Food and Agriculture Organization of the United Nations

ADVANCING THE FOREST AND WATER NEXUS

A CAPACITY DEVELOPMENT FACILITATION GUIDE

ADVANCING THE FOREST AND WATER NEXUS

A CAPACITY DEVELOPMENT FACILITATION GUIDE

Ute Eberhardt, Elaine Springgay, Victoria Gutierrez, Sara Casallas-Ramirez, Rachel Cohen

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, 2019

Required citation:

Eberhardt, U., Springgay, E., Gutierrez, V., Casallas-Ramirez, S. and Cohen, R. 2019. *Advancing the forest and water nexus: A capacity development facilitation guide*. Rome, FAO.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO.

ISBN 978-92-5-131859-1
© FAO, 2019

Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO endorses any specific organization, products or services. The use of the FAO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons licence. If a translation of this work is created, it must include the following disclaimer along with the required citation: "This translation was not created by the Food and Agriculture Organization of the United Nations (FAO). FAO is not responsible for the content or accuracy of this translation. The original [Language] edition shall be the authoritative edition."

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization http://www.wipo.int/amc/en/mediation/rules and any arbitration will be conducted in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

Third-party materials. Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Sales, rights and licensing. FAO information products are available on the FAO website (www.fao.org/publications) and can be purchased through publications-sales@fao.org. Requests for commercial use should be submitted via: www.fao.org/contact-us/licence-request. Queries regarding rights and licensing should be submitted to: copyright@fao.org.

Contents

Acknowledgements

This publication has been produced with generous contributions of time and knowledge from a number of experts. Initiated in 2017, the process to prepare the Facilitation Guide included pilot trainings in Cambodia, Ethiopia, India and Viet Nam – FAO is grateful to all the facilitators, workshop participants and others who supported these. In particular, FAO thanks Aida Bargues Tobella, Chandra Ghimire, Kevin Jeanes and Sooyeon Jin for sharing their feedback and experiences in facilitating the workshops.

The Facilitation Guide also benefited from the contributions of Angela Bernard-Socciarelli, Jacob Bourgeois, Sally Jansen, Cara Pratt and Vitor Vannozzi Brito. FAO extends gratitude to the reviewers, who enhanced the publication: Justin Chisenga, Rosalie Fuentes, Michelle Geringer, Sameer Karki, Laura Máiz-Tomé, Lotta Samuelson, Marlos De Souza and Ekrem Yazici.

Elaine Springgay coordinated the publication, with the assistance of Sara Casallas Ramirez and support from Yuka Makino. Special thanks goes to the editor Clare Pedrick, and Kate Ferrucci who performed the layout.

Executive summary

Forests are intrinsically linked to water – forested watersheds provide 75 percent of our accessible freshwater resources (Millennium Ecosystem Assessment, 2005) – and both forest and water resources are relevant to the achievement of all 17 Sustainable Development Goals (SDGs). Despite the important interlinkages, the forest-water nexus is often unaccounted for in policy and planning. For example, three-quarters of forests are not managed for soil and water conservation, which poses a fundamental challenge to achieving sustainable and resilient communities and ecosystems (FRA, 2015 and Abell *et al.*, 2017).

It is paramount to adopt an integrated approach to forest and water resources in management and policy, which takes into account the complexity and contextual nature of forest-water relationships. To achieve this, we must improve our understanding of forest-water relationships within local contexts and at different scales, as well as our ability to design, implement, and learn from landscape approaches that both rely on these forest-water relationships, and have an impact on them.

In this context, the Food and Agriculture Organization of the United Nations' (FAO) Forest and Water Programme has developed a module-based capacity development workshop guide for forest, water and land managers, as well as project and community stakeholders involved in forest, water and natural resource management. The aim is to ensure that we apply our knowledge to better manage forests and trees for their multiple benefits, including water quantity, quality and the associated socio-economic benefits on which people within and outside forests so heavily depend.

The overall objective of the capacity development programme is to improve the **management of forests and trees for the provision of water-related ecosystem services**. This can be achieved through:

- An improved understanding of forest-water relationships and the contribution of these interactions to water and food security, as well as community resilience.
- The inclusion of water considerations in forest and/or land-use planning, as well as the incorporation of forests as natural solutions to water management.

The capacity development programme has been designed to be flexible, according to the needs of the participants or projects. It is based on the understanding that participants have a variety of relatable experiences and different sets of skills and knowledge that can be leveraged and repurposed to better address forest-water issues in their forest and tree management activities. The programme promotes an interactive approach to learning, using practical exercises and field activities to build on theoretical knowledge.

This facilitation guide has been developed to support both expert facilitators with some natural resource management understanding, and technical forest-water experts with limited training experience in practical settings. The guide provides learning and facilitation tools and recommended workshop scheduling, as well as background information, key messages, resources and presentations on the following topics:

- Introducing forest-water relationships
- Understanding the impact of changing landscapes on water
- Monitoring forest-water relationships
- Field study – Monitoring for forests and water
- The forest-water nexus in action
- Measuring the benefits of the forest-water nexus

©CANVA

Introduction

Mainstreaming an integrated approach to forest and water resources in management and policy is paramount in order to achieve sustainable and resilient communities and ecosystems. To achieve this, we must improve our understanding of forest-water relationships, as well as our ability to design, implement and learn from landscape approaches that both rely on these forest-water relationships, and have an impact on them.

It is acknowledged that the relationships between forests and water are complex and context specific. The range of forest-water interactions, and the way in which different processes and effects occur at different spatial and temporal scales, can be challenging. In particular, **we urge caution with regard to generalized assumptions: what is true for one location may not be true for another**. There is therefore a need for more research and monitoring on forest-water interactions, as well as on forest management for water-related ecosystem services.

For this reason, capacity development in the forest-water nexus is required, so as to ensure that we apply our knowledge to better manage forests and trees for their multiple benefits, including water quantity, quality, regulation and the associated socio-economic benefits on which people within and outside forests so heavily depend.

Forest and water relationships are relevant to the achievement of all the Sustainable Development Goals (SDGs). In particular, the forest-water nexus has a direct impact on the SDGs aimed at achieving clean water and sanitation (SDG 6), supporting life under water (SDG 14), and maintaining life on land (SDG 15). They also have an indirect link to the SDGs that seek to address food security (SDG 2); combat climate change (SDG 13); provide benefits to sustainable cities and communities (SDG 11); and support affordable and clean energy (SDG 7). Regulatory water-related ecosystem services influence water availability, which is important for addressing gender equality (SDG 5), since women and girls are most often burdened with fetching water; it is estimated that women and girls collectively spend more than 200 million hours per day carrying water (UNICEF, 2016). Restoring degraded lands and maintaining forests to regulate stream flow and recharge groundwater is likely to improve the accessibility of water resources, reducing the time required to collect water. It is therefore important to consider water-related ecosystem services when making forest management decisions such as species choice, so that forests are managed in sustainable and responsible ways – thereby contributing to SDG 12: sustainable consumption and production patterns – and maximize water-related ecosystem services, thereby contributing to the well-being and resilience of people and the environments that sustain them.

In this context, FAO's Forest and Water Programme is promoting a capacity development programme, whose overall objective is to improve the **management of forests and trees for the provision of water-related ecosystem services**. This can be achieved through an improved understanding of forest-water relationships and the contribution of these interactions to water and food security, and to community resilience. Also important will be the inclusion of water considerations in forest and/or land-use planning and management, as well as the incorporation of forests as natural solutions to water management. In order to achieve this objective, a module-based facilitation guide has been developed for the delivery of capacity development workshops for project and community stakeholders involved in forest, water and natural resource management.

Objective

This guide is intended to provide appropriate background information, resource materials and a proposed facilitation plan to support the delivery of a participatory learning workshop, or capacity development programme on the forest-water nexus.

Specific learning objectives:

- To develop an understanding of forest-water interactions within local and broader contexts.
- To conceive specific activities and/or actions that take an understanding of forest-water interactions into account.
- To design a forest-water monitoring plan and system that can work for the local context, ensuring that activities appropriately address forest-water relationships.

Learning outcomes (see page 11 for further explanation of learning outcomes):
At the end of the workshop, participants will be able to:

- Characterize and discuss how forest-water interactions may apply to their region, area, project and/or activities.
- Demonstrate the ability to adequately monitor water (quantity and quality) and other relevant forest-water relationships.
- Describe and explain the implications of forest-water interactions on the forest, land, water body, watershed and/or natural resource management within local and other contexts.
- Design next steps of a forest-water strategy or action plan for their region.

Target audiences for training:

1. Forest/land/water management and restoration practitioners engaged in the development and/or implementation of integrated forest, land, water and natural resource management.
2. Project staff engaged in forest-related projects or activities.
3. Community stakeholders engaged in forest and tree management, as well as water and other types of natural resource management, and/or project beneficiaries with some technical knowledge.

The training material for all sessions will provide homogenous technical content for the workshops delivered by different trainers. This does not mean that content is identical – it will have to be aligned with the respective situations and contexts of projects and participants. Key messages, underlying principles and main topics will be consistent between the workshops.

Who is this guide for?

The intended users of this guide are training facilitators who will organize and deliver capacity development training related to 'forests and water'. Here they will find methodological guidance and a set of materials designed to undertake effective training on the forest-water nexus.

The facilitation guide will be helpful for technical and subject matter experts experienced in academic or formal education settings, who may have less exposure to participatory adult learning and capacity development. It will also support expert capacity development facilitators with some technical knowledge of natural resource management, especially forest, land and/or water management.

How to Use this Guide

This guide is designed with a modular curriculum to allow for flexibility, depending on the needs and learning objectives of the participants, as well as their existing capacities and knowledge. The guide also provides guidance on the preparatory and follow-up activities that are important for delivering effective capacity development. These include pre- and post-workshop participant surveys and reporting.

There are 6 modules in total, covering the basic theory of the forest-water nexus and its role in the greater landscape, as well as modules that describe how to measure/monitor forest-water relationships and take them into consideration in management. Modules have recommended resources for further reading, as well as other supporting materials. Workshop trainers are encouraged to customize presentations, background documents and case studies according to the learning objectives of the participants and the local contexts.

Each module has the same structure:

- **At-a-glance**: a one page introduction to the module including learning objectives and outcomes, key messages, required materials and basic details on the sessions included in the module;
- **Background**: information providing the essential theory and/or fundamental principles that the facilitator should be familiar with prior to facilitating any trainings;
- **Sessions**: details about the sessions, including recommended activities and timing, as well as supplementary materials, such as handouts.

The background sections at the beginning of each module will provide broad information that may be included as key messages. These messages will serve as the basis to more national or local contextualized information that the facilitator should prepare prior to the workshop in order to complement the broader context with local realities.

Additional resources, including case studies can be found on the FAO Forest and Water Programme webpage, as well as the FAO SFM Toolbox. Facilitators are invited to share other materials used during training with Forest-and-Water@fao.org to improve the resources database and curriculum.

©FAO/JAKE SALVADOR

Boxes and icons

To facilitate rapid identification of training components, content is organized in text boxes throughout the guide. To identify such components, the following icons are used:

TABLE 1. BOXES AND ICONS USED IN THE DOCUMENT

	DEFINITION BOXES	these define or explain concepts, perspectives or approaches.
	HANDOUT	for active and group work.
	KEY MESSAGE	or point of interest worth highlighting.
	LEARNING OUTCOMES	these indicate what participants will be able to do as a result of the learning session(s).
	MATERIALS	needed for the workshop or session.
	OBJECTIVES	these define the expected knowledge that participants will gain from the session.
	POWERPOINT	slide available
	RESOURCES	materials for interactive exercises, further reading etc.
	TEMPLATE	examples that can be adapted.
	TIME	indicates the suggested time per session or activity.
	TIPS	these boxes present recommendations, tips and tested advice.

Selecting Modules

The actual duration of the workshop is contingent on the modules and sessions selected and on a minimum one-day field study. If all modules are selected, it is advised that multiple workshops be conducted, so as to enable progressive learning. Workshop duration will also depend on the location of the field study area, and may have to be extended accordingly.

MODULE 1 **Introducing forest-water relationships**

MODULE 2 **Understanding the impact of changing landscapes on water**

MODULE 3 **Monitoring forest-water relationships**

MODULE 4 **Field study – Monitoring for forests and water**

MODULE 5 **The forest-water nexus in action**

MODULE 6 **Measuring the benefits of the forest-water nexus**

The modules selected should be based on the workshop participants and their learning objectives. The should ideally be based on an assessment of existing capacity and learning needs conducted

before the workshop. For example, an awareness-raising workshop for a high-level audience would have a recommended duration of 1.5–2 days, covering Modules 1 and 2. A technical workshop targeting practitioners would have a recommended duration of 5–6 days, covering Modules 1–5, or 7 days if it covered Modules 1–6. It is recommended that if all modules are required, the training should be divided into two workshops: the first covering Modules 1–5, and the second reviewing modules 3–5 and adding Module 6.

TABLE 2. MODULES AND TARGET AUDIENCES

Target audience	The importance of the forest-water nexus		Monitoring forest-water relationships		Forests & water in action	Measuring impact
	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Policy-makers	■	■				
Technicians; practitioners; natural resource managers	■	■	■	■	■	■
Community members engaged in natural resource management	■	■	■	■		■
General public	■	■				

TABLE 3. WORKSHOP GOALS, ASSOCIATED MODULES AND POTENTIAL TARGET AUDIENCE

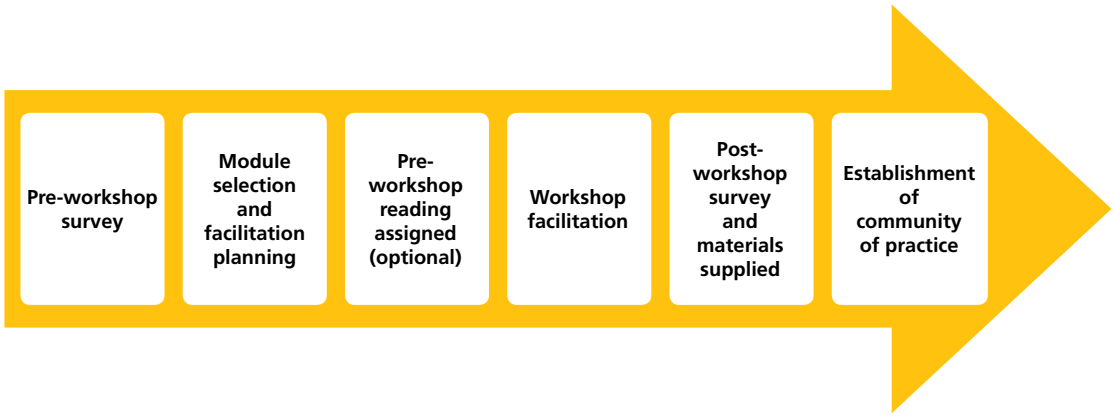
Goal	Modules	Potential target audience
Introduction to the forest-water nexus, raising awareness, or clarifying terminologies and concepts.	Module 1	Policy-makers; technicians; practitioners; community members
	Module 2	
Learning how to measure forest-water relationships to establish a baseline, or monitor changes.	Module 3	Practitioners; technicians; community members
	Module 4	
Identifying actions or activities to manage for the forest-water nexus.	Module 5	Technicians; practitioners
Learning how to measure socio-economic impacts as a result of managing for the forest-water nexus	Module 6	Technicians; practitioners; community members

Preparation and general tips

Training situations vary significantly. The materials and suggestions provided in this guide should therefore be considered as an orientation tool to conduct successful training. The knowledge and skill levels of participants, their needs and the training context (complexity of the project in which the trainees are involved, composition of groups, location, etc.), are factors that need to be taken into account when planning the workshop and choosing the modules.

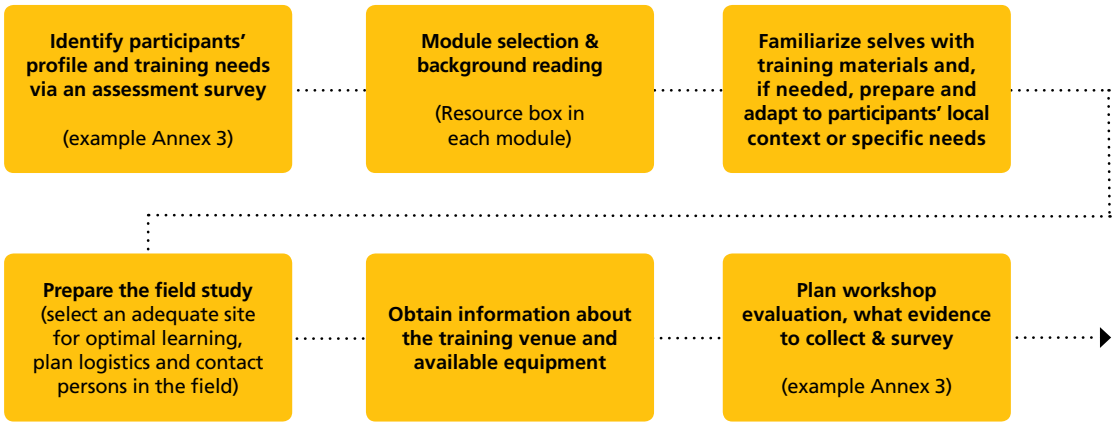
> **TIP**
>
> This guide includes many interactive learning opportunities for participant discussion and involvement, with templates and examples that can be adapted.

Capacity development is a long-term process that requires a number of steps before and after a workshop, or a series of trainings are delivered:



The facilitator should **follow a number of steps** in order to prepare for the training, as shown in Figure 1.

FIGURE 1
Preparing for the training



A careful assessment of these different elements is recommended prior to starting preparation, so as to plan realistically for the work and time required to conduct a successful workshop. In addition to setting aside the time required to prepare for the training workshop, it is critical to bear in mind that acquiring a full understanding of the proposed methodology, and good familiarity with this facilitation guide (and how to use it), may require additional preparation time that should not be underestimated. It should be noted that the following timings are suggestions only – concrete planning depends on the situation of each trainer and workshop.

In general, the training organizers should begin preparation approximately 4 to 6 weeks prior to training. The facilitator(s) should be involved in some of the early preparatory activities, including choosing appropriate module options, as well as resources and activities, depending

on the needs and learning objectives of participants, their experience and knowledge, and the equipment and resources available.

Depending on their familiarity with participatory methods and the specific context of participants, facilitators should start working on materials approximately 2–3 weeks prior to the workshop. Please note that additional time may need to be allocated to certain modules or components, since issues with technology may occur, and there may be a need for more in-depth discussions/clarifications, etc.

See Annex 2 for an example of a facilitation plan and the need for flexibility. Sessions and activities may need to be adjusted as the day progresses, and should be reviewed during breaks and at the end of every day.

TABLE 4. PREPARING FOR THE TRAINING: SUMMARY OF STEPS

Period	Activity	Persons responsible
4–6 weeks before start of workshop	Identify participants and decide on which module option should be organized.	Organizers together with trainer/facilitator
	Invite participants – mention that project concept notes and monitoring plans should be brought to the workshop, if available.	Organizers
	Choose workshop facilitation/organization team.	
	Choose a training venue.	
Depending on need and availability of translators and complexity of language(s).	Translation of the training material into local language(s) (if applicable), and inclusion of a local facilitator as part of the facilitation team.	Organizers
2–3 weeks before start of workshop	Analyse participant profiles, projects and context.*	Trainer/facilitator
	Identify field study area and visit the area (if possible).	Trainer/facilitator, maybe together with workshop organizers
Depending on familiarity of trainer with the topic 2–3 weeks before.	Review background reading and compile studies or knowledge material relevant to the local context, including national, regional or local case studies.	Trainer/facilitator
Depending on familiarity of trainer with the methodology of collaborative adult training:	Review facilitation guide and underlying methodology.	Trainer/facilitator
1–2 weeks before start of workshop	Identify/adjust training material (case studies, PowerPoint presentations, examples) to the local context and workshop participants.	Trainer/facilitator
A few days before start of workshop	Adapt flow of workshop, including tasks for group work and timing of activities, as per participant needs.	Trainer/facilitator
	Prepare equipment (computer, projector) and visuals.	Organizers and trainer/facilitator

* This analysis enables the trainer to define priorities in the training programme, such as:
- Topics for presentation on Day 2 (Session 2.2), including case studies or participant projects.
- Selecting adequate elements of the FAO monitoring plan to be presented (methods/tools for measuring, Sessions 3.3, 4.3, 6.2 and 6.3).

Successful facilitation

Main principles of adult learning

Participant-centred training for active learning

CAPACITY DEVELOPMENT

Capacity development is a process based on understanding that participants have their own reference points and experiences that serve as a foundation for learning. Adults already have a variety of relatable experiences and different sets of skills and knowledge that can be leveraged and repurposed. They seek concrete answers and solutions to problems they are facing.

Adults who will be attending these workshops are actively engaged in professional activities. Rather than starting from scratch, they are **already experienced and possess different sets of skills and knowledge with relevance to the training topic**. They are often under time pressure due to their obligations, and do not want to 'waste time' on tedious and irrelevant training.

©FAO/SARA CASALLAS

Training events should therefore be based on participants' own learning objectives and needs. This information may be based on previous discussions and/or needs assessments. However, it is highly recommended that all intended workshop participants complete a pre-workshop survey, which assesses existing knowledge and experience, and identifies short- and long-term learning objectives.

Contents addressed during the training should focus on elements that deepen the existing understanding of participants, and allow them to gain new insights relevant to their professional responsibilities and challenges. Furthermore, all content should be tailored to local conditions and knowledge. This will ensure that participants understand and are able to apply the concepts presented during the workshop.

Problem-solving approach

Participants in a training/capacity development process are seeking **solutions to challenges that they face in their specific professional context**:

- Solutions to one or several problems with which they are confronted;
- Help on how to change an unsatisfactory situation;
- Knowledge and skills needed for implementation of new concepts or strategies related to innovations, new laws and regulations, or situations needing a new approach.

Workshop participants are therefore in need of skills and attitudes that allow them to be more efficient on a professional level. Concepts and theories presented in the workshop should be closely related to skills and capabilities they require in order to deal with their professional problems and challenges. For this reason, effective training (objectives, volume and complexity of contents, methods, tasks, etc.) must be designed around those needs.

Engaging training methods for active and experiential learning

Learning is most effective when learners are active. Therefore, in successful workshops for adult learners:

- **Participants are important resources**. Participants are not just consumers, but help to shape the teaching/learning process – their knowledge and experience enrich the training.
- **There is active participant engagement**. The teaching methods must mobilize the participants, engage them and allow them to share responsibility for the teaching/learning process.
- **Use is made of real-life scenarios**. Training takes into consideration different situations that participants may face, in order to build appropriate skills and approaches.
- **Relevant case studies are incorporated**. Group work based on real cases of participants are planned in order to prepare future implementation.
- **Learning continues outside the classroom**. Field studies related to the workshop topics are incorporated, to allow for the application of new knowledge and skills.

Crucial factors for successful capacity development include sharing experience, mutual learning, and forging a strong link between learning activities and implementation of new skills and knowledge in the professional contexts and realities of participants.

Learning activities in capacity development processes

LEARNING ACTIVITIES

Adults learn and remember best by actively experimenting or 'learning by doing', reflecting on and internalizing lessons drawn from experience. The key to conducting experiential training is to avoid providing the answers, and instead to strengthen the analytical and technical capacities of learners by encouraging reflection through practical demonstrations and exercises.

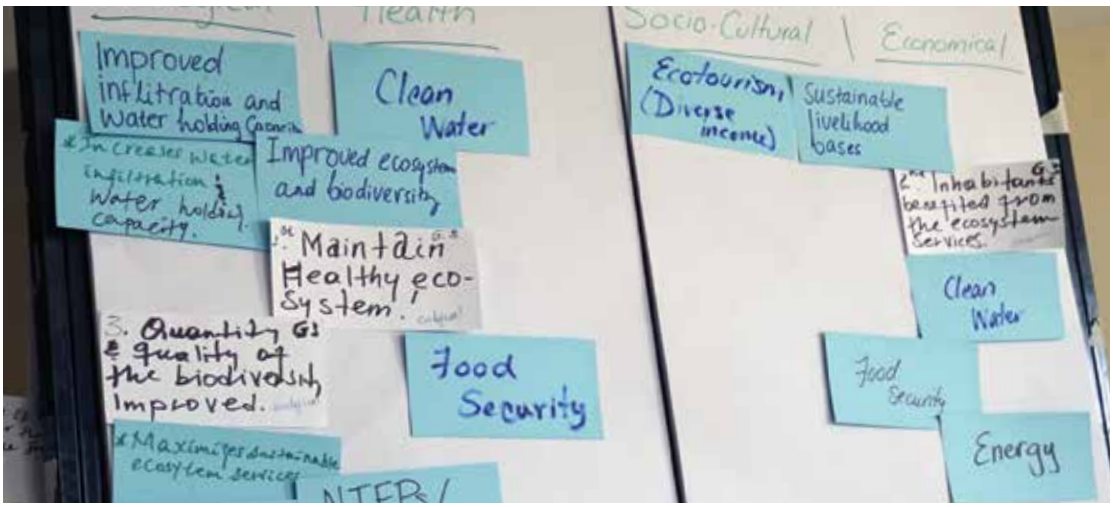
No learning without learning activities!

Since participants already have certain knowledge and skills related to the topic, this learning guide is based on a participatory and experiential learning approach. Through different formats of group work sessions, exchange in plenary and peer reviews, participants are actively involved in the learning process and engaged in critical thinking, problem-solving and decision-making in contexts relevant to them.

The introduction of content in a presentation, slide show or video without any pedagogical activity does not necessarily lead to learning. A learning activity has to be added in order to transform information into knowledge and/or skills.

Learning activities (see Annex 1 for description of activities) in this capacity development workshop include:

- Presentations on concepts and/or case studies by subject matter experts
- Group discussions and exchange of experience
- Group work in various formats
- Concrete measuring exercises (e.g. for measuring water quality, quantity)
- Field studies to strengthen analytical capacities of participants
- Design of reality-related transfer activities: action plans, strategies for preparing implementation of new skills and knowledge in participants' professional context



©AIDA BARGUÉS

WHAT ARE LEARNING OUTCOMES?

Learning outcomes are statements about what we expect participants will be able to do as a result of the learning session(s). Learning outcomes are used to assess whether learning objectives have been met, and must therefore be observable and measurable.

If learning objectives are what we plan in order to achieve the course goals, learning outcomes are what learners actually produce as a result of the workshop instructions, analysis or discussion.

Since participants will exhibit learning outcomes as a result of the learning activity, it is important to collect evidence of the participants' performance before, during and after the workshop.

It is crucial that both facilitators and participants are clear about the learning objectives and outcomes of each workshop session, since this clarifies what areas the modules will cover, as well as what participants stand to gain from taking part in each activity.

Facilitation in practice

ROLE OF THE FACILITATOR

Rather than simply teaching, the role of the facilitator is to **enable** collective and individual analysis and reflection, and to foster the exchange of knowledge and experience.

It is important to recognize that the participants themselves are a resource for information and problem-solving. Solutions should therefore come, whenever possible, from the participants through the sharing of ideas, mutual learning and exchange of experience.

Hence, the facilitator has a twofold role:

- First of all, s/he is a facilitator of (mutual) learning.
- When additional knowledge is needed and not available within the group of participants, the facilitator must act as a resource person, introducing the required background and expertise.

The training should be focused on the participants' needs for knowledge and skills, rather than on the facilitator's wish to address a topic as extensively as possible.

The user of this guide should be comfortable with his/her role as facilitator of experiential learning approaches. Facilitating experiential learning is easier in some cultures. For example, some participants might expect the facilitator to provide them with answers that they can quietly and respectfully absorb. The facilitator needs to be sensitive to these cultural expectations, and to adapt the pace of the self-directed learning approach accordingly. To set the right environment for experiential learning, the facilitator must act as one among equals. It

is essential to create an informal and open atmosphere, where participants are welcomed to share their experience and debate, and encouraged to respect a diversity of opinions. Views, even from the facilitator, should be presented as opinions rather than truths. This approach provides space for different views, and allows participants to express themselves freely, without worrying about saying the wrong thing.

The facilitator should have a deep understanding of forest-water issues and/or the specific local contexts – both social and environmental – relevant to the participants and should tailor the training accordingly. For example, materials and case studies should include examples that reflect these local conditions.

Whenever the facilitator needs to act as a resource person, s/he should make it clear that during such interventions, the facilitator is acting as a subject matter expert. Even so, s/he should still be focused on helping the participants to understand a concept or a strategy that may be useful for their professional practice, rather than simply teaching them. Using local examples that participants can relate to is particularly important in these situations. Examples of case studies can be found in the FAO Forests and Water Programme website and as part of the FAO SFM toolbox.

Framing the workshop

When planning a workshop, it is important to consider the space needed for the different activities. It is therefore recommended to have a space that accommodates presentations, group work, and easy movement of participants. As the workshop progresses, materials from brainstorming activities and discussions, including flipcharts and visual cards, will be produced and should be kept on display for easy reference. For this reason, it is important to consider wall space, and whether it is possible to stick materials on them.

TIP

- Consider using display boards, string with clothing pins, or sticky tack to display materials.
- Remember to take photographs of materials for ease of reference, and to ensure that the information is captured for reporting and other purposes.

It is also important to allocate sufficient time to introduce and conclude the workshop. These sessions not only open and close the workshop, but provide an opportunity to recognize how the training is relevant to the participants and the broader activities they represent, acknowledge the donors and organizers, and appreciate the hard work of the participants. Regardless of the workshop format and the number of modules and sessions selected, the following two sessions are suggestions to open and close the proceedings.

WELCOME AND INTRODUCTION

SESSION 0.1

2h*

Learning objectives	• To open and welcome participants to the workshop. • To introduce participants and facilitator. • Presentation of overall workshop programme, objectives and methodology.
Learning outcomes	At the end of this session, participants will agree on and recognize the workshop programme and objectives.
Steps (order may vary depending on usual practice)	1. **Opening speech(es) (30 min)** 2. **Answering the 4 key questions: who – why – what – how: (60 min)** • Introduction of participants **(25 min)** • Brief introduction of participants' expectations (collected before the workshop **(15 min)** • Presentation of workshop overall objectives and programme **(10 min)** • Key points of methodology and rules for the workshop: collaborative learning, exchange of experience, mutual listening, no hierarchy of participants, practical learning **(10 min)**
Comments and tips for facilitators	The method for **introductions** depends on different factors: If participants know each other already, the presentation of the facilitator and a short exercise for building an informal atmosphere are sufficient. If not, different methods exist: tour de table, pre-written participants list on a flipchart and facilitator asks who is who, socio-metric exercise, peer presentation (facilitator should be comfortable with the method). Presentation of participants should not take more than **25 min.** Summary of expectations should be linked to workshop objectives and programme, so that participants see how their expectations are taken into account. Unreasonable expectations should be clarified.
	Ice breakers are short activities or games involving the whole group, which can be a fun and helpful way to start off the workshop or a session. Ice breakers help participants to become more engaged and more comfortable interacting with each other, in so doing getting the workshop off to a good start. Such activities can also be used throughout the workshop as **energizers** when people's attention and/or energy drops. It can be useful to ask for participants to be in charge of ice breakers/energizers during the workshop. This can ensure participation and foster collaboration and relationship-building. For example, ask participants to volunteer for one of the several ice breakers or energizers included in the workshop programme. **Note**: Ice breakers and energizers should be sensitive to factors such as culture, gender and religion, among others. Activities should therefore be carefully selected. When asking participants to propose ice breakers or energizers, facilitators should have a chat with those suggesting ideas, in order to avoid potentially uncomfortable situations. On YouTube: About Ice Breakers African Action Song Stop-Walk Energizer Ideas for Ice Breakers
*including coffee break	If opening speeches are made by external/guest speakers, it is often good to have the coffee break immediately afterwards, so that the speakers can leave without feeling uncomfortable.

SESSION 0.2

30–45 min

WORKSHOP CLOSURE AND EVALUATION	
Learning objectives	• To identify participants' experiences, perspectives and suggestions regarding the workshop. • To recognize the achievement of participants.
Learning outcomes	At the end of the session, participants will: • Produce an evaluation that reflects on their experiences, views and learning in a constructive way. • Receive a certificate acknowledging their participation in the workshop.
Steps	1. **Instruct participants to take time to reflect** on their workshop experience, and to be constructive in their feedback. This is important as their evaluation should help you to understand what went well, or not so well. 2. **Workshop evaluation** form to be filled out by participants. 3. **Collect all forms**. **OR** **Visualized brainstorming on a pinboard:** 1. Each participant **fills in up to 2 cards** per question: **(10 min)** • *What is one thing you liked and will take home from the workshop?* • *What is one thing you would change (or would remove) about the workshop?* • *What is one thing you would add to the workshop?* 2. **Pinboard is turned around** so that participants can fix their cards anonymously. 3. Time permitting, **results can be presented** and/or discussed in plenary. 4. **Collect all cards**. Next steps (if applicable). Final speeches and awarding of course certificates.
Comments and tips for facilitators	For best feedback, it should be anonymous. If the second option is used, the 2 questions should be written on big cards, each in a **different colour**, and be visible by participants throughout the brainstorming. Distribute 2 cards of each colour to every participant. Advantage of the method: Evaluation results are shared and can be discussed with the group. Problem: formal tracking of results.

Workshops are highly dynamic, involving participants with different skills, experiences, learning styles and personalities. They must achieve a balance between covering a large number of topics and materials and ensuring that participants progress together. It can be challenging to be inclusive of everyone's point of views in discussions, and to keep to time. It is therefore highly recommended to have a 'parking lot', where participants and facilitators can record issues and questions that they would like to address and/or clarify at a future point during the workshop. The parking lot should be easily accessible to participants throughout the workshop, and clearly visible to the facilitator, so that s/he can refer to it as needed.

PARKING LOT – A CLASSROOM TOOL

What is it?

The parking lot is a designated chart paper for participants and/or facilitators to jot down questions/issues/ideas to be addressed during the workshop. It is useful in encouraging shy participants to ask difficult or embarrassing questions, and serves as a placeholder for questions or topics that participants want to discuss further, or to understand when time permits. It gives the facilitator an indication of where the group's concerns are, and therefore helps to reassess the delivery programme.

How to use it?

The parking lot should be made available in a part of the room that is easily seen and accessible by all participants. It is advised to introduce the parking lot concept and how to use it to all participants during the introduction session of the workshop. Participants are asked to write questions that need clarifying on sticky notes at any time, and place them on an agreed paper chart.

Before dismissing the group for the day, or on returning from a break, the facilitator should review parking lot questions and answer a couple. It is advisable to address the parking lot at least once during the day.

Sticky notes work well.

Materials needed: chart paper, sticky notes, pens.

© IUCN/LAURA MÁIZ-TOMÉ

Tips for successful facilitation

Elements of an effective PowerPoint presentation

Presentations are best used sparingly for explaining concepts and introducing topics that are new to participants. Although there are debates on the effectiveness of Powerpoint (ppt) presentations, they can be useful to highlight key messages and illustrate concepts.

A PowerPoint presentation is a document that supports a training session. It is not a learning activity. Therefore, presentations should be kept short: not exceeding 35 minutes and limited to 15 slides. Presentations must also be accompanied by other activities, such as question and answer (Q&A) periods, allowing for sufficient time for participants to reorganize or reformulate the information, share their experience, etc. If you finish with a Q&A session, questions and

DESIGNING A POWERPOINT PRESENTATION

Before thinking about graphical elements of a PowerPoint presentation, 3 key questions should be answered:

- **What is my communication objective?** (informing, sensitizing, training)
- **Who is my target group and what is its level of instruction?** (producers, community members, technicians, (university) graduates)
- **How much time do I have for my presentation?**

Based on the answers to these questions, you can select the adequate content of slides, choose the levels of complexity and language, and adapt the number of slides to the given time (without exceeding suggested time for ppts).

Graphical and other aspects for successful PowerPoint presentations:

- Font size >= 24.
- Allow approximately 1 slide per minimum of 1.5 minutes' speaking.
- Present one idea per slide and use appear animation as needed.
- Limit bullet points and text with the maximum number of total lines per slide <= 10, e.g. 5 bullet points of 2 lines each.
- Use colours, bullet points, icons, symbols for structuring.
- Use high-quality graphics and photos and relevant short videos.
- No more than 35 minutes of presentation (after that time concentration drops noticeably).

TIPS FOR FACILITATORS

- Check the projector, computer and clicker or laser pointer before the session (format
- and size of slides, type of plugs and connectors).
- Presenters should ensure that there are no more than 15 slides and that the presentation does not exceed 35 min.
- If you finish with a Q&A session, questions and answers should be visualized on a flipchart, or ideally on a pinboard (cards), for easy clustering during the session.

answers should be visualized on a flipchart, or on a pinboard (with cards), for easy clustering or organizing during the session.

Even if you have experience with PowerPoint presentations, it is useful to reflect on your approach. Also remember that when using Powerpoint presentations, it is important to check the projector, computer and clicker or laser pointer before the session; as well as to verify the format and sizes of slides, plug types and connectors.

Brainstorming

An effective way of involving all participants is through brainstorming. Participants are invited to offer their points of view on an issue or question, without judgement from others. This is a particularly useful method for taking stock of knowledge and ideas within the workshop. It is meant to be a relatively quick activity, with an emphasis on gathering as much information as possible, which can then be organized and used to foster further discussion.

There are multiple ways to conduct a brainstorming activity, with different comparative advantages, including asking participants to verbalize their responses, with the facilitator noting them on a flipchart, or requesting participants to write their ideas on cards. The former reduces replication of ideas, but may not capture all participants unless the facilitator goes around the room, asking everyone to contribute. The latter can involve a degree of anonymity, encouraging participants to be more forthcoming, and categorizing responses can also identify key or priority issues through representation.

RULES FOR SUCCESSFUL VISUALIZATION ON CARDS

- Write in printed/block letters (handwriting is less legible)
- Use a felt pen for writing
- Maximum 3 lines per card (if not, text will be too small)
- Limit use of abbreviations, or only use common abbreviations
- For brainstorming: 1 idea per card (for easy clustering of ideas)

Dealing with difficult training situations

1. **Situation**: Unequal participation and engagement among participants – certain individuals dominate the conversation while others remain quiet:
   - Paraphrase, repeat the question to ensure that everyone has understood.
   - Let a participant saying that s/he has understood explain the question/task.
   - Provide a concrete example of an answer.
   - Invite everyone to share an answer individually.
   - Go directly to the participants who you know can answer, and would feel comfortable being called on.
   - Check that there is no specific reason for the non-response of some participants, e.g. is it a taboo or a sensitive issue to which some participants do not want/cannot answer (in the presence of others? For reasons of hierarchy?).

2. **Situation**: A participant is disturbing the group with provocative remarks, or tries to be always in the limelight;
   - Stay calm without succumbing to provocation.
   - Stress that this is a process of constructive collaboration and learning, and that the active participation of everyone is necessary to achieve results.
   - Give feedback in a playful way to the person who may be unaware of their behaviour.
   - Give the participant a specific and empowering task/role (time manager in an exchange of ideas in plenary, rapporteur who writes down the bullet points for the presentation of a sub-working group, let the participant present her/his experience) in order to channel energy.
   - If that does not help, take the participant aside and explain the issue, or let a member of the group do it.

3. **Situation**: There is tension between some participants:
   - Stress that this is a process of constructive collaboration and learning, and that the criticisms made of other participants must be constructive rather than destructive.
   - Ensure that the participants are separated when working in groups.
   - Time and context permitting, try to find out the reason behind the tension, and address it.

4. **Situation**: A debate is becoming heated:
   - Stay calm.
   - Reframe the discussion around the objective to be achieved.
   - Clarify the reason for the debate.
   - Ensure that participants are focused on the content, and not on the views.
   - Take a short break.
   - Try to understand if the reason could be outside the theme of the workshop/discussion, and attempt to resolve the situation before resuming the discussion.

5. **Situation**: The participation and energy of the group is lagging:
   - Ensure that participants have understood the meaning of the ongoing activity.
   - Check if the discussion is already finished, or if all the key points have been mentioned.
   - See if there are potential sources of disturbance (noise, conflicts, tiredness), and address these before resuming the discussion/work with the group.
   - Is the group tired? Change method, propose an energizing activity (see Tip on page 13), take a break. Also, see Stop-walk energizer video.

MODULE 1

Introducing forest-water relationships

MODULE 1
Introducing forest-water relationships

Session at a glance

OBJECTIVES

- To introduce a range of forest-water relationships and explain their potential multiple benefits.
- To familiarize participants with approaches that take account of forest-water interactions, and explore how to better integrate water considerations into forest and tree-related areas/projects.

MATERIALS

- ☐ Projector & computer
- ☐ Objectives & programme (as handouts, on flipchart)
- ☐ Pinboard
- ☐ Coloured cards and pens
- ☐ Flipchart
- ☐ Sign-in sheet or register
- ☐ Handout 1.3.1

LEARNING OUTCOMES

At the end of this module, participants will be able to:

- Characterize and explain forest-water interactions and their multiple benefits.

KEY MESSAGES

- Forested watersheds supply 75 percent of renewable freshwater used for human and environmental needs (Millennium Ecosystem Assessment, 2005).
- Forested watersheds supply high-quality water to 90 percent of the world's largest cities (McDonald and Shemie, 2014).
- Despite the importance of forests for water, only 25 percent of the world's forest are managed with soil and water conservation as a management objective (FAO, 2015).
- Sustainable development is dependent on the forest-water nexus. Integrated forest and water management is needed to address water, food and energy security.
- Bridging science, practice and policy gaps is essential to improve the management of forests within the landscape for quality water resources.

Overview of sessions

	MODULE 1 SESSION CONTENT	RESOURCES
SESSION 1.1 **1 h 45 min**	Reflecting on forest & water relationships – group activity and presentation	Powerpoint: Introduction to forest and water relationships and the hydrological cycle Video Earth's water cycle 5:25min
SESSION 1.2 **45 min**	Water quality and water quantity – presentation	Powerpoint: Forest and water relationships: Effects on water quantity and quality
SESSION 1.3 **1 h**	Benefits of forest management for water – group activity	**Template 1.3** for group work. Benefits of managing forests and trees for water-related ecosystem services **Handout 1.3.2**. Benefits of managing forests and trees for water-related ecosystem services

NOTES

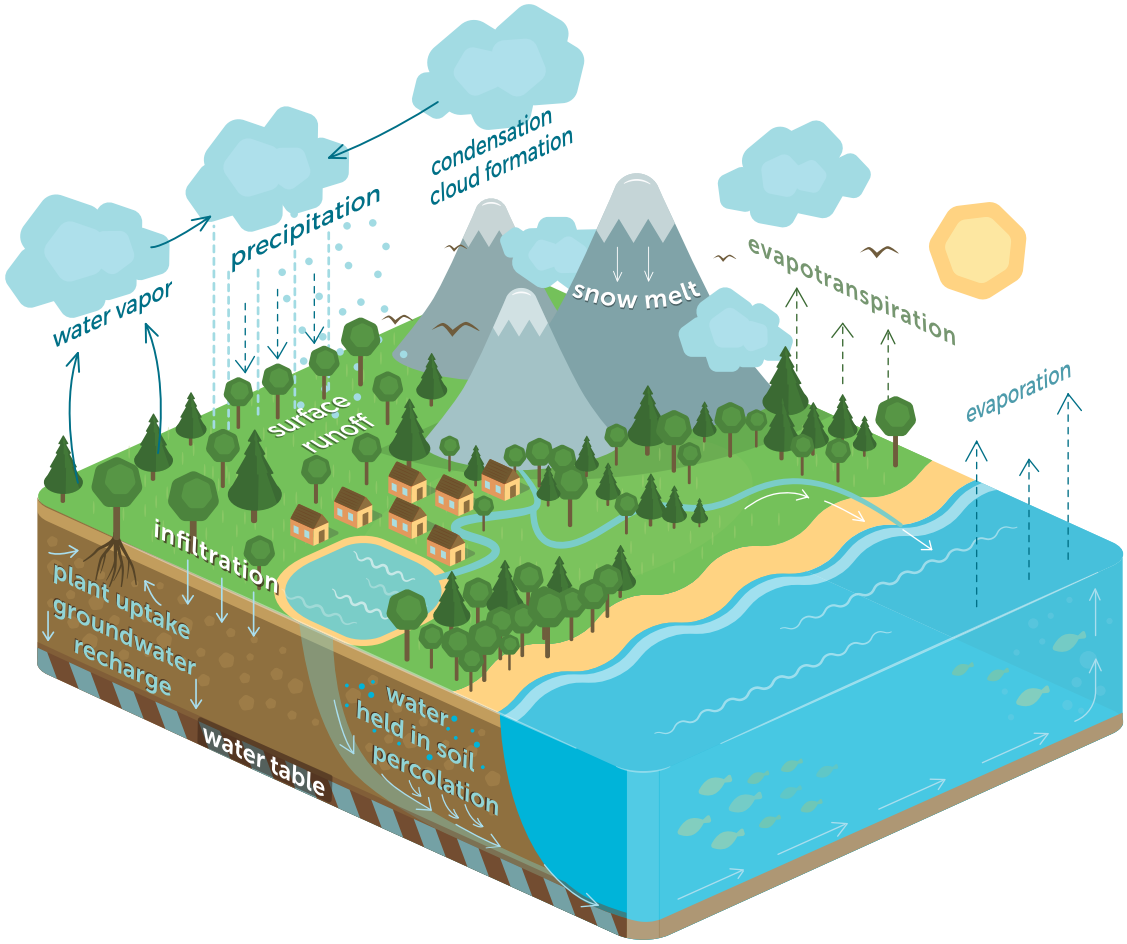


FIGURE 2
Forest and water functions

Background

Water and trees, both inside and outside forests, are two of the most important natural resources for people and the planet Earth. Not only is water necessary for life, but so are forests. Forests provide a wide range of goods and ecosystem services, including carbon storage, soil stabilization, and the generation of oxygen through photosynthesis. Both water and forests influence the availability of food and energy, while providing habitats and resources for life on Earth.

Trees and water are also highly interdependent resources. Forests play a crucial role in the hydrological cycle, influencing water availability and quality (Figure 2), as well as in general, reducing the risk of water-related hazards such as landslides, local floods and droughts. The interdependence of trees and water is even more visible in forests and tree-covered landscapes that have adapted to specific soil and water conditions, and depend on particular water regimes to survive. These include dryland forests, swamp forests, forested peatlands and mangroves, to name but a few. Hazards such as drought or floods have varying levels of intensity, duration, spatial extent and impacts. This in turn, makes the role of forested landscapes important at various spatial and temporal scales. Forests and tree-covered landscapes can mitigate the risks associated with minor to moderate water-related hazards; large, frequent or exceptional events may exceed mitigation thresholds.

The ability of forests to provide water-related ecosystem services cannot be underestimated. For example, forested watersheds supply 75 percent of the world's accessible freshwater for human consumption and agriculture, as well as offering many other biological, cultural, and socio-economic functions (MEA, 2005).

Forested areas regulate streamflow, support groundwater recharge and, through evapotranspiration, contribute to cloud generation and precipitation. They also act as natural water purifiers, filtering water, reducing soil erosion and sedimentation of water bodies. The extent to which forests provide these functions depends on local circumstances, including soils, the degree of forest and land degradation, geology, vegetation, climate, weather, extractions, etc. Even two adjacent watersheds with similar characteristics can behave differently. There are few universal truths about forest-water relationships that can be applied widely to an array of ecosystems, in different regions, or across various scales. The benefits and/or impacts of forests in relation to water can also be a matter of perspective, such as upstream/downstream, upwind/downwind, and can be dependent on scale: local, national, regional, etc.

Changes in land cover and land use can affect the ability of soils to absorb and hold water, as well as the health of vegetation. It is therefore crucial to understand the impact of forest cover in moderating high water flows, avalanches, mudslides or flooding events in areas with a great deal of local precipitation, storm surges or high surface runoff potential.

Seeking consensus within and between the forest and water sectors, and ultimately establishing collaboration, has proved challenging, since both sectors are narrowly focused on their respective subjects, and have been slow to recognize and shift their attention to the interactions of forest and water. Given the complexity of these interactions, the result is that the water-related ecosystem services of forests are often misunderstood, undervalued and therefore overlooked.

FORESTS AND WATER QUANTITY AND TIMING

- Forested areas and landscapes with trees influence water quantity and timing by using water to produce biomass, through evapotranspiration, and by enhancing soil infiltration and soil water storage. These processes can have both positive and negative impacts on stream flow and groundwater recharge. Thus, the net impact of changes in tree/forest cover, composition or management can vary.
- Forests do not always improve water yield; this is dependent on location, forest type and age, scale (physical and temporal), land-use and management practices, and the season.
- Evapotranspiration from forested areas is greater than from other vegetation types, and can sometimes be seen as water loss. However, evapotranspiration from forests can have a positive effect on downwind precipitation, a process referred to as water recycling.

It is generally agreed that forests regulate water by maintaining soil health and moisture, supporting soil infiltration and groundwater recharge. However, whether forests 'provide' or 'use' water is contested (van Noordwijk *et al.*, 2018), as evidence shows this relationship is site specific, and also dependent on tree species composition, age structure and tree density. As

a community of living organisms, forests require water, but can also contribute to base flows (and atmospheric moisture and precipitation). Whether we see forests as users or 'recyclers' can depend on the scale at which we operate. While at local scale forests may use water that becomes precipitation outside the catchment, at global scale forests are seen as recycling water from one location to another.

Forest ecosystems are significant regulators of water supply within local and neighbouring catchments, with forest management playing an integral role in influencing the quantity and timing of surface water flows and groundwater recharge. Changes to water flow can have a significant impact on forest resources and related human activities, as well as on non-forest human activities, and may result from changes to forest structure and species composition through either planned activities, such as timber harvesting or forestation, or unplanned events such as natural disasters. The quantity and timing of water flowing from forested areas, including annual, seasonal and long-term patterns, can be an indication of the quality of forest management, and a good indicator of overall ecosystem health.

FORESTS AND WATER QUALITY

- Forests generally improve water quality by acting as a natural filter for nutrients, and by reducing soil erosion and sedimentation.
- Floodplain and riparian forests are critical to sustaining aquatic and water-related ecosystems.
- Forested watersheds provide water to 90 percent of the world's largest cities (McDonald and Shemie, 2014).

It is widely accepted that forests improve water quality, which is used for drinking water, food and energy production, as well as sustaining resilient communities and environments. Forests act as a natural filter, reducing sedimentation and pollution through erosion control. Along with impacts on water quantity, the regulation of water quality within a catchment is among the most significant ecosystem services provided by forests, with changes in forest management practices affecting a variety of chemical, biological and hydro-morphological processes, both locally and downstream. While changes in water quality have significant implications for human health and the economic security of local communities, such changes are also indications of ecosystem health, with aquatic and riparian forest habitats among the most biologically diverse and productive forest ecosystems.

However, the extent of forests required and their location in the landscape in order to maximize this benefit is unknown, which also means trade-offs are not known either. At the same time, there are best management practices that are quasi regulatory and/or required by certification, and which have been shown to be effective in protecting water quality. The valuation of forests for water quality is an area of interest that may help decision-makers to choose between grey and green solutions.

The relationship between forests and water is complex, but it is critical that it should be taken into consideration in forest and water management and planning. Management of these resources often falls under different jurisdictions, and this becomes a limiting factor for

proper management and monitoring, as different sectors concentrate on managing either forests or water. Hence, practitioners are tasked with finding ways of integrating forest -water interactions within their fields to ensure proper management of these resources. In the case of forest managers, this may involve considerations in species selection, reducing densities, prolonging rotation cycles and conserving native forests in riparian areas. In the case of water management practitioners, integrated water resource management provides a good framework for the inclusion of forest-water interaction in water resource management and planning. Other natural resource management approaches where the forest-water nexus aligns include, but is not limited to: integrated landscape management, forest and landscape restoration, and integrated coastal zone management.

BENEFITS OF MANAGING FOR THE FOREST-WATER NEXUS

- Forest-water relationships influence water and food security, and thus impact human health and well-being.
- Trees/forests provide multiple benefits. We need to manage forests for multiple purposes within a mosaic of land uses and in relation to other interventions, including natural ecosystems and managed systems, in order to maximize overall benefits, and ensure equitable distribution of these benefits.
- Managing for the forest-water nexus has trade-offs; therefore, understanding forest-water relationships is paramount for sustainable management.

Forest management that takes into account or prioritizes improving hydrological functions within a catchment or landscape can also provide numerous social, cultural and economic goods and services. Many communities, including indigenous peoples, urban centres and agricultural communities, rely on forest-water relationships for their livelihoods, sustenance, and well-being. In addition, the spiritual and cultural connections of local communities, such as indigenous peoples, to these ecosystems may form part of their identity and livelihood. These values may be deeply held and influence people's attitudes and perspectives towards forest management, and how it impacts local water resources. For this reason, we need to understand the net balance of forests and ensure multistakeholder participation in forest, land and water resource planning and management. For example, women are more likely to manage forests for multiple goods and services, and to be directly impacted by changes in water supply.

Managing forests for the enhancement of water-related ecosystem services can deliver a variety of economic benefits, such as improvements in the economic productivity of a catchment, participation in Payment for Ecosystem Services (PES) agreements with upstream or downstream water users, and monetary benefits from recreation and tourism.

When managing for forest-water relationships, it is therefore important to take into consideration indirect socio-economic factors. Information on the socio-economic impacts of managing forests for water-related purposes, including social and cultural benefits, economic opportunities, as well as equity and opportunity costs, illustrate how communities can benefit from or potentially be impacted by changes in management practices. Similarly, information on the revenues and other economic benefits associated with forests managed for water-related purposes, as well

as the extent to which forests are managed to maintain such water-related economic benefits for local communities, is useful in helping to understand that forest management for water has quantifiable impacts.

Similarly, integrated water resource management promotes sustainable land and water management practices, aiming to find a balance between all the different uses of land and water within the watershed. It considers land and water resources holistically. This means that watershed restoration measures will probably include initiatives that are key for forest- water interactions. For example, slope stabilization, gully control and landslide prevention often involve key restoration and rehabilitation activities that will have a direct impact on the provision of water-related ecosystem services.

One limiting factor that should be mentioned is that the assessment and management of water resources is often limited to the water body, and does not take into account surrounding ecosystems such as riparian areas. In this sense, it is important for water resource management practitioners to consider forest-water interactions at the ecosystem or watershed scale, and not just at local or stream scale. Managing water for the protective nature of forests is just as important as managing forests for water.

Good management for the forest-water nexus is dependent on a clear understanding of local forest-water relationships, and how these may react to changes in biophysical, and even socio-economic contexts. Generally, activities that mitigate tree loss and soil degradation, as well as maintain adequate riparian buffers, will contribute to ensuring that the integrity of water-related ecosystem service delivery is minimally disturbed. Ideally, forest and tree management should take into consideration baseflow, or water availability in the dry season, ensuring that activities do not negatively affect water quantity and quality of baseflows.

RESOURCES

- Resources can be found on the FAO Forests and Water Programme website as well as in the FAO Sustainable Forest Management (SFM) Toolbox
- Working Paper: Championing the forest-water nexus: Report on meeting of key forest and water stakeholders
- Presentation: Forest-water interactions: A reply to the water yield debate
- Article: Trees, forests and water: Cool insights for a hot world
- Article: Water, forests, people – building resilient landscapes
- Article: Forestry Paper 155: Forests and water
- Article: Can't see the water for the trees?
- Article: Forests and water: International momentum and action
- Report: Running pure: The importance of forest protected areas to drinking water
- Online Tool: Urban water blueprint
- Book: The United Nations world water development report 2018: Nature-based solutions for water

SESSION 1.1
1h 45

REFLECTING ON FOREST & WATER RELATIONSHIPS

Learning objectives	• To discuss the hydrological cycle. • To discuss forest-water relationships.
Learning outcomes	At the end of this session, participants will be able to: • Characterize and discuss forest-water interactions in general, and with respect to local conditions. • List and describe the general hydrological functions of forests and how these can be observed within the local context.
Steps	1. **Brainstorming in groups (25 min)** • Create random groups of 3 members each, explain the task and writing rules **(10 min)**. • Groups brainstorm and write their answers on cards **(15 min)** • Question: *What comes to mind when you hear the combination of words: forests and water?* 2. **Clustering of answers in plenary (20 min)** • Collect all cards, cluster them into thematic groups with the help of participants – time permitting, give titles to the thematic groups of cards. 3. **Short summary of findings by facilitator** and link to workshop topics and the following presentation **(5 min)** 4. **Slide presentation: Introduction to forest and water relationships and the forest hydrological cycle** – linking, whenever possible, the presentation to findings of the brainstorming session and to the local context **(40 min)** 5. **Questions and answers (15 min)**
Comments and tips for trainers	**Brainstorming in groups**: write down the exact question for the brainstorming (for instance on the flipchart, or as a slide as part of the presentation), and keep it visible at all times. **Clustering answers in plenary**: Facilitator should be prepared to structure the answers according to different criteria (for instance: benefits, situation in participants' areas, current problems, challenges). The results of the brainstorming, even when not fully exhaustive, will show the various aspects of the forests and water issue, and will also highlight the workshop methodology: participant-centred approach. **Short summary of findings** by facilitator: summing up **participants' findings** and linking them to the next step: presentation. **Slide presentation**: whenever possible, refer to results of the brainstorming and use local examples that participants can easily recognize and understand. **Questions and answers** (duration depending on how much time is left) **Take photos of results/flipchart, as these serve as evidence of learning outcomes, will help reflect on achievements, and may be useful when writing relevant reports.**

SESSION 1.2

45 min

WATER QUALITY AND WATER QUANTITY

Learning objectives	• To introduce and discuss the effects of forests on water quantity and quality. • To introduce and discuss the complexities of the forest-water nexus particularly within the framework of local conditions.
Learning outcomes	At the end of this session, participants will be able to: • Describe a number of pathways through which forests can influence water quantity and quality. • Describe a number of factors that mediate and influence forest impacts on water quantity and quality, especially in their local context.
Steps	1. **Slide presentation: Forest and water relationships: effects on water quantity and quality** – linking, whenever possible, the presentation to findings of the brainstorming session **(30 min)** 2. **Questions and answers (15 min)**
Comments and tips for trainers	Presentation: if possible, refer to participants' cases Questions and answers

SESSION 1.3

1 h

BENEFITS OF MANAGING FORESTS FOR WATER

Learning objectives	To better understand how forest management practices can influence and/or improve water-related ecosystem services for their respective contexts.
Learning outcomes	At the end of this session, participants will be able to: • Produce a structured list of the various benefits associated with forest management practices that influence water ecosystem services.
Steps	1. **Present the activity** and share the prepared **Handout 1.3.1 (3 min)** 2. **Explain the purpose** and instructions of the group work session and divide participants into 4 groups **(5 min)** 3. **Give the groups 40 minutes** to produce results. Distribute cards where they can write down the results of group work (cards should not be fixed on a support, but arranged according to the titles of columns as per the template). 4. Provide participants with **Handout 1.3.2**
Comments and tips for trainers	The groups can be formed according to project/area, type of project. If all participants come from the same project, groups can be formed randomly, or in line with their role in the project. For this first group work, you may want to distribute some brief instructions. Give rules for how to **highlight** specificities in group work results: a specific colour of felt pens, underlining or other. Provide examples for this activity if necessary. **At the end of the session, the facilitator may conclude with the following key messages:** By providing high-quality freshwater, regulating discharge and runoff and maintaining healthy soils, forests can contribute significantly to the wealth and welfare of human societies, as well as to the environments and natural resources on which they depend. Well managed forests and tree systems within landscapes can sustain water supply for drinking water, agriculture, energy, etc.

TEMPLATE 1.3

TEMPLATE FOR GROUP WORK: BENEFITS OF FOREST MANAGEMENT FOR WATER

In your working group, answer the following question:

- **What are the various benefits related to forest-water relationships?**
- **Highlight the benefits that are particularly important for your specific projects/areas**
- Think about: ecological, health-related, social, economic and possibly other aspects.

For each benefit identified within your group, write 1 card (this will simplify the structuring during the plenary session)

During presentation, cards will be fixed on a pre-structured board in plenary

Time for group work: **45 min**

Time for presentation in plenary: **10 min** (up to **5 min** for presentation of results, up to **5 min** for Q&A by other participants)

HANDOUT 1.3.1

BENEFITS OF MANAGING FORESTS AND TREES FOR WATER-RELATED ECOSYSTEM SERVICES				
Biophysical	**Health-related**	**Sociocultural**	**Economic**	**Other?**

HANDOUT 1.3.2

BENEFITS OF MANAGING FORESTS AND TREES FOR WATER-RELATED ECOSYSTEM SERVICES				
Biophysical	**Health-related**	**Sociocultural**	**Economic**	**Other?**
Positive effect on rainfall (hydrological cycle)	High-quality water	Recreational values	Energy, food (for animals and humans)	
Regulating stream flow	Recreational aspects (public health)	Development of sustainable communities downstream	Provide/increase income to population	
Preventing landslides	Reduced pollutants	Reduction of time to reach/ collect water resources	Water for irrigation: agriculture, market, gardening, fruit production	
Buffer for flooding events		Biodiversity for cultural values	Habitats	
Reduction of droughts		Cultural values (including indigenous people and religious faith)	Ecotourism potential	
Fighting desertification			Reducing costs associated with dams	
Groundwater recharge and soil water storage			Clean water	
Positive effects on biodiversity (flora, fauna, including aquatic species)			Fishing	
Growth of biomass			Navigation	
Increased resilience of tree species and forest ecosystems			Livestock	
Mitigating dryland salinization				
Reducing sedimentation, pollution, runoff and soil erosion				

©AIDA BARGUÉS

MODULE 2

Understanding the impact of changing landscapes on water

MODULE 2
Understanding the impact of changing landscapes on water

Session at a glance

OBJECTIVES

- To improve understanding of the various hydrological impacts linked to changes in land cover and land use, involving an increase or decrease in tree cover.

MATERIALS

- ☐ Objectives & programme (as handouts, on flipchart)
- ☐ Sign-in sheet or register
- ☐ Flipchart or cards
- ☐ Projector & computer
- ☐ Slides
- ☐ Printed out case studies (at least 2 copies per working group)
- ☐ Felt pens

LEARNING OUTCOMES

At the end of this module, participants will be able to:

- Explain how landscape changes can affect water-related ecosystem services, and apply such knowledge to the specific context of forest and landscape restoration.
- Name and explain examples of tree-related project interventions and their implications for water.

KEY MESSAGES

- Landscapes undergo changes such as deforestation, degradation, afforestation, reforestation, restoration, and rehabilitation, all of which affect the water cycle.
- Understanding how landscape interventions (e.g. restoration) affect the water cycle can help to design adequate management plans.
- Trees and forests provide multiple benefits. Landscape approaches emphasize the need to manage forests for multiple purposes and within a mosaic of land uses or management systems, including natural ecosystems and managed systems, in order to maximize overall benefits, and ensure their equitable distribution.

Overview of sessions

	MODULE 2 SESSION CONTENT	RESOURCES
SESSION 2.1 **1 h**	The forest-water nexus in changing landscapes – group activity and presentation.	Powerpoint: Negative/positive impacts of deforestation **Handout 2.1.1**. The 6 principles of forest and landscape restoration.
SESSION 2.2 **1 h 45**	Case studies: Integrating water considerations into forest and tree-related projects/activities – group activity.	**Handout 2.2.1**. Case study analysis –Integration of forest-water consideration into forest and tree-related/water-related projects/ activities. **Handout 2.2.2**. Case study 1 – Forest catchment treatment in India. Additional case studies can be found at in the FAO Forests and Water Programme website

NOTES

Background

When forests experience significant changes in extent, composition and structure, become degraded or undergo conversion to another land use, the entire ecosystem and beyond is affected, including hydrological function. The complexity and variability of forest-water relationships makes predicting the effects of land-use change on hydrological systems difficult and uncertain. The effect of land-use changes such as deforestation, forest degradation, afforestation and reforestation on hydrological function is highly context dependent. The hydrological response to changes in forest dynamics will be determined by such factors as local and regional climate, degree and type of disturbance, soil type and health, geology and topography. In addition, the hydrological response will differ according to spatial and temporal scales.

Effects of land-use change on water quantity and timing

The removal of forest does not necessarily result in a reduction of water yield. Indeed, in some cases, it can result in increased total streamflow, at least in the short term. Similarly, whether forest cover expansion or restoration can improve water provision services will depend on numerous factors, with some still unclear and disputed. In some cases, dense reforestation has been shown to reduce water yields (e.g. in drylands). Different general theories have been offered to explain the relationship between forests and water yield (e.g. the 'sponge', 'pump' and 'trade-off' theories), leading to various assumptions regarding the effects of forest cover change on water yields. Such theories do not capture the observed variability and complexity in relationships between land-use change and indicators such as soil infiltration, seasonal stream flow, runoff and groundwater recharge used to characterize and measure hydrological processes. For example, some studies in planted forests have shown that short-term reductions in stream flow are reversed once trees reach maturation (Scott and Prinsloo, 2008). Understanding which types of trees and forests will increase or reduce water yield, and where trees should be located, will improve land management and sustainable development outcomes.

BENEFITS OF MANAGING FOR THE FOREST-WATER NEXUS

- When deforestation occurs without soil degradation, forest removal has been shown to result in increases in dry season flow, because less vegetation means less water use. However, such cases are uncommon since deforestation is typically followed by land conversion and soil degradation.

Effects of land use change on water quality

In some circumstances, land-use change involving the removal of ground litter or vegetation cover and the prolonged exposure of bare soil can result in increased soil erosion, which can in turn lead to increased sediment loading and nutrient pollution of receiving water bodies, and hence a degradation of water quality. This is most likely in cases where vegetation has been removed from hillslopes or along water bodies such as streams and rivers. The contribution of landscape interventions such as forest restoration to tackle issues of poor water quality will

depend on a variety of factors, including sources of pollution, location of the intervention, topography, soil type and condition, plant species composition and management regime.

Scale matters: influence of spatial and temporal scales on water-related impacts of land-use change

Forest, water (and climate) interactions take place at different spatial and temporal scales. For this reason, the impact of land-use change on hydrological processes must also be considered at local, regional and global levels and across seasonal, annual and multi-decade time frames. For example, advances in remote sensing techniques have allowed for causal relationships to be established between long-term and wide-scale deforestation and reduction in precipitation at the watershed scale (McAlpine *et al.*, 2018). Recent studies have also highlighted the potential for land-use change (i.e. deforestation and forest degradation) to substantially alter precipitation regimes at regional, continental and global scales (van der Ent *et al.*, 2010; Gebrehiwot *et al.*, 2018), and emphasize the need to consider scale in managing natural resources generally, and water resources in particular.

FOREST AND LANDSCAPE RESTORATION (FLR) CAN SUPPORT THE RECOVERY OF HYDROLOGICAL PROCESSES IN DEGRADED LANDSCAPES

By recognizing that forests and trees exist and interact with multiple land uses within landscapes, forest and landscape restoration has the potential to improve water supply. Planning FLR interventions that aim to increase water availability or quality involves the assessment of forest-water interactions across the entire landscape, trade-offs for upstream and downstream users, and an understanding of the effects of other land uses or management practices (e.g. agricultural irrigation) and infrastructure (e.g. dams) on hydrological processes. As a process that aims to regain multiple ecological and socio-economic functions, FLR can operate at larger spatial and temporal scales. However, most restoration interventions receive only short-term funding of years rather than decades, so evaluation of outcomes and long-term impacts is lacking as a result.

FLR objectives will be specific to each intervention, but in all cases align with the priorities of global initiatives such as the UN Sustainable Development Goals and the UN Framework Convention on Climate Change. Designing FLR interventions to achieve specific objectives related to the safeguarding and/or enhancement of water-related ecosystem services may or may not involve defining the landscape at the scale of a watershed. In this way, FLR can embed many features of integrated water resource management as part of the broader scope of the initiative.

FLR promotes multisectoral engagement in planning, restoring and managing landscapes for water. For example, the exchange and collaboration between forest and water sectors is seen as essential, and requires the engagement of water governing bodies, upstream and downstream users, urban planning officers, industry and other relevant stakeholders. This requires a willingness to truly integrate participatory approaches into natural resource management, decision-making and benefit sharing.

Proponents of the 'biotic pump theory' suggest that the deforestation of continuous forests that stretch from the coast inland, which through high transpiration and condensation cause ocean to land moisture flow, disrupts the transport of rainfall far within interior regions (Makarieva and Gorshkov, 2007). While there is increasing support for this theory, in practice, the restoration of the biotic pump and regional rainfall dynamics would require the conservation of large extensions of old forest, and the integration of these within ambitious conservation and restoration approaches (e.g. natural and assisted regeneration), as part of regional initiatives.

To date, the effects on water yield of land-use changes that increase tree cover in landscapes, such as afforestation, reforestation or restoration, have only been studied at small spatial scales (watershed or site levels). There is therefore little empirical evidence of the impacts of large-scale reforestation on the hydrological cycle. Similarly, most studies on the impacts of increasing tree cover on water yield have measured changes in hydrological processes over short time periods, which do not capture the changing relationship between growing forests and hydrological processes in the long term (Filoso *et al.*, 2017).

RESOURCES

- Resources can be found on the FAO Forests and Water Programme website as well as on the FAO Sustainable Forest Management (SFM) Toolbox
- Report: Forest and water on a changing planet: Vulnerability, adaptation and governance opportunities
- Report: International standards for the practice of ecological restoration – including principles and key concepts.
- Article: Impacts of forest restoration on water yield: A systematic review
- Article: Afforestation, restoration and regeneration. Not all trees are created equal
- Article: Land use, land-use change and forestry
- Article: van der Ent *et al.* 2010. Origin and fate of atmospheric moisture over continents
- Article: Gebrehiwot *et al.* 2018. The Nile Basin waters and the West African rainforest: Rethinking the boundaries
- Article: Scott & Prinsloo. 2008. Longer-term effects of pine and eucalypt plantations on streamflow
- Article: McAlpine *et al.* 2018. Forest loss and Borneo's climate
- Report: Gilmour, D. 2014. Forests and water: A synthesis of the contemporary science and its relevance for community forestry in the Asia–Pacific region. RECOFTC Issue Paper no.3. RECOFTC - The Center for People and Forests, Bangkok.
- Report: Besseau, P., Graham, S. & Christophersen, T., eds. 2018. Restoring forests and landscapes: The key to a sustainable future. IUFRO on behalf of the Global Partnership on Forest and Landscape Restoration, Vienna, Austria. Available in several languages.
- Video: Bruijnzeel, 2014. Breakthroughs in tropical landuse change impacts.

SESSION 2.1
1h

THE FOREST-WATER NEXUS IN CHANGING LANDSCAPES

Learning objectives	• To better understand the various hydrological impacts of changes in tree and forest cover. • To understand the key processes and effects of forestation on water availability.
Learning outcomes	At the end of this session, participants will be able to: • Provide an overview of the hydrological impacts of changes in landscapes, including deforestation and forest degradation, reforestation, afforestation and restoration.
Steps	1. **Brainstorming**: What are the impacts of reforestation/afforestation/ restoration? What impacts of deforestation do you observe in your project area/community? Facilitator writes the answers on a flipchart **(10 min).** 2. **Presentation of slides** showing the negative/positive impacts of deforestation **(40 min)** 3. Q&A and stand-up or **sociometric exercise**: who thinks that reforestation is an important action to be taken in project area/village? (very much convinced; more or less convinced; hesitant; not convinced at all)? Where does your project/village stand in terms of reforestation/forest restoration? (nothing is done nor planned; planned but not implemented)? **Handout 2.1.1**. Do you have a monitoring plan on forest & water aspects? **(10 min)**
Comments and tips for facilitators	During the presentation it is important not to adopt a 'teacher attitude', but rather to encourage an exchange of views with participants, building on the slides. Slides might be introduced by questions such as: Which problem can you identify here? What happened here? *(explanation of the sociometric exercise: see Annex, and tips for implementing training methods). If time is too short, trainer can skip Question 2 and/or 3.

©CANVA

SESSION 2.2

1 h 45

CASE STUDIES: INTEGRATING WATER CONSIDERATIONS INTO FOREST AND TREE-RELATED PROJECTS/ACTIVITIES

Learning objectives	• To familiarize selves with different examples of project interventions related to forest & water. • To analyse the consequences of forest-related interventions on water.
Learning outcomes	At the end of this session, participants will be able to: • Identify and describe examples of forest and landscape management projects and their implications (positive and negative) on water. • Explain water-related forest and landscape management projects (examples) and their positive and negative implications for water.
Steps	1. **Presentation of case study/activity**. The facilitator should prepare a list with explicit titles of cases **(10 min)**. For example, **Handout 2.2.1** (Case study analysis – Integration of forest-water consideration into forest/tree-related/water-related projects/activities) and **Handout 2.2.2**. (Case study 1 – Forest catchment treatment in India). Additional case studies, included in resource folder, could be used. Explain the instructions and form 4 groups (participants may want to choose their group according to type of case study). 2. **Group work**. Groups become familiar with 'their' case and analyse it according to the following criteria: (problematic) situation to be solved – intervention(s)/solution(s) chosen by 'project' – positive impacts (if applicable) – problems caused/negative impacts (if applicable). Groups should fill out **Handout 2.2.1 (50 min)**. 3. **Presentation of group work results** (**10 min** per group) **45 min total**. Each group representative summarizes its findings: What have we learned from the case study analysis?
Comments and tips for trainers	The trainer can use cases other than those suggested in the handbook, but case description should be as concise as in the examples – participants should use the time for analysing the case and not for understanding it! The trainer should choose case studies that match with group of participants, if possible, taken from/close to their project context or area. If participants come from different projects and areas, organize: presentation of participants' projects: name of project – objectives – activities – challenges/ problems to be solved through the project (if time allows: positive/negative impacts of project intervention). For the session summary, it would be ideal to have all group results visible at the same time. Relate the outputs of this session to the key messages and outputs from the previous session(s), where relevant. **Alternatively, if presentation of case studies is provided by participants:** **Presentations can be done in an Information Market**: flash presentation – **90 seconds** per project, then market with further products and discussions occurring in parallel **40 min** (group members can alternate); summary by trainer or participants: What have we discovered through the presentation of other participants' projects?

HANDOUT 2.1.1

THE 6 PRINCIPLES OF FOREST AND LANDSCAPE RESTORATION	
Focus on landscapes	FLR takes place within and across entire landscapes, not individual sites, representing mosaics of interacting land uses and management practices under various tenure and governance systems. It is at this scale that ecological, social and economic priorities can be balanced.
Engage stakeholders and support participatory governance	FLR actively engages stakeholders at different scales, including vulnerable groups, in planning and decision making regarding land-use, restoration goals and strategies, implementation methods, benefit sharing, monitoring and review processes.
Restore multiple functions for multiple benefits	FLR interventions aim to restore multiple ecological, social and economic functions across a landscape and generate a range of ecosystem goods and services that benefit multiple stakeholder groups.
Maintain and enhance natural ecosystems within landscapes	FLR does not lead to the conversion or destruction of natural forests or other ecosystems. It enhances tha conservation, recovery and sustainable management of forests and other ecosystems.
Tailor to the local context using a variety of approaches	FLR uses a variety of approaches that are adapted to the local social, cultural, economic and ecological values, needs, and landscape history. It draws on latest science and best practice, and traditional and indigenous knowledge, and applies that information in the context of local capacities and existing or new governance structures.
Manage adaptively for long-term resilience	FLR seeks to enhance the resilience of the landscape and its stakeholders over the medium and long-term. Restoration approaches should enhance species and genetic diversity and be adjusted over time to reflect changes in climate and other environmental conditions, knowledge, capacities, stakeholder needs, and societal values. As restoration progresses, information from monitoring activities, research, and stakeholder guidance should be integrated into management plans.

Source: Besseau, P., Graham, S. & Christophersen, T, eds. 2018. Restoring forests and landscapes: The key to a sustainable future. IUFRO on behalf of the Global Partnership on Forest and Landscape Restoration, Vienna.

CASE STUDY ANALYSIS – INTEGRATION OF FOREST-WATER CONSIDERATIONS INTO FOREST/ TREE-RELATED/WATER-RELATED PROJECTS/ACTIVITIES

HANDOUT 2.2.1

In your working group, familiarize yourselves with the case/project, analyse the situation, and fill in the following table:

Title of the case:

Situation/problem to be solved	Intervention(s)	Scale: landscape or site level	Negative consequence(s) (if applicable)	Positive consequence(s) (if applicable)

Notes/Comments:

Time for group work: **50 min**

Time for presentation in plenary: **10 min** (up to **5 min** for presentation of results, up to **5 min** for Q&A by other participants).

HANDOUT 2.2.2

FOREST CATCHMENT TREATMENT IN THE SHIWALIK HILLS, INDIA

Background

The Shiwalik Hills are located at the foot of the Himalayan range in Haryana State, India. The altitude ranges from 500 to 1 000 m.a.s.l., and the slope is moderate (6–10%). Original forest has almost disappeared due to over-exploitation. Some areas are completely bare because of overgrazing and woodcutting, leading to soil erosion, landslides and low water retention. Despite having an average annual rainfall of 1 000-1 200 mm, water scarcity is an issue in the area.

Current situation

Currently, the main land uses in the region are croplands, grasslands and low altitude rehabilitated forests, which were planted to achieve production and environmental benefits through a combination of structural, vegetative and management measures in badly degraded catchments above villages.

The purpose of forest catchment treatments is to rehabilitate the forest through a number of measures. These include, the protection of the area by 'social fencing' (villagers agreeing amongst themselves to exclude livestock without using physical barriers), the construction of soil conservation measures (staggered contour trenches, check dams, graded stabilization channels), and 'enrichment planting' of trees and grasses within the existing forest stand to improve composition and cover. These species usually include trees such as *Acacia catechu* and *Dalbergia sissoo*, and fodder grasses - as well as *Eulaliopsis binata*, which is used for rope making. The combined measures are aimed at reestablishing the forest canopy, understorey and floor, thereby restoring the forest ecosystem together with its functions and services. Biodiversity is simultaneously enhanced.

The other main objective is to provide supplementary irrigation water to the village below through construction of earth dams. The village community – organised into a Hill Resource Management Society – is the source of highly subsidised labour for forest catchment treatment. After catchment protection around the proposed dam sites, dams and pipelines are constructed. The dams are generally between 20 000 and 200 000 m^3 in capacity, and the pipelines are usually one kilometre or less in length. Apart from irrigation, the villagers benefit from communal use of non-timber forest resources.

Possible solutions

The forest catchment treatment aimed to improve production and restore degraded land while addressing surface and gully soil erosion, landslides and aridification. The project had positive socio-cultural, economic and ecological impacts, but conflicts in water distribution are still high. In that sense, Hill Resource Management Societies, through the elaboration of a management plan, may address the issue. Maintenance activities are also needed in order to keep the positive results. These activities should include desilting of water harvesting structures, repair of channels and maintenance of the structures.

Financial resources are limited to monitor the impact of the project. However, field staff has high expertise to monitor water-related socio-cultural and economic impacts, and moderate technical knowledge to monitor other indicators.

FOREST CATCHMENT TREATMENT IN THE SHIWALIK HILLS, INDIA

HANDOUT 2.2.2 (CONTINUED)

Answer Key for FL-WES questionnaire

1. Watershed/Regional (R)
2. Forest – Low altitude plains;
   Cropland;
   Grassland
3. Medium: 1 000–1 500 mm
4. a. Water stress/scarcity
   d. Erosion
5. a. Dams/reservoirs
   f. Reforestation / afforestation / restoration
6. c. Forest products (non-wood)
   d. Conservation (biodiversity)
   f. Protective function (natural hazard mitigation)
   m. Restoration
7. b. Groundwater recharge/storage
   f. Biodiversity
   h. Water stress
   i. Soil erosion
   k. Water-related socio-cultural impact
   m. Green/natural infrastructure
   o. Water-related governance mechanisms
   q. Management plans and/or forest practices for soil / water conservation
8. i. Soil erosion
   j. Water-related economic impact (including Payment for Ecosystem Services)
   k. Water-related socio-cultural impact
9. High expertise to water-related economic and socio-cultural impact
   Some expertise to the others
10. Limited resources to all

© CANVA

MODULE 3

Measuring and monitoring forest-water relationships

MODULE 3
Measuring and monitoring forest-water relationships

Session at a glance

OBJECTIVES

- To understand the key elements of effective monitoring.
- To acquire an overview of the forest-water indicators within FAO's Forest and Water Monitoring Framework.
- To design (or improve) the framework for a monitoring plan for forest-water indicators suited to the projects/activities of participants.

MATERIALS

- ☐ Objectives & programme (as handouts or on flipchart)
- ☐ Sign-in sheet or register
- ☐ Monitoring framework indicator ppt
- ☐ Flipchart paper
- ☐ Pinboards
- ☐ Coloured cards
- ☐ Felt pens in different colours
- ☐ Handouts 3.2.1, 3.2.2, 3.2.3 and FAO's Monitoring Framework

LEARNING OUTCOMES

At the end of the module, participants will be able to:

- Demonstrate familiarity with elements of effective measuring and monitoring of forest-water relationships.
- Explain the purpose of FAO's Forest-Water Monitoring Framework.
- Identify and select forest-water indicators that are suitable for their projects/activities using FAO's framework.

KEY MESSAGES

- Monitoring is the periodic or continuous collection of data (measured parameters) using systematic methods. The types of monitoring and the corresponding rationale for data collection can vary greatly across projects.
- Understanding forest-water relationships in local contexts and making informed management decisions is dependent on available data and observations.

Overview of sessions

	MODULE 3 SESSION CONTENT	RESOURCES
SESSION 3.1 **1 h 30**	Key elements of forest & water monitoring – group activity and presentation	Powerpoint: Key elements of effective monitoring presentation
SESSION 3.2 **2 h 30**	Monitoring: Selecting indicators and variables – group activity	Powerpoint: Monitoring: Selecting indicators and variables Template for group work – Monitoring: Selecting indicators and variables **Handouts 3.2.1**, **3.2.2** and **3.2.3**. Case studies. **Handout 3.2.4**. Monitoring: Selecting indicators and variables
SESSION 3.3 **2 h 10**	Monitoring: Selecting indicators and variables using the Forest-Water Monitoring Tool – group activity and presentation	Powerpoint: Forest-Water Framework and Tool FAO Forest-Water Monitoring Framework document Template for group work – Selecting indicators and variables using the Forest-Water Monitoring tool **Handout 3.3.1**. Monitoring selecting indicators and variables using the Forest-Water Tool
SESSION 3.4 **2 h 40**	Improving a monitoring plan – group activity and presentation	Powerpoint: Improving a monitoring plan **Handout 3.4.1**. Improving a monitoring plan

NOTES

Background

Monitoring and evaluation is a key area of a project that provides project managers and decision-makers with the necessary information to measure the progress of the project or programme, and to make the best possible management decisions. It starts during the project planning process, as the needs assessment and monitoring framework (e.g. logframe) are established. Once this is defined, the monitoring plan is implemented. The results of the monitoring are shared and reported periodically, allowing feedback to be incorporated into the process. Considering that monitoring is the systematic collection and analysis of measured parameters it is important to note that mechanisms and protocols for measuring must be carefully chosen in order to obtain the desired data that will allow proper monitoring.

Monitoring measures progress, occurring continuously throughout the project, as specified in the project's framework. Evaluation measures impact and is conducted periodically, usually at the end of the project or programme, but can also be included as part of a mid-term review. Figure 3 provides an overview of this process.

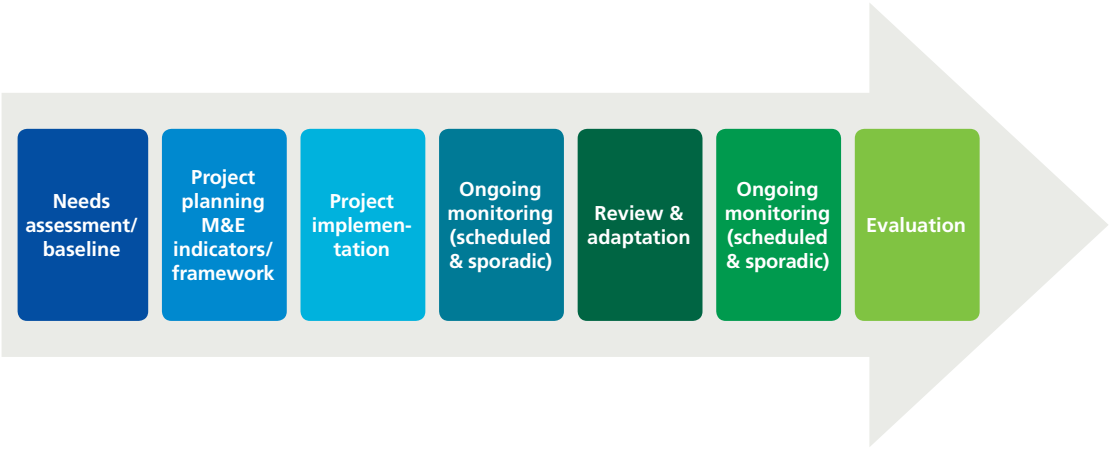


FIGURE 3
Monitoring the framework development process

WHAT IS MONITORING AND EVALUATION?

- **Monitoring** is the systematic collection and analysis of information about a project or programme as it progresses. It is aimed at learning about and improving the efficiency and effectiveness of a project or programme.
- **Evaluation** is the periodic, retrospective assessment of a project or programme. It is the comparison of actual project impacts against the agreed strategic plans. It looks at what you set out to do, at what you have accomplished, and how you accomplished it.

Why monitor forest-water interactions?

Monitoring strengthens our understanding of the many factors that influence forest and water interactions. It tells us whether the intended objectives of the interventions have been met, and informs us about their effectiveness. Monitoring how the management of forests, trees and landscapes affect water-related ecosystem services in the short and long term will

improve our capacities for decision-making and management of natural resources, ultimately resulting in more resilient communities and landscapes. Since many forest-water relationships can change temporally – e.g. stream flow can vary for dry and wet seasons within a single year, or baseflow may fluctuate as vegetation regenerates and then stabilize as it matures – it is important to monitor the forest-water nexus at correct intervals, so as to understand these dynamic relationships, and account for them in management decisions.

WHAT DOES MONITORING AND EVALUATION OF FOREST-WATER INTERACTIONS INVOLVE?

Monitoring

- Establishing forest-water indicators and sub-indicators that need to be measured based on project goals and local conditions.
- Setting up networks and/or monitoring protocols to systematically collect information relating to these indicators and sub-indicators.
- Analysing the information and reporting.
- Using the information to inform day-to-day management and adapt project management when necessary.

Evaluation

- Looking at what the project of programme aims to achieve.
- Assessing the progress and impact of the project or programme, and if the monitoring is actually measuring the indicators and sub-indicators as intended.
- Assessing the strategy of the project.
- Assessing the success of the project or programme, its sustainability and use of resources.

Including monitoring of forest-water interactions in projects and programmes

Project plans and programmes should include monitoring of forest-water interactions from the inception phase. Monitoring plans should be tailored to local conditions and based on the indicators that will be measured throughout the project. Since forest-water interactions are dynamic, project managers are advised to develop their projects by carefully considering the relevant spatial and temporal scales, so that the monitoring plan can produce results within the framework of the project's objectives and management goals, as well as beyond the project phase. This is particularly important to ensure that monitoring plans are set up in a way that makes the best use of human, technical and financial resources, to produce short- and long-term results.

In addition, the variables to be measured should be chosen carefully in order to should make use of existing data and data collecting infrastructure, where available, to complement data collected during monitoring. As shown in Figure 3, monitoring should be planned as an adaptive process that helps managers to measure their progress and improve their implementation of the project and monitoring plan.

Including all relevant stakeholders in the measuring and monitoring process will also increase awareness and ownership of the project, and improve its implementation. Principles of multi-stakeholder participation should apply to all aspects of management, including planning,

implementation and monitoring. For monitoring, it is recommended to engage community members, since they can provide local knowledge and history, as well as regular observations that serve as field measurements that may enhance or triangulate field data collected. Furthermore, due to the spatial scale at which some of these forest-water interactions occur, stakeholders may be key in data collection. Indeed, many monitoring programmes now include community participation (citizen science) in data collection, as this improves the scale at which data are collected, and reduces the cost of monitoring.

Community engagement plays an important role in legitimizing and contributing to the sustainability of any actions involving natural resource management, and specifically the forest-water nexus.

FAO's Forest and Water Framework

The FAO Forest and Water Monitoring Framework was developed to address a need to better understand how forest management affects the delivery of water-related ecosystem services within a landscape.

The overall goal is that the Monitoring Framework and Tool will ultimately support the justification of integrated forest-water practices and policies, as well as improve our understanding of forest-water interactions, thereby facilitating natural resource planning, practices and policies, so as to achieve better management of forest ecosystems.

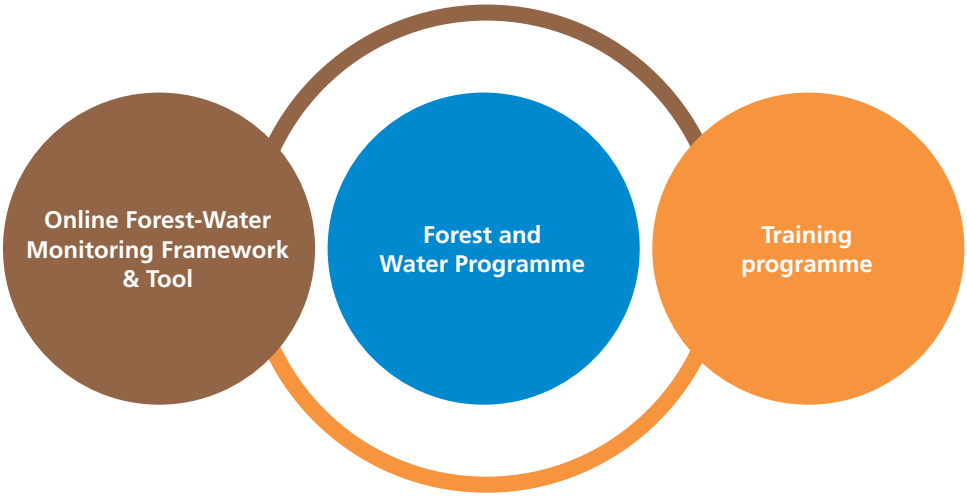


FIGURE 4. The Forest and Water Programme has been developed as a global capacity-building programme with two components: the development of an online Forest-Water Monitoring Framework and Tool with standardized indicators and recommended methods, and a training programme that involves multiple modules to meet the needs of countries and stakeholders wishing to implement the framework at national or project-based level.

An informal, preliminary assessment of forest-related projects has shown that the monitoring of forest-water interactions, including water availability, quality and soil health, has not been formally included in practice. Although there is increased recognition of the importance of forests for water resources, the lack of monitoring of forest-water interactions and available data means that there has been limited influence over policy and practice.

THE OVERALL OBJECTIVES OF DEVELOPING A FOREST-WATER MONITORING TOOL ARE AS FOLLOWS:

1. **Making monitoring more accessible**, even to non-academic project developers and/or policy-makers by providing an interactive, online platform that adapts automatically to the needs of users.
2. **Improving forest management decisions** by making more explicit the link between forestry and hydrological dynamics through the provision of relevant indicators based on recent science, and preferred methodologies based on project context.
3. **Providing practitioners with tools** to collect, aggregate and visualize data from specific projects over time that cover a wide range of contexts globally.
4. Supporting collection of data that can be used to **inform management guidelines** by providing users with ways to interpret data as a cost-effective alternative to publications.

Since 2002, more than 15 international meetings on forest-water interactions have been held. This ongoing process, called the International Forests and Water Agenda (FAO, 2013), has consistently highlighted the need to improve the monitoring and evaluation of forest-water relationships, and to enhance our knowledge for different biomes, at different spatial and temporal scales, and for varying climate change scenarios. This knowledge also needs to be applied in practice and policy.

The scientific community has led the way in understanding interactions between forests and water, from individual tree and stand to regional and even global scales. However, research is often biased towards particular geographic and social contexts, and is often limited in time scale. As a result, there are still knowledge opportunities to be explored in understanding the effects of land-use change and forest management on water yields and quality, as well as the protective function of forests.

©CANVA

TABLE 5. FAO'S FOREST-WATER MONITORING FRAMEWORK IDENTIFIES 6 OVERARCHING QUANTITATIVE AND QUALITATIVE INDICATORS

QUANTITATIVE AND QUALITATIVE INDICATORS					
Water quantity and timing	**Water quality**	**Water-related ecosystem services delivery**	**Integrated management**	**Enabling environment**	**Socio-economic benefits**
The status of water supply (quantity and timing) within and from forested areas.	The status of water quality within and from forested areas.	The status of forest-based water-related ecosystem services.	The effectiveness of integrated forest-water approaches in practice.	The effectiveness of legal, institutional and economic frameworks to recognize and implement integrated forest-water approaches.	The effectiveness of forest management for water-related ecosystem services to provide socio-economic benefits.

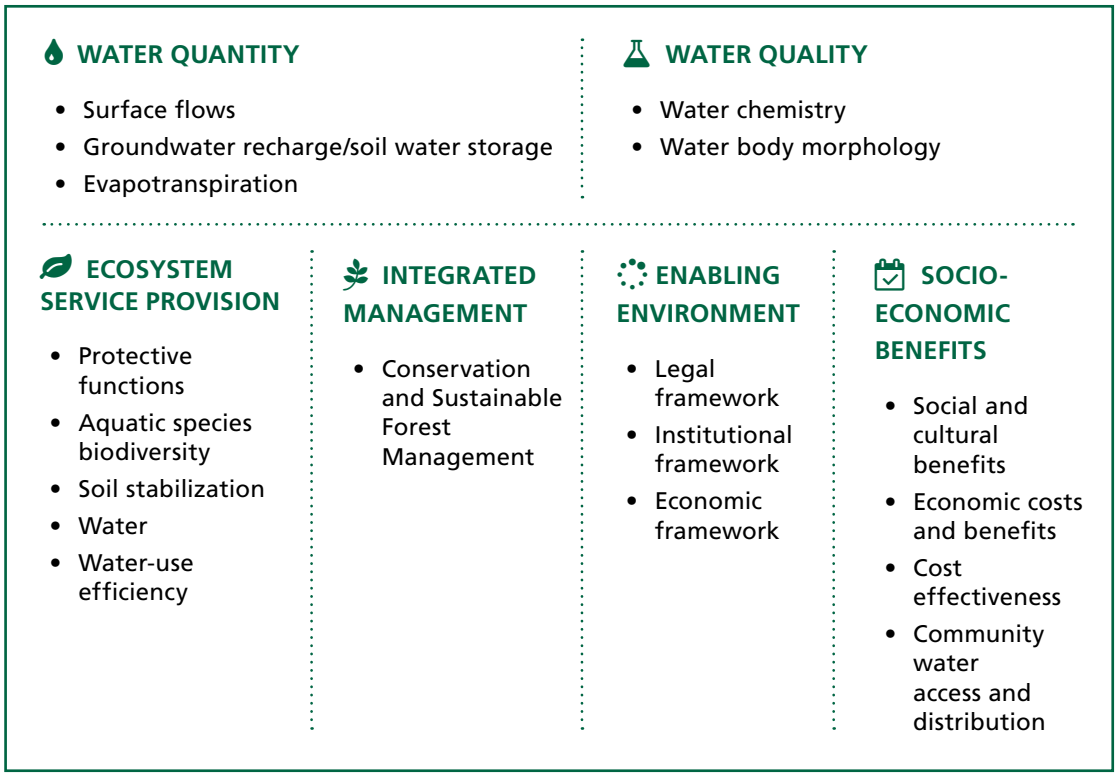


FIGURE 5
The six overarching indicators of the FLWES

RESOURCES

- FAO's Forest-Water online monitoring tool
- Report: **Bonfantine, K., Zebrowski, J. & Egan, A.** 2018. *Guidelines and protocols for monitoring riparian forest restoration projects*. New Mexico Forest and Watershed Restoration Institute.

©FAO/DANIEL HAYDUK

SESSION 3.1
1h

KEY ELEMENTS OF FOREST & WATER MONITORING

Learning objectives	• To understand the difference between monitoring and evaluation, and why monitoring is important for understanding forest-water interactions. • To better understand what monitoring is and why it is important.
Learning outcomes	At the end of this session, participants will be able to: • Explain and justify the concept of monitoring.
Steps	1. **Group work concept cloud (30 min)**: Participants will receive flashcards where they will write why they think monitoring of forest-water interactions is important, what forest-water interactions they have monitored in the past, and what methodologies they have used to do so. The flashcards will then be grouped into 3 categories: • Water quantity and timing • Water quality • Forest-based, water-related ecosystem services 2. Summary by facilitator **(10 min).** 3. What is monitoring? **Interactive presentation of slides (20 min).** Summary: Interactions between forest ecosystems and hydrological functions are complex, dynamic and context-specific. As shown by the concept cloud, there are many ways to measure forest-water interactions; many can be grouped under the 3 categories or indicators mentioned above. How these indicators are measured varies on a case-by-case basis.
Comments and tips for facilitators	Slide presentation should be interactive. If participants mention the main points, there is no need to present the masked slide with answers. Style of language and complexity of presentation content may have to be adjusted according to the level of participants. **Use easily understandable words and examples** if there are several community stakeholders within the group (of participants).

SESSION 3.2
2h 30

MONITORING: SELECTING INDICATORS AND VARIABLES

Learning objectives	• To identify and justify relevant forest-water indicators for case studies.
Learning outcomes	At the end of this session, participants will be able to: • Identify and justify forest-water indicators that are relevant for different scenarios. • Compare and contrast variables for measuring the indicators.
Steps	1. **Present the group activity. Presentation of instructions** and constitution of work groups **(15 min).** 2. **Group work** (related to Indicators 1, 2 and 3 of Monitoring Framework) **(1h 15 min):** Participants will break into groups of 3–5 and work on project case studies (**Handouts 3.2.1**, **3.2.2**, **3.2.3**). They will use the information provided to create a list of indicators, sub-indicators and variables that they would measure if they were the project manager. They should also provide some methodologies to measure the variables. Case studies are provided. 3. **Presentation of group work results**. Each group has **12 minutes** for presentation and Q&A. 4. **Summary by facilitator (10 min):** Monitoring is case specific and depends on available data and resources (human and financial). Facilitators should build on differences in indicators and variables that each group came up with for each case study.
Comments and tips for facilitators	According to the composition of participants in the workshop, create groups that • include members from different backgrounds • include members with different levels of experience (up to 4 working groups, each with up to 5 people). Alternatively, you can create peer groups or groups of 3 (if the above-mentioned criteria are not met). In this case, the presentation time for each group will be shorter, but the facilitator should maintain a strong presence during group work, to avoid/correct errors. Presentation time may vary from one group to another. The facilitator should ensure that groups do not exceed 12 minutes for presentation and Q&A by others. If time is short, the group work exercise can be done together in one group, and with just one case study (this is less creative and may not allow the facilitator to check if all participants have understood the concepts behind monitoring and choosing indicators, sub-indicators and variables). Time is based on 4 working groups. If there is a different number of working groups, adapt the timing for presentation and discussions accordingly. Case studies are provided, but the facilitator could create his/her own case study. Be sure to include information on the resources available, if some level of monitoring is already in place, and finally, include some information that is not useful for the exercise, so as to make the activity more dynamic and have an opportunity to mention the need for clear information.

TEMPLATE 3.2

TEMPLATE FOR GROUP WORK: MONITORING – SELECTING INDICATORS AND VARIABLES

According to the case studies provided:

- Identify the objectives of the activities and the environmental and resource contexts for each case.
- Check which existing indicators, sub-indicators, variables are being monitored, if any. Use **Handout 3.2.4** provided.
- Consider: *If you were the project manager, which forest-water indicators, sub-indicators and variables would be appropriate? Which ones should be prioritized? Why were these chosen?*
- Consider: *Which monitoring methods would be most suitable for the indicators chosen? Why?*
- Explain briefly why you consider the indicators you chose to be relevant.

Prepare a presentation on a pinboard or flipchart (according to trainer's instructions).

Time for group work: **90 min.**

Time for presentation in plenary: **12 min** (up to **7 min** for group results, up to **5 min** for Q&A by other participants).

©AIDA BARGUÉS

SESSION 3.3
2h 10

MONITORING: SELECTING INDICATORS AND VARIABLES USING THE FOREST-WATER MONITORING TOOL

Learning objectives	• To become familiar with the FAO Forest-Water Monitoring Framework and Tool, so as to develop or improve forest-water monitoring plans. • To deliver suggestions for appropriate tools/methods for measuring chosen indicators (focus on recording methods). • To comfortably navigate and use the Forest-Water Monitoring Tool.
Learning outcomes	At the end of this session, participants will be able to: • List suggestions for improving the existing monitoring plan of their case studies. • State and justify choice of realistic options for measuring and recording the selected indicators.
Steps	1. **Detailed explanation of forest & water monitoring indicators**, plus details on Indicators 1,2,3 and the online monitoring tool. Slides available **(30 min)**. 2. **Group work**: Interactive exercise where participants will use Forest-Water Monitoring Tool to identify indicators, sub-indicators and methodologies for case studies from Session 3.2 **(30 min)**. The group will come together to discuss how the tool validates or differs from work done in Session 3.2 **(20 min)**. This activity can be done using participants' laptops (if available), or in groups, using one computer per group. 3. **Presentation of group work results** (**40 min**, or **10 min** per group). 4. **Facilitator's summary (up to 15 min)**.
Comments and tips for facilitators	The session can build on previous Session 3.2, moving the focus from the selection of indicators and sub-indicators to thinking about what other indicators, sub-indicators and variables need to be measured. If time allows, issues of sampling, recording and resources can also be discussed. It depends very much on what already exists according to the case studies, and on group composition and experience. If all participants come from 1 single area of expertise, they may have been biased in selecting the indicators and variables in Session 3.2. This is an opportunity to highlight how complex and site-specific forest-water interactions are. The objective of this session is not that participants understand all the measuring tools and methods mentioned, but that they grasp the **logic behind the framework** and elements that might be **interesting for their projects**. An analysis of participants' projects by the trainer prior to the workshop helps in the selection of points of interest to the group of participants. If time allows and all participants come from the same project, the trainer may choose to spend some time evaluating the current or possible monitoring programme. The trainer moves from group to group and gives advice. (This session can also be done using the digital file of indicators, and presented to plenary in digital format, but this is less collaborative and does not allow a comparison of all the results at the end of the presentation in plenary).

TEMPLATE 3.3

TEMPLATE FOR GROUP WORK: SELECTING INDICATORS AND VARIABLES USING THE FOREST-WATER MONITORING TOOL

Based on your work on (sub) indicators and variables (Session 3.2):

- Use the Forest-Water Monitoring Tool to identify indicators, sub-indicators and methodologies for the case studies from Session 3.2.
- Check if the indicators, sub-indicators and methodologies you identified in Session 3.2 were also identified by the tool.
- Based on the methodologies provided by the tool, propose appropriate **measuring methods/tools**, and describe how they work.
- Explain briefly why you consider them to be adequate/relevant (**Handout 3.3.1**).

Prepare a presentation on a pinboard or flipchart (according to trainer's instructions).

Time for group work: **90 min.**

Time for presentation in plenary: **15 min** (up to **10 min** for group results, up to **5 min** for Q&A by other participants).

©CANVA

IMPROVING A MONITORING PLAN

SESSION 3.4
2 h 40

Learning objectives	• To develop an improved forest-water monitoring plan by integrating additional considerations using the Forest Water Framework and Tool. • To deliver suggestions for appropriate tools/methods for measuring chosen indicators (focus on recording methods).
Learning outcomes	At the end of this session, participants will be able to: • List suggestions for improving the existing monitoring plan of their projects/areas. • State and justify choice of realistic options for measuring and recording the selected indicators.
Steps	1. **PowerPoint: Improving a monitoring plan (15 min).** 2. **Introduction to group work (10 min)**. 3. **Group work**: Groups should discuss their project/area monitoring plan and use the Forest-Water Monitoring Framework and Tool to suggest adequate indicators, sub-indicators and variables (if not yet existing in the project/area), or check and justify adequacy of existing (sub) indicators and variables. Groups will then use the information provided by the Forest and Water Tool to identify recording methods/tools for monitoring selected indicators (use **Handout 3.4.1**) **(60 min)**. 4. **Presentation of group work results (1 hour or 15 min per group).** 5. **Facilitator's summary (up to 15 min)**.
Comments and tips for facilitators	The session can build on knowledge gained through Sessions 3.2 and 3.3. If time allows, issues of sampling can also be discussed. It depends very much on what already exists in participants' projects/areas and on group composition. If all participants come from 1 single project, it could be interesting to check/verify in plenary if all elements of the monitoring plan are complete, realistic. If the situation is very diverse, several groups could work on different tasks: providing suggestions for creating a monitoring sheet or improving an existing one. The trainer moves from group to group and gives advice. If a monitoring plan is not available, one can be created in groups and compared in plenary.

TEMPLATE FOR GROUP WORK: IMPROVING A MONITORING PLAN

TEMPLATE 3.4

Based on your work on your project/area and monitoring plan (if available), and using **Handout 3.4.1**:

- Use the Forest-Water Monitoring Tool to identify indicators, sub-indicators and methodologies for your project/area.
- Based on the methodologies provided by the tool, propose appropriate **measuring methods/tools** and describe how they work.
- Explain briefly why you consider them to be adequate/relevant, or what has changed (if anything) in your initial monitoring plan. Use the handout provided for this exercise.

Prepare a presentation on a pinboard or flipchart (according to trainer's instructions).

Time for group work: **90 min.**

Time for presentation in plenary: **15 min** (up to **10 min** for group results, up to **5 min** for Q&A by other participants).

HANDOUT 3.2.1

THE TACANÁ WATERSHEDS, GUATEMALA AND MEXICO

(This case study has been adapted from Barchiesi and Córdoba, 2016)

Background

The watersheds surrounding the Tacaná volcano, the second highest peak in Central America, with an elevation of 4,060 m.a.s.l., form a transboundary area of 3 170 km² between the Department of San Marcos, Guatemala and the State of Chiapas, Mexico. They are of great strategic importance for both countries, providing water for agricultural irrigation and urban supply. Fishing is a valuable source of income in the lower reaches. The area also encompasses the Volcán Tacaná Biosphere Reserve, an area that supports high biological diversity due to the presence of key habitats such as paramos, medium altitude and cloud forests. Riparian forests also occur in the area along the waterbodies. The watersheds present high average annual precipitation, ranging from 2 000 to 5 000 mm.

Current situation

Despite its significant potential, the area faces pronounced vulnerabilities and risks. There is a high occurrence of hurricanes and volcanic activities. Unregulated land-use change has led to deforestation and degradation, causing erosion, mudslides and floods, and reducing the capacity of the watersheds to retain water, mainly during the rainy season, from May to October. During the dry season, water scarcity is also an issue, affecting agricultural production, and community income generation as a result. Among sociopolitical shortcomings, challenges in the region include lack of technical support among institutions, the marginalization of indigenous peoples, high rates of illiteracy and mortality, very high population growth, a complex land tenure rights scenario, youth migration and land fragmentation.

Environmental degradation – including land degradation and pollution – linked to weak institutions and social challenges have undermined the resilience of the Tacaná Watersheds. Marginalized farmers have been forced to move to higher altitudes, clearing forests to make way for small farms. In the low and middle parts of the catchment, sugar-cane, coffee, African palm and banana industries contaminate water, and large-scale farming has degraded the land. Soil erosion resulting from unregulated land-use change has strongly increased the risk of floods and mudslides. Furthermore, lack of organization at institutional level hinders local people from taking action to avert these risks.

Possible solutions

A range of interventions, taking diverse perspectives, have been developed to address the issues faced by the Tacaná Watersheds. To safeguard ecosystems and livelihoods, 8 community pilot projects have been designed in Guatemala and 21 in Mexico, addressing water, soil and environmental conservation and disaster risk reduction, and aiming to empower communities to self-organize and improve their development opportunities. Community forest management plans have also been developed, and different activities supported, including beekeeping, fish farming, butterfly farm ecotourism, community gardens, organic farming and soil conservation.

A Payments for Ecosystem Services (PES) programme has been launched, seeking to implement revenue mechanisms to feed an environmental fund dedicated solely to conservation work in the Tacaná Watersheds. The systematization of national information on PES, preparation of a glossary of PES terminology, and training for technicians are among the outcomes achieved.

Community self-organization has been encouraged, with support for small business enterprises and the setting up of microwatershed councils to coordinate resource management of shared water and land resources.

High financial resources and experts are currently available for monitoring the following areas of interest: the PES scheme, water-sharing community arrangements and management plans. Regarding further monitoring, there is high expertise and high availability of financial resources for monitoring water-related socio-cultural and economic impacts, water governance mechanisms and water access.

There is also some expertise and funding available for monitoring of biodiversity, water-use efficiency, water stress and soil erosion. The expertise available for monitoring other variables is limited even though there are some financial resources available.

THE TACANÁ WATERSHEDS, GUATEMALA AND MEXICO

HANDOUT 3.2.1 (CONTINUED)

Answer Key for FL-WES questionnaire

1. Watershed/Regional (R)
2. Forest – Low altitude plains;
   Forest – Low altitude upland
   Forest – Montane
   Cropland
3. High: 2 000–5 000 mm
4. a. Water stress/scarcity
   c. Poor water quality
   d. Erosion
   e. Flooding/high seasonal flows
   h. High precipitation seasonality
5. b. High conservation ecosystems/biodiversity hot spots
   c. Protected area
   d. Religious or culturally significant areas
   e. Riparian forest
   g. Deforestation / land-use cange
   j. Payment for ecosystem services scheme
6. c. Forest products (non-wood)
   d. Conservation (biodiversity)
   f. Protective function (natural hazard mitigation)
   o. Community development/livelihoods
7. b. Groundwater recharge/storage
   d. Water quality
   e. Water-related natural disaster mitigation
   j. Water-related economic impact (including Payment for Ecosystem Services)
   l. Water-sharing community or political arrangements
   q. Management plans and/or forest practices for soil / water conservation
8. j. Water-related economic impact (including Payment for Ecosystem Services)
   l. Water-sharing community or political arrangements
   q. Management plans and/or forest practices for soil / water conservation
9. Mark **high expertise** for the following: Water-related economic impact (including Payment for Ecosystem Services); water-related socio-cultural impact; water sharing community or political arrangements; water access; water-related governance mechanisms; management plan and/or forest practices for soil and water conservation

   Mark **some expertise** for the following: Biodiversity; water-use efficiency; water stress; soil erosion

   Mark **limited expertise** for all other items. None of the items have "no expertise"
10. Mark **high resources** for the following: Water-related economic impact (including Payment for Ecosystem Services); water-related socio-cultural impact; water sharing community or political arrangements; water access; water-related governance mechanisms; management plan and/or forest practices for soil and water conservation

    Mark **some resources** for all other items. No items should be marked under the "limited resources" or "no resources" category.

HANDOUT 3.2.2

PANGANI RIVER BASIN, TANZANIA

(This case study has been adapted from Welling et al., 2011)

Background

The Pangani River Basin covers approximately 44 000 km^2, with 95 percent of its total area located in Tanzania, and 5 percent in Kenya. The river starts as a series of small streams draining from Mt. Kilimanjaro, Mt. Meru and the Pare and Usambara mountain ranges, and flows into the Indian Ocean. Riparian forest is relatively well conserved. Land cover includes low altitude and montane forests, cropland, grassland and human settlements. The annual average precipitation is 820 mm.

The livelihoods of more than 3 million people depend on the Pangani River Basin, primarily through agriculture and fisheries. It has fertile soils and ample rainfall, and the area is considered the food basket of Tanzania.

However, the river basin is increasingly under pressure. Its natural resources are being used in various ways, including for timber, land, fishing, mining and hydroelectric power activities. Deforestation is increasing, due to pressure for land conversion, leading to erosion. Climate change and the overexploitation of water resources are also challenging the delivery of water services in the river basin where water quality and quantity are continuously declining. For example, flows have already declined from several hundred cubic metres (m^3) to less than 40 m^3 per second due to climate change. In addition to reduced flow, the region is experiencing rapid population growth, which increases competition for diminishing water resources, and has already led to tensions between the various stakeholders within the basin.

Models of population growth and climate change scenarios show that rainfall in the upper Pangani River Basin will increase between 16 and 18 percent in the 2050s relative to 1980–1999, while temperature is projected to increase by an average 2°C. The overall annual water demand in the Pangani basin is expected to increase from 1 879.73 million cubic metres (Mm^3) in 2011 to 3 249.69 Mm^3 in the 2060s, resulting in unmet demand of 1 673.8 Mm^3 (51.5 percent).

Current situation

The Pangani Basin Water Board has the tools, knowledge and capacity to implement a sustainable management plan. To date, the board – established in 1991 – has worked in accordance with the Water Resources Management Act No. 11 of 2009 to implement a comprehensive, integrated and holistic approach to the management of water resources, aiming to increase their resilience in order to combat climate change. In 2002, the Ministry of Water launched a new National Water Policy, which recognized the important link between a healthy environment and productive livelihoods, including the relevance of riparian forest management for the provision of good quality water for urban areas.

Stakeholders currently involved in managing the basin include public institutions and the private sector (representatives of catchment water committees, local government associations, Ministry of Water, private sector water users, and water-related sectors).

Although the Pangani is a very important transboundary river basin, and there is substantial local stakeholder engagement, very little monitoring is conducted, mainly focused on surface water flows and water access, making it difficult for the Pangani Basin Water Board to assess the current situation and make management decisions.

Possible solutions

The Pangani Basin Water Board would like to see further cross-sectoral management and more monitoring, so as to fully integrate forest and water linkages. It has some financial resources available to address these issues over the next five years. They also have high expertise in areas related to water quality, biodiversity, water stress, soil erosion, water sharing arrangements, water access and management plans. Some expertise is also available for monitoring surface water flows, water-related socio-cultural impacts and water governance mechanisms. In other topics, however, the board has limited or no expertise. Water experts are overly represented among the stakeholders involved in management decisions.

Since the board has some expertise in the topic of Payment for Environmental Services, it also wishes to explore this option of to raise awareness of potential water security issues, and involve local people in sustainable management of the basin.

PANGANI RIVER BASIN, TANZANIA

HANDOUT 3.2.2 (CONTINUED)

Answer Key for FL-WES questionnaire

1. Watershed/Regional (R)
2. Forest – Low altitude plains;
   Forest – Low altitude upland
   Forest – Montane
   Cropland;
   Grassland;
   Settlement
3. Medium: 800–1 000 mm
4. a. Water stress/scarcity
   c. Poor water quality
   d. Erosion
5. a. Dams/reservoirs
   e. Riparian forest
   g. Deforestation / land-use change
   h. Integrated forest-water policies
   i. Integrated management plan
6. a. Forest products (natural forest - wood)
   c. Forest products (non-wood)
   i. Climate change adaptation
   k. Riparian management
   l. Urban
   n. Governance
7. a. Surface water flows
   h. Water stress
   i. Soil erosion
   j. Water-related economic impact (including Payment for Ecosystem Services)
   l. Water-sharing community or political arrangements
   o. Water-related governance mechanisms
   q. Management plans and/or forest practices for soil / water conservation
8. a. Surface water flows
   n. Water governance

Mark **high expertise** for the following: Water quality; biodiversity; water stress; soil erosion; water sharing community or political arrangements; water access; management plan and/or forest practices for soil and water conservation

Mark **some expertise** for the following: Surface water flows; water-related economic impact (including Payment for Ecosystem Services); water-related socio-cultural impact; water-related governance mechanisms.

Mark **limited expertise** for the following: Groundwater recharge/storage; water-related natural disaster mitigation; green/natural infrastructure; riparian management.

Mark **no expertise** for all other items.

9. Mark **some resources** for all items.

HANDOUT 3.2.3

KRUENG PEUSANGAN WATERSHED

(This case study has been adapted from Khasanah et al., 2010)

Background

The Krueng Peusangan Watershed is located in Indonesia, in the province of Aceh. It has a total area of around 2 268.4 km^2, and consists of 11 sub-watersheds and Lake Laut Tawar, which is in the upper reaches. The annual rainfall in the Krueng Peusangan watershed varies between 1 848–2 000 mm per year. Natural vegetation in the watershed includes low altitude forests.

The Krueng Peusangan Watershed has been designated a 1st priority degraded area by the Aceh Department of Public Works and Water Resource Services, meaning that its restoration is considered to be urgent. Communities living within the watershed have experienced flooding, riverbank collapse and abrasion and soil erosion/sedimentation. They believe that this is mostly due to deforestation, logging and land conversion.

The Aceh Provincial Government wants to develop a strategic plan for integrated and sustainable watershed management of the Krueng Peusangan Watershed, so as to prevent further degradation.

Current situation

The watershed has high rainfall during wet seasons. The area is culturally important, since it is home to ethnic communities, mainly the Gayo and Aceh people. The Gayo people mostly plant upland rice, coffee, cocoa, and pinang under both monoculture and mixed crop systems. The Acehnese practise fishing and grow rice in irrigated paddy systems, as well as coconut and oil palm.

Communities in upstream and downstream areas recognize the importance of the river. However, due to the problems described they have suffered major economic losses. Nearly 40 percent of people living in mid and upper watershed areas rely on the fishing industry for their livelihoods. Fishing communities have been affected by reduced river flows in the dry season and increased siltation in Lake Laut Tawar. It is important to note that there are endemic and endangered species of fish in the watershed.

Policy-makers, such as district and provincial government officials, recognize the economic and ecological importance of the watershed. They agree with the problems identified by the communities, and consider forest clearing, mining activities and wild foraging as the main drivers.

A land cover analysis (between 1990 and 2009) using satellite data has shown a decrease of forest and pine forest cover (of about 40 percent) and an increase in settlements, oil palm plantations and other tree cover systems, such as coffee agroforestry, monoculture and complex mixed tree plantations. As a consequence of changing land uses and tree cover loss over the past 20 years, total water yield as a fraction of total rainfall has increased. High total water yield, especially under intensive rainfall events, as measured from local monitoring stations, is believed to have contributed to increasing surface flow, leading to floods, soil erosion and riverbank abrasion.

Some monitoring is being conducted in the watershed, albeit with a number of limitations. For example, long-period daily rainfall data covering the entire sub-catchment of the Krueng Peusangan Watershed is not available. The volume of the lake is unknown, and river flow data are available for six years only.

Possible solutions

Recognizing the environmental, cultural and economic importance of the watershed, the Aceh Provincial Government wants to develop a strategic plan for integrated and sustainable watershed management within the next three years, in order to halt and reverse degradation. The national Government has allocated a limited amount of financial resources to develop the plan, and the provincial Government has access to many local experts, students and volunteers.

Some of the suggested solutions proposed by local communities include planting valuable trees in mixed tree crop systems, coffee agroforestation and riparian area restoration. Local communities are also highly knowledgeable about tree species used to reduce erosion, as well as simple constructions to maintain the stability of riverbanks.

KRUENG PEUSANGAN WATERSHED

HANDOUT 3.2.3 (CONTINUED)

Answer Key for FL-WES questionnaire

1. Watershed/Regional (R)
2. Forest – Low altitude plains;
   Forest – Low altitude upland
   Forest – Planted
   Agroforestry;
   Cropland;
   Settlement
3. Medium: 1 500–1 200 mm
4. d. Erosion
   e. Flooding/high seasonal flows;
   h. High precipitation seasonality
5. b. High conservation ecosystems/biodiversity hot spots
   d. Religious or culturally significant areas
   f. Reforestation / afforestation / restoration
   g. Deforestation / land-use cange
   i. Integrated management plan
6. b. Forest products - (planted forest)
   c. Forest products (non-wood)
   d. Conservation (biodiversity)
   f. Protective function (natural hazard mitigation)
   j. Agroforestry/silvopastoral
   k. Riparian management
   m. Restoration
7. a. Surface water flows
   e. Water-related natural disaster mitigation
   f. Biodiversity
   i. Soil erosion
   q. Management plans and/or forest practices for soil / water conservation
8. a. Surface water flows
9. **High expertise** to all.
10. **Limited resources** to all.

HANDOUT 3.2.4

MONITORING-SELECTING INDICATORS AND VARIABLES

Name of project:

Overall project objective(s):

Indicators/ sub-indicators/ variables	Why was this chosen?	How would you measure it?	Frequency	(leave empty for the moment)
Indicator: Water Quantity and Timing				
(Sub)indicator/Variables				
Sub-indicator …				
Variable …				
Variable …				
Variable …				
Sub-indicator …				
Variable …				
Variable …				
Indicator: Water Quality				
Sub-indicator …				
Variable …				
Variable …				
Indicator: Forest-Based, Water-Related Ecosystem Services				
Sub-indicator …				
Variable …				
Variable …				

HANDOUT 3.3.1

MONITORING-MEASURING METHODS

Name of project:

Overall project objective(s):

Indicators/ sub-indicators/ variables	Why was this chosen?	How would you measure it?	Frequency	Was this identified as key indicator/ sub-indicator/ variable by the Forest-Water tool? What methodology would you choose to measure it? (comments)
Indicator: Water Quantity and Timing				
(Sub)indicator/Variables				
Sub-indicator …				
Variable …				
Variable …				
Variable …				
Sub-indicator …				
Variable …				
Variable …				
Indicator: Water Quality				
Sub-indicator …				
Variable …				
Variable …				
Indicator: Forest-Based, Water-Related Ecosystem Services				
Sub-indicator …				
Variable …				
Variable …				

IMPROVING A MONITORING PLAN

Project title:

Goal:

Indicator/ Sub-indicator	**Variable**	**Assumptions/ Risks**	**Methodology to measure a variable**	**Field work considerations**				**Desk study**	**Cost $/$$/$$$**
			(what data needs to be collected and in what format? where will the data come from? How easy is it to collect it? Is it cost efficient? Are there proxy measures?)	**Scale** (what is the appropriate scale for data collection and how sampling points are needed?)	**Frequency** (including start date/end date and frequency of monitoring)	**Equipment and/or facilities**	**QA and QC and uncertainty** (How are you ensuring quality and how are you controlling it? What is the uncertainty associate with this methodology?)	Sources of data	(Take into account the technology, materials, human resources, skills, time, travelling needs etc.)

MODULE 4

Field study – Monitoring for forests and water

MODULE 4
Field study – Monitoring for forests and water

Session at a glance

OBJECTIVES

- To become familiar with practical monitoring methodologies in the field.
- To reflect on lessons learned from field practice and discuss ways to integrate new knowledge into project activities.

MATERIALS

- ☐ Objectives & programme (as handouts, on flipchart)
- ☐ Sign-in sheet or register
- ☐ Field equipment (according to needs of the selected tools and related exercises)

LEARNING OUTCOMES

At the end of this module, participants will be able to:

- Gain practical experience in measuring forest-water indicators.
- Consider potential challenges in field work and propose appropriate solutions.

KEY MESSAGES

- Effective monitoring requires testing and learning about local field conditions. Planning and allocating time to evaluate any challenges and their appropriate solutions must therefore be considered.
- It is suggested that Sessions 4.1–4.3 be completed the day before going to the field (Session 4.4), so as to allow for sufficient time there. Sessions 4.5–4.6 could be completed the day after visiting the field.

Overview of sessions

	MODULE 4 SESSION CONTENT	RESOURCES
SESSION 4.1 **30 min**	Introduction to field study	
SESSION 4.2 **1 h 15**	Prepare monitoring sheets Planning/designing measuring – group activity	Template for group work: Preparing the monitoring sheet
SESSION 4.3 **1 h 15**	Measurement exercises – group activity	Field equipment
SESSION 4.4 **Full day**	Measurements in the field	Field equipment, monitoring sheets
SESSION 4.5 **40 min**	Lessons learned from field study – group activity	Template for group work
SESSION 4.6 **45 min**	Reflecting on results, experience, problems in monitoring and how to address them – group activity	Template for group work: Field work challenges and solutions

NOTES

Background

During this module, participants will apply their skills, understanding and learning acquired during the preceding module(s), making connections between theory and practice. To ensure that the module is delivered according to plan, facilitators should begin the planning and preparation of the field visit as soon as possible before the start of the workshop. The following are some recommendations to help prepare the field study day.

Pre-workshop preparation for field visit

Clarify your preparation 'needs' as early as possible, particularly if you have to hire local expertise (e.g. interpreter), need permits, or to purchase equipment. Other considerations apply to site selection, equipment, logistics and field safety.

Site selection

An appropriate site(s) for the field visit should be pre-identified using the facilitator's own expert knowledge, that of local contacts, and any other sources of site information (e.g. maps, satellite imagery). Considerations for site selection will be dependent on the local context, and the scope of the field work to be undertaken. However, general factors to take into account include: site accessibility and travel times, terrain and site conditions (e.g. soil conditions for infiltration measurements), site safety and proximity to water sources (needed for some measurements). If possible, it is preferable to take participants to a site(s) that demonstrates at least some of the key concepts of forest-water interactions and land-use change covered in Modules 1 and 2. Advance contact should be made with all relevant public bodies, landowners and/or community groups, in order to obtain any necessary site access and work permission. It is generally advisable to select several potential sites, in case permission for some sites are delayed or not obtained, or site conditions are not as desired. Ideally, potential sites should be visited prior to the workshop, to ensure suitability, though this may not always be possible.

Equipment

For practical reasons, facilitators should consider in advance which forest-water indicators will be measured in the field. Depending on which measurements are chosen, equipment lists should be compiled, taking into account the number of participants and how the equipment will be used in the field – for example, will participants be working in smaller or larger groups? How many groups? Local partners, including universities, research institutions, NGOs, etc. should be engaged not only for facilitation, but also for access to equipment and observation sites. It may not be possible to source all equipment locally, so consideration of shipping costs, times etc. should be made in advance.

Logistics

Depending on the circumstances, arranging transport to and from field sites can be problematic and often costly. It is therefore crucial to consider transport options when choosing potential sites for the field visit. It is important to ensure **safe** transport for participants, including checking

driver qualifications and that vehicles are roadworthy and properly insured. If facilitators are not familiar with field sites, it is strongly recommended that an experienced and reputable guide be engaged from the local area, in addition to obtaining any current maps available. Ensuring an adequate supply of food (in accordance with dietary requirements) and drinking water for all those attending the field visit (participants, facilitators and any field staff) is a key consideration. In some circumstances, it may be necessary to transport drinking water to the field site, in which case it is advised to seek advice on how much to budget per person, given factors such as climate, activities and length of day, including a margin of error.

Field safety

Ensuring the safety of everyone on the field visit is paramount. For this reason, it is always advisable to carry out a full risk assessment at the earliest opportunity, once the site and specific activity details have been confirmed. Risk assessments make us think about all types of hazards (e.g. physical, biological, chemical, man-made) that may be encountered in the field, and what measures could be put in place to remove or control them. Risk assessments should also be used to assess the impact on the environment of field activities, and identify steps to avoid or reduce any negative impacts.

It is important to know where you are going. In addition to using current maps and an appropriate global positioning system (GPS) device it is often advisable to engage a local guide to help with navigation, particularly if the facilitating team is unfamiliar with the area. It is important to recognize that depending on the location of the field site, communication options via mobile phone may be limited or zero. In such circumstances, and where possible, it is advisable to carry a satellite phone in case of emergencies. Regardless of the location of field sites, it is highly advisable to ensure that at least one person in attendance is trained in fieldwork first aid, and that there is a full first aid kit(s) available.

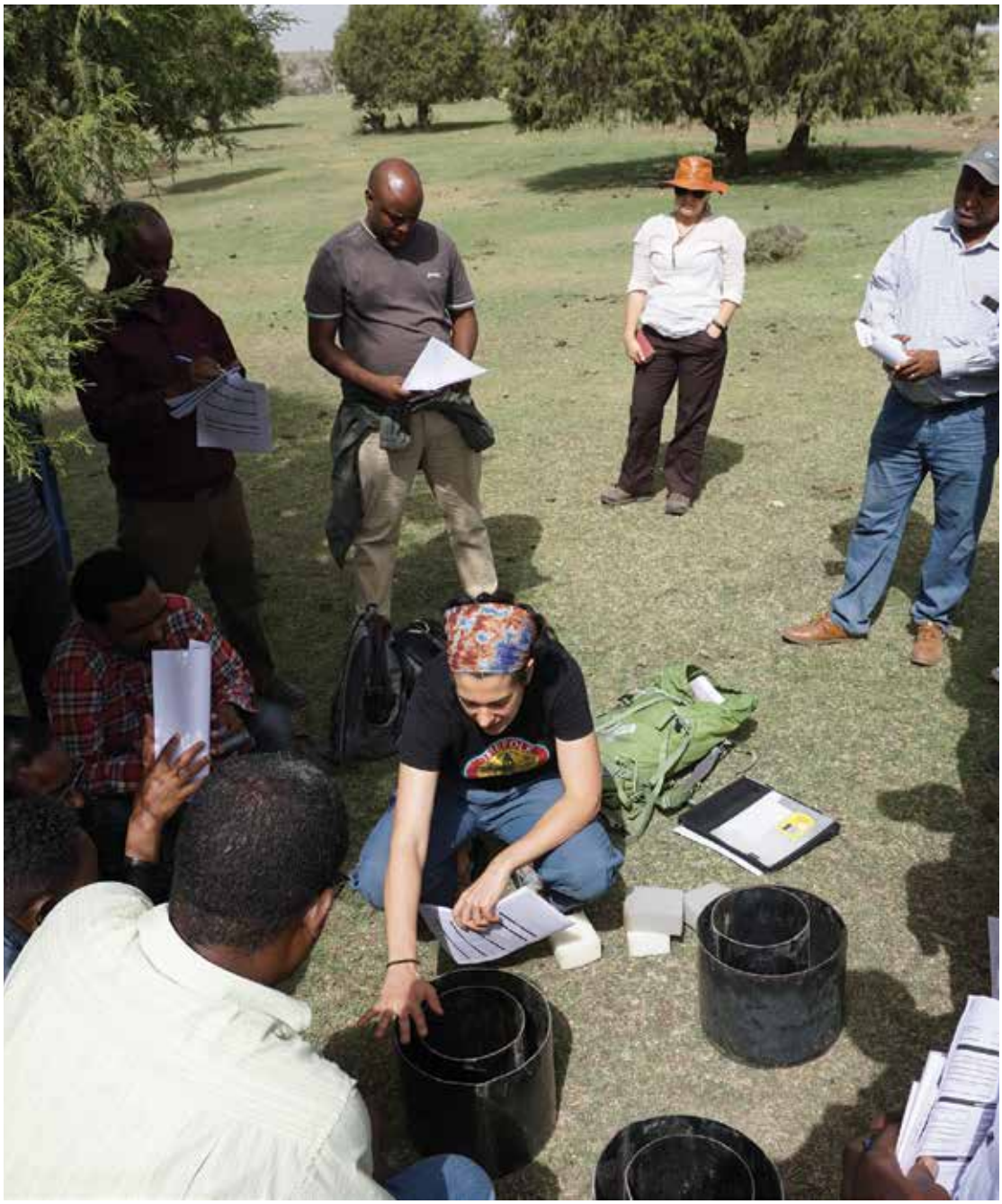
Preparing participants for the field study

In preparation for the field study, it is important that participants understand some general field study concepts. This will be particularly important for participants who have had less practical field experience, or who undertake field work infrequently. Such general concepts will depend on the specifics of your programme, but could include how to select sites for forest-water monitoring (criteria and considerations), how to design an appropriate sampling scheme, and how to conduct field work.

To ensure efficiency and maximize the field experience it is important to share the agenda in advance, prepare the participants with information about the site they will visit, the measurements they will make, the methodologies and equipment they will use (in-class practice with equipment is advised), the recording sheets, and how to record their observations.

RESOURCES

- Resources can be found on the FAO Forests and Water Programme website as well as on the FAO Sustainable Forest Management (SFM) Toolbox
- Report: **Bonfantine, K., Zebrowski, J. & Egan, A.** 2018. *Guidelines and protocols for monitoring riparian forest restoration projects* [online]. New Mexico Forest and Watershed Restoration Institute. [Cited 8 July 2019].



© AIDA BARGUÉS

SESSION 4.1
30 min

INTRODUCTION TO FIELD STUDY	
Learning objectives	• To introduce participants to the field study day objectives and activities to be undertaken. • To introduce participants to the specific study site.
Learning outcomes	At the end of this session, participants will be able to: • Identify the specific conditions of the study site that will affect data collection methods.
Steps	1. **Provide Information** necessary for allowing participants to choose and plan the methods/tools that they want to test, such as background information to study site area **(10 min)**. 2. **Review rationale**, equipment and process for field work **(10 min)**. 3. **Q&A (10 min)**.
Comments and tips for facilitators	This session prepares participants for the field work and will need to be tailored to the specifics of the workshop being delivered, the nature of the field experience, and the particular conditions for field work.

SESSION 4.2
1 h 15

PREPARE MONITORING SHEETS PLANNING/DESIGNING MEASURING	
Learning objectives	• To tailor monitoring sheets for the recording of selected metrics. • Collect data using the selected methods/tools.
Learning outcomes	At the end of this session, participants will be able to: • Explain what will be measured and how during the field study. • Produce a tailored data collection sheet(s) to be used during the field trip.
Steps	1. **Explanation of instructions** by trainer **(10 min)**. 2. **Group work** as for monitoring sheets **(65 min)**. 3. **Facilitator constantly checks group work** and gives advice as needed.
Comments and tips for facilitators	The facilitator should be available for questions from groups during group work, and intervene only when noticing serious errors, without being too directive or having too much of a 'teacher attitude'. Participants will identify errors and deal with difficulties by themselves during the measuring exercise(s) in the training venue or during the field study.

TEMPLATE 4.2

TEMPLATE FOR GROUP WORK: PREPARING THE MONITORING SHEET

For indicators and sub-indicators selected for your project, and taking into consideration the possibilities of the field study:

- Discuss the indicators you want to measure during the field study.
- Discuss the appropriate methodology/tool for measuring the indicator.
- Choose an appropriate monitoring sheet that you can adapt for your project, or improve existing monitoring sheet of your project/area.

List the required material and other elements that need to be prepared.

Time for group work: **65 min**

No presentation in plenary, but concrete measuring exercise after coffee break.

Trainer will be available during group work in the event of questions.

MEASUREMENT EXERCISES

SESSION 4.3
1 h 15

Learning objectives	• To implement selected methods/tools for measuring indicators.
Learning outcomes	At the end of this session, participants will be able to: • Demonstrate familiarity with the methods/tools to be used during the field trip. • Produce monitoring sheets and instructions for the field trip.
Steps	1. Based on selected variables and tools: **exercise in classroom setting** (pull-out equipment e.g. rain gauge etc. practice in 'classroom' controlled environment and test their monitoring sheets. Depending on number and diversity of tools to be tested, exercises can be done consecutively while other participants observe and give feedback, or simultaneously, with trainer moving from one group to another) **(1 h)**. 2. **Wrapping up**: Lessons learned from planning and implementation exercise **(10 min)**. • Question: Tell us **1 insight gained**/lesson learned from the planning and implementation exercise. • Participants stand in a circle, an object (pen/ball) is given to the first participant who wants to answer. She/he throws the object to the next participant who wants to answer. It is not compulsory for each participant to answer. 3. If needed, participants can **adjust their planning of measurement** for field study.
Comments and tips for facilitators	The wrapping up in a circle should provide a quick summary of the exercises, without a long description of what has happened. Make sure that participants mention just 1 insight, so that the recap can be a collective moment. If your group is talkative, you can establish the rule: 1 insight = 1 sentence!

MEASUREMENTS IN THE FIELD

SESSION 4.4
Full day

Learning objectives	• To implement selected methods/tools for measuring indicators.
Learning outcomes	At the end of this session, participants will be able to: • Demonstrate familiarity with the methods/tools used in the field. • Produce data using the monitoring sheets.
Steps	1. **Introduce and review** proper safety protocols and data quality assurance techniques. 2. In a large group, **give demonstrations of the methodologies** to be used (one at a time). 3. Divided into smaller groups, participants will **practise the methodologies** to measure selected variables and collect data using their monitoring sheets. **Full day**
Comments and tips for trainers	Make sure that facilitators visit all groups during the session, to answer questions and clarify issues throughout the day. For each method demonstrated, allow participants sufficient time to practise before introducing others.

SESSION 4.5
40 min

LESSONS LEARNED FROM FIELD STUDY

Learning objectives	• To collect and document lessons learned during the field study.
Learning outcomes	At the end of this session, participants will be able to: • Describe and reflect on various challenges experienced during the field trip.
Steps	**Visualized brainstorming:** 1. **Each participant is given up to 3 cards** on which she/he can write answers to the following question: • *What new insight(s) did I get from the field trip?* (Answers can refer to technical, organizational and other aspects) **(10 min)** 2. **Facilitator collects cards**, shuffles them and pins them in thematic clusters on the pinboards; participants are actively involved in forming the thematic clusters **(20 to 30 min)** 3. Time permitting, **titles can be formulated** for the different clusters.
Comments and tips for facilitators	This session is useful for bringing the group 'together again' after the field study, during which participants may have had diverse experiences.

SESSION 4.6
45 min

REFLECTING ON RESULTS, EXPERIENCE, PROBLEMS IN MONITORING, AND HOW TO ADDRESS THEM

Learning objectives	• To reflect on results, experience, problems in monitoring and how to address them.
Learning outcomes	At the end of this session, participants will be able to: • Describe and reflect on ways to address field work problems and incorporate them into monitoring plans.
Steps	1. **Brainstorming**: What are the problems you faced in monitoring during the field trip (facilitator writes answers on a pre-structured board) **(15 min)** 2. **Discussion in plenary**: How to address these problems (insert agreed answers onto the board) **(30 min)** 3. **Make final adjustments** to monitoring plans and/or sheets (if necessary).
Comments and tips for facilitators	Make sure that all participants take active part in the discussion.

TEMPLATE 4.6

TEMPLATE FOR GROUP WORK: FIELD WORK CHALLENGES AND SOLUTIONS

In your working group, answer the following questions:

- *What were the problems faced during monitoring?*
- *What suggestions could you make to address the problem?*

For each problem and solution identified within your group, write 1 card (this will simplify the structuring during the plenary session). During presentation, cards will be fixed on a pre-structured board in plenary.

Time for group work: **15 min**

Time for presentation in plenary: **30 min**

MODULE 5

The forest-water nexus in action

MODULE 5
The forest-water nexus in action

Session at a glance

OBJECTIVES

- To conceptualize how water considerations in forest and tree management can be incorporated into the relevant contexts for participants.
- To develop an action plan to assist in implementing integrated forest-water activities.
- To discuss and develop the next steps for participants (lessons learned).

MATERIALS

- ☐ Objectives & programme (as handouts, on flipchart)
- ☐ Sign-in sheet or register
- ☐ Flipchart
- ☐ Projector & computer
- ☐ Slides
- ☐ Printed out templates (at least 2 copies per working group)
- ☐ Felt pens
- ☐ Handout 5.3.1

LEARNING OUTCOMES

At the end of the module, participants will be able to:

- Produce concrete action plans with activities for the better integration of forest-water monitoring in participants' project/area.

KEY MESSAGES

- The *results-based management approach* emphasizes the results achieved through the Forest & Water Action Plan and depends on overall ownership of the project, inclusiveness through stakeholder engagement, and a focus on the results to be achieved.

Overview of sessions

	MODULE 5 SESSION CONTENT	RESOURCES
SESSION 5.1 **1 h 15**	Integration of water considerations into participants' forest/tree-related projects/activities – group activity	Template for group work (same title)
SESSION 5.2 **45 min**	Presentation of ideas for integrating water considerations into forest/tree-related projects/activities and forests in water projects/activities	
SESSION 5.3 **1 h 30**	Designing a Forest and Water Action Plan – group activity	**Handout 5.3.1**. Designing a forest-water action plan

NOTES

Background

The purpose of a Forest & Water Action Plan, which is an action plan that integrates forests and water considerations into a project or programme, is to support decision-makers in managing and measuring the progress of steps taken to monitor, maintain and/ or improve the ability of forests to provide water-related ecosystem services. This is a multidisciplinary and multistakeholder process, which can help to improve local or regional environmental conditions and contribute to addressing drivers of forest loss, as well as water quality and availability.

As shown in Figure 6, the Forest & Water Action Plan involves a planning team that must follow a number of steps before moving into the implementation phase. To ensure the success and relevance of the plan, the planning team must identify the stakeholders who need to be taken into account. These include, but are not limited to, community and civil society groups, industries in the area and downstream, government institutions, indigenous groups and representatives of academia. This process will help the planning team to identify its monitoring needs and questions. It will also increase the public's ownership of the plan and commitment to achieving its objectives.

Once the stakeholder engagement process is finalized, project developers or the planning team should align the project with development or programme priorities and/or policies. The action plan's (or project's) conceptual framework should then be developed. The resulting Forest & Water Action Plan should have a clear impact, as well as specific outputs and outcomes. It should be measurable through the choice of indicators and sub-indicators that provide the framework for the monitoring plan, attainable in its overall scope and aims, relevant to the local context and time-bound and targeted in order to allow for evaluation of the plan and adjustment if necessary. To achieve the best possible results, this facilitation guide suggests that project managers use the results-based management (RBM) approach. The action plan should also include a budget, and activities should be planned and coordinated according to the funds available.

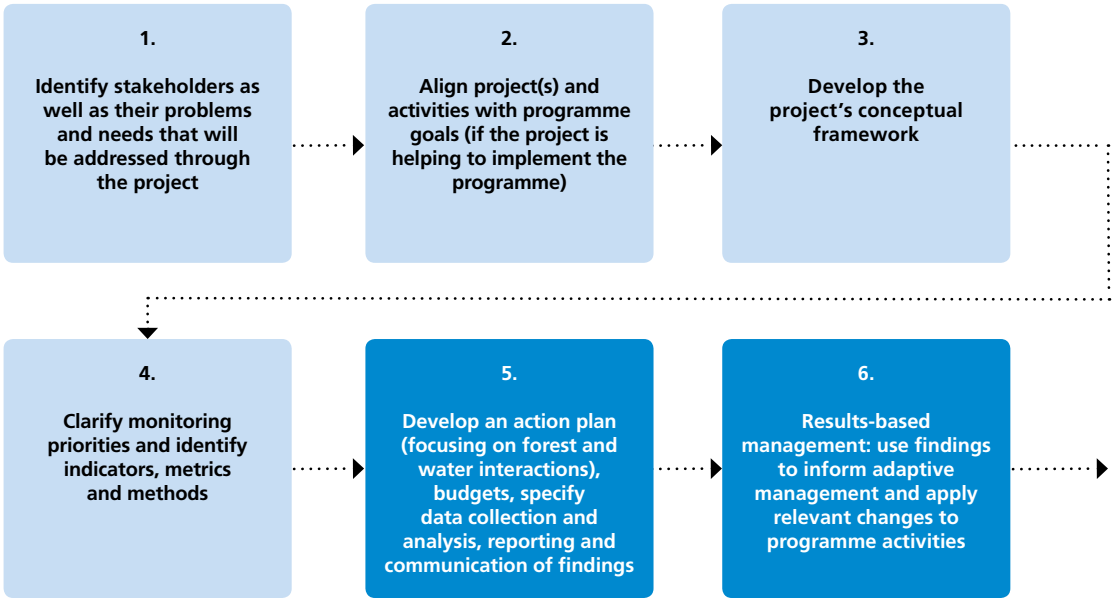
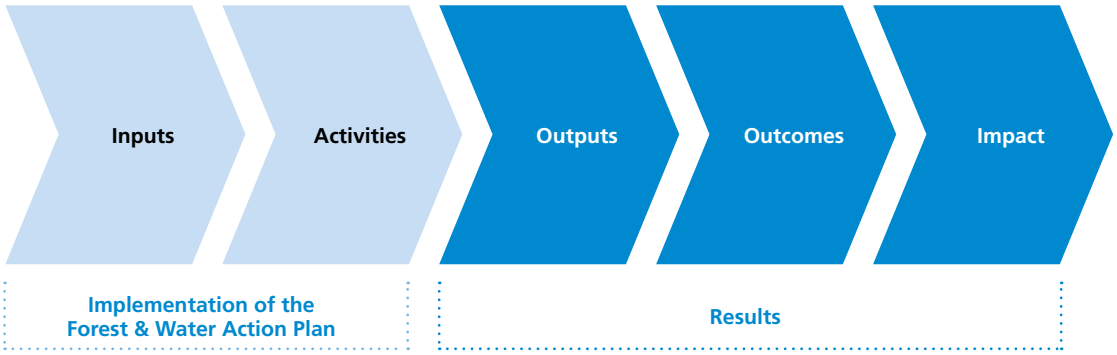


FIGURE 6. General framework of a project cycle. An action plan that helps to include forest and water interactions should be embedded within the project and include the implementation of the monitoring framework.

This approach emphasizes the results achieved through the Forest & Water Action Plan and depends on overall ownership of the project and inclusiveness through stakeholder engagement. The results should always be kept in mind during the design, implementation and monitoring and evaluation sections of the plan, as everything must have a logical cause-and-effect relationship. Within the RBM framework, the following general terminology applies:

- **Results**: outputs, outcome(s) and impact that a programme or project aims to bring about
- **Impact**: long-term goals
- **Outcomes**: medium-term objectives
- **Outputs**: short-term deliverables

FIGURE 7
Results chain of the results-based management framework



The logical framework approach

The results chain shown in Figure 7 may be used in a logical framework matrix to summarize the Forest & Water Action Plan. This overview of the plan is a useful tool to visualize the logic behind the overall plan. Table 6 provides an example of a logical framework matrix. Output 1 in this example relates to the monitoring plan developed in Module 3 of this facilitation guide.

©FAO/VITOR BRITO

TABLE 6. LOGICAL FRAMEWORK MATRIX EXAMPLE (FAO)

QUANTITATIVE AND QUALITATIVE INDICATORS					
Results chain	**Assumptions**	**Indicator**	**Baseline**	**Target**	**Means of verification**
Impact Water scarcity is reduced or eliminated.					
Outcome Improve water quality and quantity through better management of forests for the provision of water-related ecosystem services.					
Output 1 Forested watershed monitoring plan that will provide information on priority areas for restoration. *(See Module 3 on how to create or improve a monitoring plan)*	• General information on the forested watershed is available. • There are no security threats or major events that will hinder monitoring. • Monitoring accepted and encouraged by all stakeholders.	Implementation of a forested watershed monitoring plan.	Historical averages for variables measured if available.	One monitoring plan in place and completely implemented.	• Monitoring plan • Reports and data results from monitoring protocols for different indicators and sub-indicators
Activity 1.1 Development of a monitoring plan	General information on the forested watershed is available.	Monitoring plan document finalized.	none	One monitoring plan for the forested watershed.	Monitoring plan for forested watershed published and shared with relevant stakeholders.
Activity 1.2 Implementation of the monitoring plan	There are no security threats or major events that will hinder monitoring.	Monitoring plan implemented and monitoring carried out.	Historical averages for variables measured if available.	One monitoring plan completely implemented.	Reports and data results from monitoring protocols for different indicators and sub-indicators.
Output 2 Restoration measures identified and implemented					
Activity 2.1 Plan for restoration measures developed					
Activity 2.2 Implementation of restoration measures					

RESOURCES

- Resources can be found on the FAO Forests and Water Programme website as well as on the FAO Sustainable Forest Management (SFM) Toolbox
- Guidelines for forest management planning
- Guidelines for formulating national forest financing strategies
- Forest management planning

SESSION 5.1
1 h 15

INTEGRATION OF WATER CONSIDERATIONS INTO PARTICIPANTS' FOREST/TREE-RELATED PROJECTS/ACTIVITIES	
Learning objectives	• To analyse the consequences of their forest-related activities on forests and water. • To develop first ideas on how to integrate water considerations into their projects/activities.
Learning outcomes	At the end of this session, participants will be able to: • Describe and analyse participant's context(s). • Generate and explain ideas for integrating water considerations into an action plan.
Steps	1. **Forming of groups and explanation of instructions for group work**; form groups according to project similarities **(15 min)**. 2. **Group work (1 h)**. **On the basis of experience and on observations during field study** • *What forest- and tree-related activities can be identified? Why are these being implemented?* • *What positive and negative impacts do they have on 1) the forest and 2) on your water resources?* **For community stakeholders:** • *What could you as community stakeholders do differently to improve or address these issues?* **For project staff:** • *What type of positive/negative changes do you observe in your project area?* *– on your forests?* *– on your water resources?* • *What could/should be done in order to improve or address these changes?*
Comments and tips for facilitators	If all participants come from 1 single project: Analysis should be according to types of stakeholders' points of view (population upstream and downstream, project staff – for instance: forest technicians, staff who must cooperate with local, regional, national authorities). If they come from different projects: groups to be formed according to projects or types of project. Refining of task will depend on composition of group of participants.

TEMPLATE 5.1

TEMPLATE FOR GROUP WORK: INTEGRATION OF WATER CONSIDERATIONS INTO PARTICIPANTS' FOREST/TREE-RELATED PROJECTS/ACTIVITIES

On the basis of your observations during the field trip and your experience in general

For community representatives and project staff:

- What **forest activities are you performing**? What impacts (positive and negative) do you observe in your project area?
- Which of these, in your opinion, have negative impacts:
  a. on your forests?
  b. on your water resources?
- What could you do differently in order to prevent these negative impacts?

Time for group work: **60 min**

Time for presentation in plenary: **10 min** (up to **5 min** for presentation of results, up to **5 min** for Q&A by other participants).

SESSION 5.2
45 min

PRESENTATION OF IDEAS FOR INTEGRATING WATER CONSIDERATIONS INTO FOREST/ TREE-RELATED PROJECTS/ACTIVITIES

Learning objectives	• To communicate and gain inspiration and ideas on how to integrate water considerations into projects/activities.
Learning outcomes	At the end of this session, participants will be able to: • Produce a list of forest and water-related problems existing in participants' project area/village, and first ideas of solutions/actions to be taken.
Steps	Depending on the number of groups/projects, **select a format and provide instructions (5 min)**: • 4 or more projects: Information Market • 3 projects: peer review • 2 projects: presentation in plenary • 1 project but different types of stakeholders: role play – stakeholder meeting **Run group activity (30 min)** **Wrap-up brainstorming**: What have we learned from this activity? **(10 min)**
Comments and tips for facilitators	Refer to the toolkit in the Annex to explore the format of activities and methods. The wrap-up may lead to answers such as: • Our activities have more negative implications than we thought. • Different perspectives on impacts according to stakeholders, such as upstream/downstream, upwind/downwind. • Vision also depends on scale: local, national, regional, etc. • It is difficult to seek consensus within and between the forest and water sectors, and establish collaboration.

SESSION 5.3
1 h 30

DESIGNING A FOREST-WATER ACTION PLAN

Learning objectives	• To design a forest-water related action plan for their project/area.
Learning outcomes	At the end of this session, participants will be able to: • Produce a concrete action plan of activities to be put into practice.
Steps	According to projects of participants and group composition, **create several working groups or work in pairs**. Then: 1. **Design an action plan (up to 1 h)** using **Handout 5.3.1**. 2. **Conduct presentation/exchange** in a ' World Café' style setting (group moves from 1 work station to the next, while respective subgroup members present their work) **(up to 30 min)**
Comments and tips for facilitators	Timing of sessions depends greatly on groups and contents of the action plans. When monitoring plans are already well formulated, the action plans might relate to other topics like: identifying reforestation plots, improving exchange of information between community and project stakeholders.

©IUCN/LAURA MÁIZ-TOMÉ

DESIGNING A FOREST-WATER ACTION PLAN

HANDOUT 5.3.1

In your working group, consider the next steps to be taken within your project/community for improving water-related forest management, by indicating as precisely as possible:

Results chain	Assumptions	Indicator	Baseline	Target	Means of verification	Person responsible (or in collaboration with)
Impact:						
Outcome:						
Output 1:						
Activity 1.1:						
Activity 1.2:						
Output 2:						
Activity 2.1:						
Activity 2.2:						

©FAO/RICCARDO VENTURI

MODULE 6

Measuring the benefits of the forest-water nexus

MODULE 6
Measuring the benefits of the forest-water nexus

Session at a glance

OBJECTIVES

- To understand the broader implications of managing for the forest-water nexus, including human well-being, socio-economic factors and the development of appropriate policies or incentives.
- To understand if and how enabling environments, including institutions and frameworks, support forest-water management.
- To develop knowledge on how to measure and consider the broader impact of managing for the forest-water nexus in the relevant contexts of participants.

MATERIALS

- ☐ Objectives & programme (as handouts, on flipchart)
- ☐ Sign-in sheet or register
- ☐ Pinboards
- ☐ Cards for participants
- ☐ Handout 1.3.1
- ☐ Handout 6.2.1
- ☐ Handout 6.4.1

LEARNING OUTCOMES

At the end of the module, participants will be able to:

- Identify sociocultural and economic benefits of managing forests and trees for water services.

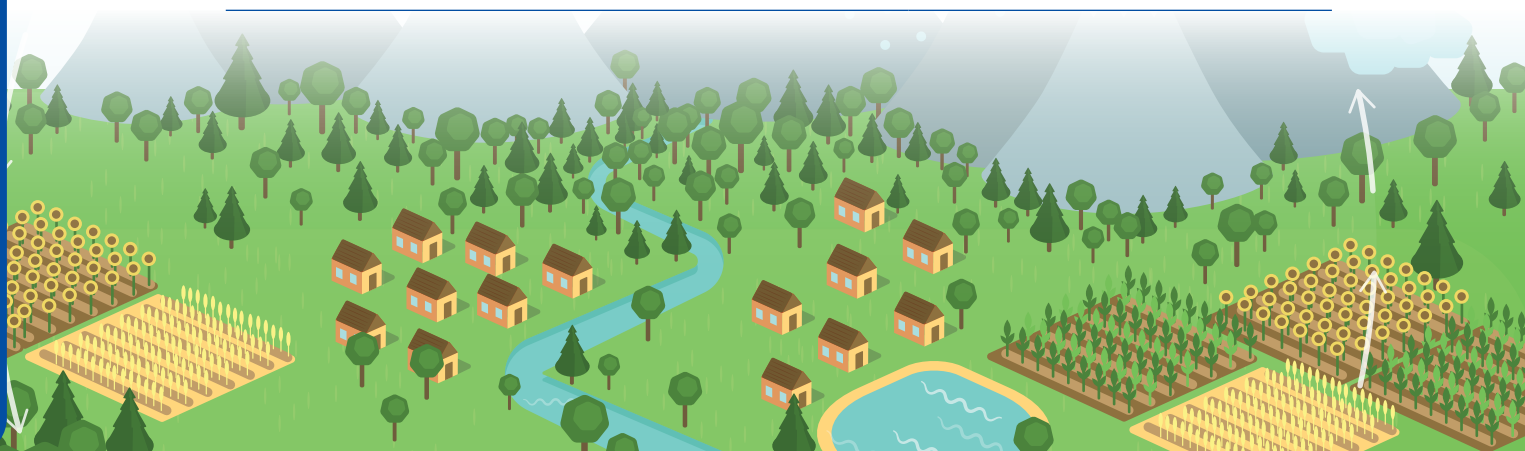
KEY MESSAGES

- Understanding the broader sociocultural and economic benefits of managing forests for water is essential for the long-term success of projects and programmes.
- Monitoring the benefits and impacts of managing forests for water-related ecosystem services is a difficult task. Indicators and sub-indicators must be chosen and measured very carefully.

Overview of sessions

	MODULE 6 SESSION CONTENT	RESOURCES
SESSION 6.1 **1 h**	The benefits of managing for the forest-water nexus – group activity and presentation	Powerpoint: FAO Forest-Water Monitoring Tool **Handout 1.3.1**. Benefits of managing forests and trees for water-related ecosystem services
SESSION 6.2 **1 h 30**	Monitoring the benefits and impacts of managing for the forest-water nexus – group activity	Template for group work: How to measure the sociocultural and economic impacts **Handout 6.2.1**. How to monitor the sociocultural and economic impacts of forest-water projects/ programmes FAO Forest-Water Monitoring Framework
SESSION 6.3 **1 h 15**	Introduction to qualitative survey methods – group activity	Template for group work: Brainstorming on key aspects of successful field surveys
SESSION 6.4 **2 h 15**	Survey design: Formulating efficient questions for monitoring the forest-water nexus impacts – group activity	**Handout 6.4.1**. Formulating survey questions for monitoring benefits/ impacts of water related forest management in your project
SESSION 6.5 **30 min**	Field surveys in practice – group activity	**Handout 6.4.1** (completed)
SESSION 6.6 **60 min**	Reflecting on results, experience, problems in monitoring, and how to address them – group activity	Template for group work: Field survey challenges and solutions

NOTES



Background

Many communities depend on the water-related goods and services that a healthy forest ecosystem provides. However, monitoring the benefits and impacts of managing forests for water-related ecosystem services is a difficult task. Indicators and sub-indicators must be chosen and measured very carefully in order to encompass all the possible results. One of the best ways to measure socio-economic indicators is through surveys. However, it is important to note that survey results are often limited by awareness of the services provided by forests, since these are not always obvious to the interviewee if they do not have a direct, measurable impact on their life. For example, a farmer may not be aware of the benefits of conserving forested watersheds for fish diversity. Likewise, services such as habitats for pollinators or landscape beauty are non-marketed services, for which it is difficult to estimate value or monetary contributions.

As highlighted in the FAO Manual for National Socio-economic Surveys in Forestry (FAO, 2016), awareness of the services provided by forests and their value may improve as forest landscapes undergo changes that may lead to problems with erosion, shifts in water flow, and even changes in microclimate. This may result in increased local awareness of the benefits of forests for water-related ecosystem services, even if the term 'environmental services' is not well known or understood.

The information presented in this module aims to complement the information provided in module 3, which focuses on monitoring of physical and chemical conditions of forest-water interactions.

What should be measured?

Managing forests taking into consideration water-related ecosystem services requires an effective framework that allows stakeholders to make use of these goods and services sustainably over time. Maintaining effective management practices that explicitly address the forest-water nexus is critical for fostering recognition of this link among local forest users, as well as for ensuring that forest management follows best practices and takes the needs of upstream and downstream water users into account. Project managers should therefore consider the extent to which forest management practices and/or regulations exist in their project areas, and whether they explicitly address water-related ecosystem services and follow best practices.

Legislation, institutional capacity and economic arrangements, with associated policy measures at both national and subnational levels, can create an enabling environment to support forest-water interactions, or conversely, hinder a coherent understanding of the forest-water relationship. Measuring indicators related to the enabling environment can help to identify where frameworks lack a coordinated approach to forest policy and water outcomes, and contribute to the promotion of policy effectiveness within a sustainable development framework (The Montréal Process, 2015).

Forest management that focuses on improving hydrological functions within a catchment can also provide numerous social, cultural and economic goods and services that meet the needs of local communities. Many such communities, including indigenous people, rely on forest-water relationships for their livelihood, sustenance and well-being. Information on the socio-economic

impacts of managing forests for water-related purposes, including social and cultural benefits, economic opportunities, equity (including gender, youth and minorities) and opportunity costs, illustrates how communities can benefit from changes in management practices.

Surveys or other methodologies used to monitor the benefits and impacts of managing forests for water-related ecosystem services should aim to capture the economic benefits that households may obtain from the provision of environmental services, such as the protection of forests for watersheds, conservation of aquatic biodiversity, or mitigation of climate change impacts. These may be embedded within a number of processes, so it is important to identify if Payment for Ecosystem Services (PES) mechanisms include forest-water services, as they could be an additional source of income for many households.

Methodologies used to monitor socio-economic indicators and sub-indicators should be re-evaluated periodically, in order to track changes in forest-water management practised over time. They should also aim to gather information from a broad range of socio-economic, environmental, demographic and cultural gradients (FAO, 2016).

Data collection – considerations to bear in mind

(Adapted from National Socio-economic Surveys in Forestry, FAO, 2016)

Familiarity with concepts – It is important to be familiar with local terminology and local names for fauna, flora, rivers etc., as well as knowledge of concepts such as 'ecosystem services.' It may be necessary to adapt the line of questioning.

Frequency of monitoring – Monitoring should take into account seasonal or environmental activities in order to capture and account for their impact. For example, people may be more

©AIDA BARGUÉS

aware of the role of trees in erosion control during the rainy season, and will be more likely to flag it.

Units and price – As mentioned above, it is hard to conceptualize certain units, especially when some ecosystem services do not have a perceived economical value or a unit. This may need to be explained in more detail, without creating a bias when doing the surveys. Regarding monetary benefits, people may not want to disclose information related to their earnings, so it is suggested that the line of questioning be adapted in this case.

Useful data – Data collection is conditioned by the overall monitoring objective, and can range from local to national level surveys. This should be carefully planned in order to obtain unbiased results.

Training of enumerators – This is an essential step in measuring socio-economic indicators. It will ensure consistency in data collection, and the same understanding of concepts and how to explain them, and will equip people with interview and data-recording techniques. Having enumerators answer the survey themselves, and practising using role play, will help to identify any knowledge gaps or questions that the enumerators may have.

Quality control and testing – Time needs to be allocated to periodically check that data are being collected in an appropriate manner, check for data gaps, issues with particular questions, etc.

Paper vs. tablets – In recent years, tablets or mobile phones have become commonplace in survey data collection. Benefits include the possibility of uploading data as soon as an Internet connection becomes available, making the data entry process easier. The GPS capabilities of these devices may be harnessed if georeferenced data is to be used. In many cases, these devices can save a great deal of time, but they are costly and depending on the project, paper surveys may be preferred.

CHARACTERISTICS OF GOOD SURVEY QUESTIONS:

- Open questions wherever/whenever possible.
- Clearly understandable; use language and terms easily understood by interviewee.
- Non-biased (no manipulation, no leading questions).
- No double-barrelled or compound questions that can only have one answer.
- No discriminatory questions.
- Avoid 'trivial' questions (questions should not give the impression that you underestimate interviewees' knowledge).
- Allow interviewed persons to express their experience and views.
- Seek depth by complementing general questions with more specific questions.
- Keep a logical order of question, use warming up and cooling off questions. Start with easier, more general questions, and gradually move to more in-depth and challenging ones.
- No taboo questions (be informed about potential taboos before interviewing).
- Consider asking for information using different questions to validate responses.

SESSION 6.1
1 h

THE BENEFITS OF MANAGING FOR THE FOREST-WATER NEXUS

Learning objectives	• To recall benefits of management for the forest-water nexus. • To contextualize and introduce group work.
Learning outcomes	At the end of this session, participants will be able to: • List benefits of management for the forest-water nexus.
Steps	1. **Short reminder**: table of benefits, contextualization of group work, use **Handout 1.3.1**. Benefits of managing forests and trees for water-related ecosystem services (Session 1.3): • "We have identified the benefits associated with managing forests for water services, and made suggestions on how to measure ecological and health impacts (Indicators 1-3) • "We will now take a closer look at other benefits, such as the sociocultural and economic benefits." **(15 min)**. 2. **Presentation of overview of Indicators 4-6 (45 min)**.
Comments and tips for trainers	Choice of indicators to be presented depending on specific situation and needs of participants' project, and on existing monitoring systems.

SESSION 6.2
1 h 30

MONITORING THE BENEFITS AND IMPACTS OF MANAGING FOR THE FOREST-WATER NEXUS

Learning objectives	• To improve the understanding of sociocultural & economic (sub) indicators, stakeholders to engage for monitoring, and methods for measuring/monitoring the resulting benefits, as applied to participants' project/area.
Learning outcomes	At the end of this session, participants will be able to: • Demonstrate understanding of sociocultural and economic sub-indicators and methods for measurement by applying this understanding to their projects, using a given handout.
Steps	1. **Form groups**. 2. **Instructions for group work**: Review the existing monitoring system/plan of your project/area. Are sociocultural and socio-economic aspects being monitored? In your groups, address questions in **Handout 6.2.1**. **(5 min)**. 3. **Group work** according to the instructions and template, **45 min** to fill in handout. 4. **Time for presentation in plenary**: **30 min** (up to **20 min** for presentation of results, up to **10 min** for Q&A by other participants).
Comments and tips for trainers	Depending on composition of group of participants: If all participants come from 1 project, the entire set of benefits should be divided among up to 4 working groups (take care to ensure equal workload). If participants come from different projects, divide participants in a way that in each working group there is at least 1 project member (in this way, each project group participates in work related to all benefits). Depending on earlier group work results, you may want to hand out the FAO Monitoring Framework Indicators 4–6 for group work. Regularly check workflow of groups! Note: The suggested tool will be a survey, but tools used for a survey can/should vary. There can be a set of questions, participatory exercises such as mapping, drawing cards, completing a matrix. It would be a good learning exercise to let groups discover this. However, if time is short, or if there is a risk that groups will discuss for too long, the trainer could already announce that the method used will be a survey.

TEMPLATE 6.2

TEMPLATE FOR GROUP WORK: HOW TO MEASURE/MONITOR THE SOCIOCULTURAL AND ECONOMIC IMPACTS OF FOREST-WATER PROJECTS/PROGRAMMES

For the benefits assigned to your group:

- Revise the existing monitoring system/plan of your project/area.
- For each selected benefit identify the (sub) indicator (refer to **Handout 6.2.1**).
- Highlight modifications/new elements according to existing monitoring system/plan in a different colour.

Time for group work: **45 min**

Time for presentation in plenary: **30 min** (up to **20 min** for presentation of results, up to **10 min** for Q&A by other participants).

SESSION 6.3
1 h 25

INTRODUCTION TO QUALITATIVE SURVEY METHODS

Learning objectives	• To understand the key elements and steps of a successful field study/ survey as a method of data collection that can contribute to the monitoring of forest-water management projects, and particularly to participants' projects. • To familiarize selves with the characteristics of efficient and valid survey questions.
Learning outcomes	At the end of this session, participants will be able to: • List and explain the key elements and steps of field surveys as these may apply to participants' projects. • Name characteristics of efficient and valid survey questions.
Steps	1. What are the main steps for the preparation and implementation of a field study that can track impacts of forest-water management – **list answers on a flipchart or pinboard (10 min)**. 2. How to make data collection effective? **Brainstorming in plenary** – facilitator or participants write on cards during brainstorming. Facilitator pins cards on the board, according to categories (for list of potential categories see below) without writing titles. Once all ideas have been collected and pinned, the trainer invites participants to find titles for the categories created during the brainstorming **(30 min)**. 3. **Presentation in plenary** of group work results **(45 min)**.
Comments and tips for facilitators	The first step should be quick – a field study must be well prepared if it is to be effective! The choice of interviewees is crucial, especially for monitoring impacts of water-related forest management, where differences between upstream and downstream communities may be significant. If answers during brainstorming are 'weak', the trainer may write the titles of the different categories (see below for suggestions) on the board, to give inspiration and structure to participants' reflections.

TEMPLATE 6.3

TEMPLATE FOR GROUP WORK: BRAINSTORMING ON KEY ASPECTS OF SUCCESSFUL FIELD SURVEYS

Write one idea per card, answering the question:

- **What are the main steps for the preparation and implementation of a field survey?**
- **How to make data collection effective?**
- Think about: Who will be surveyed, the process of data collection, tools available, behaviours.

TEMPLATE

Example of responses:

Choice of stakeholders to be contacted	Process of data collection	Tools for effective data collection	Behaviour concerning persons to be interviewed
Preparing choice of persons to be interviewed: Capture experience of all (types of) stakeholders involved. **Key informants at national/regional/ district/subdistrict/ community level? NGOs?**	Be sure to collect data you really need. It is not good to waste people's time! Make a full record of the interview.	Participatory tools for increasing participation, motivation and ownership of people interviewed. Workshops versus individual interviews.	Respect of people interviewed when asking questions. Important to follow a code of ethics (informed consent, anonymity, right to withdraw, etc.).
Community level: Interviewing minorities or those who are often disregarded (women, youth, minorities, hard to reach separately from 'powerful stakeholders'.	Asking different questions of different sources within a commmunity, or in an area affected by your project.	Visual tools such as drawing maps, completing tables, transects.	Active listening. Saying as little as possible, using probes and prompts to encourage further explanation while remaining neutral is key to acquiring in-depth information.
Take into consideration downstream and upstream communities.	Cross-checking of collected answers/data (triangulation and/or members checking). It is useful to ask questions in different ways, so as to validate responses.	Good clear questions allowing unbiased answers (avoiding leading or double-barrelled questions).	Choose convenient time, duration and frequency of interviews (respect of time schedule of persons to be interviewed). Use language that the interviewee understands. Conduct the interview in the local dialect if possible. Avoid the use of jargon. Explain terms and concepts.

Time for group work: **30 min**

Time for presentation in plenary: **45 min** (up to **15 min** for presentation of results, up to **30 min** for discussion).

SURVEY DESIGN: FORMULATING EFFICIENT QUESTIONS FOR MONITORING THE FOREST-WATER NEXUS IMPACTS

SESSION 6.4
2 h 15

Learning objectives	• To formulate efficient survey questions for monitoring impacts and benefits of water-related forest management in participants' project/area. • To identify participatory methods for data collection with community stakeholders. • To have an overview of questions to be asked for successful monitoring of benefits of water-related forest management.
Learning outcomes	At the end of this session, participants will be able to: • Design efficient survey questions for application to known projects, using a given handout. • Name and explain participatory methods for data collection with community stakeholders.
Steps	1. **Summary of characteristics of good questions** for monitoring impacts of/benefits of water related forest management. 2. **Introduction to group work** (group composition: according to projects). 3. **Group work**. For selected indicators and interviewees related to the monitoring of benefits/impacts of water-related forest management in your project, formulate efficient questions and suggest a method for efficient participatory data collection. Use **Handout 6.4.1**. **(1 h)**. 4. **Presentation in plenary**: **1 h** (up to **10 min** per group (based on 4 groups) for presentation of results, up to **5 min** for Q&A by other participants). 5. **Summary** (up to **15 min)**.
Comments and tips for trainers	Choice of indicators to be measured and volume of modifications to be introduced into monitoring plans, depending on participants' projects and existing monitoring systems/plans.

FIELD SURVEYS IN PRACTICE

SESSION 6.5
30 min

Learning objectives	To become familiar with qualitative data collection by practising conducting a field survey.
Learning outcomes	At the end of this session, participants will: • Have experience conducting an individual field survey.
Steps	1. Using the survey questions identified in Session 6.4, participants will **practice conducting surveys in pairs (30 min)**. Use **Handout 6.4.1** (completed).
Comments and tips for trainers	Ask participants to spread out. Ensure pairs have adequate space and can communicate clearly with each other.

SESSION 6.6
1 h

REFLECTING ON RESULTS, EXPERIENCE, PROBLEMS IN MONITORING AND HOW TO ADDRESS THEM

Learning objectives	• To anticipate and overcome problems faced in monitoring processes. • To integrate lessons learned in monitoring planning or methodologies (if applicable).
Learning outcomes	At the end of this session, participants will: • List potential problems faced during monitoring and name solutions for addressing them. • Know how to adapt their monitoring plan and/or data collection methodologies based on experience.
Steps	1. **Brainstorming in plenary**: What are the problems you faced in monitoring during the field trip (facilitator writes answers on a pre-structured board)? Use template for group work: Field survey challenges and solutions **(15 min).** 2. **Discussion in plenary**: How to address these problems (insert agreed answers on the board **(30 min)**, and adjust monitoring plans and/or data collection sheets **(40 min).** 3. **Summary (5 min).**
Comments for facilitator	Make sure that all participants take active part in the discussion.

TEMPLATE 6.6

TEMPLATE FOR GROUP WORK: FIELD SURVEY CHALLENGES AND SOLUTIONS

In your working group, answer the following question:

- What were the problems faced during the survey?
- What suggestions could you recommend for addressing the problem?

TEMPLATE

Problems faced in monitoring	Suggestions for problem solving

Time for group work: **15 min**

Time for presentation in plenary: **30 min**

HOW TO MONITOR THE SOCIO-CULTURAL AND ECONOMIC IMPACTS OF FOREST-WATER PROJECTS/PROGRAMMES

HANDOUT 6.2.1

Benefit/Impact	What do we need to measure/monitor? (sub) indicator	How to get the information? (by which method?)	Whom to address/contact

FORMULATING SURVEY QUESTIONS FOR MONITORING BENEFITS/IMPACTS OF WATER RELATED FOREST MANAGEMENT IN YOUR PROJECT

HANDOUT 6.4.1

Based on the indicators selected to monitor the impacts of managing forests and trees for water, identify/formulate the methods you suggest to use for efficient data collection In doing so:

- Formulate efficient questions to be asked to the different stakeholders to be interviewed
- Suggest participatory methods for data collection

Indicator Sub-indicator	Question/method 1 Question/method 2 Question/method 3	Stakeholder(s)

Time for group work: **2 h**

Time for presentation in plenary: **15 min** (up to **10 min** for presentation of results, up to **5 min** for Q&A by other participants)

ANNEX 1

A toolkit for implementing the workshop's participatory training methods

This section describes a sample of different training methods and tools that can help you to run effective and enjoyable workshop sessions. The toolkit comprises helpful information on the following:

1. **Brainstorming (oral version)**
2. **Visualized brainstorming**
3. **Sociometric exercises**
4. **Phases of effective group work**
5. **Setting up an Information Market**
6. **The World Café process (simplified version)**
7. **Mechanisms of a peer review**

FOR EACH METHOD/TOOL YOU WILL FIND:

- A general description of the benefit of using the method or tool
- A detailed explanation on how to implement the method or tool
- An example of a template to be presented to participants (if appropriate)

©AIDA BARGUÉS

1. Brainstorming (oral version)

Brainstorming is a problem-solving group technique, whereby participants spontaneously offer ideas to a specific problem or question. Participants are asked to produce ideas and solutions without much judgement. The emphasis of the exercise is on quantity rather than quality.

A brainstorming session brings together a wide range of viewpoints, and is a good way to introduce a new topic while encouraging collaboration, creative thinking and mobilizing the knowledge existing within the group of participants.

HOW TO CONDUCT A BRAINSTORMING SESSION (ORAL VERSION)

- **Read the question aloud and make sure that it is understood by all participants** (keep a written version of the question on a flipchart or pinboard visible at all times so that the participants do not forget its exact formulation).
- **Invite everyone to propose solutions to questions without overthinking**. Emphasize that you want to generate a list of ideas, the more the merrier. Invite everyone to participate actively in the brainstorming.
- **Collect answers** (write them on a flipchart or on cards). Summarize results and link them to the next step of the learning process – a brainstorming session is not a goal in itself; it is a tool to connect participants' knowledge or experience to a concept.
- **The priority of brainstorming is quantity not quality**. It is important to reassure everyone that the session is about creative thinking. No idea is stupid.
- **Minimize influence from group members**. Allow individuals to write down their ideas first. Not doing so can lead to 'anchoring' bias, where the discussion becomes influenced by early ideas.
- **Wait to evaluate**. Avoid evaluating any ideas until everyone has the opportunity to share.

2. Visualized brainstorming

Visualized brainstorming relies on building a diagram or visual map of ideas offered by participants through a brainstorming process. By placing ideas on a board, the group can map associations, organize (and reorganize) information, and visualize how concepts come together.

It is best used when the topic is complex, or a new concept is to be introduced. Participants contribute their ideas on a flipchart or cards, which in turn can be collated and restructured to build the concept.

Participants are actively involved in the process; their knowledge and experience are valued, and no time is lost in presenting them with information that they already know.

STEPS OF A VISUALIZED BRAINSTORMING SESSION

- **Explain the mechanism of the brainstorming session** (individual, groups).
- **Read the question aloud and make sure that it is clearly understood** by all participants (keep a written version of the question on a flipchart or pinboard visible at all times so that the participants do not forget its exact formulation).
- **Provide sufficient time** for answers (depending on the complexity of the question).
- **Collect answers** (if written on cards, collect and shuffle cards).
- **Read each card aloud**, showing it to the plenary.
- **Fix cards on pinboard** (or other supports such as a wall, cloth, flipchart, paper), asking participants to help match them in a logical manner.
- If you like (and have time), titles can be given to clusters.
- **Summarize results** and link them to the next step of the learning process.

3. Sociometric exercises

A sociometric exercise is a pleasant and time-efficient way to show tendencies, statistical distribution of situations or opinions in a group. Sociometric techniques are qualitative methods of measuring aspects of the social world, such as the structure of social communication and relations. The process can be used to study group choices, communication and interpersonal relationships of people belonging to different groups.

IMPLEMENTING A SOCIOMETRIC EXERCISE

- The idea of this sociometric exercise is to get participants to express a point of view through a position in space (i.e. the place where the participant stands reflects an opinion, and/or presents information).
- Facilitator and participants are standing in the training room.
- The facilitator asks a question. The different answers are either announced by the facilitator, or ideally written on cards. To each anwer, a specific place in the room is dedicated. For instance: **Question: How content are you with your project results?** Answers: **very much** (stand on the right side of the room) – **quite satisfied** (stand in the middle) – **not at all satisfied** (stand on the left side of the room).
- Cards with the respective answer placed on the floor can help participants to get organized quickly.
- It can be useful to briefly 'interview' some participants, to find out more details on their relative position/response, e.g. asking: why did you answer like this?
- Of course there may be more answers; in this case, more cards (and places to stand) would need to be defined by the trainer.
- Each question (and respective answer) forms 1 round of the exercise.
- There can be several rounds of questions.

4. Group work

Working in small groups is one of the key methodologies in participatory adult training. Participants can engage meaningfully with each other, obtaining inspiration and feedback from people with similar expertise and experience.

Group work is often used for in-depth analysis of a topic, for transferring theoretical activities to participant realities, for deliberating on decision-making processes, or for designing concrete action plans.

In groups where a strong interpersonal hierarchy impedes the free exchange of ideas, it is advisable to assign the dominant and less dominant individuals to different working groups, so as to promote active participation by everyone.

Group work involves the following steps:

- Arrange your room, or workshop location, to ensure that all groups have ample space for participants to gather and discuss, without noise pollution from other groups.
- Make sure that all group members have understood the instructions.
- Ensure that all members of the group have a clear view of the instructions and the material.
- Select a group facilitator, notetaker and timekeeper.
- All group members should contribute – no hierarchy within the group.
- Keep a record of the group discussion, including brainstorming.
- Make sure that the results match the expected outcome of the group work.
- Choose a presenter.

HOW TO RUN EFFECTIVE GROUP WORK

Introduction:

- Explain the activities and make sure that they are understood.
- Build groups according to relevant criteria (depending on the type of task and the composition of participants attending the workshop).
- Clearly indicate the time allocated for group work (and presentation later on).
- For the first session, you may want to provide groups with some hints for effective group work (see below).

During group work:

- The groups should be given sufficient space so that they don't disturb each other while discussing and producing.
- Check regularly that groups are 'on the right track', and that their results match the instructions and objectives of the activity (groups often get sidetracked).
- Regularly indicate the remaining time for group work.

continues on next page

continued from previous page

Presentation of group work:

- Have a clear plan for group presentations:
  - What and how to present? (this should already be indicated in the activity instructions)
  - How much time per group? (for presentation, for Q&A, for discussion)
- Make sure that presentation rules are respected (content and type of presentation, time management, behaviour of audience) – a participant could be selected as timekeeper.
- Encourage constructive discussion. Participants should be reminded that this is a process of mutual learning and exchange of ideas/experiences; therefore all participants should engage, in a respectful manner.
- If necessary, add important points that are missing.
- Provide a short summary at the end of the session, in order to underline key findings and link them to the workshop activities and expected outcomes.

Organizing groups

- Ensure a balanced number of group members (4–6 per group is optimal).
- When participants choose their group, you can set a maximum number of persons for each one. The group is considered complete when this number is reached. Remaining participants will have to join other groups.
- Do not waste too much time on group composition.

Not all groups have to work on the exact same question or issue. According to the composition of the group, complementary working groups might make more sense!

Variations of group composition:

- Groups with multiple profiles of members:
  - to ensure a wide range of ideas, opinions
  - to seek consensus
- Groups with a homogenous profile related to the topic (for instance, project managers, community representatives):
  - to work on profile specific issues
  - to deepen certain aspects
  - to allow 'dominated groups' (minorities) to express themselves more freely in the event of hierarchies within the group
- Participants choose their working group according to their own field of interest:
  - to allow work on the real problems of participants
  - in the event of cross-cutting issues
- Random group composition:
  - for short brainstorming sessions
  - for cross-cutting issues

5. Setting up an Information Market

An Information Market is a space where groups gather to exchange their findings. Such a technique gives the class an opportunity to present and discuss a relatively large quantity of information, allowing participants to choose the 'product' (results of work presented) that they prefer to invest their time in.

HOW TO ORGANIZE AND IMPLEMENT AN INFORMATION MARKET

- **Explain the instructions and make sure that they are understood by all participants.**
- **Create working groups according to the group needs and the learning process/ objectives.**
  - For groups where participants will implement projects/action plans in pairs, you can create groups of 2; in other workshops, groups of 3–4 might make more sense.
  - Later on, several working groups will be brought together in 1 subgroup, which will present during the market 'round' of a market (e.g. if there are 8 small groups, you can divide them into 2 subgroups of 4). The number of working groups per subgroup and the number of subgroups can vary according to the number of participants and group composition logic.
- **Illustrate the steps of an Information Market (best in a visualized form):**
  - Preparation of work results according to instructions (peer/small group work).
  - **Lightning presentation Subgroup 1**: Successive presentation of all 'products' (visualization of group work results) of Subgroup 1 – each group has **90 seconds** for the presentation.
  - **Market round 1**: The products of all members of Subgroup 1 are placed in different parts of the workshop room; 1 member of each group stays with the product and is in charge of presenting it, answering questions, listening to comments (it can be interesting to write down comments by other participants and discuss them later with group members). The other participants walk around the room and discover the products, ask questions, give comments/ideas/advice. Every participant can freely choose the order of his/her visit to the products and the time spent with each of them. Half-way through Market round 1, the facilitator invites groups to change presenters, so that all members of the working group have the opportunity to visit the products exposed simultaneously.
  - **End of round 1**: after approx. **30 min**, or when the facilitator observes that discussions and exchange diminish, the market is 'closed' (prepare a clearly audible sign: a bell, whistle, gong, mobile phone ringtone).
  - **Market round 2**: Same as round 1.
  - Depending on the number of subgroups created, there can be more than 2 rounds of a market.
- **If possible, allow time for the groups to hear comments by other participants, and discuss which of the comments/ideas/advice they want to include in their work.**
- **Summarize results and link them to the next step of the learning process.**

TEMPLATE FOR INFORMATION MARKET

- **Preparation of work result according to instructions** (peer/small group work) x minutes (best: indicate time e.g. 2:00–3:30).
- **Flash presentation Subgroup 1**: Successive presentation of all 'products' of Subgroup 1: **90 seconds** per group for the presentation x minutes (depending on number of groups).
- **Market round 1**: (x minutes, best: indicate time e.g. 3:40–4:10).
  Simultaneous exposition of all products of Subgroup 1; one member of each working group stays with the 'product' – the other participants walk about in the room, discover other groups' products, ask questions, give ideas/comments (the presenter should write down suggestions by other participants). A sign will be given when presenters are to be changed. Market round is closed upon sign of facilitator.
- **Flash presentation Subgroup 2**: Successive presentation of 'products' of Subgroup 2: **90 seconds** per group for the presentation x minutes.
- **Market round 2**: (x minutes, best: indicate time e.g. 4:40–5:10).
  Initial working groups gather for discovery and consolidation of suggestions/ comments x minutes (e.g. 5:10–5:30).
- **Short summary**: new insights gained trough the Information Market.

©AIDA BARGUÉS

6. World Café (simplified version of Information Market)

A World Café is an interesting alternative to presenting the results of group work in plenary. It allows each participant to discover the results of the other groups and receive feedback from other participants on their group results. Although intense, participants are able to both give and receive constructive feedback.

The consolidation activity at the end of the World Café enables groups to complete their work with newly gained insights through comments from other participants.

N.B. the World Café process requires more time than a presentation session in plenary, but has the advantage of deepening learning through a feedback and review process.

See video: World Café Method

HOW TO IMPLEMENT A WORLD CAFÉ PROCESS

- **Introduction and group work:**
  - Explain the instructions and make sure that they are understood.
  - Construct groups according to criteria (depending on the type of task and composition of participants attending the workshop) and assign a letter to each group (A,B,C).
  - Briefly explain the flow of the World Café and clearly indicate the time allocated for group work.
  - Group work should last (depending on topic) between **40 and 60 min.**
  - Ideally, groups should be working in the same room, seated in alphabetical order in different parts of the room.
- **1st round of discovering and discussing results in World Café style:**
  - At a signal from the trainer, groups of participants (except 1 or 2 presenters) rotate clockwise, so that Group A goes to the work station of Group B, Group B to the work station of Group C, etc.
  - The presenter(s) of each group briefly introduce(s) to 'visitors' the results of group work, and invite(s) them to give comments, ask questions, suggest improvements, which are written down for later discussion with initial group members.
- **2nd round of discovering and discussing results in World Café style:**
  - Same as 1st round – clockwise continuation of the process.
- **3rd round of discovering and discussing results in World Café style:**
  - (Number of clockwise movements of groups will depend on the number of groups – from 3 to a maximum of 5 groups, for optimal concentration on each of the groups' work results to be discussed).
- **Discovery and consolidation:**
  - Groups return to their initial work station and discover through a short summary by 'presenter' comments and suggestions of 'visitors'.
  - Group members decide which suggestions should be taken into account to consolidate their work.

continues on next page

continued from previous page

- **Winding up the World Café:**
  - Time permitting, a short summary of findings should close the World Café: for instance, groups can mention the 4 or 5 most important findings/challenging tasks identified, and the 2 or 3 most innovative solutions proposed during the World Café.
  - Note: Groups can remain at their work stations during the winding up, and a group representative stands up to present the group summary.

TEMPLATE FOR WORLD CAFÉ

Group work in 'initial' groups (A,B,C,D) according to instructions: 14:00–14:45

1st round of World Café: 14:45–15:05 *
- Select 1 (or 2) group presenters
- Groups rotate clockwise (A → B → C, etc.), presenters stay in work station
- 'Visitors' discover work of group through a short summary by presenters (no more than 5 min), can ask questions, give comments, make suggestions; presenter(s) take(s) notes for later disucssion with initial group members

2nd round of World Café: 15:05–15:30
- Rotation continues, same process as round 1

Coffee break

3rd round of World Café: 15:45–16:05

4th round of World Café: 16:05–16:25

Consolidation phase: 16:25–16:50

Winding up: 16:50–17:00

*at the beginning of each new round, facilitator will give a clear signal (using for instance a bell, a gong)

7. Mechanisms of a peer review

A peer review process involves both the review of work and the provision of constructive feedback by colleagues. The opportunity to give and receive a review to peers can be very helpful.

A peer review offers an opportunity to save time when a complete World Café is not possible. It allows participants to work on results of a limited number of topics – each participant may review results of and receive feedback from participants of 2 other groups.

PEER REVIEW PROCESS

- **Introduction and group work:**
  - Explain the instructions and make sure that they are understood.
  - Form groups according to criteria (depending on the type of task and composition of participants attending the workshop) and assign a number or letter to each group (A,B,C; 1,2,3).
  - Briefly explain the flow of the peer review and clearly indicate the time allocated for group work.
  - Group work should last (depending on topic) between **45–75 min.**
- **1st round of peer review:**
  - At a signal from the trainer, groups of participants (except 1 or 2 presenters) move to another group station in order to discover their results.
  - The presenter(s) of each group **briefly** introduce(s) to 'visitors' results of group work and invite(s) them to give comments, ask questions, suggest improvements, which are written down for later discussion with initial group members.
- **2nd round of peer review:**
  - Same as 1st round – clockwise continuation of the process.
- **Discovery and consolidation:**
  - Initial groups return to their work station and can add new elements discovered through peer review.
  - Group members consolidate their work.
- **Winding up the peer review:**
  - Time permitting, a short summary of findings should close the peer review:
  - for instance, groups can mention the 4 or 5 most important findings/challenging tasks identified, and the 2 or 3 most innovative solutions to a problem related to the subject identified during the peer review.
  - Note: Groups can remain at their work stations during the winding up, and a presenter stands up to introduce the group summary.
- **If it makes sense for the group process, the facilitator can change the composition of groups during the peer review** (groups split up, and new members arrive). Instructions for new group composition must be very clear!
- The consolidation phase might take a bit more time in this case, because participants will have different perspectives while reviewing different products.
- Note: A peer review is possible with any number of groups above 2 (the ideal being 3–4).

TEMPLATE FOR PEER REVIEW

Group work in initial groups (A,B,C) according to instructions: 14:00–14:45

1st round of peer review: 14:45–15:10 *

- Select 1 (or 2) group presenters
- Groups move clockwise, presenters stay at work station
- 'Visitors' discover work of group through a **short** summary by presenters (no more than 5 min), can ask questions, give comments, make suggestions; presenter(s) take(s) notes for later discussion with initial group members.

2nd round of peer review: 15:10–15:30

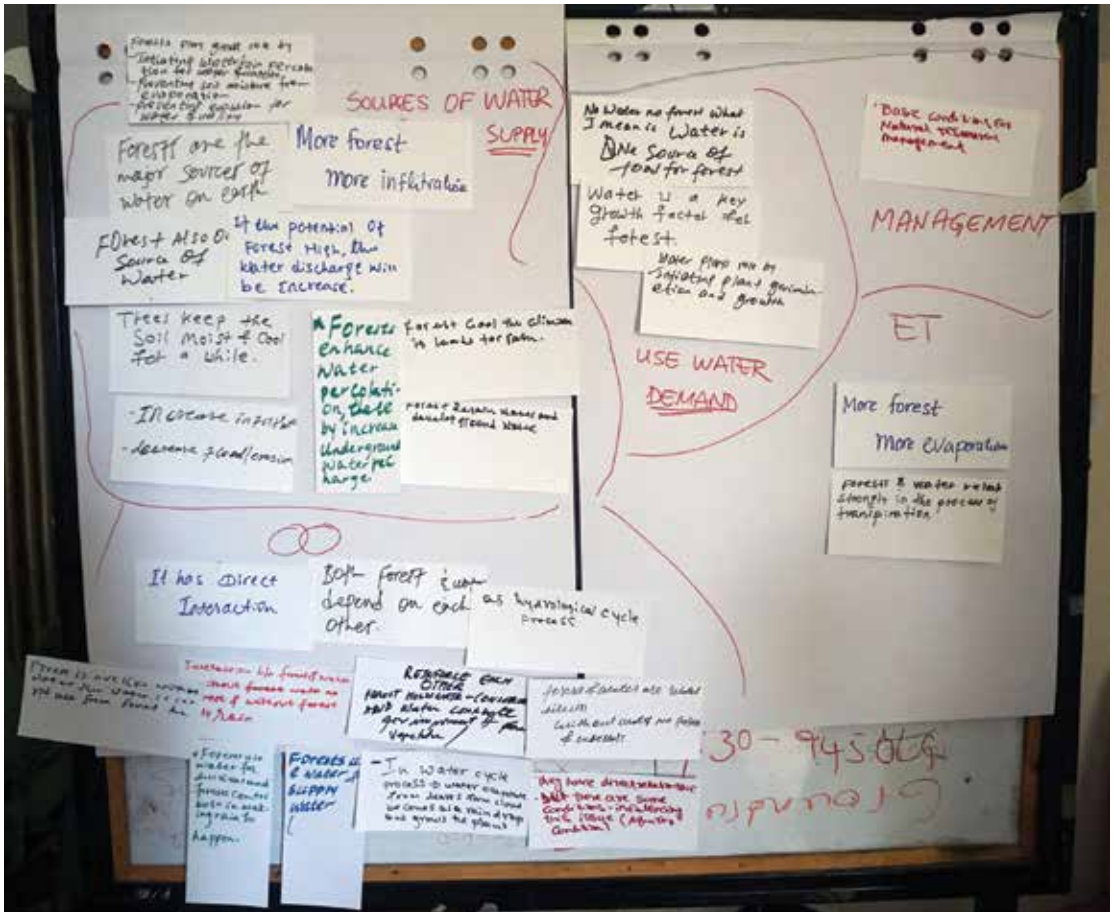
- Rotation continues, same process as round 1

Coffee break

Consolidation phase: 15:50–16:20

Winding up: 16:20–16:30

*at the beginning of each new round, the facilitator will give a clear signal (with a bell, gong)



©AIDA BARGUÉS

ANNEX 2

Sample of the workshop programme structure

Example of the programme for day one of a workshop. The text in yellow indicates the changes that were made to the programme as the the day progressed.

Day 1 Introduction to Forest and Water					
		Time	**Activity**	**Lead**	**Materials**
08:30–10:00	Welcome and introduction to workshop	0:20	Welcome message (details of speaker required)		laptop, projector
		0:40	Participant introductions		
		0:10	Workshop objectives, program, learning approach		"Parking lot"
		0:15	Rules (participatory)		flipchart, markers
10:00–10:30	Coffee break	0:30			
10:30–12:10	Reflecting on forest and water relationships Based on Q&A switching sessions	0:05	Brainstorming activity: how do forests and water relate		cards, markers, board
		0:40	Clustering of responses and short summary		board, tape
		0:30	Presentation and short video: the F-W Nexus		laptop, projector
		~~0:10~~ 0:15	Q&A		
		0:10	Energizer – introduce a fellow participant		
switch → 12:10–13:00	Introduction to Forest and Landscape Restoration	0:50	Presentation: FLR and F&W considerations + 15 min Q&A		laptop, projector
13:00–14:00	Lunch break	1:00			
14:00–14:20	FAO's Forest and Water Programme	0:20	Presentation: FAO Forest & Water Programme		laptop, projector
14:20–15:15	Understanding forests for water quality and quantity	0:45	Presentation: Forests for water quantity and quality		laptop, projector
		0:10	Q&A		
~~15:15–15:30~~ 15:30–15:45	Coffee break	0:15			
~~15:30–16:50~~ 15:45–17:20	Benefits of forest-water relationships	0:05	Intro to group activity: what are the benefits of F&W?		cards, markers, flipchart
		~~0:30~~ 0:40	Group activity		
		~~0:40~~ 0:45	Presentation of group activity outputs		
		0:05	Summary of activity		
~~17:00–17:10~~ 17:20–17:30	Day 1 wrap-up	0:10	Summary of Day 1 and Evaluation Parking lot question answered		flipchart, markers

** Make sure to add extra time to Day 1 recap (many Parking Lot questions added).*

** Need one more energizer in afternoon in Day 2.*

ANNEX 3

Survey templates

PRE-WORKSHOP SURVEY TEMPLATE

To help us understand your experience of and concerns about forests and water we would like you to spend a few minutes thinking and answering the following questions. Please answer them alone. There is no right or wrong and we will not share your answers with anyone in the workshop.

About you:

Name: _____

Organization/village/town: _____

Project:

_____

What is your position or job?

_____

Years in the position/job? _____ years

How does your job relate to forests or water?

_____

What are your activities related to forests or water?

_____

Why are you joining this workshop?

_____

Questions about forest and water:

1. What are the 3 most important problems that you think relate to forest and/or water in your area? Please cite in order of importance.

The most important problem is _____

_____

The second most important problem is _____

_____

The third most important problem is _____

_____

PRE-WORKSHOP SURVEY TEMPLATE

(CONTINUED)

2. Do you think trees are relevant for water?

_____

3. In what way are trees associated with water? Name any tree-water connections you can think of:

_____

_____

_____

4. How confident are you talking to others about forest-water interactions?
Tick where appropriate.
☐ 1=not at all confident ☐ 2=not very confident
☐ 3=neither confident nor unconfident ☐ 4=confident ☐ 5=very confident

5. In relation to solving any of the problems you mention above, what successes have you achieved, what has worked well in your project area?

_____

_____

_____

6. Do you have a system or plan for monitoring forest and water relationships?
Underline or highlight your answer. ☐ Yes ☐ No

If yes, what do you measure?_____

According to your experience, what is difficult to measure?

_____

What would you measure if you had unlimited resources?

_____

7. What would you like to learn during this workshop? Do you have any comments or concerns?

_____

_____

_____

POST-WORKSHOP SURVEY TEMPLATE

As the workshop ends, we would like you to provide some final thoughts. Please answer these questions honestly. There is no right or wrong, and we will not share your answers with anyone.

Name:

_____

Did you attend the full workshop (every day)? ☐ Yes ☐ No

Have your views changed during this week? ☐ Yes ☐ No In what way?

_____

_____

_____

_____

Questions about forest and water:

1. What are the 3 most important problems that you think relate to forest and/or water in your area/village/project/town? Please cite in order of importance.

The most important problem is _____

_____

The second most important problem is _____

_____

The third most important problem is _____

_____

2. Do you think trees are relevant for water?

_____

3. In what way are trees associated with water? Name any tree-water connections you can think of:

_____

4. How confident are you talking to others about forest-water interactions?
Tick where appropriate.
☐ 1=not at all confident ☐ 2=not very confident
☐ 3=neither confident nor unconfident ☐ 4=confident ☐ 5=very confident

POST-WORKSHOP SURVEY TEMPLATE

(CONTINUED)

5. How useful is the FAO forest-water monitoring framework?
(Scale 1 to 5; 1: not at all useful and 5: very useful) ☐1 ☐2 ☐3 ☐4 ☐5

6. What is the likelihood of using the forest-water framework in your work?
(Scale 1 to 5; 1: not at all useful and 5: very useful) ☐1 ☐2 ☐3 ☐4 ☐5

7. If you are involved or were to become involved in monitoring forest and water relationships, what would you measure if you had unlimited resources?

_____

_____

_____

8. What have you learned during this workshop?

_____

_____

_____

_____

9. How confident would you be in facilitating a forest and water workshop?

☐1 ☐2 ☐3 ☐4 ☐5

10. How pleased are you with the workshop in general?
☐1 =not at all pleased ☐2=not very pleased
☐3=neither dissatisfied nor pleased ☐4=pleased ☐5=very pleased
Why?

_____

_____

_____

11. Suggestions for improving the workshop

_____

_____

_____

_____

GLOSSARY [1]

Adaptation: The process of adjustment to actual or expected climate and its effects (United Nations Convention to Combat Desertification (UNCCD).[2]

Afforestation: Establishment of forest through planting and/or deliberate seeding on land that, until then, was under a different land use, implies a transformation of land use from non-forest to forest.

Avalanche: Mass of snow and ice suddenly sliding down a mountain-side and often taking with it earth, rocks and rubble (World Meteorological Organization (WMO).[3]

Base flow: The theoretical flow in rivers and lakes that results from long-term average precipitation events.

Baseline: Reference for measurable quantities from which an alternative outcome can be measured, e.g. a non-intervention scenario used as a reference in the analysis of intervention scenarios.

Biological diversity: The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species and of ecosystems.

Biomass: Organic material both above-ground and below-ground, and both living and dead, e.g., trees, crops, grasses, tree litter, roots etc. Biomass includes above- and below-ground biomass.

Capacity development: The process of unleashing, strengthening and maintaining the ability of people, organizations and society as a whole to manage their affairs successfully. Capacity development includes training for nutritionists, agronomists, lawyers, professionals working in food security, and officials such as policy-makers and administrators.

Carbon storage: Storage of carbon for an extended period in a chemical form that does not contribute to global warming. The most common methods of carbon sequestration are above- and below-ground additions to biomass, additions to soil organic carbon, and additions to stocks of inorganic carbon compounds that do not break down easily (e.g. calcium carbonate).

Catchment: The area from which a stream or waterway and reservoir receives surface flow, which originates as precipitation.

---

1 All definitions are from FAO, unless otherwise indicated.

2 https://knowledge.unccd.int/unccd-terminology

3 https://library.wmo.int/doc_num.php?explnum_id=4712

Climate change: A change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use (UNCCD).

Deforestation: Any combination of loss of soil fertility, absence of forest cover, lack of natural function, soil compaction, and salinization that either impedes or retards unassisted forest recovery through secondary succession.

Desertification: Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities.

Disaster: Serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (United Nations Office for Disaster Risk Reduction (UNISDR).[4]

Disaster risk management: The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

Disaster risk reduction: The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Discharge: Outflow of water from a stream, pipe, groundwater aquifer or watershed.

Drought: A period of abnormally dry weather sufficiently prolonged for the lack of water to cause a serious hydrologic imbalance (e.g. crop damage) in the affected area.

Ecosystem: A system in which the interaction between different organisms and their environment generates a cyclic interchange of materials and energy.

Ecosystem services: The direct and indirect contributions of ecosystems to human well-being.

Effluents: A surface stream that flows out of a lake, e.g. an outlet, or a stream or branch that flows out of a larger stream, e.g. a distributary.

Enabling environment: A set of policy, institutional, regulatory, infrastructure and cultural conditions that govern formal and informal business activities (United States Agency for International Development (USAID).[5]

Erosion: The process of removal and transport of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, winds, and underground water.

---

4 www.unisdr.org/we/inform/terminology#letter-d

5 USAID. 2011. Business Enabling Environment Measure Plus: Indonesia. Business Growth Initiative. Washington, DC: Weidemann Associates, Inc. for the Business Growth Initiative Project and financed by the Office of Economic Growth of EGAT/USAID.

Evaluation: A periodic, retrospective assessment of a project or programme. It is the comparison of actual project impacts against the agreed strategic plans. It looks at what you set out to do, what you have accomplished, and how you accomplished it.

Evapotranspiration: The net water loss (in vapour form) per unit area of land, both directly from the land surface, and indirectly through transpiring leaves.

Forest: Land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.

Forest degradation: The reduction of the capacity of a forest to provide goods and services.

Forest and landscape restoration (FLR): an approach to regaining ecological functionality and enhancing human well-being in deforested or degraded landscapes.

Forest management: The process of planning and implementing practices for the stewardship and use of forests and other wooded land to meet specific environmental, economic, social and cultural objectives.

Flood: The overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas not normally submerged.

Floodplain: Nearly level land along a stream flooded only when the streamflow exceeds the water carrying capacity of the channel.

Forest rehabilitation: A management strategy applied in degraded forest lands that aims at re-establishing site productivity and protective functions and many of the ecological services provided by a functional forest or woodland ecosystem.

Geology: The study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them.

Groundwater recharge: The process where water moves downward from surface water to groundwater, allowing the refilling of aquifers.

Groundwater: Water in soil beneath the soil surface, usually under conditions where the pressure in the water is greater than the atmospheric pressure, and the soil voids are substantially filled with water.

Hazards: The potential of a risk source to cause an adverse effect (s)/event(s).

Infiltration: The process whereby water enters the soil through the surface and seeps downward into it.

Interception: The process by which precipitation is caught and held by vegetation (canopy, bark and litter structures) and then may be lost by evaporation without reaching the ground (WMO).

Integrated management: A continuous process through which decisions are made for the sustainable use, development and protection of areas and resources. Integrated management acknowledges the relationships that exist among different uses and the environments they potentially affect.

Land degradation: This covers all negative changes in the capacity of the ecosystem to provide goods and services, including biological and water-related goods and services, as well as land-related social and economic goods and services.

Land use: The purpose for which a specific land area is used by people; the socio-economic function of such an area. Classification of land according to the activity undertaken on the land.

Landscape: A social-ecological system that consists of a mosaic of natural and/or human-modified ecosystems, often with a characteristic configuration of topography, vegetation, land use, and settlements that is influenced by the ecological, historical, economic and cultural processes and activities of the area (Landscapes for People, Food and Nature (LPFN).[6]

Landscape approach: This seeks to provide tools and concepts for allocating and managing land to achieve social, economic and environmental objectives in areas where agriculture, mining, and other productive land uses compete with environmental and biodiversity goals.

Learning outcomes: Statements about what we expect participants will be able to do as a result of the learning session(s). Learning outcomes are used to assess if learning objectives have been met, and therefore, must be observable and measurable.

Livelihoods: Combination of the resources used and the activities undertaken in order to live.

Logical framework (Logframe): Management tool used to improve the design of interventions, most often at project level. It involves identifying strategic elements along the results chain (inputs, outputs, outcomes, impact) and their causal relationships, indicators, and the assumptions or risks that may influence success or failure. It thus facilitates planning, execution and evaluation of a development intervention.

Mitigation: The elimination, reduction or control of adverse environmental impacts, including countermeasures against negative environmental impacts of development.

Monitoring: A continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development interventions with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds (Organisation for Economic Co-operation and Development (OECD).[7]

Mudslide: Flow of water so heavily charged with sediment and debris that the flowing mass is thick and viscous (WMO).

Nutrients: A chemical element (such as potassium, calcium, magnesium, nitrogen, phosphorus, sulphur) of which relatively large quantities are essential to the growth and welfare of a plant.

Payment for Ecosystem Services: Voluntary and conditional transactions over well-defined ecosystem services between at least one supplier and one user.

Photosynthesis: A chemical process by which green plants synthesize organic compounds from carbon dioxide and water in the presence of sunlight.

Precipitation: Any kind of water that falls from clouds as a liquid or a solid.

Reforestation: Re-establishment of forest through planting and/or deliberate seeding on land classified as forest.

---

[6] http://peoplefoodandnature.org/

[7] www.oecd.org/dac/evaluation/2754804.pdf

Resilience: The ability of a system (people or ecosystem) to recover quickly from a shock.

Restoration: The active intervention and management of degraded biotic communities, land forms and landscapes in order to restore biological character, ecological and physical processes and their cultural and visual qualities.

Riparian areas: Land adjacent to a stream.

Risk: The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity (UNISDR4).

Runoff: Portion of rainfall, melted snow or irrigation water that flows across the ground's surface and is eventually returned to streams.

Salinization: The accumulation of soluble salts at the surface or at some point below the surface of the soil conditions to levels that have negative effects on plant growth and/or on soils.

Sedimentation: Accumulation of organic sediments at the bottom of a water body (WMO3).

Soil health: The continued capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain biological productivity, promote the quality of air and water environments, and maintain plant, animal and human health.

Soil moisture: Moisture contained in the portion of the soil, which is above the water table, including water vapour, which is present in the soil pores.

Stabilization: One of the eco-hydrological functions provided by forests in slopes and hillsides (Tambosi *et al.*, 2015).[8]

Storm surge: A rise in tidal height, above the predicted tide, due to wind blowing onshore.

Stream flow: The volumetric flow rate (expressed in units of volume over time) passing by a particular river cross-section at a particular instant. General term for water flowing in a stream or river channel.

Surface water: All water naturally open to the atmosphere, concerning rivers, lakes, reservoirs, ponds, streams, impoundments, seas, estuaries and wetlands.

Water cycle: The continuous cycling of water between the earth and the sky.

Water recycling: A conservation measure to prevent waste, consisting of the collection of water for treatment and reuse.

Water retention: That part of the precipitation falling on a drainage area which does not escape as surface stream flow during a given period (WMO).

Watershed: Area from which all precipitation flows to a single stream or set of streams.

Watershed management: Planned use of watersheds in accordance with predetermined objectives through the control of the quality and quantity of water, and the effective human use of water resources within the watershed.

---

[8] Tambosi, L.R., Visal, M.M., Ferraz, S.F.B., Metzger, J.P. 2015. Funções eco-hidrológicas das florestas nativas e o Código Florestal. Estudos Avançados, 29(84).

REFERENCES

Abell, R., Asquith, N., Boccaletti, G., Bremer, L., Chapin, E., Erickson-Quiroz, A. & Higgins, J. 2017. *Beyond the source: the environmental, economic and community benefits of source water protection*. Arlington, USA, The Nature Conservancy.

Barchiesi, S. & Córdoba, R. 2016. *The Tacaná Watersheds: Developing untapped potential: strengthening resilience through cross-sectoral collaboration*. Gland, Switzerland, International Union for Conservation of Nature.

Besseau, P., Graham, S., & Christophersen, T. 2018. *Restoring forests and landscapes: The key to a sustainable future*. Vienna, Global Partnership on Forest and Landscape Restoration.

FAO. 2013. *Forests and water: International momentum and action*. Rome.

FAO. 2015. *Global Forest Resources Assessment 2015: How are the world's forests changing?* Second Edition. Rome.

FAO. 2016. *Manual for national socio-economic surveys in forestry*. Rome (also available at www.fao.org/3/a-i6206e.pdf).

Filoso, S., Bezerra, M. O., Weiss, K. C., & Palmer, M. A. 2017. Impacts of forest restoration on water yield: A systematic review. *PloS one*, 12(8), e0183210.

Gebrehiwot, S. G., Ellison, D., Bewket, W., Seleshi, Y., Inogwabini, B. I., & Bishop, K. 2019. The Nile Basin waters and the West African rainforest: Rethinking the boundaries. *Wiley Interdisciplinary Reviews: Water*, 6(1), e1317.

Khasanah, K., Mulyoutami, E., Ekadinata, A., Asmawan, T., Tanika, L., Said, Z., van Noordwijk, M. & Leimona, B. 2010. *A study of rapid hydrological appraisal in the Krueng Peusangan Watershed, NAD, Sumatra*. Bogor, Indonesia, World Agroforestry Centre.

Landscape for People, Food and Nature. 2019. (LPFN) [online]. [Cited 10 July 2019]. http://people foodandnature.org

Makarieva, A. M., Gorshkov, V. G., & Li, B. L. 2009. Precipitation on land versus distance from the ocean: Evidence for a forest pump of atmospheric moisture. *Ecological Complexity*, 6(3), 302–307.

McAlpine, C. A., Johnson, A., Salazar, A., Syktus, J., Wilson, K., Meijaard, E. & Sheil, D. 2018. Forest loss and Borneo's climate. *Environmental Research Letters*, 13(4), 044009.

McDonald, R.I. & Shemie, D. 2014. *Urban water blueprint: Mapping conservation solutions to the global water challenge*. Washington DC, The Nature Conservancy (also available at http://water.nature.org/waterblueprint/#/intro=true).

Millennium Ecosystem Assessment. 2005. Global Assessment Report. Washington, DC, Island Press.

Scott, D. F., & Prinsloo, F. W. 2008. Longer-term effects of pine and eucalypt plantations on stream flow. *Water Resources Research*, 44(7).

The Montréal Process. 2015. *Criteria and indicators for the conservation and sustainable management of temperate and boreal forests*. Fifth Edition. (also available at www.montrealprocess.org/documents/publications/techreports/MontrealProcessSeptember2015.pdf.

United Nations Children's Fund. 2016. Collecting water is often a colossal waste of time for women and girls. UNICEF press release 29 August 2016. (also available at www.unicef.org/press-releases/unicef-collecting-water-often-colossal-waste-time-women-and-girls).

van der Ent, R.J., Savenije, H.H.G., Schaefli, B. & Steele-Dunne, S.C. 2010. Origin and fate of atmospheric moisture over continents. *Water Resources Research*, 46: W09525.

van Noordwijk, I.F. *et al.* 2018. Climate-forest-water-people relations: Seven system delineations. In I.F. Creed. & M. van Noordwijk, eds. *Forest and water on a changing planet: Vulnerability, adaptation and governance opportunities.* A Global Assessment Report, vol.38, 188 pp. Vienna, IUFRO World Series.

Welling, R., Cartin, M., Barchiesi, S. & Cross, K. 2011. *Pangani River Basin, Tanzania: Building consensus on water allocation and climate change adaption*. Gland, Switzerland, International Union for Conservation of Nature.

World Overview of Conservation Approaches and Technologies. 2007. SWC Technology: Forest catchment treatment, India. In Where the land is greener.

©CANVA

ADVANCING THE FOREST AND WATER NEXUS
A CAPACITY DEVELOPMENT FACILITATION GUIDE

The Food and Agriculture Organization of the United Nations' (FAO) Forest and Water Programme has developed this module-based facilitation guide to provide appropriate background information, resource materials and a proposed facilitation plan to support the delivery of participatory learning workshops, or capacity development programmes on the forest-water nexus. The FAO Forest and Water Programme strives to mainstream water considerations in forest management, recognizing forests as nature-based solutions for water management and disaster risk reduction, thus contributing to more sustainable and resilient environments and communities.

More information:
www.fao.org/in-action/forest-and-water-programme

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Viale delle Terme di Caracalla
00153 Rome, Italy

ISBN 978-92-5-131859-1
9 789251 318591
CA6483EN/1/10.19