Supporting Madagascar Team in EFlows Assessment and Implementation

10th – 21st December 2022

Mission Report

Preamble

The ongoing EFlows demonstration projects under component C of the WIOSAP being implemented in the three WIO countries (Tanzania, Madagascar and Mozambique) provide a benchmark for the EFlows implementation following the assessment. Possible interventions have been proposed and presently being piloted in specific areas within the study catchments. While acknowledging the efforts, there are notable differences in the project implementation progress among the three countries due to the varied capacities and data availability for undertaking a meaningful EFlows assessment. Comparatively, there has been slow progress in the Madagascar. Therefore, to speed up the process and in harnessing the spirit of shared regional learning, and leveraging on the available regional capacity, the Nairobi Convention made some resources available to support the EFlows capacity building to the Madagascar EFA team in the implementation of their demo project titled "*Sustainable management of E-Flows for west coast rivers of Madagascar: a case of Betsiboka River*".

EFA Mission and Objective

The EFA mission to Madagascar was conducted from 10th to 21st December 2022. The objective of the mission was to build capacity of EFlows Assessment to Madagascar EFA Team to be able to design and undertake EFlows Assessment and Implementation.

Specific Tasks

The assignment involved the following tasks but not limited to:

i. Building capacity on EFlows and the assessment methods.
ii. Capacity building on EFlows site selection and monitoring of physical, chemical and biological processes of river systems that are relevant for EFlows.
iii. Capacity building on co-design, co-implementation and co-management of EFlows
iv. Expose EFlow team to factors that support or obstruct the successful implementation of environmental flows in a river basin.

Mission outcomes

At the end of the mission, the Madagascar team is expected to be able to:

i. Compare the methodologies for assessing EFlows and synthesize the knowledge acquired to propose a methodological approach to assess EFlows in Betsiboka river.
ii. Describe the physical, chemical and biological processes of river systems that are relevant to EFlows.
iii. Analyze the factors that support or obstruct the successful implementation of environmental flows. iv. Design interventions to support EFlows implementation

Mission Itinerary

The following table provides a summary of the mission itinerary.

SN	Date	Activity
1.	10/12/2022	Travel from Morogoro to Dar es Salaam then fly to Madagascar
2.	11/12/2022	Work in Antananarivo, Madagascar
3	12/12/2022	Meet the EFlows Team in Antananarivo, receive progress and plan for the fieldwork (team, tools), check available data and quality
4	13/12/2022	Travel to Betsboka catchment for field activities
5	14-15/12/2022	Fieldwork in Betsboka catchment and hold a stakeholders' meeting to discuss preliminary findings and co-profile some possible interventions
6	16/12/2022	Capacity building on EFA methods and procedure for BBM methodology
7	17/12/2022	Travel to Mahajanga en-route visit the planned intervention site along Betsboka river
8	18/12/2022	Break
9	19/12/2022	Travel to Antananarivo en-route visit the tree nursery at the Forestry Department
10	20/12/2022	Feedback to EFA team regarding observations and key considerations
11	21/12/2022	Travel back to Tanzania

Key considerations for EFlows using Building Block Methodology (BBM)

i) Data and data quality

The data availability and quality of data are key to a meaningful Environmental Flows Assessment. The important data for EFlows assessment using BBM include:

- River flow data from gaging station at a daily time resolution –at least 20 years
- Climatic data (mostly total daily rainfall and average daily temperature of at least 20 years)
- Hydraulic data (river channel cross-sections, hydraulic ratings)
- Riparian ecology data
- Aquatic ecology data
- Geomorphological data
- Social economic data
- Water quality data

ii) Building Block Methodology (BBM) Interdisciplinary EFA team

- Hydrologist
- Hydraulic engineer
- Riparian ecologist
- Aquatic ecologist (fish and macro inverts)
- Geomorphologist
- Socio-economist
- Water quality expert
- Overall EFA coordinator (one with EFA experiences – normally the Hydrologist)

iii) Design of field sampling for the BBM

Before sampling, EFA sites must be selected based on the criteria specified in the BBM Manual. Once the sites have been confirmed, sampling follows for both wet and dry season. Site selection is

normally conducted in the dry season at the low water levels when it is possible to wade through the cross section (nevertheless, depending on the situation of the river, a boat might be needed). It is important to note that during sampling, all the experts should be in the field at the same time and date. This allows comparisons of collected data and building relationship among the collected variables and river flows.

iv) Design of interventions and Implementation plan

The interventions must be informed by the EFA objectives through the stakeholders' desired ecological management class (EMC) and must be co-designed with the communities. For interventions aiming at restorations, one must avoid introduction of invasive species and leverage on the local knowledge using dominant local species found at water sources, thus harnessing the nature-based solutions.

Key Observations and recommendations

The EFlows project in Madagascar adopted a BBM approach, and a local consulting organization led by Prof. Eddy was engaged for the project implementation. The consultant and his team presented on the progress of the project implementation. Generally, there are notable progress with regards to assessment but there is largely lack of coherence and inconsistency with regards to BBM requirements and procedures, also the used flow data are questionable. **It came out clear from the presentation that the concept of EFA and the methods were not yet clear to the Consultant team although it was much emphasized during the last visit**.

Specific issues and recommendations

The following are the specific issues and recommendations:

i) Data and data quality

It was presented and observed that the consultant team has not been able to access the reliable daily flow and climatic data. They only managed to obtain some monthly data (but patchy) and the team is not sure of how the sourced data was generated. Generally, access to **daily data** has proven to be very difficult.

Also, various uses of the water for the river are presently unavailable/not assessed to support the EFlows recommendations. *It is recommended to conduct a thorough assessment of water offtakes and map their locations.*

To generate daily flows, it is recommended to source some global climatic data and setup a rainfall-runoff model to simulate the flows. These will definitely be just estimates missing the observed information for calibration and validation of the model outputs, but will be something to start with.

It must be noted that flow regimes characterization (e.g. wet year, maintenance year and drought year flows as well as low flows, floods) are critical for BBM application in EFA.

ii) Building Block Methodology (BBM) Interdisciplinary EFA team

The review of the EFA team put up by the Consultant revealed absence of key disciplines to support EFA. The missing disciplines in the team include Hydrologist, Fish specialist, Invertebrate specialist and Socio-economist. This accounts for 5 out 7 expertise needed for meaningful BBM application.

Indeed, this is a major gap and even those available (Hydraulics, Riparian ecologist) do not have clear terms of reference to guide their expected deliverables for EFA.

The Consultant has been advised to reconstitute/strengthen the EFA Team and each participating expert be furnished with the Terms of Reference with clearly defined deliverables for both dry and wet season sampling. Samples of ToR have been shared for their customization.

iii) Design of field sampling for the BBM

The dry season sampling in May 2022 was not guided by the BBM protocol and largely fallen short of the required expertise. Most of the sampling was done at varied time and inconsistently. Therefore, the legitimacy of the collected information is questionable and thus wonder whether could be used in EFlows recommendations. The Consultant admitted this shortfall and hope to rectify the situation in the coming wet season sampling in January 2023 after the recruitment of all the required experts with clear ToR. A challenge that the Consultant will have to overcome will be the establishment and survey of the cross-sections at each EFA site. Ideally, for each EFA site, at least three surveyed cross-sections spanning at least 20m apart will be required to enable the development of a site specific hydraulic model in HECRAS (the mostly used hydraulic modelling software). Also to emphasize here, for each EFlows sampling mission, all experts should be present. This will to some extent reduce the field costs while at the same time allowing building relationship among the sampled variables and flows.

Another important consideration to the sampling design is the availability of tools and equipment. Specific tools and equipment are needed to support various site activities and sampling. The unavailable equipment and tools include:

- Acoustic Doppler Current Profiling (ADCP) velocity and flow measurement (see details at https://www.ysi.com/rs5)
- Multiparameter Water Quality Meter (e.g. Hanna type or Aqua TROLL 500 Multiparameter Sonde)
- Electrofisher for fish sampling
- D-net using a 500µm sieve bucket for benthic macroinvertebrates sampling (visit https://extension.usu.edu/utahwaterwatch/monitoring/field-instructions/macroinvertebratesampling/index)
- Survey tools (e.g. Levelling machine, levelling staff) and a boat to support the cross-section survey works as well as flow measurements, hydraulics and other sampling works.

Therefore, the EFA Team will have to source the equipment and tools from within and from outside the country for a meaningful wet season sampling in January 2023 and the dry season sampling in May 2023 (to be redone). In the absence of such equipment and tools, it will be impossible to get reliable information for EFlows assessment and ultimately the recommendations.

iv) Design of interventions and Implementation plan

The EFA Team intends to use the seedlings from the available tree nurseries under the Forestry Department for riparian and catchment restoration activities. A visit to the department revealed existence of a tree nursery at an early stage of plant development. The most available species are exotic (eucalyptus, pine, ..). Such species are not recommended for restorations at the water sources except for other parts of the catchments away from the sources and normally grown commercially. *Therefore, it was agreed to establish two new nurseries, one in the upper catchment near Antananarivo for the ease of management and one in the lowland near the National Park using local species found at water sources. The identification of the plant species and establishment will be led by the communities and the Forestry Department so as to create a sense of ownership and thus enhance effective engagement and management. There is in Maevatanana at the Forestry*

Department a nursery with species (Kaya, Acacia,…) that could be used for catchment rehabilitation, also Mango plants, lebbeck (albizia, bonara) where young plant could be collected for restoration, as well as bamboo and reeds for protection of banks.

Policy, Legal and Institutional Issues

Enabling and supportive policy, legal and institutional frameworks are key to the success of EFA. The review of the existing water related policies and institutional frameworks revealed a number of issues of concerns including inconsistencies in regulatory and legal frameworks as well as institutional roles and responsibilities, and funding constraints. For example, the 1999 National Water Code, and its subsequent decrees are the foundation of Madagascar's water policies for the management, conservation, and development of water resources. The Madagascar's National Environmental Action Plan, which has been renewed in phases since its inception in 1989, prioritizes IWRM planning as a framework to reduce resource degradation, promote reforestation, and improve systems for groundwater monitoring and water supply management. Achieving this sectoral goal has been difficult following limited fund allocation. Therefore, dedicated government entities and funding mechanisms for IWRM-based planning are not operational; and this has had effect on the establishment of water monitoring networks among others.

In 2004, the National Authority for Water and Sanitation (ANDEA) was established to coordinate and regulate IWRM mechanisms and policies across the agriculture, hydropower, mining, fishing, industry, tourism, and domestic water sectors. ANDEA was tasked with managing the National Water Resources Fund (FNRE) to finance IWRM through water withdrawals and wastewater discharge fees. Following its contestation, this has become a non-starter and the ANDEA's objectives, including the establishment and oversight of regional and sub-regional basin agencies, management and coordination of watershed master plans, and catchment monitoring have stalled down.

Another issue of concern is on the frequent changes to water sector governance structures that have slowed IWRM implementation. Presently, the Ministry of Water, Sanitation, and Hygiene (MEAH) is the main institution overseeing the development and implementation of IWRM policy until issues with ANDEA are resolved. Originally established in 2008, the MEAH has experienced several major structural changes in the last ten years, including the merger and separation of the energy, water, and the environment ministries. Four different ministers have led the water sector between 2017 and 2020 alone and each round of new leadership results in new appointees and disruptions to sectoral governance, which remains highly centralized (USAID/SWP, 2021).

Reflections from the previous recommendations to the EFA Team

It has been noted that the given guidance and recommendations during the last visit have not been fully worked out. The reasons as to why most have not been worked out is very unclear. To cite some:

- The Besiboka River Basin is very extensive. It will be difficult to experiment for the entire basin although the assessment can be done for the entire basin. It is thus recommended to decide on the restoration objective and apply an adaptive management approach to demonstrate some of the restoration options in few selected areas. The assumption is that the key success lessons from the demo area could later be scaled to a bigger area for the greater impact realization. Given the lapse time since the last visit and the present, it was expected that the EFA team would have already started the co-identification of local species for restoration works and the establishment of the tree nurseries.

- The previous visit advised the EFA Team to read and understand the Regional EFlows Guideline as well as the Building Block Methodology (BBM) by Jackie King and Cate Brown of 1998. *My discussion with the Team revealed a varied understanding and some have not seen the document though the documents were shared from the previous mission revealing some level of laxity.*

Summing actions and the way forward

SN.	Description of issue	Actions
1.	Daily climatic and flow data	EFA team is following up with the South African expert to assist with the modelling and generation of the data. The process has started according to the Consultant and data will be made available in February 2023.
2.	Recruitment of missing disciplines in the EFA Team	Consultant in collaboration with the Madagascar EFA Team to recruit the experts before the wet season sampling in January 2023. Each expert to be given the ToR.
3.	Internal BBM Capacity building	Consultant to ensure each participating expert reads and understands the BBM approach before going to the field.
4.	Establishment of two tree nurseries using indigenous trees species	The EFA Team led by Ms Noeline to establish two nurseries (one in Antananarivo and the other near the National park in the lowlands) in Maevatanana. The exercise will take advantage of the ongoing rainfall to collect seedlings of indigenous trees from sources. The exercise will ensure a full engagement of communities within the localities.
5.	Next visit to Madagascar	Agreed the next visit by Prof. Kashaigili to Madagascar to be conducted in May 2023. This will be the time when the EFA Team will be redoing the dry season sampling followed by a Flow recommendation workshop.