UNITED NATIONS ENVIRONMENT PROGRAMME
NAIROBI CONVENTION

WIOSAP FULL PROPOSALS TEMPLATE

Call title: Implementation of the Strategic Action Programme for the protection of the Western Indian Ocean from land-based sources and activities (WIO-SAP)

Participating countries: Comoros, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa, Tanzania [and France (not project beneficiary)]

Executing organization: Nairobi Convention Secretariat

Duration of demo projects: 2 years

Stage of the call: Full proposals

Submission dateline: October 2019

INSTRUCTIONS

Organisation Name	Directorate General of Environment at the Ministry of Environment and Sustainable Development
Project Title	**Sustainable management of EFlows for west coast rivers of Madagascar: a case of Betsiboka River**
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Registration Details	Type of organisation: Government Country: MADAGASCAR Registration Number: Year: 1990

Executive Summary: The project consists of conducting environmental flow assessment activities through sensitization and information sharing with the stakeholders. The project will carry out an environmental flow study to find out implementable solutions for managing environmental issues, in a rational and sustainable way, the river flows and sediment load of rivers coming from the Betsiboka catchments by promotion of water and technical soil conservation recommended and adapted to the situation, the reconstruction of natural resources by the ecosystem and the agro-ecosystem while ensuring the socio-economic development activities are improving the incomes of the local populations in the environment. The project will contribute to the proposal for a rational and sustainable catchment scheme, environmentally sensitive agrarian systems and the improvement of the vulnerability of the exploitation and population activities. The project will adopt the participatory, spatial, and empowering and gender approach.

I. BACKGROUND AND JUSTIFICATION

The problem or critical issue which the proposal seeks to resolve:

The absence of environmental flows puts at risk the very existence of ecosystems, people and economies (Dyson *et al*., 2003). Accounting for environmental flows is an integral part of the of river basin management, and leads to obtaining good ecological state for rivers subjected to pressure from exploitation of their waters, particularly for irrigation purposes and episodes of drought that regularly reduce their flow to bare minimum.

The National Development Policy of Madagascar (2015-2019) has highlighted the importance of man in harmony with his environment. It commits all stakeholders to actively contribute to economic development focused on the dynamism of territorial development. One of the strategic plans of this policy is on the sustainable management of the ecosystems and the capacities to adapt and mitigate the effects of the climatic change, the economic valuation and the preservation, and the sustainable use of the natural resources. In addition, the Constitution of Madagascar imposes on every citizen the protection of the environment. The State ensures the protection, conservation and enhancement of the environment through appropriate measures (Art. 39). The existence of the Malagasy Environment Charter Law which also mentions the need for the protection of the environment and specified in the decree of Compatibility of Investments with the Environment that Basin Rivers are sensitive areas and using a large amount of water requires an environmental assessment. And in water legislation, water withdrawal of more than 1 m^3/sec requires authorisation from competent authority. Despite the policy and legislative provisions, the situation on the ground is worsening due to increased land degradation.

The World Bank report of July 2018 mentioned an economic growth estimated at 4.2% in 2017 and 5% in 2018, in perspective, for the further improvement of this growth. Despite the noted economic growth, 80% of the Malagasy population are small scale farmers, who do not fully derive any benefits from the seemingly good national-level economic growth. Majority of the people depend on natural resources to make a living. Owing to this, there has been over the time continued land degradation with the increasing rates of sedimentation in rivers. In particular, Betsiboka Rivers have been chosen due to extensive deforestation in the respective catchments following rampant fire in forests, agriculture, gold mining, and livestock grazing. This has resulted in extensive soil erosion which is transported by the tropical rains into the rivers and ultimately to the sea. One of the most frightening cases of this phenomenon is the Betsiboka River, which is usually red in colour, carrying laterites of around 250 tonnes per hectare per year in certain areas of the Mozambique Channel. In general, the degradation of the environment has several aspects with cascading effects as follows: the mining activities cause the reduction in water flow, bring water pollution, erosion, and sediment supply, soil erosion of steep slopes, alteration of river beds and the sediment load and properties, the alteration of the river flow and discharge, the degradation of marine and coastal ecosystem, reduced yields of fishermen and Fish-farmer, the formation and increase of lavaka (hole) following erosion, the silting up of rice fields, and the degradation of water quality.

This environmental flow study will improve the flow of river by identifying all issues in the management of local use of rivers and watersheds and provide data on the current state of Betsiboka flows. In this study, the state of degradation of all components of the Environment, such as: soil, vegetation, forests and its biodiversity will be evaluated**.** As a result of the identified problems and negative impacts, mitigation measures and actions will be proposed and implemented, which will lead to improved river flows.

The Betsiboka River represents a big catchment area of 49,000 km^2 and pass through three different regions, which this project is designed to strengthen environmental preservation in areas concerned with economic development.
Given the current deterioration of the state of the river by the intensification of forest fires and deforestation, the multiple use of water in the regions, it is urgent to integrate the management of water resources in the development activities, influence development processes and limit flow pressures.

How the need for the project was determined:
Aquatic ecosystems, such as rivers, wetlands, estuaries and near-coast marine ecosystems provide a great variety of benefits to people. These include 'goods' such as clean drinking water, fish and fibre, and 'services' such as water purification, flood mitigation and recreational opportunities. Healthy rivers and associated ecosystems also have an intrinsic value to people that may be expressed in terms of cultural significance, particularly for indigenous cultures. This intrinsic value is often overlooked as it is difficult to identify and quantify (Dyson *et al*., 2003).

It is evident that rivers and other aquatic ecosystems need water and other inputs like debris and sediment to stay healthy and provide benefits to people. Therefore, environmental flows are a critical contributor to the health of these ecosystems. The initial communications with communities along the Betsiboka River revealed a need for environmental flows to balance development and environmental protection. There is presently low agricultural productivity, especially the local rice production which is caused by the silting up of the rice field and croplands in the downstream. There are a lot of environmental aspects, that are human induced and to some extent caused by climate change, e.g. the drought of 2017 and the cyclones accounted for by reducing approximately 20% of the supply of locally produced rice. This also reflects the degradation of the environment, a situation which evokes the importance of giving particular consideration to the management of river flows in large basins, particularly in the western part of Madagascar.

Therefore, the interest of the project is for the balance of the use of catchment by the stakeholders such as the existing and future private investors, the associations of the water users such as agricultural (Water User Associations), miners and fishers. The project is expected to support the establishment of monitoring systems for hydrological and ecosystem data collection which are presently insufficient from the catchment of Betsiboka River.

How the proposed action relates to other relevant national development strategies and policies. WIOSAP priorities and relevant global commitments.
As part of the implementation of the partnership in the Western Indian Ocean Region strategic action program against marine pollution from land-based sources and activities of the Nairobi Convention, the proposed project will address *component C: Sustainable management of the flow of rivers and major river basins in western Madagascar, which results in: Evaluation of environmental flows and products C.1.1 Assessment of environmental flows and C.1.2 Implementation of evaluation recommendations flow.*

"*Environmental flows can be described as the quantity, quality and timing of water flows required to maintain the components, functions, processes, and resilience of aquatic ecosystems which provide goods and services to people*".
The proposed project is well aligned with the national policies, legislation and strategies including the constitution (e.g. The National Development Policy of Madagascar (2015-2019), Malagasy Environment Charter Law and the Constitution of Madagascar) that advocate for environment protection and sustainable resource uses. The project has a global relevance, and it is envisioned to contribute to the Sustainable Development Goals 14 with targets for managing and protecting life below water. Also, the SDG 15 aim to conserve and restore the use of terrestrial ecosystems such as forests, wetlands, dry lands and mountains by 2030. And for SDG13 highlighted that every country in the world is seeing the drastic effects of climate change, some more than others. The project uses Betsiboka River as a case for addressing ecosystem to maintain agriculture irrigation, alluvial mining exploitation, aquatic needs, wellbeing and provide goods for people.

To achieve outputs that would contribute to this objective (Component C), we will implement proposed activities on Betsiboka River, as a demonstration site before applying lessons to other rivers in the west coast of Madagascar. These include, from north to south, Mahavavy, Sofia, Manambolo, Tsiribihina, Mangoky and Onilahy (the characteristics of these rivers are provided in Annex E).

Whether there are other programmes and activities which will complement the proposal:
Moreover, efforts are currently underway in Madagascar for the sustainable management of water resources, including the establishment of the National Authority for Water and Sanitation (in French, Autorité Nationale de l'Eau et de l'Assainissement ANDEA), as an organization responsible for ensuring integrated management of water resources and the national development of the water and sanitation sector in Madagascar, provide databases on river systems, all kinds of authorization, technical data. The Agency consists of an administrative and technical structure whose mission is to manage the shared water resource in the province concerned and the association of municipal water users, the Association of Water Users (AWU) is also necessary for the investigation of the local situation. At the level of

studies, Integrated Water Resources Management (IWRM) documents have already been completed but obviously missing environmental flows which is a key component of IWRM. The IWRM report highlighted a need to improve techniques for exploration and exploitation of water resources and the acquisition of multidisciplinary multipurpose measurement sites, for field work and to have tools adapted to different issues. Hence the need for Environmental Flow Assessment (EFA) as proposed in this study. It is on this background that we seek the support of the secretariat of the Nairobi Convention to finance this project so as to help in the implementation of environmental provisions in the National Policy for Development and of the sustainable activities for reducing poverty. Further, Macquarie University (Dr. Joseph Maina) has in the past developed hydrological models for establishing the baseline for sediment and river flow. These models will be made available to this project for informing activities and for further development.

II. PARTNERSHIPS

a. The mandate and role of each partner
Mandate and role of each partner are in the below table.

b. Kind of resources the Lead Agency and partners will provide

Partner Name & Mandate	Role in the project	Resources partner will provide
Ministry in charge of Water	Official interlocutor of any actor intervening in the Water, Sanitation and hygiene sector	During all the life of the project/Data base
Ministry in charge of Agriculture	Actor intervening in the agriculture sector	During all the life of the project/Date base
Ministry in charge of Fisheries and fishery resources	Actor intervening in the fishing sector	During all the life of the project/Data base
Ministry in charge of Meteorology	Contributing to scientific and technical exchanges in the field of meteorology and hydrology at national and international levels	Actor involved in climate, hydrology monitoring/Data base
ANDEA	National Authority of Water and Sanitation	Support to the integrated management of water resources in Madagascar , provide databases on river systems, all kinds of authorization (ANDEA), technical data
AUE	Association of Water Users (Association des Usagers de l'Eau)	Necessary for investigation of the local situation
CNEAGR	National Centre for Water, Sanitation and Rural Engineering	Provides studies in the field of water: hydro agricultural development, water supply, Provide research results and provide guidance on integrated management of water resources.

CNRE	The CNRE (National Centre for Environmental Research) has a mission to conduct research in the knowledge and preservation of biodiversity, in improving the quality of life of rural and urban communities, and in training of national and foreign experts in its fields of competence	Provide research results on the rivers of Madagascar
Fishermen's Association	Partner	Investigate and provide view on project activities, fishermen are among the people directly concerned with the management of water, they know better the management of the river and the problem related to their activities.
CTD (Decentralized Territorial Communities)	Local Administrative Authorities	For administrative assistance/ Manager of Protected Areas to provide site status data for terrestrial, marine and coastal ecosystems at their respective sites
Macquarie University	Hydrological model for catchments in the Western Madagascar	Researcher in water resources and data base

III. OBJECTIVES

A. Overall objective

To promote sustainable management of the river basins in the west coast of Madagascar to maintain a healthy flow and reduce sediment load to minimize detrimental impacts on coastal ecosystems.

Given the acceleration of environmental degradation upstream, actions to protect watersheds and shorelines are essential to limit erosion and sedimentation of downstream shorelines. Reasons why the integration and put in place tools, data and methods adequate for effective of the use of watershed flows is significant. It promotes good practices in the various sectors (mining, agriculture, livestock, and forestry). Among other things, all these actions aim at short-term to have hydrological and ecological data, acquired local technical capacities, awareness of the local population on the interest of flow management, to start restoration upstream catchment with replanting natural tree and grasses, minimize deforestation in concerned area and in long-term to bring together the policy of poverty reduction and sustainable development.

B. Immediate/specific objectives

SO1: To increase awareness on EFA and sustainable practices for reduced sediment pollution and downstream impacts.

For sustainable and efficient river water flow management, this objective aims to build and strengthen the capacity of the project's actors and stakeholders about EFA. Then, will raise awareness and draw their attention to the need to find adequate and effective solutions to reduce pollution and sedimentation in downstream rivers. Stakeholders will be informed in advance of all information relating to the flow of river water, in particular the Betsiboka River, as well as the current ecological, biophysical and socio-economic problems involved.

SO2: To conduct the EFA in the pilot rivers catchment of Betsiboka to inform sustainable management of river flows.

Studies are carried out to assess the current state of the Betsiboka River and its surrounding environment, with the aim of developing appropriate measures to improve environmental flow by choosing a pilot site as a reference. Detailed assessment using holistic methods will be employed to establish the required environmental flows in consideration of the various multiple water uses and demands.

SO3: To implement the recommendations of the EFA for sustainable river management:

Following the EFA, implementation and operationalization of the recommended actions will follow in the selected pilot site in order to improve the quality of the flow by improving and downstream. At this stage, the areas for short-

term and long-term interventions/restorations will have already identified and prioritised through a spatial planning tools. Key lessons generated from the actions will be used to inform the policies and strategies for sustainable river catchment management.

IV. PROJECT IMPLEMENTATION AND MANAGEMENT PLAN (See definitions in Annex 3)

A. Expected project results and indicators

SPECIFIC OBJECTIVE 1: The capacity of the stakeholders on EFA and sustainable practices for reduced sediment pollution and downstream impacts increased.
Outcome 1.0: The capacity of the stakeholders on EFA and sustainable practices for reduced sediment pollution and downstream impacts increased
Outputs1.1: Improved knowledge on EFA by different stakeholders.

SPECIFIC OBJECTIVE 2: To conduct the EFA in the pilot catchment of Betsiboka to inform sustainable management on river flows.
Outcome2.0: The EFA for the pilot catchment of Betsiboka conducted and used for sustainable flows management.
Output 2.1: EFA document established

SPECIFIC OBJECTIVE 3: To implement the recommendations of the EFA for sustainable river management
Outcome 3.0: Improved quality of the water and ecosystem condition through the EF implementation
Output.3.1. Restored pilot site (improved water quality, reduced sediment loads, etc.)

B. Project activities and work plan
The summary of the project activities and work plan is presented in Annex A.

C. Project Beneficiaries
The direct beneficiaries will be the local populations bordering the large western rivers of Madagascar, especially those who carry out agricultural activities estimated at about 80% of the Malagasy active population. Among them are associations of water users, associations and groups of fishermen and aqua culturists.

Decision-makers both at the level of the Decentralized Territorial Collective on the design or rectification of the municipal development scheme and the Regional Development Plan at Regional and National level on the development of the energy sector (hydroelectric dam) and the transport sector (on road infrastructures), will also benefit from the realization of this project.

Planners and researchers at the level of the different ministerial departments will also have a direct interest in this project, not to mention the managers of protected areas.

Among the indirect beneficiaries are the actors in the tourism sector.

D. Implementing agency and management of project

The Secretary General at the Ministry of the Environment and Sustainable Development through WIOSAP Project Unit will coordinate as executing agency and the Environmental Assessments Directorate will direct the execution of field operations as well as the others. National research institutions (structure putting place in the future, for complementarities with relevant and related programs).

V. PROJECT METHODOLOGY

In Madagascar, the validation for all studied project such as the Environmental Flow Assessment (EFA) must be treated jointly with an agreed and specialized consultancy firm. As part of this project, the project team will collaborate with a consultant specialized in Environmental Flows Assessment within the WIO region countries. The Terms of Reference (TOR) for the consultant will be prepared, indicating categorically the roles and tasks to be delivered. Ideally, the consultant will lead the team in every step to ensure effective implementation of the Environmental Flows project. The consultant will make sure that adequate capacity and competence on EFA is built to local stakeholders to ensure sustainability.

SO1: To increase awareness on EFA and sustainable practices for reduced sediment pollution and downstream impacts.

i) Literature review and collection of secondary data

The project team will conduct a literature review to understand the level of knowledge available on environmental flows assessment as well as the local environment. Through the review, various existing data including the spatial layers will be collected. The literature review will mainly be a desk work and the output of the review is expected to be a comprehensive document describing the scientific understanding of environmental flow assessments methods as well as profiling various sustainable practices for reduced sediment pollution and downstream impacts.

ii) Raise awareness and build capacity of stakeholders on scientific EFA processes and Decision Making Tools for management of flows

The project team underscores the fact that in Madagascar, there is very limited understanding of EFA processes including the implementation. Therefore, creating awareness on EFA methods to project members and the direct project beneficiaries including other key prayers around project implementation will be very instrumental at the beginning of the project. This activity will largely be carried out by the identified EFA expert in collaboration with the project team. The awareness will among others be on ecosystems services, environmental Flow Assessments (EFAs) and Decision Support Tools (DST).

Through the capacity building process, it is expected that the water and natural resources managers, catchment committees, water user associations and other participating government officials will be able carry out water monitoring and ensure quality of data for informed decision making. It is expected that stakeholders will be able to use the acquired knowledge to do appropriate sampling and water quality measurements in identified hotspot areas or sampling EFA sites. The engagements will be necessary for instilling sustainability and create a sense of ownership of the involved processes.

(iii) Establish the baseline condition of the catchment

The baseline will be used to understand the landscape characteristics (socio-economic setting, institutional arrangement, degradation hotspot areas, bio-indicators present, river health), bio-physical condition - species or vegetation (including rare and threatened species), and farming practices including levels of degradation, drivers, pressures, states and impacts at the catchment based on the perception of the local communities. The team will use participatory rural appraisal (PRA) techniques to explore the drivers for the change, the local knowledge, attitudes and perceptions on ecosystems and restoration programs which are crucial in environmental flow management. The project will use the Contingent Valuation (CV) Method which assesses people's willingness to accept (WTA) to give up a good and their willingness to pay (WTP) (Arrow *et al*., 1993). This will enable the project to evaluate the knowledge, attitudes and perceptions of public towards environmental flows and restoration programs to restore the degraded watersheds for the sustainability of ecosystems services as used by (Alam, 2008). The remote sensing and GIS techniques will be used to characterize the present state of the Betsiboka River catchment. To ensure wide dissemination of the baseline information, findings will be packaged in different forms such as brochures, leaflets, and publications to the audiences in the target area, in the country and in the entire region.

iv) Promote multi-stakeholder engagement and participation

The project will engage with state and non-state actors such as NGOs and the private sectors who in one way or another are concerned with improving or restoration of environmental flows and reduce impacts of land-based activities on the flow regimes and the coastal or marine environment. In this case, the planners, policy makers, decision makers, practitioners and the private sector will be crucial in attainment of the project goal. Face-to-face, meetings, workshops and different forum will be used to bring together the different actors and encourage their participation.

v) Evaluate and disseminate technologies and practices for reduced sediment pollution

Integration of flow management into catchment development provides the means to make consensus-based decisions on how to manage trade-offs between development, livelihoods and ecosystems. The documentation of existing technologies and prioritization of the technologies will be done through consultation with stakeholders for improving catchment management. The dissemination of the selected technologies in the pilot areas will be done with a long term. In this regards, the project will seek to document and prioritize technologies through consultations with stakeholders for improving catchment management and widely disseminate the selected technologies in the pilot areas with a long-term goal of sustainability and buy-in by local people. A database for storing catchment data will be set up to facilitate manipulation, access and sharing of collected data both biophysical and socio-economic data.

SO2: To conduct the EFA in the pilot rivers catchment of Betsiboka to inform sustainable management of river flows.

Reviews and evaluations of available historical data will be done to produce comprehensive report outlining on various parameters such as the socio-economic condition, hydrological characteristics, rivers flow, and water use in the upstream and downstream, flood season, climate - rainfall variations, temperature, wind direction, soils - state of erosion and silting of riverbeds, soil characteristics and land use. Also, the following biological parameters will be conducted: floristry and faunal inventory and ecosystem services. The report will also detail on the activities that may impact river flows (mining, agriculture, hydropower, dam, river transport, fishing, livestock farming, industry, tourism, and drinking water supply and sanitation).

Using available historical data records and from the monitoring, the project team under the guidance of the EFA expert (consultant) will apply a holistic/ multidisciplinary framework using a Building Block Methodology (BBM) (King *et al.*, 2008). The BBM relies on the formation of multidisciplinary team of scientific experts of diverse disciplines. The process will involve) carrying out selection of critical assessment sites within the Betsiboka River catchment where flow-ecology or flow-ecosystem services relationships are critical and sites where management interventions are needed by prioritizing issues related to levels of degradation, competing uses of water, location and its connectivity to the estuary/Indian Ocean. The team of experts comprising hydrology, hydraulics, fish and invertebrates, geomorphology, socio-economic, water quality and ecology (riparian vegetation) will carry out preliminary assessments as indicated in the BBM protocol which will be followed by:

i) Environmental flow assessment at selected sites

The determination of the Environmental Flow for specific sites in the selected river catchments will involve carrying out field sampling campaigns during both the dry and wet seasons, following which data from the field studies and information from the scientific literature will be used to develop flow requirement for a specific sites in the river system.

ii) Ecological and hydrological modelling, hydraulic modelling& simulations and connectivity assessment

The Macquarie University has in the past developed hydrological models for establishing the baseline for sediment and river flow. The model is suggested to be used to assess flow regime and erosion processes controlled by land-based activities and climate in the study catchment. The estimated discharge and sediment time series from the hydrologic modelling will be used for hydraulic simulations on the reach scale. The Hydrologic Engineering Centre River Analysis System (HEC-RAS) - a one dimensional model will be used along with the Adaptive Hydraulics Modelling System (AdH) - a two-dimensional model to simulate water depth, flow velocity, substrate changes and sediment transport. Different land use scenarios for development and restoration options will be evaluated to show how the interventions in catchment Betsiboka resonate through to biodiversity, ecosystem service and livelihoods.

SO3: To implement the recommendations of the EFA for sustainable river management

It is envisioned that the implementation of environmental flows will help to achieve the wise use of catchments and natural resources and contribute to attainment of SDG 6, 14 and 15. However, realizing the full benefit requires coordination of stakeholders at the different levels including the grassroots level. In this regards, the implementation of recommended environmental flows will follow a participatory approach and gender empowerment through presentations of the findings to the public concerned and drawing their attention to engage in piloting the

recommended actions. The field learning schools will be established in a participatory manner with good participation of all ranges of stakeholders where different techniques will be demonstrated. Activities such as promotion of good agricultural practices, reforestation through planting of trees (including fruit and spice trees) and grasses with the ability to regulate flows and rehabilitate bare land, reduce rate of land clearing, as well as protection of wetlands will be tested for the effectiveness in managing or improving environmental flows.

An incentive-based system with major drivers on maintaining environmental flows, stakeholders' participation and use of modern and emerging technologies in water and catchment management will be crucial. Therefore, the project will evaluate decision support tools (DST) as well as the existing ecosystem service models for the valuation of benefits derived from the ecosystems in the context of catchment or landscape restoration and for their ability to be used in conjunction with EFA to enhance stakeholder's participation and catchment management resulting into improved quantity and quality of river flows and guide water allocation process.

The project team will formulate effective measures and set up an environmental management plan to guide the implementation. The plan will among others be used for monitoring the effectiveness of the actions carried out that among others include water quality monitoring, soil restoration monitoring, macro invertebrates and vertebrates inventories and water utility monitoring. Sampling protocols for different parameters will be put in place including laboratory analyses. To be able draw inferences on the improvement following the actions, statistical analysis will be done to compare with the baseline condition. Among others, the remote sensing techniques will be used to ascertain the level of improvement by comparing with the baseline conditions. The key lessons generated from the project will be documented and presented to the ministries responsible for water and the environment. The lessons will be useful in informing the Integrated Water Resources Management plan and in the formulation of strategies for sustainable catchment management.

VI. SUSTAINABILITY AND REPLICABILITY

The results of the project will be definitively viable thanks to the tool (decision support tool) to be set up at the national level to provide adequate data for the best management of the flow of rivers and large river basins, the results will be sustainable and complementary to the SDGs.

VII. PROJECT MONITORING AND EVALUATION

The mechanisms for monitoring project operations will be located at the level of the WIO-SAP PMU and at the level of the Directorate General for the Environment, the Ministry of the Environment and Sustainable Development (MEDD). The procedures will be based on the monitoring and evaluation of the achievement of the objectives through activity reports.

VIII. BUDGET:

The budget indicating categories, sub-categories, quantities, unit cost and total cost for supporting the implementation of the proposed project activities is presented in "Annex D". These activities will co-finance in-kind contribution (i.e. staff time, office space, vehicles and utilities) to the tune of 9% of the total project budget.

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- Document of the National Development Policy of Madagascar PND (2015-2019);
- Document Rivers and Rivers of Madagascar;
- Report of the World Bank on Economic Outlook in Madagascar: sustained growth but which should benefit the poorest more (July 2018);

- Decree n ° 2003-191 concerning the creation of the basin agencies and determining their organization attributions and functioning, of the 04/03/03 (Ministry in charge of the water Madagascar);
- Decree No. 2003-192 of March 4, 2003 amended by Decree 2004-532 of May 11, 2004 establishing the organization, attributions and operation of the National Authority for Water and Sanitation (ANDEA) (Ministry in charge of water Madagascar);
- Document on the exploitation of water resources, rational, for all, efficient, sustainable, integrated by RakotondrainibeHerivelo in 2016;
- ANDEA and Integrated Water Resources Management, by RakotondrainibeHerivelo, in July 2018;
- Climate change and integrated management of water resources by Rakotondrainibe Herivelo November

Annex A: Project Work plan

Project title: Sustainable management of E-flow for west coast rivers of Madagascar: a case of Betsiboka river catchment

Activities	Responsible	Year1												Year2											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Overall Objective: To promote sustainable management of the river basins in the west coast of Madagascar to maintain a healthy flow and reduce sediment load regimes to minimize detrimental impacts on coastal ecosystems																									
Outcome 1.0: The capacity of the stakeholders on EFA and sustainable practices for reduced sediment pollution and downstream impacts increased																									
Output 1.1 Improved knowledge on EFA by different stakeholders																									
A.1.1.1 Collection of available data from different stakeholders and NGOs and literature review	SEE/MEDD																								
A.1.1.2 Communication meeting at central level and National Technical Committees establishment.	SEE/MEDD, CTN																								
A.1.1.3 Preliminary field visit (courtesy visit to administrative authorities, local and traditional authorities)	SEE/MEDD																								
A.1.1.4 Guided tour on project site (upstream, middle and downstream of the Betsiboka River)	SEE/MEDD, CTN																								
A.1.1.5 Regional communication meeting and regional technical committees establishment	SEE/MEDD, CTN, CTR																								
A 1.1.6 Public consultation (communication and outreach)	SEE/MEDD, CTN, CTR																								
A.1.1.7 Raising awareness and capacity building of trainers Meeting	SEE/MEDD, CTN, CTR, Expert																								
A.1.1.8 Awareness raising and capacity building workshop for local stakeholders on EFA	Consultant, SEE/MEDD, CTN, CTR																								
A.1.1.9 Planning, task sharing and workshop coordination for conduct of the EFA	SEE/MEDD, CTN, CTR																								

Activities	Responsible	Year1												Year2											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Outcome 2.0: The EFA for the pilot rivers catchment of Betsiboka conducted and used for sustainable flows management																									
Output.2.1. EFA document established																									
A 2.1.1 TORs for EFA management elaboration and validation	SEE/MEDD, CTN																								
A 2.1.2 Call interest manifestation to conduct the EFA	SEE/MEDD, CTN, PRMP/MEDD																								
A 2.1.3 Conduct of the EFA (according to ToRs and methodology): inventory, surveys, data analysis, evaluation matrix...	Consultants (EFA Experts), SEE/MEDD, CTN, CTR																								
A 2.1.4 Monitoring the development of the EFA	SEE/MEDD, CTN, CTR																								
A 2.1.5 Meetings to validate the EFA document by the CTRs and CTNs	Consultant, SEE/MEDD, CTN, CTR																								
A 2.1.6 Restitution of information Workshop.	SEE/MEDD, CTN, CTR, stakeholders, consultant																								
A 2.1.7 Pilot sites visit according to the EFA results	SEE/MEDD, CTN, CTR																								

Activities	Responsible	Year1												Year2											
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Outcome 3.0: improved the quality of the water and ecosystem condition through the EF implementation																									
Output.3.1. Restored pilot site (improved water quality, reduced sediment loads, etc.)																									
A 3.1.1 Information and awareness meeting at the pilot site	SEE/MEDD, CTN, CTR, Beneficiaries																								
A 3.1.2 Setting up learning groups by sector and common interests	SEE/MEDD, CTN, CTR, learning groups																								
A 3.1.3 Implementation of farmer school fields by sector and interest group	SEE/MEDD, CTN, CTR, learning groups																								
A 3.1.4 Implementation of the actions recommended by the EFA (ecological restoration, reforestation, CES, etc.) to reduce river silting.	SEE/MEDD, CTN, CTR, learning groups, individuals consultants																								
A 3.1.5 Monitoring the effectiveness of carried out actions	SEE/MEDD, CTN, CTR																								
A 3.1.6 Review meetings with learning groups	SEE/MEDD, CTN, CTR, learning groups																								
A 3.1.7 Capitalization of the project's achievements	SEE/MEDD, CTN, CTR																								
A 3.1.8 Results report Workshop	SEE/MEDD, CTN, CTR, learning groups																								

Annex B: Logical Framework

Project title: Sustainable management of E-flow for west coast rivers of Madagascar (case of Betsiboka river)			
Project overall objective: To promote sustainable management of the river basins in the west coast of Madagascar to maintain a healthy flow and reduce sediment load regimes to minimize detrimental impacts on coastal ecosystems			
Project Results	**Outputs**	**Activities**	**Costs /output (US$)**
Outcome 1.0: the capacity of the stakeholders on EFA and sustainable practices for reduced sediment pollution and downstream impacts increased	**O.1.1** Knowledge acquired in terms of EFA Well-defined and well coordinated task and responsibility of each actor	A.1.1.1 Collection of available data from different stakeholders and NGOs and literature review	**27 642**
		A.1.1.2 Communication meeting at central level and National Technical Committees establishment.	
		A.1.1.3 Preliminary field visit (courtesy visit to administrative authorities, local and traditional authorities)	
		A.1.1.4 Guided tour on project site (upstream, middle and downstream of the Betsiboka River)	
		A.1.1.5 Regional communication meeting and regional technical committees establishment	
		A 1.1.6 Public consultation (communication and outreach)	
		A.1.1.7 raising awareness and capacity building of trainers Meeting	
		A.1.1.8 Awareness raising and capacity building workshop for local stakeholders on EFA	
		A.1.1.9 Planning, task sharing and workshop coordination for conduct of the EFA	
Outcome2.0: The EFA for the pilot rivers catchment of Betsiboka conducted and used for sustainable flows management.	O.2.1. EFA document established	A 2.1.1 TORs for EFA management elaboration and validation	**72 391**
		A 2.1.2 Call interest manifestation to conduct the EFA	
		A 2.1.3 Conduct of the EFA (according to TDR and methodology): inventory, surveys, data analysis, evaluation matrix...	
		A 2.1.4 Monitoring the development of the EFA	
		A 2.1.5 Meetings to validate the EFA document by the CTRs and CTNs	
		A 2.1.6 Restitution of information Workshop.	
		A 2.1.7 Pilot sites visit according to the EFA results	
Outcome 3.0: Improved the quality of the water and ecosystem condition through the EF implementation	O.3.1. Restored pilot site (improved water quality, reduced sediment loads, etc.)	A 3.1.1 Information and awareness meeting at the pilot site	**99 961**
		A 3.1.2 Setting up learning groups by sector and common interests	
		A 3.1.3 Implementation of farmer school fields by sector and interest group	
		A 3.1.4 Implementation of the actions recommended by the EFA (ecological restoration, reforestation, CES, etc.) to reduce river silting.	
		A 3.1.5 Monitoring the effectiveness of carried out actions	
		A 3.1.6 Review meetings with learning groups	
		A 3.1.7 Knowledge of Capitalization with CTRs, CTNs	
		A 3.1.8 Results report Workshop	

Annex C: Project Monitoring Plan

Project Title: Sustainable management of E-flow for west coast rivers of Madagascar: a case of Betsiboka river catchment			
Project overall objective: To promote sustainable management of the river basins in the west coast of Madagascar to maintain a healthy flow and reduce sediment load regimes to minimize detrimental impacts on coastal ecosystems.			
Project Results	Indicator	Target/baseline	Method
Outcome 1.0: The capacity of the stakeholders on EFA and sustainable practices for reduced sediment pollution and downstream impacts increased	IND.1.1.Number of awareness (list of stakeholder in different level)	Target: Stakeholders understand about the environmental flows assessment Baseline : Lack of information and knowledge about river flows by stakeholders	Workshops, meetings and investigation , literature review
Outcome 2.0: The EFA for the pilot rivers catchment of Betsiboka conducted and used for sustainable flows management.	IND.2.1. EFA information available and used in sustainable management river catchment	Target: - EFA estimate helping the management modified river flow regimes, Baseline: No existence of EFA information to guide sustainable river management	Inventory, data analyzes (more details required: modeling of river, rainfall, sediment), ecological sampling and modelling, water quality sampling and analysis, socio-economic surveys
Outcome 3.0: Improved the quality of the water and ecosystem condition through the EF implementation	IND.3.1. Water quality standard increased and ecological characteristic improved	Target: The water quality is of acceptable standard, and supporting ecosystem, with reduced sediment loading to the downstream and estuary environment. Baseline: The quality of water is not acceptable standard, for wellbeing humanity and the ecosystem with high sediment load	Flow measurement, monitoring of the water quality, laboratory analyzes, statistics analyzes for comparison

Annex D: BUDGET

Title of the Project : Sustainable management of E-flow for west coast rivers of Madagascar: a case of Betsiboka river catchment											
Expected results	**Number Activity**	**Activity**	**Allowances for project staff /contractual services**		**Travel/ Mission**		**Logistic/ equipment**		**Training/ communication**		**Total cost (US$)**
			Year1	**Year2**	**Year1**	**Year2**	**Year1**	**Year2**	**Year1**	**Year2**	
Outcome 1.0: The capacity of the stakeholders on EFA and sustainable practices for reduced sediment pollution and downstream impacts increased											
	A.1.1.1	Collection of available data from various concerned entities and NGOs and literature review	1 000		0		1 840		80		2 920
	A.1.1.2	Communication meeting at central level and National Technical Committees establishment.	500		0		694		80		1 274
	A.1.1.3	Preliminary field visit (courtesy visit to administrative authorities, local and traditional authorities)	6 900		2 889		694		100		10 583
	A.1.1.4	Guided tour on project site (upstream, middle and downstream of the Betsiboka River)									
	A.1.1.5	Regional communication meeting and regional technical committees establishment									
	A.1.1.6	Public consultation (communication and outreach)									
	A.1.1.7	Raising awareness and capacity building of trainers Meeting	1 650		0		278		0		1 928
	A.1.1.8	Awareness raising and capacity building workshop for local stakeholders on EFA	3 300		1 111		556		70		5 037
	A.1.1.9	Planning, task sharing and workshop coordination for conduct of the EFA	250		0		0		0		250
		Co-financing	2 000		1 750		1 900				5 650
		Subtotal for Outcome 1.0									**27 642**

Expected results	Number Activity	Activity	Allowances for project staff /contractual services		Travel/ Mission		Logistic/ equipment		Training/ communication		Total cost (US$)
			Year1	Year2	Year1	Year2	Year1	Year2	Year1	Year2	
Outcome2.0: The EFA for the pilot rivers catchment of Betsiboka conducted and used for sustainable flows management											
	A 2.1.1	TORs for EFA management elaboration and validation	900		0		0		10		910
	A 2.1.2	Call interest manifestation to conduct the EFA	1 250		0		0		150		1 400
	A 2.1.3	Conduct of the EFA (according to TDR and methodology): inventory, surveys, data analysis, evaluation matrix...	30 000		0		0		0		30 000
	A 2.1.4	Monitoring the development of the EFA	17 400		6 000		0		70		23 470
	A 2.1.5	Meetings to validate the EFA document by the CTRs and CTNs	3 850		1 111		1 389		50		6 400
	A 2.1.6	Restitution of information Workshop.									
	A 2.1.7	Pilot sites visit according to the EFA results		3 450		1 111		0		0	4 561
		Co-financing	2 000		1 750		1 900				5 650
		Subtotal for Outcome 2.0									**72 391**

Expected results	Number Activity	Activity	Allowances for project staff /contractual services		Travel/ Mission		Logistic/ equipment		Training/ communication		Total cost (US$)
			Year1	Year2	Year1	Year2	Year1	Year2	Year1	Year2	
Outcome 3.0: improved the quality of the water and ecosystem condition through the EF implementation											
	A 3.1.1	Information and awareness meeting at the pilot site									
	A 3.1.2	Setting up learning groups by sector and common interests		6 900		2 222		1 000		250	10 372
	A 3.1.3	Implementation of farmer school fields by sector and interest group									
	A 3.1.4	Implementation of the actions recommended by the EFA (ecological restoration, reforestation, CES, etc.) to reduce river silting.		24 000				15 000			39 000
	A 3.1.5	Monitoring the effectiveness of carried out actions		12 600		4 000		0		0	16 600
	A 3.1.6	Review meetings with learning groups		9 600		3 333		300		90	13 323
	A 3.1.7	Knowledge Capitalization with CTRs, CTNs		4 550		1 333		700		60	6 643
	A 3.1.8	Results report Workshop		4 550		1 333		1 389		100	7 372
		Co-financing	2 000		1 750		1 900	1 000			6 650
		Subtotal Outcome 3.0									**99 961**
										TOTAL COST (US$)	**199 994**

Annex D1: Budget (Total budget for the Output applied for MUST NEVER exceed the ceiling given in the background document)

	Category	Quantity	Unit Cost (US$)	Total Cost (US$)	WIOSAP Support	Co-financing
1.	Allowances for project H/J			84 650	78 650	6 000
2.	Logistic / Equipment			30 540	23 840	6 700
3.	Operating costs			1 110	1 110	
4.	Contract Services			54 000	54 000	
5.	Travel			29 694	24 444	5 250
			TOTAL COST (US$)	**199 994**	**182 044**	**17 950**

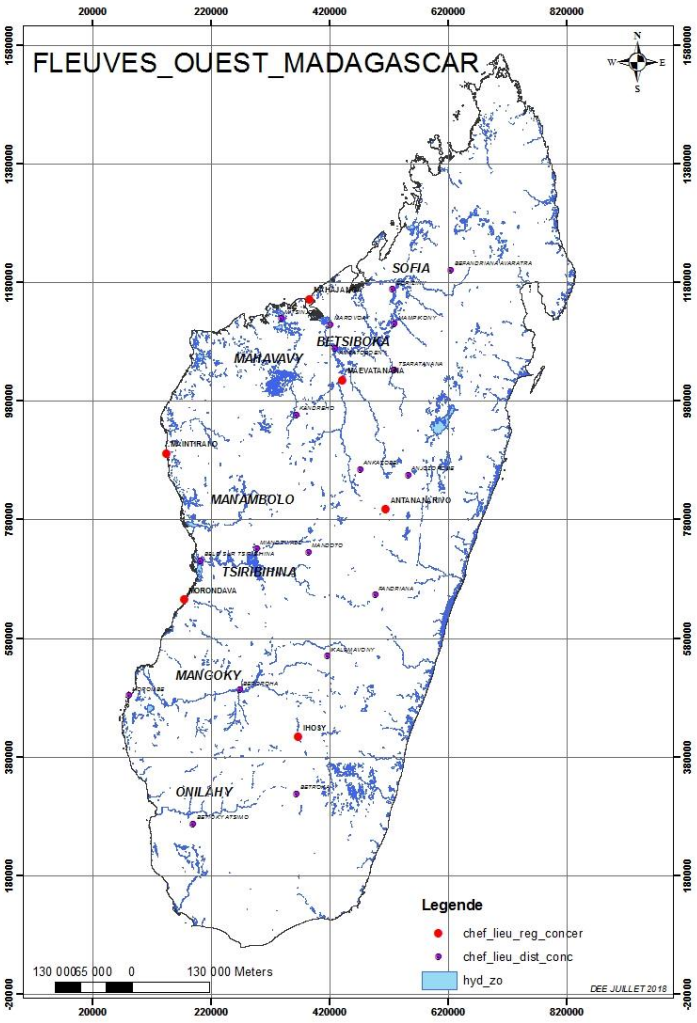
Annex D2: Budget justification

	Category	Justification
1.	**Allowance for project**	Personnel will include coordination functioning and working members' participation during the implementation of the project activities.
2.	**Equipment**	Water quantity and quality measurement equipment and biological sampling tools need to be procured to support continued monitoring. Computers are required to store data. Also some equipment will have to be hired.
3.	**Operating costs**	Communication will enable constant engagement with project members and partners as well as project management unit. Stationeries will be needed.
4.	**Contract Services**	Experts with requisite knowledge in EFA will be engaged during implementation of the project. These include the socioeconomic, geomorphologist, hydraulic engineer, hydrologist, ecologists, water quality expert, and sediment expert. Regular engagement meetings will be conducted requiring hiring of venues through contracted conference packages.
5.	**Travel**	Transport will be needed for fieldwork and attending meetings. Therefore, transport costs and daily subsistence allowance will have to be paid.

Annexe E: The characteristics of the rivers of western Madagascar

01-SOFIA Length :L 328 Km Area of BV "Bemarivo" 15 270 km2	03- Mahavavy Length: L 410 km Area of the BV 18 500 km2	05- TRISIBIHINA Length: L 7025 km Area of the BV: 49 800km	07- Onilahy Length: 400 km Area: 32 000km2
02- Betsiboka Length: L 531 Km Area of BV "Betsiboka" 49 000 km2 Length of "Mahajamba" L 153 km Area 9,750 km2	04- Manambolo Length: L 370 km Area: 13,970km2	06- Mangoky Length: L 714 km Area of the BV: 55,750 km	

Annex F: Presentation map of the western rivers of Madagascar



Picture of the rivers of Madagascar

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