



Promotion of BAT / BEP to reduce releases of uPOPs from open burning of waste in Madagascar

**INVENTORY, EVALUATION OF
INFORMATION RELATING TO WASTE
MANAGEMENT IN MUNICIPALITY OF:
ANTEHIROKA- IVATO-TALATAMATY**

September 2018

Draft version

ABBREVIATIONS

CUA	:	Commune Urbaine d'Antsirabe / Municipality of Antsirabe
BEP	:	Best Environmental Practices
BAT	:	Best Available Technologies
ONE	:	Office National pour l'Environnement / National Office for Environment
NGO	:	Organisme Non Gouvernemental / Non-Governmental Organisation
RF2	:	Rafitra Fanadiovana Fako
uPOPs	:	Polluants Organiques Persistants non intentionnels / Unintentional Persistent Organic Pollutant
SADC	:	

TABLE OF CONTENTS

1	Context and justification	10
2	Methodological approach	11
3	The Municipality of Antehiroka.....	11
3.1	General information.....	11
3.2	The different types of activities at Antehiroka municipality level	12
3.3	Characterization of Antehiroka municipality waste	13
3.3.1	Waste at the household level.....	13
3.3.2	Waste at the landfill.....	17
3.4	Resources allocated by the municipality for waste management	20
3.5	The current system of waste collection at the municipality level.....	21
3.6	Valorisation and recycling of waste at the municipality level.....	22
3.7	The municipality temporary dumpsite.....	23
3.7.1	General information	23
3.7.2	Problems encountered and actions taken	24
3.8	Proposal for a waste collection system for Antehiroka municipality.....	24
3.8.1	Establishment of sorting at the source (at the household level)	25
3.8.2	Reinforce the existing pre-collection system	25
3.8.3	Establishment of a waste sorting centre	26
3.8.4	Analysis of proposals	27
3.9	Proposal for dumpsite	27
4	Municipality of IVATO.....	28
4.1	General information.....	28
4.2	The different types of activities at municipality level	29
4.3	Characterization of Ivato municipality waste	30
4.3.1	Waste at the household level.....	30
4.3.2	Waste at the dumpsite.....	33

4.4	Resources allocated by the municipality for waste management	36
4.5	The current system of waste collection at Ivato municipality level.....	37
4.6	The municipality dumpsite	40
4.6.1	General information	40
4.6.2	Problems encountered and actions taken	42
4.7	Proposal for a waste collection system for Ivato municipality	42
4.7.1	Establishment of sorting at the source (at the household level)	42
4.7.2	Reinforce the existing pre-collection system	43
4.7.3	Establishment of a waste sorting centre	43
4.7.4	Analysis of proposals	44
4.8	Proposal for dumpsite	45
5	Municipality of TALATAMATY.....	45
5.1	General information	45
5.2	The different types of activities at municipality level	48
5.3	Characterization of waste in Talatamaty municipality.....	48
5.3.1	Waste at the household level.....	48
5.3.2	Waste at the dumpsite.....	51
5.4	Resources allocated by the municipality for waste management	54
5.5	The current system of waste collection at Talatamaty municipality level.....	55
5.6	Valorisation and recycling of waste at the municipality level.....	57
5.7	The municipality dumpsite	58
5.7.1	General information	58
5.7.2	Problems encountered and actions taken	59
5.8	Proposal for a waste collection system for Talatamaty municipality	59
5.8.1	Establishment of sorting at the source (at the household level)	59
5.8.2	Reinforce the existing pre-collection system	60
5.8.3	Establishment of a waste sorting centre	60
5.8.4	Analysis of proposals	61

5.9	Proposal for dumpsite	61
6	Proposed short term action plan.....	62
7	Conclusion	64

LISTS OF FIGURES

Figure 4-1 Map of Ivato municipality	28
Figure 5-1Map of Talatamaty municipality.....	46

LISTS OF TABLES

Table 3-1 Distribution of population and households by fokontany in Antehiroka municipality	12
Table 3-2 Summary of activities at the Municipality of Antehiroka level.....	13
Table 3-3 Average daily amount of waste generated per household and by Fokontany.....	15
Table 3-4 Estimated amount of waste generated annually at the household level	17
Table 3-5 Estimated amount of waste collected and transported at the landfill	18
Table 3-6 Estimated amount of waste collected and transported at the landfill	19
Table 3-7 Estimated quantity by type of waste collected and transported at the Temporary landfill	19
Table 3-8 Budget allocated by the municipality for waste management per year.....	20
Table 3-9 Summary of the rolling materials of the Municipality of Antehiroka and their respective capacity.....	20
Table 3-10 Analysis of proposed activities	27
Table 4-1 Distribution of population and households by fokontany in Ivato municipality	29
Table 4-2 Summary of activities at the Municipality of Ivato level	29
Table 4-3 Average daily amount of waste generated per household and by Fokontany in Ivato municipality.....	31
Table 4-4 Estimated amount of waste generated annually at the household level in Ivato municipality.....	33
Table 4-5 Estimated amount of waste collected and transported at Ambohimasina dumpsite	34
Table 4-6 Estimated amount of waste collected and transported at Ambohimasina dumpsite	35
Table 4-7 Estimated quantity by type of waste collected and transported at Ambohimasina dumpsite	35
Table 4-8 Budget allocated by the municipality for waste management per year.....	36
Table 4-9 Estimation of the amount of household waste that can be valorised	40
Table 4-10 Analysis of proposed activities	44
Table 5-1 Distribution of population and households by fokontany in Talatamaty municipality	47
Table 5-2 Summary of activities at the Municipality of Talatamaty level.....	48
Table 5-3 Average daily amount of waste generated per household and by Fokontany in Talatamaty municipality.....	50

Table 5-4 Estimated amount of waste generated annually at the household level in Talatamaty municipality.....	51
Table 5-5 Estimated amount of waste collected and transported at Ambohidratrimo temporary dumpsite	52
Table 5-6 Estimated amount of waste collected and transported at Ambohidratrimo dumpsite	53
Table 5-7 Estimated quantity by type of waste collected and transported at Ambohidratrimo temporary dumpsite.....	53
Table 5-8 Budget allocated by the municipality for waste management per year.....	54
Table 5-9 Purchase prices of some wastes	57
Table 5-10 Estimation of the amount of household waste that can be valorised	57
Table 5-11 Analysis of proposed activities	61
Table 6-1 Proposed short term action pla	63

1 Context and justification

As part of the Stockholm Convention on Persistent Organic Pollutants ratified by Madagascar in August 2005, Parties are required to take the necessary measures to reduce or eliminate releases of POPs covered by the Convention, namely, among others:

- Measures to reduce or eliminate releases from intentional production and use;
- Measures to reduce or eliminate releases from unintentional production;
- Measures to reduce or eliminate releases from storages and wastes.

The regional project "Promoting BAT / BEP to reduce uPOP releases from open burning of waste in SADC participating African countries" has the overall objective of significantly and sustainably reducing the releases of uPOPs in the sector of open burning waste by improving guidance on best available techniques and best environmental practices for open burning processes of waste and biomass.

The specific objective of the project is to achieve a continuous reduction of uPOP releases in the open burning waste sector in participating African countries in the SADC region by introducing best available techniques and best environmental practices (BAT / BEP) on certain priority demonstration sites.

For Madagascar, two sites have been identified and selected for the establishment and implementation of waste management plans introducing these BAT / BEP. The first site is the Municipality of Antsirabe and the second site includes the municipalities of Ambohibao Antehiroka, Talatamaty and Ivato.

To do this, the consultant is asked to:

- Collect data, information on the feasibility of reducing open burning practices for waste in both sites: population served, characterization of waste, existing management system (collection, route, cost, ...)
- To propose a system of collection facilitating the recycling of the waste: advantages, constraints, possible costs...
- Evaluate the collected data / information in order to identify the relevant options for the implementation of the BAT / BEP to enable the realization of waste management plans in the sites;
- Compile the information obtained in a report;

In addition, a collection of waste management data at the level of textile free enterprises was entrusted to the consultant (type and volume of waste generated, method of processing, etc.)

2 Methodological approach

To carry out the various activities entrusted to the mandatory, the following approach is adopted:

- Development of sheets related to collection of information;
- Documentary study: monograph of Municipality,
- Field visit to gather the different information on the existing management systems:
 - o Contact and interview with the different people involved in municipal waste management: Mayor, technical managers, chefs fokontany,
 - o Contact of the entities that deal with the valorization of waste at local level: companies, associations, individuals ...
- Characterization of waste at the household level and landfills
 - o Choice of Fokontany;
 - o Household sampling; sorting and quantification of waste at the household sample level for a given period;
 - o Sorting and quantification of the waste brought by the trucks to the landfills by applying the system of quarts (Sorting and weighing the QUART of the total capacity of the truck)
- Compilation and synthesis of all information collected;
- Proposal for a waste collection and management system for the sites;

3 The Municipality of Antehiroka

3.1 General information

The Municipality of Antehiroka is made up of 9 Fokontany with a total population of 75 124 habitants in 14 046 households. At the level of the Municipality, on average, 40% of households are served by a collection system organized either by the Municipality itself through its technical service or individually at the household level itself. In the waste management system, the Municipality is currently working with the RF2 structure which is in charge of pre-collection of waste from household to municipality collecting point. Antehiroka municipality is around 10.15 Km²

Table 3-1 Distribution of population and households by fokontany in Antehiroka municipality

	Fokontany	Population	Household	Collecting point	Household deserved by collection system	Household non deserved by collection system
1	Ambohibao	11 511	6 126	3	40%	60%
2	Amboaroy	4 254	600	2		
3	Ambohijanahary	6 400	1 300	1		
4	Andranoro	11 970	1 200	6		
5	Antalamohitra	7 824	950	4		
6	Antsankambahiny	4 485	820	9		
7	Ankadivory	4 680	550	2		
8	Antanetibe	7 676	1 000	3		
9	Morondava	16 324	1 500	5		
	TOTAL	75 124	14 046			

Source: Service Technique Municipality of Antehiroka- August 2018

3.2 The different types of activities at Antehiroka municipality level

In the Municipality, all activities could be found ranging from small shops and supermarkets to industries mainly textiles and plastics transformation. There are some spaces for agriculture in the activities identified at the municipality level.

The table below summarizes these different activities:

Table 3-2 Summary of activities at the Municipality of Antehiroka level

Activités	Types	Localisation	Nombre	Commentaires
	Textile	Ambohibao	5	
	Plastics transformation	Ambohibao	3	AREPLAST, COMEPLAST, SMTP
	Others	Ambohibao	1	AGRIVET (Feed Mill)
Trade	Banks/Insurance/ Pharmacie/Snack	All Fokontany	28	
Market		Ambohibao/Amb ohijanahary	2	Sale of local products: vegetables, fruits, meat
Hotel, Karaoke, Restaurant, Espaces		Antanetibe Ambohibao Antalamohitra	10	
	Type		Occupied surface (ha/a)	
Agriculture	Rice		594 ha	
	Maize		138 a	
	Cassava		138 a	
	Vegetables		2937 a	
	Others		10 ha	Sylviculture

Source: Service Technique Municipality of Antehiroka- August 2018

3.3 Characterization of Antehiroka municipality waste

3.3.1 Waste at the household level

To make the typology and quantification of waste at the household level, seven (7) Fokontany were chosen by considering the size, the number of the population, the diversity of activities at the household level, the socio-economic situation. Among these Fokontany are Antsankambahiny, Ambohibao, Antalamohitra, Amboaroy, Morondava, Ambohijanahary, Antanetibe. Six (6) households per fokontany were taken as a sample. Garbage bags for sorting different types of waste were distributed and weighed daily and for two days.

Note that the limit of the study is the number of households sampled and the period because the amount generated depends on the season. Nevertheless, it allowed having a global idea of the quantity produced at the level of each household.

The results of household level waste characterization are presented in Appendix 2. The average daily amount of waste generated per household is presented in Table 3.3. If this daily average is returned to all households at the municipality level to obtain an estimation of the annual amount of waste generated, the results are presented in Table 3.4.

Table 3-3 Average daily amount of waste generated per household and by Fokontany

FOKONTANY	Antsakambahiny	Ambohibao	Antalamohitra	Amboaroy	Ambohi-janahary	Morondava	Antanetibe	Average	%
	(g)	(g)	(g)	(g)	(g)	(g)		(g)	
TYPES									
Paper, Cardboard	45,3	19,5	65,3	32,8	107,5	9,0	31,3	44,4	4,5
Wood	-	-	2,5	-	117,0	97,2	-	31,0	3,2
Plastic	31,8	130,5	56,2	30,3	160,0	127,3	135,7	96,0	9,8
Glass, Ceramic	-	-	36,8	68,3	12,5	10,7	-	18,3	1,9
Food Waste / Green Waste	284,0	494,7	828,5	209,0	-	1 026,0	1 039,0	554,5	56,6
Metals	6,3	-	-	33,0	64,8	11,8	12,3	18,3	1,9
Textiles, Leather	-	6,1	15,2	-	11,5	-	-	4,7	0,5
Rubble	412,3	6,8	42,5	-	662,3	278,8	64,3	209,6	21,4
Particles	-	-	-	6,5	-	20,0	-	3,8	0,4
Other	-	-	-	-	-	-	-	-	-
	779,5	657,7	1 047,0	379,8	1 135,5	1 580,8	1 282,7	980,4	

Source: Household survey- August 2018

Table 3-4 Estimated amount of waste generated annually at the household level

Types	Households			
	Average amount generated (kg / d)	Total amount generated (Kg / Household / d)	Average amount generated per year (T)	%
Paper, Cardboard	0,04	623,4	227,5	4,53
Wood	0,03	434,8	158,7	3,16
Plastic	0,10	1 347,7	491,9	9,79
Glass, Ceramic	0,02	257,3	93,9	1,87
Green Waste	0,55	7 788,0	2 842,6	56,55
Metals	0,02	257,2	93,9	1,87
Textiles, Leather	0,00	65,8	24,0	0,48
Rubble	0,21	2 943,6	1 074,4	21,38
Particles	0,00	53,2	19,4	0,39
Other	0,00	-	-	-
TOTAL	0,98	13 770,97	5 026,40	

Note that the estimated amount of waste generated at the household level changes with the seasons and increases during the fruit season (rainy season) while the study was conducted during the dry and cold season.

3.3.2 Waste at the landfill

The municipality of Antehiroka does not have a landfill site for their waste. They use a temporary site that the neighbouring municipality (Ambohidratrimo) leases to them for 3-4 months.

In order to determine the amount of waste collected and transported to the Ambohidratrimo land, the quart's system is used. It consists in taking the QUART of the truck body and proceeding to sort waste and weighing of each type. Note that the capacity of truck is around 6 m³ so the ¼ is 1.25m³.

The results of data collection at the temporary landfill are presented in the table below:

Table 3-5 Estimated amount of waste collected and transported at the landfill

<u>LOCALISATION :</u>	Temporary site storage		
<u>DATE :</u>	25/07/2018		
<u>ORIGIN:</u>	Fokontany Ambohibao		
TYPES	Quantity (Kg)	Average	%
Paper, Cardboard	14,5	14,5	7,55
Wood	2	2	1,04
Plastic	26,5	26,5	13,80
Glass, Ceramic	5	5	2,60
Green waste / Food waste	123	123	64,06
Metals	1	1	0,52
Textiles, leather	9	9	4,69
Particles	2,5	2,5	1,30
Batteries	0	0	-
Others (Baby diapers...)	8,5	8,5	4,43
TOTAL	192	192	

From these collected data, an estimation of the quantity collected and transported at the landfill level annually is presented in Tables 3.6 and 3.7.

Table 3-6 Estimated amount of waste collected and transported at the landfill

VOLUME OF WASTE	1,25	m3	Freq/day	QTTY/day	Quantity/week	Quantity/year
WEIGHT OF WASTE	192	Kg				
DENSITY	153,6	Kg/m3				
COLLECTED QUANTITY (m3/day)	23	m3	2	46	230	11960
COLLECTED QUANTITY (T)				7,0656	35,328	1837,056

Table 3-7 Estimated quantity by type of waste collected and transported at the Temporary landfill

Types	Temporary landfill (Ambohitrarimo)			
	Quantity collected (Kg /d) (1/4 of truck)	Total quantity collected (Kg / d)	Average amount collected per year (T)	%
Paper, Cardboard	14,5	533,6	138,7	7,55
Wood	2,0	73,6	19,1	1,04
Plastic	26,5	975,2	253,6	13,80
Glass, Ceramic	5,0	184,0	47,8	2,60
Green waste / Food waste	123,0	4 526,4	1 176,9	64,06
Metals	1,0	36,8	9,6	0,52
Textiles, leather	9,0	331,2	86,1	4,69
Rubble	2,5	92,0	23,9	1,30
Particles	-	-	-	-
Others (Baby diapers...)	8,5	312,8	81,3	4,43
	192,00	7 065,60	1 837,06	

By comparing the estimated amount of waste produced by households with the waste collected and transported at the level of the temporary landfill, we could say that the collection rate is around 36%. Note that these data do not include waste generated by industries and economic activities that have their own waste management system (collection, transportation and even private waste).

3.4 Resources allocated by the municipality for waste management

The budget allocated by the Municipality of Antehiroka is shown in table below:

Table 3-8 Budget allocated by the municipality for waste management per year

Type	Amount (Ariary)
Fuel	75 000 000
Maintenance of Equipment	13 500 000
Salaries	60 000 000
Land	6 000 000
Cleaning activities	2 000 000
TOTAL	156 500 000

Source : Financial service of municipality - 2018

The material resources available to the municipality shown in the table below:

Table 3-9 Summary of the rolling materials of the Municipality of Antehiroka and their respective capacity

C.2. SYSTEME DE COLLECTE						
Type of operators	:	Public	X	Private		Others
Number of operators	:	Municipality				RF2 (Association /Fokontany)
Type of contrat	:					
Trucks(a)/ Tracteur (b)/ Others (c)		Number		Capacity		Freq/day
		2		(18 + 5) = 23 m3		2
						5days/week

Source: Technical service of municipality- 2018



First truck of Antehiroka municipality



Second truck of Antehiroka municipality

3.5 The current system of waste collection at the municipality level

Globally, 40% of households are served by collection system. The municipality is mainly in charge of the collection of household waste at collection points and the transport to the temporary dumpsite.

In fact, waste collection points are more than truck crossing points. Their passage at the level of the Fokontany and their frequency are scheduled per day / week at times fixed in advance.

The collection is carried out along the main axes of roads.

As mentioned in the previous paragraph, if we refer to the estimates of waste generated in households and those collected by the Municipality, the collection rate is around 36%.

Pre-collection of household waste to collection points is provided by RF2 (Association responsible for cleaning the sanitation network and waste collection at household level).

Currently, it works at all Fokontany of Antehiroka municipality. To do this, it proposes a household participation of 500 Ar / month. Note that the recovery rate is around 40% and this amount is mainly used for the salaries of the agents of the RF2 but is not enough for the maintenance and the acquisition of new equipment (wheelbarrows, shovels, ...).

In the beginning and during 1 year, RF2 was supported by ENDA OI an NGO specialized in waste management, as part of a waste management project in collaboration with the municipality. As part of the project, they equipped RF2 with small equipment and materials.

3.6 Valorisation and recycling of waste at the municipality level

Apart SMTP the only one industrial unit in the municipality level which introduce in his process a recyclable material, there are no other recycling units at the municipality. SMTP produces plastics equipment and materials (pipes, tanks...) and use 250 Kg/day of LDPE recyclable materials. Information about SMTP's activities is shown in Appendix 3.

The estimation of waste that can be valorized from the waste generated by households is presented in the table below:

Tableau 3-1 Estimation of the amount of household waste that can be valorized

VALORISABLES	QUANTITY (T/year)
Paper	227
Wood	159
Plastic	492
Glass, ceramic	94
Green waste/Putrescible	2842
Metals	94
Textiles, leather	24

3.7 The municipality temporary dumpsite

3.7.1 General information

The municipality of Antehiroka don't have a landfill. Before, they deposited their waste along Ikopa's riverbank. Because of interdiction from administration, they negotiated a land with their neighboring municipality (Ambohidratrimo) who leases them a temporary site for a few months. The dump site that was proposed by Ambohidratrimo is an old ditch to defend a city frequently used in Madagascar in the 17th and 18th century. At the time of the report, the site is half-filled. Every week, the municipality of Ambohidratrimo asks a road construction company to cover the waste with laterite.



The temporary site in Ambohidratrimo



3.7.2 Problems encountered and actions taken

The main problem for Antehiroka municipality is that they don't have their own land to dump the wastes. They are obliged to negotiate with neighboring municipalities by leasing lands. For them, it is a temporary solution and they need to think about more sustainable situation.

The municipality has identified a state owned site and has begun to discuss with the responsible ministry but has not yet received a positive response.

All the actions that the mayor has undertaken so far have not succeeded and their situation is currently in "stand by".

3.8 Proposal for a waste collection system for Antehiroka municipality

The main objectives of the project on the promotion of BEPs and BAT to reduce releases of uPOPs from open burning of waste are:

- Reduce waste to be sent to the landfill by valuing the waste that is generated at the household level;
- Put in place the BEP and BAT for waste treatment to avoid open burning

The direct consequence at the municipality level is the reduction of waste management costs as there will be a reduction in the cost of collection and transportation.

To do this, sorting at the source (at the household level) coupled with a waste recovery process will be proposed upstream of the management system. In addition, downstream of the management system, facilities to prevent burning at the disposal site will be considered.

In order to set up a new waste collection system, five (5) Fokontany were chosen. Among the selection criteria of Fokontany are:

- The existence of operational system of collection
- The interest displayed by households in sorting (assessed during characterization of waste in households);
- The existence of space to develop waste sorting centre

The Fokontany chosen are: Antsankambahiny, Andranoro, Ambohibao, Amboaroy, Morondava

3.8.1 Establishment of sorting at the source (at the household level)

Currently, household waste is mixed and brought to collection points (garbage bins, wild dumps) by themselves. The objective of the proposed activity is to get households to make a SORTING at the source of their waste to facilitate their valorisation.

Three (3) types of bins will be proposed to households:

- A bin for compostable waste: putrescible food waste and green waste
- A bin for other valuable / recyclable waste: plastics, glasses, metals, fabrics, leathers
- A bin for non-valuable

To do this, an awareness campaign and the household endowment of small bins for sorting are necessary.

3.8.2 Reinforce the existing pre-collection system

As mentioned in paragraph 3.5, pre-collection of household waste to collection points is provided by RF2 (Association responsible for cleaning the sanitation network and waste collection at household level).

Currently, it works at all Fokontany of Antehiroka municipality. To do this, it proposes a household participation of 500 Ar / month.

In the beginning and during 1 year, RF2 was supported by ENDA OI an NGO specialized in waste management, as part of a waste management project in collaboration with the municipality. They equipment endowment.

Pre-collection system dealing with the recovery of sorted waste at the household level, their transfer to the collection points of the municipality, the sorting of waste for recovery / recycling with a participation per household.

The main problems that RF2 faced are the following:

- the recovery rate is around 40% and this amount is mainly used for the salaries of the agents and the operating budget;
- No budget for the maintenance and renewal of the equipment (wheelbarrows, shovels, ...).

For the reinforcement of RF2, the following activities are planned:

- Recruitment of new agents;
- Provision of small equipment and materials (wheelbarrows, shovels, brooms, bins / collection drums, PPE ...);
- Sensitization of the population on the attributions of RF2.

3.8.3 Establishment of a waste sorting centre

For the valorisation of waste, a sorting centre will be set up at Fokontany level according to the availability of space. RF2 will take care of the management of this centre:

- Manual sorting of valuable waste;
- Sale of waste and customer search;
- Maintenance of equipment;
- Support Antsankambahiny (Fokontany) initiative to put in place a composting platform.

Revenue from the sale of waste will be used to replenish the RF2 's fund to ensure its operation and the sustainability of these activities.

For the establishment of a sorting centre, the following activities need to be carried out:

- Land identification and acquisition;
- Construction / development of an office;
- Arrangement of a manual sorting platform;
- Training of agents responsible for sorting;
- Support of RF2 in search of outlets / customers;

3.8.4 Analysis of proposals

An analysis of the benefits and constraints associated with the proposed activities is presented in Table 3.10.

Table 3-10 Analysis of proposed activities

Activities	Advantages	Constraints
1- Establishment of Sorting at the source (at the household level)	<ul style="list-style-type: none"> ○ Easy recovery of waste ○ Uncontaminated waste because separated at the source ○ Reduction of waste sent to the landfill ○ Existence of sensitization material in municipality : mobile sound system, 	<ul style="list-style-type: none"> ○ Reluctance of households to sort ○ Need to set up a motivation system ○ Availability of sorting bins. Support for the acquisition of bins
2- Setting up a pre-collection system	<ul style="list-style-type: none"> ○ Existence of operational structure RF2 in all Fokontany ○ Opportunity to employ people with limited resources in Fokontany (job creation) ○ More organized collection at the household level ○ Reduction of municipality costs for transportation of waste to the landfill ○ Existence of waste recovery initiatives by composting waste in Antsankambahiny Fokontany 	<ul style="list-style-type: none"> ○ Consent to pay households. The recovery rate of RF2 is around 40% ○ This rate covers only the operation of the association without maintenance or renewal of equipment ○ Capacity of members to manage the association ○ Inexistence of regulation in the municipality level to enforce the waste management system
3- Establishment of a reusable waste sorting centre	<ul style="list-style-type: none"> ○ Reduction of waste sent to the landfill ○ Reduction of CUA costs for transporting waste to the landfill ○ Source of additional money for RF2 ○ Possibility of a return to the household level (motivation) ○ Market creation 	<ul style="list-style-type: none"> ○ Capacity of the association to manage the centre ○ Sustainability of the Centre (no market) ○ Support for the installation and maintenance of materials / equipment ○ Land availability

3.9 Proposal for dumpsite

At this stage of the study no proposal could be put forward without the results of the solutions research carried out by municipality.

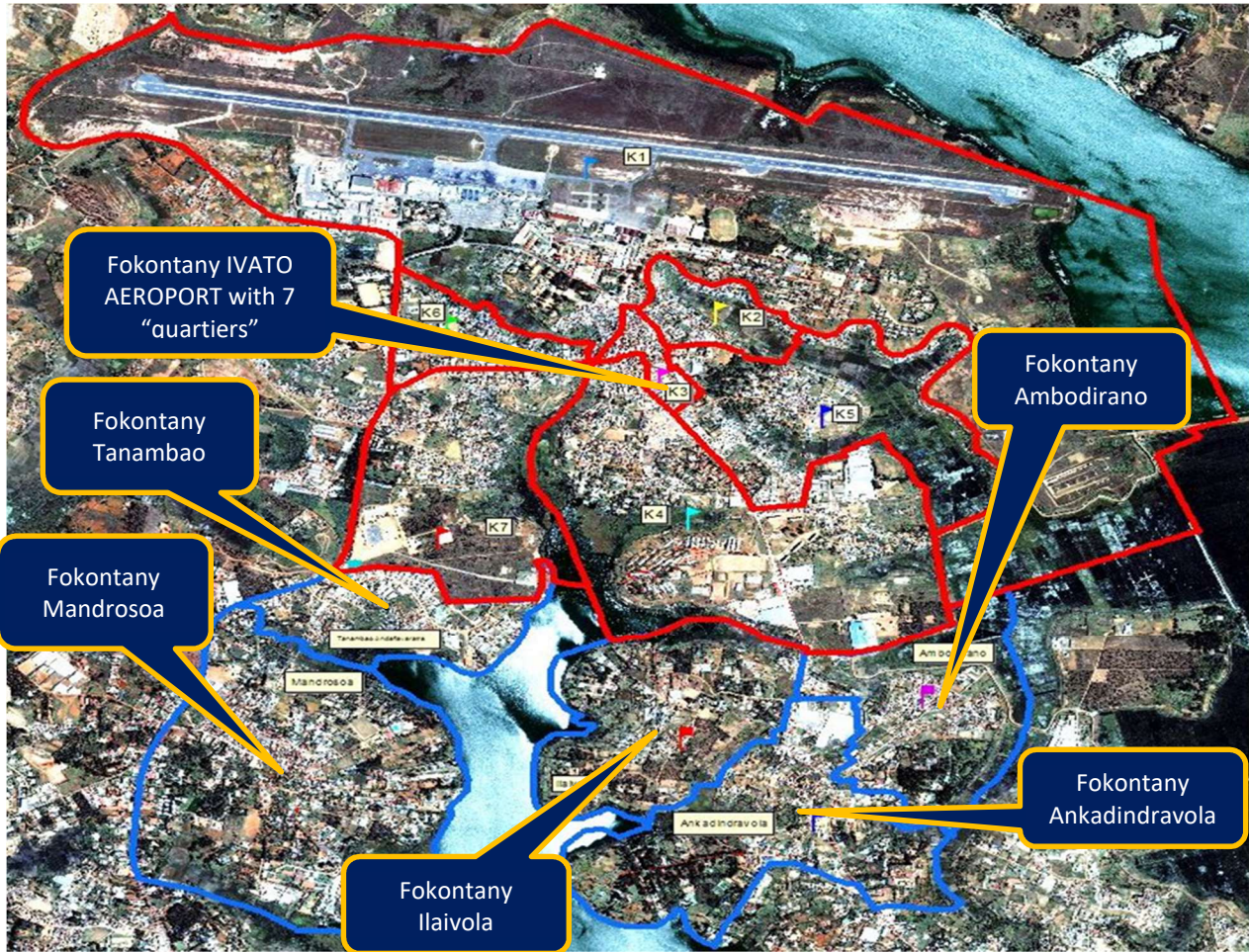
For greater efficiency, the three (3) municipalities (Antehiroka, Talamaty, Ivato) must work together to lobby with relevant ministries for land.

4 Municipality of IVATO

4.1 General information

The Municipality of Ivato is made up of 6 Fokontany with a total population of 63 754 habitants. If we consider that the number of persons per household is on average 6, the households in the municipality are estimated around 10 624. At the level of the Municipality, on average, 60% of households are served by a collection system organized either by the Municipality itself through its technical service or individually at the household level itself. In the waste management system, the Municipality is currently working with the RF2 structure which is in charge of pre-collection of waste from household to municipality collecting point. Ivato municipality is around 11.64 Km² and 5 Km² is occupied by International Airport of IVATO. The map showing the limit of municipality is presented in the Figure 4.1 and the distribution of population by Fokontany in Table 4.1.

Figure 4-1 Map of Ivato municipality



Source: Monographie de la Commune Rurale d'Ivato -2017

Table 4-1 Distribution of population and households by fokontany in Ivato municipality

	Fokontany	Population	Household (Estimation: 6 pers/household)	Household deserved by collection system	Household non deserved by collection system
1	Ankadindravola	7 621	1 270		
2	Mandrosoa	9 327	1 554		
3	Ilaivola	3 669	611		
4	Ambodirano	5 350	892		
5	Tanambao	3 740	623		
6	Ivato aéroport	34 047	5 674		
	TOTAL	63 754	10 624		

Source: Monographie de la Commune Rurale d'Ivato - 2017

4.2 The different types of activities at municipality level

In the Municipality, all activities could be found ranging from small shops and supermarkets to industries mainly textiles transformation. There are some spaces for agriculture in the activities identified at the municipality level.

The table below summarizes these different activities:

Table 4-2 Summary of activities at the Municipality of Ivato level

Activités	Types	Localisation	Nombre	Commentaires
Industries	Textile, cardboard, ...	All Fokontany	59	
Trade	Banks/Insurance/ Pharmacie/Snack/ Commercial center	All Fokontany	253	
Market		Ivato	1	Sale of local products: vegetables, fruits, meat

Activités	Types	Localisation	Nombre	Commentaires
Hotel/ Espaces	< 50 rooms	Ivato	2	
Hotel/ Espaces	> 50 rooms	All Fokontany	14	
	Type		Occupied surface (ha/a)	
Agriculture	Rice		78 ha	
	Food crops (Maize, Cassava ...)		nd	
	Vegetables crops		nd	

Source: Monographie de la Commune Rurale d'Ivato- 2017

4.3 Characterization of Ivato municipality waste

4.3.1 Waste at the household level

To make the typology and quantification of waste at the household level, five (5) Fokontany were chosen by considering the size, the number of the population, the diversity of activities at the household level, the socio-economic situation. Among these Fokontany are Ivato, Ambodirano, Ilaivola, Antanambao, Mandrosoa. Six (6) households per fokontany were taken as a sample. Garbage bags for sorting different types of waste were distributed and weighed daily and for two days.

Note that the limit of the study is the number of households sampled and the period because the amount generated depends on the season. Nevertheless, it allowed having a global idea of the quantity produced at the level of each household.

The results of household level waste characterization are presented in Appendix 4. The average daily amount of waste generated per household is presented in Table 4.3. If this daily average is returned to all households at the municipality level to obtain an estimation of the annual amount of waste generated, the results are presented in Table 4.4.

Table 4-3 Average daily amount of waste generated per household and by Fokontany in Ivato municipality

FOKONTANY	Ivato	Ambodirano	Ilaivola	Antanambao	Mandrosoa	Average	%
	(g)	(g)	(g)	(g)	(g)	(g)	
TYPES							
Paper, Cardboard	77,33	32,33	8,67	106,67	82,83	61,57	6,54
Wood	80,83	20,00	23,17	-	72,83	39,37	4,18
Plastic	131,83	54,33	34,83	240,33	146,83	121,63	12,92
Glass, Ceramic	80,00	69,67	-	-	20,17	33,97	3,61
Food Waste / Green Waste	1 064,33	421,67	-	391,33	130,67	401,60	42,67
Metals	-	-	-	-	106,17	21,23	2,26
Textiles, Leather	88,33	35,50	1,83	45,00	70,17	48,17	5,12
Rubble	100,00	148,50	181,33	39,67	599,00	213,70	22,70
Particles	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-
	1 622,67	782,00	249,83	823,00	1 228,67	941,23	

Source: Household survey- August 2018

Table 4-4 Estimated amount of waste generated annually at the household level in Ivato municipality

Types	Households			
	Average amount generated (kg / d)	Total amount generated (Kg / Household / d)	Average amount generated per year (T)	%
Paper, Cardboard	0,06	654,1	238,7	6,54
Wood	0,04	418,2	152,7	4,18
Plastic	0,12	1 292,2	471,7	12,92
Glass, Ceramic	0,03	360,9	131,7	3,61
Green Waste	0,40	4 266,6	1 557,3	42,67
Metals	0,02	225,6	82,3	2,26
Textiles, Leather	0,05	511,7	186,8	5,12
Rubble	0,21	2 270,3	828,7	22,70
Particles	0,00	-	-	-
Other			-	
TOTAL	0,94	9 999,66	3 649,88	

Note that the estimated amount of waste generated at the household level changes with the seasons and increases during the fruit season (rainy season) while the study was conducted during the dry and cold season.

4.3.2 Waste at the dumpsite

The municipality of Ivato does not have a land to dump their waste. They rent a private property located at Ambohimasina in the neighboring municipality of Imerimandroso at about 10 km from their office.

In order to determine the amount of waste collected and transported to Ambohimasina, the quart's system is used. It consists in taking the QUART of the truck body and proceeding to sort waste and weighing of each type. Note that the capacity of truck is around 4 m³ and ¼ of the ¼ was sorted. It is around 0.25m³.

The results of data collection at the dumpsite are presented in the table below:

Table 4-5 Estimated amount of waste collected and transported at Ambohimasina dumpsite

LOCALISATION :

DATE :

01/08/2018

ORIGIN:

Mixed : Market and household

TYPES	Quantity (Kg)	%
Paper, Cardboard	3,014	3,10
Wood	0,924	0,95
Plastic	10,239	10,54
Glass, Ceramic	1,35	1,39
Green waste / Food waste	67,4	69,41
Metals	0,148	0,15
Textiles, leather	2,411	2,48
Particles	6,5	6,69
Batteries	0	-
Others (Baby diapers...)	5,125	5,28
TOTAL	97,111	

From these collected data, an estimation of the quantity collected and transported annually at the dumpsite level is presented in Tables 4.6 and 4.7.

Table 4-6 Estimated amount of waste collected and transported at Ambohimasina dumpsite

C.2. COLLECTION SYSTEM					
Type of operators :	Public	X	Private		Others
Number of operators :					RF2/RF3 (Association /Fokontany)
Type of contract :	Direct management				
Trucks (a)/ Tractors (b)/ Autres (c)	Number		Capacity		Trip/day
	2		(4 + 6) = 10 m3		3 for 4 days
					2 for 2days
					160 m ³ /week

Table 4-7 Estimated quantity by type of waste collected and transported at Ambohimasina dumpsite

Types	Dumpsite (Ambohimasina)			
	Quantity collected (Kg /d) (1/16 of truck)	Total quantity collected (Kg / d)	Average amount collected per year (T)	%
Paper, Cardboard	3,0	1 929,0	100,3	3,10
Wood	0,9	591,4	30,8	0,95
Plastic	10,2	6 553,0	340,8	10,54
Glass, Ceramic	1,4	864,0	44,9	1,39
Green waste / Food waste	67,4	43 136,0	2 243,1	69,41
Metals	0,1	94,7	4,9	0,15
Textiles, leather	2,4	1 543,0	80,2	2,48
Rubble	6,5	4 160,0	216,3	6,69
Particles	-	-	-	-
Others (Baby diapers...)	5,1	3 280,0	170,6	5,28
	97,11	62 151,04	3 231,85	

By comparing the estimated amount of waste produced by households with the waste collected and transported at the dumpsite, the collection rate could be 88% but some of the waste that is transported to the landfill came from the markets. Indeed, the waste that was weighed during the study came from households and the market.

We could say that the capacity of the municipality is not sufficient to collect all the waste generated by households.

Note that the waste transported to the dumpsite do not include waste generated by industries and economic activities that have their own waste management system (collection, transportation and even private waste). Furthermore, during the rainy season, the number of trip decrease because of difficulty of access to the site. So, the collection rate will be less than 88%.

4.4 Resources allocated by the municipality for waste management

The budget allocated by the Municipality of Ivato is shown in table below:

Table 4-8 Budget allocated by the municipality for waste management per year

Type	Amount (Ariary)
Fuel	50 000 000
Salaries	70 000 0000
TOTAL	120 000 000

Source : Financial service of municipality - 2018

Note that the maintenance of equipment cost is not included on this amount.

The municipality has two (2) trucks with a capacity of 4m³ and 6 m³ for the transport of waste to the dumpsite. In addition, the municipality employs field agents who accompany trucks for the collection of waste.



One truck of Ivato municipality

4.5 The current system of waste collection at Ivato municipality level

Concerning the pre-collection (household to collection points), RF2 /RF3 (Association responsible for cleaning the sanitation network and waste collection at household level) provide their service for three (3) fokontany (Ivato, Mandrosoa, Ambodirano). To do this, it proposes a household participation of 500 Ar to 10 000 Ar per month depending of standard of living of the population.

The other three (3) fokontany (Ilaivola, Ankadindravola, Antanambao) are directly served by the collection system of the municipality.

Globally, 60% of households are deserved by collection system. The municipality is mainly in charge of the collection of household waste at collection points and the transport to the dumpsite.

In fact, waste collection points are more than truck crossing points because there is no infrastructure (waste bin) in place. Their passage at the level of the Fokontany and their frequency are scheduled per day / week at times fixed in advance. The collection is carried out along the main axes of roads.

As mentioned in the previous paragraph, if we refer to the estimates of waste generated in households and those collected by the Municipality, the collection rate is around 88%.



Collection point at Fokontany of Ambodirano



Collection point at Fokontany of Ivato



Handcart used by the RF2 in the Ivato Fokontany

Valorisation and recycling of waste at the municipality level

There is no recycling unit at the Ivato commune level. Nevertheless, some types of waste such as bone and metals are purchased by buyers. The bones are bought at 250 Ar the kilo while the metals at 400 - 500 Ar the kilo. The estimation of waste that can be valorised from the waste generated by households is presented in the table below:

Table 4-9 Estimation of the amount of household waste that can be valorised

VALORISABLES	QUANTITY (T/year)
Paper	238
Wood	152
Plastic	471
Glass, ceramic	131
Green waste/Putrescible	1 557
Metals	82
Textiles, leather	186

4.6 The municipality dumpsite

4.6.1 General information

As mentioned in paragraph 4.3.2, Ivato municipality rent a private land to dump his wastes. Ambomasina dumpsite is located in a mountain at about 1400m above sea level and 10km from the office of Ivato commune. Access is very difficult especially during the rainy season.

The site is not developed and the waste is deposited directly on the side of the mountain.



Wastes deposited directly on the side of the mountain



View of Ivato municipality from Ambohimasina mountain

4.6.2 Problems encountered and actions taken

Two points could be mentioned concerning the problems of the municipality of Ivato dumpsite:

- the risk of breach of contract by the owner;
- the difficult access of the site which generates a lot of expenses in terms of repair and maintenance of the trucks;

Currently, the municipality does not see other alternatives and continues to use the site.

4.7 Proposal for a waste collection system for Ivato municipality

The main objectives of the project on the promotion of BEPs and BAT to reduce releases of uPOPs from open burning of waste are:

- Reduce waste to be sent to the landfill by valuing the waste that is generated at the household level;
- Put in place the BEP and BAT for waste treatment to avoid open burning

The direct consequence at the municipality level is the reduction of waste management costs as there will be a reduction in the cost of collection and transportation.

To do this, sorting at the source (at the household level) coupled with a waste recovery process will be proposed upstream of the management system. In addition, downstream of the management system, facilities to prevent burning at the disposal site will be considered.

In order to set up a new waste collection system, three (3) Fokontany were chosen. Among the selection criteria of Fokontany are:

- The existence of operational system of pre-collection
- The interest displayed by households in sorting (assessed during characterization of waste in households);
- The existence of space to develop waste sorting centre

The Fokontany chosen are: Ivato, Mandrosoa, Ambodirano

4.7.1 Establishment of sorting at the source (at the household level)

Currently, household waste is mixed and brought to collection points (garbage bins, wild dumps) by themselves. The objective of the proposed activity is to get households to make a SORTING at source of their waste to facilitate their valorisation.

Three (3) types of bins will be proposed to households:

- A bin for compostable waste: putrescible food waste and green waste
- A bin for other valuable / recyclable waste: plastics, glasses, metals, fabrics, leathers
- A bin for non-valuable

To do this, an awareness campaign and the household endowment of small bins for sorting are necessary.

4.7.2 Reinforce the existing pre-collection system

As mentioned in paragraph 4.5, pre-collection of household waste to collection points is provided by RF2 or RF3 (Association responsible for cleaning the sanitation network and waste collection at household level) depending on the Fokontany.

Pre-collection system dealing with the recovery of sorted waste at the household level, their transfer to the collection points of the municipality, the sorting of waste for recovery / recycling with a participation per household.

The main problems that RF2/RF3 faced are the following:

- the recovery rate is around 50-60 % and this amount is mainly used for the salaries of the agents and the operating budget;
- No budget for the maintenance and renewal of the equipment (wheelbarrows, shovels, ...).

For the reinforcement of RF2/RF3, the following activities are planned:

- Recruitment of new agents;
- Provision of small equipment and materials (wheelbarrows, shovels, brooms, bins / collection drums, PPE ...);
- Sensitization of the population on the attributions of RF2 to increase household's participation

4.7.3 Establishment of a waste sorting centre

For the valorisation of waste, a sorting centre will be set up at one (1) or two (2) localities of Ivato Fokontany according to the availability of space. RF2/RF3 will take care of the management of this centre:

- Manual sorting of valuable waste;
- Sale of waste and customer search;
- Maintenance of equipment;

Revenue from the sale of waste will be used to replenish the RF2/RF3 's fund to ensure its operation and the sustainability of these activities.

For the establishment of a sorting centre, the following activities need to be carried out:

- Land identification and acquisition;
- Construction / development of an office;
- Arrangement of a manual sorting platform;
- Training of agents responsible for sorting;
- Support of RF2/RF3 in search of outlets / customers;

4.7.4 Analysis of proposals

An analysis of the benefits and constraints associated with the proposed activities is presented in Table 4.10.

Table 4-10 Analysis of proposed activities

Activities	Advantages	Constraints
4- Establishment of Sorting at the source (at the household level)	<ul style="list-style-type: none"> ○ Easy recovery of waste ○ Uncontaminated waste because separated at the source ○ Reduction of waste sent to the landfill ○ 	<ul style="list-style-type: none"> ○ Reluctance of households to sort ○ Need to set up a motivation system ○ Availability of sorting bins. Support for the acquisition of bins
5- Setting up a pre-collection system	<ul style="list-style-type: none"> ○ Existence of operational structure RF2/RF3 in 3 Fokontany ○ Opportunity to employ people with limited resources in Fokontany (job creation) ○ More organized collection at the household level ○ Reduction of municipality costs for transportation of waste to the landfill 	<ul style="list-style-type: none"> ○ Consent to pay households. The recovery rate of RF2 is around 50-60% ○ This rate covers only the operation of the association without maintenance or renewal of equipment ○ Capacity of members to manage the association ○ Inexistence of regulation in the municipality level to enforce the waste management system
6- Establishment of a reusable waste sorting centre	<ul style="list-style-type: none"> ○ Reduction of waste sent to the landfill ○ Reduction of municipality costs for transporting waste to the landfill ○ Source of additional money for RF2 /RF3 ○ Possibility of a return to the household level (motivation) ○ Market creation 	<ul style="list-style-type: none"> ○ Capacity of the association to manage the centre ○ Sustainability of the Centre (no market) ○ Support for the installation and maintenance of materials / equipment ○ Land availability

4.8 Proposal for dumpsite

As the search for land has not yet been completed, the municipality of Ivato has decided to continue to rent the current land as a dumpsite. The main risk for the municipality is the breach of the lease by the owner of the land.

For greater efficiency, the three (3) municipalities (Antehiroka, Talamaty, Ivato) must work together to lobby with relevant ministries for land.

5 Municipality of TALATAMATY

5.1 General information

The Municipality of Talatamaty is located in the Region ANALAMANGA. It is part of the District of AMBOHIDRATRIMO. It is 8 km from Antananarivo city and 4 km from Ivato International Airport, crossed by the national road n ° 4 towards Mahajanga.

Talatamaty is limited by the following municipalities:

- In the North: Ivato;
- In the South: Ambohitrimanjaka;
- In the West: Ambohidratrimo
- In the East: Ivato and Antehiroka

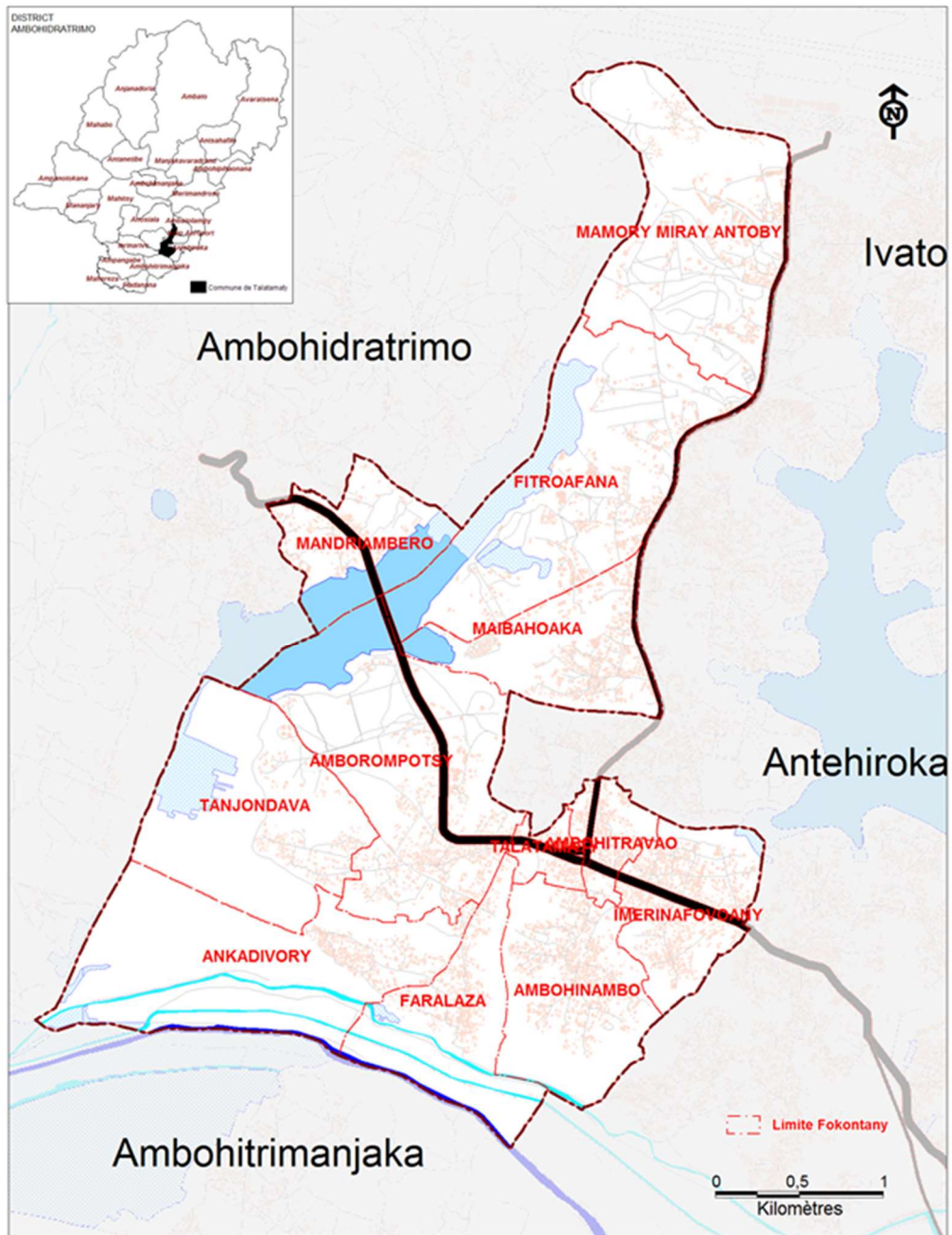
The Municipality of Talatamaty is made up of 12 Fokontany with a total population of 59 799 habitants. The households in the municipality are estimated around 9 967. The average household size is 6 people (*Source: Monographie de la Commune de Talatamaty*),

At the level of the Municipality, on average, 60% to 70% of households are served by a collection system organized either by the Municipality itself through its technical service or individually at the household level itself.

In the waste management system, six (6) Fokontany are served by RF2 which is in charge of pre-collection of waste from household to municipality collecting point.

Talatamaty municipality is around 12.19 Km². The map showing the limit of municipality is presented in the Figure 5.1 and the distribution of population by Fokontany in Table 5.1.

Figure 5-1 Map of Talatamaty municipality



Source: Monographie de la Commune Rurale de Talatamaty -2017

Table 5-1 Distribution of population and households by fokontany in Talatamaty municipality

	Fokontany	Population	Household (Estimation: 6 pers/household)	Number of collecting point	Household deserved by collection system	Household non deserved by collection system
1	Ambohinambo (*)	4190	698	2	60%	40%
2	Ambohitravao (*)	3535	589	1		
3	Amborompotsy	5793	966	-		
4	Ankadivory (*)	3163	527	2		
5	Faralaza (*)	4771	795	2		
6	Fitroafana	2193	366	-		
7	Imerinafovoany (*)	19 549	3 258	1		
8	Maibahoaka	4101	684	-		
9	Mamory Atoby (*)	5061	844	-		
10	Mandriambero	2368	395	-		
11	Talatamaty	2550	425	1		
12	Tanjondava	2525	421	-		
	TOTAL	59 799	9 967			

Source: Monographie de la Commune Rurale de Talatamaty – 2016

() : Fokontany deserved by RF2 for the pre-collection*

5.2 The different types of activities at municipality level

In the Municipality, all activities could be found ranging from small shops and supermarkets to industries mainly textiles transformation. There are some spaces for agriculture in the activities identified at the municipality level.

The table below summarizes these different activities:

Table 5-2 Summary of activities at the Municipality of Talatamaty level

Activités	Types	Localisation	Nombre	Commentaires
Industries	Textile	Talatamaty	4	
	Transformation plastique		2	
	Bois		1	
	Autres : bouton, boulangerie, Briquetterie	All fokontany		
Trade	Banks/Insurance/ Pharmacie/Snack/ Commercial center	All Fokontany		
Market	Sale of local products: vegetables, fruits, meat	Talatamaty	2	
	Type		Occupied surface (ha/a)	
Agriculture	Rice		361	
	Food crops (Maize, Cassava ...)		214	

Source: Monographie de la Commune Rurale de Talatamaty- 2016

5.3 Characterization of waste in Talatamaty municipality

5.3.1 Waste at the household level

To make the typology and quantification of waste at the household level, five (5) Fokontany were chosen by considering the size, the number of the population, the diversity of activities at the household level, the socio-economic situation, the existence of pre-collection system. Among these Fokontany are Ambohinambo, Ambohitrao, Ankadivory, Faralaza and Imerinafovoany. Six (6) households per fokontany were taken as a sample. Garbage bags for sorting different types of waste were distributed and weighed daily and for two days.

Note that the limit of the study is the number of households sampled and the period because the amount generated depends on the season. Nevertheless, it allowed having a global idea of the quantity produced at the level of each household.

The results of household level waste characterization are presented in Appendix 5. The average daily amount of waste generated per household is presented in Table 5.3. If this daily average is returned to all households at the municipality level to obtain an estimation of the annual amount of waste generated, the results are presented in Table 5.4.

Table 5-3 Average daily amount of waste generated per household and by Fokontany in Talatamaty municipality

FOKONTANY	Ankadivory	Faralaza	Ambohinambo	Imerinafovoany	Ambohitravao	Average	%
	(g)	(g)	(g)	(g)	(g)	(g)	
TYPES							
Paper, Cardboard	104,50	26,67	17,50	44,75	174,67	73,62	6,92
Wood	-	-	-	111,25	46,50	31,55	2,96
Plastic	70,00	62,33	36,00	115,50	168,00	90,37	8,49
Glass, Ceramic	-	-	2,33	177,25	183,00	72,52	6,81
Food Waste / Green Waste	476,67	455,50	251,67	208,75	794,67	437,45	41,11
Metals	-	-	22,00	76,00	17,83	23,17	2,18
Textiles, Leather	-	-	7,67	130,00	74,17	42,37	3,98
Rubble	650,67	110,50	123,33	280,50	292,33	291,47	27,39
Particles	-	-	8,50	-	-	1,70	0,16
Other	-	-	-	-	-	-	-
	1 301,83	655,00	469,00	1 144,00	1 751,17	1 064,20	

Source: Household survey- September 2018

Table 5-4 Estimated amount of waste generated annually at the household level in Talatamaty municipality

Types	Households			
	Average amount generated (kg / d)	Total amount generated (Kg / Household / d)	Average amount generated per year (T)	%
Paper, Cardboard	0,07	733,7	267,8	6,92
Wood	0,03	314,5	114,8	2,96
Plastic	0,09	900,7	328,7	8,49
Glass, Ceramic	0,07	722,8	263,8	6,81
Green Waste	0,44	4 360,1	1 591,4	41,11
Metals	0,02	230,9	84,3	2,18
Textiles, Leather	0,04	422,3	154,1	3,98
Rubble	0,29	2 905,0	1 060,3	27,39
Particles	0,00	16,9	6,2	0,16
Other	0,00	-	-	-
TOTAL	1,06	10 606,88	3 871,51	

Note that the estimated amount of waste generated at the household level changes with the seasons and increases during the fruit season (rainy season) while the study was conducted during the dry and cold season.

5.3.2 Waste at the dumpsite

The municipality of Talamaty is in the same situation as Antehiroka municipality. They use the same temporary site that the neighbouring municipality (Ambohidratrimo) leases to them for 3-4 months.

In order to determine the amount of waste collected and transported to the temporary dumpsite, the quart's system is used. It consists in taking the QUART of the truck body and proceeding to sort waste

and weighing of each type. Note that the capacity of truck is around 2 m³ and ¼ of the ¼ was sorted. It is around 0.125m³.

The results of data collection at the dumpsite are presented in the table below:

Table 5-5 Estimated amount of waste collected and transported at Ambohidratrimo temporary dumpsite

LOCALISATION :

DATE :

01/08/2018

ORIGIN:

Mixed : Market and household

TYPES	Quantity (Kg)	%
Paper, Cardboard	7	6,00
Wood	0,815	0,70
Plastic	6,5	5,57
Glass, Ceramic	0	-
Green waste / Food waste	90	77,12
Metals	0	-
Textiles, leather	1,5	1,29
Particles	1,38	1,18
Batteries	0	-
Others (Baby diapers...)	9,5	8,14
TOTAL	116,695	

From these collected data, an estimation of the quantity collected and transported annually at the dumpsite level is presented in Tables 5.6 and 5.7.

Table 5-6 Estimated amount of waste collected and transported at Ambohidratrimo dumpsite

C.2. COLLECTION SYSTEM					
Type of operators :	Public	X	Private		Others
Number of operators :					RF2(Association /Fokontany)
Type of contract :	Direct management				
Trucks (a)/ Tractors (b)/ Autres (c)	Number		Capacity		Trip/day
	2		(4,8 + 8) = 12.8 m3		2 per days
					6 days a week
					153m ³ /week

Table 5-7 Estimated quantity by type of waste collected and transported at Ambohidratrimo temporary dumpsite

Types	Dumpsite (Ambohidratrimo)			
	Quantity collected (Kg /d) (1/16 of truck)	Total quantity collected (Kg / d)	Average amount collected per year (T)	%
Paper, Cardboard	7,0	919,0	286,7	6,00
Wood	0,8	107,0	33,4	0,70
Plastic	6,5	853,3	266,2	5,57
Glass, Ceramic	-	-	-	-
Green waste / Food waste	90,0	11 815,4	3 686,4	77,12
Metals	-	-	-	-
Textiles, leather	1,5	196,9	61,4	1,29
Rubble	1,4	181,2	56,5	1,18
Particles	-	-	-	-
Others (Baby diapers...)	9,5	1 247,2	389,1	8,14
	116,70		4 779,83	

By comparing the estimated amount of waste produced by households with the waste collected and transported at the dumpsite. It can be seen that the quantity of waste transported to the landfill is higher than that estimated by households. Indeed, some of the waste came from the market because they are mixed with the household waste at the collection bin.

If we consider that the households served by a collection system at Talatamaty is about 60%, we could estimate that 60% of these wastes transported to the landfill could come from households.

Note that these data do not include waste generated by industries and economic activities that have their own waste management system (collection, transportation and even private waste).

Furthermore, during the rainy season, the number of trip decrease because of difficulty of access to the site.

5.4 Resources allocated by the municipality for waste management

The budget allocated by the Municipality of Ivato is shown in table below:

Table 5-8 Budget allocated by the municipality for waste management per year

Type	Amount (Ariary)
Fuel	43 680 000
Salaries	22 800 000
Maintenance	3 680 000
TOTAL	70 160 000

Source: Financial service of municipality - 2018

Note that the maintenance of equipment cost is not included on this amount.

The municipality has two (2) trucks with a capacity of 6m³ and 2 m³ for the transport of waste to the dumpsite. In addition, the municipality employs field agents who accompany trucks for the collection of waste.



Two trucks of Talatamaty municipality



5.5 The current system of waste collection at Talatamaty municipality level

Concerning the pre-collection (household to collection points), RF2 (Association responsible for cleaning the sanitation network and waste collection at household level) provide their service for six

(6) fokontany (Ambohinambo, Ambohitrao, Ankadivory, Faralaza, Imerinafovoany, Mamory Atoby). To do this, it proposes a household participation of 500 Ar to 5 000 Ar per month depending of standard of living of the population and their willingness to pay.

The other six (6) fokontany such as Amborompotsy, Fitroafana, Maibahoaka, Mandriambéro, Talatamaty, Tanjondava, they are directly served by the collection system of the municipality.

Globally, 60% of households are deservéd by collection system. The municipality is mainly in charge of the collection of household waste at collection points and the transport to the dumpsite.

For the fokontany deservéd by RF2, there are collecting points located in each Fokontany (see Table 5.1) and the RF2 is in charge of pre-collection from households to these points. For the rest of the Fokontany, waste collection points are more than truck crossing points because there is no infrastructure (waste bin) in place. Their passage at the level of the Fokontany and their frequency are scheduled per day / week at times fixed in advance. The collection is carried out along the main axes of roads.



Collection point at Fokontany of Talatamaty

5.6 Valorisation and recycling of waste at the municipality level

There is no recycling unit at the Talatamaty commune level. Nevertheless, some types of waste such as bones and metals are purchased by buyers. The purchase prices of some types of waste are presented in the table below :

Table 5-9 Purchase prices of some wastes

Type of waste	Unit	Unit Price (Ar)
Metal box	Piece	50
Plastic bottle	Piece	20
Plastics	Kg	300
Metal	Kg	200
Bones	Kg	50

The estimation of waste that can be valorised from the waste generated by households is presented in the table below:

Table 5-10 Estimation of the amount of household waste that can be valorised

VALORISABLES	QUANTITY (T/year)
Paper	267,8
Wood	114,8
Plastic	328,7
Glass, ceramic	263,8
Green waste/Putrescible	1 591,4
Metals	84,3
Textiles, leather	154,1

5.7 The municipality dumpsite

5.7.1 General information

As mentioned in paragraph 5.3.2, Talamaty municipality don't have a land to dump their wastes. The municipality of Talatamaty has negotiated with Ambohidratrimo the same site that Antehiroka asked to temporarily dispose of its waste.



Temporary dumpsite used by Talatamaty and Antehiroka



5.7.2 Problems encountered and actions taken

The main problem for Talamaty municipality is same as Antehiroka (see 3.7.2). They are obliged to negotiate with neighboring municipalities by leasing lands. For them, it is a temporary solution and they need to discuss with Antehiroka and Ivato municipalities to think about more sustainable solution.

5.8 Proposal for a waste collection system for Talatamaty municipality

The main objectives of the project on the promotion of BEPs and BAT to reduce releases of uPOPs from open burning of waste are:

- Reduce waste to be sent to the landfill by valuing the waste that is generated at the household level;
- Put in place the BEP and BAT for waste treatment to avoid open burning

The direct consequence at the municipality level is the reduction of waste management costs as there will be a reduction in the cost of collection and transportation.

To do this, sorting at the source (at the household level) coupled with a waste recovery process will be proposed upstream of the management system. In addition, downstream of the management system, facilities to prevent burning at the disposal site will be considered.

In order to set up a new waste collection system, three (4) Fokontany were chosen. Among the selection criteria of Fokontany are:

- The existence of operational system of pre-collection
- The interest displayed by households in sorting (assessed during characterization of waste in households);
- The existence of space to develop waste sorting centre

The Fokontany chosen are: Ambohinambo, Ambohitravao, Ankadivory and Faralaza

5.8.1 Establishment of sorting at the source (at the household level)

Currently, household waste is mixed and brought to collection points (garbage bins, wild dumps) by themselves. The objective of the proposed activity is to get households to make a SORTING at source of their waste to facilitate their valorisation.

Three (3) types of bins will be proposed to households:

- A bin for compostable waste: putrescible food waste and green waste
- A bin for other valuable / recyclable waste: plastics, glasses, metals, fabrics, leathers
- A bin for non-valuable

To do this, an awareness campaign and the household endowment of small bins for sorting are necessary.

5.8.2 Reinforce the existing pre-collection system

As mentioned in paragraph 4.5, pre-collection of household waste to collection points is provided by RF2 (Association responsible for cleaning the sanitation network and waste collection at household level) depending on the Fokontany.

The willingness to pay of households varies according to their standard of living. The amount varies from 500 Ar to 5 000 Ar per month.

Pre-collection system dealing with the recovery of sorted waste at the household level, their transfer to the collection points of the municipality, the sorting of waste for recovery / recycling with a participation per household.

The main problems that RF2 faced are the following:

- the recovery rate is around 40% and don't exceed 60% and this amount is mainly used for the salaries of the agents and the operating budget;
- No budget for the maintenance and renewal of the equipment (wheelbarrows, shovels, ...).

For the reinforcement of RF2, the following activities are planned:

- Recruitment of new agents;
- Provision of small equipment and materials (wheelbarrows, shovels, brooms, bins / collection drums, PPE ...);
- Sensitization of the population on the attributions of RF2 to increase the amount of household's participation

5.8.3 Establishment of a waste sorting centre

For the valorisation of waste, a sorting centre will be set up at Fokontany level according to the availability of space. RF2 will take care of the management of this centre:

- Manual sorting of valuable waste;
- Sale of waste and customer search;
- Maintenance of equipment;

Revenue from the sale of waste will be used to replenish the RF2's fund to ensure its operation and the sustainability of these activities.

For the establishment of a sorting centre, the following activities need to be carried out:

- Land identification and acquisition;
- Construction / development of an office;
- Arrangement of a manual sorting platform;
- Training of agents responsible for sorting;
- Support of RF2 in search of outlets / customers;

5.8.4 Analysis of proposals

An analysis of the benefits and constraints associated with the proposed activities is presented in Table 4.10.

Table 5-11 Analysis of proposed activities

Activities	Advantages	Constraints
7- Establishment of Sorting at the source (at the household level)	<ul style="list-style-type: none"> ○ Easy recovery of waste ○ Uncontaminated waste because separated at the source ○ Reduction of waste sent to the landfill ○ 	<ul style="list-style-type: none"> ○ Reluctance of households to sort ○ Need to set up a motivation system ○ Availability of sorting bins. Support for the acquisition of bins
8- Setting up a pre-collection system	<ul style="list-style-type: none"> ○ Existence of operational structure RF2 in 6 Fokontany ○ Opportunity to employ people with limited resources in Fokontany (job creation) ○ More organized collection at the household level ○ Reduction of municipality costs for transportation of waste to the landfill 	<ul style="list-style-type: none"> ○ Consent to pay households. The recovery rate of RF2 is around 40% ○ This rate covers only the operation of the association without maintenance or renewal of equipment ○ Capacity of members to manage the association ○ Inexistence of regulation in the municipality level to enforce the waste management system
9- Establishment of a reusable waste sorting centre	<ul style="list-style-type: none"> ○ Reduction of waste sent to the landfill ○ Reduction of municipality costs for transporting waste to the landfill ○ Source of additional money for RF2 ○ Possibility of a return to the household level (motivation) ○ Market creation 	<ul style="list-style-type: none"> ○ Capacity of the association to manage the centre ○ Sustainability of the Centre (no market) ○ Support for the installation and maintenance of materials / equipment ○ Land availability

5.9 Proposal for dumpsite

For greater efficiency, the three (3) municipalities (Antehiroka, Talamaty, Ivato) must work together to lobby with relevant ministries for land.

6 Proposed short term action plan

The short-term action plan presented in Table 6.1 could be proposed to each municipality. The points that will differentiate them concern:

- actors / stakeholders;
- the Fokontany chosen for the implementation;
- the needs and supports that the project could provide.

With regard to the landfill, the three municipalities are proposed to seek a more sustainable and viable common solution.

Table 6-1 Proposed short term action pla

Municipality	Main activities	Action	Responsible	MONTHS						
				M1	M2	M3	M4	M5	M6	
EACH MUNICIPALITY	1. Establishment of sorting at source	1.1. Identify needs	Municipality	■						
		1.2. Awareness campaign	Municipality/RF2/Project	■	■	■	■	■	■	■
		1.3. Endowment of small bins (households)	Municipality/Project			■				
	2. Reinforce the existing pre-collection system	2.1. Identification of RF2 needs	RF2/Municipality	■	■					
		2.2. Maintenance of equipments	RF2/Project		■					
		2.3. Provision of small equipment and materials	Municipality/Project			■				
		2.4. Campaign of sensitization to increase the recovery	Municipality/RF2/Project	■	■	■	■	■	■	■
	3. Establishment of waste sorting centre	3.1. Site identification/ Contract with owners,...	Municipality/RF2	■						
		3.2. Construction of infrastructure (platform,...)	Municipality/RF2/Project		■	■	■			
		3.3. Training of agents responsible for sorting	Municipality/Project			■	■			
		3.4. Equipment allocation	Municipality/Project				■	■		
		3.5. Support of RF2 to find customers/buyers	Municipality/Project		■	■	■	■	■	■
Antehiroka- Talatamaty-Ivato	4. Landfill site	4.1. Identification of land	Municipalities	■	■	■				
		4.2. Negotiation and agreement	Municipalities			■	■			
		4.3. Faisability study	Municipalities/Project				■	■	■	
		4.4. Developement of Construction plan	Municipalities/Project				■	■	■	

7 Conclusion

This report on the inventory and assessment of waste management information in the Municipalities of Antehiroka, Ivato and Talatamaty as part of the promotion of BEP / BAT to reduce emissions from uPOPs from open burning of waste is far from complete.

Overall, the establishment of an upstream waste management system (pre-collection, collection, sorting center, transport) could be envisaged at the level of these municipalities, taking into account the various information mentioned in the report. On the other hand, the common problem of the three municipalities is the availability of land for the establishment of a landfill site. They should join together to discuss this with the relevant authorities and find a sustainable solution.

BIBLIOGRAPHY

- Commune Rurale d'Ivato, 2017, Monographie
- Commune Rurale Talamaty, 2016, Monographie

APPENDICES

Appendix 1: List of people contacted

LOCALITY	Surname and Names	Entity	Title/Responsability	Contact Information
ANTEHIROKA	RAZAKANDRAINY François Xavier	CR Antehiroka	Maire	
	RAKOTOARIMANANA Justin	CR Antehiroka	1er Adjoint au Maire	033 11 542 61
	ANDRIANARISON Ferdinand Harintsoa	CR Antehiroka	Technicien de Mairie Assistant au Maire Chargé de Développement et de l'Urbanisme	034 70 074 98 fehandrianarison@gmail.com
	RAKOTOMAMONJY Zacharias	CR Antehiroka	Responsable Technique Service Technique	034 29 212 35
	RAKOTONDRAMANANA Jacob	CR Antehiroka	Responsable Problèmes Fonciers Service Technique	034 04 002 38
IVATO	RAKOTOSOLO Albert Clément	CR IVATO	2 ^{ème} Adjoint au Maire	033 04 129 97
	RAZAFIMAHERY Niaina	CR IVATO	Voirie	034 45 359 33
	ANDRIAMARO Robson Jocelyn	CR IVATO	Fkt/RF2 Mandrosoa	034 12 541 46
	RAZANAKOLONINDRINA Marka	CR IVATO	Fkt/RF2 Ambodirana	034 15 985 28
	RAKOTOMAROARIVONY Mitamirija	CR IVATO	Fkt/RF2 Tanambao	034 25 703 50
	RANDRIANASOLO Flavien	CR IVATO	Fkt/RF2 Ilaivola	034 06 463 40
	RAKOTOARIMANGA Norbert	CR IVATO	Fkt Ivato Aéroport	034 77 914 79
	RANAIVO Jones Jean	CR IVATO	Fkt Mandrosoa	034 04 371 65
	TRINH CAO HAI Jean Fidèle	CR IVATO	Fkt Ivato	033 12 974 44

LOCALITY	Surname and Names	Entity	Title/Responsability	Contact Information
	RANDRIAMAHAVELONA Félix	CR IVATO	Fkt Ambodirano	033 62 598 90
TALATAMATY	RAZAFINDRATSIMBA Dieu Donné Adrien	CR Talatamaty	Maire	034 01 576 83 Rado.razafindratsimba@gmail.com
	RABIBISOA Andoniaina	CR Talatamaty	Secrétaire Général	034 12 141 69
	RAKOTONDRAIBE Honoré	CR Talatamaty	Voirie	034 69 365 19
ENDA OI	RAZAFINJATO Norolalaina Fabienne	Enda Océan Indien	Coordonatrice du Projet Assainissement	032 11 775 50 adqua@enda.mg
	Antsa	Enda Océan Indien	Responsable RF2 Antehiroka	034 11 811 38

**Appendix 2: Quantification Results of Waste at the Level
of 6 Fokontany in Antehiroka**

FOKONTANY :

ANTSANKAMBAHINY

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	105	53	76	38		-		-
Bois		-		-		-		-
Plastique	46	23	81	41		-		-
Verre, Céramique		-		-		-		-
Déch Alim/Déch verts	520	260	616	308		-		-
Métaux		-	25	13		-		-
Textiles, Cuir		-	-	-		-		-
Gravats	800	400	849	425		-		-
Particules	-	-		-		-		-
Autres		-		-		-		-

FOKONTANY :

AMBOHIBAO

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	-	-	103	52	23	12	30	15
Bois	-	-	-	-	-	-	-	-
Plastique	418	209	289	145	182	91	155	78
Verre, Céramique	-	-	-	-	-	-	-	-
Déch Alim/Déch verts	8	4	1 450	725	2 500	1 250	-	-
Métaux	-	-	-	-	-	-	-	-
Textiles, Cuir	-	-	-	-	-	-	49	25
Gravats	5	2	-	-	50	25	-	-
Particules	-	-	-	-	-	-	-	-
Autres	-	-	-	-	-	-	-	-

FOKONTANY :

ANTALAMOHITRA

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	288	144	47	24	57	29		-
Bois	15	8	-	-	-	-		-
Plastique	228	114	49	25	60	30		-
Verre, Céramique	-	-	221	111	-	-		-
Déch Alim/Déch verts	812	406	2 455	1 228	1 704	852		-
Métaux	-	-	-	-	-	-		-
Textiles, Cuir	53	27	16	8	22	11		-
Gravats	156	78	99	50	-	-		-
Particules	-	-	-	-	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY :

AMBOHIJANAHARY

MENAGE :	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	171	86	259	130		-		-
Bois	-	-	468	234		-		-
Plastique	182	91	458	229		-		-
Verre, Céramique	-	-	50	25		-		-
Déch Alim/Déch verts	-	-	-	-		-		-
Métaux	-	-	259	130		-		-
Textiles, Cuir	46	23	-	-		-		-
Gravats	-	-	2 649	1 325		-		-
Particules	-	-	-	-		-		-
Autres	-	-	-	-		-		-

FOKONTANY :

MORONDAVA

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	12	6	15	8	-	-		-
Bois	-	-	8	4	567	284		-
Plastique	50	25	53	27	558	279		-
Verre, Céramique	-	-	32	16	-	-		-
Déch Alim/Déch verts	-	-	3 078	1 539	-	-		-
Métaux	-	-	-	-	71	36		-
Textiles, Cuir	-	-	-	-	-	-		-
Gravats	-	-	-	-	1 673	837		-
Particules	-	-	60	30	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY :

AMBOAROY

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	54	27	77	39		-		-
Bois	-	-	-	-		-		-
Plastique	16	8	105	53		-		-
Verre, Céramique	-	-	273	137		-		-
Déch Alim/Déch verts	836	418	-	-		-		-
Métaux	-	-	132	66		-		-
Textiles, Cuir	-	-	-	-		-		-
Gravats	-	-	-	-		-		-
Particules	26	13	-	-		-		-
Autres	-	-	-	-		-		-

FOKONTANY :

ANTANETIBE

MENAGE :	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	25/07/2018		25/07/2018		25/07/2018		25/07/2018	
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)
TYPES								
Papier, Carton	18	9	76	38	-	-	-	-
Bois		-	-	-	-	-	-	-
Plastique	9	5	398	199	-	-	-	-
Verre, Céramique	-	-	-	-	-	-	-	-
Déch Alim/Déch verts	477	239	660	330	1 980	990	-	-
Métaux	-	-	37	19	-	-	-	-
Textiles, Cuir	-	-	-	-	-	-	-	-
Gravats	50	25	59	30	84	42	-	-
Particules	-	-	-	-	-	-	-	-
Autres		-	-	-	-	-	-	-

FOKONTANY	ANTSANKAMBAHINY	AMBOHIBAO	ANTALAMOHIRA	AMBOAROY	AMBOHJANAHARY	MORONDAVA	ANTANETIBE	Moyenne	%	Moyenne (Kg)
TYPES										
Papier, Carton	45,25	19,50	65,33	32,75	107,50	9,00	31,33	44,38	4,53	0,04
Bois	-	-	2,50	-	117,00	97,17	-	30,95	3,16	0,03
Plastique	31,75	130,50	56,17	30,25	160,00	127,33	135,67	95,95	9,79	0,10
Verre, Céramique	-	-	36,83	68,25	12,50	10,67	-	18,32	1,87	0,02
Déch Alim/Déch verts	284,00	494,75	828,50	209,00	-	1 026,00	1 039,00	554,46	56,55	0,55
Métaux	6,25	-	-	33,00	64,75	11,83	12,33	18,31	1,87	0,02
Textiles, Cuir	-	6,13	15,17	-	11,50	-	-	4,68	0,48	0,00
Gravats	412,25	6,81	42,50	-	662,25	278,83	64,33	209,57	21,38	0,21
Particules	-	-	-	6,50	-	20,00	-	3,79	0,39	0,00
Autres	-	-	-	-	-	-	-	-	-	-
	779,50	657,68	1 047,00	379,75	1 135,50	1 580,83	1 282,67	980,42		0,98

Appendix 3: Information about SMTP activities

* * * *

RECUEIL D'INFORMATIONS RELATIVES AU RECYCLAGE ET VALORISATION DES DECHETS

A- INFORMATIONS GENERALES

Nom de l'établissement : SMT P

Adresse : Lot 01 - A. Ambuhubao

Localisation : Antananarivo

Statut juridique : EI SA SARL Autres _____

Principales activités : Transformation et vente de produits en plastique.

Nom du responsable : Fanantohana RANAROSON

Contact téléphonique/e-mail : 0341167280

Brève description du processus (principales étapes) : Collecte - Triage
Broyage
Nettoyage - Séchage
Extrusion - Co-extrusion
Granulation

Capacité de production : 250 kg/jour.

Matières recyclables utilisées : LDPE FILM.

**Appendix 4: Quantification Results of Waste at the Level
of 5 Fokontany in Ivato**

FOKONTANY :

IVATO

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	27/07/2018		27/07/2018		27/07/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	65	33	399	200	-	-		-
Bois	77	39	408	204	-	-		-
Plastique	91	46	-	-	700	350		-
Verre, Céramique	-	-	480	240	-	-		-
Déch Alim/Déch verts	2 387	1 194	1 228	614	2 771	1 386		-
Métaux	-	-	-	-	-	-		-
Textiles, Cuir	-	-	530	265	-	-		-
Gravats	1 165	583	3 500	1 750	6 500	3 250		-
Particules	-	-	-	-	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY :

AMBODIRANO

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>	5	5	4	
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	27/07/2018		27/07/2018		27/07/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	85	43	72	36	37	19		-
Bois	-	-	120	60	-	-		-
Plastique	253	127	-	-	73	37		-
Verre, Céramique	418	209	-	-	-	-		-
Déch Alim/Déch verts	1 768	884	391	196	371	186		-
Métaux	-	-	-	-	-	-		-
Textiles, Cuir	194	97	19	10	-	-		-
Gravats	371	186	440	220	80	40		-
Particules	-	-	-	-	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY :

ILAIVOLA

MENAGE :	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	27/07/2018		27/07/2018		27/07/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	31	16	21	11	-	-		-
Bois	139	70	-	-	-	-		-
Plastique	92	46	43	22	74	37		-
Verre, Céramique	-	-	-	-	-	-		-
Déch Alim/Déch verts	-	-	-	-	-	-		-
Métaux	-	-	-	-	-	-		-
Textiles, Cuir	11	6	-	-	-	-		-
Gravats	539	270	271	136	278	139		-
Particules	-	-	-	-	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY :

ANTANAMBAO

<u>MENAGE :</u>	1	2	3	4
<u>Nombre de personnes/ ménage</u>	5			
<u>Adresse :</u>				
<u>Activité du ménage :</u>			Epicerie	

Date	27/07/2018		27/07/2018		27/07/2018		Qtte 2j (gr)	Qtte (J/gr)
	Qtte 2j (gr)	Qtte (J/gr)	Qtte 2j (gr)	Qtte (J/gr)	Qtte 2j (gr)	Qtte (J/gr)		
TYPES								
Papier, Carton	30	15	469	235	111	56		-
Bois	-	-	-	-	-	-		-
Plastique	99	50	1 164	582	80	40		-
Verre, Céramique	-	-	-	-	-	-		-
Déch Alim/Déch verts	698	349	952	476	-	-		-
Métaux	-	-	-	-	-	-		-
Textiles, Cuir	135	68	-	-	-	-		-
Gravats	119	60	-	-	-	-		-
Particules	-	-	-	-	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY :

MANDROSOA

MENAGE :	1	2	3	4
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	27/07/2018		27/07/2018		27/07/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	412	206	33	17	52	26		-
Bois	57	29	380	190	-	-		-
Plastique	427	214	166	83	288	144		-
Verre, Céramique	99	50	22	11	-	-		-
Déch Alim/Déch verts	521	261	-	-	263	132		-
Métaux	141	71	219	110	277	139		-
Textiles, Cuir	-	-	421	211	-	-		-
Gravats	810	405	537	269	2 247	1 124		-
Particules	-	-	-	-	-	-		-
Autres	-	-	-	-	-	-		-

FOKONTANY	IVATO	AMBODIRANO	ILAIVOLA	ANTANAMBAO	MANDROSOA	Moyenne	%
TYPES							
Papier, Carton	77,33	32,33	8,67	106,67	82,83	61,57	6,54
Bois	80,83	20,00	23,17	-	72,83	39,37	4,18
Plastique	131,83	54,33	34,83	240,33	146,83	121,63	12,92
Verre, Céramique	80,00	69,67	-	-	20,17	33,97	3,61
Déch Alim/Déch verts	1 064,33	421,67	-	391,33	130,67	401,60	42,67
Métaux	-	-	-	-	106,17	21,23	2,26
Textiles, Cuir	88,33	35,50	1,83	45,00	70,17	48,17	5,12
Gravats	100,00	148,50	181,33	39,67	599,00	213,70	22,70
Particules	-	-	-	-		-	-
Autres	-	-	-	-	-	-	-
	1 622,67	782,00	249,83	823,00	1 228,67	941,23	

**Appendix 4: Quantification Results of Waste at the Level
of 5 Fokontany in Talatamaty**

FOKONTANY :

ANKADIVORY

MENAGE :	1	2	3	
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	08/08/2018		08/08/2018		08/08/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton		-	27	14	600	300		-
Bois		-		-		-		-
Plastique	35	18	98	49	287	144		-
Verre, Céramique		-		-		-		-
Déch Alim/Déch verts	12	6	348	174	2 500	1 250		-
Métaux		-		-		-		-
Textiles, Cuir		-		-		-		-
Gravats	239	120	49	25	3 616	1 808		-
Particules		-		-		-		-
Autres		-		-		-		-

FOKONTANY :

FARALAZA

MENAGE :	1	2	3	
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	08/08/2018		08/08/2018		08/08/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	52	26	49	25	59	30		-
Bois		-		-		-		-
Plastique	56	28	29	15	289	145		-
Verre, Céramique		-		-		-		-
Déch Alim/Déch verts	223	112	1 185	593	1 325	663		-
Métaux		-		-		-		-
Textiles, Cuir		-		-		-		-
Gravats		-	663	332		-		-
Particules		-		-		-		-
Autres		-		-		-		-

FOKONTANY :

AMBOHINAMBO

MENAGE :	1	2	3	
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	08/08/2018		08/08/2018		08/08/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	94	47	-	-	11	6		-
Bois		-	-	-	-	-		-
Plastique	186	93	-	-	30	15		-
Verre, Céramique	14	7	-	-	-	-		-
Déch Alim/Déch verts	1 510	755	-	-	-	-		-
Métaux	132	66	-	-	-	-		-
Textiles, Cuir	46	23	-	-	-	-		-
Gravats	740	370	-	-	-	-		-
Particules		-	23	12	28	14		-
Autres		-		-		-		-

FOKONTANY :

IMERINAFOVOANY

MENAGE :	1	2	3	
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	08/08/2018		08/08/2018		08/08/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	133	67	46	23		-		-
Bois		-	445	223		-		-
Plastique	268	134	194	97		-		-
Verre, Céramique	709	355	-	-		-		-
Déch Alim/Déch verts	714	357	121	61		-		-
Métaux	182	91	122	61		-		-
Textiles, Cuir	361	181	159	80		-		-
Gravats	193	97	929	465		-		-
Particules		-		-		-		-
Autres		-		-		-		-

FOKONTANY :

AMBOHITRAVAO

MENAGE :	1	2	3	
<u>Nombre de personnes/ ménage</u>				
<u>Adresse :</u>				
<u>Activité du ménage :</u>				

Date	08/08/2018		08/08/2018		08/08/2018		Qtté 2j (gr)	Qtté (J/gr)
	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)	Qtté 2j (gr)	Qtté (J/gr)		
TYPES								
Papier, Carton	363	182	244	122	441	221		-
Bois	215	108	-	-	64	32		-
Plastique	281	141	727	364	-	-		-
Verre, Céramique		-	-	-	1 098	549		-
Déch Alim/Déch verts	58	29	2 777	1 389	1 933	967		-
Métaux	107	54	-	-	-	-		-
Textiles, Cuir	351	176	-	-	94	47		-
Gravats	146	73	1 393	697	215	108		-
Particules		-		-		-		-
Autres		-		-		-		-

FOKONTANY	Ankadivory	Faralaza	Ambohinambo	Imerinafovoany	Ambohitra	Moyenne	%
TYPES							
Papier, Carton	104,50	26,67	17,50	44,75	174,67	73,62	6,92
Bois	-	-	-	111,25	46,50	31,55	2,96
Plastique	70,00	62,33	36,00	115,50	168,00	90,37	8,49
Verre, Céramique	-	-	2,33	177,25	183,00	72,52	6,81
Déch Alim/Déch verts	476,67	455,50	251,67	208,75	794,67	437,45	41,11
Métaux	-	-	22,00	76,00	17,83	23,17	2,18
Textiles, Cuir	-	-	7,67	130,00	74,17	42,37	3,98
Gravats	650,67	110,50	123,33	280,50	292,33	291,47	27,39
Particules	-	-	8,50	-	-	1,70	0,16
Autres	-	-	-	-	-	-	-
	1 301,83	655,00	469,00	1 144,00	1 751,17	1 064,20	