HANDBOOK

W-FLR Tool: Water-smart Forest and Landscape Restoration

Integrating water in forest and landscape restoration for long-term resilience and sustainability.

SIWI

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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Authored by
Lundberg Ingemarsson, M., Mingasson, D., Wennerholm, M., Tengberg, A.

Cover image
Anna Tengberg

Editing
SIWI

Layout
Picture + Verse

Contact
Stockholm International Water Institute
Kabyssgatan 4D, 120 30, Stockholm, Sweden
Visiting Address: Hammarbybacken 31
Tel. +46 8 121 360 00 • www.siwi.org

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Abbreviations

CBD – Convention on Biological Diversity
CBD NBSAPs – National Biodiversity Strategies and Action Plans
CS – Citizen Science
FLR – Forest and Landscape Restoration
GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit
HRBA – Human rights-based approach
M&E – Monitoring and Evaluation
NbS – Nature-based Solutions
NGO – Non-Governmental Organisation
SDGs – Sustainable Development Goals (SDGs)
UN – United Nations
UNCCD – United Nations Convention to Combat Desertification
UNCCD NAPs – National Action Programmes to Combat Desertification
IWRM – Integrated Water Resources Management plans/River basin plans/ Watershed plans
UNFCCC – United Nations Framework Convention on Climate Change
UNFCCC NAPs – National Adaptation Plans
UNFCCC NDCs – Nationally Determined Contributions, especially in priority interventions related to ecosystem management, etc.
W-FLR – Water-smart Forest and Landscape Restoration

1. Introduction

Why a Handbook on W-FLR?

- Human activities, including deforestation, forest and landscape degradation, and climate change threaten ecological functionality and water-related ecosystem services.
- Threats to water-related ecosystem services result in increased risks to local communities and adjacent urban areas that rely on functional ecosystems and ecosystem services for their livelihoods.
- Forest ecosystems and water security are highly interlinked – especially in the context of climate change.
- Forest and Landscape Restoration (FLR) is a long-term landscape approach, aiming to unite competing societal interests for restoring degraded forest land.
- It is essential to consider hydrological aspects when restoring forest landscapes, to avoid unintended side-effects and to ensure that restoration efforts are successful both in the short and long term.
- Until now, many forest and landscape initiatives do not integrate hydrological aspects.

Forest ecosystem services and water security are inextricably linked – especially in the context of climate change. Forests are critical to the successful implementation of ecosystem-based climate change mitigation and adaptation actions since they act as carbon sinks and flood moderators. In addition, forests are water filters and reservoirs which ensure water quality and quantity in a time where water security is increasingly under threat due to climate change. Forests also offer essential habitats for endemic species, contributing to biodiversity. However, forests are also water consumers in a time where water scarcity is becoming more serious in many parts of the world. Any action with cross-sectoral implications on water need to be carefully planned to avoid unintended side-effects. This means that integrated management of forest and water resources is crucial and more important than ever – not the least in forest and landscape restoration (FLR). Therefore, the Water-smart Forest and Landscape Restoration (W-FLR) Tool is designed to guide planners and policymakers to systematically integrate water into new and ongoing FLR initiatives.

Background to FLR

Increased need for - and *awareness* of the need for - restoration has brought together restorative activities at the landscape scale under a common approach to FLR. This is the main approach behind the Bonn Challenge and many other global restoration initiatives (Table 1). FLR is a long-term, planned process that aims to regain ecological functionality and enhance human wellbeing in deforested or degraded multifunctional forest landscapes (Besseau et al., 2018; IUCN & WRI, 2014). FLR is designed to be a flexible process that includes multistakeholder participation, adequate monitoring and evaluation processes, and adaptive management responsive to social, economic, and environmental change (Maginnis & Jackson, 2012).

> "FLR is an active process that brings people together to identify, negotiate and implement practices that restore an agreed optimal balance of the ecological, social and economic benefits of forests and trees within a broader pattern of land uses."
>
> *Global Partnership on Forest Landscape Restoration*

Restoration efforts may include natural regeneration and tree planting such as reforestation, afforestation and agroforestry, as well as assisted natural regeneration within a longer-term goal to regain ecological

functionality across whole landscapes. The pace of recovery in FLR initiatives is site-specific and dependent on a number of factors, e.g., the initial level of degradation, current and past land management, as well as planned/implemented restoration methods. FLR requires a multi-year vision for most of the ecosystem services and benefits to human well-being that restoration of ecological functionality will produce. FLR is also a key measure to mitigate climate change directly through increased carbon sequestration, and indirectly through increasing evapotranspiration to reduce local air temperatures and providing moisture

Table 1. Examples of existing international commitments on forest and landscape restoration.

INITIATIVE	OBJECTIVE OR COMMITMENT	MHA (MILLION HECTARES)	YEAR OF LAUNCH/ADOPTION & ORGANISATIONS BEHIND IT
Bonn Challenge for 2030	Restore 350 Mha of forests globally.	350 Mha	Launched by the Government of Germany and IUCN in 2011.
African Forest Landscape Restoration Initiative (AFR100)	Restore at least 100 Mha of degraded land in Africa by 2030.	100 Mha	Launched by the African Union Development Agency, WRI, Germany's Federal Ministry for Economic Cooperation and Development, and the World Bank in 2015.
Initiative 20x20	Bring 50 Mha of land in Latin America into restoration by 2030.	50 Mha	Launched at the 2014 UN COP20 by WRI, CIAT, CATIE, and IUCN.
ECCA30	Bring 30 Mha of land in Europe, the Caucasus and Central Asia into restoration by 2030.	30 Mha	Launched by UNECE, FAO, IUCN, WRI and the World Bank in 2019.
New York Declaration on Forests	10 goals including end the loss of natural forests by 2030 and restore 350 Mha of degraded landscapes and forestlands.	350 Mha	A voluntary political declaration, built on dialogue at the UN Climate Summit in 2014. Signed by 37 governments, 20 sub-national governments, 53 multi-national companies, 16 indigenous communities and 63 NGOs.
UNCCD's Land Degradation Neutrality	Achieve land degradation neutrality.	Unspecified	SDG Target 15.3 is linked to the UNCCD: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.
UN Global Forest Goals and Targets	6 Global Forest Goals and 26 associated targets to be achieved by 2030, including global forest area is increased by 3 %.	Unspecified	Adopted by the UN General Assembly in 2017.
CBD Kunming-Montreal Global Biodiversity Framework (GBF)	4 goals and 23 targets to be achieved by 2030, including conserve at least 30 % of lands and oceans by 2030.	Unspecified	Adopted at the UN 2022 CBD COP15.
Glasgow Leaders Declaration on Forests and Land Use	Halt and reverse forest loss and land degradation by 2030.	Unspecified	Launched at the 2021 UN COP26, endorsed by over 140 nations.
UN Decade on Ecosystem Restoration 2021-2030	Restore a total of 1,000 Mha of ecosystems globally.	1,000 Mha	Launched by UNEP in 2021.
UN Decade on Family Farming 2019-2028	Achieve globally diverse, healthy, and sustainable food and agricultural systems, and resilient communities free from hunger and poverty.	Unspecified	Launched by FAO in 2019.
UNFCCC Nationally Determined Contributions (NDCs)	NDCs contain national policies, targets, and measures for achieving the climate goals in the Paris agreement. Countries share new or updated NDCs every five years starting in 2020.	Unspecified	Entered into force with the Paris Agreement in 2016. As of March 2020, 186 parties (185 countries plus the European Union) had communicated their first NDCs to the UNFCCC.
UN Sustainable Development Goals (SDGs)	Several SDGs are relevant for FLR and contain targets on ecosystem restoration. E.g., Target 15.2: End deforestation and restore degraded forests.	Unspecified	The voluntary targets were adopted by the UN General Assembly in 2015.

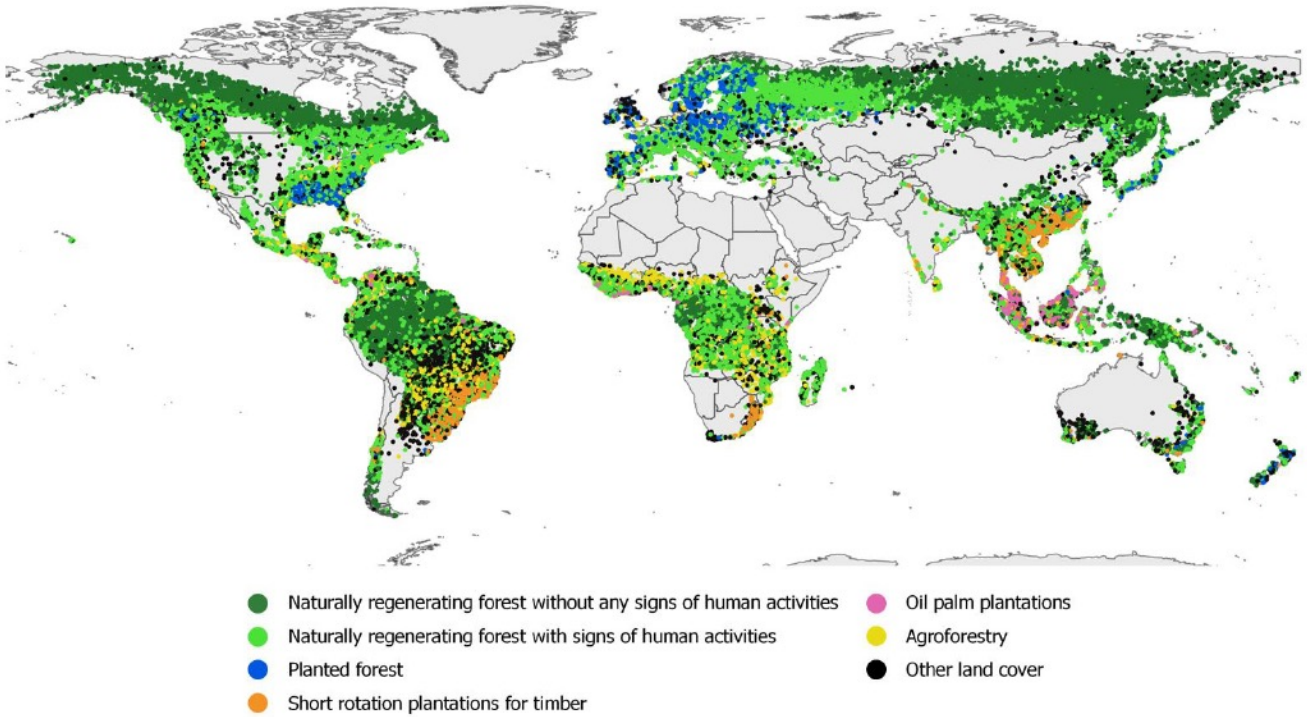


Figure 1. Global forest land use in 2020. Different colours indicate occurrence of naturally regenerating forest without any signs of human activities (e.g., primary forests), naturally regenerating forest with signs of human activities (e.g., logging, clear cuts etc.), planted forest, short rotation plantations for timber, oil palm plantations and agroforestry. Source: European Commission, Joint Research Centre 2024.

recycling (Ingemarsson et al., 2024, chapter 6 on climate mitigation in land-based ecosystems). Fully restoring these ecosystem services and functions can take decades.

FLR is a landscape approach, aiming to unite competing societal interests for restoring degraded forest land with a triple focus on social, economic, and environmental values – many of which are dependent on water. Large forest areas today are either degraded or deforested (Figure 1). The largest formerly forested areas in need of FLR in the world are often multifunctional landscapes that can be subjected to mosaic restoration (World Resources Institute 2014). Multifunctional and mosaic landscapes are characterised by diversified and integrated types of land cover and uses, including natural forests, secondary forests, timber plantations, farmlands, agroforestry, farms, fields, crops, fallow areas, and small villages (Figure 2). The FLR intervention consequently needs to recognise the interconnections between people, nature, and water, especially in places where productive land uses – such as forestry, agriculture, and mining – compete with environmental and biodiversity goals.

For up-to-date information on restoration projects and where they are located, access **Restor** that is a science-based open data mapping platform to share ecological information and support and connect the global restoration movement.

Mosaic landscapes offer a great variety of ecosystem services and thereby potentially covering many, often competing interests of different stakeholder groups. Restoring such areas can involve changes across old-growth and logged forests and on-farm trees in combination with other land uses, including agroforestry, plantations, smallholder agriculture, and human settlements. For water-smart FLR, water needs to be integrated into FLR initiatives and planned for in FLR projects to ensure that all important aspects of water are considered, both as a limiting factor as well as a service. Today, this is often not the case.

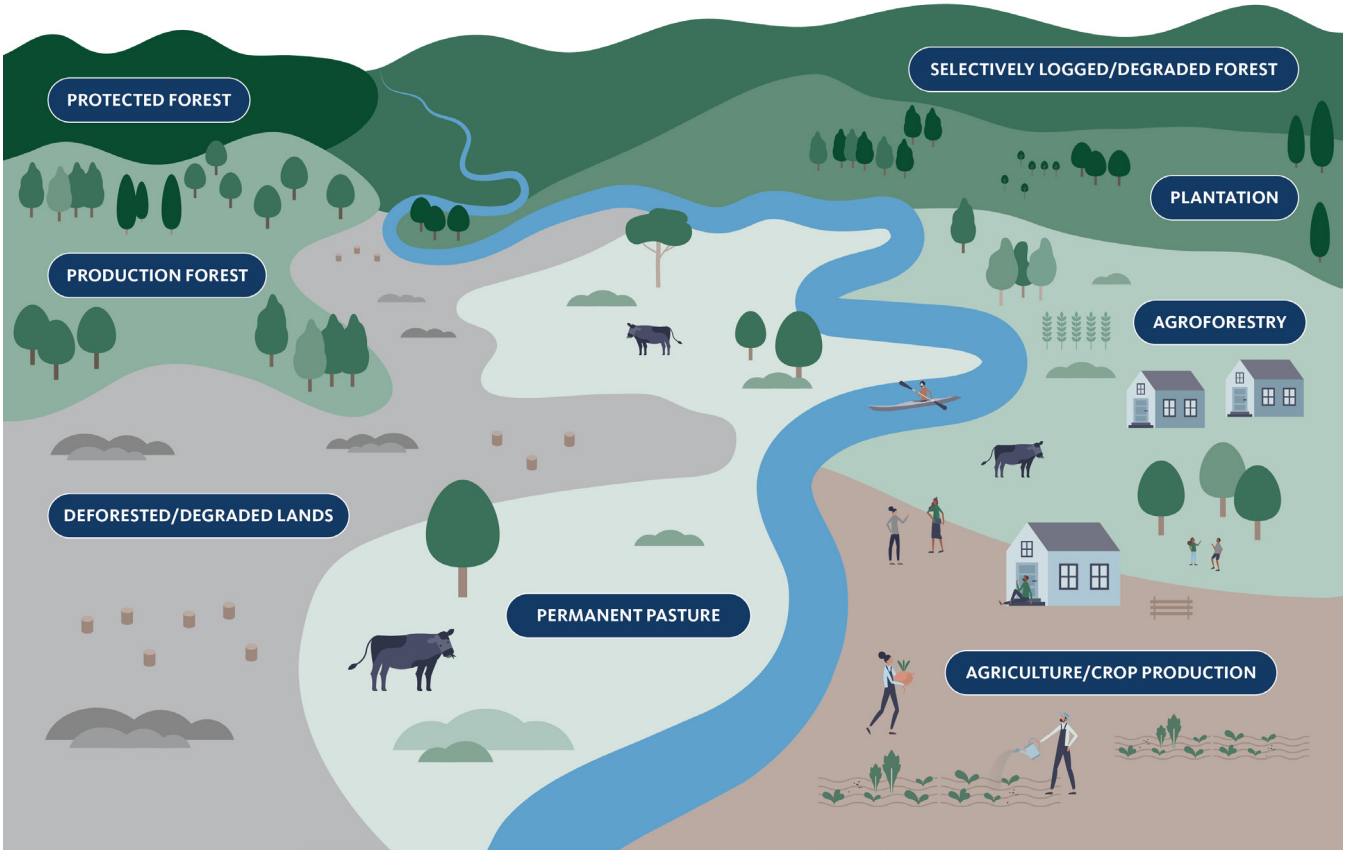


Figure 2. Multifunctional and mosaic landscape.

The water challenge in forest and landscape restoration

Human activities and climate change threaten ecological functionality and associated water-related ecosystem services, including food and wood production and provision of habitats for biodiversity, as well as climate regulation. Deforestation and forest and landscape degradation affect both blue and green water quality and quantity (see Figure 3 and Box 1), can cause impaired water flows downstream, reduced precipitation down-wind and biodiversity loss, and reduce climate change mitigation and adaptation opportunities, and have negative effects on people's livelihoods. Moisture recycling, infiltration and groundwater recharge are under threat from processes that increase water risks in the form of too little, too much or too dirty water, affecting the potential for landscape restoration. This results in increased risks to local communities that rely on functional ecosystems and ecosystem services for their livelihoods, as well as increased risks to water supply to adjacent urban areas. Impaired water flows also reduce the production of natural resources and raw materials that industries and economies in rural and urban areas rely on (Gustafsson et al., 2019).

To limit the risk of water becoming a constraining factor in multifunctional forest landscapes, it is vital to be aware of the drivers of deforestation and degradation, such as unsustainable forestry and agriculture, poverty, climate change and urban development. One way to address these societal challenges systematically and holistically is through a landscape approach. However, in general, landscape approaches need to better integrate hydrological processes to ensure the long-term sustainability, resilience and multifunctionality of forest landscapes to meet the targets of the Sustainable Development Goals (SDGs) 1 on No Poverty, 6 on Water, 13 on Climate Action and 15 on Life on Land (Ingemarsson et al., 2022; Tengberg et al., 2021). There is also a need to address policy and governance challenges related to the forest-water nexus. For example, current climate policies are often limited to targets aimed at reducing greenhouse gas emissions to increase carbon storage. There is a risk that single-goal local-scale restoration efforts to increase carbon storage may affect the hydrological cycle and impair other ecological functions. As an example, restoration initiatives may use fast-growing exotic tree species for efficient carbon sequestration, but those species are often water demanding and risk outcompeting native species which

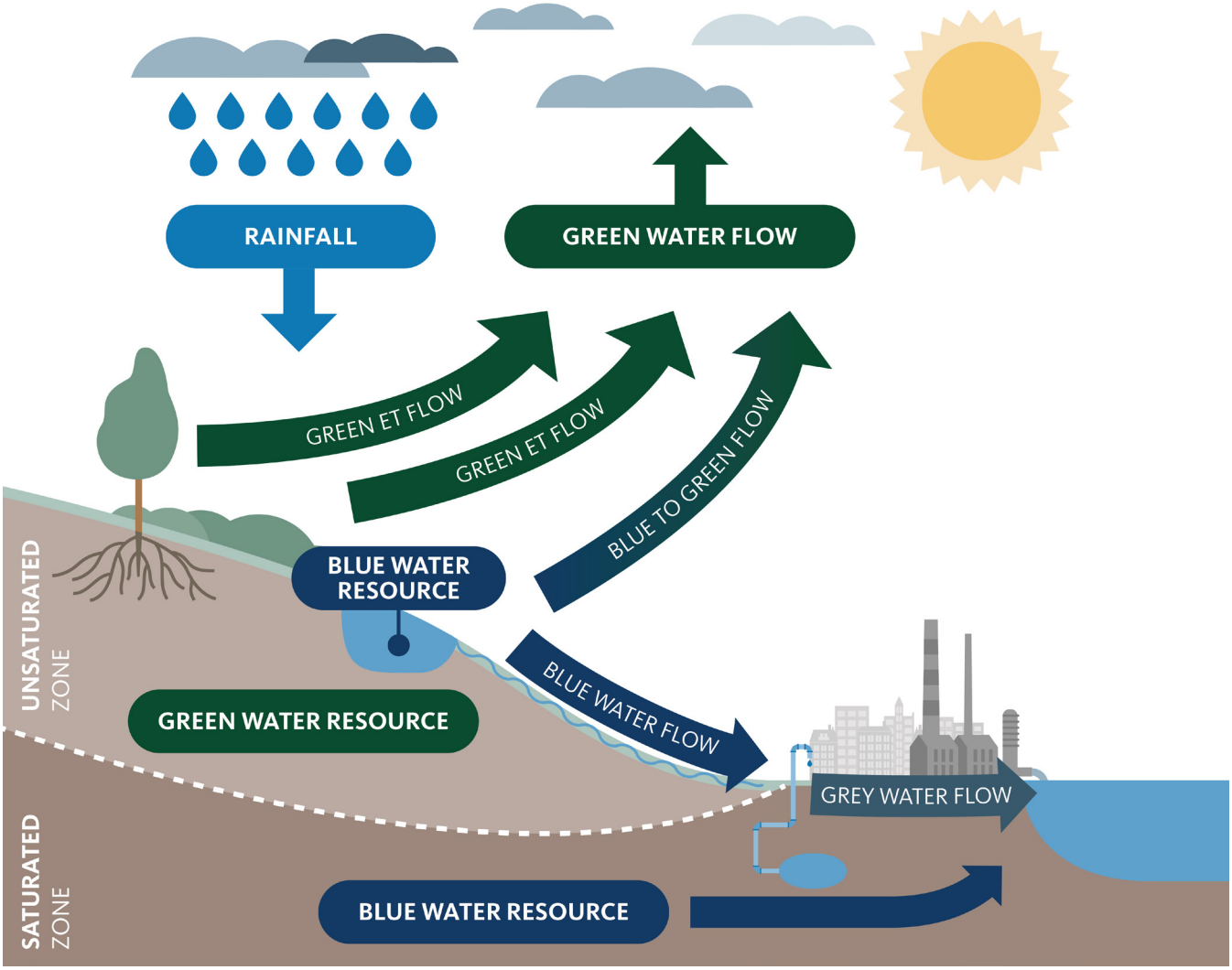


Figure 3. The water cycle. The water cycle can be divided into three types of freshwater on earth: 1) Blue water is surface and groundwater (e.g., rivers and lakes, groundwater and the water frozen in glaciers and the polar ice caps) 2) Green water includes precipitation, plants transpiration and soil moisture (water found in rain, soil and plants) 3) Grey water is polluted water from domestic or industrial activities Source: SIWI adapted from (Falkenmark & Rockström, 2006).

may cause negative effects on local water availability and biodiversity. Furthermore, planting trees in water-stressed areas may also pose a risk for the success of the project, as there might not be enough water available for the trees to grow.

To reduce negative effects, it is important to use a holistic and integrated approach in restoration initiatives, and accounting for impacts on the water cycle is an efficient way to widen the scope. Placing water at the centre when discussing forest-landscape-climate interactions will ensure that more balanced measures can be promoted through policies that integrate these different elements using a systems approach (Creed & van Noordwijk, 2018).

The earth's freshwater resources can be divided into green-water resources available to plants through rain, evapotranspiration and soil moisture, and blue-water resources available in lakes, rivers, wetlands, groundwater, glaciers, and impoundments e.g., dams. There are also grey-water resources from domestic and industrial activities. Together the blue, green, and grey water flows are creating the water cycle (Falkenmark & Rockström, 2006) (see Figure 3 and Box 1).

The forest-water nexus

Links between forest and water – the forest-water nexus – play an important role in FLR (see Figure 4). Forests are critical for water quality and quantity since they filter pollution and sediment particles and improve infiltration into the soil. Forests can also reduce flooding and landslides as they reduce runoff velocity and timing and the tree roots help locking the soil particles in the ground. The forest canopy, foliage layer, root system and modification of soil structure can also prevent erosion by reducing the sediment input to watercourses.

Box 1. Blue, Green and Grey water

What is blue water?

Blue water is found in lakes, rivers, and reservoirs. It can be seen in wetlands, or it can be pumped from below surface aquifers. Available blue water is used for many purposes, including drinking water and irrigation. Blue water is "recharged" by precipitation, either as rainfall or snowmelt.

What is green water?

Green water is the water available in the soil for plants and soil microorganisms. It is the water absorbed by roots, used by plants, and released back to the atmosphere through the process of transpiration. Green water can also leave the soil and plant surfaces through evaporation or subsurface runoff. Green water in the form of atmospheric moisture from transpiration and evaporation is sometimes called rainbow water.

What is grey water?

Grey water refers to water that has become polluted by human activities and requires dilution to meet water quality standards. Grey water is usually treated and discharged but can in some situations be used to supplement green water.

(E.g., Falkenmark, 1995; Mekonnen and Hoekstra, 2011)

Forest can be water consumers, since an increase in the number of trees often leads to higher evapotranspiration. Forests and reforestation can also have a positive impact on water availability as they can "pump" atmospheric moisture from the ocean over continents.

Key factors influencing the impacts of FLR on water resources:

- **Area:** That includes factors such as mountainous or plane, costal or inland, dry or wet. Important for certain interactions (e.g., interception of precipitation).
- **Tree stand age:** Water consumption of young tree stands is usually much higher compared to older stands. The positive effects of trees on the water regime only become apparent after a certain age.
- **Tree species:** Slow-growing native tree species and mixed trees have better water use efficiency.
- **Tree density:** Optimal tree cover is site specific. E.g., a medium tree density has been shown to be most suitable in the dry areas of West Africa.
- **Current and previous land use practices:** Current management practice, level of deforestation, level of degradation.

Identification of FLR implementation scenarios is also supported by a research project funded by the Swedish Research Council for Sustainable Development (FORMAS) that will (1) design forest-based mitigation scenarios in close collaboration with stakeholders, (2) quantify the resilience and sustainability of the biosphere integrity of forest-based climate mitigation measures, (3) analyse the local and remote effects of hydroclimatic adaptation, and (4) holistically assess the social-ecological resilience of forest-based climate change mitigation measures. More information is provided on the following link (reformit.org).

Forests and trees provide a range of ecosystem processes, functions and services (see Box 2) that will be discussed more in depth in the next section in Module 1. FLR interventions need to consider possible trade-offs between different ecosystem services important for water and food security, and the long-term resilience and sustainability of forest landscapes and their social ecological systems.

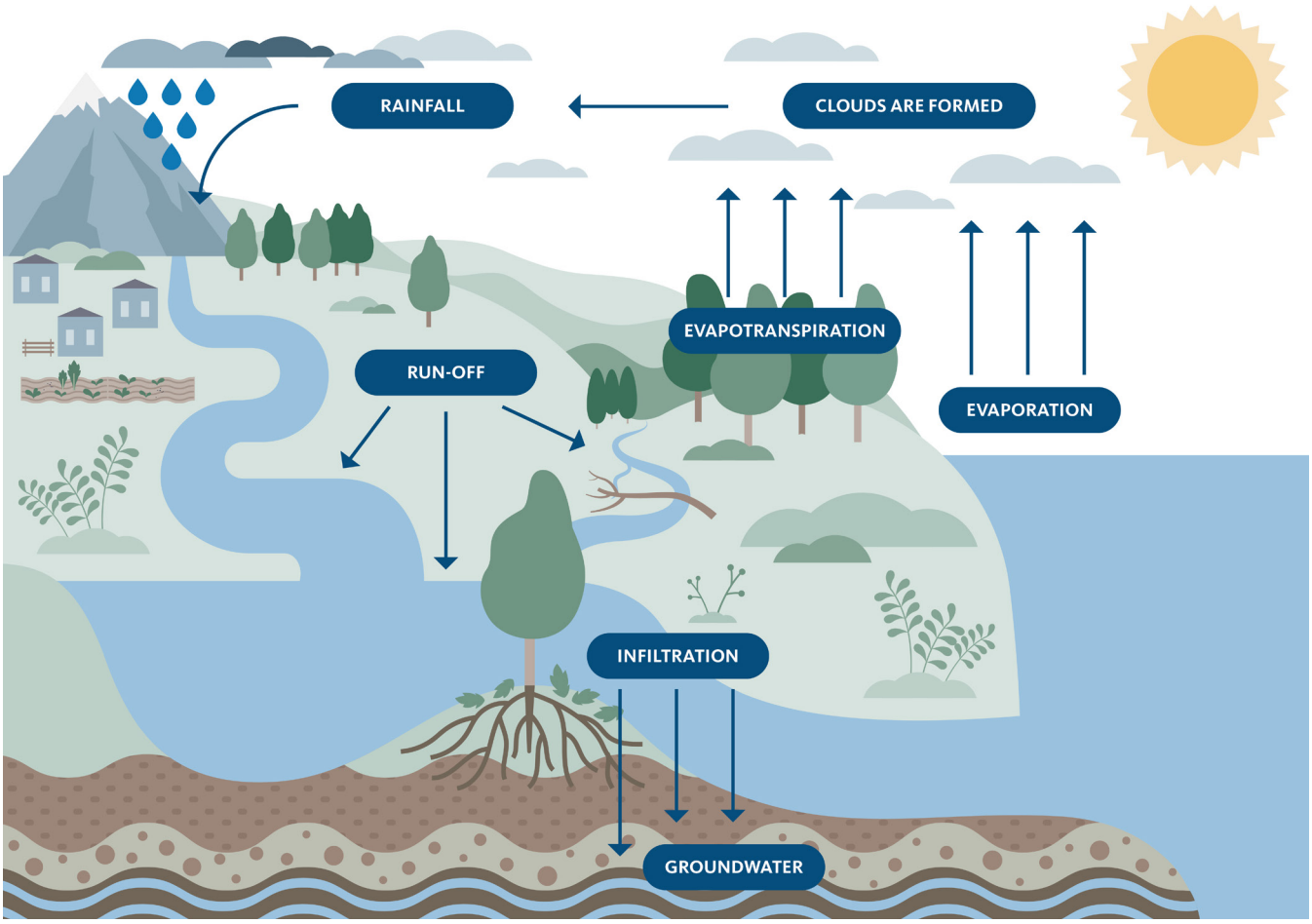


Figure 4. The forest-water nexus, illustrating the hydrological cycle through a landscape. Source: SIWI.

Box 2. Ecosystem service definitions.

Ecosystem processes: changes or reactions occurring in ecosystems; either physical, chemical, or biological; including decomposition, production, nutrient cycling, and fluxes of nutrients and energy.

Ecosystem functions: intermediate between ecosystem processes and services and can be defined as the capacity of ecosystems to provide goods and services that satisfy human needs, directly and indirectly.

Ecosystem services: contributions of ecosystem structure and function—in combination with other inputs—to human well-being.

Ecosystem structures: biophysical architecture of ecosystems; species composition making up the architecture may vary.

Ecosystem service trade-offs: The way in which one ecosystem service responds to a change in another ecosystem service.

(Crossman et al., 2013)

2. The W-FLR Tool

The W-FLR Tool objective and outputs

The W-FLR Tool is designed to support water-smart FLR during the UN Decade of Ecosystem Restoration, and beyond, and to help achieve the targets of the Bonn Challenge of restoring 350 million ha of land by 2030 as well as other relevant restoration goals and commitments (Table 1). The W-FLR Tool is composed as a handbook with six modules, with the overall objective to assess water risks and opportunities, and mainstream water into FLR-relevant plans and initiatives. The method can be used to incorporate water perspectives in the planning phase of new FLR initiatives, but also to ensure that water is adequately considered in existing and ongoing interventions. The output of the W-FLR method is an assessment and identification of water-relevant ecological functions, associated ecosystem services, sectors, and stakeholders to consider in water-smart FLR, including priority actions for water-smart FLR related to: 1) policy mainstreaming; 2) capacity development; and 3) implementation, as well as types of indicators to integrate into participatory monitoring and evaluation systems for the targeted landscape. The results of the assessment will be compiled into a Roadmap with next steps for an FLR initiative to become water-smart. Based on the assessment, the Roadmap will indicate whether priority actions and next steps should involve policy mainstreaming, capacity development and/ or implementation. The W-FLR Tool thus takes you to the stage where you are ready to start identifying how to implement water-smart FLR on the ground using existing tools and best practice databases.

The Tool's main target groups are sectors, organisations, agencies, and practitioners involved in FLR or other relevant landscape interventions at national, sub-national, and local level. The Tool addresses water risks and opportunities, while ensuring that the intervention is participatory, inclusive, and transparent. It includes steps that guide the participants on how to identify the required stakeholders, how to improve institutional arrangements and with this the quality of water-smart FLR governance.

Rationale for the W-FLR Tool

The W-FLR Tool closes the implementation gap between integrated water and forest management approaches. To this end, the W-FLR Tool builds on a range of existing tools related to resilient landscapes that SIWI has engaged with in different projects and programmes together with partners such as the Food and Agriculture Organization of the United Nations (FAO), the Swedish Forest Agency, the International Union for Conservation of Nature and Natural Resources (IUCN), etc. (see Table 2). These include tools for monitoring effects of land management practices on water (FL-WES) and the vulnerability of riparian areas (BT) – that have water as an important entry point. Other tools, such as Role-Playing Games (RPGs) can have water as a focus, but it depends on the context. However, a closer look at FLR tools, such as the Restoration Opportunities Assessment Methodology (ROAM), the Toolkit for Ecosystem Service Site-based Assessment (TESSA), etc., reveal that these tools do not address water risks in the landscape, but rather use other entry points for FLR, such as carbon storage/sequestration and biodiversity conservation. Moreover, other water-relevant tools focus on agriculture (e.g., Aqueduct) as well as on downstream and coastal issues (e.g., Source-to-Sea, S2S). Thus, the W-FLR Tool helps bridging the gap between water and forest management approaches.

There are several best practices databases for different types on land management, such as the Framework for Ecosystem Restoration Monitoring Registry (FERM) that among others include the World Overview of Conservation Approaches and Technologies (WOCAT) database. These databases can include many relevant practices for water-smart FLR, especially in drylands, but do not have water as a search criterion.

This manual will help you implement Water-smart FLR, by identifying which ecosystem services to target, which in turn will guide the selection of best practices. The tools and databases in Table 2 are further described in other relevant sections in the handbook.

Table 2. Examples of tools relevant to water-smart FLR

TOOL	FOCUS AREA	BRIEF DESCRIPTION	REFERENCE
Type: Assessment of ecosystem services			
WET-Ecoservices Version 2	Wetlands/ Riparian	Assessing wetlands and riparian areas ecosystem services. Indicators are used to rate the ability of the wetland to provide 16 different ecosystem services.	Kotze et al. 2020
Toolkit for Ecosystem Service Site-based Assessment (TESSA)	All terrestrial/ wetland habitats	Enables qualitative onsite assessment of ecosystem services. Guidance on methods to evaluate benefits to people from nature. Influence decision making.	Peh et al. 2013
Type: Best practices			
Framework for Ecosystem Restoration Monitoring (FERM)	Restoration	A geospatial platform and a registry of restoration initiatives. Tracking global progress and disseminating good practices for the UN Decade on Ecosystem Restoration.	https://ferm.fao.org/
World Overview of Conservation Approaches and Technologies (WOCAT)	Sustainable land management	A global network on Sustainable Land Management (SLM) that support adaptation, innovation and decision-making through documentation, sharing and use of knowledge.	https://wocat.net/en/
Type: Capacity development			
FAO/SIWI e-learning course "Forest and Water Nexus – Introduction"	Forest-water nexus	Provides overview of forest and water relationships and understanding of the impacts of changing landscapes on water resources. Digital certification.	https://elearning.fao.org/course/view.php?id=727
Role Playing Games	Stakeholder engagement	Pedagogical tools for educating participants in workshops and trainings, targeting issues such as conflict management, hazard prevention seminar, etc.	Ruiz-Ezquerro 2021; Daniau 2016
Type: Water Management			
FAO Forest and Landscape Water Ecosystem Services (FL-WES)	Forest-water nexus	Supports forest and water monitoring, with environmental, economic and social indicators. Inform policy/ management decisions to improve forest management.	https://www.fao.org/in-action/forest-water-tool/en/
Blue Targeting (BT) App	Riparian	Evaluate the condition of a watercourse in the forest. Management recommendations and advice on actions to improve the functionality of the riparian area.	Henrikson 2018
Water Footprint Assessment Manual	Water resilience	Calculate and map the water footprint of a country or a river basin. Assess sustainability and identify strategic actions to improve water use.	Aldaya et al. 2012
Standards of practice to guide ecosystem restoration	Restoration	Key recommendations for restoration projects, applicable to a broad array of activities across all types of ecosystems and restoration projects.	SER CEM 2021
Water Resilience Tracker for National Climate Planning	Water resilience	Provide guidance on how to design and implement coordinated and targeted climate action which acknowledges the critical role of water.	https://www.alliance4water.org
Restoration Opportunities Assessment Methodology (ROAM)	Restoration	A framework developed for countries to conduct forest and landscape restoration opportunity assessments and to identify specific priority areas at a national or sub-national level.	Maginnis et al. 2014
WWF Water Risk Filter	Water risks	Screening tool to help companies and investors to address water risks for enhancing business resilience and contributing to a sustainable future.	Laporte-Bisquit 2021
Aqueduct tools	Water risks	Toolkit that maps water risks. It includes country rankings, water risks to agriculture and food security and coastal and riverine flood risks.	https://www.wri.org/aqueduct
International Principles & Standards for the Practice of Ecological Restoration	Restoration	Guidance on the practice of ecological restoration, clarifies the breadth of ecological restoration and allied environmental repair activities.	Gann et al 2019

The W-FLR Tool approach and method

The W-FLR Tool and method is organised into a handbook with six modules to help you assess water risks and opportunities in FLR together with relevant stakeholders, and to identify response options/solutions to these risks to strengthen water governance and actions on the ground. The assessment of water risks in FLR as well as possible response options/solutions, will be based on a participatory assessment with key sectors and actors, which will vary with the scale and scope of the water-smart FLR initiative or project. The modules will be implemented in two steps, the preparatory phase and the workshop phase (Figure 5).

The **preparatory phase** involves three modules and will be undertaken by a core team in charge of the water-smart FLR initiative. The decisions made and material compiled in this phase are necessary preparations for the following phase. The second step, the **workshop phase**, involves organising a workshop with key stakeholders identified in Module 3 to identify priorities and readiness for W-FLR in a participatory and inclusive manner. As a control function, the initiating task of the workshop is to give the participants the opportunity to discuss and validate the results of the preparatory phase. The time necessary for completing each module and task, especially in the preparatory phase, will vary due to the flexibility of the Tool. Large and complex restoration initiatives will require more time compared to smaller and less complex initiatives. We recommend that you invest some time in each task, without delving too deeply into details.

All information compiled during the preparatory phase and the workshop will be compiled into a Roadmap for water-smart FLR. The W-FLR Roadmap will identify priority actions and indicators within policy mainstreaming, capacity development, and/or implementation aimed at ensuring that water is fully integrated into the restoration initiative. The development of the Roadmap is a collaborative process where key stakeholders should be involved in agreeing on the results communicated in the Roadmap. This is where the Tool stops, but a subsequent step could involve the organisation of a final workshop with key policy and decision makers to present the Roadmap and discuss sectoral engagement and financial support to water-smart FLR.

Examples will be provided throughout the handbook to assist planners and policymakers in the tasks. The examples build on pilot water-smart FLR cases in Benin, Ethiopia and Madagascar.

Support throughout the water-smart FLR process

The W-FLR Tool is designed so that a local project team can conduct the water-smart FLR methodology without assistance, other than the input from the relevant stakeholder identified in the process. The idea is that the Tool should be practical and user-friendly, and that the Tool users should not need expert opinions to complete the different tasks. However, if you are in need of more support, you can reach out to the W-FLR Helpdesk for guidance on how to apply the Tool and on the implementation of water-smart FLR related to issues such as identifying where in the landscape tree plantation would be most beneficial, spacing of trees, and species selection based on assessments of local water risks.

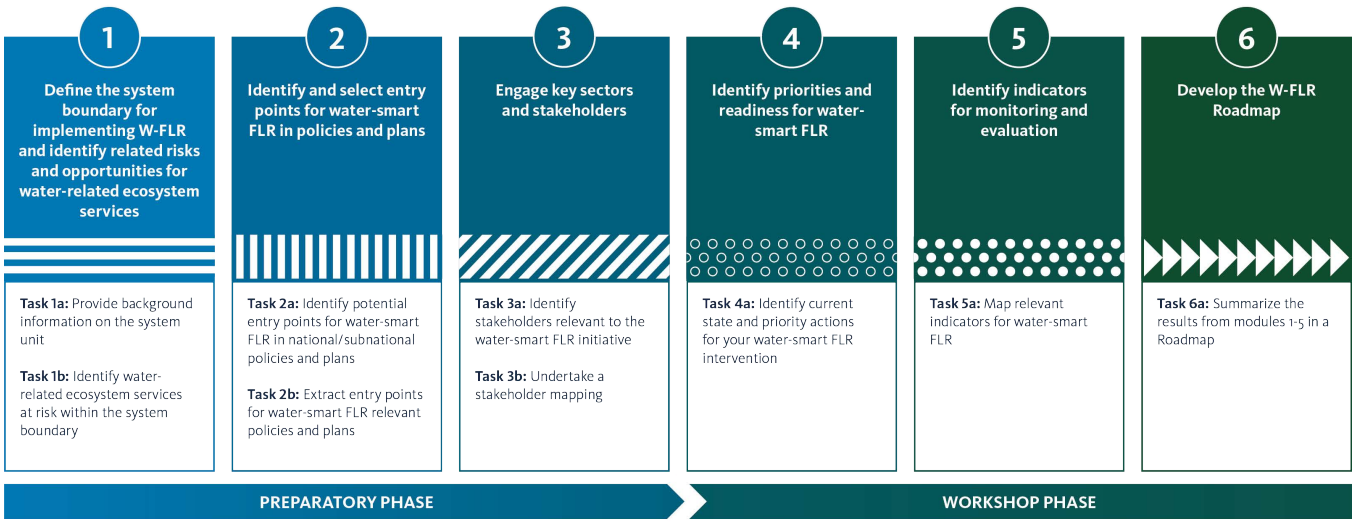


Figure 5. Flowchart summarising the water-smart FLR method and process.

3. The W-FLR handbook - preparatory phase

The first three modules of the process are part of the Preparatory Phase. During this phase, your W-FLR team or working group will develop background knowledge and material to ensure the best possible outcome of the second phase, the Workshop Phase. The preparatory steps involve an assessment of the need for water-smart FLR at the national/sub-national level and a mapping of related risks and opportunities for water-related ecosystem services (Module 1); identification and selection of entry points for water-smart FLR in policies and plans (Module 2); and engagement of key sectors and stakeholders (Module 3).

Use the **Practical Tasks Manager** document to compile the relevant insights.

Validation of results

The results from the Preparatory Phase will be presented and discussed with the stakeholders participating in the workshop in the second phase. The validation of these results is a key step, since the relevance of the outcomes reached at the end of the process are highly dependent on an accurate description of the context described in the first phase.

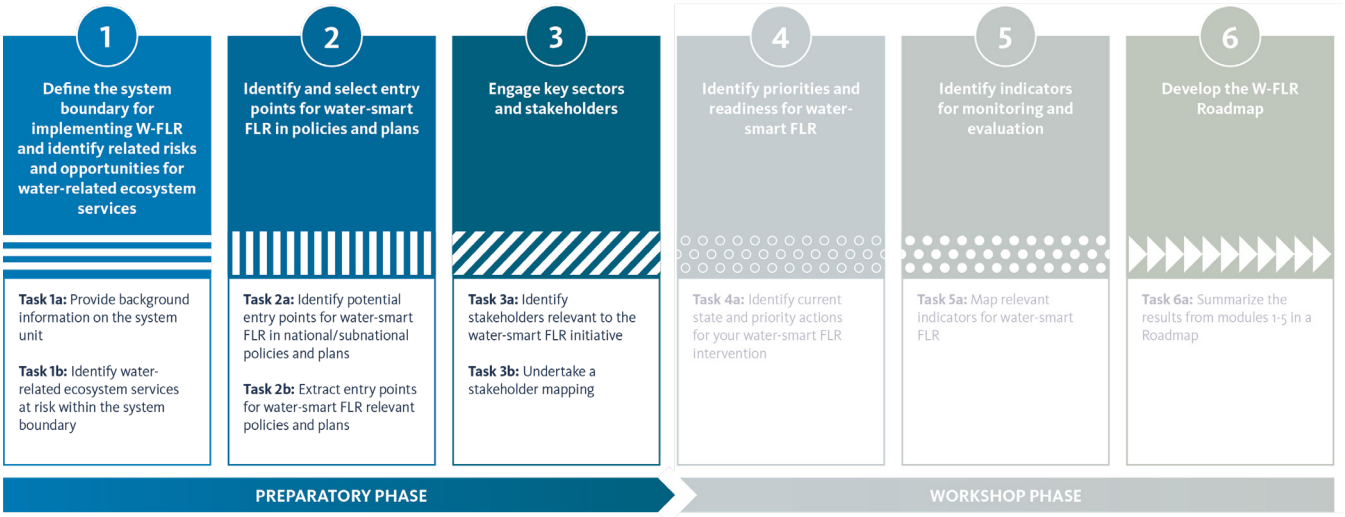
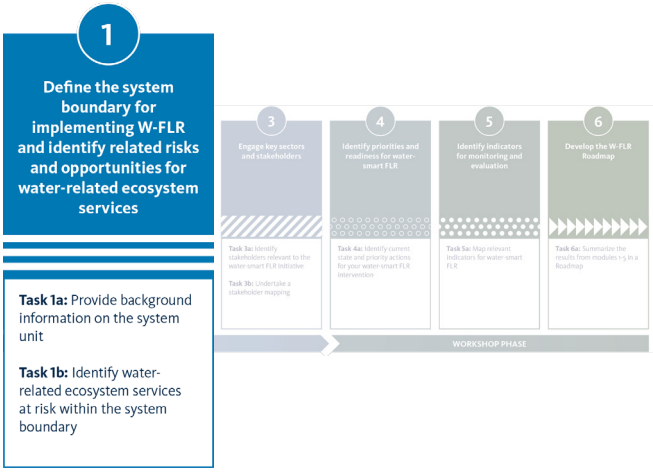


Image 1. Lakes Abaya and Chama, Ethiopia. Source: SIWI

Module 1: Define the system boundary for implementing W-FLR and identify related risks and opportunities for water-related ecosystem services



Objectives

- Identify and define the system boundary of the FLR intervention.
- Identify key drivers of degradation and barriers to restoration within the system boundary.
- Identify water-related ecosystem services at risk within the system boundary.

Why is this important?

- To define the natural boundaries for the water-FLR intervention, to identify water-risks to ecosystem services, as well as identifying relevant stakeholders, sectors and policies to consider in subsequent modules.
- To map the key drivers of degradation as well as potential barriers to restoration, to tailor restoration interventions that address these causes of degradation.
- To define water-related ecosystem services within the system boundary and to identify and understand the risks to these water-related ecosystem services.

Task 1a. Provide background information on the system boundary

The system boundary in water-smart FLR should factor in the hydrology of the landscape and consider its natural hydrological boundaries, such as a river basin, a watershed/catchment, riparian areas, source water areas, groundwater aquifers, etc. It is key to account for aspects related to both land and water governance and management.

This can be challenging, since there are different definitions and traditions to factor in. For instance, landscapes are defined based on natural characteristics (rivers, landscape formation vegetation, climatic conditions, etc.), administrative borders such as municipalities, counties etc, and socio-economic factors – for example by the residents and the different ways in which they perceive and use existing natural resources. In contrast, physical water boundaries cannot be limited to administrative criteria such as regional or district boundaries. Water flows through landscapes, crossing borders, which may encompass upstream-downstream user conflicts due to water scarcity or impacts on environment and social-economic conditions.

There is also a need to consider the interface with other systems and flows in and out of the system through, for example, moisture exchange with the atmosphere. Note that there may not be an evident system boundary for an intervention, and that users should establish contextually appropriate boundaries for their specific application.

Examples of water-related system boundaries:

River basin - A river drainage basin is an area of land where all flowing surface water converges to a single point, such as a river mouth, or flows into another body of water, such as a lake or the ocean. A basin is often separated from adjacent basins by natural landscape boundaries, such as ridges and hills. The term “basin” often describes a large watershed of a named river.

Watershed/catchment - A watershed is an area of land that drains water into a specific waterbody, for example rivers or lakes. A watershed is a multiscale concept with no fixed spatial scale – it comes in all sizes. It describes the basin that is influencing a stream or river network above a certain point in the landscape. Watersheds are nested, i.e., many small watersheds are contained within the watersheds of larger downstream rivers or other bodies of water such as lakes and deltas.

Source-to-sea system - A source-to-sea system is the land area that is drained by a river system, its lakes and

tributaries (the river basin), connected aquifers and downstream recipients including deltas and estuaries, coastlines and near-shore waters, the adjoining sea and continental shelf as well as the open ocean. A source-to-sea system can also be defined at a larger scale to include a sea and its entire drainage area, which may include several river basins.

Source water area - Source water refers to sources of water (such as rivers, streams, lakes, reservoirs, springs, and ground water) that provide water to public drinking-water supplies and private wells. The sources can include surface water (e.g., rivers, streams, lakes, springs, reservoirs), ground water (e.g., aquifers) and recycled or reused water.

Riparian area - A riparian zone or riparian area is the interface between land and water, and occur along the edges of rivers, streams, lakes, and other water bodies. The area, including its soil and vegetation, is directly influenced by permanent water and differ from surrounding uplands. Examples of riparian areas are streambanks, riverbanks, and flood plains.

Coastal zone - A coastal zone is the interface between land and ocean. It is defined as the part of the land affected by its proximity to the sea (influence of marine processes), and the part of the sea affected by its proximity to the land (influence of terrestrial processes). Mangroves and coastal wetlands are examples of important ecosystems in the coastal zone.

Groundwater aquifer - Groundwater aquifers are underground bodies of permeable rock or sediment that are saturated with groundwater. Groundwater enters the aquifer when precipitation seeps through the soil. The water can move through the aquifer and resurface via springs and wells. Groundwater can be divided into shallow and deep groundwater.

Practical Task 1a: Provide background information on the system boundary

Please define the system boundary for the water-smart FLR intervention, based on the information on landscapes and system boundaries provided above. Try to briefly describe the hydrology of the area. List the key drivers of landscape and forest degradation. Drivers can be categorised in their respective sectors, e.g. forest, landscape, water resources. Finally, identify the potential barriers to restoration and enabling opportunities for restoration (see the example on the next page and Table 1 in the Practical Tasks Manager).

Image 2. Aerial view of meandering river meeting the sea. Source: Shutterstock.

Example: Background information on the system boundary – the Benin case study

BACKGROUND INFORMATION ON THE SYSTEM BOUNDARY	
System boundary	
Location, villages, districts, municipalities, population, width, water-flow, length, area, etc.	• The micro-basin of the Bouérou River is located in the sub-basin of the Mékrou, which is itself a transboundary sub-basin shared between Benin, Niger, Burkina Faso and Nigeria. • Area of the hydrographic unit: 39,050 ha • Length of the main watercourse: 31 km, intermittent length depending on the season (dry, rainy) • Population around the hydrographic unit: 18,280 of which 9021 women and 9259 men • Municipality of Péhunco • Arrondissement Péhunco centre and Gnémasson • Villages: Bouérou, Gbéba, Sinaourarou, Sinaourarou-gah, Beket, Doh
Ecological and hydrological description	• Demographic and social changes leading to a growing demand for water management infrastructure and complicating the management of transboundary watercourses. • Sudano-Guinean climate with alternating dry and rainy seasons. • Precipitation: 800 mm – 1190 mm per year with a standard deviation of 185.38 mm and an interannual rate of change of 14.60%. • Average annual temperature: 25°C to 31°C • Polluted surface and groundwater (pesticides, phosphate/nitrogen water, herbicides, domestic use, etc.) • Water scarcity (in the context of dry season livestock • Problem of pasture and watering availability (farmer-farmer and farmer-herder conflict) • Flooding (during flood periods, rainy season, frequent problem) • Filling of the watercourse (due to the passage of animals on the banks and crops on the banks, this promotes soil erosion) • Composition and occupation of the hydrographic unit: – Arable land and fallow: 67.12% or 24,902 ha – Wooded and shrubby savannah: 13.38% or 4963 ha – Gallery forest and riparian forest: 9.35% or 3467 ha – Plantation: 4.37% or 1621 ha – Agglomeration: 3.31% or 1229 ha – Water: 2.33% or 866 ha – Eroded bare soil: 0.13% or 50 ha • Use of the unit for uses: – Agricultural (tomato, leafy vegetables, potato, okra, chilli, carrot, soybean, sorghum, millet, cassava. Yams, corn and cotton can also be grown on the banks) – Breeding – Fisheries – Cultural – Domestic workers (dishes, laundry, shower, construction, motorcycle washing)
Key drivers of forest and landscape degradation	<u>Climate change:</u> – Extreme climate variability – Drought, excessive heat, floods, floods, late and violent rains etc) <u>Agriculture:</u> – Agricultural activities (pesticides, phosphate/nitrogen water, herbicides, monoculture, overexploitation of land, slash-and-burn clearing, etc. – Pastoral activities (movement of herds) <u>Fishing:</u> – Dams – Use of prohibited fishing gear (motor pump, fine mesh net, chemicals, etc.) <u>Institutional challenge:</u> – Lack of an appropriate resource conservation framework – Functionality of the management bodies (CLE, CSB) to be improved/revitalized

	Forest industry: – Fraudulent logging (timber for services and lumber (housing), firewood, fodder for livestock, slash-and-burn land for agriculture) Mining industry: – Mining (mainly sand) Invasive species: – Herbaceous invasive species (Hyptis suaveolens) in savannahs à herbicide use – Pests that attack tree roots (potentially due to the use of pesticides/herbicides etc) Bush fires (outbreak of bush fires by hunters, vain grazing in order to renew grazing more quickly during the dry season) Strong population growth
Potential barriers to forest and landscape restoration	Monitoring and evaluation: – Inadequate hydrological and piezometric data collection networks, water collection/retention infrastructure not resilient to climate change – Lack of a reliable risk forecasting system in the sector – Low knowledge of water resources and hydro-climatic risk management Institutional: – Low use of water resources (low development of irrigated agriculture) – Governance of the water resources sector to be strengthened (coordination between government and local agencies to be improved, lack of resources) Environmental: – Water pollution by industrial waste (pesticides, phosphate/nitrogen water, herbicides, etc.) – Variable water availability – Management of bush fires (outbreak of bush fires by hunters, vain grazing) – Soil quality and diversity Land tenure: – Traditional land management (difficult access to plots, especially for women) Community Engagement: – Establishment of participatory decision-making processes and involvement of local communities in project planning to increase acceptance and support for restoration initiatives (lack of awareness) Financial constraints: – Difficulty in obtaining subsidies Anthropogenic activity: – Agriculture (land clearing, incineration, etc.) – Overgrazing (excessive cutting of trees) Strong population growth
Enabling opportunities for forest and landscape restoration	Commitment of the authorities: – Commitment of the national and local authorities of Benin to restore the forest landscape (national objective of restoring 500ha of landscapes) Existing initiatives: – Sustainable Land Restoration and Management Initiatives/Project (ProSol Project (GIZ) – Tasco (EU) – Ecosystem-Based Adaptation Project (EBAP) – Integrated Programme for Climate Change Development and Adaptation in the Niger Basin (PIDAC) – Project for the Sedentarization of Ruminants (PROSER) – Forests4Future (ProSol Project (GIZ) – Water Development and Management Scheme (SAGE) – AGIR water – RBT-WAP – National Tree Day – Etc.

	Institutional: – Sub-basin management committee that supports local committees Local knowledge and traditional practices: – Integrating traditional knowledge and practices into restoration strategies can strengthen community buy-in and ensure cultural sensitivity Willingness to set up payment for ecosystem services (PES) systems: – Putting in place mechanisms to reward communities for protecting and restoring water resources through PES systems can generate financial incentives and create sustainable financing models for restoration projects

Task 1b. Identify water-related ecosystem services at risk within the system boundary

Within a system boundary, nature provides many services that human society depends on. These ecosystem services depend on different ecological processes and functions, and trade-offs may occur where a landscape provides multiple functions or services. Ecosystem services can be divided into provisioning, regulating, supporting and cultural services that provide many invaluable benefits to people (Hassan et al., 2005). Some ecosystem services are difficult to value economically. These include cultural services, such as aesthetics, recreation or sacred places and natural bodies such as sacred rivers and forests (Tengberg et al., 2012). To fully address the potential of a water-smart FLR initiative, it is important to adopt a holistic approach that considers the entire range of ecosystem services, including non-monetary and social values. Ecosystem services are affected by many different drivers of change in the landscape, such as changes in land use and cover, loss of biodiversity and climate change. These changes in turn impact the hydrology of the landscape (see Figure 6). Thus, the risk assessment identifies the status of water-related ecosystem services and potential current and future threats, vulnerabilities, and risks of being reduced or lost.

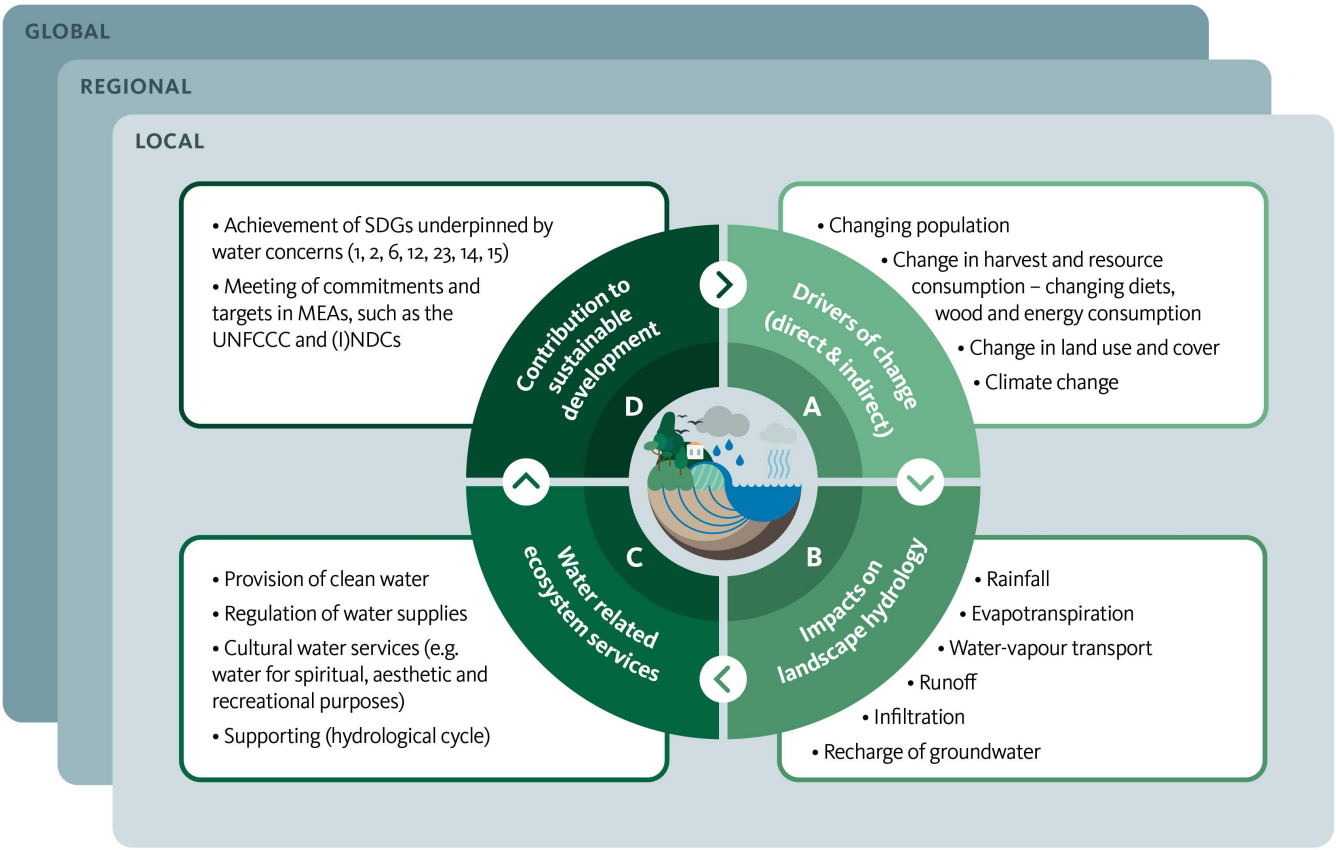


Figure 6. Conceptual framework for water-related ecosystem services in landscapes. Source: (Tengberg et al., 2021).

A range of ecosystem services are explicitly linked to the water cycle that we, in this manual, call "water-related ecosystem services" (see Figure 7). These water-related ecosystem services are listed in Table 3, together with the ecosystem process that support each service. The W-FLR Tool entry point to water-related ecosystem services is based on a wide landscape perspective where all ecosystem services that are linked to water are included. Water-related services delivered by ecosystems include providing clean drinking water, regulating water flows and flood events, and creating opportunities for water-based recreation and cultural practices. Water-related ecosystem services can also contribute to mitigating climate change by enhancing carbon sequestration and storage below and above ground, and by providing habitat for biodiversity, including native plants and animals (Ingemarsson et al., 2022; Tengberg et al., 2021).

Water-related ecosystem services relevant to water-smart FLR can also be instrumental in reducing poverty in rural areas, provided that there are clear incentives for the local population to manage the land sustainably. Sustainable management of forests and trees as well as restoration of degraded landscapes have the potential to provide a range of ecosystem services that can support local livelihoods (Hassan et al., 2005). Incomes can be generated from timber, fibres, bioenergy, and non-timber forest products (NTFPs) such as fruit, fodder, and honey, as well as from agriculture. A stable supply of clean water can be ensured through an optimal tree cover and planting of trees along streams and rivers. Payment for ecosystem services could support FLR where short-term income from forest and tree products is small or non-existent (Fernandes et al., 2022).

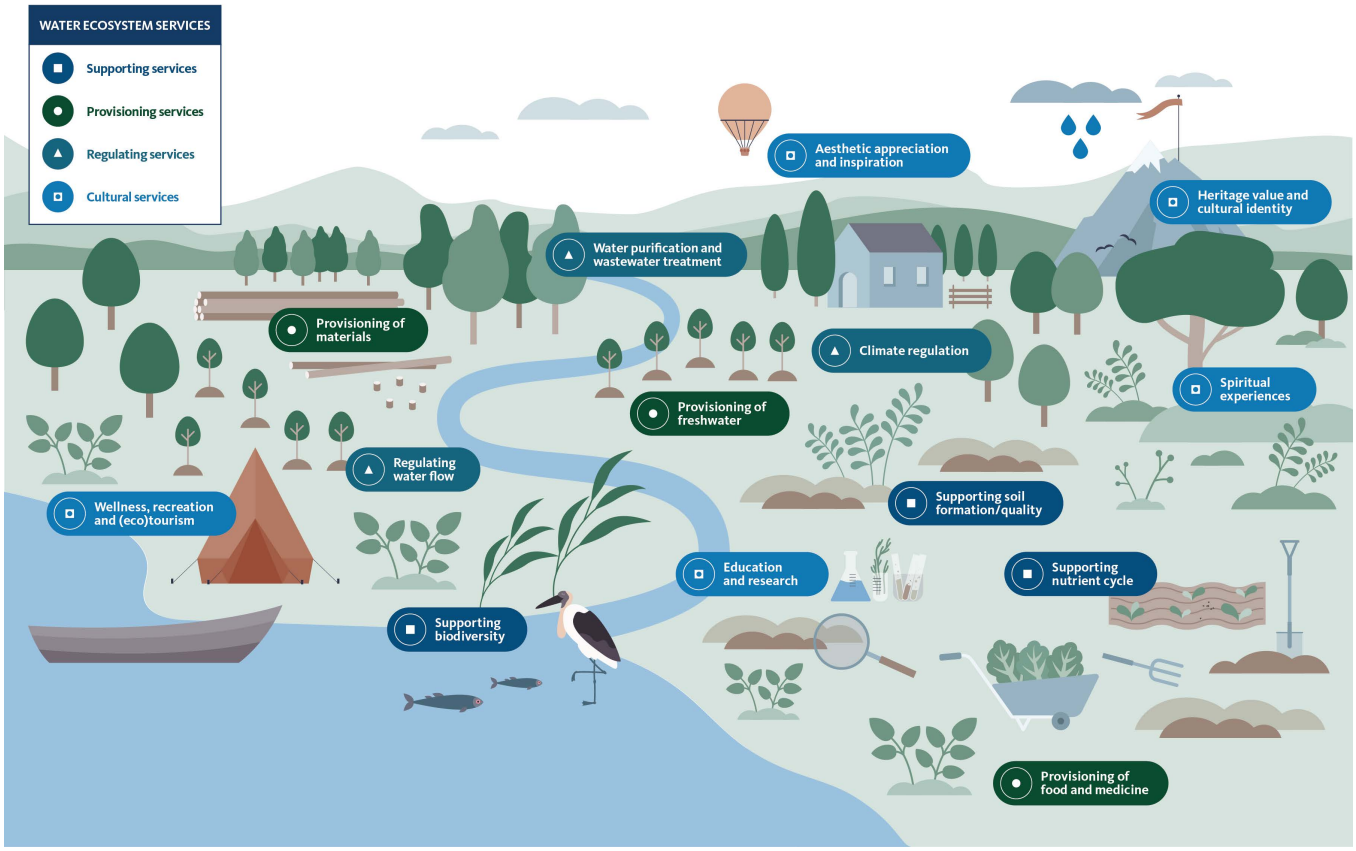


Figure 7. Water-related ecosystem services. The figure illustrates the many ecosystem services provided by productive and well managed multifunctional landscapes. Many of these ecosystem services are water related. Source: SIWI.

Table 3. Synthesis of water-related ecosystem services. Source: (Tengberg et al., 2021).

ECOSYSTEM SERVICES	EXAMPLES OF ECOSYSTEM PROCESSES SUPPORTING THE SERVICE
Supporting ecosystem services	
Supporting hydrological cycle	**Transpiration.** Trees impact water availability by extracting water from the soil or groundwater and emit it to the atmosphere as vapour. With the right management, it can improve local scale atmospheric moisture and green water flows.
	Canopy interception. Forest cover/tree canopy reduces the speed of falling rainwater on the surface of the forest floor, potentially reducing surface runoff and erosion.
	Hydraulic redistribution. During dry periods with low transpiration (e.g. night or high humidity), deep-rooted trees can improve soil moisture by passively redistribute water from moist to dry soil layers via their roots.
	Terrestrial moisture recycling. Forests recharge atmospheric moisture and influence cloud formation, driving (pumping) atmospheric moisture flows from the coastline in over continental interiors which can enhance in-land precipitation.
Supporting nutrient cycling	Water supports the cycling of soil nutrients (e.g. nitrogen and phosphorus) in forest soils from organic materials (living and dead) and minerals in soils and rocks, and from nutrients transported in the flowing water. Tree roots also lock the nutrients in the soil, preventing nutrient leaching into rivers and streams.
Supporting soil formation/quality	Tree roots and soil organic matter from litter inputs (e.g. dead leaves) improve soil structure, slow down water movement and promote faunal activity.
Supporting biodiversity	Forest water creates habitats that safeguard fisheries and biological diversity. Flowing water in forests support primary production, carrying capacity and niche formation, water also enables dispersal of organisms, pollen and propagule.
Provisioning ecosystem services	
Provision of clean water	Tree roots filter water through several physical, chemical, and biological processes that help remove sediments, nutrients, pathogens, and pollutants from water before it reaches groundwater, rivers, or other bodies.
Provision of food and medicines	Water is essential for forests to provide the conditions for growing and harvesting food and extracting medicines, e.g. from fruits, mushrooms or bark.
Provision of wood, fibre, energy and fuel	Water is essential for forests to provide wood-related materials for construction, production, energy and fuel including textile, biofuels and plant oils.
Regulating ecosystem services	
Water purification	**The litter layer on the forest floor,** made of fallen leaves, needles, and branches, absorbs and filters out excess nutrients and sediment from e.g. rainwater and agricultural runoff. As rainwater moves through the forest soil, the soil particles and the root systems filter out sediment, bacteria, and pollutants like nitrates, phosphates, and pesticides.
Regulate water flow	**Infiltration.** Forest and trees impact the entry of water into soil, controlling forest floor runoff and soil and groundwater recharge which can regulate soil moisture and hydrological flows. In dry soils, the tree roots break through the hard surface and open passages where water can seep into the soil.
	Stem water storage. Trees store water, allowing them to maintain high transpiration for some periods even when uptake from the soil is limited; this allows trees to emit vapour over more extended periods, thus influencing atmospheric moisture.
Flood and erosion control	**Forests intercept and store water**, slowing runoff and reducing flood peaks. They also stabilize soil with roots, preventing erosion and landslides.
Climate regulation	**Reducing local temperature and soil evaporation.** Forest and trees return energy and moisture to the atmosphere and create microclimates under tree canopies, thereby cooling the land surface and promoting precipitation.
	Carbon sequestration and storage. Water plays a key role in maintaining forests' carbon uptake and safeguarding already sequestered carbon.
Cultural ecosystem services	
Heritage value and cultural identity	Landscape-related "memories" from past cultural ties, mainly expressed through characteristics within cultural landscapes.
Spiritual experiences	Holy or spiritual places important to spiritual or ritual identity, e.g. River Ganges in India, sacred forest groves, sacred plants or animals.
Wellness, recreation and (eco) tourism	Pleasure, comfort, discovery and socialisation that takes place in leisure in nature and observing natural elements.

Education and research	Climate, topography, water cycle or soil and biota used for education and research.
Aesthetic appreciation and inspiration	Visual perception of ecosystems and landscape.
	Lakes and rivers represented in songs, poetry, paintings, etc.

Box 3. Method for self-assessment of ecosystem services at risk

The assessment of water-related ecosystem services at risk of being reduced is based on the Ecosystem Services framework of supporting, regulating, provisioning and cultural ecosystem services (MA, 2005). The self-assessment is guided by the ecosystem services listed in Table 2 and other information gathered during the preparatory phase, such as available maps and reports of relevance. The W-FLR Team or Working Group together assess risk-level of different water-related ecosystem services in a workshop where they meet onsite or online. The assessment by experts will be validated by stakeholders in a local workshop within the selected area and system boundary in the workshop phase of the tool.

Results from self-assessments show that there can be disagreements between different stakeholder groups on risk level, but that the workshop-based approach can be an effective way of enhancing multistakeholder cooperation, identifying case-specific challenges, and building consensus around solutions and action plans (Mascarenhas et al., 2013; Ansell & Gash, 2007).

A way of further facilitating the self-assessment of ecosystem services is to link them to specific challenges, such as water security and disaster risk reduction, following the approach of IUCN, with their Nature-Based Solutions (NbS) Self-Assessment Tool, to evaluating the impact of NbS on the provision of water-related and water-dependant ecosystem services shown below (Marijuan et al., 2024).

Practical task 1b: Identify water-related ecosystem services at risk within the system boundary

The next step is to identify water-related ecosystem services at risk of being reduced or lost within the system boundary. To this end, as ecosystem processes are interlocked in the ecosystem services, focus on ecosystem processes which will, ultimately, reflect the status of ecosystem services. The aim of the task is to identify which ecosystem processes are at risk due to ecosystem degradation. Assess the ecosystem processes at risk, based on your knowledge and experiences, to further be able to prioritize actions for restoration (Module 4). This assessment is qualitative (no measurement required) and can be adjusted during the application of the Tool (see Box 3 for more background on the self-assessment methodology).

Mark the degree of risk to the ecosystem processes as follows in Table 2 in the **Practical Tasks Manager** (see example on the next page):

LOW RISK | INTERMEDIATE RISK | HIGH RISK

Tips:

1. Start by using your own expert knowledge of the status of the restoration area. Note that this is a qualitative assessment.
2. If necessary, turn to local stakeholders or forest/landscape/water resources experts at hand to gather information on the current status of ecosystem processes.
3. If you still wish for more help with the assessment, please turn to the **W-FLR Helpdesk** which can guide you.

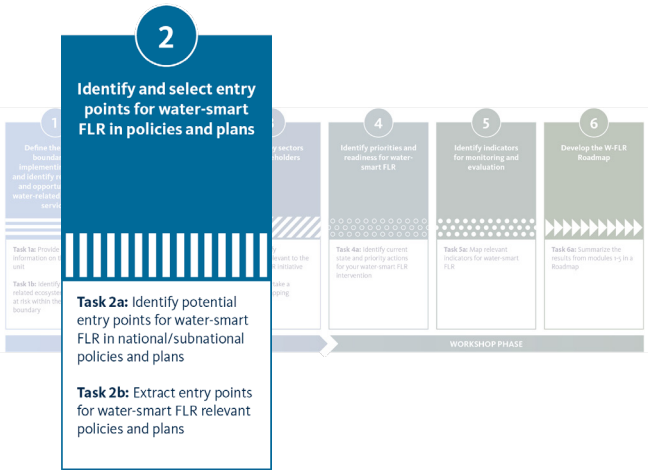
Example: Water-related ecosystem services at risk – the Madagascar case study

ECOSYSTEM SERVICES	EXAMPLES OF ECOSYSTEM PROCESSES SUPPORTING THE SERVICE	TASK 1B: CURRENT STATUS OF WATER-RELATED ES	TASK 2B: ADDRESSED IN PLANS & POLICIES
Supporting ecosystem services			
Supporting hydrological cycle	**Transpiration.** Trees impact water availability by extracting water from the soil or groundwater and emit it to the atmosphere as vapour. With the right management, it can improve local scale atmospheric moisture and green water flows.		
	Canopy interception. Forest cover/tree canopy reduces the speed of falling rainwater on the surface of the forest floor, potentially reducing surface runoff and erosion.		
	Hydraulic redistribution. During dry periods with low transpiration (e.g. night or high humidity), deep-rooted trees can improve soil moisture by passively redistribute water from moist to dry soil layers via their roots.		
	Terrestrial moisture recycling. Forests recharge atmospheric moisture and influence cloud formation, driving (pumping) atmospheric moisture flows from the coastline in over continental interiors which can enhance in-land precipitation.		
Supporting nutrient cycling	Water supports the cycling of soil nutrients (e.g. nitrogen and phosphorus) in forest soils from organic materials (living and dead) and minerals in soils and rocks, and from nutrients transported in the flowing water. Tree roots also lock the nutrients in the soil, preventing nutrient leaching into rivers and streams.		
Supporting soil formation/ quality	Tree roots and soil organic matter from litter inputs (e.g. dead leaves) improve soil structure, slow down water movement and promote faunal activity.		
Supporting biodiversity	Forest water creates habitats that safeguard fisheries and biological diversity. Flowing water in forests support primary production, carrying capacity and niche formation, water also enables dispersal of organisms, pollen and propagule.		
Provisioning ecosystem services			
Provision of food and medicines	Water is essential for forests to provide the conditions for growing and harvesting food and extracting medicines, e.g. from fruits, mushrooms or bark.		
Provision of wood, fibre, energy and fuel	Water is essential for forests to provide wood-related materials for construction, production, energy and fuel including textile, biofuels and plant oils.		
Regulating ecosystem services			
Water purification	The litter layer on the forest floor, made of fallen leaves, needles, and branches, absorbs and filters out excess nutrients and sediment from e.g. rainwater and agricultural runoff. As rainwater moves through the forest soil, the soil particles and the root systems filter out sediment, bacteria, and pollutants like nitrates, phosphates, and pesticides.		
Regulate water flow	**Infiltration.** Forest and trees impact the entry of water into soil, controlling forest floor runoff and soil and groundwater recharge which can regulate soil moisture and hydrological flows. In dry soils, the tree roots break through the hard surface and open passages where water can seep into the soil.		
	Stem water storage. Trees store water, allowing them to maintain high transpiration for some periods even when uptake from the soil is limited; this allows trees to emit vapour over more extended periods, thus influencing atmospheric moisture.		
Climate regulation	**Reducing local temperature and soil evaporation.** Forest and trees return energy and moisture to the atmosphere and create microclimates under tree canopies, thereby cooling the land surface and promoting precipitation.		
	Carbon sequestration and storage. Water plays a key role in maintaining forests' carbon uptake and safeguarding already sequestered carbon.		

Cultural ecosystem services			
Heritage value and cultural identity	Landscape-related "memories" from past cultural ties, mainly expressed through characteristics within cultural landscapes.		
Spiritual experiences	Holy or spiritual places important to spiritual or ritual identity, e.g. River Ganges in India, sacred forest groves, sacred plants or animals.		
Wellness, recreation and (eco)tourism	Pleasure, comfort, discovery and socialisation that takes place in leisure in nature and observing natural elements.		
Education and research	Climate, topography, water cycle or soil and biota used for education and research.		
Aesthetic appreciation and inspiration	Visual perception of ecosystems and landscape.		
	Lakes and rivers represented in songs, poetry, paintings, etc.		

Image 3. Cloud formation over forested hills in the Rift Valley, Wondo Genet, Ethiopia. Source: SIWI.

Module 2: Identify and select entry points for water-smart FLR in policies and plans



Objectives

- Identify water-related ecosystem services, including actions and targets that may influence the ecosystem services, that ministries and/or agencies are targeting in their official documents.
- Based on this, identify and select entry points in existing policies and plans most relevant and most achievable in your water-smart FLR intervention.
- Identify lead coordinating institutions and national priorities relevant to the water-smart FLR intervention.
- Identify potential financing/funding sources for the water-smart FLR intervention.

Why is this important?

- To get clear indications on how to align your water-smart FLR project or initiative to national/ sub-national policies and plans, to ensure that it is working towards already set goals.
- Identifying national priorities will help engaging key policy makers and decision makers from different sectors as well as other stakeholders with interests in, or influence on, how landscapes are managed – and can build high-level support for water-smart FLR. Water-smart FLR is not only important for water flows and quality, but also for reaching productivity, livelihood, conservation and climate goals in restoration projects and strategies.
- There may be opportunities to mobilise resources by linking the intervention to funding mechanisms for Multilateral Environmental Agreements and climate finance, which can aid further development implementation of your water-smart FLR initiative (see Box 7).

Task 2a. Identify potential entry points for water-smart FLR in national/ subnational policies and plans

Before making detailed plans for the water-smart FLR intervention, it can be of great support to examine national, regional, district, basin and catchment policies and plans that can be of relevance. Looking at national (or sub-national) assessments will provide the contextual framework for enabling conditions for potential restoration strategies within a country. In Task 2a, you will therefore map what entry points (objectives/ measures/ actions/ project and programmes; water-related ecosystem service and ecosystem processes; responsible ministries/agencies) related to natural water resources and associated sectors are mentioned in existing plans and policies which may have impacts on the water-smart FLR intervention.

What documents to look in?

This task should be a rapid screening of the most relevant plans and commitments. The mapping may include official government policies and strategies on land use, conservation, restoration etc., that both explicitly and indirectly address restoration and FLR. The latter may also focus on biodiversity, climate change, land degradation, etc., since water-smart FLR can be a method for reaching conservation, sustainable use, productivity and climate goals in restoration projects and strategies. Which documents are most useful will be highly country-specific. Still, be prepared to invest some time into this task.

Commitments relevant to water-smart FLR could for example be identified in:

- **UNFCCC NDCs** – Nationally Determined Contributions, especially in priority interventions related to ecosystem management, etc.
- **UNFCCC NAPs** – National Adaptation Plans
- **CBD NBSAPs** – National Biodiversity Strategies and Action Plans
- **UNCCD NAPs** – National Action Programmes to Combat Desertification
- **FLR** – Forest and Landscape Restoration plans

- **IWRM** – Integrated Water Resources Management plans/River basin plans/Watershed plans
- Other national and sub-national development plans as well as international FLR commitments (see Table 1)

Tips:

- Water considerations and the forest-water nexus should be the main elements driving the review. Still, these topics are rarely addressed directly in official documents. Instead, policies and strategies often address forests and water in separate silos, focusing on their respective activities and services, which can unintentionally undermine the forest-water nexus. It is therefore important to cover a broad range of keywords in the analysis (see list in the practical task 2a).
- Based on the consultation of local experts, review the **five most relevant** national, regional and/or local plans.
- The NDCs are a good start for identifying entry points in documents. Most NDCs address commitments from a national perspective, so depending on your system boundary this might require you to look further for identification of sub-national commitments, risks, and opportunities. IWRM plans and basin/watershed plans are useful for restoration efforts reliant on local catchments and interactions. For countries with a developed UNFCCC NAP, further entry points might be found by looking at potential synergies within forestry and water targets.
- Information required in this task can be found in different sections of the documents as water is an inherent element of multiple sectors (see example on next page). Type of information to look for:
  - Objectives, measures, actions, projects and programs relevant to water and/or the forest-water nexus
  - Water-related ecosystem services and processes
  - Responsible national ministries and agencies (if this information is missing in the documents, it can be added in the workshop phase)

Practical task 2a: Identify potential entry points for water-smart FLR in national/subnational policies and plans

The aim of this Task is to provide overall comments reflecting on the composition of the plans. You can assess both the presence of a forest-water links, and the mentioning of water resources in mitigation and/or adaptation objectives in national policies and plans, like the NDC.

We suggest that you follow these steps to fill in "Table 3. Identification of potential entry points in national/ subnational documents" in the **Practical Tasks Manager**:

1. Review the table of contents in the documents (to assess which sections are relevant).
2. Search through the document to collect objectives/ measures/ actions/ projects/ programs which may have an impact on the water-smart FLR intervention, related to 1) natural water resources and associated sectors and 2) the forest-water nexus.
3. Use the concepts explained in "Table 2. Synthesis of water-related ecosystem services" to identify relevant water-related ecosystem services/ processes.

Note that ecosystem processes might not be mentioned as detailed in the national documents, as they are in Table 2, or they may be addressed using a different type of wording. Therefore, remain flexible when you map water-related ecosystem services in the documents, but be careful to not add personal interpretations.

4. Identify responsible ministries/ agencies
5. Provide overall comments reflecting on the composition of the plans regarding the presence of a forest-water nexus and the mention of water resources

Use search words to be more efficient in the review process.

Examples of search words: water, hydro(logy), flood, drought, IWRM, water security, forest(s/ry), restoration, ecosystem services, specific words related to your system boundary, i.e., river basin, watershed, riparian, land degradation, plantation, Forest and Landscape restoration, FLR, agroforestry.

Example: Identification of potential entry points in national/ subnational documents – the Benin case study

TYPE OF POLICY OR PLAN		COMMENTS
UNFCCC NDC	**Commitments or measures in plan**	The NDC does not establish a direct link between forestry and water. In the mitigation targets section, the water sector is mentioned only once in the context of rice farming activities, while in the adaptation targets section, water resources have their own section. In terms of technology transfer, the mitigation aspect does not include the water sector. The link between forest and water is non-existent in both the mitigation and adaptation objectives sections. The benefits, end results and limitations of water-related reforestation/afforestation projects are not mentioned. Forests are mainly associated with a single ecosystem service, carbon sequestration.
	Mitigation objectives • Development and irrigation of rice growing areas with water control on 52,000 ha. – Unconditional: 22,000 ha of rice growing perimeters developed and irrigated with water control. – Conditional: 30,000 additional ha of irrigated rice fields with water control. **Horizon 2030 adaptation targets** • Reduce the vulnerability of natural and human systems to water stress, flooding and water quality degradation • Improve knowledge of the climate system and tools to produce climate and hydrological information and predict climate risks. • Promoting water management and good governance • Tourism: contribute to the reduction of negative territorial and environmental impacts by offering more water- and energy-efficient consumption patterns. **Means of implementation:** Technology transfer needs (adaptation aspect): • Agriculture: – Mulching: reduces water loss through evaporation, protects soil from wind and water erosion, improves rainfall infiltration and irrigation by maintaining good soil structure. • Water resources: – Development of small watersheds to improve the food and nutrition security of vulnerable populations. – Integrated management of rice fields – Forage polyvalent – Capacity building – Strengthening the capacity of the decentralised services of the Water Directorate to predict risks and manage hydro-climatic crises. – Capacity building for the integration of climate change issues into water resources management policies. – Training of technical staff in the field of the vulnerability of water systems to climate change and on the methodology for studying the vulnerability of water resources to climate change. – Development of integrated water resources management projects under climate change conditions. **Strategy, programmes and projects for the preparation and implementation of the NDC** • Agricultural Infrastructure Support Project in the Ouémé Valley (PAIA-VO) • 1,000 ha of irrigated perimeters with total water control • Project to strengthen the resilience of vulnerable populations and vulnerable ecosystems in the Ouémé watershed to climate change through CSA and sustainable management of land and water resources. • Integrated Programme for Adaptation to Climate Change through the Development of Agriculture, River Transport and Tourism in the Niger Valley in Benin (UNDP) • The project consists of the development of 500 ha of irrigated perimeters downstream, the rehabilitation of seven hydro-agricultural dams, the development of 200 ha of lowlands with partial water control, the development of 500 ha of flood recession perimeters, the construction of four (04) flood water spreading weirs for flood recession perimeters. • Programme for the Promotion of Hydro-Agricultural Schemes for Water-Controlled Rice Cultivation	

	Responsible national ministry or agency Information missing. **Water-related ecosystem service and processes in document** **Supporting the hydrological cycle** • Vegetation helps regulate the climate. **Supporting nutrient cycling** • Biogeochemical support in the atmosphere, availability/type of nutrients in soil, rocks and organic matter. **Supporting biodiversity** • Habitats that preserve fisheries and biological diversity. **Food supply** • Ecosystems provide the conditions for growing and harvesting food. **Supply of wood, fibre and fuel** • Ecosystems provide feedstock for construction, production and fuel, including wood, biofuels and vegetable oils. **Water purification and wastewater treatment** • Reducing pollutants entering waterways. **Climate regulation** • Soil carbon sequestration. • Carbon sequestration in above- and below-ground vegetation. • Regulation of the local temperature by evapotranspiration. **Wellness, leisure and (eco)tourism** • Pleasure, comfort, discovery **Aesthetic appreciation and inspiration** • Visual perception of ecosystems and landscapes.	
NAP (Benin National Adaptation Plan to Climate Change)	**Commitments or measures in plan** **Planning adaptation actions** Strategic objective 1: Promote a resilient system of governance of development sectors • Water Resources Sector: – Development of climate-resilient infrastructure (hydro-agricultural infrastructure) – Support for the establishment and functioning of water management bodies – Application of water resources management regulations – Capacity building of women and men and other vulnerable groups to implement local adaptation strategies in the event of seasonal droughts, sea level rise, floods, heavy rains, and excessive heat – Raising awareness on how to behave in the event of water scarcity and difficulties in accessing drinking water – Application of transhumance regulations Strategic objective 2: Promote a resilient system of management and exploitation of natural resources and ecosystems • Water Resources Sector: – Development of infrastructure for the sustainable mobilization of water resources **(restoration and safeguarding of gallery forests)** – Ensuring the artificial renewal of groundwater – Mobilization and sustainable management of water resources – Improved knowledge, governance and management of hydroclimatic risks – Construction and multiplication of water points to facilitate access – Strengthening measures to reduce the effects of drought – Ensuring women's effective participation	There are relevant objectives, but few concrete actions associated explaining how to achieve these objectives. The measurements are not sufficiently precise and transparent in view of the associated / generated benefits. The impact of measures on ecosystem services is non-existent. For example, the construction of protective dikes or the development of riverbanks do not specify the type of solution (artificial, nature-based, etc.) with an assessment of the associated advantages and disadvantages. The forest-water link is very little mentioned. The benefits, end results, risks and limitations of water-related reforestation/ afforestation projects are not mentioned.

- Ensuring fairness in distribution and access
- **Continuation of reforestation campaigns and protection of the banks of lakes and watercourses**
- Construction of protective dikes
- Implementation of a dredging plan for the beds of rivers and water bodies
- Development of watercourse banks

- Forest sector:
  - Reforestation of the watersheds of the main rivers of forests under management with species with a high tolerance to drought
  - Enrichment/afforestation of conservation and protection series (riverbanks with native species resilient to climate change)
- Estimated cost of implementing adaptation measures:

Development Sector	Estimated cost (US$ million)
Infrastructure and urban planning	1075
Littoral	757
Tourism	747
Forestry	554
Health	390
Agriculture	377
Water	153
Energy	112
Gender, migration, and endogenous knowledge	75
Total	4240

Strategic Objective 2 contains word-for-word the same actions in the water resources sector and in the forestry sector. As the measures are focused on the water sector, the link between the 2 sectors is not very explicit.

The water development sector has a very low estimated cost of implementing adaptation measures compared to other sectors. The estimated cost is not representative of the allocated budget and the effectiveness of the measures implemented; however, we can note that the measures are inexpensive compared to other sectors.

Responsible national ministry or agency

Information missing.

Water-related ecosystem service and processes in document

Supporting soil formation and quality

Energy supply

- Surface water resource for hydropower

Food and medicine supply

- Ecosystems provide the conditions for growing and harvesting food, as well as for extracting medicines.

Spiritual Experiences

- Holy or spiritual places important for spiritual or ritual identity.

Wellness, leisure and (eco)tourism

- Fun, comfort, discovery and socialization.

Education and research

- Climate, topography, water cycle, or soil and biota used for education and research.

Task 2b. Extract entry points for water-smart FLR relevant policies and plans

Task 2b is based on your findings in Task 1b, where water-related ecosystem services at risk within the system boundary were defined, and Task 2a, where you identified ecosystem services and processes considered in national and sub-national policies and plans.

The objective of this task is to combine results from Task 1b and Task 2a to identify the type and status of water-related ecosystem services and processes that are mentioned in the different policies and plans collected in Task 2a.

Note that some ecosystem services and processes you have identified as at risk (in Task 1b) may not be mentioned in the commitments or plans you are investigating (in Task 2a). In that case, actions are needed for policy mainstreaming (see Module 4) to ensure that water-related ecosystem services are considered in commitments, policies and plans.

This task will help you to identify the entry points for the water-related ecosystem services that are most relevant and most achievable in your water-smart FLR intervention. Remember to use the perspective of your system boundary. Many of the policy documents will focus on a national perspective, while your restoration initiative probably needs to be adapted to regional and local scales.

Practical task 2b: Extract entry points for water-smart FLR relevant policies and plans

Use Table 2 in the **Practical Tasks Manager** and report in the column "Task 2b: Addressed in relevant plans and policies" what plans consider water-related ecosystem services. Make an overall comment analysing and linking Task 1b and Task 2b (see example on next page).

Tips:

SIWI, through the support of the UNDP-SIWI Water Governance Facility and GIZ, prepared a review on how the inclusion of water has evolved within Nationally Determined Contributions (NDCs), with key trends, gaps, and recommendations (UNDP-SIWI Water Governance Facility 2023). Based on that study we recommend that, the overall comment must reflect on the composition of the policies and plans:

- Type of water-related ecosystem services (supporting, provisioning etc.) that are addressed directly or indirectly in policies and plans.
- Number of water-related ecosystem processes or services addressed in policies and plans.
- Water-related ecosystem services at risk considered in policies and plans.

Also, the comment should focus on the type of water-related ecosystem services that are underrepresented in policies and plans and are at risk.

Image 4. Strengthening riversides with raffia plantation together with Forests4Future and local stakeholders, Boeny, Madagascar. Source: SIWI.

Example: Entry points for water-smart FLR relevant policies and plans – the Madagascar case study

ECOSYSTEM SERVICES	EXAMPLES OF ECOSYSTEM PROCESSES SUPPORTING THE SERVICE	TASK 1B: CURRENT STATUS OF WATER-RELATED ES	TASK 2B: ADDRESSED IN PLANS & POLICIES
Supporting ecosystem services			
Supporting hydrological cycle	**Transpiration.** Trees impact water availability by extracting water from the soil or groundwater and emit it to the atmosphere as vapour. With the right management, it can improve local scale atmospheric moisture and green water flows.		CDN, 2022 PNA, 2021
	Canopy interception. Forest cover/tree canopy reduces the speed of falling rainwater on the surface of the forest floor, potentially reducing surface runoff and erosion.		PNA, 2021
	Hydraulic redistribution. During dry periods with low transpiration (e.g. night or high humidity), deep-rooted trees can improve soil moisture by passively redistribute water from moist to dry soil layers via their roots.		
	Terrestrial moisture recycling. Forests recharge atmospheric moisture and influence cloud formation, driving (pumping) atmospheric moisture flows from the coastline in over continental interiors which can enhance in-land precipitation.		
Supporting nutrient cycling	Water supports the cycling of soil nutrients (e.g. nitrogen and phosphorus) in forest soils from organic materials (living and dead) and minerals in soils and rocks, and from nutrients transported in the flowing water. Tree roots also lock the nutrients in the soil, preventing nutrient leaching into rivers and streams.		
Supporting soil formation/ quality	Tree roots and soil organic matter from litter inputs (e.g. dead leaves) improve soil structure, slow down water movement and promote faunal activity.		PNA, 2021
Supporting biodiversity	Forest water creates habitats that safeguard fisheries and biological diversity. Flowing water in forests support primary production, carrying capacity and niche formation, water also enables dispersal of organisms, pollen and propagule.		CDN, 2022
Provisioning ecosystem services			
Provision of food and medicines	Water is essential for forests to provide the conditions for growing and harvesting food and extracting medicines, e.g. from fruits, mushrooms or bark.		PNA, 2021
Provision of wood, fibre, energy and fuel	Water is essential for forests to provide wood-related materials for construction, production, energy and fuel including textile, biofuels and plant oils.		CDN, 2022 PNA, 2021
Regulating ecosystem services			
Water purification	The litter layer on the forest floor, made of fallen leaves, needles, and branches, absorbs and filters out excess nutrients and sediment from e.g. rainwater and agricultural runoff. As rainwater moves through the forest soil, the soil particles and the root systems filter out sediment, bacteria, and pollutants like nitrates, phosphates, and pesticides.		
Regulate water flow	**Infiltration.** Forest and trees impact the entry of water into soil, controlling forest floor runoff and soil and groundwater recharge which can regulate soil moisture and hydrological flows. In dry soils, the tree roots break through the hard surface and open passages where water can seep into the soil.		
	Stem water storage. Trees store water, allowing them to maintain high transpiration for some periods even when uptake from the soil is limited; this allows trees to emit vapour over more extended periods, thus influencing atmospheric moisture.		

Climate regulation	**Reducing local temperature and soil evaporation.** Forest and trees return energy and moisture to the atmosphere and create microclimates under tree canopies, thereby cooling the land surface and promoting precipitation.		PNA, 2021
	Carbon sequestration and storage. Water plays a key role in maintaining forests' carbon uptake and safeguarding already sequestered carbon.		CDN, 2022 PNA, 2021
Cultural ecosystem services			
Heritage value and cultural identity	Landscape-related "memories" from past cultural ties, mainly expressed through characteristics within cultural landscapes.		
Spiritual experiences	Holy or spiritual places important to spiritual or ritual identity, e.g. River Ganges in India, sacred forest groves, sacred plants or animals.		
Wellness, recreation and (eco)tourism	Pleasure, comfort, discovery and socialisation that takes place in leisure in nature and observing natural elements.		CDN, 2022 PNA, 2021
Education and research	Climate, topography, water cycle or soil and biota used for education and research.		
Aesthetic appreciation and inspiration	Visual perception of ecosystems and landscape.		
	Lakes and rivers represented in songs, poetry, paintings, etc.		

Comments

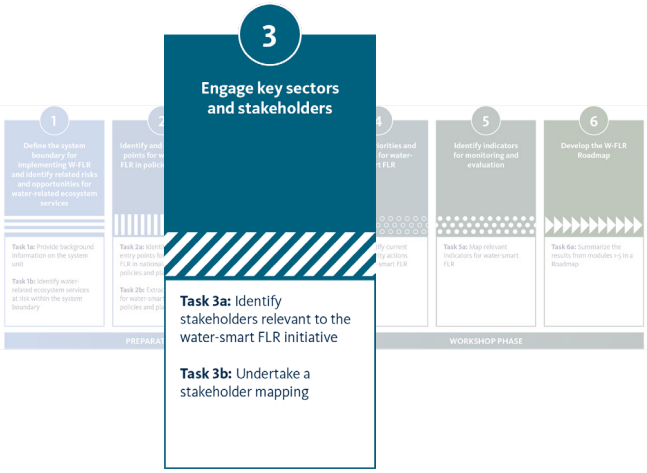
We can see that of the 20 ecosystem processes, 10 are at high risk, 3 are at medium risk, and 7 are at low risk. We note that all regulating ecosystem services are at high risk and that the majority of supporting ecosystem services are also at high risk. Conversely, all provisioning ecosystem services and the majority of cultural ecosystem services are at low risk.

We can see that only five of the 20 ecosystem processes are mentioned in the NDC, two in supporting ecosystem services and one in the other categories. As for the NAP, nine of the 20 ecosystem processes appear in this document. In total, combining the two national documents, ten of the 20 ecosystem processes are present in these reports. There are therefore overlaps and similarities with regard to the ecosystem processes addressed in these two documents.

Of the 10 ecosystem processes mentioned in the two national documents, seven are devoted to high-risk ecosystem processes, two to low-risk processes, and one to intermediate-risk processes. Consequently, of the 10 high-risk ecosystem processes, only three do not appear in the national documents reviewed. Of the three medium-risk ecosystem processes, only one was mentioned in the national plans.

Image 5. Erosion after slash-and-burn, Vakinankaratra, Madagascar. Source: SIWI.

Module 3: Engage key sectors and stakeholders



Objectives

- Identify and map stakeholders relevant to the FLR initiative, which you will invite to the Workshop Phase.
- Ensure representation of all stakeholder groups, including women, youth and indigenous people, and organisations directly affected by the FLR initiative in the Workshop Phase.

Why is this important?

- Forest restoration must be adapted to local conditions in everything from soil, hydrology, and native tree species to land tenure regulations and social structures.
- To fully understand the capacity, potential, and limitations of local conditions, it is helpful to involve a broad range of actors, stakeholders and sectors in the planning of the water-smart FLR initiative. This includes representatives from local communities and public interest groups, local non-governmental organisations and private companies operating in the selected landscape, and local government representatives.
- To be successful and sustainable in the long-term, the restoration initiative needs acceptance and support from the people who are directly affected by it, including women, youth and indigenous people. Local communities can play an important role in the planning process by ensuring that local traditions and knowledge are taken into consideration.

Task 3a. Identify stakeholders relevant to the water-smart FLR initiative

In this task, the aim is to identify which stakeholders (organisations/ companies/ ministries/ local groups/ etc.) to involve in the water-smart FLR initiative, by using a human rights-based approach (see Box 4). For sustainable and long-term change, it is necessary to ensure that all relevant stakeholders are involved in the process of developing a common vision. Consider involving stakeholders at all levels (national/sub-national/district/local) that are relevant for creating change within the system boundary. Ensure inclusivity by involving local communities, indigenous groups, women, and youth in the planning process. It is important for the sustainability of the initiative that the stakeholders involved are positive to the initiative and engage with constructive problem-solving minds.

Equally important as identifying the necessary sectors, ministries and agencies, is to find the right persons within these entities. Sometimes it is better to include deeply knowledgeable topic experts than top-executives, who may not be familiar with the technical aspects, but have prestigious positions to defend. In subsequent stages the representatives included will know best how to persuade the decision makers of their organisations.

Practical Task 3a: Identify stakeholders relevant to the water-smart FLR initiative

Map relevant sectors and stakeholders by listing all actors that may have a potential role in your water-smart FLR intervention. Include actors that have influence on and/or are interested in restoration, but also stakeholders that are affected by it. "Table 4. Potentially relevant stakeholders", in the **Practical Tasks Manager**, does not provide an exhaustive list, other additional stakeholders may be involved. The “explanation” column is optional and can be used to describe the potential role of stakeholders.

Aim at ensuring inclusivity and representativeness of all relevant groups, including women, youth, and indigenous peoples. In the comment box at the end of Table 4, in the **Practical Tasks Manager**, please indicate if you have faced any challenges in this regard, and reflect on gender inclusivity and the representativeness of vulnerable groups in your selection.

Box 4. Human rights and a human rights-based approach

A key element of any successful FLR initiative is to respect and protect the rights of the people affected by it. This can be achieved by applying a human rights-based approach (HRBA). The human rights system is adopted under international law by the United Nations, and it applies to every human being, regardless of nationality, gender, religious conviction, ethnic origin or any other such attributes. Human rights serve in parallel to other (domestic law) rights systems, such as property rights (land ownership, usage rights, etc.), water rights (permit to abstract water, to discharge wastewater, drill a well, build a dam, etc.), permits for forest clearance, plantation, diversion of forest land, etc., as well as nature conservation area regulations. In 2022, the UN adopted the human right to a clean, healthy, and sustainable environment which may be of high importance for water-smart FLR initiatives.

HRBA is especially important for poor and marginalized groups who often are disproportionately affected by water-related problems. Applying a human rights-based approach is important when growing water scarcity requires difficult prioritisations. It can help prevent a vicious cycle where the poor are at risk of falling further behind since they tend to be disproportionally affected by climate change and environmental degradation.

The main purpose of the HRBA is to further the realization of human rights, with the desired outcome of empowering all people – girls and boys, women and men, old and young – to claim their human rights (as rights holders) and to increase the capacity of those who are obligated to respect, promote, protect, and fulfil those rights (as duty bearers). The HRBA checklist below can be used to help empower people – not least the most marginalized – to participate in decision-making that concerns them and to hold accountable those who have a duty to act on or refrain from infringing on human rights. By considering the HRBA during all phases of your FLR intervention, it is possible to avoid discriminatory practices that would hinder and undermine human rights.

HRBA checklist

The Swedish Development Agency (Sida) uses the letters in P.L.A.N.E.T as checkpoints to consider and promote human rights in FLR. Each keyword represents one important principle of the human rights concept.

Participation: Is there active and meaningful participation available for all relevant stakeholders in the FLR intervention, including opportunities for participants to influence the formulation of problems, planning and implementation? Are there follow-up workshops and evaluations for improving future programs?

Linking to human right instruments: Does the FLR intervention include links to human right instruments, such as laws, treaties, and systems?

Accountability: Who are the duty bearers in forest restoration activities on local, district and national level? Do they have the necessary knowledge, mandate, resources, and willingness to ensure their human rights obligations? Are the rights holders capable of holding governments to account?

Non-discrimination: Are women, elderly persons, indigenous peoples, minorities, disabled, and other vulnerable groups considered in the FLR intervention? How can discrimination actively be counteracted?

Empowerment and capacity development: What capacity do duty bearers have to fulfil their obligations? What capacity do the rights holders have to claim their human rights? How can the ability of stakeholders to actively participate in the FLR intervention be strengthened?

Transparency: Is information available in an accessible way to duty bearers and rights holders? Can they attend and observe meetings and processes where issues that affect them are discussed?

Example: Stakeholders relevant to the water-smart FLR initiative – the Madagascar case study

STAKEHOLDER SECTORS:	SPECIFY (E.G. NAME OF ORGANISATION, AREA OF WORK, CONTACT INFORMATION):	EXPLANATION (OPTIONAL)
National level		

National ministries and regulatory agencies (e.g., Forestry, Agriculture, Environment, Climate, Energy, Water – see Task 3)	• Ministry of the Environment and Sustainable Development (MEDD)
	• Ministry of Agriculture and Livestock (MINAE)
	  – Rural engineering department (DGR)
	• Ministry of Water, Sanitation and Hygiene (MEAH)
	  – National Water and Sanitation Authority (ANDEA)
	• Ministry of Decentralization and Regional Planning (MDAT)
	• Ministry of Fisheries and the Blue Economy (MPEB)
	• Ministry of the Interior (MININT)
		Ministry of Agriculture and Livestock (MINAE) > Infrastructure work (dams, civil engineering, etc.)
		
		ANDEA > organization involved in integrated water resources management
		
		MININT > In the context of payments for ecosystem services (PES)

Non-Governmental Organisations (NGOs)	• RAN'EAU • CARE • WaterAid Madagascar • GRET • RIF/WPD: Rano Iankinan'ny Fampandrosoana/Water Pillar of Development • InterAide • ADRA • Office International de l'Eau (OIEau)	RIF/WPD to promote integrated water resource management at basin level, water master plans to ensure equitable management of river resources

Universities and research institutes	• University of Mahajanga
	  – Faculty of Science (specialization: Land Rural Water) at the Mahajanga University Institute of Technology and Agronomy (IUTAM)
	  – Life and environmental science
	• Diana School of Agricultural and Environmental Sciences (ESAED)
	• Ecole supérieure Polytechnique (ESPA) (Diana)	

National society	• Jiro sy Rano Malagasy (JIRAMA) • Natur'eau • Eau vive • Sainto • Star • Vitalo	Jirama is a water supply company (state-owned structure) Natur'eau, Eau vive, Sainto, Star, Vitalo to mineral water production company
Other:	UNICEF	Drilling operations
Regional/sub-national level		
Regional entity	• Directeur de la Valorisation de la Potentialité Economique (DVPE) • Directeur de Préservation de l'Environnement et de l'Ecologie au niveau de la Région Boeny (DPEE) • FLR Working Groupe (GT RPF) Boeny region	DVPE: Formerly known as the DDR in the Boeny Region
Basin organisations	• Regional Department for the Environment and Sustainable Development (DREDD) • Regional Department of Water, Sanitation and Hygiene (DREAH) • Regional rural engineering department (SGR) • Regional Directorate for Fisheries and the Blue Economy (DRPEB)	
Regional bureau/ Councils	Madagascar National Park (MNP)	
Other:		

Local/ district level		
District authorities and their technical agencies (e.g. agricultural extension)	• Authority of the Regional Department of Agriculture and Livestock – Ambatoboeny agriculture and livestock district • Authority of the Regional Directorate for Fisheries and the Blue Economy – Ambatoboeny fishing district • Authority of the regional environment and sustainable development department – Ambatoboeny environment and forestry cantonment	
Local communities	VOI KMTA reforesters in collaboration with Tany Meva	
Women associations	• Miaradia Women's Association (rice and market gardening) • Tsimanavaka Andranomandevy Women's Association	
Youth associations	Fikambanan'ny Tanora Andranomandevy (Youth association)	
Indigenous groups	Representative of displaced migrants (Marolambo, Andranomandevy)	
Water user associations	For the moment: The SBV Marolambo Management Committee, which plays this role	
Forest/smallholder associations	• Group of Members for Reforestation in Andranomandevy (GAR) • Association Antsika Piscicole (Pisciculture)	
Farmer cooperatives	Cooperative : Kaoperativa Mpiompy Trondro Andranomandevy (KMTA)	
Local committee	• Committee for the Fight Against Bushfires (Komity Miaro amin'ny Doro Tanety or KMDT Andranomandevy) • Sub-basin management committees (Bemangoraka, Marolambo, Masokena, Manondro, and Andavatsiotra) • Water Resource Committee (Komity Loharano in the Fokontany Andranomandevy)	
Locally active NGO's	NGO MAZAVA	
Private sector		
Value chain actors (Producers, processors, marketers, etc.)	Andranomandevy Mango Value Chain Cooperative	
Local plantation companies		
Other:		

Image 6. Agricultural land, Vakinankaratra, Madagascar. Source: SIWI.

Task 3b. Undertake a stakeholder mapping

Tasks 2a, 3a and 3b above give an indication of who to invite, based on where there is a need to better integrate water into existing plans and policies relevant to water-smart FLR within different sectors and planning instruments, such as NDCs, NBSAPs, IWRM plans and NPAs. Prioritise the stakeholders that are most relevant to the project. Preferably those who were identified to have high interest and/or high influence in the project. The number of people invited will vary from case to case, and can range from, for example, 5-20 people.

In this task, you will classify the actors that are relevant in your water-smart FLR initiative according to interest and influence, based on the RAPID Outcome Mapping Approach (ROMA). By knowing who has the **influence** to make change and who has the **interest** to make change, you can identify how to engage with the different categories of actors. Make sure to involve the stakeholders that are affected by the water-smart FLR initiative, identified in Task 3a.

- **Upper left box:** Actors with **high influence/power but low interest** are crucial for the change process to happen and should be targeted to develop their interest or capacity.
- **Upper right box:** Actors with **high interest and high influence/power** can be teamed up with in partnerships to work towards the intended goal.
- **Lower right box:** Actors with **high interest but low influence** can be used as influencers to raise the interest among actors with low interest and high influence.
- **Lower left box:** Actors with **low interest and low influence/power** can often be ignored. However, keep monitoring them to notice any potential changes in future interest or influence.

Practical Task 3b: Undertake a stakeholder mapping

In Figure 1 in the Practical Tasks Manager, place the stakeholders you identified in Task 3a in the relevant box for each stakeholder (see example opposite).

Then, use "Table 5: Selected stakeholders for the workshop" in the Practical Tasks Manager, to select relevant stakeholders to invite to the workshop based on the stakeholder mapping, aim for meaningful inclusivity and representativeness of all groups, especially youth, women and indigenous people. In the comment box, reflect on your effort on inclusivity and representativeness.

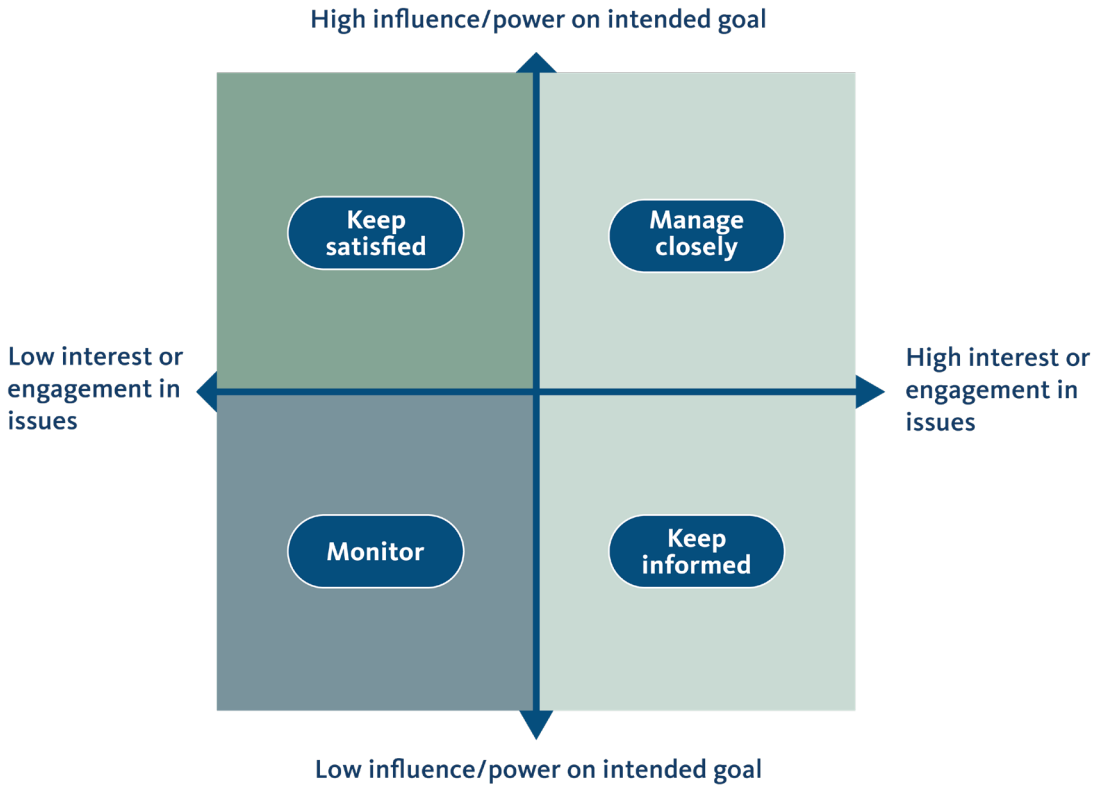
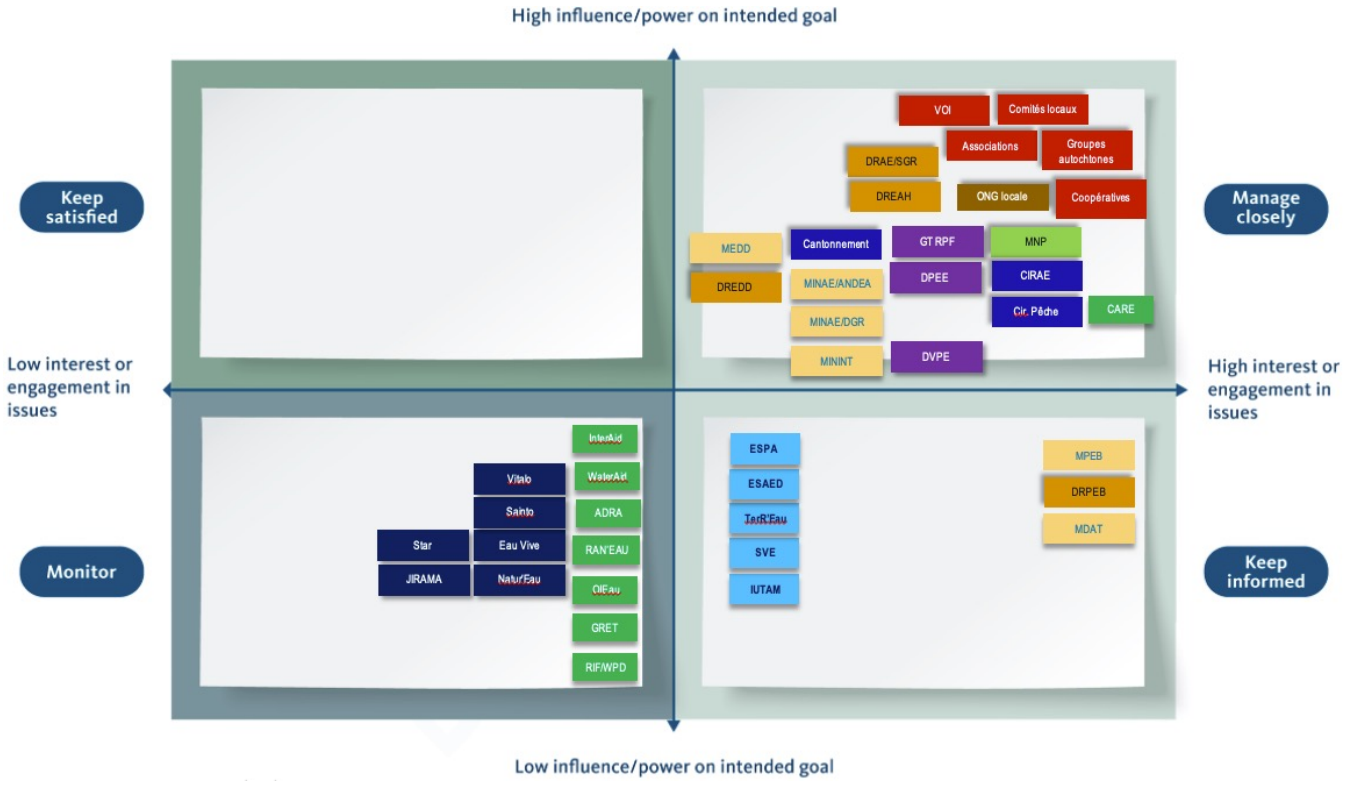


Figure 8. Stakeholder mapping grid. Source: SIWI.

Example: Stakeholder mapping – according to a SIWI-led W-FLR workshop in Madagascar.



Example: Selected stakeholders for the workshop.

N°	STAKEHOLDERS	SECTORS	NUMBER OF PARTICIPANTS
1	GIZ	Development Cooperation	4
2	SIWI	Water governance	2
3	Chief of village	Local communities	1
4	Elected municipal representative	Local authority	1
5	A representative	NGO	1
6	A representative	Women association	1
7	A representative	Youth association	1
8	A representative	Academic	1
9	A representative	Loggers	1
10	A representative	Hunters	1
11	A representative	Farmers	1
12	A representative	Forests	1
13	A representative	Mining operation	1
14	A representative	State water services	1
15	A representative	Local Water Committee	1
Comments (e.g. efforts/ challenges to ensure inclusivity, representativeness):			
Relevant representatives of women, youth, and local groups were invited to the workshop.			

Preparation for the workshop

Before the workshop:

1. Prepare the material from the preparatory phase to be presented to W-FLR stakeholders

The material that needs validation, is the results from Module 1 on the background information and water risks and opportunities of the targeted area as well as relevant results from the Module 2 analysis. It may be necessary to adapt the material that is presented to the workshop participants. Local stakeholders, like farmers and landowners, may not have insight into specific writings in national policies and plans, while, on the other hand, national stakeholders may not hold expertise in specific land-use approaches and hydrological issues in the targeted system boundary. The results from Module 3 should not be presented in the workshop, but it is still important to ask the participants if there are key stakeholders to the W-FLR initiative that they are missing in the workshop.

2. W-FLR training with national stakeholders

Once you are ready to share the results of the preparatory phase, we recommend organising a training (it can be in-person or online) with national stakeholders to introduce the W-FLR Tool and present the results from Modules 1 to 3. The purpose of this training is to validate the results in the preparatory phase and discuss current national objectives, policies, and plans regarding water-smart FLR interventions. It can further be useful to provide inputs to local stakeholders on the current work and vision at national scale.

The process is now entering the Workshop Phase, and it is time to plan and invite the relevant stakeholders identified and mapped in Module 3 to a workshop.

Image 7. W-FLR workshop together with Forests4Future and local stakeholders, Boeny, Madgascar. Source: SIWI.

4. The W-FLR handbook - workshop phase

Why organise a workshop?

During the workshop, the stakeholder group will work together to identify priorities and readiness for water-smart FLR (Module 4), identify relevant indicators for a monitoring and evaluation system for the W-FLR initiative (Module 5), and develop the water-smart FLR Roadmap (Module 6). The focus of the workshop is to create a shared understanding of the necessity for water-smart FLR among participants. Participants will share their perspectives and knowledge of opportunities for restoration, as well as current obstacles, barriers, and potential solutions.

Main objectives

The main objective of the workshop is to create a shared understanding among participants on the necessary steps for water-smart FLR. This includes:

- Module 4: Identifying priority actions for capacity development, mainstreaming and implementation, to ensure the readiness of the water-smart FLR intervention.
- Module 5: Identifying indicators for monitoring and evaluation (M&E), to ensure that the water-smart FLR project is implemented correctly and performing as expected.
- Module 6: Develop the water-smart FLR Roadmap by compiling the results from Modules 1-5.

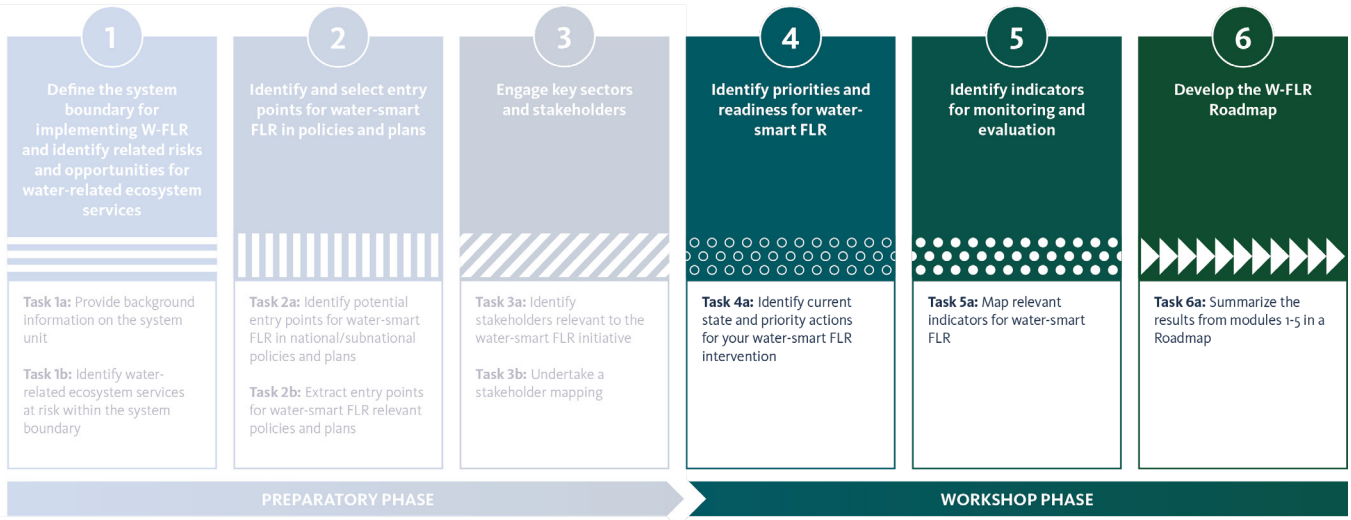
Workshop outcome

The aim of the workshop is to create a common understanding of water-smart FLR and to initiate a collaboration among relevant stakeholders that can aid the policy mainstreaming, capacity development and successful implementation of W-FLR in your project or new FLR initiative under development. The co-developed Roadmap will provide guidance on the specific priority actions needed to ensure water-smart FLR in your project/initiative.

How to organise a workshop?

When planning a workshop, it can be of help to take the following into consideration:

- If possible, the workshop should take place in person. The facilitated dialogue and forming of relationships between participants are key for a successful workshop.
- Make sure you have a space or venue big enough for the number of people that will participate, as well as room for presentations and group work.
- Consider and decide on how much time will be allocated for the workshop. This can vary from 2-3 days, depending on system boundary, capacity and sectors of the stakeholders, etc.



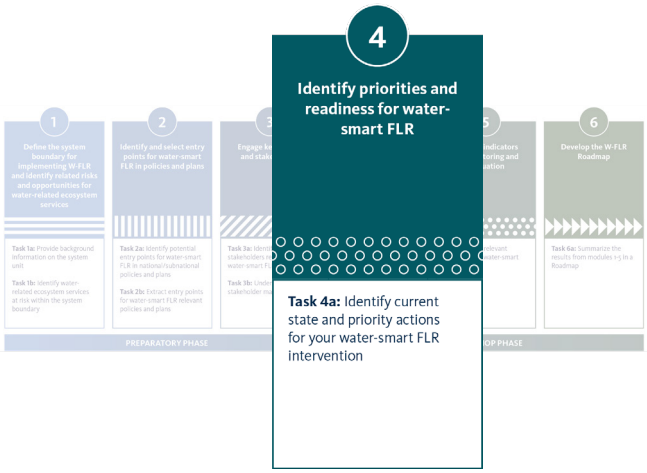
- Prepare materials needed such as papers, pens, sticky notes, tape, etc. It can also be of use to have a wall or board to display the material produced (such as notes or mind maps) during the workshop.
- Provide invited participants with the results from the Preparatory phase (Module 1-3) ahead of the workshop, so they can familiarise themselves with the material and share their comments with the facilitator a couple of weeks prior to the workshop. This is essential for validation of the results from the Preparatory phase.
- If the workshop is taking place online, make sure to use an app/program that allows smooth interaction between participants, for example break out rooms, online whiteboard, etc.
- It is also important to allocate sufficient time to introduce and conclude the workshop, where participants are informed of the objective and can reflect on the outcomes of the workshop.

The agenda for the workshop can vary depending on participants, scope of the project, etc. However, the following is a suggested program for the workshop:

1. Welcome and introduction of all participants. (add suggested time for each point)
2. Provide a brief introduction of the objective of water-smart FLR and what outcomes you want to achieve with the workshop.
3. Validate/ Adjust the results from Module 1-3 by discussing them with the invited participants.
4. Include a short break if necessary.
5. Introduce Task 4 in Module 4. If the group is more than 6 people, it can be a good idea to break it up into smaller groups of 3-5 people.
6. Let the group(s) work on Task 4. It can be helpful to provide materials such as paper, pens, and sticky notes, for the group to brainstorm and compile their ideas.
7. If participants have discussed in smaller groups, let them briefly present their key ideas and conclusions.
8. Do step 5-7 again for Module 5 and Module 6. Include short breaks if necessary.
9. Facilitate a general discussion on participants' and working groups' results from Module 4-6. Summarise the outcomes and ask the group if there is anything else to be added, that has not already been brought up.
10. Inform participants on next steps.

Image 8. Protected land with sacred baobab trees, Menabe, Madagascar. Source: SIWI.

Module 4: Identify priorities and readiness for water-smart FLR



Objectives

Assess the readiness of the water-smart FLR initiative by identifying priority actions to make FLR more water-smart within your system boundary in three major domains:

- **Policy mainstreaming** – water needs to be integrated and reflected in policy instruments and plans relevant for water-smart FLR.
- **Capacity development** – key stakeholders need to understand the benefits of FLR and to have capacity to identify how they can engage in water-smart FLR at different levels.
- **Implementation on-the-ground** – identifying how to implement water-smart FLR on the ground using existing tools and best practice databases.

Why is this important?

- For water-smart FLR to be viable in the long term, there needs to be a conducive enabling environment and supportive policies in place that integrate water into relevant plans and budgetary commitments. If this is not the case, the readiness for water-smart FLR is low and **policy mainstreaming** for decision-makers at national, regional and/or local levels should be a priority.
- **Building institutional and technical capacity** among the identified stakeholders at relevant level(s) is also required to design water-smart FLR interventions and monitoring systems that consider water. Building this capacity is necessary before the implementation of water-smart FLR can start at scale.
- **Implementation** of the restoration initiative should only start when policy mainstreaming and capacity development are sufficient. Still, the methodology of this task can also improve the effectiveness and longevity of existing and ongoing restoration initiatives that lack support from national, regional and local decision-makers and capacity among stakeholders.

Task 4a. Identify current state and priority actions for your water-smart FLR intervention

The main aim of the W-FLR Tool is to assess readiness for water-smart FLR in your restoration initiative, and to ensure that the correct measures have been taken to implement an effective and long-lasting restoration intervention. This may not be the case if mainstreaming of water in relevant policies and plans for FLR has not taken place or if overall capacity in integrating water into FLR is low. However, the W-FLR Tool methodology can also improve the effectiveness and longevity of existing and ongoing restoration initiatives, by providing a methodology to ensure support from national, regional and local decision makers and capacity among stakeholders. Also, small pilots or demonstrations of implementation of water-smart FLR could be started in parallel with policy mainstreaming and capacity building interventions. Below follows some guidance on how to identify priorities for the different domains and already available tools that could be used in this process.

1. Identify priorities for mainstreaming of water in policy and plans relevant to FLR

The W-FLR workshop is the first step in mainstreaming issues relevant to water-smart FLR into existing and planned policies and plans. It includes discussing priority actions that are required to ensure that the forest-water nexus is considered in relevant strategies, policies and plans. There are several good examples of integrated approaches that mainstream water into policies and plans, such as the Integrated Water Resource Management approach, the landscape approach and the Source-to-sea approach (Ingemarsson et al., 2022, chapter 9). Another example of an integrated approach is the NDCs, though the forest-water links are generally missing (UNDP-SIWI Water Governance Facility, 2023). Instead, in the NDCs, it can be useful to search for issues addressing forests or water that are relevant for water-smart FLR.

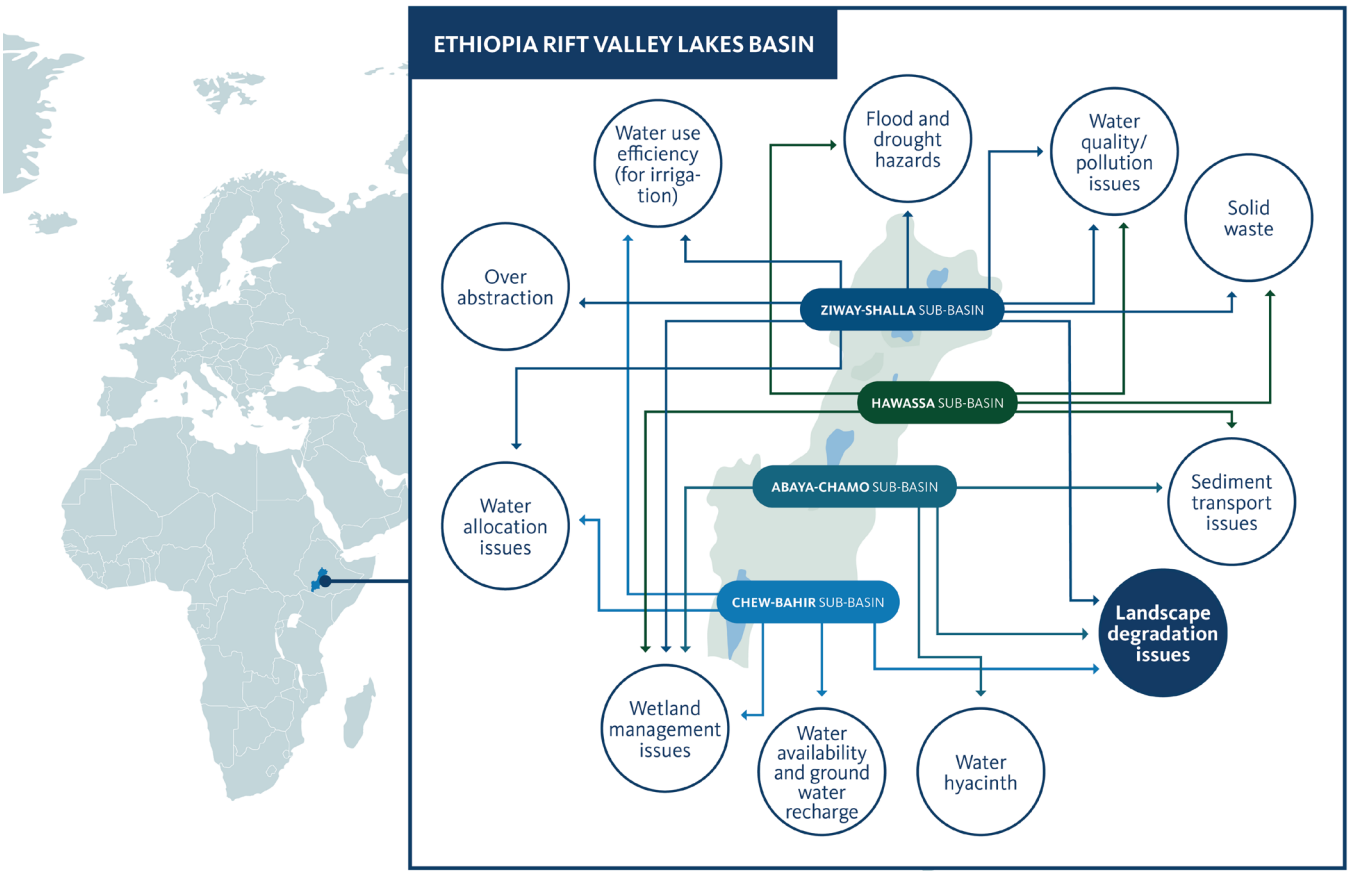


Figure 9. Key challenges in the Ethiopia Rift Valley Lakes Basin and its four sub-basins of endorheic lakes. Landscape degradation issues are affecting three out of four sub-basins. Source: SIWI.

With respect to IWRM that has water as the main entry point for planning, there can be a need to instead mainstream FLR into basin and watershed plans. Figure 9 shows an example of how the landscape approach and FLR have been linked to IWRM policy and planning in Ethiopia. The key is to recognise and assess all relevant ecosystem services provided by different ecosystems and land uses within the river basin system boundary. It is important to link participatory land-use planning with basin and sub-basin planning to maintain the provision of critical ecosystem services from different land uses. This includes the provision of food, energy, and freshwater; the regulation of hydrological flows; the carbon and nutrient cycles; and cultural services, such as recreation and tourism. This approach is being demonstrated in the Ethiopia Rift Valley Lakes Basin and its four sub-basins of endorheic lakes where deforestation is one of the key drivers of loss of water-related ecosystem services (Mekuria et al., 2021) and landscape degradation and associated sedimentation threatens most of the lakes.

Learn about integrated approaches:

More information about integrated approaches can be found in the webinar: Unpacking freshwater's role: Joint climate action through integrated approaches

The webinar explores in what ways integrated approaches, that account for the interconnections between freshwater and climate mitigation, are necessary to achieve water-wise climate mitigation. A brief summary of chapter 9, "Achieving climate mitigation through integrated and cross-sectoral approaches", is held, followed by presentations on the Source-to-Sea approach and Integrated Water and Landscape Management for water-wise climate mitigation measures.

One way of ensuring a water-sensitive approach to climate adaptation and resilience in national climate plans (both NDCs and NAPs) is the **Water Resilience Tracker for National Climate Planning**. The Tool is a diagnostic guide aimed at strengthening national climate plans and turning climate commitments into effective, bankable investments that meet national and global climate targets. The goal is to help countries self-assess and strengthen water resilience in their national climate plans.

2. Identify priorities for capacity development in water-smart FLR

Identifying priorities and readiness for water-smart FLR also involves assessing capacity development needs of stakeholders. This is based on the stakeholder analysis conducted in Module 3, where stakeholders with low interest or awareness, but with high influence were identified (Task 3b). Capacity development in water and FLR can be a first step in engaging them, taking for example the **Forest and Water Nexus course** can provides an overview of forest and water relationships to create an understanding of the impacts of changing landscapes on water resources.

3. Plan for the implementation of water-smart FLR

When you have conducted the necessary activities for mainstreaming water in policy and plans relevant to FLR and developing the water-smart FLR capacity of stakeholders, it is time to start planning the implementation of water-smart FLR. There are many tools that can give useful support when you are planning the implementation. Depending on the ecology and hydrology of your restoration area, as well as the identified water risks that you are targeting, there are different tools and databases of best practices that can give valuable insights to your planning. Start by familiarising yourself with existing tools to see if they can help you to solve the specific water challenges in your FLR intervention. Relevant tools include:

- **Blue Targeting (BT)** is a tool for best management practice (BMP) for forestry along small streams. The tool was originally developed by WWF Sweden in cooperation with the forestry sector. It was constructed for small streams (width approx. <10 m) in boreal and Scandinavian conditions. However, by changing the in-data, the tool can be adapted to streams in other biomes. The main objective of the tool is to identify the right measure at the right place to the right extent (Henrikson, 2018). Since 2017 BT is in operational use by the Swedish Forest Owners Association when developing forest management plans. Swedish companies with large forest areas have implemented BT at a landscape level in pilot studies. It has also been adapted for Baltic States and Russia and is being tested to be used in Brazil.
- **The Water Footprint Assessment Tool** can assist in assessing the water footprint (WF) of a product by estimating the total volume of freshwater used to produce the product (le Roux et al., 2017). WF accounting divides water consumption into blue water use, which includes water from rivers, dams and underground sources, and green water use, which includes water stored in the soil and available for vegetation growth (see Box 1 for more info about blue and green water). It is based on relatively simple calculations by considering the runoff fractions from certain land uses to become blue water available within a catchment or basin.
- **WET-Ecoservices tool** is developed for South Africa and provides quick ecosystem service assessments of wetlands useful for decision-makers, governments, planners, consultants, and educators (Rebelo et al., 2019). The first step is to classify the wetlands into hydro-geomorphic types, such as seep, valley-bottom, floodplain, and depression. It assesses 15 ecosystem services using scores from 0 to 4 based on questionnaires that have been developed for each ecosystem services. Scores are based on field observations or easy-to-do measurements, calculations and information from literature, databases, and expert knowledge.
- **Tool kit for Ecosystem Service Site-based Assessment (TESSA)** emphasises the importance of comparing estimates for alternative states of a restoration site (for example, before and after conversion to agriculture) so that decision-makers can assess the net consequences of such a change, and the benefits for human well-being that may be lost through the change or gained by conservation (Neugarten et al., 2018). It requires primary data collection including vegetation surveys, soil

sampling, and stakeholder consultations, and can therefore be time consuming depending on the context.

- **Restoration Opportunities Assessment Methodology (ROAM)**, developed by the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Resources Institute (WRI), involves a stepwise and iterative application of a series of analyses to identify the best set of FLR opportunities applicable to a specific area (Hanson et al., 2015). Important steps include stakeholder prioritisation of restoration interventions, restoration opportunities mapping, economic modelling, and validation, followed by cost-benefit carbon modelling using relatively simple tools, such as **the EX-Ante Carbon-balance Tool (EX-ACT)**, diagnostic of presence of key success factors, and finance and resource analysis.

Another tool for ensuring water-smart FLR is to identify relevant cases of implementation in best practices databases. One good source of best practices is **the World Overview of Conservation Approaches and Technologies (WOCAT)**. WOCAT is a database where you can search for sustainable land and forest management and restoration practices, while also gaining experiences for subsequent scaling up (see example in Box 5). Best practice examples can also be useful in communication with relevant stakeholders to illustrate the methodology and benefits of water-smart FLR. WOCAT and other relevant databases can be found on the **Framework for Ecosystem Restoration Monitoring** (FERM) platform, developed by FAO and partners under the UN Decade on Ecosystem Restoration. FERM serves as a platform to monitor, collect, and disseminate good restoration practices from around the globe.

Practical Task 4a: Identify current state and priority actions for your water-smart FLR intervention

Together with workshop participants, identify priority actions for water-smart FLR in the three following pillars, 1) policy mainstreaming, 2) capacity development, and/ or 3) implementation, to gain an overview of the readiness for water-smart FLR within your system boundary. The actions should be based on the results and facts compiled from Modules 1-3, including water-related ecosystem services at risk and the aim of the project, as well as participants' experiences, knowledge and suggestions (see example on page 48). Use paper notes during the workshop and then, report the actions in Table 6 of the **Practical Tasks Manager**.

As a workshop facilitator, you will guide the discussion and may need to help the participants sorting and if necessary, narrowing down the proposed activities under the most relevant pillar. Some priority actions may involve activities that are relevant to more than one pillar. Therefore, it is important to take time during the workshop to ensure clarity of the action with participants.

After outlining the actions, the next step is prioritization, where participants will vote to determine the most urgent and relevant actions. Each participant will receive five stickers from the workshop facilitator to place on the key actions that are most important to them across the different pillars. Participants are allowed to place two or more stickers on the same action to strengthen their vote.

Image 9. Voting process during W-FLR Workshop in Madagascar together with Forests4Future and local stakeholders. In picture, Rasoamahafaly Augustine, Chief of Division of Environmental Education, Boeny. Source: SIWI.

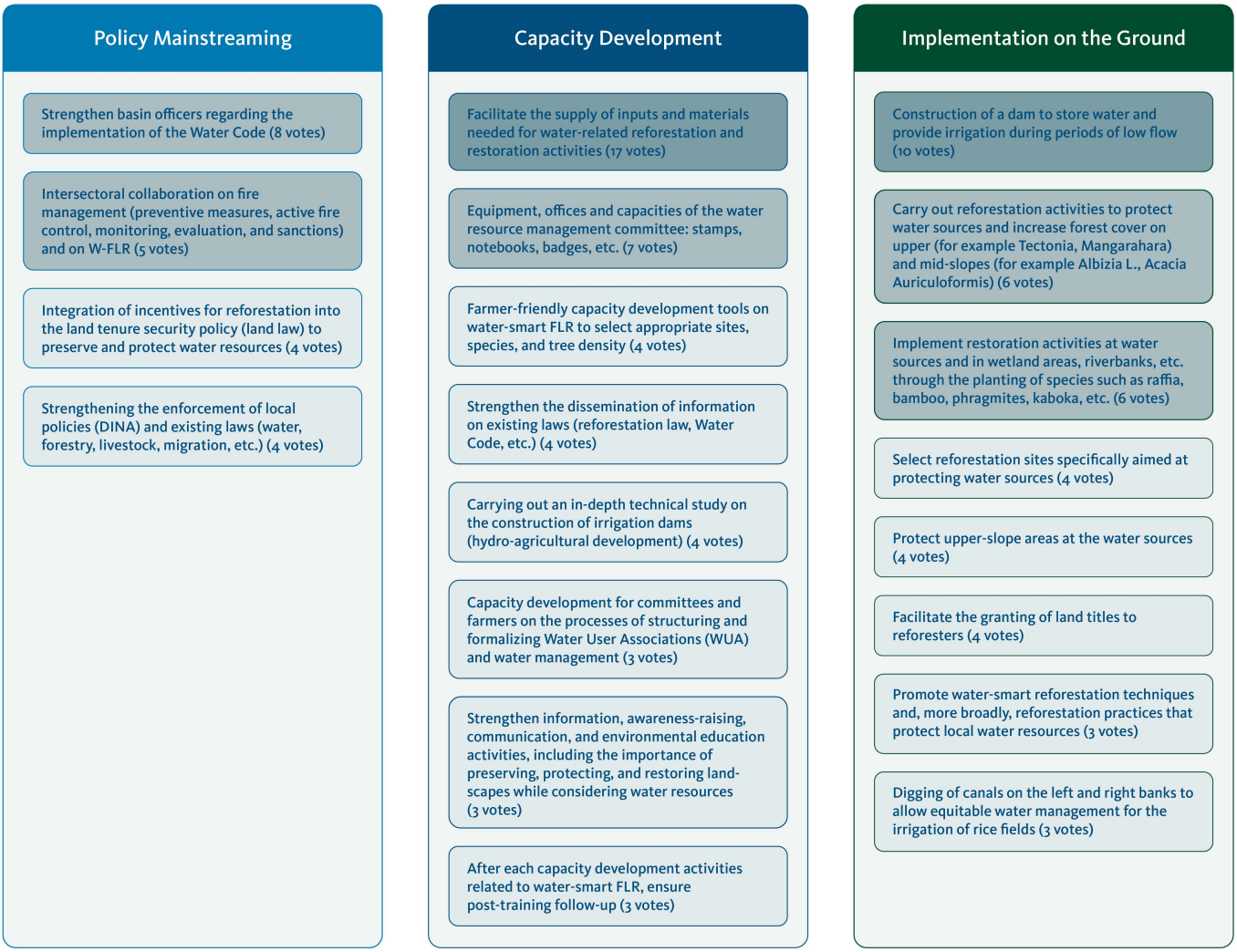


Figure 10. Example of how to visualize the ranking of priority actions.

The voting results may indicate insights on the level of readiness for water-smart FLR, where, for instance, more votes within the implementation domain may suggest that the readiness for water-smart FLR is high and vice-versa. If the analysis shows that policy coherences and general knowledge and capacity is sufficient for water-smart FLR, the resources should be invested in identifying and implementing actions on the ground. At that stage, the focus should be on enhancing water-related ecosystem services through water-smart implementation techniques e.g., choosing nursery and planting practices suitable for the ecosystem, ensuring an optimum tree cover, and using tree species that are adapted to the local environment and hydrology.

After the workshop, the W-FLR team should – based on their expertise – interpret the results in conjunction with the results from previous Modules and input from local and national experts to ensure a comprehensive analysis. The identified actions should be ranked within each pillar according to number of votes. It can be useful to make a figure showing the ranked actions (see example in Figure 10). Potentially, the team also want to suggest additional actions that they see are needed for successful W-FLR. Those should then be given the lowest rank with a guiding text explaining that they are added by the W-FLR team after the workshop.

Next, the actions with the highest ranks – the priority actions – should be inserted into "Table 6: Priority actions and indicators for your water-smart FLR interventions" in the Practical Task Manager, in order of rank. It can be helpful to categorize the priority actions as high, moderate and low priority depending on level of votes. This can guide the post-Roadmap discussions on next step and responsible entities. It is sometimes efficient to address several priority actions at the same time. Policy mainstreaming activities with key sectors may be combined with targeted capacity building, as well as demonstration of water-smart FLR in a smaller scale pilot project. A best practice example within a watershed or forest landscape can help illustrate water-smart FLR to other stakeholders while also gaining experience for subsequent scaling up (see Box 5).

Tips:

- Actions must align with the needs identified in Module 1-3 and relate to water-smart FLR
- Actions must follow a holistic approach to also preserve ecosystem services that are at low risk
- Actions must consider water resources. If not, kindly ask participants to revise their actions
- Ensure that participants vote for actions across pillars and not within each pillar
- Ensure that women, youth and other relevant marginalized groups are involved in the process of elaborating of actions

Example: Priority actions for your water-smart FLR intervention – the Ethiopian case study

TASK 4A: PRIORITY ACTIONS	POLICY MAINSTREAMING OF WATER-SMART FLR	CAPACITY DEVELOPMENT IN WATER-SMART FLR	IMPLEMENTATION OF WATER-SMART FLR	TASK 5A: INDICATORS
Action 1 – Advocate for policy reforms integrating water-related ecosystem services in national/ regional policies	Develop and adopt guidelines for W-FLR integration into existing policies.			
Action 2 – Promote cross-sectoral collaboration to ensure W-FLR		• Strengthen technical W-FLR capacity of government agencies and local institutions • Develop W-FLR training programs for local stakeholders		
Action 3 – Monitoring and evaluation (M&E) integration of water in FLR initiatives	Develop indicators to track progress and assess the impact of FLR interventions on water-related ecosystem services, biodiversity, and livelihoods.	Train staff in data collection, analysis, and reporting methods using a mix of methods including Citizen Science, Remote Sensing and GIS, etc...	Monitor and evaluate ongoing W-FLR projects to ensure they meet water-smart criteria and adjust practices as needed.	
Action 4 – Restore degraded forests/ wetlands to improve water regulation/ filtration		Identify priority areas for forest and wetland restoration.	Develop and implement restoration plans for degraded areas, including tree planting, wetland rehabilitation, and erosion control measures.	
Action 5 – Promote integrated landscape management (ILM) using e.g. the Learning Watershed approach		Provide training to equip stakeholders with the knowledge/ skills needed to apply these frameworks (e.g. the FAO/SIWI e-training on the Forest-Water Nexus).	Pilot ILM and Learning Watershed approaches in FLR.	
Action 6 – Assess the benefits of W-FLR			Develop and implement framework for assessing impact of W-FLR on water-related ecosystem services.	
Action 7 – Ensure alignment of national/ regional strategies with international commitments	Establish multilevel Task Force on alignment of national and regional strategies with international commitments in MEAs, AFR100, etc.			
Action 8 – Strengthen early warning systems for water-related risks		• Improve early warning systems at national level for floods, droughts, and water quality issues. • Train local communities on early warning systems/ emergency response.	Invest in infrastructure for early warning systems, such as weather stations and communication networks.	

Box 5 . A best practice example on Gmelina-Based Agroforestry for improved soil, biodiversity and optimization of the hydrological cycle

Image 10. Gmelina trees in Savalou, Benin. Source: WOCAT.

Gmelina trees as a basis for an agroforestry system help increase the soil's organic matter content, foster associated biodiversity, optimize the hydrological cycle, mitigate soil erosion, and generate income.

Gmelina arborea trees are used in agroforestry systems. This technology serves multiple purposes, including:

- Restoring and preserving soil fertility
- Enhancing the microclimate
- Mitigating soil erosion and degradation caused by runoff water
- Reducing the soil's reliance on mineral fertilizers
- Acting as a windbreak to mitigate damage from strong winds

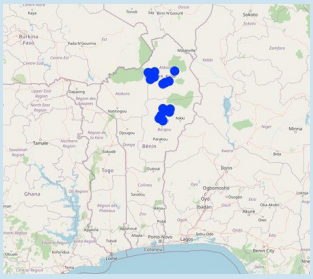
The planting process begins with clearing, staking and drilling. The seedlings are then planted at intervals of 2 m within rows and between 2.5 and 3 m between rows, resulting in a density of just over 1,000 seedlings per hectare.

To optimize the use of the plots where Gmelina seedlings are introduced, producers adopt the taungya system where seedlings are planted within annual crops like soybeans or maize. This approach offers the advantage of reducing initial plantation maintenance costs.

With respect to management procedures, weeding is conducted once or twice annually, and firebreaks are set up to mitigate the risk of bush fires. Additionally, clearing, pruning, and thinning operations are carried out. The thinning performed by producers reduces the number of trees per hectare to 750 and 450 for the first and second thinning respectively. They do so to leave the most vigorous trees standing for the production of economically valuable timber at the final cut. The harvests consist of poles.

The third and fourth thinning operations, which result in the production of logs (sawn timber and/or poles of various diameters), will take the plantation to around 250 and 150 trees per hectare respectively. It is worth noting that since the documented plantation was established, thinning has been carried out at intervals of 5 to 7 years, depending on the site's productivity index (soil production capacity).

For producers, the implementation of this technique generates several income-generating activities. These include both timber and non-timber products. Producers even install beehives.



Location: Savalou, Collines, Benin

No. of Technology sites analysed: Single site

Spread of the Technology: Evenly spread over an area approx. < 0.1 km2 (10 ha)

In a permanently protected area?: No

Date of implementation: 2016

Type of introduction: Through projects/ external interventions

Source: WOCAT

Module 5: Identify indicators for monitoring and evaluation

Objectives

- Identify types of indicators to integrate into participatory monitoring and evaluation systems for the water-smart FLR initiative.

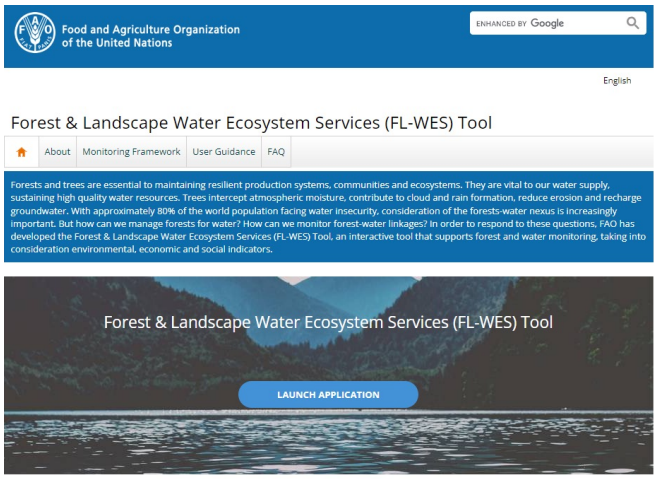
Why is this important?

- It is essential to ensure that water-smart FLR projects are implemented correctly and performing as expected so that the intended benefits can be achieved – this is done through a monitoring and evaluation (M&E) system with relevant indicators.

Task 5a. Map relevant indicators for water-smart FLR

- An M&E system is a support to evaluate that project resources are used efficiently and effectively which often is a requirement from donors/financing institutions. To increase the probability of the solutions being implemented, it is important to ensure that the water-smart FLR intervention is a participatory process where all relevant stakeholders are included.
- Different types of indicators are relevant for the three categories of water-smart FLR interventions:
  - **Policy mainstreaming** – indicators that describe the integration of the forest-water nexus in relevant policies and plans (e.g. number and type of policies and plans, cross-sectoral coordination mechanism, type of water-smart FLR measures recommended, etc.).
  - **Capacity development** – indicators that describe the number and type of stakeholders that have capacity to engage in water-smart FLR in different sectors and at different levels in implementation and M&E.
  - **Implementation on-the-ground** – number and type of water-smart FLR practices implemented on a given area of land and number of local beneficiaries disaggregated by gender, etc.

The Forest & Landscape Water Ecosystem Services (FL-WES) tool is designed to increase our understanding of forest-water interactions and ensure that they are taken into account in policy and management decisions. The FL-WES tool can assist the user in selecting the most relevant forest-water indicators and monitoring methods based on factors such as context, management, budget, resources, and technical expertise. The user can log in to the FL-WES tool and complete the Guidance survey. Based on the results in the survey, it will be possible to identify relevant indicators and variables that can be used to monitor the priority actions in Task 4 above. There may exist other tools that are more relevant for a specific water-smart FLR intervention.



Note that our entry point to water-related ecosystem services is based on a wider landscape perspective compared to the FL-WES tool. Therefore, there may be sub-indicators relevant for your water-smart FLR initiative in all the indicator categories listed in the FL-WES tool, and not only the category "Water-related Ecosystem Services". In addition to the FL-WES tool, FAO is also providing relevant information on how to monitor FLR in the FAO e-learning course Monitoring

Forest and Landscape Restoration. To ensure inclusiveness and diversify the data, we recommend using Citizen science (see Box 6). Linking the assessment to geospatial data through e.g. remote sensing and water balance modelling tools can also support you in determining water risks and water balance.

Setting-up community-based monitoring requires properly outlining and following a series of steps. Further reading on the topic is provided by the SIWI/ IWMI Training Manual on Hydrological Impacts of Watershed Management.

Practical Task 5a: Map relevant indicators for water-smart FLR

Based on Task 4a, identify measurable indicators for your priority actions related to policy mainstreaming, capacity development, and/or implementation using one or several of the M&E tools and approaches discussed above (see example on the next page). Use Table 6 in the Practical Tasks Manager.

Box 6. Citizen science, and local and indigenous knowledge

Citizen Science (CS) is an approach where non-scientists are actively involved in generating new scientific knowledge. CS is about co-generation of knowledge and interactive learning exchange. It brings citizens into the democratic dialogue to answer questions such as: How to better capture and understand local experiences, concerns, and solutions to water challenges? How to support local implementation to reach specific water related targets? How to link these actions to relevant governance structures and adaptive governance? CS methods are not the standard way data is collected in the field of water. Data variables commonly collected include precipitation, streamflow, water quality, and water use. In scientific programs, expensive instruments are often used to collect these data, with no accessibility for local citizens. All these variables can be also collected using quite simple, cheap instruments, including buckets and timers, and given the opportunity, CS can contribute with certain tools/methods to develop new ways of collecting data.

Figure 11. Steps involved in hydrological monitoring using citizen science. Source: SIWI adapted from (Haile & Tengberg, 2021)

The CrowdWater App is one example of independent and reliable data collection by citizens. It can be used for modelling of floods and droughts and as a supplement to existing measurements. The information can be shared among citizens and other tool users. The method is developed scientifically by the University of Zurich such that it can be applied in remote areas and regions with low data availability. The project is supported by the Swiss National Science Foundation.

Figure 11 gives an example of the steps involved hydrological monitoring using citizen science in Ethiopia.

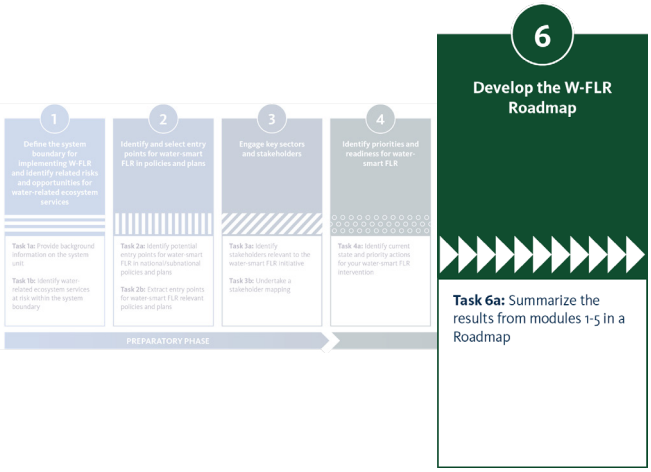
Example: Priority actions for your water-smart FLR intervention – the Ethiopian case study

TASK 4A: PRIORITY ACTIONS	POLICY MAINSTREAMING OF WATER-SMART FLR	CAPACITY DEVELOPMENT IN WATER-SMART FLR	IMPLEMENTATION OF WATER-SMART FLR	TASK 5A: INDICATORS
Action 1 – Advocate for policy reforms integrating water-related ecosystem services in national/ regional policies	Develop and adopt guidelines for W-FLR integration into existing policies.			• Guidelines for integration of W-FLR into relevant policy frameworks • No. policy reforms advocated • No. policies updated
Action 2 – Promote cross-sectoral collaboration to ensure W-FLR		• Strengthen technical W-FLR capacity of government agencies and local institutions • Develop W-FLR training programs for local stakeholders		• No. cross-sectoral meetings held • No. stakeholders trained • No. technical capacity assessment
Action 3 – Monitoring and evaluation (M&E) integration of water in FLR initiatives	Develop indicators to track progress and assess the impact of FLR interventions on water-related ecosystem services, biodiversity, and livelihoods.	Train staff in data collection, analysis, and reporting methods using a mix of methods including Citizen Science, Remote Sensing and GIS, etc...	Monitor and evaluate ongoing W-FLR projects to ensure they meet water-smart criteria and adjust practices as needed.	• Indicator framework for W-FLR • No. of staff trained on W-FLR indicators • No. of projects/ programmes evaluated/ adjusted to integrate water indicators
Action 4 – Restore degraded forests/ wetlands to improve water regulation/ filtration		Identify priority areas for forest and wetland restoration.	Develop and implement restoration plans for degraded areas, including tree planting, wetland rehabilitation, and erosion control measures.	• Area of forests and wetlands restored • Improvement in water quality and quantity • Increase in biodiversity
Action 5 – Promote integrated landscape management (ILM) using e.g. the Learning Watershed approach		Provide training to equip stakeholders with the knowledge/ skills needed to apply these frameworks (e.g. the FAO/SIWI e-training on the Forest-Water Nexus).	Pilot ILM and Learning Watershed approaches in FLR.	• No. of ILM projects implemented focused on the forest-water nexus
Action 6 – Assess the benefits of W-FLR			Develop and implement framework for assessing impact of W-FLR on water-related ecosystem services.	• Framework developed and implemented
Action 7 – Ensure alignment of national/ regional strategies with international commitments	Establish multilevel Task Force on alignment of national and regional strategies with international commitments in MEAs, AFR100, etc.			• No. strategies aligned with international commitments • Amount of financial support provided by GCF, GEF, etc. • No. partnerships established

Action 8 – Strengthen early warning systems for water-related risks		• Improve early warning systems at national level for floods, droughts, and water quality issues. • Train local communities on early warning systems/ emergency response.	Invest in infrastructure for early warning systems, such as weather stations and communication networks.	• No. early warning systems established • Effectiveness of early warning systems in reducing impacts of disasters

Image 11. Natitingou, Benin. Source: SIWI.

Module 6: Develop the W-FLR Roadmap



Objectives

- Develop a Roadmap that will indicate whether priority actions and next steps should involve policy mainstreaming, capacity development and/ or implementation.
- Take you to the stage where you are ready to start identifying how to implement water-smart FLR on the ground using existing tools and best practice databases.

Why is this important?

- The purpose of the Roadmap is to create an overview of the results compiled in the different W-FLR Modules, so that this information can form the basis for future water-smart decisions in FLR.
- The Roadmap can also be used to share results with the stakeholder group for continued collaboration on integrating water into FLR in relevant sectors and plans, building capacity of key stakeholders, and implementing joint water-smart FLR initiatives on the ground.

Task 6a. Summarize the results from modules 1-5 in a Roadmap

After the workshop, the W-FLR team will compile the results from the W-FLR method into a Roadmap, in the form of a short report (about 20 pages). This Roadmap will provide results from the assessment of water-related ecosystem services to consider (Module 1) as well as their current integration into policy and practice (Module 2), entry points for how water can be integrated into relevant policies and plans (Module 2), key sectors and stakeholders to involve and influence (Module 3), priority actions related to policy mainstreaming, capacity development and implementation (Module 4), and, indicators for monitoring and evaluation (Module 5). Synthesise the results in a report as shown in Task 6a on the below.

The draft Roadmap is then to be reviewed by the key stakeholders that contributed with knowledge and inputs during the Workshop phase. This is an important step since the W-FLR Tool methodology is designed as a co-creative process, where the Roadmap should be developed in collaboration with key W-FLR stakeholders. The involvement of relevant stakeholders is essential to ensure that all perspectives, needs and demands are taken into consideration, a crucial step in developing a long-term viable and effective restoration initiative.

Practical Task 6a: Summarise the results from Task 1-5 in a Roadmap

The water-smart FLR Roadmap will have the following headings:

1. **Introduction to the W-FLR area in focus**
2. **Water-related ecosystem services to consider and as well as their current integration into policy and practice**
3. **Entry points for how water-related ecosystem services can be integrated into relevant policies and plans**
4. **Key sectors and stakeholders to involve and influence**
5. **W-FLR Roadmap, priority actions and indicators related to policy mainstreaming, capacity development and implementation**
6. **Summary of the system readiness for W-FLR**

Circulate the draft Roadmap to key W-FLR workshop participants for them to review the results. Revise the document based on the feedback and share it again with the stakeholders to reach a consensus on the results.

5. Next steps

With your water-smart FLR Roadmap, you should now have a clear idea of where to start integrating water into your restoration initiative. Below are some suggested next steps that are not covered in detail by this manual but are essential to ensure that the water-smart FLR Roadmap is implemented.

- Present the water-smart FLR Roadmap to key policy and decision-makers at local and national level.
- Organise follow-up workshops with key sectors to discuss responsibilities for implementing priority actions.
- Identify existing tools and best practice databases that could be used in implementing the Roadmap.
- Mobilise resources to implement water-smart FLR actions.

Identifying sources of funding for the different actions in the Roadmap can be done in different ways. Policy mainstreaming can often be financed through existing sector budgets once there is awareness about the importance of including water in FLR-related activities. Capacity development could be funded by a wide range of sources and normally requires less funding than the implementation stage. Funding for capacity development and implementation could be accessed through both multilateral and bilateral mechanisms. Especially climate finance has an important role to play, as water-smart FLR could support both climate change adaptation and mitigation (see Box 7). Market-based instruments, such as payments for ecosystem services (PES) and Public-Private Partnerships (for e.g. establishment of tree nurseries) could also be considered.

Box 7. Climate finance for water-smart FLR

A number of financial mechanisms can be accessed to mitigate as well as to adapt to climate change in mosaic landscapes, with a focus on water. Here are some examples:

The **Global Environment Facility (GEF)**, financial mechanism of the Rio Conventions, was set up in 1991 to fund the incremental costs of addressing global environmental problems related to climate change, biodiversity loss and land degradation. In addition, it has also evolved to fund costs related to international waters, and persistent organic pollutants. It has increasingly supported integrated programs across two or more environmental issues and sectors to foster synergies and address more drivers of environmental change (Tengberg & Valencia, 2018). The new GEF cycle will seek to promote a green, blue, and resilient recovery, and create pathways to an equitable, nature-positive, and carbon neutral world (Global Environment Facility & World Bank Group, 2021).

The **Least Developed Countries Fund (LDCF)** helps recipient countries to address their short-, medium- and long-term resilience needs and reduce climate change vulnerability in priority sectors, including the water sector, and ecosystems. LDCF support helps countries implement National Adaptation Programs of Action (NAPAs). It also supports the implementation of National Adaptation Plans (NAPs), and the Least Developed Countries work program under the UNFCCC. The LDCF, along with the **Special Climate Change Fund (SCCF)**, is mandated to serve the Paris Agreement. Both funds are managed by the GEF. The SCCF provides support to the adaptation needs of Small Island Developing States (SIDS), and also facilitates the creation of strong, climate-resilient economies and communities by helping countries address a range of barriers, including: limited access to climate-resilient technologies and infrastructure; limited institutional capacity to foresee and manage climate risks; low engagement by the private sector, including small and medium-sized enterprises and entrepreneurs, for developing and providing adaptation solutions; and lack of access to finance from public sources and to markets for adaptation solutions.

The **Green Climate Fund (GCF**) was established at COP16 in Cancun in 2010 as the new primary climate finance mechanism by the Parties of the UNFCCC. The GCF funds both climate change mitigation and adaptation as well as cross-cutting interventions that combine the two. It is guided by an objective to promote a paradigm shift towards low-emission and climate-resilient development pathways (Green Climate Fund, 2021).

In addition to GEF and GCF, the 1997 Kyoto protocol set up a **Clean Development Mechanism (CDM)**. Article 12 defines a CDM whereby high-income countries (Annex 2 countries) earn certified emission reductions through projects implemented in low-income countries. However, since CDMs are not an instrument under the Paris Agreement, the mechanism is currently phased out. Instead, a new central mechanism will take its place under **Article 6.4** of the Paris Agreement once its rules and regulations have been adopted.

The **Adaptation Fund (AF)** was established in 2001 to finance concrete adaptation projects and programs in developing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. The AF is financed with a share of proceeds from the CDM project activities and other sources of funding. It has been decided that the Adaptation Fund shall serve the Paris Agreement and once the share of proceeds becomes available under Article 6, paragraph 4, of the Paris Agreement, the Adaptation Fund shall no longer serve the Kyoto Protocol.

Some Land-Use, Land-Use Change and Forestry (LULUCF) projects can also access funding through **Reduce Emissions from Deforestation and forest Degradation in developing countries (REDD+)**. REDD+ is recognised in Article 5 of the Paris Agreement, where parties reiterated encouragement to implement REDD+ activities and that these should be an integral part of climate action. Challenges to implementation of REDD+ on-the-ground include problematic policy design processes, limited engagement with local communities, and that limited access to water and land among poorer households in REDD+ schemes can raise pressure on protected forests (Duchelle et al., 2018).

Thus, the GEF, GCF and the AF serve the Paris Agreement and fund priority projects in developing countries related to both mitigation and adaptation identified in **Nationally Determined Contributions (NDCs)**. NDCs are non-binding national plans highlighting climate actions, including climate related targets for greenhouse gas emission reductions as well as policies and measures governments aim to implement in response to climate change.

At COP28 climate change conference in Dubai, a formal decision was taken to establish a **Loss and Damage Fund** to support developing countries to deal with loss and damage from climate change. The fund aims to provide financial assistance to nations most vulnerable and impacted by the effects of climate change. Loss and damage refer to the negative consequences that arise from the unavoidable risks of climate change, many of which can be relevant for water-smart FLR like prolonged heatwaves, desertification, and extreme events, such as bushfires, floods and droughts.

A number of countries have pledged funds to the Loss and Damage fund, for example, the host nation of COP 28, the United Arab Emirates, pledged $100 million, as has Germany, while the EU has pledged €25 million and the United States $17.5 million. There remain many unclarities regarding e.g. what types of losses and damages that should be covered, and how the funds will be administered and paid out. These are central issues to sort out for the fund to be able to function fully.

There are also numerous bilateral mechanisms and foundations that could provide finance for implementation of water-smart FLR that could be identified on a case-by-case basis.

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