20⁴⁵
- International Model Forest Network⁴⁶
- International Tree Foundation⁴⁷
- JUSTDIGGIT⁴⁸
- Million Trees in New York (McPhearson *et al.*, 2011)
- Million Trees in Los Angeles (McPherson *et al.*, 2008)
- National Greening Program⁴⁹
- Norway's International Climate and Forest Initiative⁵⁰
- One Billion Trees Programme⁵¹
- ONETREEPLANTED⁵²
- Oppla⁵³
- Plant with Purpose⁵⁴
- Rainforest Alliance⁵⁵
- Say Trees⁵⁶
- Society for Ecological Restoration⁵⁷
- Sustainable Harvest International⁵⁸
- Terra Match⁵⁹
- The Global Partnership on Forest and Landscape Restoration⁶⁰
- The Great Green Wall (Goffner *et al.*, 2019)
- The Nature Conservancy⁶¹
- ThinkNature⁶²
- Tree Aid⁶³
- TREES FOR THE FUTURE⁶⁴
- Trillion Trees⁶⁵
- Trillion Tree Campaign⁶⁶
- Trillion Tree Platform⁶⁷
- Tropenbos International⁶⁸
- WeForest⁶⁹
- Wildlife Works⁷⁰
- World Agroforestry (ICRAF)⁷¹
- 1t.org⁷²
- 1% FOR THE PLANET⁷³
- 3 billion trees in the European Union (European Commission, 2021)
- 50 million trees in Beijing (Yao *et al.*, 2019)

³⁵ <https://ecologi.com/>

³⁶ <https://www.ecosia.org/>

³⁷ <https://bio4climate.org/era/>

³⁸ <https://landrestorationalliance.org/>

³⁹ <https://forest.eea.europa.eu/>

⁴⁰ <https://www.evergreening.org/>

⁴¹ <https://www.globalforestgeneration.org/>

⁴² <https://www.wellington.ca/en/discover/greenlegacyprogramme.aspx>

⁴³ <https://greenworld.org/>

⁴⁴ <https://greeningcommodities.com/>

⁴⁵ <https://initiative20x20.org/>

⁴⁶ <https://imfn.net/>

⁴⁷ <https://www.internationaltreefoundation.org/>

⁴⁸ <https://justdigg.it/>

⁴⁹ <https://treecanada.ca/our-programs/national-greening-program/>

⁵⁰ <https://www.regjeringen.no/en/topics/climate-and-environment/climate-and-forest-initiative/id2000712/>

⁵¹ <https://www.mpi.govt.nz/forestry/funding-tree-planting-research/one-billion-trees-programme/>

⁵² <https://onetreeplanted.org/>

⁵³ <https://oppla.eu/>

⁵⁴ <https://plantwithpurpose.org/>

⁵⁵ <https://www.rainforest-alliance.org/>

⁵⁶ <https://saytrees.org/>

⁵⁷ <https://www.ser.org/>

⁵⁸ <https://www.sustainableharvest.org/>

⁵⁹ <https://www.terramatch.org/>

⁶⁰ <https://www.forestlandscaperestoration.org/>

⁶¹ <https://www.nature.org/en-us/>

⁶² <https://www.think-nature.eu/>

⁶³ <https://www.treeaid.org/>

⁶⁴ <https://trees.org/>

⁶⁵ <https://trilliontrees.org/>

⁶⁶ <https://www.trilliontreecampaign.org/>

⁶⁷ <https://www.1t.org/>

⁶⁸ <https://www.tropenbos.org/>

⁶⁹ <https://www.weforest.org/>

⁷⁰ <https://www.wildlifeworks.com/>

⁷¹ <https://www.worldagroforestry.org/>

⁷² <https://www.1t.org/>

⁷³ <https://onepercentfortheplanet.org/>

More examples related to the implementation of forestry-based NbS approaches are available in Cohen-Shacham *et al.* (2016), Chausson *et al.* (2020), Kehayova *et al.* (2020), and Liu *et al.* (2021).

For example, Chausson *et al.* (2020) reviewed the global distribution of studies, including Türkiye and Uzbekistan, examining the effectiveness of NbSs to combat the negative impacts of climate change. Most studies focus on created ecosystems, restoration, and management; the remaining studies include protection or a combination. The most represented ecosystems in the studies were forests and mountain ecosystems. The study revealed that NbS implementations have positive, negative, mixed, or no effects.

Kehayova *et al.* (2020) offered forest-based NbSs for Kazakhstan, Kyrgyzstan, and Tajikistan to achieve or support meeting NDC commitments. NbSs include afforestation with fast-growing species (i.e., poplar), natural forest management, and SFM in Kazakhstan; afforestation with fast-growing species, agroforestry, and joint forest management in Kyrgyzstan; and joint forest management (i.e., reforestation and rehabilitation) in Tajikistan. The study also calculated the climate change mitigation benefits of implementing NbSs. Afforestation with fast-growing species would sequester 11.9 tCO₂/year/ha, SFM sequesters 6.6 tCO₂/year/ha, and joint forest management sequesters 7.0 tCO₂/year/ha.

Liu *et al.* (2021) reviewed the different NbS types and searched the benefits of NbSs implemented in Europe. The study categorized NbSs and highlighted the key methods, criteria, and indicators to identify and assess the impacts, co-benefits, and trade-offs related to the NbSs. The study showed that several NbS projects use hybrid approaches to addressing societal challenges. The study provides evidence that NbSs provide benefits in climate change mitigation and adaptation.

6.4.6. Publications on NbSs from FAO and World Bank

The following publications are available and will establish the basis for further developing the Guidelines.

- Arnés García, M., Santivañez, T., 2021. Hand in hand with nature – Nature-based solutions for transformative agriculture. A revision of Nature-based solutions for the Europe and Central Asia region, supported by Globally Important Agricultural Heritage System (GIAHS) examples. Budapest, FAO. <https://doi.org/10.4060/cb4934en>.
- Sonneveld, B.G.J.S., Merbis, M.D., Alfara, A., Ünver, O., Arnal, M.A., 2018. Nature-Based Solutions for agricultural water management and food security. FAO Land and Water Discussion Paper no. 12. Rome, FAO. 66 pp. Licence: CC BY-NC-SA 3.0 IGO.
- Hallstein, E., Iseman, T., 2021. Nature-based solutions in agriculture – Project design for securing investment. Virginia. FAO and The Nature Conservancy. <https://doi.org/10.4060/cb3144en>.
- Miralles-Wilhelm, F., 2021. Nature-based solutions in agriculture – Sustainable management and conservation of land, water, and biodiversity. Virginia. FAO and The Nature Conservancy. <https://doi.org/10.4060/cb3140en>.
- World Bank, 2017. Implementing nature-based flood protection: Principles and implementation guidance. Washington, DC: World Bank.
- World Bank, 2021. A Catalogue of Nature-based Solutions for Urban Resilience. Washington, DC World Bank Group.
- World Bank, 2022. Climate and Development Brief: Nature-based Solutions for Climate Resilience and Adaptation. 7p.

6.4.7. NbS Examples from Scientific Papers

In total, 250 scientific papers and reports were downloaded during the stocktaking study. Some of the scientific papers and reports were briefly explained in this report. The remaining relevant scientific papers and reports will be integrated into the Guidelines.

Anderson and Gough (2022) presented a typology of NbSs, addressing the need for a standardized source of definitions and nomenclature and facilitating communication in this interdisciplinary field of theory and practice. The study also provided examples of NbSs, such as ecosystem restoration, issue-specific, infrastructure-related, ecosystem-based management, and ecosystem protection approaches.

Boisvenue et al. (2022) provided a framework and the information needed to implement forest-related NbSs for climate change mitigation.

Bona et al. (2023) identified the prominent and most recent NbSs applied in European urban environments and analyzed integrating different measures as an innovative analysis based on real cases. The study identified city parks, green corridors, urban forests, urban trees, and mixed forests as European forest-related NbSs.

Chausson et al. (2020) globally mapped the evidence on the effectiveness of NbSs for addressing the impacts of climate change and hydrometeorological hazards on people. The study defined the broad types of NbSs (establishment or management of created ecosystems-34%; restoration-29%; protection of existing ecosystems-21%) and the most represented ecosystems (forests-53%; mountain ecosystems-19%) and detected some studies from Europe and Central Asia (26%), including Türkiye and Uzbekistan as well as 59% of the effectiveness of the NbSs.

Cohen-Shacham et al. (2016) compared ten NbS approaches that predominantly focus on conserving, protecting, or managing water and forest ecosystems to address global societal challenges (i.e., climate change). The study provided examples of ecosystem-related approaches, such as NbSs and case studies worldwide.

Drever et al. (2021) estimated the climate change mitigation potential of 24 natural climate solutions related to protecting, managing, and restoring natural systems providing various co-benefits. Some natural climate solutions were improved forest management, avoided forest conversion, forest restoration, and trees in outside forests (i.e., tree intercropping, silvopasture, riparian tree planting, avoided conversion of shelterbelts, and urban trees).

Fargione et al. (2018) quantified the potential of 21 natural climate solutions for conservation, restoration, and improved land management interventions on natural and agricultural lands to increase carbon storage and avoid GHG emissions in the United States. The study estimated a maximum GHG removal potential of 1.2 (0.9 to 1.6) Pg CO₂e/year, equal to 21% of the current net annual emissions of the country.

Griscom et al. (2017) listed 20 natural climate solutions, i.e., reforestation, avoided forest conservation, natural forest management, improved plantations, avoided woodfuel, and fire management approach that could contribute to over one-third of mitigation contributions from forests, croplands, grasslands, and wetlands. Among the options, reforestation and avoided forest conservation have the maximum climate change mitigation potential.

Haase (2017) addressed the role of riparian forests as an NbS for climate change adaptation in cities and the neighborhood and their functions, providing co-benefits.

IUCN (2020a) developed a global standard for NbSs to ensure the application of NbSs is consistent and grounded since NbSs are integrated into the policies and implemented through projects. The Standard aims to provide a robust framework to design and verify NbSs to achieve expected outcomes in solving social, economic, and environmental challenges.

IUCN (2020b) provides guidance and a global framework to design, verify, and scale up NbSs. The Standard established globally consistent Criteria and Indicators in line with the principles for NbSs to measure the effectiveness of NbS interventions. In this regard, 8 Criteria and 28 Indicators were developed to assess the extent to which a proposed solution qualifies as an NbS and identify specific actions to be taken to strengthen the robustness of the intervention further; and enable a targeted design of an NbS to adhere to the Criteria and Indicators, while building in adaptive management mechanisms to maintain the relevance and robustness of the NbS through its lifespan.

Kaarakka et al. (2021) introduced improved forest management (IFM) as a natural climate solution because of the mitigation potential of existing forests and other co-benefits. The study reviewed IFM approaches in the United States.

Kehayova et al. (2020) assessed the options for NbSs to enhance NDC commitments in Kazakhstan, Kyrgyzstan, and Tajikistan through technical and financial analysis of promising NbSs for climate change. The proposed NbSs are (i) Afforestation with fast-growing species in Kazakhstan (Poplar plantations on private lands), (ii) Agroforestry in Kyrgyzstan, (iii) Joint forest management and improved pasture management in Tajikistan, and (iv) Natural forest management in Kazakhstan.

Key et al. (2022) reviewed the outcomes of 109 NbSs for climate change adaptation using 33 indicators of ecosystem health across eight main categories. The study showed that 88% of interventions had positive outcomes for climate change adaptation, including benefits for ecosystem health. The study also showed that interventions were associated with a 67% average increase in species richness.

Kim et al. (2021) analyzed the contribution of NbSs to improving environmental and socio-economic resilience to achieve the SDGs. The study compared four forestry-related NbS case studies from the Republic of Korea (reforestation), China (afforestation), Kazakhstan (afforestation), and Mongolia (afforestation), which were all implemented by the Republic of Korea.

Kumar et al. (2020) studied the operationalization and the acceptance of NbSs for managing hydrometeorological hazards such as floods, droughts, landslides, coastal erosion and storm surge, and nutrients and sediment loading. The study provided examples from countries, including Türkiye, regarding natural hazards. Moreover, various NbS examples, including forestry, were presented for hazards to facilitate and guide the planning and designing of NbS projects.

Liu et al. (2021) discussed the NbS concept and its related terminologies, reviewed the NbS types implemented in Europe, and explored their benefits over time before categorizing them and highlighting the essential methods, criteria, and indicators to identify and assess the impacts of NbSs, co-benefits, and trade-offs. The study reviewed the websites of 52 projects and some relevant publications funded by EU Research and Innovation programs and other relevant publications. The results show a shared understanding that the NbS concept encompasses the benefits of restoration and rehabilitation of ecosystems, carbon neutrality, improved environmental quality, health, and well-being, and evidence for such benefits.

Mori et al. (2021) assessed the biodiversity–productivity relationships, and the study found that the relationship between biodiversity and productivity is vital to nature-based climate solutions. The study reported that areas with rich tree diversity tend to be more productive and store more carbon.

Morita and Matsumoto (2021) analyzed the development and implementation of the three existing types of NbSs: NbS for climate change mitigation and adaptation, Eco-Disaster Risk Reduction, and green infrastructure in Asia. The study also addressed the common and specific governance challenges for NbS implementation in Asian countries.

Osaka et al. (2020) reviewed how natural solutions to climate change have been framed, examined the normative and practical implications of this framing, and reviewed what counts and what does not count as a natural solution. The study also covered a brief history and presented various definitions of "natural climate solutions" and "NbS" for climate change through a systematic review of recent literature.

Ostoić et al. (2018) reviewed recent studies on the benefits of urban forests as NbSs in the Mediterranean region against social, economic, and environmental challenges.

Pathak et al. (2022) present a set of seven key considerations from the USA and worldwide for their use in community-based adaptation to support the adoption and effective implementation of NbSs.

Roe et al. (2021) refined and updated the mitigation potentials for 20 land-based measures in more than 200 countries and five regions, including assessing the implementation feasibility at the country level.

Seddon et al. (2020a) highlighted the role of NbSs in climate policy, showing their mitigation and adaptation potential, discussed the barriers to their evidence-based implementation, outlined the leading financial and governance challenges to implementing NbSs, and defined the need for further research.

Seddon et al. (2020b) analyzed NbSs in the NDCs of 168 countries submitted to the UNFCCC. The study revealed that 104 governments included adaptation-related NbSs, 77 governments included both adaptation and mitigation-related NbS, and 27 governments included mitigation-related NbSs in their NDCs. The study also provided recommendations on how relevant stakeholders can increase ambition for NbSs to climate change impacts.

Seddon et al. (2021) discussed the promise and pitfalls of the NbS framing and its current political traction. The study presented recommendations for policymakers, practitioners, and researchers to consider the synergies and trade-offs associated with NbSs and to follow four guiding principles to enable NbSs to provide sustainable benefits to society. The article provides examples of major tree-planting initiatives and recent corporate funding pledges for nature and climate.

Springgay (2019) addressed forests as NbSs for providing water-related ecosystem services. The study analyzed the role of forests and other lands with trees in the water cycle, such as regulating streamflow, fostering groundwater recharge, and contributing to atmospheric water recycling, including cloud generation and precipitation through evapotranspiration. Forests also support water-related ecosystem services acting as natural filters, reducing soil erosion and sedimentation to provide high-quality water for human consumption, industry, and the environment.

Teo et al. (2021) modeled the global potential and extent of urban reforestation worldwide. The study found that 17.6% of all city areas covering 10.9 ± 2.8 Mha are suitable for reforestation, offsetting 82.4 ± 25.7 MtCO₂e/yr of GHG emissions.

Welden et al. (2021) addressed how the NbS concept is being framed internationally, particularly in human-environment relations. Since NbSs foresee a transformative change, the study explored the implications that the framings of NbSs hold for such change.

Wu et al. (2021) studied the relationship between landscape dynamics and biodiversity patterns and conceptualized and developed a framework incorporating landscape dynamics and biodiversity into the design of large-scale NbSs. They evaluated the framework in a case study area in the Odense area, Denmark, under the EU-funded RECONNECT project.

6.5. Nature-based solutions suitable for the sub-region

Suitable NbSs for sub-region forests under climate change are synthesized and categorized under the selected NbS approaches. To support regional and national efforts, these Guidelines offer selected NbSs to combat the negative impact of climate change. The selected NbS approaches include:

- 1) Ecosystem restoration approaches;
- 2) Infrastructure-related approaches;
- 3) Ecosystem-based management approaches;
- 4) Issue-specific ecosystem-related approaches;
- 5) Ecosystem protection and conservation approaches.

- **Ecological (ecosystem) restoration approaches**

Ecological restoration can extend forest area and tree coverage in the sub-region through revegetation, afforestation, reforestation, restoration, rehabilitation practices, and invasive species removal. These activities enhance the carbon sequestration and storage capacity of forests and strengthen the forest structure under the negative impacts of climate change. Similarly, **Forest Landscape Restoration** aims to regain ecological functionality and enhance human well-being in deforested or degraded landscapes.

- **Infrastructure-related approaches**

Urban trees, public open green spaces, green corridors, botanical gardens, arboretums, gardens, and parks are integral to **green infrastructure**, including ecosystem ponds for flood control. Urban and peri-urban forests are **natural infrastructures** that play a critical role in climate change mitigation and adaptation and provide various forest ecosystem goods and services, such as wood, non-wood forest products, recreation, ecotourism, carbon sequestration and storage, soil and water conservation, and biodiversity conservation.

- **Ecosystem-based management approaches**

Improved forest management is a practical methodology covering several silvicultural activities that enhance carbon stocks in carbon pools and reduce GHG emissions to improve the climate change mitigation potential of forests. **Adaptive forest management** is fundamental to reducing forest vulnerability and maintaining forest productivity. Adaptation measures might include the selection of heat-tolerant and drought-tolerant species, using planting stock from a range of provenances, underplanting using tree varieties adapted to expected climatic conditions, and the assisted natural regeneration of adapted species and varieties. **Integrated natural resource management or integrated (sustainable) land management** involves coordination and cooperation among stakeholders to implement sustainable forest, land, water, and biological resource management. The use of forest resources is integrated with the use of other resources that form a specific productive landscape. **Natural regeneration** is the process whereby forests are restocked by trees germinating from seeds falling from nearby standing mother trees. It can also include regeneration from stumps and roots. **Assisted natural regeneration** can be defined as the process of rehabilitating clear-cut forest lands by taking advantage of trees already growing in the surrounding area.

- **Issue-specific ecosystem-related approaches**

Ecosystem-based adaptation is one of the subsets of NbS approaches developed to address the role of ecosystem services in facilitating the adaptation of humans to climate change. **Ecosystem-based mitigation** focuses on carbon sequestration and storage and avoiding GHG emissions in ecosystems to ensure ecosystem functionality, human health, and socio-economic security. **Climate adaptation services** aim to complement the ecosystem services concept and contribute to developing options for climate change adaptation, focusing on understanding the vital ecological mechanisms and characteristics that support the ecosystem capacity. **Ecosystem-based disaster risk reduction** approach focuses on minimizing the impacts of hazards by enhancing the capacity of communities to better manage and recover from the effects of hazards.

- **Ecosystem protection and conservation approaches**

NbS implementation generates biodiversity co-benefits. Biodiversity conservation is essential to combat the negative impacts of climate change, and NbSs that conserve and restore biodiversity lead to more resilient forests and ecosystem services. In this regard, **area-based conservation and protected area management** ensure the conservation of particular areas and species with significant importance. Establishing protected areas to conserve particular areas and species is one of the best examples of area-based conservation. **Assisted migration of native tree species and populations** inside the native range

is recognized as a potentially critical response to climate change. **Old-growth forests** must be strictly protected. Old-growth forests store significant carbon stocks and remove carbon from the atmosphere while being of paramount importance for biodiversity and the provision of critical ecosystem services. **Fire management** is an essential part of climate change adaptation and mitigation strategies. It includes fuel management, fire occurrence prediction, fire prevention, fire detection, initial attack and suppression, and forest restoration. **Pest and disease management** and preventing their spread will help ensure that forests remain healthy in the face of climate change.

6.6. NbS examples from the sub-region

6.6.1. Nationally Determined Contributions

The Paris Agreement introduced NDCs as the implementation tool for the post-2020 period to achieve the Agreement's long-term goals. In this context, NDCs define a roadmap for the countries to set and strengthen their efforts and contributions to tackling climate change, including adaptation communications.

As evidence strengthens, NbSs are increasingly prominent in climate change policy, particularly in developing countries (Seddon *et al.*, 2020b). Four countries (Kyrgyzstan, Tajikistan, Türkiye, Uzbekistan) included NbSs in their mitigation and adaptation components of NDCs, and two countries (Azerbaijan and Turkmenistan) included them as part of their mitigation plans. Finally, Kazakhstan included NbSs in the adaptation component of its NDC. In other words, all sub-region countries have committed to working with ecosystems, particularly forests, and the commitments focus more on managing and restoring than protecting forest ecosystems. However, NDCs lack quantified targets.

In this regard, NbS implementation in the NDCs of FAO-SEC countries focuses on protection and conservation (i.e., Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan), restoration and expansion of forests (i.e., all countries), and sustainable management of forests (i.e., Tajikistan) contributing climate change mitigation and adaptation and other co-benefits.

More specifically, **Azerbaijan** aims to establish new forest areas and water and land-protecting forest strips (windbreaks) and implement urban and roadside greening activities. **Kazakhstan** includes the Land Use, Land Use Change, and Forestry (LULUCF) sector to combat the negative impact of climate change on forestry; however, no specific targets were listed. **Kyrgyzstan** offers to protect and increase forests and expand the perennial plantations, as well as increase adaptive capacity, strengthen climate resilience, and reduce vulnerability to the adverse effects of climate change.

Tajikistan proposed the following measures to combat the negative impact of climate change on forestry (i) implement afforestation/reforestation, natural regeneration, and active regeneration for erosion stabilization/prevention and reduce land degradation, (ii) promote NbSs, FLR, and other relevant approaches to improve forest conditions, (iii) promote forest protection, sustainable forest management, and provision of ecosystem services, and (iv) promote crosscutting actions such as integrated land management. **Türkiye** targets to increase the sink capacity of forests through SFM, afforestation, reforestation, restoration, rehabilitation, and regeneration, and encourage nature and/or technology-based solutions, protect agricultural lands, improve grasslands, prevent, control, and reduce desertification and land degradation, and increase the number of protected areas. **Turkmenistan** aims to protect and improve the quality of forests for climate change mitigation, implement reforestation and afforestation activities, and establish new woodlands. Finally, **Uzbekistan** aims to reforest the foothills of mountains, safeguard native plant species in semi-deserts and deserts, and protect, restore, and maintain ecological balance in protected areas.

Including the forestry-based NbSs in the NDCs presents opportunities to achieve global goals related to climate change and the corresponding need for international support.

6.6.2. Field implementation

All sub-region countries are aware of the negative impacts of climate change on forests, and they are committed to protecting, conserving, restoring, sustainably managing, and using forest ecosystems. Significant protection and conservation approaches include **conserving the existing forests and biodiversity in protected areas** and **fire management**; restoration approaches include **increasing forest areas through afforestation and reforestation** and **restoration/rehabilitation of degraded forests**; sustainable forest management includes **natural regeneration** and **assisted natural regeneration**.

Substantial efforts have been made to implement NbSs to combat the negative impact of climate change on forestry in the sub-region. **Plantation** activities have been launched using native tree species for extending forest areas and restoring/rehabilitating degraded forests and for carbon sequestration and storage and soil conservation (i.e., erosion control, flood control, and avalanche control). **Area-based conservation** methodologies, **fire management**, and **pest and disease**

control activities are critical in conserving the existing forests and biodiversity. **Natural** and **assisted natural regeneration** are critical in tackling climate change's negative impacts on forests and providing ecosystem services.

For example, **Azerbaijan** has implemented afforestation, reforestation, rehabilitation, and restoration activities in forest fund lands on an average of 9,727 ha since 2000. 214,200 ha of degraded forestland has been afforested, reforested, rehabilitated, and restored since 2000 (GoA, 2022). Liu *et al.* (2021) reviewed NbS implementation across Europe, and NbSs in Azerbaijan were categorized as ecological engineering. Azerbaijan aims to increase forest cover to 20 percent by rehabilitating forests and establishing new forest areas in 593,000 ha by 2030. Azerbaijan had three national parks covering 84,500 ha in 2003, and the number of national parks has increased to 10, covering 421,400 ha in 2021. Additionally, Azerbaijan had 12 state natural reserves covering 186,500 ha in 1990; however, the number of state natural reserves has decreased to 10, covering 120,700 ha in 2021 (GoA, 2022).

Kazakhstan aims to increase forest areas by 5 percent by 2025 by planting two billion seedlings of drought-resistant and economically valuable pine, oak, walnut, and linden tree species. In addition, Kazakhstan has established eight particular plantations with fast-growing tree species in the last decade. Additional work is being conducted to save the Aral Sea basin from salinity and improve soil fertility through afforestation activities of saxaul species on 0.25 million ha, and the afforestation area in the Aral Sea will be extended to 1 million ha. Kazakhstan cooperated with Korean Forest Service to rehabilitate the Aral Sea beds through afforestation (Kim *et al.*, 2021). In this regard, 3,759,400 saxaul trees (*Haloxylon aphyllum*) were planted in 10,800 ha on the eastern Aral Sea bed in the Kyzylorda region from 2018 to 2019 (Korea Forest Service, 2020). Moreover, Kazakhstan has established 155 new forest nurseries and modernized existing nurseries to provide high-quality seedlings to achieve the abovementioned objectives. Furthermore, there is an aim to reduce fire, pest, and disease risks by 20 percent in 2025.

Kyrgyzstan has planned a 1,000-ha annual plantation program to expand protected natural areas to 10 percent. Kyrgyzstan has implemented reforestation (planting and seed sowing) activities on 28,860 ha between 2008 and 2021 (GoK, 2023). Protected areas provide excellent opportunities for biodiversity conservation, protection of the environment, and climate change mitigation and adaptation. The total number of state reserves and natural parks has reached 23, covering 1,305.4 thousand ha (State reserves: 578,600 ha and natural parks: 726,800 ha) in 2021 (GoK, 2023). Moreover, Kyrgyzstan has 64 nature sanctuary/zakaznik (complex, botanical, zoological, and forest), natural monuments, botanic gardens, and zoological parks. Furthermore, Sary-Chelek State Natural Park (1979) and the Issyk-Kul Biosphere Reserve (2001) were included in the UNESCO World Network of Biosphere Reserves based on the Law on Biosphere Territories in the Kyrgyz Republic (1999) (Burzhubaev *et al.*, 2019). In total, protected areas cover 1,463,242 ha (7.38%) in the country (GoK, 2019).

Tajikistan implements 2,000 ha of annual plantation activities to increase the GHG mitigation potential through participatory forestry sector development. Leasing forest areas to local people ensures these areas' conservation, improves local livelihoods, and ensures food security. Tajikistan has also developed a new concept for walnut and almond plantations. In addition, Tajikistan has initiated strategic governance to integrate climate change and has developed a database for fast-growing species. Tajikistan has also established protected areas and conducted afforestation activities on 66,000 ha under the Bonn Challenge, mostly saxaul and pistachio.

Türkiye recently initiated the "National Afforestation and Erosion Control Mobilization Action Plan" and "Breath to the Future" afforestation campaigns and other programs to contribute to climate change mitigation, including raising awareness on forests. Türkiye implemented natural regeneration (1,454,472 ha), maintenance (12,896,051 ha), and conversion of coppice forests to high forests (1,406,404 ha) activities on over 15.75 million ha since 1988. Afforestation, soil conservation, forest rehabilitation, pasture rehabilitation, private afforestation, artificial regeneration, and establishment of energy forests activities were implemented on 2,577,508 ha, 1,646,619 ha, 3,394,374 ha, 294,256 ha, 157,986 ha, 923,805 ha, and 622,878 ha, respectively. Erosion, avalanche, and flood control measures under soil conservation were implemented on 1,604,996 ha, 1,015 ha, and 40,608 ha, respectively. Türkiye has increased forest areas from 20.2 million ha to 23.25 million ha between 1973 and 2022. Besides, 6.6 million ha of forest area were certified to ensure SFM. Türkiye has also implemented forest pest and disease control measures on 1,779,232 ha from 2013 to 2022 to protect and increase forest resilience. Various protected area categories are available in Türkiye, which cover 3,666,573 ha. The protected areas include national parks, nature parks, monuments, conservation areas, wildlife development sites, wetlands, Ramsar areas, protection forests, gene conservation forests, seed stands, seed orchards, and urban forests. Moreover, 19 special environmental protection areas cover 3,834,213 ha, and 3,279 natural sites cover 2,136,638 ha in Türkiye. On the other hand, forest fires affect the sustainability of forests. For example, on average, Türkiye faces more than 2,193 forest fires per year; in total, 498,104 ha of forests have been burnt since 1988 in Türkiye. Facts revealed that forest fires had affected 1,864,275 ha since 1937. The number of annual forest fires has an increasing trend since the 1960s. However, according to the Constitution, these forests were reforested (OGM, 2023).

Turkmenistan conducts afforestation activities with drought-resistant plant species and established the "Golden Century Lake" in the Karakum Desert to improve the climate conditions and conserve biodiversity.

The environmental disaster in the Aral Sea region of **Uzbekistan**, formerly abundant in flora and fauna species, has sharply decreased biological diversity. In this sense, Uzbekistan declared the Aral Sea region an environmental protection area and plans to implement afforestation activities on 0.5 million ha until 2030 to create the green cover zone. Afforestation activities have been conducted on 1.5 million ha to support climate change mitigation actions with saxaul (*Haloxylon aphyllum*) and *Tamarix ramissosima* through Climate Adaptation and Mitigation Program for Aral Sea Basin and other programs. The main ecological task of forests and woodlands in the Aral Sea basin includes greening area, carbon sequestration and storage, fixing sand and dust, and water flow regulation. The most valuable nut species in Uzbekistan is the pistachio. Currently, pistachio plantations cover more than 30,000 ha. The area under nuts (pistachios, almonds, walnuts) has increased significantly recently. In particular, pistachio plantations have been expanded in the country's low- and non-irrigated areas. In Uzbekistan, 7.8 million ha of land were categorized as non-irrigated areas suitable for pistachio plantations. The pistachio plantations are very resistant to droughts and dry conditions, and pistachio plantations seem to be a possible and probably the only solution for reforestation of the arid foothill zones of the country. In Uzbekistan, legally protected areas cover less than 1.5 million ha or 3.31 percent of the country's territory (UN, 2020). Uzbekistan has seven state reserves, one wildlife sanctuary, and three national natural parks (GoU, 2018).

In this regard, Table 2 presents the alignment of global NbS in the sub-region.

6.6.3. Projects

Many projects introducing NbSs (i.e., protection, conservation, restoration, management) have been implemented or are being implemented in the sub-region by governments, UN organizations, non-governmental organizations, and the private sector. The list of selected projects is presented below.

- **Azerbaijan**

- Towards a Land Degradation-Neutral Azerbaijan
- Conservation and sustainable use of biodiversity: Strengthening network of protected areas through advanced governance and management
- Forest Resources Assessment and Monitoring to Strengthen Forest Knowledge Framework in Azerbaijan
- Sustainable Land and Forest Management in the Greater Caucasus Landscape
- Climate Change Action in Developing Countries with Fragile Mountainous Ecosystems from a Sub-Regional Perspective
- Strengthening Country Capacities for NDC Implementation in the Agriculture and LULUCF Sectors and Supporting the Identification of Potential Direct Access Entities from Different Sectors Relevant for the Implementation of the Country Work Programme in Azerbaijan
- Increasing the resilience of forest ecosystems against climate change in Southern Caucasus countries
- Forestry activities aimed at preventing floods in Kish village of Sheki district
- Forest expansion pilot Project in Ismayilli-Zagatala (KfW Bank of Germany)

- **Kazakhstan**

- Tien Shan Ecosystem Development Project
- Conservation and Sustainable use of biodiversity in the Kazakhstani Sector of the Altai-Sayan Mountain Ecoregion
- Forest Protection and Reforestation
- Pilot Project on Inventory of Unaccounted Forests in Kostanay and North Kazakhstan Regions and Automation of Information Collection on Forestry
- Investigation of the Resistance of Black Saxaul (*Haloxylon aphyllum*) Forms to Gall-Forming Insects

- **Kyrgyzstan**

- Integrated Community-based Management of High Value Mountain Ecosystems in Southern Kyrgyzstan for Multiple Benefits
- Conservation of Globally Important Biodiversity and Associated Land and Forest Resources of Western Tian Shan Forest Mountain Ecosystems to Support Sustainable Livelihoods
- Conservation of Snow Leopard Habitats
- Improving the Coverage and Management Effectiveness of Protected Areas in the Central Tian Shan Mountains
- Biodiversity Conservation and Poverty Reduction through Community-based Management of Walnut Forests and Pastures

Table 2. Alignment of global NbS in the sub-region

						Existing NbS in the
Global NbS Approach	Global NbS Action	Adaptation of Action	Azerbaijan	Kazakhstan	Kyrgyzstan	Tajikistan
Ecological (ecosystem) restoration	<ul style="list-style-type: none"> Ecosystem restoration (1) FLR (2) 	2	1	1	1	1
Infrastructure-related	<ul style="list-style-type: none"> Green infrastructure (3) Natural infrastructure (4) 	-	3, 4	3, 4	3, 4	3, 4
Issue-specific ecosystem-related	<ul style="list-style-type: none"> Climate adaptation services (5) Ecosystem-based mitigation services (6) Ecosystem-based adaptation services (7) Ecosystem-based disaster risk reduction (8) 	5, 7, 8	6	6	6	6
Ecosystem-based management	<ul style="list-style-type: none"> Improved forest management (9) Adaptive forest management (10) INRM (11) Natural regeneration and ANR (12) 	9, 10, 11, 12	-	-	-	-
Ecosystem protection and conservation	<ul style="list-style-type: none"> Area-based conservation and protected area management (13) Assisted migration of native tree species (14) Conservation of old forests (15) Fire management (16) Pest and disease management (17) 	14, 15	13, 16, 17	13, 16, 17	13, 16, 17	13, 16, 17

- **Kyrgyzstan**

- Ecosystem-based Adaptation to Climate Change in High Mountainous Regions of Central Asia
- Sustainable Management of Mountainous Forest and Land Resources under Climate Change Conditions
- Conservation and Adaptation in Asia's High Mountain Landscapes and Communities
- Research Project on Current Forest Status, International Cooperation, Strategic Development Plan, and Best Forest Management Practices in Greater Central Asia Region
- Sustainable and Climate Sensitive Land Use for Economic Development in Central Asia
- Pilot Programme for Climate Change and Resilience in Central Asia
- Integrated Forest Ecosystem Management Project
- Sustainable Ecosystem Transformation of Natural Resources Management in the Kyrgyz Republic
- Carbon Sequestration through Climate Investment in Forests and Rangelands in Kyrgyz Republic
- Integrative and Climate Sensitive Land Use in Central Asia
- Biodiversity of Western Tian Shan
- Kyrgyz-Swiss Forestry Program
- Kyrgyz-Norwegian Program
- The Central Asian Hub of the Mountain Partnership
- Issyk-Kul Biosphere Territory (1997-2005; GIZ)
- Introduction of Sustainable Multipurpose Management of Juniper Forests
- Support for Joint Forest Management in the Kyrgyz Republic
- Pamir-Alai Landscape Project
- Mainstreaming of Biodiversity Conservation in Forestry Sector of South Kyrgyz Mountains
- Strengthening the Capacity of Conservation of Forests in Kyrgyzstan
- Management of Forests and Biodiversity
- Regional Project on Ecosystem-based Adaptation to Climate Change in High Mountainous Regions of Central Asia
- Support to Multifunctional Forest Management Planning at District Levels
- Capacity Building on Forest Conservation in the Kyrgyz Republic
- Forest Management Program
- Study on Current Status, International Cooperation, Development Strategy of Forestry and Best Practices of Forest Management in Greater Central Asia is

- **Tajikistan**

- Biodiversity Conservation and Sustainable Development in the Gissar Mountains of Tajikistan
- Conservation and Sustainable Management of High-Value Arid Ecosystems in the Lower Amu Darya Basin
- Demonstrating Local Responses to Combating Land Degradation and Improving Sustainable Land Management in SW Tajikistan-under CACILM Partnership Framework, Phase 1

- **Türkiye**

- In-Situ Conservation of Genetic Biodiversity
- The Eastern Anatolia Watershed Rehabilitation Project
- Biodiversity and Natural Resources Management Project
- The Anatolia Watershed Rehabilitation Project
- Enhancing Coverage and Management Effectiveness of the Subsystem of Forest Protected Areas in Türkiye's National System of Protected Areas
- Enhancing the Capacity of Türkiye to Adapt to Climate Change
- Strengthening the Management of Forest Protected Areas
- Integration of Biodiversity into Forestry Management
- The Adaptation of Forest Ecosystem and Forestry to Climate Change in the Seyhan Basin
- Research, Conservation and Management of Large Mammal Species
- Proposals for Climate Change Adaptation and Mitigation/Forest Ecosystems/Case of Ankara
- Support Capacity Building for Sustainable Management of Mountain Watersheds in Central Asia and the Caucasus
- Technical Assistance for Strengthening the National Nature Protection System for Implementation of Natura 2000 Requirements
- Coruh River Watershed Rehabilitation Project
- Murat Watershed Rehabilitation Project
- Adapting Mediterranean Forests to Climate Change in the Konya Region

- Integrated Approach to Management of Forests in Türkiye, with Demonstration in High Conservation Value Forests in the Mediterranean Region
- Sustainable Land Management and Climate-Friendly Agriculture
- Integrated Natural Resources Management in Drought-prone and Salt-affected Agricultural Production Landscapes in Central Asia and Türkiye
- Conservation and Sustainable Management of Türkiye's Steppe Ecosystems
- Contributing to Land Degradation Neutrality (LDN) Target Setting by Demonstrating the LDN Approach in the Upper Sakarya Basin for Scaling up at National Level
- Türkiye Resilient Landscape Integration Project (TULIP)
- Sustainable and Integrated Water Resource Management in Gediz River Basin in Türkiye
- Forest Restoration Improvement for Environmental Development and Sustainability in Central Asia
- Integrated Natural Resource Management in Very Humid Climatic Regions of Eastern Black Sea Region in Türkiye
- Strengthening the Conservation of Biodiversity and Sustainable Management of Forest Landscapes in Türkiye's Kazdaglari Region
- Improving Biodiversity and Sustainable Forestry
- Climate Resilient Forestry Project
- EU Nature Conservation in Türkiye Forests (Practicability of EU Natura 2000 Concept in the Forested Areas of Türkiye)
- Biodiversity and Natural Resource Management Project
- Sustainable Use and Conservation of Biodiversity in Istranca / Yıldız Mountains – Opportunities, Threats for Incentives, and Implementation of the Concept of Transboundary Biosphere Reserve
- Sustainable Management of Western Taurus Mountains Forest Ecosystems Project
- Capacity Building Project for the Management of Chestnut Cancer and the Improvement of Forest Health and Vitality
- Adaptation of Forests in the Marmara Region to Climate Change (2020-2021)
- Project on Rehabilitation of Burnt Areas and Establishment of Fire-Resistant Forests

- **Turkmenistan**

- Conservation and Sustainable Management of Land Resources and High Nature Value Ecosystems in the Aral Sea Basin for Multiple Benefits
- Strengthening the Turkmenistan Protected Areas System
- Conservation and Sustainable Use of Globally Significant Biological Diversity in Khazar Nature Reserve on the Caspian Sea Coast

- **Uzbekistan**

- Sustainable Forest and Rangelands Management in the Dryland Ecosystems of Uzbekistan
- Sustainable Management of Forests in Mountain and Valley Areas
- Sustainable Natural Resource Use and Forest Management in Key Mountainous Areas Important for Globally Significant Biodiversity
- Strengthening Sustainability of the National Protected Area System by Focusing on Strictly Protected Areas
- Establishment of the Nuratau-Kyzylkum Biosphere Reserve as a Model for Biodiversity Conservation
- Climate Adaptation and mitigation program for the Aral Sea Basin
- Restoration of degraded land through afforestation of the dried bed of the Aral Sea project
- Forest planting in the dried bed of the Aral Sea
- Enhancing environmental welfare in the Aral Region
- Achieving ecosystem stability on degraded land in the Karakalpakstan Kyzylkum Desert
- Afforestation of the dried bottom of the Aral Sea and agrotechnology of cultivation of poplars in the Fergana Region
- Central Asia Transboundary Biodiversity Project
- Tugai forest conservation and strengthening of protected area systems in the Amu Darya delta of Karakalpakstan
- Developing National Forestry Programme and improving forestry legislation
- Promoting the use of non-timber forest resources
- FLERMONECA: Forest and Biodiversity Governance including Environmental Monitoring
- Conservation and sustainable management of lakes, wetlands, and riparian corridors as pillars of a resilient and land degradation-neutral Aral basin landscape supporting sustainable livelihoods
- National forest and tree resources assessment and monitoring
- Capacity Building for Sustainable Management of Mountain Watersheds in Central Asia and the Caucasus
- Multifunctional forest management planning, including forest inventory

- Development of modern forest nurseries techniques
- Reducing Pressures on Natural Resources from Competing Land Use in Non-Irrigated Arid Mountain, Semi-Desert, and Desert Landscapes of Uzbekistan
- Integrated Natural Resources Management in Drought-Prone and Salt-Affected Agricultural Production Landscapes (CACILM-2)
- Ecosystem-based land management and conservation of the ecosystem at the lower course of the Amu Darya (Tugai forest ecosystems)
- Regional programme on integrative and climate-sensitive use of land resources in Central Asia
Central Asian Desert Initiative (CADI) Conservation and sustainable use of cold winter deserts in Central Asia

6.7. Follow-up with the countries of the sub-region to complement the online review

An online meeting was organized on 03/23/2023 with the participation of representatives from the sub-region, FAO, and OMO. The stocktaking report was presented to the stakeholders, and their feedback was received. The stocktaking report was revised based on the feedback of the participants. The representatives of the sub-region will also serve as the resource persons for the development of the Guidelines.

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8. Annex: List of Persons Involved in the Process

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