Food and Agriculture Organization of the United Nations (FAO)

FAO Submission to the UNFCCC in the areas of ecosystems, interrelated areas such as water resources and adaptation under the Nairobi work programme

In response to the UNFCCC call for submissions by the partners in the areas of ecosystems, interrelated areas such as water resources, and adaptation under the Nairobi work programme (NWP), FAO is pleased to submit information on lessons learned and good practices in relation to: (i) adaptation planning processes addressing ecosystems and water resources, (ii) monitoring and evaluation of the implementation of ecosystem-based adaptation, and (iii) tools for assessing the benefits of mitigation and adaptation to enhancing resilience and emission reduction that eco-system-based adaptation provides.

Ecosystems and Adaptation in Agricultural Sectors

Climate change affects agro-ecosystems (including agricultural, forestry and fisheries), their functions and the many benefits and services they provide to people, such as the ability of ecosystems to regulate water flows and the cycle of nutrients. Healthy agro-ecosystems can play a major part in increasing resilience, helping vulnerable people to adapt to climate change, and in reducing climate related risk and vulnerability through the continued delivery of the range of services that play a significant role in maintaining ecosystem health and human wellbeing. Ecosystem Based Adaptation (EBA) is an approach that uses biodiversity and ecosystem services as an entry point for the development of overall adaptation strategies to climate change. The Ecosystem Based Adaptation (EBA) in agricultural sectors includes the sustainable management, conservation and restoration of agriculture, forestry and fishery related ecosystems to provide services that help people adapt to the adverse effects of climate change. Ecosystem Based Adaptation (EBA) can be cost effective, generate social, economic and cultural co-benefits, and contribute to the conservation of biodiversity, overall ecosystem health and sustainable natural resources management.

(1) Adaptation planning processes addressing ecosystems and interrelated areas such as water resources

Adaptation planning processes should explicitly address the key elements of ecosystems including ecosystem services, ecosystem health and its interrelationship with community level benefits. Central to the approach is the important role of healthy ecosystems in strengthening community adaptation to climate change. Ecosystem-based adaptation comes in the form of targeted management, conservation and restoration services and seeks to integrate the sciences of and theory of conservation, development and disaster management in order to increase community resilience to climate change. In so doing, EBA provides an approach that unifies concepts among sustainable development policy frameworks and encompasses cross-sectoral approaches viewed as more effective in reducing climate-related risks.

Successful adaptation planning processes require adaptive management to deal with the complex and dynamic nature of ecosystems and the absence of a complete understanding of their functioning. EBA does not exclude other management and conservation approaches, rather it has the potential to integrate all these approaches and other methodologies to deal with complex situations.

FAO's primary goals in implementing ecosystem-based approaches to land and water management are to equip society and governments with tools to asses, value, enhance and maintain the benefits of ecosystem services; to empower those in charge and users of ecosystems to better maintain and restore ecosystem services; and to strengthen governance for ecosystem approaches support through

dialogue and policy actions, including the recognition of the rights of local communities and their knowledge systems.

FAO has developed several approaches for the improved management of land and water resources and the maintenance of ecosystems that provide a wide range of opportunities for implementing EBA across the agriculture, forestry and fishery sectors. These approaches include the sustainable land management (SLM), the sustainable forest management (SFM), and the ecosystem-based approach to fisheries (EAF) and aquaculture (EAA).

a) Approaches relevant for adaptation planning process for addressing climate risks in agroecosystems

Sustainable Land Management (SLM): Successfully tackling land degradation is closely dependent upon how land resource users respond to climate changes. Adaptation to climate change can offer new opportunities for productive and sustainable land management (SLM) practices, such as improved water management, integrated soil fertility management, conservation agriculture, and improved rangeland management.[1] As a preventative approach to climate change, integration of SLM into adaptation planning processes can help reduce the need for costly ex post coping measures, reduce the variability of agricultural production (such as soil and water conservation that improve soil moisture holding capacity), and diversify agricultural income (such as agroforestry and non-timber tree products).[2]

To sustainably operationalize SLM's twin objectives it is vital to understand drivers and causes of land degradation and to take into account issues of current and emerging risks including: (i) the natural resource characteristics of individual ecosystems and ecosystem processes; (ii) the environmental functions and services provided by healthy ecosystems; (iii) the socio-economic and cultural characteristics of those who live in and/or depend on the natural resources of individual ecosystems; and (iv) the numerous constrains to and opportunities for sustainably utilizing ecosystem services to meet people's economic and welfare needs.

In 2015 FAO carried out a participatory review of the TerrAfrica portfolio "Strategic Investment Programme (SIP) on Sustainable Land Management in Sub-Saharan Africa under the New Partnership for Africa's Development". TerrAfrica pooled resources from regional efforts including the United Nations Convention to Combat Desertification (UNCCD), Global Environment Facility (GEF), NEPAD Action Plan for the Environment, Comprehensive Africa Agriculture Development Programme (CAADP), and the Paris Declaration to develop a collective SLM business model for Sub-Saharan Africa.

Lessons learned on planning and implementing SLM included:

(1) Successfully implementing SLM requires implementing the multi-dimensional processes including multi-stakeholder partnerships; multi-sectoral and multi-disciplinary processes; multi-scale efforts, governance and decision making from landscape to national level and across natural or administrative units (management; responsibility and accountability).
(2) Multiple and diverse SLM technologies/management practices should be catered for particular landscapes and territories. Considerations to take into account should include land potential, land uses, socio-economic context, the priorities of the land users as well as resilience, livelihoods and food security.

[1] TerrAfrica. 2009. The Role of Sustainable Land Management for Climate Change Adaptation and Mitigation in Sub-Saharan Africa.
[2] TerrAfrica. 2009. The Role of Sustainable Land Management for Climate Change Adaptation and Mitigation in Sub-Saharan Africa.

(3) Development approaches to SLM are multiple and there is no universal blueprint for its implementation. Fostering an enabling environment for SLM requires integrating social-people centered management/approaches with landscape and ecosystem management approaches as well as policies, support services, incentives and partnerships.
(4) Community-based participatory planning and technology development approaches, utilized in the majority of SIP projects, provide a useful means of better targeting both poor and vulnerable people and ecosystems as well as promoting greater ownership of interventions. Approaches and tools included participatory rural appraisal (PRA) tools for community assessment, the development of action plans for community territories, catchments and common property resources, participatory research, innovation building on local/indigenous knowledge systems, as well as participatory results based monitoring.
(5) Landscape approaches, used in SIP projects to support on the ground activities for SLM on planning within locally recognized landscape units and at transboundary level, offer an opportunity for more holistic and inter-sectoral planning of natural resources and allow for opportunities to combine relevant technologies and practices for various land uses in the landscape with the aim of optimizing on-site and off-site impacts in relation to conservation, restoration, productivity and sustainable livelihoods.[3]

A review of past SLM efforts in Sub-Saharan Africa (SSA) highlights a few key influencing factors to the success of SLM including: the restrictions and opportunities imposed by the local climate and other ecosystem resources; household and community level perceptions as to the nature and severity of existing degradation on local livelihoods; the presence or absence of effective community organisational and institutional structures with strong and respected leaders; access to secure land tenure; the nature of the political system that governs the implementation of national and local level development policies; the social and cultural norms influencing individual and communal behaviour; the capacity and availability of local advisory support services; and the type of local market structures and opportunities.[4]

Challenges to implementing SLM as identified by Terrafrica SIP review recommended setting up mechanisms for the empowerment of land users, both male and female, and communities in SLM through working with local leaders, and local structures such as water users associations, catchment management committees, as well as local service providers, and the need for enhancing capacity of extension services in district offices.[5]

These lessons learned serve as a basis for future planning processes that should also reinforce the need for enhanced capacities of extension services, local institutions, CSOs, as well as staff from ministries. There should be enhanced support in facilitating the access of smallholders and local actors to micro-financing opportunities to promote SLM.

Lessons learned have also highlighted the significant time and attention needed to ensure a process of participatory diagnostic and community planning. Participation of all groups within the community is more likely to ensure that the specific activities proposed respond to locally acknowledged needs. Effectively integrating social, gender and people-centred approaches into landscape management promotes uptake and sustainability.

[3] Woodfine et. al. 2016. Informing Future Investment for Scaling Up Sustainable Land Management in Sub-Saharan Africa : Lessons from the Strategic Investment Programme (SIP).
[4] TerrAfrica. 2011. Sustainable Land Management in Practice: Guidelines and Best Practices for Sub-Saharan Africa
[5] Woodfine et. al. 2016. Informing Future Investment for Scaling Up Sustainable Land Management in Sub-Saharan Africa : Lessons from the Strategic Investment Programme (SIP).

The multiple and interrelated development objectives within rural communities must be explicitly recognized (e.g. food security, health, education, economic development) in adaptation planning processes related to SLM. Existing institutions representing communities (e.g. village institutions, farmer's groups, elders' councils, NGOs) should be involved in - and empowered through - the design and implementation of project activities related to SLM. Similarly, field activities of SLM should aim to start small and carefully phase inputs and support for capacity building, moving on to broader aspects of natural resources management with time.[6]

The Land Degradation Assessment in drylands project (LADA): LADA is an FAO project that developed tools and methods to assess and quantify the nature, extent, severity and impacts of land degradation on dryland ecosystems, watersheds and river basins, carbon storage and biological diversity at a range of spatial and temporal scales. The project aimed to build national, regional and international capacities to analyse, design, plan and implement interventions that mitigated land degradation through improved management of natural resources based on a participatory, decentralized country-driven and integrated approach to participatory rural appraisals, field measurements, remote sensing and GIS, and expert assessment. Land degradation components included: loss of biodiversity, salinization, water erosion, sand dune encroachment, and rangeland degradation[7].

Using the developed methods, LADA assessed the baseline condition of land degradation at global and national scale to highlight the areas at greatest risk. These assessments were integrated with and supplemented by detailed local assessments focused on root cause analysis of land degradation and on local (traditional and adapted) technologies for sustainable land management. [8]

LADA international partners include Food and Agriculture Organization (FAO), Global Environment Facility (GEF), United Nations Environment Programme (UNEP) , Central Asian Countries Initiative for Land Management (CACILM), L'Istituto Agronomico Mediterraneo di Bari (CIHEAM/IAMB), NRD-University of Sassari, Global Land Cover Network (GLCN), ISRIC World Soil Information, Medcoastland Thematic Network, ODG/DEV, University of East Anglia, OSS - Sahara and Sahel Observatory, Somalia Water and Land Information Management (SWALIM), United Nations Convention to Combat Desertification (UNCCD), United Nations University (UNU), World Overview of Conservation Approaches and Technologies (WOCAT Secretariat).

LADA national partners include Agencia de Medio Ambiente (Cuba), Centre de Suivi Ecologique (Senegal), Department of Agriculture (South Africa), Direction Générale de l'Aménagement et la Conservation des Terres Agricoles (Tunisia), National Bureau to Combat Desertification (China), Secretaria de Ambiente y Desarrollo Sustentable (Argentina).

Key lessons from the LADA project included:

- Land Degradation remains and will remain a controversial issue as long as there is no general agreement on its definition. Furthermore, the economic impact of land degredation cannot easily be estimated as long as there are no agreements on the value of environmental services.
- Appropriately assessing land degradation requires taking into consideration the trade-offs made by land-users, particularly at national and local level, this can help explain the

[6] FAO. SLM at Field Farm Level. [Online] http://www.fao.org/nr/land/sustainable-land-management/field-farm-level/en/

[7] FAO. 2011. Land Degradation Assessment in Drylands. Available at http://www.fao.org/fileadmin/templates/nr/kagera/Documents/LADA_manuals/MANUAL1_final_draft.pdf.

[8] WOCAT. 2011. Meeting Proceedings: Tools for Assessing and Monitoring Sustainable Land Management/Land Degradation and Decision Support to Address Today's Global Challenges. [Online] https://www.wocat.net/fileadmin/user_upload/documents/Workshops/Proceedings/WOCAT_LADASeminar_16Feb2010.pdf.

motivations that lay behind land degradation and provide insights into appropriate remedial actions.
- Land degradation assessment should form the basis for land use planning, rural development and sustainable land management.
- The linkages between land degradation, biodiversity and climate change need to be understood and highlighted both scientifically and through local perceptions of users.[9]

The Global Soil Partnership (GSP): The Global Soil Partnership was established in December 2012 to facilitate the development of a strong interactive partnership and enhanced collaboration and synergy of efforts between all stakeholders from land users to policy makers. A key aim of the GSP is to improve governance and promote the sustainable management of soils. Since its creation, the GSP has played a pivotal role not only as a partnership but also as a platform for highlighting global soil issues.

The GSP has been instrumental in pushing forward several global and regional initiatives for the improved management of soils including: the establishment of the Intergovernmental Technical Panel on Soils, preparation of the revised World Soil Charter, production of the Status of the World's Soil Resources report, establishment of Regional Soil Partnerships, the development of capacities in developing countries on digital soil mapping, the development of the Voluntary Guidelines for Sustainable Soil Management and the establishment of national soil information systems.

The work under GSP has a strong relevance to the areas of ecosystems, interrelated areas such as water resources and climate change adaptation. A number of sustainable land management practices have been identified through FAO's work on soils and the GSP including:
- Residue covers, cover crops and mulching protect the soil surface, improve water infiltration rates, and reduce both erosion and evaporation, thus improving soil moisture compared to bare soils, even under low rainfall.
- Conservation tillage is a general term which has been defined as "whatever sequence of tillage operations that reduces the losses of soil and water, when compared to conventional tillage"
- Zero-tillage, which is the practice of leaving residue of the previous season's crops on farmland, can increase water infiltration while reducing evaporation as well as wind and water erosion.
- Conservation agriculture employs the three principles of minimal soil disturbance, permanent soil cover and crop rotations to improve soil conditions, reduce land degradation and boost yields.
- Use of deep-rooting, drought-resistant, or less water-demanding crops can help preserve soil moisture and improve food security.
- Capture of runoff from adjacent lands can lengthen the duration of soil moisture availability.
- Rainwater harvesting through planting pits can rehabilitate degraded land by improving infiltration and increasing nutrient availability, leading to significant increases in yields, improved soil cover and reduced downstream flooding.
- Knowledge-based precision irrigation, although relatively capital-intensive, can dramatically increase crop yields through improved soil moisture.[10]

Trans-boundary Agro-ecosystem Management: The Transboundary Agro-ecosystem Management Project for the Kagera River Basin (Kagera TAMP), which began in 2010, aims to adopt an integrated ecosystems approach for the management of land resources in the Kagera Basin – generate local, national and global benefits including: restoration of degraded lands, carbon sequestration and climate change adaptation and mitigation, protection of international waters, agro-biodiversity conservation

[9] FAO. 2011. Land Degradation Assessment in Drylands: Project Findings and Recommendations. pp. 21
[10] FAO. 2015. Brief for International Year of Soils. [Online] http://www.fao.org/3/a-i4890e.pdf.

and sustainable use and improved agricultural production, which in turn leads to increased food security and improved rural livelihoods.

The trans-boundary issues on which the project focus are control of soil erosion and sedimentation, water management through rainwater harvesting and soil moisture management, reduced pressures on wetlands and fragile lands, control of bush fires and the reduction of biomass burning (and as a result reduced phosphorus deposition in Lake Victoria) conservation of agro-biodiversity, management of cross-border livestock movements and plant and animal diseases, land use change and impacts on resources (including policy).

The Kagera TAMP used inter-sectoral approaches in order to address the land use-livelihood system as a whole. The approaches and methods used are: Farmer Field Schools, community active planning, transboundary management, catchment/watershed management, SLM innovation and adaptation and payments for ecosystems services. The project aimed to achieve: Improve transboundary coordination, information sharing and monitoring and evaluation mechanisms for sustainable, productive agro-ecosystems & the restoration of degraded lands (basin-wide collaboration include Lake Victoria Environmental Management Project (LVEMP), Nile Basin Initiative (NBI), and the Nile Equatorial Lakes Subsidiary Action Programme (NELSAP)); Capacity building: Enhancing capacity and knowledge at all levels for the promotion of – and technical support for – sustainable management of land and agro-ecosystems in the basin and targeting legislation issues through enabling policy, planning and legislative conditions to support and facilitate the sustainable management of agro-ecosystems and the restoration of degraded land.[11]

The project contributed to restoring degraded soils and vegetation and enhancing productivity in target catchments in Burundi, Rwanda, Tanzania and Uganda. Best practices included soil and water conservation measures, including contour farming, terracing and water harvesting and runoff trapping pits, integrated soil fertility management, including manuring and composting through crop-livestock integration and agroforestry. On sloping lands retention ditches and progressive and bench terraces were dug and constructed to restore degraded steep slopes. Tree seedlings were grown in nurseries and planted by communities in degraded lands (pines, eucalyptus, Calliandra, Leucena, coffee and fruit) to support the diversification of livelihoods. Napier grass and leguminous species were planted across the slope to conserve soil and water and to provide fodder, and degraded rangelands were re-seeded for increased livestock productivity. In Tanzania, firebreaks were constructed to protect soils and savannah lands from bushfires in the dry season.

Farmer field schools offered farmers the opportunity to test and adapt various techniques for soil and water conservation and enhancement. Furthermore, community engagement was enhanced through the training of farmer facilitators and extension staff on soil and water management, the creation of catchment committees that were then trained in the planning and implementation of catchment plans, and awareness raising in local schools on the importance of soils for food production and climate adaptation. [12]

FAO's Regional Initiative on Water Scarcity in the Near East: The Regional Initiative on Water Scarcity, launched in 2013, provides as a first output a Regional Collaborative Strategy on Sustainable Agricultural Water Management in the Near East and North Africa Region. The Regional Collaborative Strategy is based on a participatory framework that aims to assist countries in identifying and streamlining policies, investments, governance and practice that can sustainably improve agricultural productivity and food security in the Region. The planning and prioritization process by engaging countries has a strong linkage to adaptation planning at the ecosystem scale.

[11] Berttram, D. 2011. *Positioning the Kagera TAMP project in the PES landscape of East Africa.* FAO.
[12] Berttram, D (2011). Positioning the Kagera TAMP project in the PES landscape of East Africa. FAO.

More specifically, the Regional Collaborative Strategy seeks to find structured mechanisms addressing problems related to water for Agriculture in NENA Countries, identify information and knowledge gaps and key problems in water for Agriculture and provide solutions, highlight the need for strengthening knowledge and coordination amongst stakeholders at local, national and regional levels, to support and complement existing Regional Initiatives such including the Arab Water Security Strategy, the Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR), the Arab Strategy for Sustainable Agricultural Development and the Arab Disaster Risk Reduction Strategy. [13]

The overall goal of the initiative is to support member countries in streamlining priority areas of action in agricultural water management that can significantly contribute to boosting agricultural productivity, improving food security and sustaining water resources, by highlighting the specific areas that require action and building partnerships to move the process forward. Furthermore, the initiative injects fresh thinking into the process of finding sustainable solutions to water scarcity and food security problems by facilitating the implementation of cost-effective water investments and management practices that are based on FAO's publication "Coping with Water Scarcity: an Action Framework for Agriculture and Food Security".[14]

At regional level the initiative works through a network of partners, which currently includes over 19 regional and international organizations and is already providing a critical mass of expertise and capacities to deliver a positive impact in water management in the region. The regional network of partners will also support member countries in the implementation of a Regional Collaborative Strategy, facilitating a broad consensus and ownership of the water reform agenda in the region. [15]

Partnership in support of the Regional Initiative on Water Scarcity includes the ACSAD Arab Center for the Studies of Arid Zones and Dry Lands, AOAD Arab Organization for Agricultural Development, AWC Arab Water Council, CEDARE Center for Environment and Development for the Arab Region and Europe, CIHEAM International Center for Advanced Mediterranean Agricultural Studies , DRC Desert Research Center, DWFI Daugherty Water for Food Institute GIZ German Cooperation Agency, ICARDA International Center for Agricultural Research in the Dry Area, ICBA International Center for Biosaline Agriculture, IWMI International Water Management Institute LAS League of Arab States, NWRC-Egypt National Water Research Center, UNESCO UN Educational, Scientific and Cultural Organization, UNESCWA UN Economic and Social Commission for Western Asia and World Bank.

Although NENA countries have contributed considerable investments to improve water management, sustainably and efficiently managing water resources requires consistent support to comprehensive reforms that promote an innovative approach in the way water resources are allocated, governed, managed and conserved. Important measures to support this include: (i) creating a broad consensus on the water reform agenda among all involved stakeholders; (ii) acknowledging farmers' role in prompting a shift in the way water resources are used and managed; (iii) involving the private sector as the actual manager of the food value chain and the supplier of the latest available technologies; (iv) establishing partnerships that are action-oriented and result-based and (v) developing tools to

[13] FAO. Regional Initiative on Water Scarcity for the Near East and North Africa. [Online] http://www.fao.org/fileadmin/user_upload/rne/docs/WSI-Pamphlet-en.pdf.

[14] FAO. Regional Initiative on Water Scarcity for the Near East and North Africa. [Online] http://www.fao.org/fileadmin/user_upload/rne/docs/WSI-Pamphlet-en.pdf.

[15] FAO. Factsheet: Coping with water scarcity in the Near East and North Africa [Online] http://www.fao.org/docrep/019/as215e/as215e.pdf

concretely measure results and collect evidence to support policy making and decision making processes [16] .

Agriculture Water Partnership for Africa (AgWA): AgWA aims to promote investment in developing the water and agriculture potential of the continent. AgWA is an autonomous voluntary partnership that includes a large set of networks and institutions from Africa and elsewhere, all of which bring specific Agricultural Water Management (AWM) capacities to the Partnership. The members include government and inter-government organizations, United Nations agencies, civil society and other non-governmental organizations and networks, research, educational and training institutions, financing institutions, and international water management networks[17].

AgWA has developed a number of Diagnostic Tools for Investment (DTI) in Water for Agriculture and Energy that offer an integrated platform to systematically assess, at country level, trends in use of water resources, the policy and institutional frameworks and the investment needs and potential to boost the sustainable use of water[18].

b) Approaches relevant for adaptation planning process for addressing climate risks in forest ecosystems

Sustainable Forest Management (SFM): Forest managers aiming to minimize the impacts of climate change must deal with uncertainties in the extent and nature of climate change and climate variability and will need to "hedge their bets" by managing for a wide range of change and adopting "no regrets" options that are consistent with good practice and will yield climate change adaptation and mitigation benefits.

Increasingly, forest managers need to be aware of the current and potential impacts of climate change. Some effects will be direct, such as on water availability and the rate of tree growth. Other effects will be the result of modified disturbance regimes (e.g. fire, pests and storms), or will be driven by economic and social changes caused by climate change, such as population movements and changes in markets (e.g. increased demand for biofuels to replace fossil fuels).

Forest managers will also need to be aware of both the incentives available to undertake climate change adaptation and mitigation measures and to understand the evolving climate-related policy, legal and regulatory environment, which is likely to change, in order to comply with new laws and regulations and to capitalize on financial opportunities.[19]

Institutional planning and management options in SFM include enabling and supporting the involvement of local communities in forest management to increase direct livelihood benefits and adjusting forest management plans to increasingly provide for local community needs – e.g. by promoting the planting of multipurpose trees, incorporating woodfuel production in planning, and promoting agroforestry and aquaculture systems

Forestry conservation options in SFM include establishing buffer zones around forests for multiple uses by communities, protecting water sources within forests (e.g. lakes, creeks and rivers) to prevent outbreaks of water-borne diseases among forest workers and local communities and increase

[16] FAO. Factsheet: Coping with water scarcity in the Near East and North Africa [Online] http://www.fao.org/docrep/019/as215e/as215e.pdf

[17] FAO. FAO Projects: Agriculture Water Partnership for Africa (AgWA). [Online] http://www.fao.org/nr/water/projects_agwa.html.

[18] FAO. AGWA Investment tools: DTI. [Online] http://www.fao.org/agwa/investment-tools/dti/en/.

[19] FAO. 2013. Climate change guidelines for forest managers. FAO Forestry. Paper No. 172.

awareness of heightened risks of disease, regulating the use of forest products to improve the efficiency of use and thus minimize overharvesting, and protecting forest from unauthorized activities such as agricultural encroachment, illegal logging and poaching.

Planning for SFM should also include options for diversifying forestry livelihoods including supporting the development of local forest enterprises based on wood and non-wood production and processing, investing in local development to improve climate change adaptation in communities (e.g. improved efficiency in the use of wood energy), promoting agroforestry schemes and other income-generating activities, and promoting the multiple values of forests (i.e. cultural, economic, environmental, political, social and spiritual) for indigenous and other communities with customary tenure systems.[20]

The Forest and Landscape Restoration (FLR): FAO established the Forest and Landscape Restoration Mechanism (FLR Mechanism)[21] during the 22nd Session of the Committee on Forestry (COFO) in June 2014. The mechanism works in full collaboration with the Global Partnership on Forest and Landscape Restoration (GPFLR).[22]

The Mechanism aims to significantly contribute to the scaling-up, monitoring and reporting on FLR activities to a level needed to meet the Bonn Challenge - the restoration of 150 million hectares of deforested and degraded lands by 2020 - and the CBD Aichi Biodiversity Targets related to ecosystem conservation and restoration. The mechanism works to coordinate and facilitate the development and implementation of projects, programmes and related activities in FAO member countries, in full collaboration with other key actors and operates globally by developing financial intelligence functions (raising awareness on FLR and fundraising actions towards key donors), preparing guidelines and standards for baselines and verification of successful efforts.[23]

Furthermore, the FLR Mechanism supports the preparation and the implementation of national FLR Action Plans in each selected country in accordance with its own laws, regulations and policy framework as well as other relevant initiatives/programmes. To scale-up efforts the FLR Mechanism operates to promote networking and support partnerships on FLR, striving for increased intersectoral collaboration, and it also explores investment opportunities for increasing collaboration with the private sector.

Dryland Restoration Initiative Platform (DRIP): Implemented by FAO with partners, the DRIP aims to capture, evaluate and share knowledge on dryland restoration. *The Global guidelines for the restoration of degraded forests and landscapes in drylands: Building resilience and benefiting livelihoods* are an output of this initiative, drawing lessons from the many experiences in dryland restoration worldwide. These guidelines target two main groups – policymakers and other decision-makers, and practitioners – and present the essential components for the design, implementation and sustainability of restoration initiatives that can help build ecological and social resilience and generate benefits for local livelihoods. FAO is promoting the implementation of these guidelines widely across dryland regions and to support monitoring of their use in restoration projects and programme worldwide by other stake holders. Moreover, an on-line platform is developed to help gather practices and knowledge, monitor progress made so far in restoration and impacts on social, economic and environmental levels and compile good practices and case studies for dissemination.

[20] FAO. 2013. Climate change guidelines for forest managers. FAO Forestry Paper No. 172.

[21] FAO. The Forest and Landscape Restoration Mechanism (FLRM). [Online] http://www.fao.org/in-action/forest-landscape-restoration-mechanism/en/

[22] Global Partnership on Forest and Landscape Restoration. [Online] http://www.forestlandscaperestoration.org/

[23] FAO. The Forest and Landscape Restoration Mechanism: Background. [Online] http://www.fao.org/in-action/forest-landscape-restoration-mechanism/background/en/.

The Great Green Wall for the Sahara and the Sahel Initiative (GGWSSI) is a potential game changer for dryland Africa, with tremendous potential for addressing climate change adaptation and mitigation, eradicating poverty, ending hunger and boosting food and nutrition security. It has been endorsed by African Heads of State and is actively supported by the African Union and by FAO, and other partners such as the World Bank, the Global Environmental Facility, the European Union and the UN Convention to Combat Desertification among others. Under this framework, FAO is implementing The "Action Against Desertification" initiative"[24] in support of Africa's Great Green Wall and UNCCD implementation and south-south cooperation in 8 countries of the African, Caribbean and Pacific Group of States (ACP). The initiative focuses on restoring degraded lands in drylands and fragile ecosystems using plant-based solutions and putting communities at the heart of the action in Burkina Faso, Niger, Nigeria, Senegal, the Gambia, Ethiopia, Fiji and Haiti, regenerating their productivity and supporting their adaptation and resilience, and sustainable livelihoods of rural communities. The programme is implemented by FAO with partners and is co-funded by the European Union in the framework of the 10th European Development Fund (EDF). For further information: www.fao.org/in-action/action-against-desertification and www.fao.org/dryland-forestry

Mountain Forests and Watershed Management: FAO has been engaged in watershed management, forests and water[25] and sustainable mountain development[26] since the 1970s. The Mountain and Watershed team provides technical assistance for the design and implementation of field projects[27], supports international processes and prepares technical guidance and information products. It has a strong presence at field level, especially in Africa, Near East, Central Asia and Latin America.

FAO's approach to watershed management provides a framework for integrating different land-use and livelihood systems e.g. forestry, pasture and agriculture but also mixed systems. These actions focus on geographical areas that can range from small-scale upland watersheds to extended river basin landscapes. At all scales an integrated landscape management approach is applied to encourage coordinated actions within upland watersheds and to better link upstream and downstream environments and populations.

Sustainable Mountain Development is a comprehensive approach to increase the resilience of mountains through environmental sustainability and improving the situation for people living in mountainous areas, while ensuring services and resources for lower regions.[28] FAO currently hosts the **Mountain Partnership**[29], a United Nations voluntary alliance of partners dedicated to improving the lives of mountain peoples and protecting mountain environments around the world. Founded in 2002, the Mountain Partnership addresses the challenges facing mountain regions by tapping the wealth and diversity of resources, knowledge, information and expertise, from and between its more than 250 members representing governments, intergovernmental organizations, civil society, NGOs and the private sector.

COFO Working Group on "Dryland forests and agrosilvopastoral systems": At its 23rdsession, in Rome, July 2016, recognizing the critical importance of Dryland Forests and Agrosilvopastoral Systems in all

[24] http://www.fao.org/in-action/action-against-desertification/en/
[25] FAO. 2016. Forest and Water Programme. [Online] http://www.fao.org/in-action/forest-and-water-programme/en/
[26] FAO. 2015. Sustainable Mountain Development. [Online] http://www.fao.org/forestry/watershedmanagementandmountains/90329/en/
[27] FAO. 2013. Mountain and Watershed Management Field Projects. [Online] http://www.fao.org/forestry/watershedmanagementandmountains/74903/en/
[28] FAO. Mountain and Watershed Management. [Online] http://www.fao.org/forestry/watershedmanagementandmountains/90310/en/
[29] Mountain Partnership. [Online] http://www.mountainpartnership.org/

regions across the globe, the Committee on Forestry of FAO agreed to establish a "Working Group on **Dryland Forests and Agrosilvopastoral Systems"** in accordance with the recommendation of the 22nd Session of COFO (June 2014)[30]. Among the objectives of this working group are : (i) review and report to the Committee on Forestry on the status, trends, issues and developments in dryland forests and agrosilvopastoral systems, and make recommendations to the Committee on these matters; and (ii) as guided by the Committee, promote scaling –up of the adoption of good practices for the protection, sustainable management and restoration of drylands forests and agrosilvopastoral systems, enhancing also environmental and socio-economic resilience and sustainable livelihoods.

b) Approaches relevant for adaptation planning process for addressing climate risks in fisheries and aquaculture systems

Fisheries and aquaculture are important for food security, employment and social welfare. FAO estimates that 800 millions – i.e. 10-12% - of the world population rely on fisheries and aquaculture for their livelihoods. 50% of the people engaged in the primary and secondary sector (e.g. processing, trading) are women. Seafood is the most traded food commodity and is important to human nutrition. In addition, marine and inland waters (lakes, rivers and reservoirs) provide invaluable services to our planet.[31] The economic value of marine and inland services is not well quantified but they are well known to many local populations who depend on them for their livelihoods and everyday life.

The drivers affecting fisheries and aquaculture today include some that are familiar, e.g. pollution (fertilizers, pesticides, heavy metals, persistent organic pollutants), habitat degradation (through filling, dredging, habitat conversion, disruption of freshwater flow, interruption of migratory paths) and overfishing, and some that are novel, e.g. coastal erosion from sea level rise and extreme events, competition for water, and global warming and other effects associated with climate change. Impacts from global warming on the sector are already visible, with reported modifications of the geographic distribution of species moving towards the poles, changes in productivity and in seasonality of processes, impacts of ocean acidification and changes in coastal conditions that affect ecological habitats. This is impacting production, generally negatively in the tropics and mid latitudes, but positively in higher latitudes, with related consequences and implications for communities in terms of livelihoods, food security and health. Inland fisheries and aquaculture may also face higher mortality due to heat waves, water scarcity and competition for water. Sea level rise will affect coastal industries and will lead to the relocation of communities.[32]

In addition, climate change is likely to alter disaster risk patterns in three primary ways, with impacts on lives, equipment, infrastructure and housing:

- increase in frequency and intensity of extreme events (e.g. flooding, storms, droughts, El Niño events);
- change in the geographical distribution of areas affected by hazards (cyclone paths); and
- increase in vulnerability of particular social groups and economic sectors due to sea level rise, ecosystem stress and glacial lake outbursts.

A recent FAO study on damage and loss from natural disasters concluded that the agricultural sectors – including fisheries and aquaculture – absorb about 25 percent of the economic impact caused by medium- and large-scale climate related disasters in developing countries. Considering the vital role

[30] http://foris.fao.org/static/cofo/MQ993e.7.3.pdf

[31] These services also include climate change mitigation and adaptation such as carbon sequestration, water filtration, temperature regulation, protection from erosion and from extreme weather events, etc.

[32] The High Level Panel of Experts on Food Security and Nutrition (HLPE). 2014. Sustainable Fisheries and Aquaculture for Food Security and Nutrition.

of these sectors to global food production and livelihoods, it is critical to integrate these sectors within adaptation efforts and financing.[33]

Ecosystem Approach to Fisheries (EAF) and Aquaculture (EAA): FAO advances knowledge on climate change through national and community-level assessments such as in Bangladesh, Myanmar and Malawi, regional assessments (e.g. in the Benguela Current, Bay of Bengal and in the Gulf of Guinea large marine ecosystem fisheries) and global assessments on the vulnerability of fisheries and aquaculture sectors, carried out in the framework of EAF and EAA implementation. Moreover, the EAF-Nansen Project "Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries", a long standing programme implemented by FAO with funding from the Norwegian Agency for Development Cooperation (Norad), supports the implementation of the ecosystem approach in the management of marine fisheries.

The programme contributes to increasing global knowledge on climate change by monitoring the oceans around developing nations, with the expectation that:

- The knowledge base for the sustainable management of fisheries resources in the face of climate variability and change, pollution and anthropogenic pressures is enhanced.
- Management of fisheries in developing countries including taking into consideration the risks and opportunities related to climate, pollution and other environmental and anthropogenic stressors is improved.

As one of the most affected by climate change the fisheries and aquaculture sector is in need of coordinated and synergistic adaptations strategies and tool. Such adaptation tools would cover the same broad areas as EAF and EAA, namely capacity building, governance and institutional aspects, livelihood alternatives and the additional need to consider risk reduction to address extreme events.

Reinforcement of capacities available in fisheries management institutions is needed to implement an EAF and EAA effectively, especially when responsibilities are decentralized. FAO has developed a range of capacity building tools including bespoke trainings for EAF and support tools such as the EAF Toolbox.[34] These are variously targeted at capacity building needs for national and local fisheries management authorities, including fishery managers, scientists and stakeholders looking for practical solutions they can apply given their circumstances and resources.

In addition, FAO provides technical support to its member countries for the adoption and implementation of the EAF and EAA and to acquire additional knowledge on their marine ecosystems for use in planning and monitoring through a university-level training course on the ecosystem approach to fisheries. The ultimate goal is to build capacity of the countries' fisheries and aquaculture authorities for the development and implementation of fisheries and aquaculture management plans addressing the challenges faced by the sector, including climate change. The course has already been run in partnership with a number of universities in Africa. A handbook has been developed to complement the powerpoint resources used for the course and to combine into one document the examples provided in the course, as well as key reference materials, suggested readings, exercises and case studies, for the purpose of supporting both trainers and trainees.[35] For the Asian region the "Essential Ecosystem Approach to Fisheries Management"[36] training course has been developed to address sub-national level capacity building needs.

[33] FAO. 2015. The impacts of disasters on agriculture and food security. available at http://www.fao.org/3/a-i5128e.pdf

[34] FAO. EAF-Net. [Online] http://www.fao.org/fishery/eaf-net/about/en

[35] Source: http://www.fao.org/3/a-i5787e.pdf

[36] Source: http://www.fao.org/3/a-i3778e.pdf

Institutional and management frameworks for adaptation in fisheries: The impacts of climate change are likely to challenge the institutional and management frameworks currently in use for the management of fisheries resources. Examples of such adaptations include:

- Incorporating uncertainty in management frameworks.
- Consider flexible seasonal rights.
- Permitting the redistribution of rights among neighbouring municipalities to share responsibilities.
- Emphasize temporal and spatial planning to permit stock recovery during favourable climatic period, and
- Increasingly incorporate trans-boundary stock management to take into account changes in distribution.

There is also an important consideration of subsidiarity, as the development of EAF and EAA management plans should take place at the appropriate governance level for management and of ensuring coherence of the measures adopted by institutions at various levels of government.

Institutional and management adaptation requires a strong involvement of the key actors, particularly fish farmers and fishing communities, in relevant decision-making and management processes, which ultimately ensures that resource users act as resource stewards. The institutional framework for the implementation of EAF and EAA should be guided by the principles and internationally accepted standards for responsible governance practices. Such principles and standards are included in the Code and the SSF VG. From a human rights-based perspective; the decision-making process should comply with the seven PANTHER principles: Participation, Accountability, Non-discrimination, Transparency, Human dignity, Empowerment and Rule of law.

Tools to address climate change at the ecosystem scale in fisheries and aquaculture: The importance of an Ecosystem Approach to Fisheries (EAF) and Aquaculture (EAA) is particularly recognized in FAO's work. From a vulnerability point of view, both the EAF and the EAA can be used to identify key climate change issues that affect, or are likely to affect in the future, the ecological well-being of the system under consideration, the well-being of the people it supports, and, inter alia, its ability to achieve this (FAO, 2015). From an adaptation and mitigation point of view, they can also be used to address climate change: either through the promotion of interventions that capitalize on the role of aquatic systems and fish production activities in climate mitigation (i.e. increasing carbon sequestration and decreasing emissions), in community and livelihood adaptation, and/or the promotion of a better understanding of the synergies and trade-offs between the two (Brugère & De Young, 2015). The EAF was, in effect, adopted by COFI in 2003 as the appropriate and practical way to fully implement the Code of Conduct for Responsible Fisheries, adopted by Consensus at the FAO Conference in October 1995, and it serves as a guiding principle Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (the "SSF Guidelines"), adopted at the 31st Session of the Committee on Fisheries (COFI) in June 2014.

The purpose of an EAF is to: "plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by the aquatic ecosystems" (FAO, 2003). Similarly, the Ecosystem Approach to Aquaculture (EAA) (FAO, 2010) is seen as "a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social–ecological systems".

Healthy ecosystems and responsible management are at the heart of the Code of Conduct for Responsible Fisheries (the Code), which describes how fisheries and aquaculture should be managed

responsibly and is supported by a number of instruments providing guidance on the practical implementation of the Code principles. Twenty years after its adoption, 600 delegates representing 70 Members of FAO, the private sector, non-governmental organizations and civil society organizations, gathered in Vigo, Spain, to celebrate the adoption of the Code. They confirmed the central role of the Code for the sustainable management of living aquatic resources and the need to accelerate its implementation to meet the relevant SDG targets, in particular those of SDG 14.

The SSF Guidelines is the first international instrument dedicated to promoting and defending small-scale fisheries and the first fisheries instrument to dedicate a specific chapter to climate change and disaster risks. The benefits of the SSF Guidelines are various and include: the promotion of the use of best practices of modern fishery science and governance; complementarity with the Code of Conduct for Responsible Fisheries; compatibility with global commitments such as the CBD and UNFCCC; a focus on long term sustainable use of fisheries resources with due recognition of short term impacts from climate change and disaster; responsible governance of tenure and promotion of human rights; locally-acceptable alternative or diversified livelihoods for sustainability; and Ecosystem Approach to Fisheries (EAF), and integrated management.

d) Adaptation planning process and lessons learned in valuation of ecosystems and capacity development

Assessment and valuation of ecosystem services and biodiversity: An essential first step to protecting ecosystems and biodiversity linked to human well-being is knowing and understanding the role that these systems play and how they interact with human systems. The assessment and valuation of a country's agriculture, livestock, forestry and fisheries helps to identify how these sectors benefit from and supply ecosystem services and vice versa. Knowing these values provides greater incentive for investing in improved management of ecosystems and natural resources.

FAO works with partners, including GEF, UNEP, and IUCN to assess ecosystem services linked to food production and agriculture. This includes State of the World reports on agriculture and food[37], forestry[38], fisheries[39], and drylands[40], and assessments of food production systems[41] and the economic contributions of ecosystems[42].

Valuing ecosystems also involves accounting for natural resources. After a long process that started in the 1990s, an integrated Systems of Environmental Economic Accounting (SEEA)[43] was established and endorsed by United Nations Statistics Commission in 2012 as an international standard of accounting. Within the scope of the SEEA the WA+[44], a water accounting system, was developed by UNESCO-IHE, IWMI and FAO that reports on the availability and use of water at basin level. Based on open-access satellite measurements, WA+ allows for the computing of water consumption, flows, fluxes and

[37] FAO. 2016. The State of Food and Agriculture: Climate Change, Agriculture, and Food Security. http://www.fao.org/3/a-i6030e.pdf

[38] FAO. 2014. State of the World's Forests. http://www.fao.org/3/a-i3710e.pdf

[39] FAO. 2016. The State of the World Fisheries and Aquaculture. http://www.fao.org/3/a-i5555e.pdf

[40] FAO. 2013. Land Degradation Assessment in Drylands. http://www.fao.org/3/a-i3241e.pdf

[41] FAO. 2014. The Multiple Goods and Services of Asian Rice Production Systems. http://www.fao.org/3/a-i3878e.pdf

[42] African Forestry and Wildlife Commission, FAO. 2013. Valuation of the Contribution of Forests and Wildlife to Economic Development in Africa. http://www.fao.org/docrep/meeting/028/mi227e.pdf

[43] FAO Expert Meeting. 2014. Final Report on System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries (SEEA-AFF). http://www.fao.org/3/a-av279e.pdf

[44] http://www.wateraccounting.org/

storages by land and water use class. The approach makes a distinction between beneficial and non-beneficial, and consumptive and non-consumptive uses of water[45].

Valuation assessments are supported by numerous information platforms, including FAO AQUASTAT[46], an up-to-date global information system created to maintain an extensive multi-scale information base on water for use at global, national and local levels. The database was created in 1993 to support the sustainable use of water in agriculture and rural development by developing systematic descriptions on water resources and agricultural water management by region and country; maintaining the most up-to-date and reliable data at country level; predicting future agricultural water use and irrigation developments; developing methodologies for country water resource calculations and definitions; answering requests from governments and other stakeholders including research institutes and universities; and collaborating with other development organizations and institutes. AQUASTAT contributes extensively to the periodic issuance of the UN world Water Development report and other major assessments on food security, agriculture, food production and environmental services.

Further to accounting for natural resources, understanding the dynamic nature between humans and ecosystems is crucial to building better incentives for adopting ecosystems-based approaches to adaptation and to understanding barriers to uptake and scaling-up. Through its Incentives for Ecosystem Services (IES)[47] approach FAO works with small-holder farmers to develop IES packages of measures that aim to support farmers in the adoption of sustainable agricultural practices that will benefit the environment and protect long-term food security. The aim of the IES packages is to encourage farmers to protect and deliver more ecosystem services through better management of crops, livestock, forests and fisheries and conservation of endangered species and protected habitats.

Skills development for managing ecosystem services and biodiversity: Understanding how to manage ecosystem services and biodiversity requires understanding the trade-offs and synergies across sectors and draws on skill sets that include identifying and undertaking measures that enhance biological functions underpinning production. There is an existing base of knowledge and practices – training materials and tools – that FAO makes available to improve insight into how ecosystem services and biodiversity can be managed.

FAO has developed several approaches for the improved management of land and water resources and the maintenance of ecosystem services. These approaches as described above include the sustainable land management approach (SLM)[48], the sustainable forest management approach (SFM)[49], and the ecosystem-based approach to fisheries (EAF) and aquaculture (EAA)[50].

Within these approaches FAO has also developed several tool boxes and guidelines to support building country capacities to undertake inclusive planning processes and to develop informed policies on sustainable natural resource management. Reference documents such as FAO's Climate change

[45] Ottaviani, Tsuji, and De Young. 2016. Lessons Learned in Water Accounting. http://www.fao.org/3/a-i5880e.pdf

[46] FAO. AQUASTAT. [Online] http://www.fao.org/nr/water/aquastat/main/index.stm

[47] FAO. Incentives for Ecosystems Services. [Online] http://www.fao.org/in-action/incentives-for-ecosystem-services/en/

[48] FAO. Sustainable Land Management. [Online] http://www.fao.org/nr/land/sustainable-land-management/en/

[49] FAO. Sustainable Forest Management. [Online] http://www.fao.org/forestry/sfm/en/

[50] FAO. Ecosystem Approach to Fishery and Aquaculture. [Online] http://www.fao.org/fishery/governance/en

guidelines for forest managers[51], Sustainable Land Management[52], and Responsible Fisheries[53] help to standardize approaches to the improved management of natural resources across the sectors. Tool boxes including the SFM tool box[54], EAFnet[55] and the IES toolbox[56] bring together a wide range of guidelines, manuals, knowledge products, case studies and other tools produced by FAO and its partners to further inform Natural Resources Management (NRM) and adaptation planning processes.

Lessons learned from ecosystem-based approaches to adaptation planning: Responding to the need for ecosystem-based approaches to adaptation requires a multi-disciplinary approach that should promote the development of policies which will result in the best use and sustainable management of land and water resources, improvement and strengthening of planning, management, monitoring and evaluation systems, strengthening of institutions and coordinating mechanisms and the creation of mechanisms to facilitate the active involvement and participation of communities and people at local level. Causes of land degradation and water scarcity vary among regions and across contexts – taking into account past trends and foreseeing future biophysical conditions and human pressure projections is needed for the sustainability of EBA interventions.

Participatory and inclusive stakeholder analyses and a breakdown of institutional setups help to dismantle complex human-environmental relationships and are crucial first steps to better understanding human interactions with ecosystems in a given context. Mapping out these relationships helps to build more informed incentive packages for end-users, strengthening the likelihood of practice uptake.

Payments for environmental services are most efficient and effective when the producers, buyers and necessary management activities are clearly identified, payments are based on science, measurable improvements, and the trade-offs and costs of implementing improved forest and land management are low. Appropriate legal and institutional frameworks as well as a clear understanding of property rights is required to facilitate the participation of small farmers and rural communities.[57]

Financing better management practices: FAO reports limitations to accessing in-country money for sustainable forest and land management is closely tied to investment and legal barriers, including a limited understanding of how to access financial resources and existing legal mechanisms such as those that might restrict the use of payment for environmental services. International cooperation agencies have been and should continue to be instrumental in providing significant advisory services to partner countries in building their enabling environment for increased financing.[58]

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[51] FAO. 2013. Climate change guidelines for forest managers. FAO Forestry Paper No. 172 http://www.fao.org/3/i3383e.pdf

[52] Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. 2011. Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa. TerrAfrica, WOCAT, FAO http://www.fao.org/docrep/014/i1861e/i1861e.pdf

[53] FAO. 2009. FAO Technical Guidelines for Responsible Fisheries: Fisheries Management. http://www.fao.org/3/a-i1146e.pdf

[54] FAO. Sustainable Forest Management toolbox. [Online] http://www.fao.org/sustainable-forest-management/toolbox/background/en/

[55] FAO. EAFnet EAF Toolbox. [Online] http://www.fao.org/fishery/eaf-net/toolbox/en

[56] FAO. Incentives for Ecosystem Services. [Online] http://www.fao.org/in-action/incentives-for-ecosystem-services/toolkit/en/

[57] FAO. Policy Brief: Financing sustainable forest management. http://www.fao.org/forestry/16559-0325ac13168b9c3d84d0279e2f8adc798.pdf

[58] Asen et. al. 2011. Unlocking National Opportunities New Insights on Financing Sustainable Forest and Land Management. http://www.fao.org/docrep/016/ap451e/ap451e00.pdf; Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. 2011. Sustainable Land Management in Practice – Guidelines and Best Practices for

Continued support for countries to adapt systematic approaches to natural resource management that promote ecosystem-based approaches is needed. This should take the form of both technical and financial support. Financing value assessments of ecosystem services and the mapping of human-environmental components of EbA help to formulate plans and processes that are inclusive and over time more sustainable. Furthermore, the availability of natural resource and climate data as well as access to natural resource accounting and climate analysis tools is also important to understanding and articulating EbA needs in planning processes. Taking into consideration the cross-sectoral nature of water, FAO is currently developing a Water Platform that will serve as the secretariat for the Global Framework on Water Scarcity[59]. The platform is intended to serve as a full service tool to better integrate FAO's work on water and to provide a full stop service for information on water both internally and externally.

Obstacles to adaptation planning process involving ecosystem-based approaches: The benefits of investing in ecosystem-based approaches to adaptation do not always generate revenue for the end-user. Limited availability of past and current climate information at country level limits planning for ecosystem based adaptation in agriculture. Limited understanding of ecosystem services and the roles they play in creating and maintaining livelihoods is one of the barriers of adaptation planning processes. Difficulty in accessing financing that supports both assessments of EbA opportunities, including valuing and accounting for natural resources, and payments for environmental services[60] is also considered as a limitation for adaptation planning processes.

(2) Lessons learned and good practices in monitoring and evaluating the implementation of ecosystem-based adaptation

Monitoring and Evaluating ecosystems approaches in SLM: Measuring change through SLM is dependent on establishing baseline conditions encompassing people's attitudes for socio-economic and biophysical conditions. Determining the nature, direction and rate of change requires recurrent assessments that can be compared to baseline data. Therefore, land change indicators are required to monitor and evaluate what is changing, the processes of change and the sustainability of beneficial changes.

Through an integrated and holistic approach to land-use decisions and management, the changes in important biophysical and socio-economic attributes of land units should be monitored in terms of the:

- rates of adaptation and adoption of recommended or suggested practices;
- changes in areas under different land uses;
- changes in farm management practices;
- changes in yields and other outputs as a result of, as well as independently of, project interventions;

Sub-Saharan Africa. TerrAfrica, WOCAT, FAO. https://www.wocat.net/fileadmin/user_upload/documents/Books/SLM_in_Practice_E_Final_low.pdf

[59] FAO. 2016. Coping with water scarcity in agriculture: a global framework for action in a changing climate. http://www.fao.org/3/a-i5604e.pdf

[60] Asen et. al. 2011. Unlocking National Opportunities New Insights on Financing Sustainable Forest and Land Management. http://www.fao.org/docrep/016/ap451e/ap451e00.pdf; Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. 2011. Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa. TerrAfrica, WOCAT, FAO. https://www.wocat.net/fileadmin/user_upload/documents/Books/SLM_in_Practice_E_Final_low.pdf

- changes in the condition of land resources, both positive and negative.[61]

As natural resource conditions and relationships between people and their surroundings are complex and dynamic, a multi- and inter-disciplinary approach to assessing and analysing monitored information is essential.

Monitoring for EBA in practice: The Transboundary Agro-ecosystem Management Project for the Kagera River Basin (Kagera TAMP)[62], which began in 2010, aimed to adopt an integrated ecosystems approach for the management of land resources in the Kagera Basin in order to generate local, national and global benefits including: restoration of degraded lands, carbon sequestration and climate change adaptation and mitigation, protection of international waters, agro-biodiversity conservation and sustainable use and improved agricultural production, leading to increased food security and improved rural livelihoods.

In an effort to provide benefits for downstream water users, the Kagera TAMP is developing a plan to extend SLM and hydrological monitoring to the entire Yanze catchment with the aim of supporting work in the catchment. An increasing number of studies and projects in East Africa are using hydrological modelling to identify the best locations and predict the possible impacts of SLM activities.

The key to any successful attempt to examine the impacts and track the progress of SLM in such a catchment is dependent on the acquisition of high quality data for key hydrological variables such as river discharge, water quality and rainfall. Therefore the construction of a gauging site on the Yanze to monitor discharge would be an essential next step. Additionally due to the undulating terrain of the catchment more rain gauges, in addition to the gauge already installed by Kagera TAMP in the Marebe, are needed to capture the high spatial variability of rainfall in the catchment.

Hydrological monitoring in the Kagera River Basin: Lessons learned: Hydrological monitoring needs to be carried out at a similar scale to SLM to increase the chance of observing any impacts. Although an automated depth logger at the weir would have allowed for more detailed examination of the discharge response to rainfall, the increased cost, difficulty of acquisition and installation of the equipment and the reduced role of the local data collectors would all have to be considered. Hydrological monitoring ideally needs to be carried out over a number of years to account for high natural variability of hydrological processes. Ideally this will include baseline monitoring over a number of years prior to any SLM implementation. Alternatively, if no baseline exists, two similar catchments can be monitored using one as a control. GIS and online spatial datasets are valuable in categorizing the catchment during the planning process. Furthermore, hydrological monitoring training for local farmers can help establish the importance of SLM in reducing erosion downstream.[63]

Monitoring for change in EAF and EAA: The implementation of the Code of Conduct for Responsible Fisheries (CCRF)[64] is monitored by the Committee on Fisheries (COFI), which may also update the Code as necessary. The FAO questionnaire on the implementation of the Code of Conduct for Responsible Fisheries, covering each Article of the Code, was developed and is forwarded to all FAO Members biennially. A progress report, comprising statistical results compiled from the received responses, is

[61] FAO. 1998. Land quality indicators and their use in sustainable agriculture and rural development. https://www.mpl.ird.fr/crea/taller-colombia/FAO/AGLL/pdfdocs/landqual.pdf

[62] FAO. Kagera Agro-Ecosystems. [Online] http://www.fao.org/in-action/kagera/home/en/

[63] FAO. Tracking Impacts of Sustainable Land Management in the Kagera Basin. http://www.fao.org/3/a-au284e.pdf.

[64] FAO. 2001. What is the Code of Conduct for Responsible Fisheries? http://www.fao.org/docrep/003/x9066e/x9066e00.htm

prepared for each session of Committee on Fisheries (COFI). Work is currently underway to extend the Code questionnaire to gather baseline information related to Small-Scale Fisheries.

Member constraints to implementing the code include insufficient financial resources, limited human resources, incomplete policies and/or legal frameworks, inadequate scientific research, limited access to statistics and information, and a lack of awareness and information about the Code.[65]

Despite or because of the poor uptake of the International Plan of Action to Prevent, Deter and Eliminate illegal, unreported and unregulated fishing for the Management of Fishing Capacity (IPOA Capacity),[66] FAO has worked on developing broader normative measures to address control of fishing fleets, namely the 2001 IPOA IUU,[67] the 2009 legally binding Port State Measures Agreement (PSM),[68] planning and scoping the Global Record of Fishing Vessels,[69] International Guidelines on Deep-sea fisheries,[70] and helping member countries (MCs) build their capacity for monitoring, control and surveillance.

An evaluation of FAO's work within the CCRF found that certain FAO projects have provided positive support to countries to resolve cross-border conflicts but member countries greatly appreciated FAO's help in developing new fisheries legislation[71]. Member countries recognized that the discussion generated through FAO had raised awareness of the issues, and may lead to other measures being taken. This monitoring is further supported through FAO's Fisheries and Resources Monitoring System (FIRMS)[72], comprised of 13 members including FAO, which provides access to a wide range of high-quality information on the global monitoring and management of fishery marine resources.

Monitoring for change in SFM: Forest monitoring and reporting are important tools to measure and disseminate information on status and trends related to SFM as they provide reliable and up-to-date information that can be utilized by governments, private companies, international donors, individuals and civil society to improve forest management. FAO reports that in recent years there has been an increase in the forest area covered by forest monitoring and assessment activities.

Indicators for SFM have been developed by different international processes during the last decades and have recently become part of the monitoring and reporting framework for the SDGs. FAO works to further develop and harmonise indicators of SFM in particular on socio-economic and governance aspects, and to strengthen their use as a tool in planning, decision making and in monitoring and reporting in policy at national, regional and global levels and in forest management practice.

[65] FAO, COFI. 2014. Progress on the Implementation of the Code of Conduct for Responsible Fisheries and Related Instruments. http://www.fao.org/3/a-mk051e.pdf

[66] FAO. 2001. International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. http://www.fao.org/docrep/003/y1224e/y1224e00.htm

[67] FAO. 2001. International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing – IUU. http://www.fao.org/docrep/005/y3536e/y3536e04.htm

[68] FAO 2012-2017. Port State Measures - Web site. Port State Measures Agreement. FI Institutional Websites. In: FAO Fisheries and Aquaculture Department. http://www.fao.org/fishery/psm/agreement/en

[69] FAO 2009-2017. GR project - Web site. Global Record of Fishing Vessels Refrigerated Transport Vessels and Supply Vessels. In: FAO Fisheries and Aquaculture Department. http://www.fao.org/fishery/global-record/en.

[70] FAO 2010-2017. Fisheries and Aquaculture activities. The FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas. Activities pages. In: FAO Fisheries and Aquaculture Department. [Online] http://www.fao.org/fishery/topic/166308/en.

[71] FAO. OED. 2012. Evaluation of FAO's support to the implementation of the Code of Conduct for Responsible Fisheries. http://www.fao.org/docrep/meeting/026/me173e.pdf

[72] FAO. FIRMS. [Online] http://firms.fao.org/firms/about/en

In addition to supporting national forest monitoring[73] FAO serves as a clearing house for information and tools on global forest resources. In 2014, FAO launched the openForis[74], a free software tool that it hopes will improve the way many developing nations monitor the state of their forests to tackle deforestation and climate change. In 2015, FAO extended the openForis by partnering with Google to launch Google Collect[75]. The platform allows anyone with an internet connection to evaluate the state of forests and land-use around the world using satellite imagery. OpenForis and Google collect are intended to support REDD+ in offering countries free tools for forest monitoring.

The Rome Promise on Monitoring and Assessment of dryland for sustainable management and restoration: The First Global Drylands Assessment: FAO is working on the assessment, management and restoration of dryland forests and agro-silvo-pastoral systems. FAO organized in Rome in January 2015, in collaboration with the International Union for Conservation of Nature and the World Resources Institute (WRI) with funding support from the European Union and the GEF, the first Drylands Monitoring week - "Monitoring and assessment of drylands: forests, rangelands, trees and agro-silvo-pastoral systems".[76] More than 80 persons from various countries and international organizations attended. The event assessed the need and the status of monitoring and explored tools and new technologies to have a comprehensive monitoring of drylands (including forests and agrosilvopastoral systems). The event led to the "Rome Promise on the assessment and monitoring of drylands for their sustainable management and restoration",[77] through which participants agreed to: a) form an open-ended collaborative network or community of practice to advance monitoring and assessment of drylands, including understanding of their users; b) communicate the value and importance of drylands monitoring to relevant stakeholders, including policy makers and resource partners; and c) develop a dynamic roadmap for collaborative action.[78] A second week was organised under the theme "Drylands and Forest & landscape Restoration Week" [79]in April 2016 to follow-up on the implementation of the Rome Promise road map. Participants have reiterated their commitment and reviewed progress of the implementation of the Rome Promise road map. This Rome Promise Collaborative action has supported the preparation of the **first global drylands assessment** resulting in the launch in July 2016 of the report: "Trees, Forests and Land use in drylands: The First Global Assessment – Preliminary findings". See link for further information: http://www.fao.org/3/a-i5600e.pdf

Lessons learned in monitoring approaches to ecosystem-based adaptation: Effective M&E systems for EBA require stakeholder ownership and should be an integral part of management systems. To be useful throughout implementation, M&E requires sustained government support and the commitment of project staff. Furthermore, baseline data at the start of an intervention is essential to efficient M&E systems. Baseline studies should be made as simple as possible and rely on informal rapid appraisal assessments. More informal and participatory approaches to data collection can dramatically increase ownership of interventions and M&E systems.

It is necessary to begin monitoring when all M&E staff have been put in place and there is no misunderstanding of the role and utility of the M&E system. Further to this, it is important to ensure

[73] FAO. 2015. Forest Monitoring and Assessment. [Online] http://www.fao.org/forestry/fma/en/
[74] Open Foris [Online] http://www.openforis.org/
[75] Collect Earth. [Online] http://www.openforis.org/tools/collect-earth.html

[77] http://www.fao.org/forestry/42520-024e29e79642ddafda6941bf053ae9a35.pdf.
[78] http://www.fao.org/dryland-forestry/monitoring-and-assessment/the-rome-promise/en/.
[79] http://www.fao.org/dryland-forestry/monitoring-and-assessment/dryland-monitoring-weeks/drylands-forest-and-landscape-restoration-monitoring-week-2016/en/

that responsibilities for maintaining the system are clearly identified. The M&E should be closely tied to the decision-making system and should thus be incorporated into wider management processes.[80]

Linking scientific monitoring of complex interactions with participatory monitoring is a good entry point for better understanding how to link traditional and scientific knowledge in land and water resource management. Monitoring expertise is often available locally (e.g. community-based management) and, in many cases, innovative arrangements will have to be put in place that incorporate local expertise that can be supported by other institutions (e.g. local and regional governments and institutions). Where possible, expert knowledge from academic, practitioner and resource-user communities should be combined to increase monitoring power and provide the resource management platform needed to face climate change threats.[81]

(3) Tools for assessing the benefits of mitigation and adaptation to enhancing resilience and emissions reductions that ecosystem-based adaptation provides

Mitigation of Climate Change through Agriculture (MICCA): Through the generation and dissemination of GHG data, FAO's MICCA program continues to enrich the general body of knowledge on key GHG sources in the Agriculture, Forestry and Other Land Use (AFOLU) sector, and enables a more comprehensive understanding of the mechanisms that cause emissions. FAO has implemented since 2012, via its Monitoring and Assessment of GHG Emissions Project,[82] a series of Capacity Development workshops in support of its developing member countries in the assessment and reporting of GHG emissions, from GHG inventory management, to new emerging needs under the climate convention such as compilation of Biennial Update Reports (BURs) and data support for Nationally Appropriate Mitigation Actions (NAMAs).

Several tools developed with partners help countries to estimate emissions and integrate climate change mitigation into agricultural, forestry and land management policies and practices. These tools also provide guidance on investment in improved technologies and agricultural practices. AFOLU Emissions Analysis Tools aim to support Member Countries in improving their national capacity to address the United Nation Framework Convention on Climate Change (UNFCCC) reporting requirements and to design climate policy actions for the agriculture, forestry and other land use (AFOLU) sector.

Emissions Overview: This tool gives users an overview of emissions and trends in the AFOLU sector for one or more user-specified countries. It also contextualizes the emissions within the respective region(s), continent(s), and the world. Such information can support countries in the preparation of NAMAs and NDCs.[83]

QA/QC and Verification: This tool allows users to compare national GHG inventory data for the AFOLU sector reported to the UNFCC with data from the FAOSTAT Emissions database. The tool can help countries improve their capacity to report the AFOLU sector in their National GHG Inventory.[84]

[80] Liniger, H.P., R. Mekdaschi Studer, C. Hauert and M. Gurtner. 2011. Sustainable Land Management in Practice – Guidelines and Best Practices for Sub-Saharan Africa. TerrAfrica, WOCAT, FAO.

[81] FAO. 2013. Climate change guidelines for forest managers. FAO Forestry Paper No. 172. http://www.fao.org/3/i3383e.pdf

[82] Tubiello. 2013. Monitoring and Assessment of Greenhouse Gas Emissions and Mitigation Potential in Agriculture: The new GHG Emissions database in FAOSTAT. PDF [Online] http://www.fao.org/fileadmin/templates/ess/documents/afcas23/Presentations/AFCAS_7d_GHG.pdf

[83] FAO. Emissions Overview Tool. [Online] http://www.fao.org/in-action/micca/resources/tools/ghg/emissions-overview/en/

[84] FAO. QA-QC and Verification tool. [Online] http://www.fao.org/in-action/micca/resources/tools/ghg/qaqc-verification/en/

NAMA online learning tool: In response to a need to develop guidance for countries on developing NAMAs in the agriculture and land use sector, FAO's MICCA programme developed a NAMA online learning tool[85] on Nationally Appropriate Mitigation Actions in the agriculture, forestry and other land use sector and a guidebook on, *National Planning for GHG Mitigation in Agriculture,*[86] that provide sector specific guidance for NAMA design and implementation.

FAO-AFOLU Emissions database: The AFOLU FAOSTAT Emission database is increasingly being used worldwide as a source of statistical information. Examples include use and dissemination of FAOSTAT data by the Intergovernmental Panel on Climate Change Fifth Assessment Report, the World Resource's Institute, the Economic and Social Commission for Asia-Pacific and the FAO Year Book. The AFOLU FAOSTAT Emissions database can be used by practitioners in Member countries alongside four main dimensions, to improve national data collection and institutional coordination in support of national, regional and international climate change agreements and related implementation mechanisms[87].

Ex-ACT: The Ex-Ante Carbon-balance Tool (EX-ACT) is an appraisal system developed by FAO providing estimates of the impact of agriculture and forestry development projects, programmes and policies on the carbon-balance. The tool is a land-based accounting system, estimating C stock changes (i.e. emissions or sinks of CO_2) as well as GHG emissions per unit of land, expressed in equivalent tonnes of CO_2 per hectare and year.[88] The tool helps project designers to estimate and prioritize project activities with high benefits in economic and climate change mitigation terms. The tool can be be applied on a wide range of development projects from all AFOLU sub-sectors, including projects on climate change mitigation, sustainable land management, watershed development, production intensification, food security, livestock, forest management or land use change.[89] Ex-ACT partners include The World Bank (WB); the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ); the International Fund for Agricultural Development (IFAD); the Institut de recherche pour le développement (IRD).

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[86] FAO. 2013. National planning for GHG mitigation in agriculture A guidance document. http://www.fao.org/3/a-i3324e.pdf

[87] FAO. 2014. The FAOStat Emissions Database. http://www.fao.org/fileadmin/templates/ess/documents/apcas25/APCAS-14-12.3-FAOSTAT-Emissions-DB.pdf

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Annex 1. Ecosystem based approaches, examples of case studies, key lessons and challenges in the context of adaptation planning process in agricultural sectors (agriculture, forestry and fisheries and aquaculture)

Approaches	Main objective	Examples (Case studies)	Key lessons and good practices	Challenges
Sustainable Land Management	i) maintaining long term productivity of the ecosystem functions (land, water, biodiversity) and ii) increasing productivity (quality, quantity and diversity) of goods and services, and particularly safe and healthy food	The Transboundary Agro-ecosystem Management Project for the Kagera River Basin (Kagera TAMP),	Multi-dimensional processes and catering multiple and diverse management practices for particular landscapes is necessary for successfully implementing SLM. Good practices included contour farming, terracing and water harvesting and runoff trapping pits, integrated soil fertility management, and agroforestry.	Setting up mechanisms for the empowerment of land users and the lack of capacity of extension services and shortage of available technical experts in district offices
		The Global Soil Partnership (GSP)	Promoting partnerships and enhancing collaboration between all stakeholders helps to better identify soil degradation issues and increases the commitment to address them. Good practices in improving soil - conservation tillage, zero-tillage, residue covers, mulching, and rainwater harvesting.	Increasing awareness on and investment in sustainable soil management and promoting the establishment of inclusive policies for soil governance.

Approaches	Main objective	Examples (Case studies)	Key lessons and good practices	Challenges
		FAO's Regional Initiative on Water Scarcity in the Near East	Building consensus on the water reform agenda, acknowledging farmer roles in managing water resources, involving the private sector, and establishing partnerships are essential to comprehensively reforming the water sector.	Considerable investments to improve water management requires a consistent support to comprehensive reforms that promote an innovative approach in the way water resources are allocated, governed, managed and conserved.
		Agriculture Water Partnership for Africa (AgWA)	Supporting countries to improve agricultural water management (AWM) is necessary and requires a combination of advocacy, promoting closer collaboration, resource mobilization, information development and sharing, and building in-country capacities to plan and implement AWM.	Agricultural water management is not recognized as consumer of water and capacity to implement it in most countries in the region is limited.
		The Land Degradation Assessment in drylands project (LADA):	Appropriately assessing land degradation requires taking into consideration the trade-offs made by land-users. These assessments should form the basis for land use planning, rural development and SLM.	The economic impact of land degradation cannot easily be estimated as long as there are no agreements on the value of environmental services.
		The Greet Green Wall for the Sahara and the Sahel Initiative (GGWSSI)	Restoring degraded lands in drylands and fragile ecosystems using plant-based solutions and putting communities at the heart of the action in Burkina	

Approaches	Main objective	Examples (Case studies)	Key lessons and good practices	Challenges
			Faso, Niger, Nigeria, Senegal, the Gambia, Ethiopia, Fiji and Haiti.	
Sustainable Forest Management	Sustainable Forest Management (SFM) aims to contribute to the management, conservation and sustainable development of forests, and to provide for their multiple and complementary functions and uses.	The Forest and Landscape Restoration (FLR)	Promoting partnership and collaboration on FLR and supporting countries to develop FLR action plans according to national laws and regulations.	Developing tools to estimate the value of water-related ecosystem services by well managed forests is necessary to compensate the providers of FLR services. Furthermore, international organizations have an important role to play in supporting countries to exchange information and access funding sources for FLR.
		Mountain Forests and watershed management	Integrated landscape management approaches encourage and strengthen linkages between upstream and downstream communities.	Linking socio-economic, institutional and physical dynamics in watershed management remains a challenge. Joint analysis and design is required to promote a more unified territorial vision in watershed management.
		Integrated Natural Resource Management of the Fouta Djallon Highlands Participatory Integrated Watershed Management to combat desertification in Morocco	Integrated landscape management approaches encourage and strengthen linkages between upstream and downstream communities.	Linking socio-economic, institutional and physical dynamics in watershed management remains a challenge. Joint analysis and design is required to promote a more unified territorial vision in watershed management.
		The Mountain Partnership	Promoting, facilitating and implementing initiatives at	Increasing awareness about the the goods and services provided

Approaches	Main objective	Examples (Case studies)	Key lessons and good practices	Challenges
			national, regional and international level and raising awareness through advocacy and communications about the challenges faced by mountain peoples and environments.	by mountains for investments and policies.
		Dryland Restoration Initiative Platform (DRIP)	*The Global guidelines for the restoration of degraded forests and landscapes in drylands: Building resilience and benefiting livelihoods* and an online platform to gather practices and knowledge and monitor progress on social, economic and environmental impacts of restoration.	
COFO Working Group on "Dryland forests and agrosilvopastoral systems"	Review, report and provide recommendations to the Committee on Forestry on the status, trends, issues and developments in dryland forests and agrosilvopastoral systems, promote scaling –up of the adoption of good practices for the protection, sustainable management and restoration of drylands forests and agrosilvopastoral systems, enhancing also environmental and socio-economic resilience and sustainable livelihoods.			

Approaches	Main objective	Examples (Case studies)	Key lessons and good practices	Challenges
Ecosystems Approach to Fisheries (EAF) and Aquaculture (EAA)	The purpose of an EAF and EAA is to: “plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by the aquatic ecosystems”	EAF-Nansen Project “Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries”,	Participatory processes to formulating Fisheries Management plans, fostering partnerships: Co-financing and project delivery partnerships, and building capacities of research institutes to provide scientific information for fisheries management.	Reinforcement of capacities available in fisheries management institutions is needed to implement an EAF and EAA effectively, especially when responsibilities are decentralized.

Annex 1b. Additional FAO tools for ecosystem based adaptation and planning processes

Tools	Purpose/objective	Links
WATERLEX	A searchable database that can be used database can be used to examine the national legislation on water resources of any particular country or across any number of countries.	http://www.fao.org/legal/databases/waterlex/en/
AQUASTAT	A global information system created to maintain an extensive multi-scale information base on water for use at global, national and local levels.	http://www.fao.org/nr/water/aquastat/main/index.stm
Incentives for Ecosystem Services (IES) ToolKit	A web-based toolkit designed to support decision makers in identifying, designing and successfully implementing IES.	http://www.fao.org/in-action/incentives-for-ecosystem-services/toolkit/en/
SFM Toolbox	Brings together modules and case studies on SFM thematic areas aimed at improving capacities to plan and implement SFM.	http://www.fao.org/sustainable-forest-management/toolbox/sfm-home/en/
Module on Forest Management Planning	Aims to build capacities of forest owners and managers wishing to plan SFM activities.	http://www.fao.org/sustainable-forest-management/toolbox/modules/forest-management-monitoring/basic-knowledge/en/
Climate change guidelines for forest managers	Provides guidance on how to identify, assess and prioritize options for adjusting forest management plans and practices in response to and in anticipation of climate change	http://www.fao.org/docrep/018/i3383e/i3383e00.htm
EAF planning and tool selection (EAF Toolbox)	Assist member countries in identifying best tools and approaches for planning for fisheries management	http://www.fao.org/fishery/eaf-net/toolbox/planning/en
The Ecosystem Approach to Fisheries Management (EAFM) Training	To understand concept and need for EAFM and build capacities and planning and implementing an EAFM plan.	http://www.fao.org/3/a-i3778e.pdf
Guidelines for the Identification and Description of Nationally	To provide guidelines for the identification, selection and description of nationally based indicators of land degradation	http://www.fao.org/documents/card/en/c/3c46cfae-8c37-52a4-b5ef-71b411feac36/

Based Indicators of Land Degradation (LADA Approach)		
A framework for documentation and evaluation of sustainable land management - Watershed management	A modular questionnaire system used to evaluate land management in order to meet the needs of different user groups based on the WOCAT methodology.	https://www.wocat.net/fileadmin/user_upload/documents/Methods/WM_module_english.pdf
WOCAT/ LADA Mapping Tool	The tool utilizes participatory expert assessment (PEA) to provide a spatial overview of degradation and conservation/ SLM.	https://www.wocat.net/en/knowledge-base/slm-mapping/mapping-results.html
SFM Toolbox: Forest management monitoring	Promotes monitoring activities in forest management units (FMUs)	http://www.fao.org/sustainable-forest-management/toolbox/modules/forest-management-monitoring/basic-knowledge/en/
Implementation, monitoring and performance review – EAF Toolbox	Outlines relevant questions actions, and tools for developing a monitoring plan for EAF activities	http://www.fao.org/fishery/eaf-net/toolbox/planning/step-4/en

Annex 2. Good practices and tools in monitoring and evaluation of the ecosystem based adaptation

Tools/good practices	Main objective	Examples	Key lessons	Challenges
Hydrological Monitoring	Increasing understanding of local hydrology and the potential impact of SLM	Hydrological monitoring in the Kagera Region	Hydrological monitoring needs to be carried out at a similar scale to SLM and over a longer time period to increase the chance of observing any impacts and over a longer time period... reducing erosion downstream.	Acquiring high quality data on hydrological variables is key to successfully monitoring for impacts.
Open source geospatial forest monitoring	Developing, sharing and supporting software tools that facilitate data collection, analysis and reporting.	OpenForis Collect Earth	Open source platforms are more widely accessible, they give end-users the opportunity to be part of the development process, and the range of software and tools caters to a wider range of capacity needs.	Increasing the availability of free and timely remote sensing data and systematically applying technologies such as OpenForis Collect Earth to land and water resource assessments.
Global Dryland Assessments	Improve the monitoring and assessment of drylands for their sustainable management and restoration	The Rome Promise on Monitoring and Assessment of dryland for sustainable management and restoration: The First Global Drylands Assessment	Open-ended collaborative network/community of practice to advance monitoring and assessment of drylands, communicating the value and importance of drylands monitoring to relevant stakeholders and developing a dynamic roadmap for collaborative action.[90]	
Monitoring small-scale fisheries	Supporting the implementation of the Code of	Voluntary Guidelines for Securing Sustainable Small-	Compatible with other mechanisms such as the Code	Member constraints to implementing the code of conduct

[90] http://www.fao.org/dryland-forestry/monitoring-and-assessment/the-rome-promise/en/.

	Conduct for Responsible Fisheries	Scale Fisheries in the Context of Food Security and Poverty Eradication	of Conduct for Responsible fisheries and global commitments in UNFCCC and a focus on long-term sustainable fisheries with due recognition to climate change	include insufficient financial resources, limited human resources, incomplete policies and/or legal frameworks, inadequate scientific research, limited access to statistics and information, and a lack of awareness and information about the Code

Annex 3. Tools for assessing the benefits of mitigation and adaptation to enhance resilience and emission reduction that ecosystem based adaptation provides

Tools/good practices	**Main objective**	**Examples**	**Key lessons**	**Challenges**
AFOLU Emissions Analysis Tools	To help countries to estimate emissions and integrate climate change mitigation into agricultural, forestry and land management policies and practices, and to provide guidance on investment in improved technologies and agricultural practices.	Georeferenced data QA/QC and Verification Emissions Overview Emissions Intensities	Planning and monitoring for mitigation and adaptation requires the availability of adequate data on GHG emissions across the AFOLU sectors. Tools give countries the opportunity to access reliable and up to date emissions data as well as the chance to account for possible inconsistencies in national GHG inventories.	Systematically ensuring that accurate and up to date data on emissions is utilized in planning for mitigation and adaptation activities.
NAMA online learning tool	Increase awareness and build capacities of countries to plan for NAMAs.	The tool has been used as a tailored training for introduction to agriculture NAMA development in Zambia, dairy NAMA development in Kenya, integrated Food Energy Systems NAMA in Viet Nam and regional workshop on AFOLU NAMAs identification and design in Asia.	Trainings demonstrated that NAMAs in AFOLU can be instrumental in making crop and livestock production more productive and efficient; and NAMAs can be used as a vehicle to access climate financing for INDC implementation.[91]	Building capacities in the implementation of NAMAs is also important. Obstacles reported to implementing NAMAs included uncertainty surrounding legal tools, lack of technical knowledge of sustainable practices and difficulty in accessing credit.[92]

[91] Source: https://unfccc.int/files/cooperation_support/nama/application/pdf/fao_learning_tool_on_namas_in_the_agriculture,_forestry_and_other_land_use_sector.pdf
[92] Wilkes, A.; Tennigkeit, T; and Solymosi, K. 2013. *National integrated mitigation planning in agriculture: A review paper. http://www.fao.org/3/a-i3237e.pdf*

Tools/good practices	Main objective	Examples	Key lessons	Challenges
AFOLU FAOSTAT Emissions database	Aims to improve national data collection and institutional coordination in support of national, regional and international climate change agreements and related implementation mechanisms	Intergovernmental Panel on Climate Change Fifth Assessment Report Support to NAMA monitoring reporting and verification (MRV) process – activity data, baselines and GHG emission estimates	A unified data platform on AFOLU emissions offers a coherent framework for analyses of both activity data and emission estimates.	Data gaps concerning biomass burning, fires and drained organic soils should be addressed through improved collection and analysis of data[93].
Ex-ACT	Estimates the impact of agriculture and forestry development projects, programmes and policies on the carbon-balance.	Assessment of 4 Bio Carbon Fund Projects.[94] Enhancing agricultural mitigation within the CARE International Hillside Conservation Agriculture Project (HICAP) in the United Republic of Tanzania.[95]	EX-ACT is well-suited for the assessment of projects activities on various land use areas and scales and its inclusion of a wide spectrum of activities allows for more comprehensive assessments of land and water use activities.	Providing a tool that is as easy to use, cost effective, and adaptable over time, but at the same time capable of covering the wide range of projects relevant for the AFOLU sector.
Global Livestock Environmental Accounting Model (GLEAM)	Developed to improve the understanding of livestock GHG emissions along supply chains and to measure the effectiveness of mitigation practices and packages	Report on GHG Emissions from the Dairy Sector[96] Report on GHG Emissions from Ruminant Supply Chains[97]	Livestock GHG emissions are substantial and there is a strong link between emission intensity and resource use efficiency. Most mitigation interventions will result in	Global averages that fail to take into consideration (sub)-national or local and environmental and social conditions are usually misleading. To capture this variability, GLEAM uses regional or (sub)-national

[93] Tubiello et al. 2013. http://iopscience.iop.org/article/10.1088/1748-9326/8/1/015009/pdf
[94] Source: http://www.fao.org/tc/exact/ex-act-applications/on-projects/biocarbon-fund-projects/en/
[95] Source: http://www.fao.org/fileadmin/templates/ex_act/pdf/case_studies/kenya-micca.pdf
[96] Source: http://www.fao.org/docrep/012/k7930e/k7930e00.pdf
[97] Source: http://www.fao.org/docrep/018/i3461e/i3461e.pdf

Tools/good practices	Main objective	Examples	Key lessons	Challenges
	suitable for adoption in different production systems.		increased resource use efficiency along the sector's supply chain.[98]	information on production practices and animal parameters.

[98] Gerber, et al. 2013. *Tackling Climate Change Through Livestock – A Global Assessment of Emissions and Mitigation*