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W-FLR ROADMAP FOR THE MICRO-BASIN OF BOUÉROU, BENIN

Reviewed by Forests4Future, GIZ

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Preface

This report is part of the SIWI program for the development and piloting of the W-FLR tool handbook, supported by GIZ and SIDA. We acknowledge the invaluable support and collaboration of GIZ Benin's Forests4Future project team, whose commitment and cooperation were essential to the successful execution of this pilot in the micro-basin of Bouérou.

We also express our sincere appreciation to the stakeholders who participated in the W-FLR workshop with local stakeholders in Natitingou concerning the micro-basin of Bouérou, as well as the national stakeholders that participated in the W-FLR training in Grand Popo. Their expertise, insights, and feedback were critical in validating and refining the W-FLR Roadmap, ensuring its relevance and practicality for the communities and ecosystem serves.

The Water-smart Forest and Landscape Restoration (W-FLR) Roadmap for the micro-basin of Bouérou is the final output of a comprehensive process that began with the development of the W-FLR tool handbook, a pioneering effort by SIWI, supported by GIZ and SIDA. The roadmap was developed as part of a pilot program conducted in three countries, including Benin, where the micro-basin of Bouérou was selected as the pilot site due to its critical environmental and socio-economic significance.

The roadmap development process was structured into two main phases: the Preparatory Phase and the Workshop Phase. During the Preparatory Phase, the SIWI technical team conducted an extensive analysis based on publicly available information, focusing on three key modules: assessing the need for W-FLR at national and sub-national levels, mapping risks and opportunities for water ecosystem services, and identifying and engaging key stakeholders. The outcomes of this phase were compiled into a draft preparatory phase report, which served as the foundation for the subsequent Workshop Phase.

During the Workshop phase, the stakeholders were first consulted to validate and adjust, if necessary, the preparatory work. Further, the participants were asked to identify priority actions for water-smart FLR, related to policy integration, capacity development, and implementation.

The final roadmap incorporates the feedback and recommendations from these consultations, ensuring that it reflects the needs and priorities of the stakeholders involved. It includes newly proposed priority areas, issues, and stakeholders, as well as considerations for water ecosystem services that were identified during the workshop.

The W-FLR Roadmap provides a Strategic Actions Plan for analysis-planning-implementing water-smart forest and landscape restoration in the micro-basin of Bouérou. It outlines a clear path forward for enhancing ecosystem services, improving livelihoods, and building resilience to climate change. The successful implementation of this roadmap will depend on continued collaboration among all stakeholders, ensuring that the vision of a sustainable and resilient Bouérou micro-basin becomes a reality.

Executive Summary

This Water-smart Forest and Landscape Restoration (W-FLR) Roadmap for the micro-basin of Bouérou represents a key strategy to integrate water ecosystem services with forest landscape restoration. It builds on traditional Forest and Landscape Restoration (FLR) strategies, emphasizing the interconnection between forest and water management to enhance ecosystem services and climate resilience. The roadmap was developed through a collaborative process involving identified key stakeholders including local authorities, NGOs, and local committees.

This W-FLR Roadmap is designed to address and support the pressing environmental issues that threaten not only the ecological functions in the region, but also the well-being of local communities. The roadmap is an integrated approach designed to promote sustainable land and water management. It emphasizes the urgent need to restore water ecosystem services in the micro-basin that supports the livelihoods of the 5 villages Bouérou, Gbéba, Sinaourarou, Beket and Doh in central Benin. These services, such as freshwater provision, nutrient cycling, soil formation, and biodiversity support, are deteriorating due to pollution, land degradation, and deforestation. The decline in these services has adverse effects on water regulation, agricultural productivity, and climate resilience. The roadmap therefore focuses on reversing this trend by promoting water-smart restoration efforts that integrate forest and water management.

Components of the W-FLR Roadmap

The W-FLR Roadmap presents Priority Actions for W-FLR, which are structured around three strategic components: 1) Policy integration, which aims to incorporate water ecosystem services into national and regional policies, aligning these efforts with climate initiatives like the National Determined Contributions or the National Adaptation Plan to Climate Change. 2) Capacity building, which seeks to strengthen the technical expertise of stakeholders through training and knowledge-sharing platforms. 3) Implementation, with priority given to launching pilot projects that target forest and wetland restoration, developing early warning systems for water-related risks, and promoting integrated landscape management.

The roadmap emphasizes the importance of stakeholder engagement in ensuring the success of W-FLR initiatives. It outlines a comprehensive stakeholder mapping process that identifies key actors at different levels of society from local to national, including authorities, communities, NGOs, and the private sector. Engagement strategies are tailored to ensure inclusive participation and foster sustained commitment from these groups. This collaborative approach is crucial for achieving long-term restoration goals.

The results from the W-FLR Roadmap Strategic Actions Plan will indicate the system readiness to implement W-FLR. It assesses the capacity of existing structures to implement W-FLR, identifying gaps in policy integration, capacity building, and implementation on the ground. The roadmap calls for aligning water and forest management policies and creating synergies across sectors to enhance the effectiveness of restoration efforts. Additionally, it advocates for improved monitoring and evaluation systems to track progress and ensure adaptive management.

The W-FLR Roadmap of the micro-basin of Bouérou identifies several opportunities for advancing W-FLR initiatives. Barriers such as socio-economic pressures, deforestation, and climate variability can be overcome through the support of Benin's national policy frameworks. International funding mechanisms and strong community engagement also provide a solid foundation for scaling up restoration efforts. By addressing these challenges and leveraging available opportunities, the W-FLR Roadmap aims to create a

sustainable path forward for restoring and managing the critical water ecosystem services in the micro-basin of Bouérou.

In addition, the results from the W-FLR training of national stakeholders in Grand Popo are considered. In that training, they focused on the hydrological unit of l'Ouémé, where details of the ecological, hydrological and social aspects may differ from the micro-basin of Bouérou. Still the general trends of the results are useful to consider also in the Bouérou case.

Recommendations

To ensure the successful implementation of the W-FLR Roadmap Strategic Actions Plan, several key recommendations have been identified.

First, it is crucial to strengthen policy integration by advocating for policy reforms that support W-FLR and thus, develop clear W-FLR strategies aligned with existing national strategies. This will create a more cohesive policy framework that supports restoration efforts.

Another high-rated action by the local stakeholders is linked to promoting W-FLR as an approach to restore and reforest riverbanks. This would include the demarcation and marking of riverbanks, as well as awareness raising among local actors in the protection and sustainable management of riverbanks.

Thirdly, it is essential to enhance capacity development in W-FLR, especially among local stakeholders. This can be achieved by providing targeted trainings for example of local forestry agents and in river basin communities. Suggested trainings involve W-FLR standards as well as value chains suitable for smallholder foresters and farmers to improve their livelihoods. Increasing stakeholder engagement is also vital, for instance by promoting W-FLR among elected representatives and communities and ensuring meaningful participation by strengthening the capacities of all actors. Special attention should be given to involving underrepresented groups, such as indigenous communities and women's associations, and encouraging private sector partnerships to support restoration initiatives.

A final step in moving towards system readiness for restoring forest landscapes to improve water ecosystem services, is to implement pilot projects in high-impact areas where restoration is most urgently needed. These projects should incorporate adaptive management approaches to allow for flexibility and continuous improvement based on outcomes.

Another relevant priority action identifies by the national stakeholders in their W-FLR training involves securing sustainable funding is key to the roadmap's success. Efforts should be made to leverage both international and national funding sources while also establishing local-level financial mechanisms to support community-driven restoration projects. These steps will collectively ensure the long-term success and sustainability of W-FLR initiatives in the micro-basin of Bouérou.

In addition to the priority actions identified by the Benin stakeholder groups, the SIWI technical team suggests a number of activities that were not prioritised during workshops or trainings, that should be given priority to ensure water-smart FLR. These actions involve 1) promoting cross-sectoral collaboration and integrated landscape management to ensure W-FLR, 2) ensuring alignment of national and regional strategies with international commitments 3) establishing a monitoring & evaluation (M&E) framework for W-FLR initiatives to track progress effectively.

1. Introduction to the micro-basin of Bouérou

The W-FLR approach represents a significant shift in thinking about forest and landscape restoration, recognizing the critical role of water in ecosystem health and human well-being. The micro-basin of Bouérou, a region of significant ecological and socio-economic importance, was selected as the piloting area for the W-FLR tool in Benin.

The SIWI technical team conducted a comprehensive review of the micro-basin, utilizing publicly available data, research and figures to assess the region's environmental status and identify key challenges and opportunities. The review focused on understanding the geographic and environmental characteristics of the micro-basin, the socio-economic significance of its natural resources, and the critical environmental challenges it faces. The findings provide a detailed analysis of the drivers of degradation, potential barriers to restoration, and the enabling opportunities that could support sustainable and water-smart restoration efforts.

1.1. Geographic and Environmental Characteristics

The hydrological unit of Bouérou is a micro-basin situated within the sub-catchment of the Mekrou river in the Northern Benin. The Mekrou river is part of a transboundary basin shared between Benin, Niger, Burkina Faso and Nigeria. The Bouérou micro-basin has a maximum length of 31 km that varies depending on the seasons. It covers an area of 39 050 ha and is spread into 5 villages namely Bouérou, Gbéba, Sinaourarou, Beket and Doh.

The micro-basin is part of the Sudano-Guinean zone of Benin with a humid tropical climate and alternating an annual dry and rainy season. Annual rainfall range between 900-1200 mm per year, and temperatures vary between 21°C to 40°C (mean: 32°C) (Ahoyo et al. 2021; Gandji et al. 2020). The Bouérou landscape is to a large extent under agricultural production, with patches of wooded and shrubby savannah, gallery forest, riparian forest and plantations. The area provides vital water resources to the region's agricultural, livestock, fishery, cultural and household activities. During dry seasons, both crop and livestock production often suffer from water shortages.

1.2. Key drivers of forest and landscape degradation

The micro-basin of Bouérou is facing several key drivers of environmental degradation, the most influential include (World Bank, 2020):

- **Agricultural expansion**, including overgrazing and extensive slash-and-burn agriculture, causing overexploitation of land, pollution, erosion and damage to the hydrological cycle.
- **Fuelwood and charcoal production** as a main source of energy supply, due to that about 2/3 of the households does not have access to electricity, causing deforestation and forest degradation.
- **Timber wood collection**, both through legal and illegal logging, mainly targeting a few overexploited species that are experiencing critical reductions in regeneration.
- **Poverty and population growth**, that puts a strain on natural resources.
- **Inadequate forest governance and law enforcement** is at the root of many of the underlying causes of forest and landscape degradation, including ineffective implementation on the ground of forest laws, policies, forest management plans, and protected areas.
- **Climate change**, causing extreme climate variability, droughts, heatwaves, floods and delayed seasonal rains.

1.3. Potential Barriers to Forest and Landscape restoration

The hydrological unit of Bouérou is dealing with multiple barriers to forest and landscape restoration, the following were addressed during the W-FLR Workshop with local stakeholders:

- **Institutional barriers**, including unsustainable use of water resources, inadequate water resource governance
- **Environmental barriers**, including variable and unreliable water availability, water pollution from industrial waste, bushfire management and degraded soil fertility.
- **Land rights and tenure barriers linked to gender equality**, where traditional land management makes it complicated for women to access and own land.
- **Barriers linked to inadequate community involvement**, where participatory decision-making processes are lacking.
- **Financial barriers** due to lack in financial support for supporting and scaling up restoration activities, including inadequate access to investments, loans, credits and subsidies.
- **Anthropogenic barriers**, including poverty, high population growth, unsustainable land management.
- **Barriers linked to inadequate access to data and technology**, including poor knowledge of water resources and hydro-climatic risk management, as well as lack of hydrological and piezometric data collection networks and reliable risk forecasting systems in the sector.

1.4. Enabling Opportunities for Forest and Landscape Restoration

Despite the challenges, there are several enabling opportunities for effective forest and landscape restoration in micro-basin of Bouérou. These opportunities are primarily rooted in established Forest and Landscape Restoration (FLR) initiatives but are also relevant and beneficial for W-FLR efforts. They include policy frameworks, financial mechanisms, community engagement strategies, and alignment with global initiatives.

Enabling Policies and Frameworks

- **Alignment with global restoration initiatives**, such as the Bonn Challenge and the AFR100 support national and regional restoration efforts, such as Benin's national objective of restoring 500 000 ha of degraded land within the AFR100 initiative. Benin's participation in these global frameworks provides a mandate and goals that support W-FLR projects. Engagement in these initiatives offers access to international expertise, funding, and recognition, enhancing the effectiveness of restoration efforts.

Institutional and policy support

- **Sub-basin management committee** supporting local committees.
- **Engagement in existing FLR-relevant initiatives**: Initiatives/projects for sustainable land restoration and management, including ProSol project (GIZ), Tasco (EU), Ecosystem-based adaptation project (PABE), Integrated Program for Development and Adaptation to Climate Change in the Niger Basin (PIDAC).

Financial Mechanisms

- **International funding and support**: International financial support for environmental and restoration projects is crucial for both FLR and W-FLR. The hydrological unit of Bouérou can benefit from funding provided by bilateral donors and organizations such as GIZ (in the Bouérou Bassin with co-financing from the UE Programme PRONORD, as well as climate finance from multilateral mechanisms such as the Global Environment Facility (GEF) and the Green Climate Fund (GCF). For example, the GIZ Forests4Future project has supported various forest and landscape restoration initiatives in the area, which are directly applicable to W-FLR. These funds are used for technical assistance, capacity building, and project implementation, providing the necessary financial resources for successful W-FLR.
- **The willingness to implement payment for ecosystem services (PES) schemes**: PES can generate financial incentives and create sustainable financing models for restoration projects.

Environmental and Ecological Conditions

- **Existing Forest Resources**: The presence of existing forest resources in the micro-basin of Bouérou provides a significant opportunity for restoration efforts. Remnants of indigenous forests and afforested areas offer sources of seeds, genetic material, and habitat for wildlife, which are beneficial for both FLR and W-FLR (Gordon et al., 2017). Utilizing these existing resources can enhance the ecological success of restoration projects by improving biodiversity and habitat conditions.
- **Ecosystem Services**: The ecosystem services of the micro-basin, including water regulation, soil fertility, and carbon sequestration, are vital for supporting local livelihoods and ecosystems (Hussein et al., 2019). Recognizing and integrating these services into restoration planning can drive W-FLR efforts by highlighting their multiple benefits to communities and stakeholders. Ensuring that restoration activities enhance these ecosystem services aligns with both FLR and W-FLR objectives.

Community Engagement and Capacity Building

- **Local knowledge and traditional practices**, to strengthen community support and ensure cultural sensitivity.
- **Innovative technologies**, to improve the effectiveness of restoration efforts, for instance by improving water management, sustainable agriculture, and restoration monitoring, etc.

2. Water Ecosystem Services

The assessment of water-related ecosystem services in the micro-basin of Bouérou was conducted by the GIZ team based on available scientific knowledge and following the guidelines set out in the W-FLR tool handbook. This comprehensive evaluation utilized a holistic approach, considering the intricate interlinkages between various ecological and social processes across the landscape. Findings were validated through the workshop with local stakeholders in Natitingou, ensuring a combination of scientific analysis and local insights.

2.1. Water Ecosystem Services Risk Analysis

Understanding both the current status of ecological processes, as well as anticipated risks to water ecosystem services, is crucial for effective water-smart FLR. The current status provides insight into how well these services are functioning, while the risk assessment identifies potential future threats and vulnerabilities. This dual approach helps prioritize restoration interventions and develop adaptive strategies to address both current and emerging challenges. The SIWI W-FLR team has carried out this risk analysis based on publicly available data and information and by the stakeholder's workshop.

The micro-basin of Bouérou is experiencing significant declines across various water ecosystem services. The analysis shows that most of the ecosystem processes analysed are at high or intermediate risk within the system boundary (see Appendix 1. and summary in Table 1), which emphasizes the urgency of investing in and ensuring effective W-FLR interventions to restore the ecosystem services.

Addressing these risks is critical for ensuring the long-term sustainability of the micro-basin's ecosystem services, as well as future restoration initiatives. By adopting a comprehensive approach to risk assessment and management, it is possible to enhance the resilience of water ecosystem services and ensure the long-term health and sustainability of the micro-basin of Bouérou and its communities.

Table 1. Summary of the Water Ecosystem Services Risk Analysis of the micro-basin of Bouérou. The full table below, in Appendix 1.: Water Ecosystem Services Table.

Water Ecosystem Service	Ecosystem Process	Risks
Supporting Services		
Hydrological cycle	E.g., through evapotranspiration, recycling of precipitation, infiltration, controlling water runoff, etc.	
Nutrient cycle	E.g., in atmosphere, in soil organic matter and in soil and rock minerals.	
Soil formation/quality	Tree roots and soil organic matter improve soil moisture and structure. High rate of organic matter in soil slows down water movement.	
Biodiversity	Water linking organisms and supporting pollen/propagule dispersal. Habitats that safeguard fisheries and biological diversity.	
Provisioning Services		
Freshwater	Tree density influence groundwater recharge. Tree species and age influence water yield.	
Food and medicines	Ecosystems provide conditions for producing food / extracting medicines.	
Provisioning of materials	Ecosystems provide raw materials for construction, production and fuel.	
Regulating Services		
Water Flow Regulation	The ability of the catchment's ecosystems to regulate water flow, including water retention, streamflow regulation, and increased infiltration.	
Water Purification and Wastewater Treatment	A catchment's natural ecosystems play a crucial role in filtering pollutants and improving water quality.	
Climate regulation	Carbon sequestration in soil, as well as in above- and below-ground vegetation. Regulation of local temperature by evapotranspiration.	
Cultural Services		
Heritage / Cultural Identity	Catchment's significant cultural / spiritual value for local communities.	
Wellness, Recreation, and (Eco)tourism	The catchment offers opportunities for recreation, wellness, and ecotourism.	

3. Entry Points for Integrating Water Ecosystem Services and Policy Gaps

The micro-basin of Bouérou is a vital ecological zone, encompassing the potential for rich water resources and diverse forest landscapes. Integrating water-smart FLR into existing policies and plans is crucial for addressing environmental degradation, enhancing water ecosystem services, and promoting sustainable land management. This analysis aims to identify key entry points for policy integration, assess gaps in current policies, and propose actionable recommendations to advance W-FLR efforts.

3.1. Mapping Entry Points and Gaps in National/Sub-National Policies and Plans

Nationally Determined Contribution

Benin drew up its first Nationally Determined Contribution (NDC) and submitted it to the secretariat of United Nations Framework Convention on Climate Change (UNFCCC) in October 2017. In 2019, Benin conducted an assessment of the status of the NDC in relation to the actions implemented over the years 2017-2019. Building on those findings, they then embarked on the process of updating this instrument with the aim to raise the level of ambition. The enhanced NDC was also aimed at providing greater clarity and transparency for improved understanding of the instrument on the one hand, and better monitoring of its implementation on the other. Benin has also developed an NDC Action Plan (Partnership Plan) for the period 2021-2030, covering institutional governance, mitigation and adaptation measures for the agriculture, forestry, waste, energy, transport, infrastructure and urban development, coastal zones, water resources, health, and tourism sectors.

The enhanced NDC emphasises the importance of improving the resilience of natural and human systems to water stress, flooding and degradation of water quality, promoting water management and governance, as well as promoting the development of integrated water resource management projects under conditions of climate change. It also addresses the implementation of a reforestation plan with the objective of creating 15,000 ha of forest plantations per year, as well as the protection and conservation of natural forests to reduce the rate of deforestation.

While both water management and forest conservation are key priorities in Benin's NDC, there is a significant gap in integrating these two sectors. The narrow focus on reforestation may lead to monoculture plantations that can have negative impacts on, or may even harm, water ecosystem services. This gap may result in forest restoration efforts that fail to address the root causes of water-related challenges in the micro-basin of Bouérou, such as soil erosion, reduced water retention, and siltation of water bodies. The instrument also fails to identify synergies between mitigation and adaptation measures – those kinds of synergies are highly relevant for water-smart FLR, since they can be beneficial for both climate mitigation and adaptation (Ingemarsson 2022). Forests are mainly associated with a single ecosystem service, namely carbon sequestration.

National Adaptation Plan (NAP)

The National Adaptation Plan (NAP) of Benin, submitted to the secretariat of UNFCCC in July 2022, is a nationally lead approach to integrate climate change adaptation in development planning at the national, regional and local levels. The NAP aims to be a forward-looking medium- and long-term tool for reducing the impact of climate risks and disasters. It is focused on priority sectors in Benin, namely forestry, agriculture, water resources, energy, health, infrastructure, urban planning, tourism, and coastline. The NAP is also aimed at strengthening the climate resilience of both ecosystems, people and their livelihoods.

The NAP emphasizes the promotion of a resilient governance system in development sectors, as well as a resilient management of natural resources and ecosystems. It specifies the need for reforestation of the watersheds of the main watercourses in managed forests using species with high drought tolerance, as well as afforestation of conservation and protection series.

Although the strategy promotes reforestation and sustainable forest management, it does not integrate water-related targets, such as improving watershed management or enhancing water retention in forested landscapes. The separation of water and forest management leads to missed opportunities for synergistic interventions, where forest restoration could enhance water retention, reduce erosion, and improve water quality. Without integrated approaches, efforts in either domain may be less effective, as forest degradation directly impacts water availability and quality, and vice versa.

3.2. The Best Entry Points for W-FLR in Policies and Plans

The comprehensive mapping exercise reveals that the NDC and the NAP provide several promising entry points for W-FLR interventions in the micro-basin of Bouérou. For example, integrating water ecosystem services into forest policies should be a top priority due to its significant potential benefits. To realise these opportunities, there is a need to strengthen collaboration between actors at national and local levels by sharing knowledge and experiences.

The results from the workshop with local stakeholders show that most local actors were not familiar with the national documents (the NDC and the NAP). Therefore, the technical team received very limited feedback from participants, and it was not possible for the group to select entry points for W-FLR. On the contrary, in the workshop with national stakeholders most participants were familiar with these two documents, and some had even contributed to their elaboration. One important outcome is that during the workshop the national stakeholders discussed the fact that the links between forest and water was not mentioned in these documents and also, on the section in which it should be incorporated. The results from the national workshop also indicated that more awareness raising is needed among national stakeholders regarding the forest-water-climate nexus. The discussion indicated a knowledge gap in understanding the crucial links between the forest-water nexus and climate change mitigation, for instance that a functional hydrological cycle is necessary for both carbon sequestration and storage.

In conclusion, the policy documents reviewed are generally relevant to the goals of W-FLR in the micro-basin of Bouérou. However, the achievability of these policies varies, with common challenges including limited funding, insufficient capacity among local stakeholders, and the need for better integration of water and forest management practices. Addressing these challenges will require a coordinated effort to

strengthen policy implementation, enhance institutional capacity, and ensure that W-FLR principles are effectively integrated into national and sub-national planning processes. By doing so, Benin can achieve its environmental and development goals while ensuring the long-term sustainability of its water and forest resources.

4. Stakeholder Mapping and Analysis

An essential component of the W-FLR Roadmap involves analysing and engaging key sectors and stakeholders. The analysis aims to align Water-smart Forest and Landscape Restoration (W-FLR) with existing Forest and Landscape Restoration (FLR) efforts and other relevant initiatives and processes. Effective stakeholder involvement requires the engagement of key actors for the successful implementation and sustainability of the W-FLR Roadmap.

During the preparatory work, GIZ and SIWI identified key stakeholders across diverse sectors such as forestry, fishery, mining, and agriculture but also across various categories, including authorities, NGOs, community-based organizations, academic institutions, and the private sector. The analysis included stakeholders operating at different levels—national, sub-national (regional), and local—and holding potential roles in key action domains: policy, capacity development, and implementation. Stakeholders were then categorized into groups based on their influence, interest, and overall relevance.

Most of the invited stakeholders were part of the GIZ network as they had already collaborated in the past. On the local level, many of the workshop participants were involved in the *Comité Local de l'Eau* (Local Water Committee) but there were also several representatives from local authorities. On the national level, many represented the *Ministère du Cadre de Vie et des Transports En charge du Developpement durable* (the Ministry of Environment in charge of Sustainable Development) but also other Ministries were represented, i.e., the Ministry of Agriculture, Livestock and Fisheries, the Ministry of Development and Coordination of Government Action, the Ministry of the Family and the Ministry of Economy and Finance. Table 2 below features the organisations represented in the local W-FLR workshop, as well as in the national W-FLR training.

Table 2. Organisations represented in the local W-FLR workshop in Natitingou, as well as in the national W-FLR training in Grand Popo.

Organisations in the Local W-FLR Workshop		**Organisations in the National W-FLR Training**
National authorities		*Ministry of Lifestyle and Transport*
Atakora, Departmental Directorate of Water, Energy and Mines		Reforestation and Forest Management Unit
Local authorities		Wildlife, Biodiversity, Nature Conservation Unit
Municipality of Péhunco		Remote Sensing and Ecological Monitoring Unit
TSVL, ATDA		Policies, Studies, M&E of the DGEFC Unit
AMBERO/ Cosinus		AFR 100 Focal Point
AGIR Eau		Desertification Focal Point
N°16 Brisso		Donga Forest Inspection
RBT WAP		Forestry Inspection, the Ouémé catchment
Local water committee (CLE)		*Ministry of Agriculture, Livestock and Fisheries*

CLE chairman		Gender and Environment Unit
Local farmers, breeders and hunters		*Ministry of Water and Mines*
Orou Maro Ganniev, CLE Member		Water Sector
Housewife, CLE Member		Gender and Environment Unit
Breeder, CLE Member		*Ministry of Development and Coordination of Government Action (MDC)*
Breeder, CLE Member		Development Policy
Hunter, CLE Member		Gender and Environment Unit
Local organisations		*Ministry of the Family*
POTAL-MEN (Ag. organization in Natitingou)		Department of Social Affairs and Gender
International organisations		*Ministry of Economy and Finance*
SE/ C		Institute of Statistics
GIZ		Agronomy Faculty, University of Abomey Calavi
SIWI		*International organisations*
		GIZ
		SIWI

5. W-FLR Roadmap for the micro-basin of Bouérou

The W-FLR Roadmap for the micro-basin of Bouérou is based on the compiled results of the W-FLR workshop with local stakeholders in the micro-basin of Bouérou and the W-FLR training of national stakeholders in Grand Popo. The roadmap is the result of a process of identification, prioritization, and analysis of priority actions developed by the workshop participants. The W-FLR Roadmap is a comprehensive strategy that transitions from analysis (preparatory phase results) and planning (workshop phase, including the validation of the results from the preparatory phase) to tangible system readiness for the implementation of the W-FLR Roadmap Priority Actions.

5.1. Process of identifying W-FLR Priority Actions

The development of W-FLR Priority Actions involved several key steps:

1. **Pre-Workshop Analysis by the GIZ and SIWI Technical Team**: The W-FLR tool methodology describes a number of preparatory analyses that needs to be developed based on available data and official documents relevant for W-FLR. The analyses include identification of the system boundary and assessment of water ecosystem services at risk. It also includes identification of entry points for W-FLR in national and subnational policies and plans, as well as a stakeholder analysis. The results of the preparatory work, introduced in the above sections, was initially prepared by the GIZ and SIWI expert team.
2. **Stakeholder Verification and Validation**: The W-FLR tool is designed so that the results are based on a participatory approach where local stakeholders are involved in the development of the roadmap. The results of the preparatory work were presented to the workshop participants for validation and further development based on their experiences and observations.

3. **Development and prioritisation of priority actions:** Following the adjusted and completed preparatory work, the workshop participants were asked to develop priority actions to ensure that their planned FLR interventions are water-smart within the system boundary.

5.2. W-FLR Priority Actions of local stakeholders in the micro-basin of Bouérou

The W-FLR workshop participants of the micro-basin of Bouérou agreed on the following priority actions for water-smart FLR, divided into the three actions categories 1) Policy integration, 2) Capacity Development, and 3) Implementation on the ground (Figure 1). The participants then rated the actions by voting on the actions they assessed most urgent to achieve system readiness to implement W-FLR.

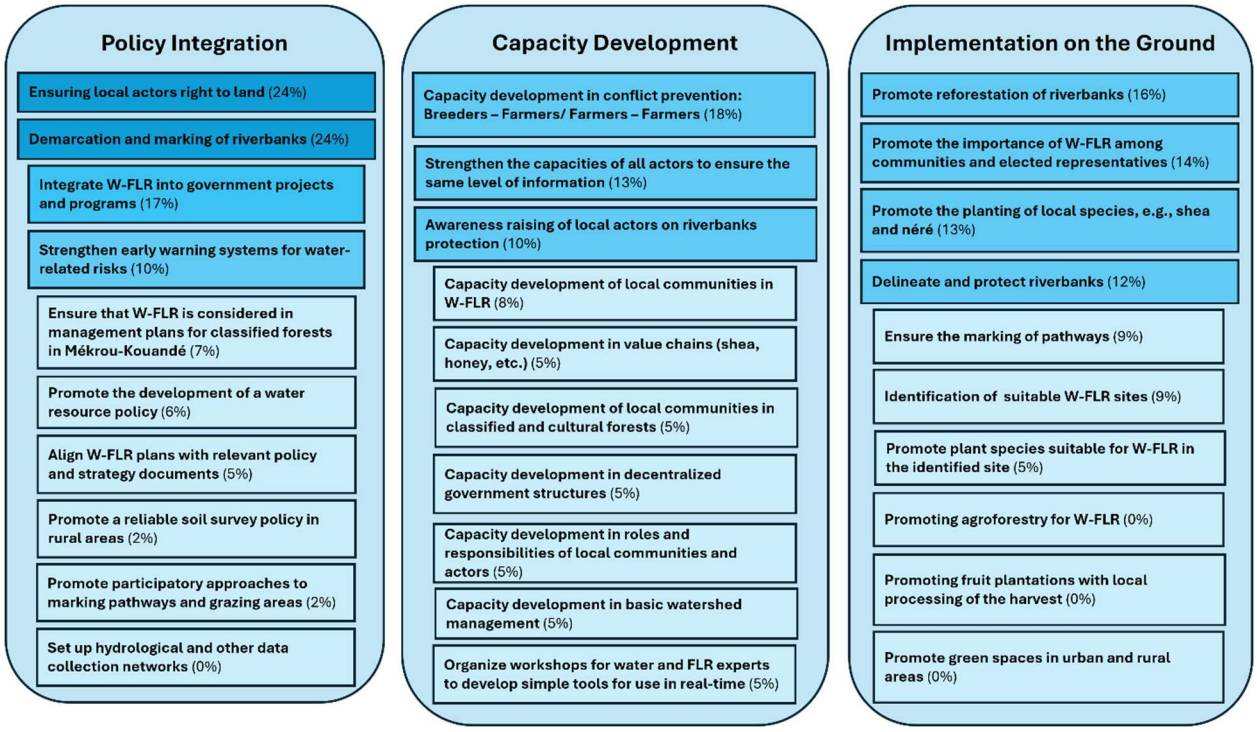

Figure 1. W-FLR Priority Actions of local stakeholders in the micro-basin of Bouérou

The local stakeholders assessed that W-FLR actions concerning policy integration are the most urgent, especially linked to land rights and the demarcation and marking necessary for reforestation of riverbanks. They also prioritized capacity development actions, e.g. training local stakeholders in conflict prevention, especially targeting farmers and pastoralists. Other priority actions include promoting the importance of W-FLR among communities and elected representatives and ensuring equality and just participation in the W-FLR process by strengthening the capacities of all actors to ensure the same level of information.

5.3. W-FLR Priority Actions identified in the training of national stakeholders

The national FLR stakeholders that participated in the W-FLR training in Grand Popo chose to focus their training on the hydrological unit of l'Ouémé, where details of the ecological, hydrological and social aspects may differ from the micro-basin of Bouérou. Still the general trends of the results are useful to consider also in the Bouérou case.

The participants of the W-FLR training with national stakeholders sorted the identified priority actions into thematic groups and voted for the groups instead of the specific actions, therefore the results look a bit different from the workshop with local stakeholders. Also here, the participants rated the groups of actions based on urgency to achieve system readiness to implement W-FLR.

Similar to the results from the workshop with local stakeholders, also in Grand Popo the highest priorities were identified in the policy integration and capacity development categories (Figure 2). The top priority actions were to promote W-FLR training for local stakeholders, and to promote the development of W-FLR relevant strategies. The national stakeholders also prioritized raising public awareness about the benefits of W-FLR, resource mobilization for W-FLR initiatives and activities, and research on the forest-water nexus to enhance the effects of W-FLR. Like the local stakeholders, they also prioritized going into implementation of restoring degraded forests and wetlands to improve water regulation and filtration.

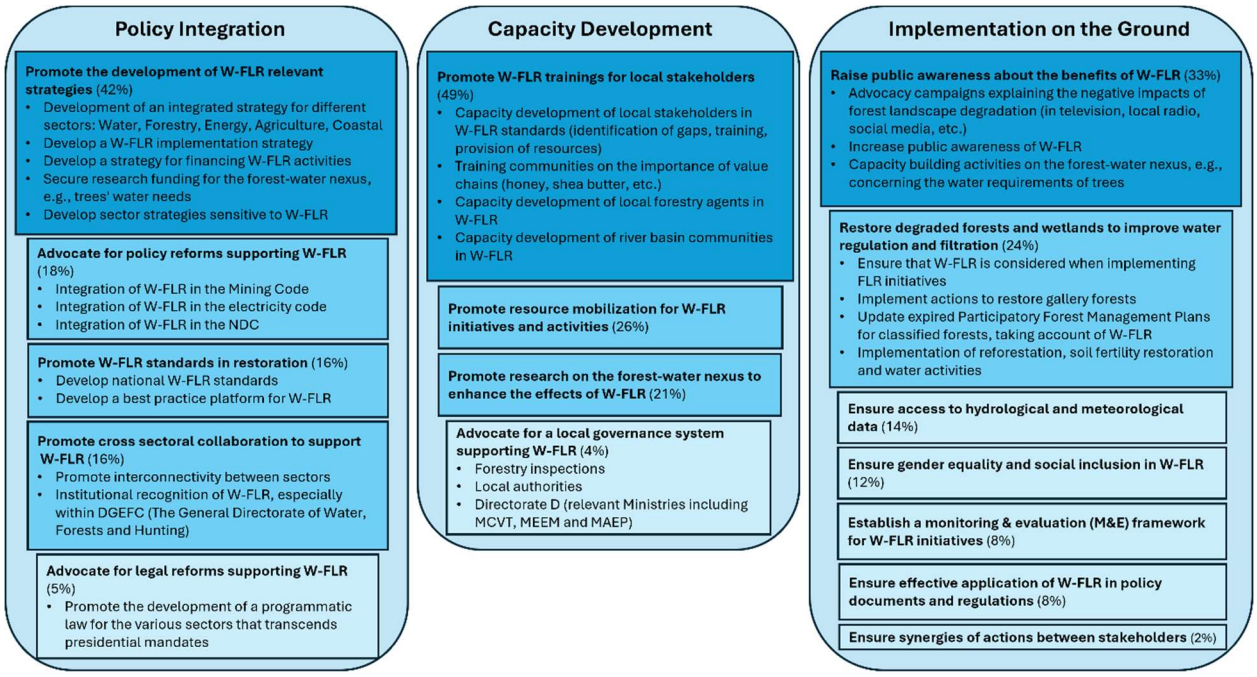

Figure 2. W-FLR Priority Actions identified by national W-FLR stakeholders in Benin.

5.4. W-FLR Roadmap Strategic Actions Plan

The W-FLR Roadmap Strategic Actions Plan (Table 3) summarise the Priority Actions identified by local and national stakeholders. The W-FLR methodology is – like all FLR initiatives – strongly site specific. Therefore, the roadmap analysis is mainly based on the result from the local workshop, with support from the results from the training with national stakeholders. During the analysis, the SIWI technical team reviewed all proposed priority actions and did some modification to ensure alignment with FLR principles, this is explained in the "Alignment with W-FLR" section below.

Table 3: The W-FLR Roadmap Strategic Actions Plan. The actions are ranked with the highest priority on the top.

Priority Actions	Policy Mainstreaming of W-FLR	Capacity Development in W-FLR	Implementation of W-FLR	Suggested indicators
1. Advocate for policy reforms that support W-FLR	• Ensuring local actors right to land • Support the development of an integrated W-FLR strategy involving relevant sectors • Develop sector strategies sensitive to W-FLR	• Capacity development in conflict prevention between actors		• No. policy reforms advocated • No. technical capacity assessments conducted
2. Promote W-FLR as an approach to restore riverbanks	• Promote demarcation and marking of riverbanks	• Awareness raising of local actors in riverbanks protection	• Promote reforestation of riverbanks	• No. of W-FLR projects in riverbank areas • Integration of riverbank restoration into FLR policies • No. stakeholders trained
3. Promote capacity development of local stakeholders in W-FLR	• Promote W-FLR among elected representatives and communities • Strengthen the capacities of all actors to ensure meaningful participation	• Promote trainings in: W-FLR standards and in value chains • Promote W-FLR trainings of local forestry agents and in river basin communities		• No. awareness campaigns conducted • No. trainings and knowledge-sharing events held
4. Raise awareness about the benefits of W-FLR	• Raise public awareness about the benefits of W-FLR • Advocacy campaigns explaining negative impacts of forest landscape degradation	• Capacity building activities on the forest-water nexus, e.g., concerning the water requirements of trees		• No. awareness campaigns conducted • No. trainings and knowledge-sharing events held
5. Restore forest landscapes to improve water ecosystem services	• Update expired strategies for classified forests, taking account of W-FLR		• Ensure that W-FLR is considered when implementing FLR initiatives • Implement actions to restore gallery forests • Promote the planting of local species, e.g., shea and néré	• Area of forests and wetlands restored • Improvement in water quality and quantity • Increase in biodiversity
6. Promote resource mobilisation for W-FLR	• Develop a strategy for financing W-FLR activities • Secure research funding for the forest-water nexus, e.g., trees' water needs			• No. W-FLR projects financed • No. W-FLR relevant research projects financed

5.5. Analysis of identified priority actions

The W-FLR Roadmap Strategic Actions Plan identified the following priority areas to ensure the successful implementation of the W-FLR Roadmap. The priority areas are ranked and listed with the most urgent action first.

1. **Ensure policy reforms that support W-FLR.** The identified action with highest priority overall is to promote and advocate for policy reforms that support W-FLR. That will involve efforts to strengthen policy integration so that water ecosystem services are incorporate in existing policies and strategies, as well as to develop clear W-FLR strategies aligned with existing national strategies, like Benin's NDC and NAP. This will create a more cohesive policy framework that supports restoration efforts and offer the greatest potential for impact and feasibility. For example, integrating water ecosystem services into forest policies should be a top priority due to its significant potential benefits.

2. **Promote W-FLR as an approach to restore riverbanks.** In the W-FLR workshop with local stakeholders the discussions often addressed the restoration and reforestation of riverbanks. The workshop participants agreed that the W-FLR methodology would be beneficial to use as a complement to existing methods to ensure sustainable use and management of water resources and the hydrological cycle. The participants specifically pointed out the need for demarcation and marking of riverbanks and the promotion of reforestation of riverbanks, as well as awareness raising among local actors in the protection and sustainable management of riverbanks.

3. **Promote local capacity development in W-FLR.** A priority that was emphasised several times in both the workshop with local stakeholders and the training with national stakeholders, is that it is essential to enhance the capacity in W-FLR among local stakeholders. This can be achieved by providing targeted trainings for example of local forestry agents and in river basin communities. Suggested trainings involve W-FLR standards as well as value chains suitable for smallholder foresters and farmers to improve their livelihoods. Increasing stakeholder engagement is also vital, for instance by promoting W-FLR among elected representatives and communities and ensuring meaningful participation by strengthening the capacities of all actors. Special attention should be given to involving underrepresented groups, such as indigenous communities and women's associations, and encouraging private sector partnerships to support restoration initiatives.

4. **Raise awareness about the benefits of W-FLR.** To enhance readiness for W-FLR, it is crucial to raise awareness among stakeholders at all levels about the importance of integrating water management into forest restoration. It is crucial to establish capacity development components that focus on educating stakeholders about the benefits of water-smart restoration practices and their roles in implementing these practices are necessary. Another option can be to create a knowledge-sharing platform for stakeholders to exchange experiences and solutions related to W-FLR. These measures should encourage active participation in W-FLR projects among all key stakeholder groups through collaborative planning and decision-making processes. In addition, to reach members of the local communities beyond the identified stakeholders, it can be effective to launch an awareness-raising campaign aimed at enhancing the understanding of W-FLR.

5. **Restore forest landscapes to improve water ecosystem services.** A first step in moving towards the broadscale implementation of W-FLR, is to implement pilot projects in high-impact areas where restoration is most urgently needed. These projects should incorporate adaptive management approaches to allow for flexibility and continuous improvement based on outcomes. The pilots can serve as examples of best practices that can inspire other stakeholders in investing in water-smart restoration initiatives.

In addition, the SIWI technical team is proposing to bring in one priority action that was identified by the national stakeholders:

6. **Promote resource mobilisation for W-FLR.** The implementation of restoration projects is often constrained by limited financial resources, impacting the scale, longevity and sustainability of interventions. To be able to implement the identified priority actions it is essential to secure long-term and sustainable funding. Efforts should be made to leverage both international and national funding sources while also establishing local-level financial mechanisms to support community-driven restoration projects. International financial support for environmental and restoration projects is crucial for both FLR and W-FLR. The micro-basin of Bouérou can benefits from funding provided by bilateral donors and organizations such as GIZ, as well as climate finance from multilateral mechanisms such as the Global Environment Facility (GEF) and the Green Climate Fund (GCF). For example, the GIZ Forests4Future project (with co-financing from UE Program PRONORD) has supported various forest and landscape restoration initiatives in Benin, which are directly applicable to W-FLR. These funds are used for technical assistance, capacity building, and project implementation, providing the necessary financial resources for successful W-FLR. Alignment with global restoration initiatives, such as the Bonn Challenge and the AFR100 can also offer access to funding, beside international expertise and recognition, enhancing the effectiveness of restoration efforts.

5.6. Ensuring alignment with W-FLR

The priority actions addressed during the W-FLR workshop were not always directly linked to official FLR principles. To ensure alignment with FLR the SIWI technical team reviewed all proposed priority actions and identified actions that required modifications to meet the FLR criteria. These modifications ensure that all priority actions are aligned with FLR, thereby enhancing the success and sustainability of the W-FLR initiatives.

5.7. Additional priority actions to consider

In addition to the priority actions identified by the Benin stakeholder groups, the SIWI technical team suggests a number of activities that were not addressed or prioritised during workshops or trainings, but that could be beneficial complements to the identified priority actions in reaching system readiness for water-smart FLR. These actions involve:

Promoting cross-sectoral collaboration and integrated landscape management to ensure W-FLR.

Promoting cross-sectoral collaboration offers an opportunity to break down silos and develop integrated policies that support W-FLR. This can be achieved through multi-stakeholder platforms, joint planning

sessions, and the creation of intersectoral task forces dedicated to W-FLR. For the micro-basin of Bouérou we suggest prioritising cross-sectoral collaborations through the identified priority actions, such as when advocating for policy reforms, promoting capacity development of local stakeholders and raising awareness about the benefits of W-FLR. As an example, agencies responsible for water and forest management need to collaborate more closely to ensure that W-FLR becomes a central component of regional development plans.

Ensuring alignment of national and regional strategies with international commitments.

In Benin, there is a lack of clear policy directives that mandate the inclusion of water-focused restoration strategies in broader forest landscape restoration (FLR) plans. For W-FLR to be fully integrated, existing environmental policies and land use plans must be revised to include specific provisions that address water management in forest restoration. This adaptation is crucial for creating a conducive policy environment that supports the implementation of W-FLR initiatives. In addition, it is important to ensure institutional support with recognition of the importance of integrated water and forest management.

Establishing a monitoring & evaluation framework for W-FLR initiatives to track progress effectively.

It is essential to ensure that W-FLR projects are implemented correctly and performing as expected so that the intended benefits can be achieved – this is done through a monitoring and evaluation (M&E) system. Different types of indicators are relevant for the three categories of FLR interventions:

- Policy integration – indicators that describes the integration of the forest-water nexus in relevant policies and plans (e.g. number and type of policies and plans, cross-sectoral coordination mechanism, type of FLR measures recommended, etc.).
- Capacity development – indicators that describe number and type of stakeholders that have capacity to engage in W-FLR in different sectors and at different levels in implementation and M&E.
- Implementation on-the-ground – number and type of W-FLR practices implemented on a given area of land and number of local beneficiaries disaggregated by gender, etc

These M&E mechanisms are critical for adaptive management, allowing for real-time adjustments to strategies based on ongoing feedback and performance data. By integrating robust M&E frameworks into the priority actions, the W-FLR initiatives are equipped to continuously evolve and improve, ensuring that they remain effective and relevant in the face of changing environmental and socio-economic conditions.

6. System Readiness for W-FLR

The W-FLR Roadmap report for the micro-basin of Bouérou in Benin aggregates the preparedness across key components necessary for the successful implementation of W-FLR initiatives. These components include policy integration, capacity development, and implementation mechanisms, each addressing a distinct aspect of readiness for W-FLR in the studied area. The analysis highlights the strengths, gaps, and opportunities across these dimensions to evaluate the overall readiness of the micro-basin.

Policy integration of W-FLR

The policy integration assesses how well W-FLR is incorporated into existing policies and whether there is adequate institutional support and coordination for its implementation. It focuses on the policy environment and the need for adaptation to include W-FLR.

Based on the above analysis the overall system readiness of the policy integration component is low on local level and moderate on national level. The absence of explicit W-FLR policies and the lack of integration between forestry and water management pose significant challenges. To achieve high readiness, concerted efforts are needed to reform existing policies, bridge sectoral silos, and build institutional capacity for W-FLR. The identified priority actions under policy integration involves the following:

- **Advocating for policy reforms that support W-FLR**: That includes ensuring local actors right to land, supporting the development of an integrated W-FLR strategy involving relevant sectors and the development of sector strategies sensitive to W-FLR.
- **Promoting W-FLR as an approach to restore riverbanks**, with special focus on the demarcation and marking of riverbanks.
- **Promoting capacity development of local stakeholders in W-FLR**: That includes promoting W-FLR among elected representatives and communities and strengthening the capacities of all actors to ensure meaningful participation.
- **Raising awareness about the benefits of W-FLR**: That includes raising public awareness about the benefits of W-FLR and investing in advocacy campaigns explaining negative impacts of forest landscape degradation.
- **Restoring forest landscapes to improve water ecosystem services**, with special focus on updating expired strategies for classified forests, taking account of W-FLR.
- **Promote resource mobilisation for W-FLR**: That includes developing a strategy for financing W-FLR activities and securing research funding for the forest-water nexus, e.g., trees' water needs.

Capacity development in W-FLR

The capacity of stakeholders is a key factor to ensuring the success of W-FLR initiatives. This component is closely linked to the presence of supportive policies, which underscores the interconnectedness of the two areas. By focusing on building capacity, the W-FLR initiatives will benefit from a well-prepared and knowledgeable workforce that is capable of executing the necessary actions.

The system readiness for capacity development in W-FLR in the micro-basin of Bouérou is currently assessed as low on local level and moderate on national level. Significant efforts are required to build the capacities needed for W-FLR implementation, especially among local stakeholders. This includes enhancing institutional expertise, bridging technical skill gaps, and fostering greater stakeholder engagement in W-FLR activities. The identified priority actions under capacity development involves the following:

- **Advocating for policy reforms that support W-FLR**, with special focus on capacity development in conflict prevention between actors.
- **Promoting W-FLR as an approach to restore riverbanks**, with special focus on awareness raising of local actors in riverbanks protection
- **Promoting capacity development of local stakeholders in W-FLR**: That includes promoting trainings in W-FLR standards and in value chains, as well as promoting W-FLR trainings of local forestry agents and in river basin communities.
- **Raising awareness about the benefits of W-FLR**, with special focus on capacity building activities on the forest-water nexus, e.g., concerning the water requirements of trees.

Implementation of W-FLR

Implementation readiness evaluates the preparedness of effectively operationalize W-FLR initiatives in the micro-basin of Bouérou. This assessment focuses on the availability and adequacy of financial resources, infrastructure, and implementation mechanisms necessary for the successful execution of W-FLR projects.

The overall readiness for W-FLR implementation on the ground is assessed as low. There are significant gaps in policy integration and capacity development, as well as in financial planning, technological infrastructure, and the adaptation of implementation mechanisms that need to be addressed to fully operationalize W-FLR projects. The identified priority actions under W-FLR implementation involves the following:

- **Promoting W-FLR as an approach to restore riverbanks**, with special focus on reforestation initiatives.
- **Ensuring that W-FLR is considered when implementing FLR initiatives**: That includes implementing actions to restore gallery forests and promoting using local species, e.g., shea and néré, in the W-FLR initiatives.
- **Promoting the implementation of pilot projects in high-impact areas** to be used as best practices to inspire stakeholders to invest in water-smart restoration initiatives.

The W-FLR Roadmap provides a Strategic Actions Plan for analysis-planning-implementing water-smart forest and landscape restoration in the micro-basin of Bouérou. By implementing these priority actions, the micro-basin of Bouérou can significantly enhance its readiness for W-FLR, contributing to the sustainable management of forest and water resources and supporting broader environmental and socio-economic goals in the region. It outlines a clear path forward for enhancing ecosystem services, improving livelihoods, and building resilience to climate change. The successful implementation of this roadmap will depend on continued collaboration among all stakeholders, ensuring that the vision of a sustainable and resilient Bouérou micro-basin becomes a reality.

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8. Appendix: Water ecosystem services table

Service écosystémique de l'eau	*Processus écosystémique*	*Tâche 1b: Situation actuelle*	*Tâche 2b: Les plans politiques pertinents*
Services de soutien			
Soutenir le cycle hydrologique	Transpiration et évapotranspiration.	Haut	NDC
	Interception de la canopée.	Haut	NDC
	La redistribution hydraulique, qui déplace l'eau d'un sol humide à un sol sec par l'intermédiaire des racines des plantes.	Haut	
	Les plantes jouent un rôle dans les cycles hydrologiques en contrôlant le ruissellement de l'eau.	Haut	
	Libération de composés organiques volatils contribuant à : - l'intensification des précipitations et un effet global de refroidissement en bloquant l'énergie solaire entrante. - l'aérosol organique secondaire qui condense l'humidité atmosphérique.	Haut	NDC
	Les arbres rechargent l'humidité atmosphérique et influencent la formation des nuages.	Haut	NDC
	La végétation contribue à réguler le climat en recyclant de grandes quantités d'eau et en maintenant la composition gazeuse de l'atmosphère.	Intermédiaire	NDC
	Recyclage de l'humidité terrestre.	Intermédiaire	NDC
	Recyclage des précipitations.	Haut	NDC
	La théorie de la pompe biotique : les précipitations à l'intérieur des continents proviennent de la circulation atmosphérique, qui est stimulée et entretenue par de vastes zones forestières continues à partir du littoral.	Haut	NDC
	Rivières aériennes - transport transcontinental de l'humidité atmosphérique affectant la disponibilité de l'eau en aval.	Haut	NDC

Soutenir le cycle des nutriments	Par exemple, dans l'atmosphère, le sol, les matières organiques et les minéraux présents dans les sols et les roches.	Intermédiaire	NDC
Soutenir la formation et la qualité des sols	Les racines des arbres et la matière organique du sol améliorent la structure du sol. La matière organique dans le sol ralentit le mouvement de l'eau.	Intermédiaire	NAP (UNFCCC
Soutenir la biodiversité	L'eau relie les organismes et favorise la dispersion du pollen et des propagules.	Haut	
	Des habitats qui préservent la pêche et la diversité biologique.	Haut	NDC
Services d'approvisionnement			
Approvisionn-ement en eau douce	La densité des arbres influence la recharge de la nappe phréatique. L'espèce et l'âge des arbres influencent la production d'eau.	Intermédiaire	
	Productivité hydrique nutritionnelle, c'est-à-dire « récolte par unité de volume d'eau ».	Intermédiaire	
Approvisionn-ement en nourriture et en médicaments	Les écosystèmes fournissent les conditions nécessaires à la culture et à la récolte des aliments, ainsi qu'à l'extraction des médicaments.	Intermédiaire	NDC NAP (UNFCCC
Approvisionn-ement de matériaux	Les écosystèmes fournissent des matières premières pour la construction, la production et les carburants.	Haut	NDC NAP (UNFCCC
Services de régulation			
Régulation du débit d'eau	Capacité de rétention d'eau, régulation du débit des cours d'eau et augmentation de l'infiltration.	Haut	
Purification de l'eau et traitement des eaux usées	Les arbres filtrent les précipitations et réduisent la sédimentation dans les cours d'eau.	Haut	
	Réduire les polluants qui pénètrent dans les cours d'eau et filtrer les eaux usées.	Haut	NDC
Régulation du climat	Séquestration du carbone dans le sol ainsi que dans la végétation aérienne et souterraine.	Intermédiaire	NDC
	Régulation de la température locale par l'évapotranspiration.	Faible	NDC
Services culturels			
Valeur identité culturelle et patrimoniale	Liens culturels liés au paysage, par exemple les caractéristiques des paysages culturels.	Intermédiaire	
Expériences spirituelles	Lieux et espèces importants pour l'identité spirituelle ou rituelle.	Intermédiaire	NAP (UNFCCC
Bien-être, loisirs et (éco)tourisme	Plaisir, confort, découverte et socialisation réalisé dans la nature et dans l'observation des éléments naturels.	Intermédiaire	NDC NAP (UNFCCC
Éducation et recherche	Par exemple, le climat, la topographie, le cycle de l'eau ou le sol et le biote.	Interdémiaire	NAP (UNFCCC
Appréciation et inspiration esthétiques	Par exemple, perception visuelle des écosystèmes et des paysages. Lacs et rivières représentés dans des chansons.	Intermédiaire	NDC