



GEF-6 PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
 TYPE OF TRUST FUND: GEF Trust Fund

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PART I: PROJECT INFORMATION

Project Title:	Promotion of waste to energy options for sustainable urban management in the Democratic Republic of the Congo		
Country(ies):	Democratic Republic of the Congo	GEF Project ID: ¹	9683
GEF Agency(ies):	UNIDO	GEF Agency Project ID:	150127
Other Executing Partner(s):	1. Ministry of Industry and SMEs 2. Ministry of Energy and Water Resources 3. City provincial government of Kinshasa 4. Sanitation Board and Public Works - Kinshasa	Submission Date:	11/18/2016
		Resubmission Date:	12/23/2016
GEF Focal Area(s):	Climate Change	Project Duration(Months)	48
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP <input type="checkbox"/>	
Name of parent program:	NA	Agency Fee (\$)	376,161

A. INDICATIVE FOCAL²

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(In \$)	
		GEF Project Financing	Co-financing
CCM – 1 Promote Innovation, Technology Transfer and Supportive Policies and Strategies	GEFTF	3,959,589	15,992,400
Total Project Cost		3,959,589	15,992,400

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: To promote waste to energy technologies for sustainable waste management in the Democratic Republic of the Congo						
Project Components	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(In \$)	
					GEF Project Financing	Co-financing
1. Policy and regulation formulation	TA	1.1. Strengthened policy and regulatory environment	1.1.1. Municipal solid waste (MSW) management strategy report prepared 1.1.2. Policy drafted for the consideration of the Government	GEFTF	150,000	120,000
2. Establishment of sustainable waste collection system	TA	2.1 Development of efficient waste collection infrastructure	2.1.1. Existing waste collection process assessed and bottlenecks identified	GEFTF	80,000	200,000
	Inv		2.1.2. Efficient waste collection infrastructure deployed in 24 communes of Kinshasa city	GEFTF	500,000	5,300,000
3. Demonstration of municipal waste to	TA	3.1. Waste to energy (WTE) technologies	3.1.1. Effective system operationalized for municipal waste sorting,	GEFTF	100,000	200,000

¹ Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#) and [CBIT guidelines](#).

³ Financing type can be either investment or technical assistance.

energy recovery technologies	Inv	implemented	handling, recycling and disposal at Mpsa site			
			3.1.2. 2 MW landfill gas (LFG) based power plant at existing landfill installed at Mpsa site	GEFTF	2,467,038	9,128,400
			3.1.3. 1MW biomethanisation power plant from the segregated organic waste installed at Mpsa site			
			3.1.4. 300 tons per day (tpd) refuse derived fuel (RDF) processing plant developed along with other material recovery options at Mpsa site			
4.Replication and scale up	TA	4.1. Potential for replication assessed	4.1.1. Country wide study conducted on waste generation, WTE potential and business opportunities for replication projects	GEFTF	290,000	200,000
		4.2. Strengthened capacity of relevant stakeholders including institutions	4.2.1. Workshops for relevant stakeholders 4.2.2. Sharing of the best practices from other countries on MSW management, energy recovery and recycling	GEFTF	104,000	300,000
5. Monitoring & Evaluation	TA	5.1. Effectiveness of the outputs assessed, corrective actions taken and experience documented	5.1.1. Mid-term review report prepared 5.1.2. End of project evaluation report prepared	GEFTF	80,000	120,000
Subtotal					3,771,038	15,568,400
Project Management Cost (PMC) ⁴				GEFTF	188,551	424,000
Total Project Cost					3,959,589	15,992,400

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ()

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
Recipient Government	Ministry of Industry and SMEs	Grants	5,000,000
Private Sector	Fond de Promotion de l'Industrie (FPI)	Grants	10,818,400
GEF Agency	UNIDO	Grants	84,000
GEF Agency	UNIDO	In-kind	90,000
Total Co-financing			15,992,400

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES), FOCAL AREA AND THE PROGRAMMING OF FUNDS^{a)}

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) ^{b)}	Total (c)=a+b
UNIDO	GEFTF	Democratic Republic of Congo	Climate Change	NA	3,959,589	376,161	4,335,750
Total GEF Resources					3,959,589	376,161	4,335,750

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

E. PROJECT PREPARATION GRANT (PPG)⁵

Is Project Preparation Grant requested? Yes No If no, skip item E.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: \$150,000					PPG Agency Fee: \$14,250		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee ⁶ (b)	Total c = a + b
UNIDO	GEF TF	Democratic Republic of Congo	Climate Change	NA	150,000	14,250	164,250
Total PPG Amount					150,000	14,250	164,250

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁷

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	<i>Hectares</i>
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	<i>Hectares</i>
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	<i>Number of freshwater basins</i>
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	<i>Percent of fisheries, by volume</i>
4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	<i>5,796,250 metric tons (direct – 2,484,107 tons and indirect – 3,312,143 tons)</i>
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	<i>metric tons</i>
	Reduction of 1000 tons of Mercury	<i>metric tons</i>

⁵ PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

⁶ PPG fee percentage follows the percentage of the Agency fee over the GEF Project Financing amount requested.

⁷ Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF, SCCF or CBIT.

Corporate Results	Replenishment Targets	Project Targets
concern	Phase-out of 303.44 tons of ODP (HCFC)	<i>ODP tons</i>
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	<i>Number of Countries:</i>
	Functional environmental information systems are implemented to support decision-making in at least 10 countries	<i>Number of Countries:</i>

PART II: PROJECT JUSTIFICATION

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area⁸ strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, CBIT and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or adaptation (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

1.1. Global Environmental Problems, Root Causes and Barriers

Globally around 1.3 billion tons of solid waste is generated per year and it is expected to increase to around 2.2 billion tons by 2025⁹. If the solid wastes are not managed properly, decomposition and putrefaction may take place, causing land and water pollution when the waste products percolate down into the underground water resources. Basic human needs such as clean water, clean air and safe food are jeopardized by improper waste management practices, with severe consequences for public health. The impact on the environment due to air, water and soil pollutions and associated health risks ultimately impact the economic sustainability of a nation. The practice of disposing solid waste indiscriminately has a price to pay in terms of collection, transport and disposal costs and loss of valuable raw materials (recyclables, reusable and repairable). Global solid waste management costs are expected to increase from today's annual expenditure of USD 205.4 billion to about USD 375.5 billion in 2025¹⁰. Cost increases will be most severe in low income countries. Developed countries spend around USD 120 billion per year on municipal solid waste management. In the developing countries, around 50% of their budget is spent on solid waste management, though they cover only 50% of their population. In the least developed countries, around 80% of the solid waste management budget is spent just in waste collection itself and only the remaining is spent on effective disposal methods¹¹.

Sub-Saharan Africa today is in the midst of a dramatic urban transition. Between 2010 and 2035, the urban population in the region is expected to more than double from approximately 298 million to 697 million¹². The growing urban population also brings in several challenges; effective solid waste management being one among them. According to World Bank 2012 report¹³, the global average per capita waste generation per day was 1.2 kg (2012). This is likely to increase to 1.42 kg/per capita/day by 2025. Waste collection efficiency in urban areas in many of the African countries remains low compared to developing countries. In 2009, this efficiency ranged from 27% to 87%¹⁴. By 2020 more than 50 per cent of the population in Sub-Saharan Africa will be living in cities. This is likely to raise the daily rate of production of waste by as much as 1.0 kg per capita per day¹⁵.

⁸ For biodiversity projects, in addition to explaining the project's consistency with the biodiversity focal area strategy, objectives and programs, please also describe which [Aichi Target\(s\)](#) the project will directly contribute to achieving.

⁹ What a waste: A global review of solid waste management (2012), The World Bank

¹⁰ What a waste: A global review of solid waste management (2012), The World Bank

¹¹ http://81.47.175.201/flagship/attachments/UNEP_Waste.pdf

¹² http://www.europarl.europa.eu/intcoop/acp/2014_mauritius/pdf/un_habitat_presentation_en.pdf

¹³ What a Waste: A global review of Solid Waste Management (2012)

¹⁴ Planning Municipal Solid Waste Management in Africa: Case Study of Matadi - The DRC, April 2012

¹⁵ Future-Directions-of-Municipal-Solid-waste-Management-in-Africa.pdf

The Democratic Republic of the Congo (DRC) is one of the Sub-Saharan countries, located in Central Africa. It is the second largest country by area in Africa with a population of nearly 81 million (2015)¹⁶. The DRC is extremely rich in natural resources. However, political instability in the recent past, lack of infrastructure, unsustainable extraction and exploitation of natural resources, etc., have limited its holistic development. As of 2015, UNDP Human Development Index (HDI), indicated a ranking of 176 out of 187 countries for DRC¹⁷. The Gross Domestic Product is around USD 500 per capita (2016)¹⁸.

The DRC also faces several challenges in the municipal solid waste (MSW) management sector. Rapid urbanization and population growth has led to vast solid waste generation every day. Total municipal solid waste generation in the country was at 4.55 million tons in 2010¹⁹. The waste generation per capita was 0.50 kg/capita/day in 2012 and is projected to increase to 0.75 kg/capita/day by 2025. The country has not yet developed sufficient regulatory and institutional environment policies to tackle the growing need for MSW management in its cities.

Thus accumulation of solid waste leads to a visible effect of local environmental degradation negatively impacting the sanitation quality in all of the DRC cities. Unmanaged solid waste disposal causes serious local environmental and health problems such as fire and explosion accidents, pollution of surrounding air and waters, and outbreaks of pests and infections. According to WHO estimates (2012), there were more than 150,000 annual deaths in DRC due to diarrhoea caused by polluted water/bad hygiene (67%), indoor air pollution (31%) and outdoor air pollution (2%)²⁰. The common prevalence of parasites like tetanus, malaria, hookworm, cholera and diarrhoea, in the province of Kinshasa is attributed to the unsanitary conditions and illegal dumping of solid wastes²¹. Most people are not aware of the fact that most of above health issues arise or aggravate under unhygienic conditions of improper waste disposal.

The unsolved problem of MSW along with other human activities has caused environmental damage to the Congo River, the second largest river in the world after the Amazon River in terms of the size of its drainage and water discharge. Different types of municipal wastes like plastics, papers, glass bottles, cans, etc., are thrown indiscriminately into the river. The river has become a severe threat to freshwater streams in the DRC. The Bitshakutshaku²² river passing through the peri-urban region of Kinshasa, has become a dumping site for every form of wastes. This river, a major tributary of the Congo river has lost its serenity due to poor maintenance and lack of waste management in the county.

Barriers

Some of the barriers²³ faced by the Government of DRC and the local authorities at all levels of waste management are: (i) Inadequate planning on future waste generation trends and capacity requirements; (ii) Lack of regulatory and support environment for developing knowledge, infrastructure and resources; (iii) Financial constraints of government agencies; (iv) Bureaucratic confusion and delays due to unclear responsibilities among the government agencies; (v) Inadequate environmental awareness and education at all stakeholder levels; (vi) Lack of skilled workforces; (vii) Absence of effective public private partnerships and (viii) Limited awareness on health risks caused by improper waste disposal

It is also noted here that only 40 percent of the funding necessary to meet the DRC's water and sanitation goals is available through planned public investments each year. Such a large funding gap can only be alleviated by bilateral and multi-lateral donors²⁴. The proposed project will try to address most of the above discussed barriers.

¹⁶https://en.wikipedia.org/wiki/Democratic_Republic_of_the_Congo

¹⁷https://en.wikipedia.org/wiki/List_of_countries_by_Human_Development_Index

¹⁸https://en.wikipedia.org/wiki/Democratic_Republic_of_the_Congo

¹⁹http://unfccc.int/essential_background/library/items/3599.php?rec=j&preref=7797#beg

²⁰http://www.vub.ac.be/klimostoolkit/sites/default/files/documents/env_policy_brief_congo.pdf

²¹ The challenges of solid waste management facing the city of Kinshasa: the case of Kinshasa local municipality

²²<http://www.internationalrivers.org/blogs/537/the-river-is-not-a-trash-can>

²³ The challenges of solid waste management facing the city of Kinshasa (2009) by Longondjo Etambakonga Clement

²⁴http://pdf.usaid.gov/pdf_docs/Pnado929.pdf

Effect of solid waste generation on climate change

Solid wastes are also the largest source of methane emissions, a powerful greenhouse gas (GHG), which has a global warming potential (GWP) 21 times greater than CO₂. On a global level, major sources of methane are: agriculture (43%), energy (38%) and waste (17%) from landfills and wastewater. The global annual methane emissions from landfilling of solid waste were estimated at 735 million tCO_{2e}, accounting for approximately 8% of estimated global emissions. Methane emissions from landfills alone in Africa were estimated at 32 million tCO_{2e} in 2010²⁵. Methane from MSW sector alone is estimated to have a share of 11% of total global methane emissions by 2020²⁶. As per the third national communication to UNFCCC from DRC (2015)²⁷, the overall country level GHG emission is 241 million tCO₂. The CH₄ emission from solid waste sector alone in the country is estimated to be around 72,060 tCH₄ or 109 million cubic meters of CH₄ per annum²⁸.

Proper waste collection and disposal practices can avoid much of the above GHG emissions. The climate change mitigation benefits from effective waste management practices include (i) avoided landfill emissions, (ii) recovered materials for reuse, (iii) energy replaced in the manufacture of new materials, (iv) energy replaced in the use of fossil-fuels and (v) carbon bound in soil through compost application. There are also co-benefits such as improved health conditions of communities, direct and indirect job opportunities to local people and community beautification.

1.2. Baseline scenario and baseline project

1.2.1. Baseline scenario and Government initiatives

The Ministry of Environment, Tourism and Nature Conservation (Ministère de l'environnement, de la nature et du tourisme) of the DRC is responsible for the integrated solid waste management (SWM) in the country. The action plans for SWM at country level are carried out through various departments under the ministry such as:

- National Sanitation Programme (Programme National d'Assainissement)
- Office of Road and Drainage (Office des Voiries et drainage)
- National Service of Rural Hydraulic (Service national d'Hydraulique Rural)

SWM activities are decentralized at provincial level and fall under the responsibility of the respective provincial government. A legislative and regulatory regime for the waste management sector in the DRC is non-existent and is not conducive for effective waste management. Almost all the provinces, cities and townships are facing critical problems regarding waste collection and disposal. Rapid urbanization and consumption resulting from economic growth is aggravating the issues. Table 1 provides the population and waste generation scenario of few cities in DRC.

Table 1: Population and waste generation in cities of DRC

No.	City	Population ²⁹	Approximate total waste generation (tons/day) ³⁰
1	Kinshasa	10,125,000	8,000
2	Lubumbashi	1,786,397	893
3	Goma	1,000,000	500
4	Matadi	350,000	175

²⁵ <http://www.sciencedirect.com/science/article/pii/S1364032115005389>

²⁶ <https://www.globalmethane.org/documents/gmi-mitigation-factsheet.pdf>

²⁷ Total GHG emissions in page 21, CH₄ emissions from solid waste in page 22 of DRC Third national communication to UNFCCC http://unfccc.int/essential_background/library/items/3599.php?rec=j&piref=7797#beg

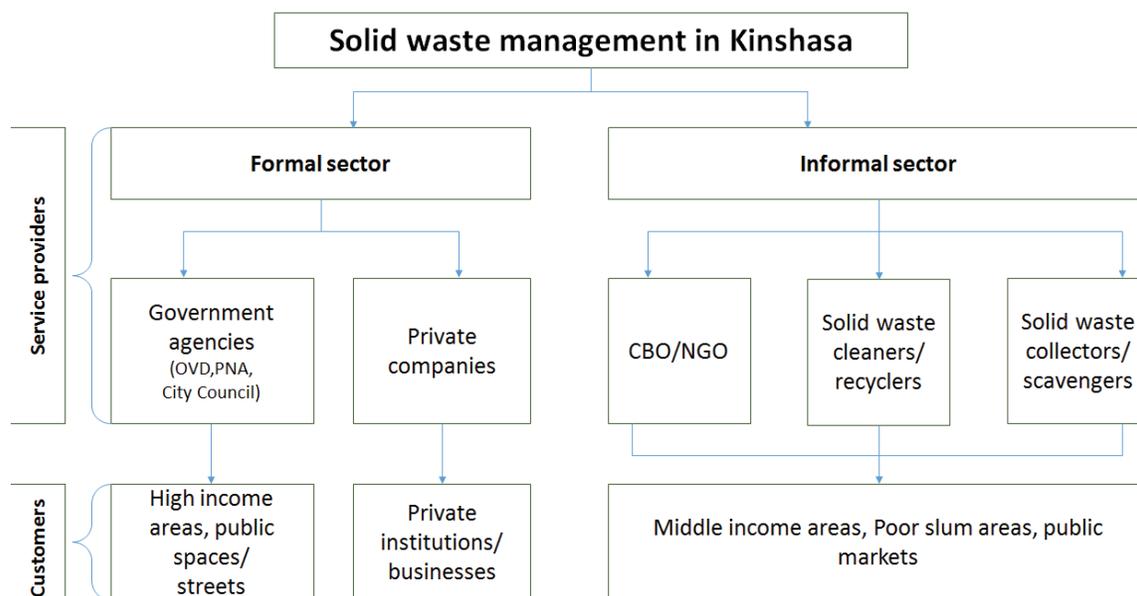
²⁸ Methane density – 0.656 kg/m³

²⁹ <https://en.wikipedia.org/wiki>

³⁰ For Kinshasa, based on circular of RATPK (2015); for others, it is based on per capita waste generation of 0.5 kg per day

Kinshasa is the capital of DRC and Kinshasa province. The city is located on the bank of Congo river. A modest home in Kinshasa city produces about 3 kg of solid waste and 30 kg of liquid waste every day.³¹ Similarly in rural regions of Kinshasa province, an average of 0.3 kg of solid wastes is generated per household per day³². The waste collection and disposal in the city is carried out by both formal and informal sectors. The city lacks capacity to enforce the waste management regulations and there is lack of cooperation among public institutions and between public and private sectors. Waste containers are stationed in specific places for collection. However, the containers are not regularly emptied leading to overflowing on sidewalks and roads.

Municipal solid waste management in Kinshasa city is a duty entrusted to public funded municipal authorities. The Board of Sanitation and Public Works Kinshasa (RATPK)³³ is an autonomous body with the responsibility to maintain sanitation and public works and is placed under the authority of the Governor of the city. Currently, there is no practice of source segregation at household level or at waste generation points. The waste management activities carried out by government agencies and formal sectors cover only the rich areas of the city. Waste collection and disposal in middle income household regions are done by informal sectors through non-governmental organisations (NGOs), community based organisations (CBOs) and scavengers. There is little or no waste collection system at all in poor household regions³⁴. The solid waste management structure in Kinshasa city is provided in figure 1.



OVD: Office Of Roads and Drainage; PNA: National Programme of Sanitation

Figure 1: Solid waste management in Kinshasa city

The collection and recycling business in the city has grown rapidly in the past decade. Waste processing and recycling have boosted green jobs and there are around 10 NGOs now which are primarily engaged in clean-up operations in the city. One such NGO, Congo Salubrité, organizes waste collection drive known as the “food for waste” exchanges. Besides being paid for the waste delivered to the company, the waste collectors receive a 1.3kg chicken or 1kg of rice as an incentive through these exchange programs. In the factory, the stored waste is processed and then reused to manufacture eco-friendly paving slabs and other valuable goods.³⁵ The City authority of Kinshasa and three NGOs, namely Congo Plast SPRL, Congo Salubrité and Kin Enviro, have launched education for

³¹ <http://speakjhr.com/2013/10/la-mauvaise-gestion-des-dechets-menagers-a-la-base-dun-probleme-de-sante-publique-au-quartier-ngbaka/>

³² <https://vertigo.revues.org/15944?lang=en>

³³ Régie d'Assainissement des Travaux Publics de Kinshasa

³⁴ Understanding solid waste management in face of political instability: actors, roles, institutions and challenges to sustainable development in Kinshasa, DR Congo.

³⁵ <http://unesdoc.unesco.org/images/0023/002303/230371E.pdf>

sustainable development programmes (2014) focusing on the pioneering plastic-waste collection and recycling industry³⁶.

Despite these efforts, the MSW management in Kinshasa is not able to meet the pressing needs of growing demand for waste collection and disposal services. The inability of municipalities to either analyse or improve their waste management performance, poor financing of SWM by government and unclear service pricing principles have led to weak control of service quality. Furthermore, research findings suggest that increased collaboration among the government, private companies, NGOs, and CBOs in solid waste management would facilitate the development of more effective and efficient integrated systems and approaches in solid waste management. This development could result in the adoption of technologies and innovative ways of managing solid waste and would promote social and environmental justice in Kinshasa.

Lubumbashi is the second largest city in DRC. Burning of wastes is practised by most households in this city as it is the most viable option. Some residences follow crude landfill system of digging and burying waste in the ground. Once filled, it is covered with earth and another is soon dug near the foremost. A third practice is to pay a street vendor who picks up the waste and dumps it in illegal areas. This is particularly harmful to nature and the environment because in the majority of cases, waste vendors dump the collected waste into rivers or in remote locations leaving no chance for authorities concerned to collect and properly dispose them. This practice is essentially common in most municipalities of Lubumbashi³⁷.

In Goma, the capital of North Kivu province, only about 28% of households use a waste collection service (2012). Efforts are being taken by city authorities to increase the SWM service utilization from 28% to 50% by 2017³⁸. Matadi is the main seaport of the DRC and it is the capital of Congo Central province. Disposal or transfer stations for waste do not exist in this province. The wastes are buried onsite, alongside the roads, in the streets, between houses, on low ground and in manmade channels. Burning of waste is a common practice³⁹.

Electricity scenario

The power sector of DRC is also underdeveloped. The country's total installed capacity is 2,442 MW which 100% constitutes of hydro power and net available capacity is 1,228 MW (2013). Despite the enormous hydro potential that DRC has, the country's electrification rate is still around 9%⁴⁰. The power tariffs to consumers are at the rate of USD 0.04/kWh for low level consumers and USD 0.11/kWh for middle level consumers. This very low electricity tariffs are also considered as a barrier for private investment in the energy sector. There is no established policy or institution in DRC for fixing electricity supply price to the end users or to manage the incentive/subsidy provided on the price of electricity. Government of DRC fixes the prices arbitrarily from time to time. This indicates the institutional weakness in the energy sector and the need for establishing policies and regulatory bodies. The power deficit at the current rate of consumption is estimated to be around 600 MW.⁴¹ If part of the generated MSW could be effectively utilized for power generation, it could help reduce this power deficit in the country.

1.2.2. Baseline project

A) National projects

- i. Plastic bottles compaction plant⁴² was initiated by the Governor of the city of Kinshasa in the N'sele commune and the operation was started in November 2015. The establishment of the plant is made through a partnership between the provincial government of Kinshasa and the group of GTR ANACO. This initiative is a part of sanitation policy that emphasizes on the rational scheme of waste management in the city of Kinshasa.

³⁶ "The green industry is booming in Kinshasa" Report, UNESCO

³⁷ Towards the efficiency of municipal solid waste management in the Democratic Republic of Congo (DRC): case study of Lubumbashi

³⁸ Low utilization of official solid waste management services, Goma, D.R. Congo

³⁹ Planning Municipal Solid Waste Management in Africa: Case Study of Matadi - The DRC, April 2012

⁴⁰ Overview of the electricity sector in the Democratic Republic of Congo (2013)

⁴¹ UNIDO mission report, August 2016

⁴² www.radiookapi.net/mot-cle/gtranaco

- ii. In 2008, a study for possible MSW management solution was conducted in Matadi⁴³ province. The study concentrated on the needed organizational, technical and financial resources and its sustainability. The study also focused on options of MSW treatment to be a profitable enterprise.
- iii. Under the co-operation of the European Commission, a “Sanitation program and urbanization of the city of Kinshasa” (PAUK) was implemented during 2007-2010. PAUK focused on municipalities of Barumbu, Gombe and Kinshasa. It also enabled the development of transfer stations for household waste in these three municipalities and the landfill site at Mpsa located 22 km east of the city. Following successful implementation of PAUK, another project entitled “Project to support the rehabilitation and urban sanitation in Kinshasa” (PARAU) was implemented during 2010-2015 with support from the European Commission. This program achieved implementing MSW management in 9 out of 24 communes of Kinshasa with a capacity of handling 11,000 m³ of municipal waste every week. The project employed around 140 staff and established transfer stations for household waste and a technical landfill site at Mpsa. The PARAU program ended in August 2015 and the Board of Sanitation and Public Works Kinshasa (RATPK) has taken up the responsibility for the continuation of the project since then⁴⁴.

The landfill site at Mpsa was a first of its kind in the country. The landfill site became operational from 2011. It covers an area of 240,000 m² and has a total capacity of 3,520,000 m³. The daily incoming waste quantity is around 900 tons per day. As of July 2016, around 1,713,268 tons of municipal solid waste is landfilled at this site. The landfill site is projected to withhold about 2.5 million tons of wastes until 2018. The composition of wastes disposed at the Mpsa site is provided in the table 2.

Table 2: Composition of MSW at Mpsa landfill⁴⁵

No.	Waste type	Percentage (%)	Tons per year (as of 2016)
1	Food waste	9.0	38,725
2	Garden and park waste	39.9	171,681
3	Paper and cardboard	12.2	52,494
4	Textiles	1.8	7,745
5	Plastic	19.6	84,334
6	Metal	4.5	19,362
7	Glass	1.5	6,454
8	Other	11.5	49,482
	Total	100	430,277

Each landfill section at the site is of 200m x 40m x 25m dimension. A plastic sheet layer is provided at the bottom of the section to collect the leachate generated. It takes two months to fill up each section with MSW. As of August 2016, there are 33 of such sections completely filled up with MSW. The leachate generated are collected and treated in three collection ponds. The site also consists of methane gas collection wells, pipeline and flaring systems installed in these 33 sections. However, the collection pipes are damaged due to increased gas pressure in the pipes. The flaring systems are not in operation now and all the collected methane is released to the atmosphere⁴⁶. Presently, the site has a capacity of generating 7,130,000 m³ of landfill gas (LFG) per year from the MSW dumped so far.

The baseline situation of Mpsa landfill site is that LFG, constituting mainly of methane, generated from the wastes dumped at the landfill is released to the atmosphere. The proposed GEF intervention will address this issue through the capture of LFG and utilization of the same for electricity generation. Also, the current landfill will exhaust in 2018 and new sections (at same Mpsa site) must be developed for landfill of future wastes generated after

⁴³ Modeling Municipal Solid Waste Management in Africa: Case Study of Matadi, the Democratic Republic of Congo, Gregory Yom Din, Emel Cohen

⁴⁴ <http://www.radiookapi.net/2015/08/20/actualite/societe/kinshasa-fin-du-programme-dassainissement-parau>

⁴⁵ Preliminary feasibility study report on Mpsa landfill in Kinshasa, August 2016

⁴⁶ UNIDO team mission report, August 2016

2018. Hence, other energy recovery (from organic wastes) and material recovery options (from inorganic wastes) have to be chosen to manage wastes brought to the site after 2018. This will also reduce the amount of waste sent to the landfill resulting in the judicious and effective use of available land area. Energy sale and recovered materials sale will also lead to additional revenue generation.

The government authorities have also taken initiatives along with NGOs to implement their solid waste management policies. Around 102 NGOs are already identified for this initiative. They are expected to manage the selective waste collection for a neighbourhood of around 2,000 families making a total of 204,000 families. This will result in increased waste collection by around 700 tons/day out of which 60-70% would be suitable for composting or landfill biogas production⁴⁷.

A preliminary feasibility study was carried out by the Korea Environment Corporation (KECO) under the guidance of UNIDO at the Mpsa landfill site. The study focused on the potential of power generation using LFG generated and recommended to install a 2 MW LFG based power generation system based on the existing conditions⁴⁸. The power generated could be supplied to the industries in Maluku SEZ, international airport and other nearby communities which face severe power shortages and depend mostly on diesel based power generation systems.

B. Private sector projects

- i. There are several plastic waste recycling companies already in operation in DRC. Recylcon, Congo Plast Ltd., Congo Salubrité's are few of such companies that are actively working in waste recycling sector.
- ii. Mr. Vwira, an individual from Goma, DRC started a business venture in 2008 for the collection and disposal of waste in the city. The company collects the litter and waste from each household of the Goma city in a single truck and disposes the refuse about 12.5 miles away from the city. It charges USD 11 per month for each household as service charge for weekly refuse collection service. The company has planned to construct European style recycling plant that costs USD 1.5 million⁴⁹.
- iii. Mr. Matthieu Nina Musey, along with his friends has set up a small venture for recycling of plastic waste in Kingasani, suburbs of Kinshasa. They buy plastic waste at USD 7 per metric ton from the people and also collect it from numerous bins throughout the city. They recycle the plastics into pellets and supply the end products to industries like manufacturing PVC tubing, flush mounting boxes, etc.⁵⁰

C. Institutional projects

The World Bank has a number of ongoing water and sanitation programmes with major components in Kinshasa, but these projects largely involve water supply, storm water drainage and institutional capacity building.⁵¹ The relevant lessons and experiences learnt from the above initiatives will be incorporated into the project for its successful and effective implementation.

1.3. Proposed alternative scenario and project

Under the business-as-usual scenario, there is a lack of regulatory policies and institutional capacity in the waste management sector. The existing infrastructure is not able to tackle the rapidly increasing solid waste accumulation in Kinshasa city and the country as whole. Without an effective intervention, the unmanaged dumping of MSW, pollution of rivers and destruction of environment will continue leading to more GHG emissions.

⁴⁷ UNIDO team mission report, August 2016

⁴⁸ Calculation of optimum power generation, page 18, [Preliminary feasibility study report on Mpsa landfill in Kinshasa, August 2016](#)

⁴⁹ <http://www.dw.com/en/recycling-garbage-in-dr-congo-crisis-city/a-18204651>

⁵⁰ The green industry booming in Kinshasa, Alfred Ntumba

⁵¹ http://www-wds.worldbank.org/external/default/WDSContentServer/WDS/IB/2014/03/03/000333037_20140303161837/Rendered/PDF/708390REVISED0000PUBLIC00CSO0DRC0En.pdf

Through this GEF intervention, the regulatory and policy environment for the waste management sector will be strengthened. Taking lead from previous programs of PAUK and PARAU, the proposed project will work in coordination with RATPK to institutionalize the current MSW management activities and exploit the benefits of WTE technologies. The proposed project will demonstrate electricity generation technology using LFG generated from wastes dumped so far in Mpsasa site. Opportunities of biomethanisation and refuse derived fuel (RDF) production will also be demonstrated from future MSW brought to the Mpsasa site. Thus, the proposed GEF project will contribute to the twin goals of establishing an effective MSW management for Kinshasa city and promoting waste to energy (WTE) projects in DRC. This intervention will also help offsetting the GHG emissions from the landfills. More employment opportunities will be generated through these project activities helping to alleviate the existing poverty level in the country.

The GEF-6 Climate Change Mitigation Strategy involves utilization of its resources to reduce risks and address barriers, so that the results can facilitate additional investments and support by other international financing institutions, private sector, and/or domestic sources. The proposed project will involve a targeted approach to demonstrate the low carbon technologies in MSW sector. Using LFG to generate power is a new technology to DRC. As of now, none of the power plants is using this technology in the country. Based on the successful demonstration of this proposed project, it is envisaged that similar LFG power generation projects would be replicated and scaled up in the future. This will be achieved through mitigation of risks and barriers, engagement of public-private partnership/investment and creation of conducive policies/support mechanisms. Thus, the proposed project is in line with the strategies of GEF-6 Climate Change Mitigation (CCM-1) program 1, which is, “To Promote timely development, demonstration and financing of low carbon technologies and mitigation options”.

The DRC is embarking on the establishment of special economic zones (SEZ) to encourage the revival of its industry. The pilot SEZ project is located at Maluku region of Kinshasa. One of the prime infrastructure requirements of SEZ is the reliable power supply to the industries created. The N'Djili International Airport, Kinshasa is the largest of the four international airports in the DRC. The industries in the SEZ and the international airport could benefit from any reliable power supply sources located nearby.

The project

The project has 5 components and the outcomes, outputs and activities under each of the components are described below:

Project Component 1: Policy and regulation formulation

Under this component, the requirements of supportive environment for sustainable waste management will be formulated and provided to government for its consideration and future enforcement. Key partners under this project component are Ministry of Industry and SMEs and Ministry of Energy and Water Resources.

Project outcome 1.1: Strengthened policy and regulatory environment

The outcome of strengthened policy and regulatory environment will be achieved through the following activities.

1.1.1. Municipal solid waste (MSW) management strategy report prepared

Inadequate waste collection services, poorly planned/maintained waste management infrastructure and lack of waste handling/disposal regulations persistently threaten the welfare of the country. The proposed GEF project will prepare a holistic strategy for an effective management and possible reuse of MSW. The overall purpose of the strategy will be to develop an action plan focusing on an effective and efficient waste management that streamlines the waste minimization, collection, reuse, recycling and recovery of materials/energy in the DRC. It will also include the mechanism for financial budgeting, partnerships between Government, private organizations, NGOs, etc., along with continuous monitoring and evaluation of the project.

This strategy will help to enhance the goals of the existing and future solid waste management policies for a sustainable environment.

1.1.2. Policy drafted for the consideration of the Government

The DRC lacks policies and regulatory frameworks for effective enforcement of SWM practices. Weak or absence of institutional and legal frameworks significantly impede the development of energy/material recovery options from the wastes. An integrated policy framework will be prepared that takes into account the waste collection, transportation, processing and disposal methods. A gap analysis will be conducted during PPG stage on policy aspects and the support required for SWM practices.

A policy paper will be prepared to include the national level regulations needed to strengthen the central, regional and local body governments for proper enforcement of SWM practices. Guidelines and standards for waste collection, transportation, processing and disposal methods will be proposed. The policy will include the country level framework needed to support the development of WTE technologies in the country. Tax incentives or duty exemptions on import of equipment for WTE technologies especially with respect to MSW can be included as well. The policy paper prepared as above will be submitted for the consideration of the government.

Project Component 2: Establishment of sustainable waste collection system

This component will focus on improving the coverage, effectiveness and reliability of the waste collection system in the city. Key partners under this project component are Ministry of Industry and SMEs, City provincial government of Kinshasa, Sanitation Board and Public Works - Kinshasa, NGOs and CBOs.

Project outcome 2.1: Development of efficient waste collection infrastructure

The outcome of efficient waste collection infrastructure will be achieved through the following activities:

2.1.1. Existing waste collection process assessed and bottlenecks identified.

The prime focus of any sustainable waste management is the waste collection system. The success of the waste management depends on effective range covered by the waste collection system. The proposed project will first assess the prevailing conditions of resources/services available in Kinshasa city in terms of practices in waste collection at households and other generation points such as hotels, restaurants and markets, etc. Meetings will be conducted with all the concerned stakeholders, such as policy makers, city authorities, private sectors, NGOs, households, etc., to understand the bottlenecks in the existing waste management system. The lessons learnt from previous programs and ongoing initiatives in the country will also be taken into consideration.

The resources available (equipment, trucks, workforce, etc.) at each stage of waste collection, handling and transfer to disposal facilities will be assessed and future requirements of the same will be estimated. A detailed assessment and report preparation will be carried out during the PPG stage. Based on this assessment, a roadmap will be developed towards sustainable waste management practices by addressing the market challenges, during the project implementation phase. The roadmap will take into account the responsibilities of key stakeholders involved in the project implementation. The roadmap will also take into consideration the development of demonstration units under this proposed project and also the future replication projects in this sector.

Kinshasa City, being the capital of DRC, generates the largest share of MSW against other cities. It has the first controlled landfill in the country. These conditions provide a favourable environment for setting up the landfill gas based WTE plant. The available institutional and regulatory set up to manage the landfill can support the sustainable operation of the demonstration units as well. Thus, this city is selected as the site for this proposed project. It is envisaged that the development taking place in Kinshasa will help in motivating and replicating such projects in other cities as well.

2.1.2. Efficient waste collection infrastructure deployed in 24 communes of Kinshasa city

As of now, the waste collection is effectively implemented only in around 9 out of 24 communes in Kinshasa city. There are around 61 waste collection stations in these 9 communes. The recyclables such as iron, glass, plastics are collected from these stations and then the remaining waste is sent to the Mpsa landfill⁵². The proposed project will focus on the ways to expand the waste collection services to all 24 communes of Kinshasa city. The waste collection infrastructure facilities will include (i) containers for waste collection at identified locations/streets (ii) workforce/vehicles for collecting waste from these containers and bringing them to waste collection stations and (iii) facilities to recover recyclables such as iron, glass, plastics, etc., at collection stations and (iv) workforce/vehicles for transporting remaining waste from the collection stations to the landfill site. Each commune will be provided with at least 5 waste collection stations to collect, process and transport the waste generated to the landfill site. Exact number of collection stations needed in each commune will be studied in detail during the PPG stage.

Measures will be taken to increase the public private partnerships to bring in the investment needed to develop the infrastructure to support waste collection from all 24 communes. The project intervention will help the city authorities to access international expertise to assist in promoting such public private partnerships. A detailed design of efficient waste collection system for Kinshasa city will be prepared by international experts to overcome the bottlenecks assessed in existing system as stated in output 2.1.1. A work plan will be prepared at the start of the project implementation stage for the step by step deployment for an efficient waste collection system. The waste collection targets achieved during actual implementation will be kept under constant monitoring and revision.

Project Component 3: Demonstration of municipal waste to energy recovery technologies

This component will focus on achieving the successful implementation of WTE options at the Mpsa landfill site. The proposed project will demonstrate the landfill gas based Waste to Energy (WTE) Technology at the existing landfill site of Mpsa. The Board of Sanitation and Public Works Kinshasa (RATPK) will be the project owner. The finance for the demonstration plant will be raised partly from GEF funding and partly through co-financing from FPI, the financial partner and Ministry of Industry and SMEs. The power generated from the WTE plant will be supplied to the industries in the Maluku SEZ, the N'Djil international airport and other potential consumers near Mpsa.

Thus, the key partners under this component are Ministry of Industry and SMEs, Ministry of Energy and Water Resources, Sanitation Board and Public Works - Kinshasa, FPI, Authority of N'Djili International Airport, and industries from Maluku SEZ, NGOs and CBOs. The demonstration plants in this GEF project are detailed in this project component.

Project outcome 3.1: Waste to energy (WTE) technologies installed

This proposed project will develop demonstration plants for an effective energy and material recovery from MSW. Besides effectively handling the disposal of waste generated, the project will also generate significant revenues for its sustainable operation in future. The revenue streams of the project will be of:

- i) Sale of electricity from the LFG power plant
- ii) Sale of electricity from the biomethanisation plant
- iii) Sale of RDF
- iv) Sale of other materials for recycling

All the demonstration units will be under the control and ownership of RATPK. The revenue generated from the project as listed above will be used by RATPK for sustained operation of the WTE plant and improving the waste management/landfill infrastructure. The industries in the Maluku SEZ and the N'Djil international airport are already identified as potential partners for power procurement from the project. Other potential consumers will be identified during the PPG stage. The activities planned under the outcome are detailed below:

⁵²[Preliminary feasibility study report on Mpsa landfill in Kinshasa, August 2016](#)

3.1.1. Effective system installed for municipal waste sorting, handling, recycling and disposal at Mpsa site

The DRC has no official dumping site other than Mpsa site. The incoming wastes to Mpsa are directly dumped into the landfills without any segregation, which plays a factor in land degradation. To prevent the degrading land, the proposed project will enable a proper and effective system to manage the incoming wastes by streamlining the waste collection methods, sorting, handling and recycling of wastes into organic and inorganic wastes and disposal of wastes into treatment plants, respectively. The activities under this output will build on the PARAU project implemented by European Commission (explained earlier under Baseline Projects).

During the PPG stage, a detailed study will be conducted for resource availability at Mpsa site, potential LFG recovery from the existing landfills, other treatment options for the future incoming wastes and other revenue generation options from MSW.

3.1.2. 2 MW landfill gas (LFG) based power plant at existing landfill installed at Mpsa site

This project will establish a 2 MW LFG based power plant as an energy recovery technology from the existing Mpsa landfills. Management and operation of the landfill will be optimized to ensure maximum energy recovery and environmental benefits. Existing gas collection facilities at site will be best utilized. Qualified EPC contractors with proven experience will be selected by following international best practices of tendering and bid evaluation. Before the actual power plant operations, plant operators and other maintenance staff will be properly trained by the equipment suppliers.

The electricity generated from the LFG power plant can be utilized for the operation of waste management plants at the site and exported to the identified consumers such as industries in Maluku SEZ and international airport. A feasibility study will be carried out as a part of PPG activities to identify more accurate capacity of the power plant. The exact off-takers of electricity will also be identified during PPG stage. GEF grant will provide a portion of the funding for the investment of demonstration unit. The remaining fund will be raised through co-financing.

An economic analysis using simple cash flow method has been carried out for the LFG to power project. The total investment cost for the 2 MW LFG based power plant is estimated to be around USD 4.5 million. The annual plant operating costs considered is around USD 360,000. The plant is expected to generate around 10,483,370 kWh of electricity per year on average. Using the current residential tariff rate of USD 0.087/kWh, the simple payback period is 7 years and with the tariff rate of USD 0.11/kWh, the simple payback period is 5 years.

This output will help mitigate the methane emissions from landfills made since 2011. The proposed output will capture an average of 5.5 million cubic meter of CH₄ per annum⁵³. The activities under this output will build on the PARAU project implemented by European Commission (explained earlier under Baseline Projects).

3.1.3. 1 MW biomethanisation power plant from the segregated organic waste installed at Mpsa site

The preliminary feasibility study indicates that around 10% of MSW (38,725 tons per year) brought to the landfill site are organic wastes such as food wastes. These wastes are currently dumped along with other wastes in landfills. If these wastes can be sorted and segregated (as proposed under output 3.1.1), then there is an opportunity to generate power through the biomethanisation process. To enable such energy recovery technology from MSW, a demonstration project of 1 MW biomethanisation power plant will be installed to utilize the organic wastes, once the segregation process starts at Mpsa site. Qualified EPC contractors with proven experience will be selected by following international best practices for tendering and bid evaluation. Before the actual power plant operations, plant operators and other maintenance staff will be properly trained by the equipment suppliers.

⁵³Preliminary Feasibility Study Report on Mpsa Landfill in Kinshasa

The electricity generated from the biomethanisation power plant can be utilized for the operation of waste management plants at the site and exported to the identified consumers such as industries in Maluku SEZ and international airport. A feasibility study will be carried out for this as a part of PPG activities. The exact off-takers of electricity will be also identified during PPG stage. GEF grant would provide a portion of the funding for the investment of demonstration unit. The remaining fund will be raised through co-financing.

This output will reduce the amount of landfill area required in future to dispose organic waste portion of MSW. The activities proposed in this output will build on the outputs of project component 2 of this proposed project

3.1.4. 300 tons per day (tpd) refuse derived fuel (RDF) processing plant developed along with other material recovery options at Mpsa site

After segregating the organic contents, the remaining wastes will be separated into combustible and non-combustible fractions. According to the preliminary feasibility study, around 54% of MSW (231,920 tons per year) brought to the landfill site are combustible wastes, such as garden/park wastes, paper & cardboard and textile wastes. For effective utilization of these combustible wastes, a RDF processing unit will be installed at the Mpsa site. The RDF can be used as an alternate fuel in many industries replacing fossil fuel/coal/charcoal.

The non-combustible wastes like plastics, iron, aluminium, etc., will also be segregated while RDF processing. These wastes will be sent for recycling, which will be added revenue to the Mpsa site. A separate waste stream will be set up for safe handling and disposal of hazardous wastes identified. Simple schematic of the waste management process is shown in the figure 2. GEF grant would provide a portion of the funding for the investment of demonstration unit. The remaining fund will be raised through co-financing.

This output will reduce the amount of landfill area required in future to dispose the combustible and non-combustible portion of MSW. Any remaining residual wastes will be sent to the future landfills. The activities proposed in this output will build on the outputs of project component 2 of this proposed project.

In the DRC, two potential plastic waste recycling ventures are in operation currently, one is a plastic bottle compaction plant⁵⁴ in the city of Kinshasa managed by the Government of the province of Kinshasa and the other by Mr. Musey⁵⁵, who owns a small recycling plant for recycling plastic waste and sells the end products in the DRC market. Both ventures will be contacted for utilization of recyclable materials from Mpsa site. The possible options for revenue generation through sale of RDF and recyclable materials will be identified during PPG stage.

⁵⁴ Plastic bottle compaction plant is established by the Governor of city province of Kinshasa, east to Mpsa landfill site and started its operation since 2015.

⁵⁵ Mr. Matthieu Nina Musey, a former employee of Congo plast SPRL, started his own private company for manufacturing plastic products in Kingasani, a district in the suburbs of Kinshasa.

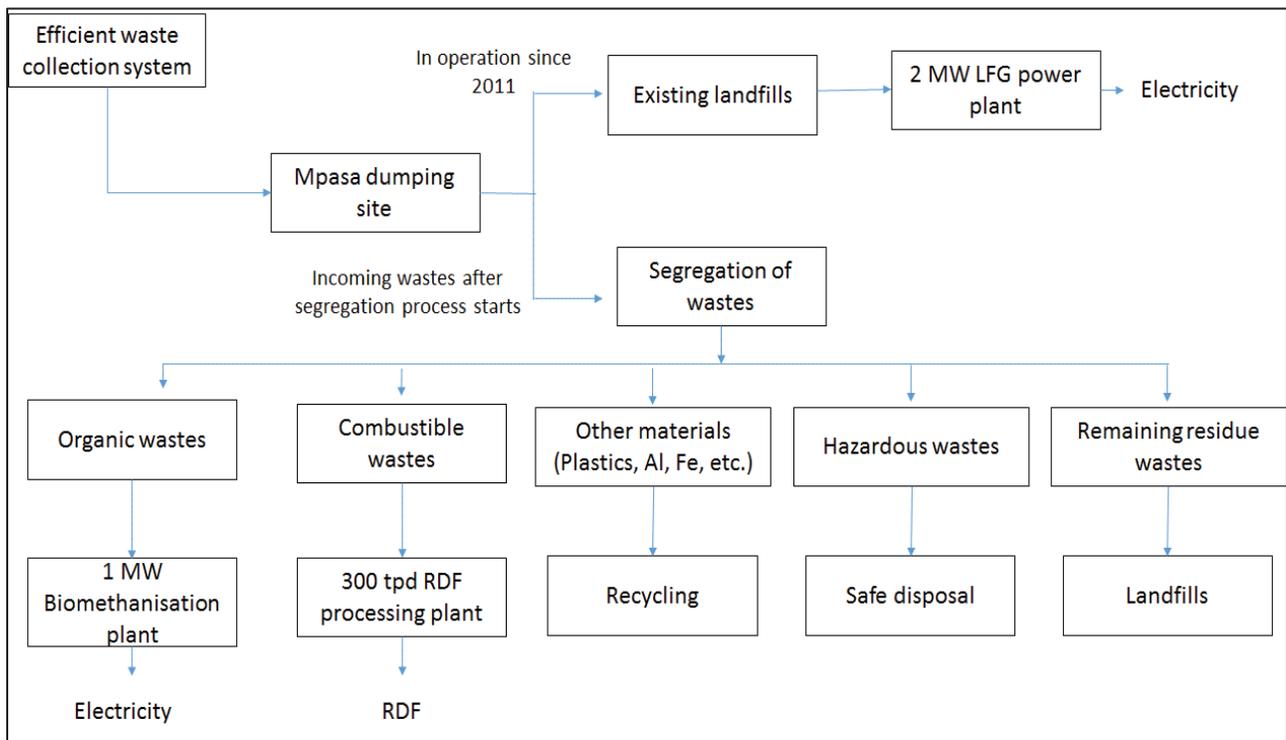


Figure 2: Schematic diagram of MSW management under proposed project

After the identification of potential for energy and material recovery options from the Mpasa site, a detailed business plan will be developed during the GEF project’s implementation phase for each of the proposed demonstration plants (2 MW LFG power plant, 1 MW biomethanisation power plant, 300 tpd RDF processing unit and other revenue generation options from plastic, metal recovery). Available investments from government and other stakeholders will be studied. A part of the GEF grant will be allocated for the purchase of equipment for these demonstration projects. The “Preliminary Information Memorandum (2010)” prepared by NEDBANK states that the total Mpasa site covers an area of 200 ha. The current landfill operation is carried out in around 24 ha (240,000 m²) only. After the current landfill area is complete, the landfill may be carried out in the next remaining total area of 176 ha (200 – 24 ha). Considering these facts, the demonstration plants in the proposed project can be installed in the remaining available land area. The tentative site layout under the proposed project is given in figure 3.

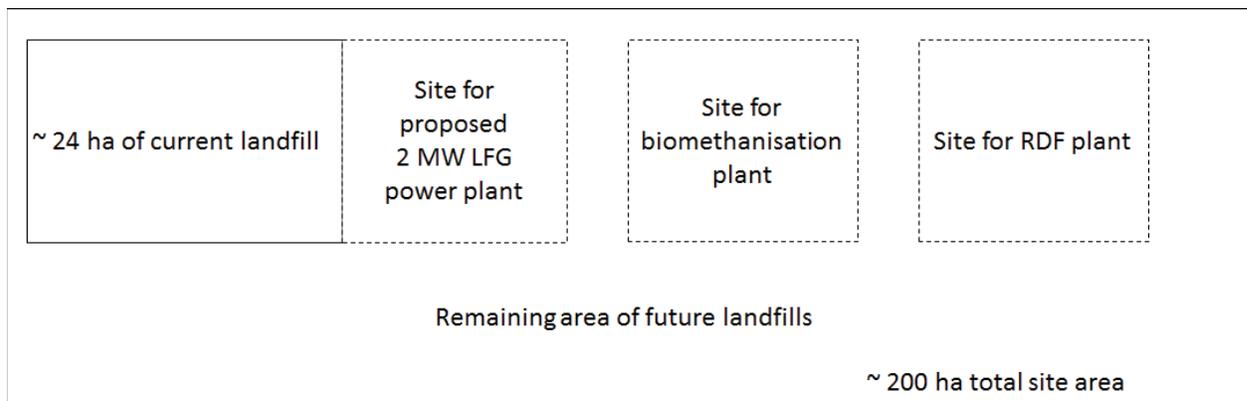


Figure 3: Tentative site layout of the proposed project

Project Component 4: Replication and scale up

Initiatives and promotional activities proposed to replicate such WTE plants elsewhere in the country are detailed in this component. Key partners under this project component are Ministry of Industry and SMEs, Ministry of Energy and Water Resources, NGOs and CBOs.

Project outcome 4.1: Potential for replication assessed

The outcome of the below activity is that all preparatory works and support measures required for any future scale up projects are made available.

4.1.1. Country wide study conducted on waste generation, WTE potential and business opportunities for replication projects

Other than the development of WTE projects in Mpassa landfill site, the proposed project will also carry out a nation-wide assessment on the WTE potentials in the country. This will help in identifying other potential sites for WTE projects in DRC. Five potential dumping sites will be identified during the country wide study and feasibility studies will be conducted for these sites. If the projects are found to be feasible, a detailed business plan will also be developed to identify the funding options. This will serve as an initiation for the replication projects.

Private sector service providers, entrepreneurs and other NGOs will be encouraged to take up the implementation of potential replication projects in other sites. Banks and financial institutions will be encouraged to provide soft loans for these projects.

Project outcome 4.2: Strengthened capacity of relevant stakeholders including institutions

Following activities will be carried out to improve the capacity of all stakeholders involved in MSW management and WTE sectors in the country:

4.2.1. Workshops for relevant stakeholders

Workshops will be conducted for Government officials, MSW service providers, WTE service providers, interested business peoples, NGOs/CBOs, etc. The workshops will mainly focus on issues of rapid urbanization, Government policies, infrastructure, investment strategy, public participation, awareness on business opportunities and cost saving benefits of MSW and planning for Integrated Solid Waste Management (ISWM). It will also bring together the experiences of service providers and other stakeholders in MSW management. Training to trainers will be provided through NGOs and CBOs who will in turn train more people in the demonstration technologies.

In addition, it will also share the success and lessons learnt from demonstration units and need for replication of similar projects throughout the DRC. The lessons learnt from demonstration units will be properly documented and presented in the stakeholder workshops as part of the knowledge management activities. These materials prepared will serve as document for evaluating the project achievements as part of Monitoring and Evaluation component under this proposed project.

4.2.2. Sharing of the best practices from other countries on MSW management, energy recovery and recycling

The Government officials from the concerned ministries will organize a study tour to MSW management projects implemented in other countries for better understanding and applying suitable technologies in the DRC. The replication projects will take the best practices followed in MSW collection, disposal, handling, energy recovery and material recovery for recycling by the other countries for their effective implementation.

The overall success of the project lies in understanding the importance of waste management by the general public and other relevant stakeholders. Hence, the project will encourage and support all types of promotional activities

such as awareness campaigns, advertisements, hand-outs, posters, etc., on effective waste management. NGOs will be involved to educate various stakeholders such as schools, hospitals, institutions, households, etc., on waste categorization and source segregation. The awareness campaigns will also focus on the concepts of 3Rs (reduce, reuse and recycle).

Methodologies/tools will be developed to use the collated information for better planning and decision making. Case studies will be prepared and presented to increase more investments in similar projects using the trained capacity that is created. An annual report and periodical newsletter on best practices, information on country level projects and key indicators of progress made under the project will be prepared and distributed to key stakeholders and agencies. Full scale project demonstration site visit and seminars will be organized and the project experiences will be disseminated to various interested stakeholders in order to increase the replication potential of the project. Various tools, such as leaflets, website, etc. will be used for effective dissemination.

Project Component 5: Monitoring & Evaluation

Continuous monitoring, periodic evaluation and respective course correction are important for successful project implementation. The monitoring and evaluation measures to be considered in this project are detailed in this component. Key partner under this project component is Ministry of Industry and SMEs.

Project outcome 5.1: Effectiveness of the outputs assessed, corrective actions taken and experience documented

The following are the activities involved to achieve this outcome:

5.1.1. Mid-term review report prepared

The project will be subject to a mid-term review and a final evaluation. The independent mid-term evaluation will be carried out at the end of 24 months of the GEF project and follow up corrective actions will be taken if needed. The mid-term review will be carried out by independent M&E experts.

5.1.2 End of project evaluation report prepared

An independent final evaluation will be conducted three months prior to the terminal review meeting. The final evaluation will look at the impact and sustainability of results, including the contribution towards capacity development and the achievement of global environmental and social benefit goals. The final evaluation will also provide recommendations for follow-up activities. The project will involve continuous monitoring. However, monitoring expenses will be covered with co-financing budget. The final evaluation will be carried out by independent M&E experts. Any other interim evaluation will be conducted internally as per the project requirements. After completion of the technical component, the project performance monitoring will be conducted to study the technical, financial, environmental and socio-economic aspects of the demonstration projects.

The documentation on lessons learnt from demonstration units as stated under Output 4.2.1 will serve as resource for evaluating the project achievements as part of this monitoring and evaluation activities.

1.4. Incremental/Additional cost reasoning:

The project is planned to establish demonstration plants for management of wastes and generation of electricity. During the initial phase, LFG based power plants will be installed at the existing landfill site. To manage the wastes that are coming in after the initiation of the project, a biomethanisation plant and a RDF processing plant will be installed at the site to utilize the organic wastes and combustible wastes, respectively. Generated electricity from the LFG power plant and the biomethanisation power plant will be supplied to the identified consumers such as industries in Maluku SEZ and international airport which will be finalized during the PPG stage. RDF will be sold as a fuel for the industries to replace the fossil fuels/coal/charcoal. Other materials recovered, such as plastics,

iron,aluminium, etc. will be used for recycling. All these activities will be carried out for the first time on the site and are incremental to the existing scenario of Mpasalandfill site.

The GEF funding will be used to partly finance the incremental cost for the investments in LFG based power plant, biomethanisation plant, RDF processing plant and other material recovery options. Remaining funds will be raised through co-financing from FPI, the financial partner and Ministry of Industry and SMEs. RATPK will hold the ownership for the demonstration units. The total co-financing expected is around USD 16 million. Wherever possible, public-private partnerships will be encouraged to bring in further investments also during project implementations. The GEF provides a grant of around USD 2,967,038 which is approximately 17% of the total incremental cost of around USD 17.39 million investment required for this proposed intervention.

1.5. Global environmental benefits

The project aims at promoting and replicating the waste management techniques and WTE technologies for the reduction of MSW disposed throughout the DRC and the neighbouring African countries. It is projected that the global emissions from waste sector will be about 959 million tCO₂ by 2030⁵⁶.

The GHG emissions clearly envisage the huge potential of emission reductions in waste sector of the country and encourage the promotion of sustainable SWM in the country. As a result of successful project implementation at Mpasalandfill, it is expected that a rapid transformation will take place to replicate the demonstration projects on commercially viable basis, in other provinces of the DRC.

The project will mitigate around 165,607tCO₂emissions per annum and 2,484,107tCO₂emissions directly throughout their lifetime of 15 years⁵⁷. The GHG emission reductions are estimated using the GEF methodology. It is expected to initiate and develop the SWM projects of the same capacity by taking replication factor as 2 within a time span of maximum 10 years after the project. This will lead to the emission reduction of 3,312,143 tCO₂e indirectly.

The total GEF resources of around 3.96 million will be used to mitigate CO₂ emission at a rate of USD 1.59/tCO₂ directly and around USD 1.20/tCO₂ indirectly. These initial estimates will be refined during the PPG phase.

Based on the Intended National Determined Contributions (INDC) to the UNFCCC, in order to reduce 17% of DRC's emission level against the baseline year of 2000, it is estimated that around 77.60 million tCO₂ emission reductions⁵⁸ from the agricultural, forestry and energy sectors with focus on CO₂, CH₄ N₂O gases, must be achieved by 2030. The proposed project is estimated to mitigate around 2,484,107 tCO₂ emissions directly which will account for 3.21% of the INDC target. Similarly, it is also estimated that the proposed project will mitigate around 3,312,143 tCO₂ indirectly which will account for around 4.27% of INDC target.

1.6. Innovativeness, Sustainability and Potential for Scaling up

This project is innovative in the following aspects:

- a) Demonstration of WTE technologies through a value chain approach and stakeholder analysis
- b) Business model developed to effectively address gaps in both waste management sectors and WTE sector
- c) Maximum recovery of material and energy from MSW that results in revenue generation; and
- d) Reduced landfill area requirement in future to dispose only residual MSW remaining after organic, combustible and recyclable materials are recovered

⁵⁶<https://www.globalmethane.org/documents/Landfill-MAC-Report-2014.pdf>

⁵⁷ Considering emission reduction from (i) methane avoidance from landfill (ii) avoided diesel use for 3 MW power generation and (iii) furnace oil replacement in industries by RDF.

⁵⁸ INDC: Opportunity for Democratic Republic of Congo, August 2015

The proposed project has a potential to revolutionize the MSW sector in the DRC through introduction of effective WTE technologies, creating tremendous value to the communities as a whole, in terms of pollution free outdoors, improved health and quality living environment.

Sustainability is ensured through following market mechanisms:

- a) Preparation of policy framework for waste sector, which does not exist in country before, will ensure support and sustainability of more such future initiatives in this sector
- b) Efficient waste collection system ensures that wastes are properly collected and transferred to plant sites
- c) Technology transfer is achieved and local skills are developed to manage WTE plants
- d) Generation of revenue from waste management plants
- e) Trainers training is provided through NGOs and CBOs to train more people in demonstration technologies

Also, UNIDO has remarkable experience in implementing WTE projects across the developing countries in Sub-Saharan Africa. It has implemented projects in South Africa, Tanzania, Kenya, Nigeria, etc., and several other projects are under implementation. UNIDO's experience and lessons learnt from all these other projects and partnership in African regions will be used as and when required for sustainable operation of the proposed project.

Market transformation: Successful implementation and operation of the demonstration projects will boost confidence of the country towards economic growth. The operationalization of WTE technology will:

- Create opportunities for local manufacturing of bins, garbage bags, etc.;
- Create opportunities for local manufacturing of spares and accessories;
- Create employment for the people;
- Promotes financial schemes and/or loans for SMEs related to waste sector;
- Reduce the usage of fossil fuels and expenditure on fuel import to the country; and
- Use of recycled materials (such as plastics, iron, aluminium, etc.); thus, reducing the investments unnecessarily in the relevant sectors.

Scaling up: Improved capacity building in WTE sector will remove significant knowledge barriers in the waste management sector. Support policies and availability of loans from financial institutions will encourage service companies, private entrepreneurs to invest in WTE sector thus, leading to additional scale up projects. The proposed project will also provide technical assistance in developing the feasibility study, as well as, the business plan report for such replication projects. Public private partnerships established, will encourage future scale up projects under similar approach. The successful implementation of proposed business models and demonstration projects will create confidence for further investment in replication and establishment of new industries in waste sector.

The proposed project has allocated a whole set of project component (PC 04) activities focused only on the replicability and sustainability aspects. These activities will result in conducive environment for scaling up of the WTE technologies.

Productive uses of the project

- Proposed project will create at least 100 job opportunities directly and at least 500 job opportunities indirectly in course of implementation of efficient waste collection systems and demonstration plants.
- The power generated from demonstration plants can be used to power households, communities and small industries near the project site. This will improve the lifestyle and economic status of those communities.
- Efficient waste collection and disposal will result in improved sanitation and local environment. This will reduce incidents of cholera and malaria thereby improving the health of urban population.

2. Stakeholders. Will project design include the participation of relevant stakeholders from [civil society organizations](#) (yes /no) and indigenous (yes /no)? If yes, identify key stakeholders and briefly describe how they will be engaged in project preparation.

The Ministry of Energy and Water Resources is the main executing partner and will take the lead role as the project steering committee (PSC) chair. It will be especially responsible for the WTE demonstration components but not for the entire project. It will be responsible for the execution, delivery of the planned outputs and achievement of the expected outcomes from the demonstration units.

The Ministry of Industry and SMEs will support in establishing the WTE power plant and their grid connection facilities. It will provide assistance in providing licenses and other permits to the service providers and private entrepreneurs involved in the MSW sector. It is the responsible authority to ensure the commercial viability of the WTE plants by supplying power to the nearby Special Economic Zone (SEZ) of Maluku which has a 10 MW power demand potential and to the N'Djil international airport. Hence, the proposed project has potential consumers to utilize the generated electricity.

The city provincial government of Kinshasa will have a close partnership with the PSC and act as a stakeholder in the execution of this project. This, along with Sanitation Board and Public Works (RATPK), Kinshasa will be responsible for providing all ground level assistance, services and infrastructure facilities for the successful execution of the project. They will play a major role in appropriate waste collection and its transport to the site.

Fond de Promotion de l'Industrie (FPI) will provide finance for investments needed for the demonstration units. End users/communities will be educated on proper segregation and disposal of wastes. Service providers will be trained on the handling and management of MSW from collection to disposal. These activities will encourage them to support the development of similar initiatives even after the end of the project.

NGOs and CSOs will be trained on entrepreneurship and business development in waste sector with specific focus on the waste collection systems. They will be playing a significant role to come up with creative and innovative strategies for the formalization of the sector. Further analysis in this regard will be conducted at the PPG stage.

The project does not have any direct involvement of indigenous people, since the project will focus on waste management in cities. Hence, the project will focus on improving sanitation/lifestyle of urban people. Also, no existence of indigenous community has been identified in Kinshasa province⁵⁹.

3. *Gender Equality and Women's Empowerment.* Are issues on equality and women's empowerment taken into account? (Yes /no). If yes, briefly describe how it will be mainstreamed into project preparation (e.g. gender analysis), taking into account the differences, needs, roles and priorities of women and men.

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. UNIDO's commitment towards gender equality and women's empowerment is demonstrated in its policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy. UNIDO has also developed an operational energy-gender guide to support gender mainstreaming of its sustainable energy initiatives. To mainstream gender into the project, an in-depth gender analysis report will be done during the PPG stage and various entry points for defining gender awareness, project outcomes, outputs, as well as activities will be identified and women engagement in various activities will be targeted. For instance, women will be engaged as trainers, international consultants, etc. wherever possible. Women participation as trainees will be encouraged from local service providers, various relevant stakeholders, etc. The project will encourage the entrepreneur skills among individuals and women self-help groups (SHGs) and create ways to generate profit by the sale of RDF, collection venture for MSW, sale of bins, etc. Local NGOs, CBOs, contractors, manpower consultancies, etc. will be used to employ women in waste segregation,

⁵⁹<https://www.ifad.org/documents/10180/60dd8d16-b433-43dd-84c3-bd141debf34f>

collection, recycling, production and sale of RDF, etc. in this project. This will provide them with permanent employment opportunities and will increase the family income.

4Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

Risk	Proposed mitigation measures	Risk level
Technical risks	<p>Only qualified EPC contractors with proven experience will be selected by following international best practices for tendering and bid evaluation.</p> <p>Operation & Maintenance (O&M) staff will be trained by the equipment supplier. Appropriate warranty, guarantee and after sales service agreement will be obtained from the technology suppliers. In addition to the above, UNIDO has expertise in implementing similar kind of projects.</p>	Low
<p>Financial risks: General perception that WTE investments yield low returns, hence the investors are not willing to invest. No off-takers for the generated electricity.</p>	<p>Co-financing letters will be obtained.</p> <p>The demand-supply gap is very high in the DRC. The generated electricity will be exported to the national grid or identified consumers, which will be identified during the feasibility study in PPG stage. The Ministry of Industry & SMEs already has a commitment of 10 MW supply to the SEZ in Maluku.</p>	Low
<p>Sustainability risk: Installation/operation of WTE plants might be ceased due by shortage of inputs and inadequate availability of trained plant operators.</p>	<p>The installations will be done only after conducting a proper resource assessment study, feasibility study and business plan. Efficient waste collection system ensures that wastes are properly collected and transferred to plant sites.</p> <p>Before the actual plant operation, the O&M staff would be trained by the equipment supplier. Appropriate warranties, guarantees and after sales service agreement will be obtained from the technology suppliers.</p>	Low
<p>Social risk: Risk of resistance against, or lack of interest in, the project activities from stakeholders.</p>	<p>This project will ensure stakeholder involvement at all levels, as well as involving CBOs and NGOs. This shall mitigate social risks and create a culture of mutual acceptance by all stakeholders including nearby communities.</p> <p>Awareness will be created among all stakeholders on the employment generation, business opportunities created, improved health benefits to attract participation.</p> <p>Environmental and Social Management Plan (ESMP) will identify and propose mitigation measures for such social risks.</p>	Moderate
Climate change risks	<p>Due to the changing weather patterns which might lead to flooding of the project sites. Adequate site assessment will be done before construction of site building and offices. All the buildings and structures will be designed and built appropriately to avoid destruction by floods and extreme weather events. Clear guidelines will be prepared and staff training will be conducted on management of such emergencies. ESMP will identify and propose mitigation measures for such climate change risks.</p>	Low

5. *Coordination.* Outline the coordination with other relevant GEF-financed and other initiatives.

The proposed project will complement the efforts of the below mentioned GEF and other national projects to achieve the improved sanitation/public health through effective MSW management and reduced GHG emissions in the country.

GEF and UNDP, along with the collaboration from the Ministry of Environment, have implemented several projects on improved capacity building and project identification to mitigate the identified risk factors in priority sectors among urban and rural population of the country. The key areas addressed by the projects are:

- 1) Land degradation and deforestation;
- 2) Public health;
- 3) Disease;
- 4) Drought/Water scarcity;
- 5) Extreme weather events;
- 6) Flood;
- 7) Sea level rise.

These projects had adopted potential measures like development of soil conservation programs, promotion of renewable energy technologies, preventive action against vectoral diseases, reinforcement of the cleansing system, etc. The proposed project will consult and collaborate with the key stakeholders of the GEF-UNDP projects. Data and resources on public health and sanitation requirements can be used in this project as well as these might be helpful inputs in the design of waste management system. Similarly knowledge sharing on landscapes, weather events, etc., will be useful for overcoming the climate change risks faced by the proposed project.

UNIDO has executed various projects in the region in Kenya, Tanzania, Uganda, Sudan, etc. on the GHG emission reduction in waste sector, WTE, disposal of hazardous wastes, etc. Necessary efforts will be taken to co-ordinate with these projects in the region through UNIDO offices in these countries.

6. *Consistency with National Priorities.* Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes /no). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The proposed project will support the following government policies and strategies for the successful implementation of solid waste management techniques and energy generation for a sustainable usage in the country:

- *National Adaptation Programmes of Actions (NAPAs), 2006:* The NAPA report identifies the following priority sectors of the DRC: 1) Water resources, 2) Coastal areas, 3) Health, 4) Agriculture and 5) Land degradation. NAPA also proposed following potential activities to be addressed including: a) Electrification of urban and rural areas, b) Development of water resources, c) Protection coastal areas, d) Management of forest resources, etc.
- *Third National Communication to United Nations Framework Convention on Climate Change (UNFCCC) (2015):* This report identified energy, agriculture and industrial sectors as the main sources of human induced GHG emissions in DRC. The energy sector will prioritize and take initiatives on the following for the reducing GHG emissions in DRC,
 - development of renewable energy sources,
 - use of clean technologies in electricity production,
 - utilization of waste for biogas and biofuel production.
- *Second Poverty Reduction and growth Strategy Paper (PRSP) (2011-2015):* The strategy places a particular emphasis on growth, employment creation and the impact of climate change. The document also focuses on the strengthening of good governance, the achievement of the MDGs by 2020 and the elimination of gender-based

inequalities. The strategy rests on four pillars: (i) The strengthening of governance and the consolidation of peace; (ii) The diversification of the economy to accelerate growth and create employment; (iii) Improvement of access to basic social services as well as the improvement of human capital; and (iv) The protection of the environment and actions to reduce the impact of climate change.

- **Intended Nationally Determined Contributions (INDC):** It is stated that the country estimates to reduce around 17% of its emission level against the baseline year of 2000. The priority sectors are agriculture, forestry and energy. The proposed project involves reduction of emission levels avoiding the use of fossil fuels in energy sector by generating power from landfill gases. Thus, it is in alignment with the INDC goals.

The proposed GEF project is therefore in line with the all above national strategies and plans.

7. Knowledge Management. Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

Feasibility studies, technical specifications, tendering procedures, business plans for demonstration project along with 5 feasibility studies and business plans for replication projects will be prepared at international standards and they will serve as a reference documents for NGOs/CBOs, individual firms, students, research scholars, government agencies, investors, industries, etc. for their application in MSW sector respectively.

The proposed project will consult and collaborate with key stakeholders of similar UNIDO-GEF projects in the region for effective knowledge sharing. A knowledge base will be developed based on the proposed study tour under output 4.2.2 to capture the best practices learnt in municipal waste collection, segregation, handling, energy recovery, recycling and disposal from this proposed project. This will serve as a database for MSW management and WTE technologies and will link with other global initiatives, as well as relevant projects. Each and every process of MSW management will be documented in a user-friendly way, to be replicated in future projects. All the lessons learnt from the project implementation will be properly documented through periodic reviews. All these knowledge management approaches will serve as a capacity building for the replication projects in future. An exclusive website will be created for MSW management, with user-friendly interface consolidating all above information.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

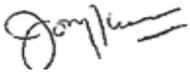
A. RECORD OF ENDORSEMENT⁶⁰ OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [Operational Focal Point endorsement letter](#)(s) with this template. For SGP, use this [SGP OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE(MM/dd/yyyy)
Mr. Vincent Kasulu Seya Makonga	Secretary General	MINISTRY OF ENVIRONMENT, NATURE CONSERVATION AND TOURISM	11/09/2015

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies⁶¹ and procedures and meets the GEF criteria for project identification and preparation under GEF-6.

Agency Coordinator, Agency name	Signature	Date (MM/dd/yyyy)	Project Contact Person	Telephone	Email
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation - PTC, UNIDO-GEF Focal Point		12/23/2016	Jossy Thomas, Industrial Development Officer, PTC/ENE/RRE	+43 - 1 - 26026- 3727	j.thomas@unido.org 

C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)

For newly accredited GEF Project Agencies, please download and fill up the required [GEF Project Agency Certification of Ceiling Information Template](#) to be attached as an annex to the PIF.

⁶⁰ For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

⁶¹ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, SCCF and CBIT