REPOBLIKAN'I MADAGASIKARA
Fitiavana - Tanindrazana - Fandrosoana

MINISTERE DE L'AMENAGEMENT
DU TERRITOIRE, DE L'HABITAT ET DES TRAVAUX PUBLICS

MAHTP
Ministère de l'Aménagement du Territoire
de l'Habitat et des Travaux Publics

PROJET DE DEVELOPPEMENT URBAIN INTEGRE ET DE RESILIENCE (PRODUIR)

ETUDE D'IMPACT ENVIRONNEMENTAL ET SOCIAL (EIES) – VERSION MISE A JOUR

TRAVAUX DE REMISE EN ETAT DES INFRASTRUCTURES DE DRAINAGE ET DE PROTECTION CONTRE LES INONDATIONS

Rapport Final

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SUMMARY

A. DESCRIPTION OF THE PROJECT

A.1. Contex and objectives of the Project

The Ministry of Spatial Planning, Housing and Public Works (MAHTP), with the help of the World Bank, wanted to implement an integrated and resilient urban development project (named PRODUIR). This project aims to improve the socio-economic and sanitary conditions of the present and future population of the Antananarivo plain, reinforce and secure the sanitation and waste network, as well as improve flood prevention infrastructure.

The project is sub-divided into four components, which together constitute a complementary programme of structural and institutional interventions. This environmental and social impact assessment only covers component 1.1. of this large comprehensive project. Specifically, this report evaluates two tasks: (i) the rehabilitation of the C3 canal to improve the drainage of rain water in three districts of Antananarivo and (ii) the reinforcement of levees on two rivers, the Ikopa and the Sisaony, in order to prevent river floods in the plains of the Malagasy capital.

On an administrative level, these works concern the first, fourth and sixth districts of the CUA and three peripheral communes: Bemasoandro, Andranonahoatra and Ampitatafka.

A.2. Description of the main activities

Rehabilitation of the C3 canal

Preliminary hydraulic studies highlighted that the C3 canal were to be prioritised in order to protect the Antananarivo plain from surface floods. As such, the studies recommended the rehabilitation as follows:

- The cleaning out of the entirety of the canal (12km) in order to bring it back to optimised standards. This includes the Anosibe and Andavamamba buffer basins as well as the Andriantany Junction canal over the course of 900m;
- Subsequently, on the C3 urban canal (4.8 km) and the Junction Canal, low masonry walls will be built in order to allow pedestrian and motorised through traffic in various areas. New footbridges will also be constructed to replace existing ones which will enhance urban mobility ;
- Finally, next to C3 Canal in the downstream plain (7.2 km), a continuous pathway will be built on both banks for pedestrian traffic. A doubling of the siphon under the GR canal will also be implemented in order to improve the hydraulic continuity in the area.

When it is technically possible, infrastructure are considering the vulnerable groups. Thus, some footbridges will be rehabilitated taking account of the accessibility constraints of people with disabilities and reduced mobility.

The entirety of waste sludge from the works will be dried on the banks before being evacuated to a storage area dedicated to the project (an environmental and social impact study specific to the PRODUIR sewage sludge containment site was carried out). The clearing of the sludge will be done at night in order to avoid disturbance to neighbouring population and on the diurnal traffic of an already congested Antananarivo.

An analysis of sludges from the C3 channel in 2017 made it possible to characterize the quality of the sludge to be cured, as summarized in the table below:

Paramètre analysé	Unité	1	2	3	4	5	6	7	8	Valeur Seuil protocole H14
Aluminium (Al)	mg/kg MS	37 000	24 000	27 000	24 000	50 000	23 000	18 000	18 000	
Chrome (Cr)	mg/kg MS	49	35	51	35	47	38	34	31	150
Manganèse (Mn)	mg/kg MS	130	140	130	140	160	190	200	270	
Fer (Fe)	mg/kg MS	21 000	18 000	23 000	17 000	28 000	19 000	19 000	19 000	
Cobalt (Co)	mg/kg MS	5	5	5	5	6	6	6	6	
Nickel (Ni)	mg/kg MS	15	15	17	14	14	17	15	15	50
Cuivre (Cu)	mg/kg MS	28	32	39	42	28	45	39	54	100
Zinc (Zn)	mg/kg MS	110	180	180	190	170	260	290	350	300
Arsenic (As)	mg/kg MS	<2,0	<2,0	<2,0	<2,0	<2,0	<2,0	<2,0	<2,0	30
Sélénium (Se)	mg/kg MS	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	
Molybdène (Mo)	mg/kg MS	<10	<10	<10	<10	<10	<10	<10	<10	
Argent (Ag)	mg/kg MS	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	0,6	0,7	
Cadmium (Cd)	mg/kg MS	<0,5	0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	2
Étain (Sn)	mg/kg MS	4	3	2	3	3	4	3	6	
Antimoine (Sb)	mg/kg MS	<10	<10	<10	<10	<10	<10	<10	<10	
Baryum (Ba)	mg/kg MS	190	180	170	190	210	230	260	230	
Mercure (Hg)	mg/kg MS	0,1	0,2	0,1	0,2	0,2	0,2	0,2	0,2	1
Plomb (Pb)	mg/kg MS	49	140	49	69	96	350	190	98	100
Paramètre analysé	Unité	9	10	11	12	13	14	15	16	Valeur Seuil protocole H14
Aluminium (Al)	mg/kg MS	21 000	11 000	13 000	12 000	18 000	7 200	15 000	30 000	
Chrome (Cr)	mg/kg MS	48	26	34	42	8	25	27	35	150
Manganèse (Mn)	mg/kg MS	260	140	140	160	120	73	98	270	
Fer (Fe)	mg/kg MS	27 000	24 000	19 000	20 000	28 000	17 000	13 000	21 000	
Cobalt (Co)	mg/kg MS	9	5	5	5	4	3	4	6	
Nickel (Ni)	mg/kg MS	29	12	14	12	5	8	11	13	50
Cuivre (Cu)	mg/kg MS	120	21	30	27	7	11	26	24	100
Zinc (Zn)	mg/kg MS	720	170	310	350	45	69	130	140	300
Arsenic (As)	mg/kg MS	2	<2,0	<2,0	<2,0	<2,0	<2,0	<2,0	<2,0	30
Sélénium (Se)	mg/kg MS	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	
Molybdène (Mo)	mg/kg MS	<10	<10	<10	<10	<10	<10	<10	<10	
Argent (Ag)	mg/kg MS	1,3	<0,5	0,7	0,5	<0,5	<0,5	<0,5	<0,5	
Cadmium (Cd)	mg/kg MS	1,2	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	2
Étain (Sn)	mg/kg MS	10	2	3	3	<2,0	<2,0	2	3	
Antimoine (Sb)	mg/kg MS	<10	<10	<10	<10	<10	<10	<10	<10	
Baryum (Ba)	mg/kg MS	370	150	180	170	120	64	150	440	
Mercure (Hg)	mg/kg MS	0,5	0,1	0,3	0,2	<0,1	<0,1	0,1	0,2	1
Plomb (Pb)	mg/kg MS	160	81	61	78	21	21	42	54	100

Source: BRL, 2018. PRODUIR. EIES des travaux de remise en état des infrastructures de drainage et de protection contre les inondations. AGETIPA.

The physico-chemical characteristics of the sediments has shown that their reuse or incineration are not technically and / or economically relevant. The PRODUIR project has therefore studied various solutions for the containment of these sludge, either in landfill (in this case the Andralanitra landfill) or on an alternative site. The study of the sludge disposal variant to the Andralanitra landfill was considered difficult to implement because it would reduce by 2 years the life of the landfill that is currently used for the whole of the agglomeration of Antananarivo; moreover, it does not allow a specific management of the effluents resulting from the sewage sludge stored, taking into account the existing configuration of the Andralanitra site.

Thus, the PRODUIR project has turned to the option of evacuation of sludge from an alternative site dedicated to their containment, the implementation of which is more controllable in technical, environmental and social terms. And after a pre-identification and site selection process, the Iarinarivo site was selected for the construction of the C3 sludge containment site, which will represent a total volume of 115,000 m3.

Reinforcement of the Ikopa and Sisaony levees

The main developments will concern the left bank of the Ikopa River, and on an ad hoc basis, the left embankments of the Sisaony River. On the right bank levees of Ikopa, the geotechnical investigations will allow, during technical specifications, to specify where reinforcements are necessary on areas that may have already been bolstered in the 1990s. The main activities will be the following:

- For the Ikopa river levees:
  - Left bank: reconstruction on 1 270m of eroded banks
  - Right bank: reconstruction of the embankment protections in areas where it is missing, over a total length of 3 200m
- For the left bank of the Sisaony river: reconstruction of eroded banks – approximately 125m

Extraction of material from borrowing sites

The rehabilitation of levees and the backfilling of the C3 banks will necessitate mobile and/or rocky materials. The procurement of these materials will require the exploitation of borrow pits. A certain number of quarries have been identified in Ambohidratrimo, Fenoarivo and Ambatomirahavavy.

Resettlement of impacted local populations

The contruction phase will require the destruction of buildings and the involuntary displacement of local populations. These populations will be resettled on one of the three sites that have been identified by the MAHTP at : Soavimasoandro, Anosiala Ambohidratrimo and Andavamamba.

B. INSTITUTIONAL AND JUDICIAL FRAMEWORK FOR IMPLEMENTATION OF THE PROJECT

B.1. Institutional Framework

Due to its crosscutting nature and its environmental conservation and sustainable urban development goals, the rehabilitation drainage project of the Antananarivo plains mobilises a wide range of different actors. Specific categories of stakeholders can be identified: the Project's Owner (MAHTP) and delegated project manager (AGETIPA), the technical and financial partner (World Bank), territorial communities and public operators (CUA and peripheral municipalities, APIPA, SAMVA, etc.), private operators and societal actors directly concerned by the project.

B.2. Legislative and regulatory reaquirements

Through its goals and approaches, the PRODUIR project is in line with the general national political framework regarding environmental and social management (Environmental Charter, MECIE Decree). Through its development, this project also includes the World Bank requirements and the legislative and regulatory context of the Republic of Madagascar which oversee the proposed activities. The latter forms a relatively comprehensive normative corpus which covers all sectors concerned by the project: territorial development law, urbanism and housing law, water sanitation law, labour code which ensures the wellbeing and safety of workers, and land law which includes land access laws and the safeguarding of family farms.

Finally, the environmental impact studies are in line with the national acts which oversee the specific environmental assessments (e.g. MECIE decree) but also with the provisions issued by the World Bank safeguarding policy. The Environmental and Social Impact Assessment (ESIA) of the project therefore incorporates both sources of provisions. It proposes a structured

evaluation around specific chapters and a Environmental and Social Management Plan (ESMP). A complementary Resettlement Action Plan (RAP) was also developed in parallel, as required by the World Bank.

C. ENVIRONMENTAL BASELINE

C.1. Physical Environment

This project will take place in the Antananarivo region, which is marked by a plain/hills dichotomy, born from its ancient geological and pedological history. This area is located in the East Tropical Zone, and is particularly vulnerable to climatic hazards.

Water resources and wetlands interspersed in the area hold a primordial role in the plain, notably by providing flood protection. Flood risk is particularly high in the grassland district, notably near the canals and rivers, and threaten the health and safety of populations in the area. It is a particularly important subject in the area, and the maintenance or restauration of underground and surface flows is a major issue in the area.

C.2. Biological Environment

Ecologically speaking, the proposed activities are mostly being undertaken in degraded habitats; these areas have suffered anthropogenic pressures which have altered the terrestrial and aquatic habitats.

- In the intervention zones around the C3 canal and embankments, the vegetation is mostly degraded due to the urban environment. Only the wetlands in the downstream plains adjacent to the C3 Canal, and lowland marshes hold noticeable biological activities, as they provide habitat for a number of birds, insects, reptiles or amphibians. Therefore, in this area, the environmental stakes are considered as minor.
- The borrow pits identified for providing backfilling materials are located in pre-existing quarries. As such, they are already in altered habitats; vegetative diversity is low, and limited to unremarkable herbaceous species necessitating no particular actions.

C.3. Social Environment

The social issues around the proposed borrow pits are limited as they are within pre-existing quarry sites. No settlements were observed in the proposed areas.

However, the social stakes around the C3 canal and its levees are much higher. In these areas, the districts are particularly dense, housing many vulnerable households and businesses. The social dynamic is therefore important and urbanisation challenges, such as control urban sprawl, are among the main priorities of the City.

The maintenance and development of infrastructure and communal amenities is also an essential social concern in these districts. The current dearth of water and sanitary networks as well as housing limits their economic development. They are also insufficient considering the natural population growth and influx of workers hoping to benefit from job opportunity in the region. The preservation, rehabilitation and completion of basic vital services, notably in the disfavoured districts of the city, can therefore be considered as a major challenge for the City as a whole.

Economic activities are also numerous and diversified in the areas near and directly adjacent to the study area. These activities are notably linked to the small scale commerce in the urban centre and downstream agriculture. The preservation of such activities should remain a priority.

Regarding cultural and religious heritage, these were found to be rather limited in the project areas. The areas of architectural or patrimonial interest are usually found in the hills, in the old

town sector which has preserved areas and a pending UNESCO heritage site candidacy. However, two churches and a rooster fight arena were identified on the banks of the C3 Canal.

D. MAJOR ENVIRONMENTAL IMPACTS

D.1. During the Construction phase

From the start of the construction, there will be positive effects resulting from the project in the different habitats. These effects will result from the following features of the construction phase:

- The decongestion of the drainage network due to the removal of waste and sediments which currently block the C3 canal ;
- The removal of invasive plant species around the buffer basins and other stagnant areas along the C3 canal, allowing the potential redevelopment of an enhanced biodiversity;
- The creation of local jobs which will benefit the redistribution of wealth in the neighbouring populations and local businesses, as well as offer professional development training.

Regarding the negative impacts, the most important are as follows:

- On the physical environment:
  - Greenhouse gas emissions, though these will be moderate and can be reduced to a minimum if regular machinery maintenance schedule is ensured and the planned work schedule respected;
  - The change of rainwater drainage flow in the downstream areas. If the pumping capacities of Ambodimita are not increased (a project currently in development), the downstream plain risks accumulating the volumes transited after the clearing of the C3 Canal.
  - Potential erosion at the borrow pits. The planned pits are sometimes in proximity of wetlands, and the land modification during the extractions will expose the soils, increasing erosion risk and sediment flow towards already degraded aquatic and semi-aquatic habitats in the vicinity.
- On the biological environment:
  - Potential ad hoc clearing of vegetation in the vicinity of the 67ha that require regulatory procedures and restoration actions (e.g. planting) as compensation.
  - The alteration of specific habitats in the wetlands downstream of the C3 due to the creation of a lateral path and pedestrian banks. This change concerns a zone that has already been altered and a small area of the Antananarivo wetlands.
  - The disturbance of species currently inhabiting aquatic and wetland environments (e.g. birds in rice paddies). Nevertheless, this disturbance will be temporary and with limited ecological stakes.
  - The remobilisation of sediments during the clearing which will create turbidity locally, though no major impact is foreseen.
  - Pollution of the habitat by the clearing sludge in the vicinity of the areas being cleared and in the storage area.
  - The possible pollution by waste and effluents from the work as well as potential accidental point pollutions by oils and hydrocarbons.
- In the social environment:
  - Involuntary displacement of local populations within the construction area. In order to limit the impacts on these populations, optimised technical solutions allowing to reach functional (hydraulic) objectives while minimising the potential impacts on local populations have been selected;
  - Social conflict and community level perturbations linked to the effects on the populations in the vicinity of the construction and restauration areas;
  - Potential institutional bottlenecks which could perturb the implementation and scheduling of activities;

- Increased risk of spreading diseases, notably during the manual sludge cleaning works;
- Accident risk for the various activities (e.g. C3 canal works, levees, storage area, borrow pits…)
- Loss of access to certain services and equipment which will be impacted during the construction phase (e.g. moving of electrical poles, right-of-way to washing sites, etc.)
- Perturbation of economic activity and other sources of revenue for business people and artisans operating on the banks of the C3, Ikopa and Sisaony Rivers;
- Perturbation of motorised traffic between the right-of-way areas and construction sites or during the evacuation of the clearing sludge. It must be noted that such perturbations will be minor in light of the existing traffic situation;
- Perturbation of cultural and religious sites: a rooster fighting area currently near the Anosibe 2 basin will have to be relocated; similarly, the annexes of the Evangelist Church will be altered in order to unblock a hydraulic lock.

D.2. During Operation Phase

The operational phase of the project will result in a number of positive impacts:

- Better management of flood risk thanks to the rehabilitation of the C3 canal which will allow a lowering of the water line; additionally, the restructuring of the levees will bolster the preventative measures in place against river floods;
- Facilitation of regular maintenance operation and control of costs. This projects represents an opportunity to partially reconquer public space which will ease the access to the C3 Canal for maintenance;
- Improvement of the receiving environment through the removal of polluted sediments and waste that currently litter the C3 Canal;
- Improvement of the sanitation situation. This project will allow to improve the transit of waste water which are currently simply dumped in the C3; it will also help eliminate unsanitary areas, increasing the overall health of certain areas;
- Improvement of motorised and pedestrian access thanks to the development of the banks and the restoration of walkways and bridges after the construction period. This will allow a partial re-appropriation of public space and improvement of urban mobility;
- Improvement of the overall urban landscape in the intervention areas such as the levees and C3 Canal through the clearance of unsafe areas and development of the banks.

There are less negative impacts than during the construction phase as no consequential work will take place after this. The main impacts during the operational phase are as follow:

- Greenhouse gas emissions, as well as emissions of leachate and smells at the storage area;
- A risk of dysfunction of the installation if adequate maintenance lacks or if illegal settlements occur in communal right-of-way locations;
- The illegal resettlement of populations who would be attracted to the improved environmental conditions in restored areas near the C3 Canal and Ikopa and Sisaony river banks.
- The disappointment of the population were the project goals not reached.

E. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The Environmental and Social Management Plan (ESMP) presents all of the measures for mitigation, planning, surveillance, monitoring, as well as the institutional changes that are required during both construction and operational phases in order to eliminate, compensate or offset negative environmental and social impacts.

E.1. Construction Phase

Monitoring programme

The monitoring allows the Client and World Bank to ensure that the contractors respect their engagements and responsibilities vis-à-vis the environment. In other words, it allows to list the project expectations and evaluate the application of risk avoidance measures during the project.

The first step will be to fulfill to the three main regulatory and administrative requirements: obtain environmental permits prior to the start of the work, get the specific authorisations necessary for project related tasks (e.g. vegetation clearance authorisation), and receive environmental clearance on completion of the works.

Subsequently, the ESMP summarises the fifty measures that will be required at the various activity areas in order to minimise previously identified impacts, such as:

- Cross-cutting measures
  - Reinforced implication of stakeholders through work meetings, integration of all stakeholders and transparency;
  - Development and implementation of a Health and Safety Plan (HSP) in accordance with the EHS directives of the World Bank, notably including rules to be implemented on the construction site, sensitisation campaigns (e.g. sludge risks, HIV risks), appropriate relationships underage persons and other vulnerable groups;
  - Development and implementation of a waste management plan (WMP) including the management of hydrocarbons and oils;
  - Development of requirements in the tender document and the implementation of a recruitment plan for local businesses;
  - Implementation of a Traffic and Machinery Circulation Plan;
  - Regular maintenance of all machinery and vehicles used during construction phase;
  - Optimisation of truck loading and shutdown of engines when vehicles are stationary;
  - Development and implementation of an Environmental Restoration Plan for construction sites after completion of works;
  - Avoidance and Management Plan for cultural and patrimonial sites;
  - Close monitoring of work progress in order to optimise the schedule and limit the use of all vehicles and machinery;
  - Intervention of an ecologist prior to the start of construction in order to defend, wherever appropriates, sites deemed particularly sensitive or near the construction areas.

- Specific measures linked to the activities concerning the C3 canal and levees
  - Implementation of works from March to November in order to avoid the height of cyclone season
  - Implementation of a clearing management plan (i.e. management optimisation)
  - Compensation for destruction of trees
  - Limitation of invasive species spread
  - Positioning of sludge drying areas at a safe distance from sensitive sites, followed by canalisation of the flows
  - Implementation of anti-dispersal barriers around the most polluted clearance zones

- Collection of floating waste in the vicinity of obstacles (e.g. bridges) prior to the start of the cleaning operation
- Implementation of a Resettlement Action Plan
- Optimisation of surface areas to be occupied by the construction zones through close consultation
- Reconstruction during the preparatory phase of any public services or equipment impacted during construction
- Implementation of alternating construction sites in order to reduce the nuisance area
- Ensuring nocturnal sludge transportation to storage sites in order to reduce traffic impacts
- Regular watering of the construction zone during the dry season in order to limit dust pollution
- Regular cleaning of living areas and access roads in order to avoid degradation of neighbourhoods and health risks
- Construction of bridges which allows the crossing of the C3 canal in downstream areas or at junctions
- Constructions of berthing areas for small boats/canoes on the Sisaony and Ikopa Rivers
- Construction of washing areas in the retention basins on the Sisaony and Ikopa Rivers
- Build water access on redeveloped banks
- Ensure the continued security at religious sites
- Suspension of work at sites in proximity of the two aforementioned churches and rooster fighting arena on days of religious importance or fights

- Specific measures for borrowing sites

  - Implementation of an Exploitations Plan and protection of extraction sites in line with World Bank environmental, sanitary and security directives for the extraction of materials for construction. This plan must also include an authorisation for exploitation (delivered by the Owner of the site and in line with the Mining legislation) and an exploitation optimisation plan in order to reduce the environmental footprint of the project.

- Measures pertaininf specifically to the sludge storage site

  - Covering dredging sludge with natural materials from the excavation of the bin to avoid dust emissions to the storage area
  - Stabilise the deposits through adequate earthworks
  - Create means to confine leachates.

Stakeholder engagement plan (SEP)

In addition to the measures proposed above, an information, exchange and communication procedure for stakeholders was initiated from the start of the project through socio-economic surveys and public consultations. This is to be continued throughout the implementation of the project in order to promote dialogue between the Client, contractors, local populations and people impacted by the project, and ensure adequate management of stakeholders' grievances.

The grievance redress mechanism will cover all types of complaints during the construction phase. It will include the following steps:

1. The reception of the complaint: a grievance registry will be available to the population in every Fokontany;
2. The treatment of a complaint: the procedure with the PRODUIR project is comprised of three successives levels of litigation, as provided by the operational policies of the World Bank: amiably (via the focal point), mediation (litigation committee) or judiciary (through courts).

Management of gender-based violence complaints

In addition to the grievance redress mechanism detailed above, a specific protocol will be defined to manage gender-based violence complaints.

Partnerships will be developed with specialized organizations. And all the complaints and denunciation of gender-based violence will be directly transferred and treated by these entities.

Monitoring programme

The monitoring programme consists of following the evolution of some components of the natural and human environments that are likely to be affected by the project, and which presented a degree of uncertainty during the conduct of the ESIA, which did not allow for the development of mitigation measures with certain effectiveness. Ten main measures have been identified and will allow to validate the impact of the project and the implementation of the mitigation measures:

- Accident and incident monitoring
- Water quality monitoring in designated areas around the C3 canal
- Waste and effluent treatment monitoring
- Vegetation clearance monitoring
- Infrastructure and construction site monitoring
- Local employment monitoring
- Monitoring of the quality of groundwater on the piezometers at the sludge deposition site
- Follow-up of the process of releasing rights of way and the resttlement of the PAPs
- Grievance monitoring
- Road condition monitoring

Roles and responsibilities

The monitoring of the proper functioning of the construction phase, equipment and infrastructure will be implemented in multiple steps, depending on whether they follow an environmental or social thematic:

- On the environmental level
    1. The technical entity in charge of project implementation will be responsible of collecting and monitoring (weekly and monthly) the work progress indicators, compliance with contractual requirements and through its Environmental Officer, also of the indicators associated to each of the ESMP mitigation measures (see chapter 5.1.1.2). This will

allow the consolidation of the environmental and social results within the Environmental and Social Monitoring Report, as described in the reporting summary (detailed below).

The testing office will also, at appropriate deadlines, identify environmental indicators described in the aforementioned monitoring programme, and will centralise them in a environmental monitoring report.

2. The results will then be discussed with the environmental officers of the AGETIPA and the central manging unit who will ensure the adherence to the legal dispositions relative to the protection of the environment and those defined by the ESMP by the company. As such they are responsible for verifying that:
    - The production of contractual documents is completed in a timely manner,
    - The implementation of mitigation measures is effective,
    - The results of the environmental monitoring programme are acceptable,
    - The mitigation measures are effective; if not, they will arrange for the application of the penalties as provided in the contract.

    The UGP project coordinator will therefore be able to advise the environmental administration on part or all of the indicators on request or through the Environmental and Social Monitoring reports delivered to the client (MAHTP).

- On the social level

1. The entity in charge of institutional and social aspects will be responsible for the communication and dialogue activities prescribed for stakeholders through the SEP. These activities will be consolidated in a social monitoring report for aspects concerning the works. This entity will also be responsible for the follow-up; these activities will be transcribed in the monitoring report of theRAP.
2. The results will then be discussed with the Social and Resettlement Officer of the AGETIPA and the UGP who will ensure the compliance by MOIS of the activities prescribed by the PEPP and the successful resettlement. AS such they are responsible of verifying that:
    - The production of contractual documents is completed in a timely manner,
    - The implementation of compensations is effective;
    - The results of the resettlement plan are acceptable; if not, they will arrange for the application of the penalties as provided in the contract.
3. The entirety of the results will then be presented and discussed with the central managing unit Coordinator who will propose corrective actions if applicable. Key data and sensitive issues can at this point be presented to the steering committee either in an informative manner or litigation if these are causing a delay in the work schedule.

Audits will be as well be conducted to monitor the environmental and social performances:

- L'UGP with the technical entity and the entity in charge of institutional and social aspects might conduct an audit during the construction phase. This process will ensure that processes, policies or activities are adequate, effective and in compliance with environnemental and social contractual requirements.
- ONE will carry out an "external audit" by directly exchanging with the UGP and the entities responsible for the environmental follow-up described below.

Capacity building

Stakeholders do not necessarily have the knowledge nor skills necessary to participate in a project like this. For instance, ONE does not necessarily have in-house all the skills relating to a sanitation project. Similarly, the MAHTP does not have an internal officer with sufficient experience or availability to ensure the implementation of the ESMP, particularly as previous experience with canal cleaning and bank reinforcement will be an asset.

Regarding the other key stakeholders which will be involved in the implementation of the ESMP (focal points, district officers, steering committee members), they do not necessarily have the skills pertaining to social and economic monitoring and follow-up and/or regarding the issues and risks of canal cleaning and bank reinforcement projects.

Certain actions are therefore proposed to enhance capacity building: (i) sensitisation of ONE towards the project, (ii) hiring of dedicated technical team and social and institutional team by AGETIPA in order to ensure the proper applications of the environmental and social clauses described in the contractual requirements ; (iii) hiring of an Environmental Expert, a Resettlement Expert and Project Coordinator by MAHTP for the UGP; (iv) sensitisation of other stakeholders (focal points, etc) on the environmental risks, etc.

E.2. Operational Phase

Monitoring programme

The ESMP proposes accompanying measures for the exploitation phases. These guideline will not be implemented under the PRODUIR Project. Rather, they are presented in an informational manner for the exploitation phase; they offer the identification of resources for the establishment and implementation of multiannual thematic maintenance plans, which are necessary to ensure the sustainability of the infrastructure. This monitoring program developed during the ESIA will be made available to the entity that will be responsible for its implementation after the PRODUIR project. The measure identified include:

- The reinforcement of the institutional stakeholders means in order to ensure a regular follow-up to avoid deterioration of the canals by the neighbouring populations through an optimised collection of waste and a relevant sediment management. This also implies the potential investigation of a burial centre, and the allocation of adequate financial, technical and human means;
- Establish and implement a multiannual maintenance plan, with the associated allocation of adequate financial, technical and human means;
- Pursue the stakeholder engagement plan
- Maintain the newly constructed infrastructure
- Ensure appropriate land tenure.

Follow-up plan

During the operational phase, a follow-up plan can be implemented by the malagasy institutions which are related to the project.

Summary of the follow-up plan

Responsable	Follow-up action	Location	Indicators	Scheduling
APIPA	Follow-up of structures and reconstructed profiles	C3 Canal and levees	Longitudinal and transverse profiles	Annually or after notable event
	Water quality and sediment follow-up	C3 Canal	Quality of various parameters	Seasonally

	Local employment follow-up	All maintenance operations	Number of jobs created for implementation of follow-up and maintenance (#) Percentage of local population employed (%)	After each intervention with an annual consolidation
SAMVA	Follow-up of sludge disposal area in the long run	Sludge disposal area	Same as during construction	Monthly
MAHTP	Follow-up of planted trees	Offset area	Viable plants (# and %)	Twice a year over 2 or 3 years

Capacity building

The enhancement of institutional capacity on the territory is scheduled under the second section of the PRODUIR project and as such, are not detailed in the present study.

F. STAKEHOLDERS CONSULTATIONS

Many consultations with stakeholders of the project were organised. Firstly, consultations and detailed socio-economic surveys with the people affected by the project were conducted near the C3 Canal and Ikopa and Sisaony rivers. These allowed to present the project and gather data on people who will potentially be impacted. Subsequently, public consultations were undertaken in each concerned fokontany. These allowed to further communicate the project details as well as the conclusions from the ESIA, such as the mitigation measures which enhance the positive effects and attenuate the negative ones. More than 1000 people took part in public consultations, on 11 sites. Approximately half of these people were women. Communication with stakeholders and at risk populations was conducted in compliance with Malagasy legislation and the operational policies of the World Bank. For instance, the means of information disclosure used were in line with the experience of the delegated project manager and stakeholders of the project (i.e. APIPA and SAMVA) and the leaders of Fokontany, but also in respect of the outbreak of the World Bank's P.B. 17.50 on the disclosure of operational information. These communication measures are also integral to the realisation of a Resettlement Action Plan for those who are undergoing physical or economic transition due to the PRODUIR project. The RAP details the results of the surveys and consultations and details a vast array of measures adapted to the local project.

These stakeholders consultations carried out in 2017 and 2018 gave the opportunity to gather the opinions, fears and complaints

F.1. Opportunities

Many stakeholders expressed a positive opinion regarding the project. They see in the project an interesting opportunity to reduce the floodrisk in Antananrivo.

A significant part of the people met during socio-economic surveys or during the public consultations would like to take advantage of the project benefits. They wish that the project will generate job locally, directly on the fokontany affected by the construction phase.

F.2 Fears

The local communities also raised fears concerning the project. Almost all the expressed concerns are associated to the social aspects of the projet and more precisely :

- The communication regarding the scope, the extent, the planning and the content of the project: populations would like to be more informed on the influences of the project, displacements which will be conduected or the resettlement sites. That confirms the need to set up a stakeholders

engagement plan in order to continuously inform the populations, in particular upstream of contruction phase ;

- Compensation methodology: local communities expressed regularly their fears to lose their houses which often represents their only good. They want to have transparent and fair analysis and treatments. The Resettlement Action Plan (RAP) clarifies the methodology that has been used to define all the compensation mechanisms (this document is available in a dedicated document) ;
- Expectations in terms of result: some inhabitants said they have somme uncertainty about the projetc results, with the inherent risks of frustration that may affect the communities. That is why rigorous roles and responsibilities have been defined and a follow-up of infrastructures encouraged for the operational phase;
- Effects of the projet on the existing activities and infrastructures: in particular rice plantations, washerwomen, recrational, collective or private infrastructures (e.g.: toilets). Measures were thus defined in the ESMP to avoid the impacts on these elements (e.g. rehabilitation.

No particular concern was expressed concerning the impacts on the biological environment or the emissions of dust or odors.

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