NORDIC DEVELOPMENT FUND

Preparation of Support under NDF's Climate Change Mandate

GHANA

Greater Accra Anaerobic Digesters Project

APPRAISAL REPORT

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May, 2011

PROJECT INFORMATION - SUMMARY

<table>
<tr><td colspan="2">Project Appraisal
Ghana – Greater Accra Metropolitan Area (GAMA) Anaerobic Septage Digesters Project (EUR 2.25 million)</td></tr>
<tr><td>Executing Agency: Ministry of Local Government and Rural Development and Metropolitan/Municipal Assemblies of Greater Accra</td><td>Sector: Water Supply & Sanitation (Waste management/disposal)
(Mitigation of Climate Change, Renewable Energy)</td></tr>
<tr><td>Project cost: EUR8.91.0 million 2 Digesters
NDF grant: EUR 2.475 million (Design and CDM Consultancy Services)
MLGRD/Lead Agency share: 555,000</td><td>NDF's Lead Agency: World Bank
Ghana Second Urban Environmental Sanitation Project (UESP II) (NDF 430 WB/IDA: P082373)</td></tr>
<tr><td>Previous NDF support to the country:
Credits: EUR 30.3 million, SDR 28.1 million</td><td>Other main financiers:
World Bank, GoG, Metropolitan/Municipal Assemblies</td></tr>
<tr><td colspan="2">General Objectives: The development objective of the Ghana UESP II, co-financed by World Bank/IDA and NDF (2004-2011), is to improve urban living conditions in Accra, Kumasi, Sekondi-Takoradi, Tamale and Tema. The proposed project is linked to Component 2 “Sanitation” of the UESP II and will strengthen the climate change profile of the UESP II by pursuing specific CDM actions that will reduce the emissions of greenhouse gases (GHG) and contribute to improved sanitation and liquid waste management as well as improve the livelihood and living conditions of the urban poor in Greater Accra.</td></tr>
<tr><td colspan="2">Specific Objectives: The specific objectives of the project are to co-fund the design and construction of two anaerobic sludge digester plants to: (i) Pave the way for, and co-finance, structural investments for sustainable CDM operations that will reduce the emissions GHG resulting from poor management of septic sludge and night soil in Greater Accra; (ii) Promote production of renewable energy; (iii) Generate revenues from carbon credits and electricity production; and (iv) Build the CDM knowledge and operational capacity of the Metropolitan and Municipal Assemblies to achieve sustainable liquid waste management services in cooperation with private operators.</td></tr>
<tr><td colspan="2">Relevance for new NDF Mandate: The proposed project is highly relevant for NDF funding since it contributes to: (i) Mitigation of climate change by limiting anthropogenic emissions of GHGs (Objective A) (The gas from anaerobic digesters comprises 50-60% of methane which is 21-times stronger GHG than CO2). (ii) Integration of climate change concerns with Ghana’s development objectives through its response to the Ghana Shared Growth and Development Agenda (GSGDA, 2010 – 2013) and the policy of the Environmental Protection Agency (EPA) (Objective C); and (iii) Support Ghana’s efforts to meet its commitment to the Kyoto Convention (Objective D).</td></tr>
<tr><td colspan="2">Component Description: The scope of the proposed NDF project will include:
1. Consultancy Services:(i) Political and Strategic Guidance on CDM; (ii) Engineering design of digester plants including CDM components; (iii) Business Plan for CDM operations and CDM Training; (iv) Processing of CDM approval by UN CDM Executive Board; (v) Capacity building in plant Operation & Maintenance and (vi) Construction supervision
2. Project Management Support: to be provided as part of UESPII and oversight of co-funding of CDM related investments: (i) GHG evacuation systems from digester; (ii) gas treatment; (iii) electric generator systems; (iv) flaring system; (v) emission verification system, and (vi) additional buildings. Total</td></tr>
</table>

estimated cost of the proposed NDF components is EUR 2.25 million.
Estimated Timetable and Duration: Tendering consultancy services May 2011-Aug 2011 (4 months) Phase 1: Implementation of Consultancy for Design Nov 2011-July 2012 (8 months) Phase 2: Construction, Supervision and Commissioning (Aug 2012- Dec 2013 (15 months) Proposed Closing date: Dec 2013
Institutional Issues: The project would be implemented under the framework of the UESP II. The signatory of the NDF Grant Agreement would be Ministry of Finance and Economic Planning and the Executing Agency would be Ministry of Local Government and Rural Development in cooperation with the Greater Accra Municipal and Metropolitan Assemblies. The Regional Coordinating Council (RCC) of the Greater Accra Region will provide project steering and coordination across the 8 Metropolitan and Municipal Assemblies constituting the GAMA area.
Project Risk: The appraisal examined and confirmed the risk factors identified at pre-appraisal, their possible consequences and mitigation measures. The risks were generally considered from low to moderate. A main challenge is the closing of the funding gap of EUR 5.35 million. During appraisal discussions were held with official of the World Bank Ghana Office and in principle agreement reached for the financing of up to EUR 6.00 million under the "GAMA Sanitation and Water Project" The likelihood of delayed project implementation is considered moderate due to close cooperation between the key partners MLGRD-PCU, MAs, WB, and NDF. The risks of cost overruns of the NDF project are however considered to be low since the cost estimates has a built-in flexibility to accommodate unforeseen expenditures. The risk of methane volumes become lower than projected is considered moderate. A cross-checking of the calculations returned same values for emissions (within 1% of pre-appraisal calculations). Another risk factor is delayed achievement of carbon credit incomes due to slow carbon validation/certification procedures. The NDF project will pay specific attention to improving the enabling environment in terms of providing MA support and training to address the new CDM challenges.
Nordic Interest, Comparative Advantage: Nordic companies and institutions are widely engaged in the fields of project so it is likely that the qualified Nordic firms will compete for the consultancy services and opt for CDM and carbon credits investments.
Relevant NDF Country/ Sector Experience: NDF has significant relevant sector and implementing agency experience from urban projects in Ghana including the ongoing Second Urban Environmental Sanitation Project (UESP II).

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ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
AMA	Accra Metropolitan Assembly
CDM	Clean Development Mechanism
CER	Certified Emission Reduction (carbon credit)
DESSAP	District Environmental Sanitation Strategy and Acton Plan (DESSAP)
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
GoG	Government of Ghana
GSGDA	Ghana Shared-Growth and Development Agenda, 2010 – 2013
KMA	Kumasi Metropolitan Assembly
LEKMA	Ledzokuku Krowor Municipal Assembly
LFG	Landfill gas
MA	Metropolitan Assembly
MDG	Millennium Development Goals
MLGRD	Ministry of Local Government and Rural Development & Environment, Ghana
MTDPF	Medium-Term Development Policy Framework
NEPAD	New Partnership for Africa's Development
NESSAP	National Environmental Sanitation Strategy and Action Plan (NESSAP)
O&M	Operations and Maintenance
PCU	Project Coordination Unit
TaMA	Tamale Metropolitan Assembly
SESIP	Strategic Environmental Sanitation Investment Plan
UASB	Up-flow Anaerobic Sludge Blanket
UESP II	Second Ghana Urban Environmental Sanitation Project

LOGICAL FRAMEWORK FOR OF THE DETAILED DESIGN AND INVESTMENT PREPARATION PROJECT

HIERARCHY OF OBJECTIVES	EXPECTED RESULTS	REACH BENEFICIARIES	PERFORMANCE INDICATORS	INDICATIVE TARGETS AND TIMEFRAME	RISKS & MITIGATON MEASURES
GOAL: Enhance the environmental health and living conditions of the population within the targeted project area of the Greater Accra Metropolitan Area.	**IMPACT**: The objectives of the GAMA Septage Treatment Project fulfilled in terms of better living conditions, improved health, poverty reduction and economic development.	• Inhabitants within locations of Digesters to direct discharge of septage &nightsoil (LEKMA & Korle Gonno and environs) • Inhabitants of the Greater Accra Metropolitan Area	**Indicators**: 1. Presence of authorized point-discharges of untreated septage/nightsoil 2. Incidence of poor Sanitation related diseases in GAMA (Top 6 Outpatient morbidity rate)	**Target:** 1. Complete elimination of the number of authorised direct discharge points without treatment in GAMA by 2013. 2. The number of outpatients diagnosed of sanitation-related diseases in GAMA reduced from XXXX to YYYY.	**Risk:** - Funding gap for structural investment of EUR 5.35 million remains uncovered. **Mitigation:** - Project very suitable for the upcoming WB "Accra Total Septage Management project"; - Bilateral co-funding agencies including AFD
OBJECTIVE: The objective of the study is to review preliminary designs and carry out detailed engineering design and construction of two digester plants for the treatment of septage and night soil in selected locations within Greater Accra Metropolitan Area (GAMA).	**OUTCOMES:** Mobilization of funds for the construction of two anaerobic digesters, biogas harvesting and re-use systems and their related appurtenances for the benefit of the entire population living within GAMA.	- Ministry of Local Government and Rural Development - Local authorities of GAMA	**Indicators**: - Commitment and level of investment resources mobilized	**Target:** - Project Appraisal approved by NDF Board in May 2011 - At least 50% of the estimated US$ 9 million cost of initial capital investments is committed by October 2012	**Risk**: - Changed framework conditions and policies in Ghana that reduces the focus on liquid waste management in 2013. **Mitigation:** - Minister, MLGRD and higher officials from the concerned MAs very supportive of project improving the urban environment and living conditions

ACTIVITIES Component I: Detailed Designs of 2 No. Anaerobic Digesters (i) Preparation of Detailed Designs by reviewing and updating of preliminary designs prepared under UESPII (ii) Procurement of Contractors for Works and Consultants to carry out Supervision of Works	OUTPUTS (i) Detailed Engineering Designs and Cost Estimates (ii) Procurement for Works and Consulting Services	Local , national and international stakeholders, civil society, private and public sectors	INDICATORS: -Design Documents submitted and approved according to specifications implementation schedule **Source**: progress reports, supervision missions and project completion report	Target: -GAMA Treatment Plant with Digesters constructed and commissioned. Time Frame: 12/2013	**Risk**: - Delayed effectiveness and/or procurement of consultant - NDF project cost overruns - Captured methane volumes are lover than projected **Mitigation:** - Timely action by PCU and MAs on processing of procurement and rapid no objection response by NDF - The budget accommodates contingencies and unforeseen expenditures - conservative BOD analysis on sludge samples combined with conservative assumptions for LFG captures from Anaerobic reactors
Component II: Project Management Support	(i) Project Management Results: (Procurement of Consultants/Contractor services for detailed design and Works, validation of and progress reports and support to MAs)	Local , national and international stakeholders, civil society, private and public sectors	Indicators: - Reports delivered and approved according to Reporting Schedule - Project completion report	Target: Component II completed Time Frame: 12/2013	**Risk:** - Staff placement at PCU not reviewed after December 2011 **Mitigation:** - The NDF project is designed to assist the MAs pursue downstream activities through engaged design consultants through 2012/2013 process.
	Financing: NDF €2,475,000; IDA: € 5,885,000; and GoG: €550,000		Total Cost: € 8,910,000		Project Duration:27 months

EXECUTIVE SUMMARY

Background: The Government of Ghana (GoG) through the Ministry of Local Government and Rural Development (MLGRD) requested the Nordic Development Funds (NDF) for partial financing from NDF grants for the Pre-Appraisal of the proposed Greater Accra Metropolitan Area (GAMA) Anaerobic Digesters Project. Based on a pre-appraisal of the project the NDF in October 2010 transmitted the pipeline approval for the Greater Accra Digesters Project up to EUR 1,200,000 under its Climate Change Mandate. This report is the output of the appraisal of the project as part of further preparatory activities. The project fulfils GoG's quest for robust technical solutions to the increasing volumes of point and non-point indiscriminate discharges of septage and nightsoil and also lays the basis for incorporating the management of GHGs in treatment facilities through CDM investments.

Objective: The GAMA Anaerobic Digesters Project will contribute to enhancing the environmental health and living conditions of the concerned populations in the targeted project area of the Greater Accra Metropolitan Area with a population estimated at 3,377,064. The specific objective of the GAMA Anaerobic Digesters Project is straightforward: *to review preliminary designs and carry out detailed-engineering design and construction of two digester plants for the treatment of septage and nightsoil*. The incorporation of process units for biogas/Landfill Gas (LFG) harvesting and use is in line with GoG's medium-term plan of pursuing a low-carbon economy, and fulfills NDF's new Climate Change Mandate.

Description: The pre-construction services for the proposed GAMA Anaerobic Digesters Project are straightforward. There are two (2) components: i). Detailed Designs of 2 No. Anaerobic Digesters incorporating appurtenances and fixtures that allow for post-construction retrofitting of units for biogas harvesting and utilization; and ii). Project Management support to the participating Metropolitan and Municipal Assemblies (MAs). The detailed design documents will be used for the procurement of works at the following stage to be financed from sources other than the NDF grant.

Cost and Funding Sources: The project will be carried out in a period of 8 months after an initial period of three (3) months covering grant effectiveness and the procurement of the services of a consulting firm. The total cost of the project is € 7,600,000 inclusive of the NDF grant of € 1,200,000 for consultancy cost for detailed designs. Agreement was reached, during appraisal, from discussions with the World Bank and the MLGRD that facilities construction component of €5,500,000 will be financed as part of the pipeline GoG/World Bank funded GAMA Sanitation and Water Project. During the application of Project Preparation Facility (PPF) of the GAMA Sanitation and Water Project an Environmental and Social Impact Assessment will be financed by independent consultants up to an amount of €030,000. It is anticipated that additional funding from NDF grant of up to €1,050,000 will be applied to post-construction Operation and Maintenance (O&M) management through Public-Private-Partnership (PPP) arrangement to secure CDM investments for improved GHG management. GoG and other partners notably the world Bank and AFD will provide the remaining balance.

Justification: The proposed project fits under NDF's Climate Change Mandate. The proposed project is part priority strategies of the Government of Ghana's (GoG's) medium-term national

development policy framework, 2010 -2013, the GSGDA whose relevant sections are in turn influenced by sector policies and plans such as the Environmental Saniation Policy (Revised, 2010) and EPA's Capacity Development for CDM initiatives.

Recommendations: Based upon a comprehensive assessment and appraisal of background information and discussions with key actors it was concluded that the proposed project is of critical relevance, will yield value-for-money (effectiveness, efficiency and economy), is viable and sustainable. The Recipient has sufficient credibility and capacity therefore an NDF grant not exceeding €2,2050,000 is recommended to the Ministry of Local Government and Rural Development (MLGRD) for the GAMA Anaerobic Digesters Porject.

1. BACKGROUND

1.1 Origin of the Project

1. The Ministry of Local Government and Rural Development (MLGRD), Ghana requested NDF in a letter of 5th January 2010 for partial financing from NDF grants of two proposed projects developed under on-going Government of Ghana (GoG)/World Bank-funded Second Urban Environmental Sanitation Project (UESP II). The two projects were (i) Appraisal of Proposed Landfill Gas Capture & Utilisation Project, and (ii) Pre-appraisal of Proposed Anaerobic Septic Digesters in Greater Accra Project.

2. A pre-appraisal report on the second project proposed strengthening the climate change profile of the UESPII through the implementation of projects that target reduction in emissions of greenhouse gases (GHGs) such as from the poor management of septic sludge and night soil in Accra. In addition the projects will aim at increasing the use of renewable energy, and improving the livelihood and living conditions of the urban poor in the city.

3. During the pre-appraisal of the project it was also recommended that a desk appraisal be carried out in consultation with MLGRD, the ministry's Project's Coordination Unit (PCU) in charge of implementing the UESP II, the World Bank (WB) and other funding partners in order to discuss outstanding issues of institutional and financial arrangements, especially the issue of closing any funding gap for actual project delivery that will not be covered by NDF.

4. The current project was borne out of the dire need for improved management of septage and nightsoil sludges expressed by the residents and Metropolitan and Municipal Assemblies (MAs) within the Greater Accra Metropolitan Area (GAMA) which covers the capital city and its environs, as well as the adjoining districts and localities stretching to and including the industrial port-city of Tema. In response the UESPII has commissioned number of studies[1] to identify potential solutions to the technical (including environmental), financial and institutional challenges faced by the MAs in managing septage and nightsoil effectively.

5. Over the period the GoG and the MAs have taken steps and made tremendous efforts to mobilize funds for designs (including conceptual and preliminary) and also the cost implications for investing in new schemes and rehabilitating of existing ones. The Accra Metropolitan Assembly (AMA), for example, has considered various options for halting the direct marine discharge of faecal sludges on the beach at Korle Gonno with its adverse impact on touristic use of the beaches. These options include the installation of covered

[1] GoG-MLGRD: (i) Liquid Waste Management in Accra. Technical Assessment Report (March 2009) by Colan Consult and (ii) HIFAB International: Accra Sanitation Upgrade – Assessment and Upgrading of the Accra Sewage Treatment/Disposal Facility. Final Report (August 2009)

lagoons for pre-treatment, the installation of anaerobic digesters and/or the retrofitting of septage/sludge pre-treatment units to the existing Upflow Anaerobic Sludge Blanket (UASB) plant. The AMA aims at using funds from its own Internally Generated Funds (IGFs) as well as from private sources to implement the appropriate scheme. Recovery of methane and the advent of private-sector management of the facility (ies) under Public-Private-Partnership is central to the proposed schemes.

6. The NDF's Board approval of the Greater Accra Anaerobic Digesters Project, based on pre-appraisal, as part of pipeline projects eligible for NDF grant financing is therefore very timely and a major boost to finding sustainable remedial actions that complement the efforts of GoG and the respective MAs.

7. In pursuance of the recommendation of the pre-appraisal report for a desk appraisal of the proposed project further analyses of relevant documents and reports, focus-group-discussions and consultations with key persons were carried out from early March and in April 2011. The consultants met with the MLGRD and various MAs, traditional authorities and community representatives, ministries of Finance and Economic Planning (MoFEP) and Environment. Science and Technology (MEST), members of the Parliamentary Select Committees on Environment, Local Government and Finance as well as other stakeholders including the Environmental Services Providers Associations (ESPA), the PCU of the MLGRD and other Development Partners, particularly the World Bank.

8. During appraisal, further discussions and analyses of initiatives in the Environment and the Environmental-Sanitation sectors reveal alignment of Government of Ghana's (GoG's) policy objectives towards measures and strategies that address issues of climate change and adoption of Clean Development Mechanism (CDM) for supporting new project initiatives.

9. The design of the project is therefore informed by findings, new insights and conclusions derived from reviews of pre-appraisal recommendations, project documentations and from consultations with stakeholders including those mentioned above.

1.2 Sectoral Priorities and Compliance with New Mandate of NDF

10. Since the inception of the GPRSII (2006 – 2009), the GoG has instituted the need for carrying out Strategic Environmental Assessments (SEA) in order to mainstream environmental sustainability in all policies and plans in fulfillment of MDG 7 "ensure environmental sustainability". The Environmental Sanitation Policy (Revised, 2010) was prepared using SEA processes and the measures assessed for responsiveness to environmental sustainability.

11. The proposed Greater Accra Anaerobic Digesters Project fits well in current Government of Ghana (GoG) priorities and those of the MAs. The MLGRD is currently implementing the Environmental Sanitation Policy (Revised, 2010) through its National Environmental Sanitation Strategy and Action Plan (NESSAP), 2010 – 2015 and accompanying Strategic Environmental Sanitation Investment Plan (SESIP) while MAs have developed District Environmental Sanitation Strategies and Action Plans (DESSAPs).

12. The Environmental Sanitation Policy (Revised, 2010) emphasizes re-use and recovery from all treatment options for all types of wastes. The NESSAP is titled "*materials-in-*

transition" (MINT) to connoting the "valuable resources from wastes. The Environmental Protection Agency (EPA) has prepared the "Capacity Development for Clean Development Mechansim (CD4CDM) in Ghana" to address the issues of potential application of CDM investments. These developments have further influenced serious consideration of design-for-re-use systems such as anaerobic digesters coupled with biogas harvesting units. All these are in agreement with current NDF's Climate Change Mandate.

13. The pursuance of aspects of 4Rs (recovery of CH4 and re-use of it) is responsive not only to NDF's mandate on Climate Change but will also assist GoG in carrying out projects that strongly demonstrate the potential of CDM financing and deepen public-private-partnerships in the delivery of municipal services hitherto not successfully implemented for faecal sludge and nightsoil treatment.

14. The proposed Project has been determined to be eligible to NDF funding since it contributes to: (i) the mitigation of climate change by limiting anthropogenic emissions of GHGs (Objective A); (ii) integration of climate change concerns with Ghana's development objectives through its response to the Environmental Protection Agency (EPA) (Objective C); and (iii) Ghana's efforts to meet its commitment to the Kyoto Convention (Objective D). The overall Project would qualify for a principal score (score "2") since its design is targeting 3 of UNFCCC principal objectives (A, C, and D) that are fundamental to its design and the main part of the budget are investments related to the achievement of these objectives.

Table 1.1: Summary of Fulfilment NDF Criteria Septic Sludge and Night Soil Digester Project

NDF Criteria	Component 1 Response
The project is found relevant and has achieved a principal or significant score with regard to the objectives of the UNFCCC	The project has received a principal score (score "2") since its design is targeting 3 of UNFCCC principal objectives (A, C, and D) that are fundamental to its design and more than 90% of the budget is investments related to the achievement of these objectives.
Activities falls within the identified NDF sectors	The Project component falls within the following NDF priority sectors: Infrastructure and Energy (Solid Waste Management, Mitigation of Climate Change, and Renewable Energy) and Capacity Building.
There is a calculation of CO2 emissions savings to be achieved by end-of-project.	The CO2 emissions savings to be achieved by end-of-project by capture and use of GHG from sludge digesters (7800 tons CO2 /yr) equivalent to 78,000 tons CO2 over 10 years period equal to EUR one million.
There is a system in place to monitor, verify and account (MRV) of the CO_2 reductions.	System and arrangements to monitor, verify and account of CO_2 reductions will be part of the NDF project.
There are significant climate benefits when compared to total project costs.	Climate change benefits considered against GHG mgmt. related investments of EUR 1.05 mill and CO2 reduction of 78,000 tons gives about 13 EUR/ ton CO_2 which is moderate compared to for example landfills. The annual revenue from carbon credits and electricity production of EUR 150,000 is about twice the annual O&M cots of GHG mgmt totalling EUR 70,000.

15. The implementation of the project will contribute to the overaching national sector goal of expanding social and economic production infrastructure for economic growth and

sustainable poverty reduction. The total economic cost of poor environmental management and sanitation is over 10% of GDP (NDPC, 2010) and the project will fulfill GoG's commitment to tackling issues and strategies for reducing vulnerability to climate variability and change. Many aspects of GSGDA strategies are directly responsive to NDF's Climate Change Mandate.

16. The new Environmental Sanitation Policy (Revised, 2010) focuses on *reduction, re-use, recycling* and *recovery* (4Rs) for all treatment options for all types of wastes. In addition the Environmental Protection Agency (EPA) has prepared the "Capacity Development for Clean Development Mechansim (CD4CDM) in Ghana" and identified a number of potential areas for application of CDM including treatment of wastewater, septage and nightosoil sludges. These developments have further influenced the consideration of design-for-re-use in all treatment schemes. All these are in agreement with current NDF's Climate Change Mandate.

17. As a demonstration of GOG's commitment, the Budget Statement and Economic Policy for fiscal year 2011 has appropriated budgets to "support the establishment of compost plants all local levels" and for "upgrading works, storm drains and sanitation landfills under UESPII. These provisions provide additional opportunities for implementing co-harvesting of LFG from adjoining solid waste treatment/disposal facilities. The space provided for implementing public-private-partnership arrangements for installation these treatment/disposal facilities will facilitate the implementation of more re-use and recovery schemes. As Ghana deepens its status as a middle-income economy the capacity to deal with all types of waste effectively and responsively to issues of climate variability and change. The proposed project fulfils and compliments this vision.

1.3 Problem Definition

18. The Greater Accra Metropolitan Area (GAMA) covers an approximate area of …km^2 with a population of …..(GSS, 2011). There are eight (8) Metropolitan and Municipal Assemblies within GAMA: Accra Metropolitan Assembly (AMA), Tema Metropolitan Assembly (TMA), Ledzorkuku-Krowor Municipal Assembly (LEKMA), Adentan Municipal Assembly (AdMA) and Ashaiman Municipal Assembly (ASHMA), Ga-West Municipal Assembly (GWMA), Ga-East Municipal Assembly (GEMA), and Ga-South Municipal Assembly (GSMA).

19. Over the past 2 decades, the GAMA area has seen rapid expansion of population and housing, while the provision of infrastructure has fallen behind and in many instances has deteriorated. A case in point is the provision of facilities for the treatment of septage (from septic tanks) and nightsoil sludge (from public toilets). While the volumes of septage/nightsoil evidenced by the number of trips of cesspit-emptier trucks to discharging points have increased, the number of functioning treatment facilities have decreased with the decommissioning of a number while others have fallen into disrepair and/or disuse.

20. The burden on the environment and the attendant health risks due to discharges of untreated septage and nightsoil from many non-point and point sources including septic tanks and

public toilets illegally connected to drains, rivulets and streams can only be imagined. This situation has persistent for over a decade now.

21. Besides the lack of incremental provision of treatment facilities to match the growth in volumes of septage/nightsoil another core challenge has been the deterioration of the operational integrity of most MA owned facilities. This challenge is country wide and a recent study (IWMI, 2009) reported that out of 44 sewage treatment plants (including 7 Faecal Sludge and Septage Treatment Plants, FSTPs) treatment facilities only 7 are functioning adequately (see a snapshot of the status of facilities, Annex …).

22. For example, the inability of AMA's Waste Management Department (AMA-WMD) to sustainably operate and maintain the Accra Sewerage Treatment Plant inherited from the Ghana Water Company Limited (GWCL), is a common challenge faced by many MMDAs including those of Kumasi, Sekondi-Takoradi, Koforidua and Tamale in managing constructed septage/faecal sludge treatment plants (FSTPs). In Kumasi, FSTP co-sited on the engineered landfill disposal site at Dompoase and commissioned in 2002 is not functioning properly with the initial anaerobic/sedimentation ponds choked due to lack of an effective means of handling septage/nightsoil sludge/slurries from the initial sedimentation ponds.

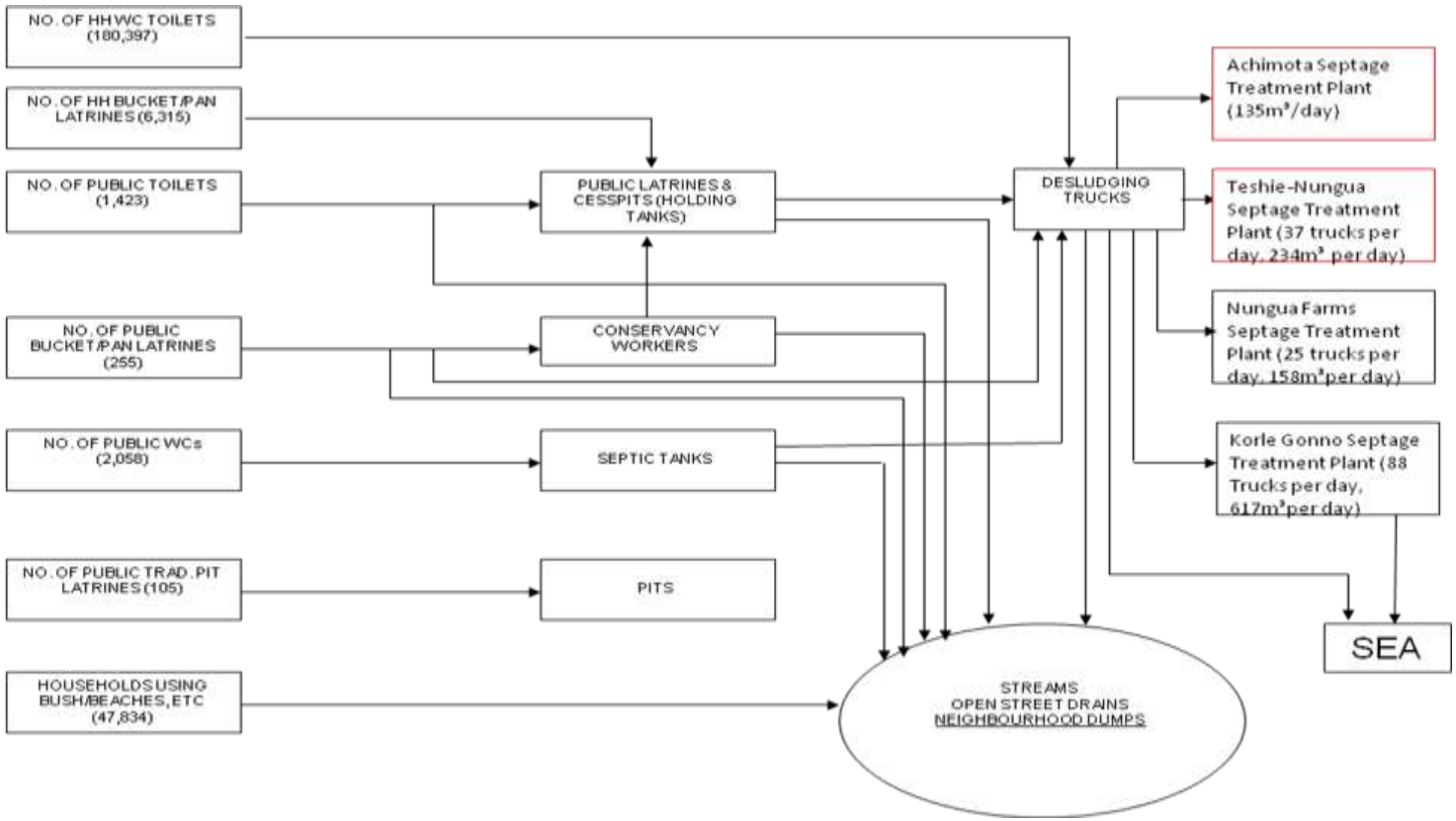
23. The difficulty of operating septage/nightsoil treatment facilities by the MAs point to the persisting need for more robust and low-cost technologies and systems better suited for the handling of the problematic high BoD (7,500 – 30,000 mg/l) of septage/faecal sludge. There is therefore urgent need for remedying this technical and operational bottleneck that MAs has faced in operating FSTPs.

24. Beyond the current situation described as a crisis situation[2], is a looming danger; as population and housing growth is not abating. For Ghana as a whole the urban population (52%) surpassed that of rural in 2010 (GSS, 2011). Housing development in GAMA is mostly in new estates and newly developing areas, with prevalence of WC/Septic tanks many without on-plot drain-fields. At the same time the number of public toilets is increasing to satisfy the demand of transient populations at markets, bus terminals and other public areas as well as for the majority of residents of low-income communities who depend on such communally shared facilities. The volumes of septage/nightsoil will continue to grow and is projected to reach 1,200m3 for the GAMA area by 2015 (AMA, 2010).

25. Figure 1.1 gives an overview of the sources of septage/nightsoil and the corresponding points of final discharge, while Table 1.2 gives the volumes of material that reach designated facilities and/or discharge points.

[2] The Ghana Country Economic Memorandum, 2007, issued by the World Bank indicated an environmental sanitation crisis with dire constraints on services including hospitality-industry and drawdown on potential earnings from tourism.

Figure 1.1: Snapshot of Septage/Nightsoil Sources and Dischage points in GAMA



Note:

- Flows at Achimota and Teshie-Nungua diverted to Korle-Gonno (due to closure of tipping points) for direct marine discharge
- Number of Households using bushes, beaches, etc. : GWSMP 2009

Table 1.2: Number of trips and volume of Septage generated per day

Treatment Facility	Average Number Of Trips Per Day	Average Volume Of Septage Delivered Per Day (m^3)	Installed Capacity (m^3/d)
Teshie-Nungua (LEKMA)	37	234	80
Tema (TMA)	25	158	200
Korle-Gonno, (AMA)	96	608	-
Total	158	1001	

Source: MLGRD, Liquid Waste Management in Accra, Assessment Report, March 2009, Colan Consult.

26. Operators of septage-haulage trucks hold all together about thirty five (35) emptiers that have resulted in further improvements in terms of access to emptying services. The private operators have formed an Association that has been mandated by the AMA to collect tipping fees from its members on each visit to any of the sites. Operation and maintenance still remains the responsibility of the AMA.

27. The Greater Accra Anaerobic Digesters project is therefore very timely and will lay the basis for tackling the key technical challenge of efficient handling the septage/nightsoil; anaerobic digesters is a proven technology with vast experiences in local and sub-regional application. After the installation of the 2 bio-digesters additional boost will be derived from harvesting biogas and the related attendant potential for CDM investments which will pave the way for resolving the challenges of financial and institutional bottlenecks encountered so far. The advent of PPP based on the management of septage/nightsoil focusing on a ready saleable by-product (bio-gas) is a departure from the past.

28. Some of the main problems enumerated as contributed by the poor handling of septage/nightsoil include and the reasons thereof include:

    a. The un-controlled discharge of untreated faecal sludges and septage into rivers, the sea as well as on refuse dumps. The burden of diseases within the immediate built environment such as cholera, dysentery and typhoid on urban poor populations living closely to the discharge sites is very high.

    b. Inadequacy of treatment systems to handle the variable strengths and properties of septage and nightsoil sludges;- the difficulty of handling of the settled sludge slurries of primary sedimentation tanks is the main culprit in the filling-up and eventual closure of many faecal sludge ponds.

    c. Rapid urbanization that is taken place with increasing lack of appropriately located open spaces for installation systems such as septage/faecal sludge treatment ponds that require large tracts of land.

d. Ineffectiveness of primary sedimentation and lagoons in odour and fly control resulting in strong resistance (NIMBY syndrome) to siting of such treatment facilities in built up neighbourhoods.

e. Hitherto disregard to design-for-re-use options that make harvesting and harnessing of biogas as a by-product of digestion of wastes.

f. The deterioration of safe water sources within the GAMA catchment area due to pollution of surface water bodies and the sea and the impact due to loss of job opportunities in the tourism and fishing industry.

g. The EPA and MAs lack the political willingness and institutional presence to effectively enforce and prevent indiscriminate discharge of septage and nightsoil at un-authorised locations knowing that the authorities are themselves the main culprits.

29. Time is long overdue for the adoption of anaerobic digesters as an alternative viable option to septage/faecal sludge lagoons. The GAMA Anaerobic Digesters Project will vitally contribute to the resolution of the above problems and is therefore very timely. The potential for harvesting methane gas (a critical component of GHGs) and the implementation of CDM investments to complement revenue from tipping charges will also enhance the implementation of Public-Private-Partnerships (PPPs) for effective O&M management.

1.4 Scope of Project Remedial Actions

30. Background studies and analysis of current and projected flows of septage and nightsoil has been adequately carried out by the UESP II. Based on the experiences and challenges of the operation and management of septage and faecal sludges, especially the initial sedimentation tanks, the NDF grant is to applied to detailed designs of the two plants based on anaerobic digestion. The designs are for the construction of two identical septage/nightsoil digester plants each with a capacity of 500m^3/day to be installed at (i) behind the lorry terminal at Achimota and (ii) Teshie-Nungua. Plans are being made to install similar plants in other parts of GAMA. All put together the plants will adequately handle the expected generated septage/nightsoil flows for city up to 2030.

31. Taking into consideration the issue of odours from ponds (and the associated NIMBY) as well as the possibilities for combination with landfill gas collection from adjacent sites the design include of the anaerobic digestion system include the following:
    1. A reception point for the discharge of septage and night soil with screens and scraper;
    2. Digester plant with capacity to handle 500 m3 of septage and nightsoil per day;
    3. A system for cleansing of effluent including generated sludges, if any as well as filtration systems or sludge drying beds.
    4. Biogas collection system e.g. Balloons
    5. Biogas-use systems and accessories including biogas/landfill gas electricity-generator sets and alternative flaring system

A simple flow diagram for the system is presented in the figure below.

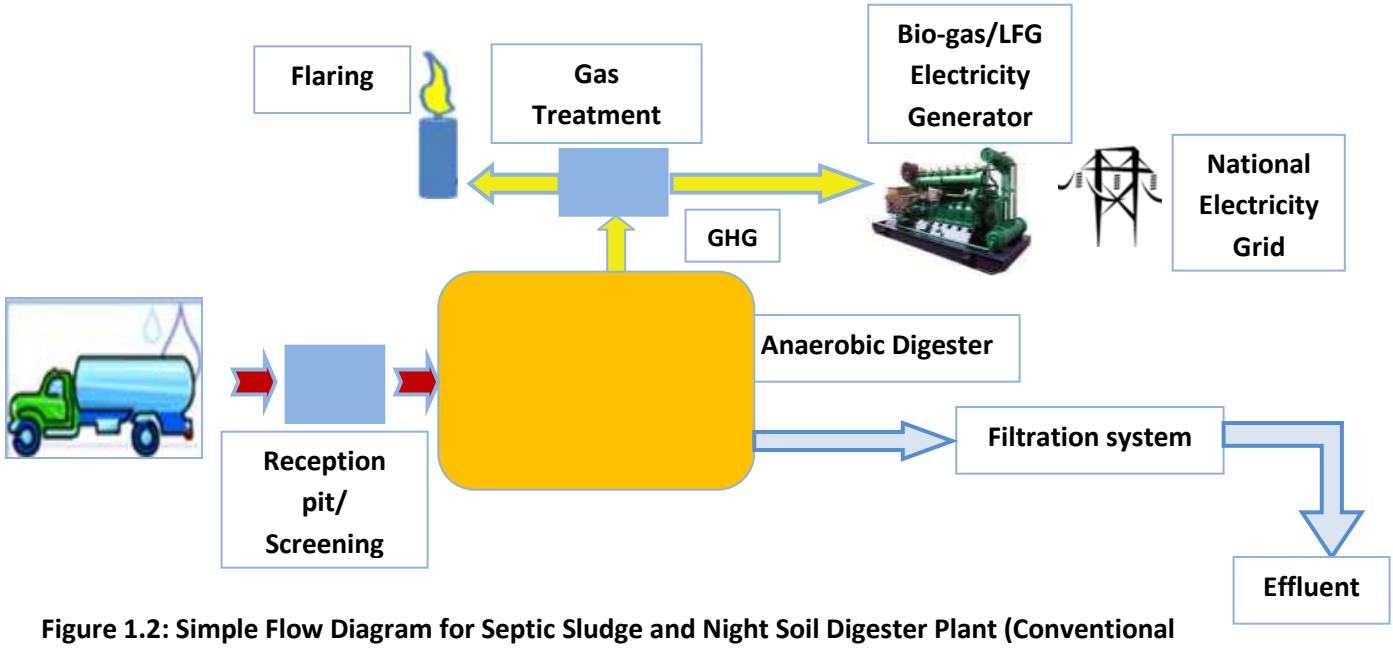


Figure 1.2: Simple Flow Diagram for Septic Sludge and Night Soil Digester Plant (Conventional Anaerobic Digestion Process)

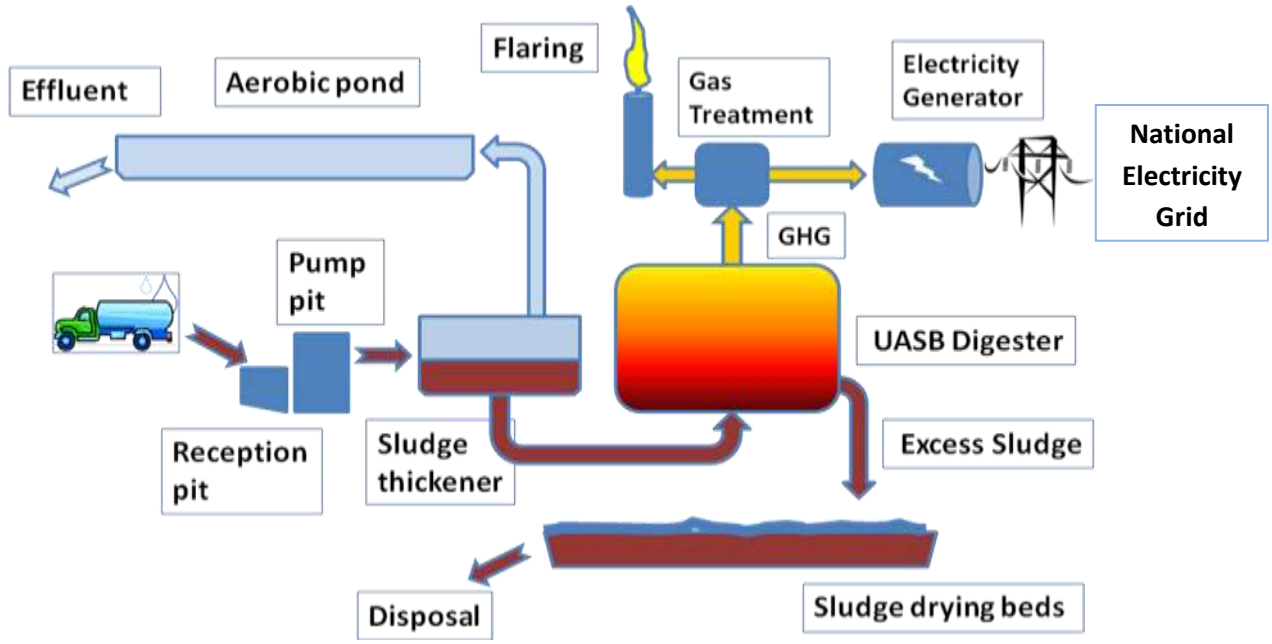


Figure 1.3: Simple Flow Diagram for Septic Sludge and Night Soil Digester Plant (UASB Process)

32. The core of the process is anaerobic digestion process (this also includes the Upflow Anaerobic Blanket, UASB variant, Figure 1.3). The appraisal Team cross-checked the cost

estimates using the preliminary designs and the adjustments to biogas-use systems and accessories (including biogas evacuation and treatment, electric generators, gas measurement and monitoring equipment) to satisfy downstream linkage to CDM investments.

33. In particular the issue of how operations will affect the out-door amenity of nearby communities have been considered. The mal-odour during discharge of septage and nightsoil, which is the greatest NIMBY threat, ought to be minimized to very low-levels with the installation of effective deodorizing unit(s) (or foul-air extraction units) as maintained at many industrial size composting plans. The additional buildings recommended during pre-appraisal are now specified as the main portal-frame that will house the digester and tipping station for septage trucks, office block and toll-booth for collection of tipping fees. The project will also be subject to an EIA study to be provided by the World Bank.

1.5 Objective of the Project

34. The specific objective of the GAMA Anaerobic Digesters Project is straightforward: *to review preliminary designs and carry out detailed-engineering design and construction of two digester plants for the treatment of septage and nightsoil incorporating process units for harvesting of biogas in selected locations within GAMA.*

35. As described in previous sections the project fulfils both national and sectoral strategic objectives as well as those of NDF's Climate Change Mandate. The climate specific objectives of the project are to: (i) lay the basis for strategic investments for sustainable CDM operations that will reduce emissions of GHGs from poor management of septage and nightsoil; (ii) promote production of renewable energy; (iii) generate revenues from carbon credits (approximately 7,800s CERs per annum, estimated at EUR 1000,000 per annum) and electricity production (in the range of 1,680 MWh per annum, estimated at EUR 50,000 per annum); and Build the CDM knoweledge and operational capacity of the MAs to achieve sustainable liquid waste management services.

36. The post-construction activity of plant management to be handled by MAs themselves (and so not defined as part of this intervention) will be aided to achieve specific objective (ii) and (iii) downstream by propositions of public-private-partnership (PPP) arrangements that will secure the CDM investments and sustainable O&M management and thus contribute to improved living conditions and livelihoods of the residents of GAMA.

1.6 Beneficiaries and Stakeholders

37. The MAs within GAMA specifically those of AMA and LEKMA where the two digesters will be located are the main beneficiaries of the project. These MAs will use the projects to show-case large scale harvesting of biogas and the potential for PPP in the implementation of improved oversight of the treatment facilities. Additional benefits include of north-south technical assistance and technology transfer from private entities with experience in the

installation of process units for gas-capture, cleaning and conversion-to-electricity as well as management of CDM portfolios.

38. The ultimate beneficiaries of the proposed project are the over 7 million residents of the GAMA area especially those living near over-flowing storage vaults and point-sources of direct discharge of untreated septage and nightsoil.

39. The institutional stakeholders comprise the MLGRD and its Directorates, MEST, MoFEP and the local authorities (MAs), community interest groups, private sector operators, and local NGOs.

40. The main development partner stakeholders include the NDF which is co-funding the UESPII with the World Bank, the African Development Bank (AfDB) which is supporting the Accra Sewerage Improvement Project (ASIP) which includes the rehabilitation and possible upgrade of the UASB plant. Other donors including Agence Francaise de Development (AFD) are focusing on urban sanitation improvements including treatment of septage and faecal sludge. International NGOs, like WaterAid-Ghana and CHF-International, are working in low-income communities to improve the provision of public toilets and drainage infrastructure including effective O&M management by community-based entities.

1.7 Nordic Interest and Comparative Advantage

41. Nordic companies and institutions have extensive experience and involvement in the fields of services and goods required by the Project. NDF has significant relevant sector and implementing agency experience from urban projects in Ghana including the ongoing Second Urban Environmental Sanitation Project (UESP II).

42. It is likely that the shortlist of consultants would include some interested, qualified Nordic firms. The main focal elements of the proposed project that will attract Nordic interest are to provide consultancy services for: (i) technical designs of methane capture and utilisation from anaerobic digesters for spetage and placed waste in landfills (a fast growing business in the Nordic Countries) and (ii) institutional capacity building and training in CDM management. In terms of post project opportunities for partnership agreements with the MAs, there is also a growing Nordic involvement in carbon credit investments.

2. THE PROJECT

2.1 Impacts

43. The GAMA Anaerobic Digesters Project fulfils both national and sectoral strategic objectives. At the national level, the medium-term national development policy framework, the Ghana Shared Growth and Development Agenda (GSGDA), 2010 – 2013, has infrastructure, energy and human settlements as a focus area. The GSGDA recognises the critical role of infrastructure in propelling economic growth and sustainable poverty reduction as Ghana aspires to become a middle-income country. Environmental sanitation and hygiene is a key policy focus area. Environmental sanitation and hygiene also plays a vital role in human settlements development strategies.

44. A pivot strategy of the GSGDA for sustainable natural resources is the adoption of Low Carbon Growth (LCG) and thus target earning benefits of international support through the implementation of emission reduction projects such as the proposed Greater Accra Anaerobic Digesters Project. The harvesting of biogas and its eventual re-use also addresses the policy objective of the GSGDA in promoting increasing reliance on renewable energy sources including wastes.

45. The expected impact of the GAMA Anaerobic Digesters Project is therefore multi-faced and will contribute directly to better living conditions, improved health, poverty reduction and economic development. The indirect benefits of demonstrating the efficacy of renewable energy from wastes, securing urban farming from re-use of treated wastewater all have attributable impacts to the proposed project.

2.2 Outcomes

46. The main outcome of the project will be the mobilisation of funds for the construction of two anaerobic digesters, biogas harvesting and re-use systems and related appurtenances the benefit of the entire population living within GAMA. This will be achieved by identifying and agreeing on sources for financing the capital investment project to be prepared as part of the appraisal.

2.3 Outputs

47. The main outputs of the GAMA Anaerobic Digesters Project arranged under two (2) components are as follows:

Component I: Detailed Designs of 2 No. Anaerobic Digesters

- Output 1: Detailed Engineering Designs and Cost Estimates Prepared
- Output 2: Procurement for Works and Consulting Services

Component II: Project Management Support

- Output 3: Project Management Results (Procurement of Consultant services for detailed design and Works, validation of and progress reports and support to MAs)

2.4 Activities

48. The outputs of the two project components are to be achieved by the delivery of the respective activities described briefly below. The scope of the assignment is presented in a schematic work-breakdown structure in Annex…The PCU will issue a detailed ToR for the prospective consultancy assignment as part project preparation up to grant effectiveness.

2.4.1 Component I: Detailed Designs of 2 No. Anaerobic Digesters

Activity 1.1: Prepare Detailed Designs by reviewing and updating of preliminary designs prepared under UESPII (including site investigations of proposed locations)

The following tasks will be carried out under this activity:

- Preparation of Site(s) Condition Report(s) in relation to geometry for each plant and appurtenances from detailed topographic surveys, mapping of sites and surveying of infrastructure and utility services
- Supplementary geo-physical and geo-technical investigations including testing of construction material
- Review of detailed-design parameters and update of preliminary designs and cost envelopes for the 2 anaerobic digesters
- Scoping and updating of the baseline information including legal and institutional environment, socio-economic and environmental data for completing Environmental &Social Impact Assessment (ESIA) for the specific projects on each site and adjoining locations and prepare environmental statement and mitigation plan
- Complete detailed multi-purpose optimisation of economic benefits, social and environmental consequences of installation of the digesters; and of harvesting, cleaning and sale of biogas and implications for CDM investments
- Prepare detailed engineering designs including technical specifications and cost estimates based on priced bill of quantities
- Propose an implementation schedule for works and appropriate contract packaging to ensure value-for-money to the clients

Activity 1.2: Procure Contractors for Works and Consultants to carry out Supervision of Works

The following tasks will be carried out under this activity:

49. The Consulting firm to be engaged under the proposed NDF support will prepare complementary tender documents for the procurement of services of contractors for the execution of works as well as services of consultants for the supervision of the works, as well as;
    - Assist the MAs in building in-house skills for project performance monitoring and evaluation
    - Support the MAs prepare a report on options for Public-Private-Partnerships for CDM investments; and

- Support MLGRD to build capacity of PCU and MAs in mainstreaming Climate Change issues and CDM strategies in the design and delivery of projects by identifying and selecting, through appropriate sourcing, firms with the requisite expertise in biogas harvesting, carbon-market trading, as well as technical assistance and technology transfer in renewable energy utilisation.

2.4.2 Component II: Project Management Support

50. One of the digesters will be located at Achimota within the Accra Metropolotan Assembly (AMA) and the other at Teshie-Nungua within the Ledzorkuk-Krowor Municipal Assembly (LEKMA). The coordination of projects delivery for these MAs each with a separate establishment mandate and jurisdictional authority will be provided by the Project Coordination Unit (PCU) of the MLGRD which is currently responsible for oversight-coordination of the on-going GoG/World Bank funded second Urban Environmental Sanitation Project (UESPII) for the five largest cities in Ghana. The PCU and the MAs will prepare jointly and separately present projects implementation performance to the designated oversight body.

51. To ensure the active involvement of the Regional Coordinating Council (RCC) of the Greater Accra Region and achieve synergy in the designs and implementation of other wastewater, septage/nightsoil treatment facilities which ultimately affects all the eight(8) metropolitan, municipal assemblies a GAMA Projects Steering and Coordination Committee (GPSCC) shall be established which's membership shall be determined under direction of the Ministry of Local Government and Rural Development.

Activity 2.1: Project Management Tasks

52. The following tasks will be carried out under this activity:
- Procurement of consulting firm for detailed designs and construction supervision;
- The review and endorsement of all reports for onward approval by the GPSCC and NDF;
- Organization of validation workshops, roundtable meetings for all studies, reports and assessments
- The acquisition of office supplies
- Procurement of equipment, vehicles, etc.;
- Advise on the assignment of counterpart staff to work with the Consultant;
- Organisation of project oversight meetings and workshops;
- Project financial management, accounting, and auditing; procurement; performance monitoring of project implementation and reporting to GPSCC

2.5 Risks Analysis and Safeguards Needs

53. A number of assumptions and risks have been considered which resulted in the logical framework matrix. The attainment of the overall objectives and actions of the The GAMA

Anareobic Digesters Project will be dependent on how these assumptions and risks become validated during project implementation. Further analysis of the risks identified and listed during pre-appraisal was carried out during appraisal. During project design and update of baseline information these risks will be reassessed and the mitigation measures adapted to reflect prevailing conditions and improve the achievement of the set objective.

54. The risks of delayed implementation of the project are considered moderate – low provided the interaction between the key partners MLGRD-PCU, MAs and NDF in terms of actions and issuing of no objection works well. The risks of cost overruns are considered low since the cost estimates has built in flexibility to accommodate price increases and unforeseen expenditures. The identified risks are summarized in Table 2.1.

Table 2.1: Risks and Mitigation Measures

Risk factor	Probability	Mitigation Measures
Funding gap for structural investment of EUR 5.35 million remains uncovered	Moderate	Project very suitable for the upcoming WB "Accra Total Septage Management project". Alternatively bilateral co-funding agencies. Funding needs to be concluded as part of the appraisal.
Changed framework conditions and policies in Ghana that reduces the focus on liquid waste management	Low	Minister of MLGRD and higher officials from the concerned Metropolitan and Municipal Assemblies very supportive to the project improving the urban environment and living conditions and sanitation.
Delayed effectiveness and/or procurement of consultant	Moderate	Expect timely actions by PCU and MAs on processing of the procurement and rapid no objection response by NDF.
Delayed project implementation after signing of contract signed	Moderate	NDF's procedures conducive for efficient project processing. Attention to be paid to PCU and MAs rapid response.
NDF project Cost overruns	Low	The budget accommodates contingencies and unforeseen expenditures
Captured methane volumes are lower than projected.	Low	The calculation builds on BOD analysis on sludge samples combined with conservative assumptions for LFG captures from UASB reactors
Delayed carbon credit incomes after project completion	Moderate	The NDF project is designed to assist the MAs pursue the validation (CDM PDD) process.
Delayed agreements and incomes from sales/utilization of methane/electricity	Low	Lessons can be learned from similar projects in Ghana
Unsuccessful/delayed EDM approval of project by UN (CDM/ EB)	Low	The project will use applied technology and solutions approved for similar projects. Anticipated processing time is 12-15 months (UN(CDM/EB)).
The market Price of Carbon lower than assumed	Moderate	Use conservative figures say carbon price in the order of 13 USD per ton CO2-e.
The CDM process terminated after 2012.	Low	CDM is a centre piece in a future climate treaty. EU-ETS already decided to continue after 2012, and there is an increased focus on climate change in the international community (EU USA, Asia)
Inefficient operations of digester including GHG capture and utilization	Low	CDM will improve the financial O&M base and staff skills to optimize the operations: "Efficient operations mean better economy".

Accidents during construction and operation.	Low	There are included necessary safety precautions against landfill gas explosions and other accidents during construction and operations.

55. One of the key risks is inadequate mobilization of funds from other sources for the downstream implementation of project works. As a mitigation measure a forum was organized involving various key stakeholders including members of parliament, the MLGRD, MoFEP and MEST and development partners such as the World Bank and AFD to secure assurance of financing especially from the proposed GoG/World Bank GAMA Sanitation Project.

56. Indeed as has been demonstrated by GoG in its 2011 Budget, there is likelihood of allocating funds from GoG sources to leverage additional funding from other partners to execute the project which is line with sector and national priorities as presented earlier.

2.6 Costs and Financing Plan

57. The total cost for the full installation of the two (2) digesters is estimated at EUR 7.6 million including Construction Costs of EUR 5.5 million and Consultancy Services (Design, Environmental and Social Impact Assessment, CDM capacity building, carbon credit certification, and construction supervision) in the order of EUR 1.5 million. The provisional cost estimate is presented in Table 2.2 indicating the proposed components for NDF funding in italics*.

58. The costs are derived from updates of detailed studies for the construction of digesters for septage/faecal sludge treatment and rehabilitation/upgrade of various treatment facilities commissioned by the UESPII. The summary of costs, by components, is presented in Table 2.3 indicating the proposed components for NDF funding in red italic*. Details are provided in Annex 2.

Table 2.2: Cost Estimates for 2 Digester Plants

	ITEM	Total (EUR)	NDF (EUR)
1	Design	200,000	*200,000*
2	ESIA	300,000	
3	CDM	700,000	*700,000*
4	Construction Supervision	300,000	*300,000*
5	Construction Cost	5,500,000	*1,050,000*
6	Project Management	600,000	
	SUB-TOTAL	**7,600,000**	***2,250,000***
	Contingencies (10%)	760,000	
	TOTAL COST	**8,360,000**	
	Total Annual O&M costs (EUR/yr)	***450,000***	

59. The total cost for detailed designs to be financed from the NDF grant of €1,200,000 will be complemented with GoG contributions in the form office spaces and of counter-part staff inputs from the MAs, and the oversight inputs by the PCU up to and until the closure of the UESP2 slated for the end of 2011. The GoG contributions are expected to continue under the proposed IDA funded GAMA Sanitation and Water Project, which is expected to provide the financing for construction as well as project management costs. The construction cost for GHG management related components of €1,050,000 is also expected to be financed by the NDF grant. The NDF grant of €2,250,000 is therefore expected to finance consultancy cost of €1,200,000 and GHG related construction activities of €1,050,000.

60. During consultations with officials at the Ghana Country Office of the World Bank, it emerged that the implementation of the Proposed GAMA Sanitation and Water Project to be funded by the World Bank is expected to commence by mid 2012. The proposed project has been agreed in principle between the GOG and Bank Management but will have to be approved by the Board of the World Bank, tentatively scheduled for April 2012. Once approved the credit will have to be signed by the GOG and comply with any effectiveness conditions. The proposed project is expected to have a component which will fund the construction of septage/faecal sludge treatment facilities in the GAMA area.

61. Prior to the construction of any treatment facilities, it will be necessary to prepare the corresponding Environmental and Social Impact Assessments in accordance to the EPA requirements and WB policies. The latter require for this type of facilities that the Environmental Assessment is prepared by a different consultant than the one doing the design. To ensure the project success and compliance with safeguards policies, adequate consultations must be held with key stakeholders, especially those living close to the proposed sites.

Table 2.3: Summary of Project Cost by Component (Amounts in € – excluding taxes and duties)

Study Components	NDF	IDA	GoG	Total
Component 1: Detailed Designs of 2 No. Anaerobic Digesters & ESIA etc	1,200,000		150,000	1,350,000
Component 2: Project Management Costs		600,000	150,000	750,000
Component 3: Construction & Construction Supervision	1,050,000	4,750,000	200,000	6,000,000
Sub-total	2,250,000	5,350,000	500,000	8,100,000
Contingencies, 10% (physical 6%; financial 4%)	225,000	535,000	50,000	810,000
Total	2,475,000	5,885,000	550,000	8,910,000
Percentages (%)	**28%**	**66%**	**6%**	**100%**

Table 2.4: Estimated Costs by Expenditure Categories (Amounts in € - excluding taxes and duties)

Categories of Expenditure	NDF	IDA	GoG	Total
Works	1,050,000	4,750,000	0	5,500,000
Services	1,200,000	300,000	0	1,500,000
Miscellaneous		600,000	500,000	1,100.000
Sub-total	2,250,000	5,350,000	500,000	
Contingency (10%)	225,000	535,000	50,000	
Total	2,475,000	5,885,000	550,000	8,910,000

Table 2.5: Financial Sources in EUR

Cost Items	**NDF**	**IDA**	**GoG**	**Total Cost**	
				Foreign	**Local**
A. Consultancy Services					
A.1 Consultancy fee	260	200	0		
A.2 Travel	40	30			
A.3 Subsistence & Accommodation	100	70			
Total A	**400**	**300**	**0**		
B Conditions Survey, Investigation, Detailed Designs & Working Drawings					
B.1 Digester No. 1. AMA-Achimota	400				
B.2 Digester No. 1 LEKMA-T. Nungua	400				
Total B	**800**	**0**			
C. Works					
C.1 Digester No1. AMA-Achimota	525	2,225			
C.2 Digester No 1, LEKMA-T. Nungua	525	2,225			
Total C	**1,050**	**4,450**	**0**		
D. Project Management, Vehicles, Operations, Training, Seminars Workshops & Meetings					
D.1 Offices Buildings and Furniture			150		
D.2.Office Equipment		40			
D.3 Vehicles		70			
D.4 Operations and running cost			350		
D.5 Training & seminars		250			
D.6 Workshops & Meetings		240			
Total D	**0**	**600**	**500**		
TOTAL COST	**2,475**	**5,885**	**500**		
Percent of total	28%	66%	6%		

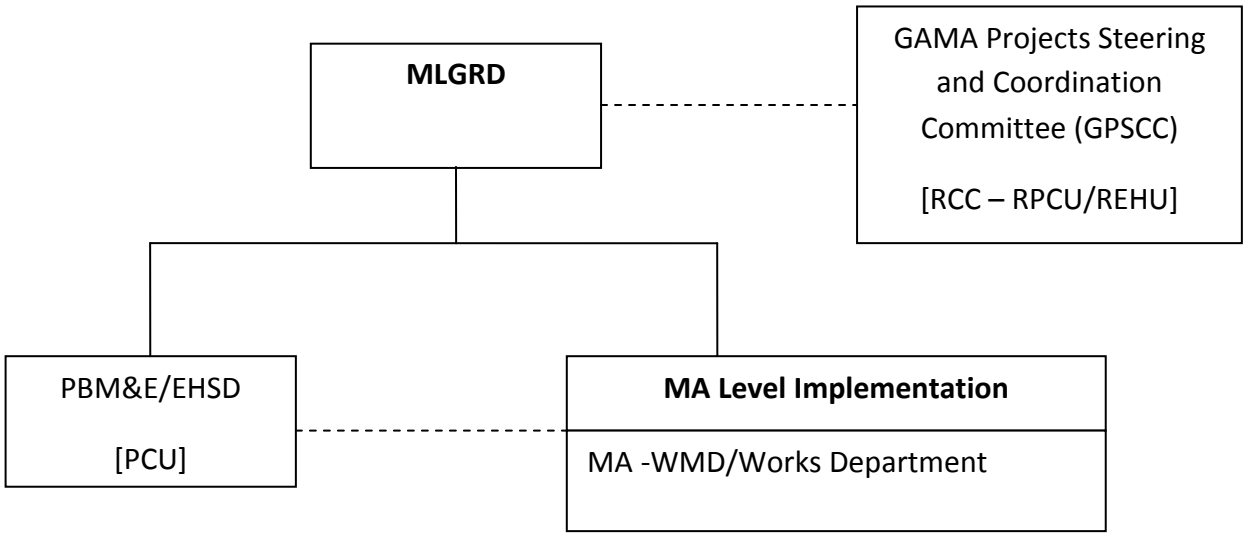
62. The financing of the project from various sources is as shown in the table above. GoG totaling €500,000 cover the operating costs of the PCU and supporting convening of the GAMA Projects Steering and Coordination Committee (GPSCC).

3. PROJECT IMPLEMENTATION

3.1 Recipient

63. The recipient of the grant is the Ministry of Finance and Economic Planning (MoFEP) of Ghana, which will be signatory of the grant. The Ministry of Local Government and Rural Development which is the oversight ministry for the participating Metropolitan and Municipal Assemblies will be executing ministry. The concerned MAs will own the constructed facilities. The MAs will as act Executing Agencies for the implementation of with the support of the Project Coordinating Unit (PCU) of the MLGRD. The organizational structure for the implementation of the project is shown below. A memorandum of understanding (MoU) attributing these roles to the various entities will be signed as a proviso for grant disbursement.

Figure 3.1: Organizational Structure for Project Management and Oversight



3.2 Project Management Arrangements

3.2.1 Project Management and Oversight

64. Project oversight and management arrangements received a lot of attention during the appraisal because of the region-wide spread and impact of the project and implications for the pipeline GoG/World Bank GAMA Sanitation Project. Figure 3.1 depicts the oversight and management arrangements for the proposed project.

65. The initial phase (design) of the proposed NDF project will be under the framework of the Ghana UESP II (2004-2011), co-financed by World Bank/IDA, NDF, and others. Its objective is to improve urban living conditions in Accra, Kumasi, Sekondi-Takoradi, Tamale and Tema. The UESP II includes activities related to improve environmental health, sanitation, drainage, vehicular access, and solid waste management with special emphasis on the poor. The key components are (1) Storm Drainage, (2) Sanitation, (3) Solid Waste Management, (4) Community Infrastructure Upgrading in Low-income Communities and, (5) Institutional Strengthening in Central and Local Government Agencies (financed by NDF credit No. 430).

66. The NDF project is related to Component (3) and targeted to strengthen the CDM profile of the UESP II. The project will also strengthen the financial situation and improve the solid waste management in the project cities that will contribute to enhanced environmental health and living conditions of the concerned populations.

67. The GAMA Projects Steering and Coordination Committee (GPSCC) will be the highest decision making body of the project that will be responsible for overall coordination of the Project and report to the Ministry of Local Government and Rural Development, for onward transmission to the Inter-ministerial Committee on Decentralisation for policy guidance. GPSCC will be made up of the representatives of the MLGRD, MoFEP, Chief Executives of the respective MAs and the head of the PCU. The GPSCC will have the already existing Regional Planning Coordinating Unit (RPCU) as its secretariat. This model if accepted will require strengthening of the RPCU.

68. It is anticipated that the GPSCC will be created before the commencement of downstream physical works and its functions clearly elaborated as part of the design of the GoG/World Bank GAMA Sanitation Project. This will not hinder the NDF funded Digesters Project as the initial work will be managed by the existing MLGRD-Projects Coordinating Unit (PCU) and oversight provided by the UESPII Steering Committee that meets once a year with staff of the World Bank, NDF and other implementation entities to review implementation performance.

3.3 Implementation Modalities

3.3.1 Procurement

69. The proposed project will basically include consulting services and other associated expenses and the procurement will be made by MLGRD-PCU following the directions given in the NDF Climate Change Strategy 2010-2011, December 2009. These are compatible with the procurement guidelines of the World Bank as the lead agency for the UESP II. Procurement for the proposed project will be made by the MLGRD in cooperation with the involved Metropolitan and Municipal Assemblies in the Greater Accra Region as Executing Agencies. For the sake of uniformity and efficiency the two digester plants will be bundled and tendered as one contract. Procurement will be announced both in Ghana and on the NDF website. Procurement opportunities will be open for both Nordic and global business community.

70. Table 3.1and Table 3.2 show summaries of the main procurement schedules for goods and services under the project. Details of procurement arrangements in line with World Bank executed projects such as the UESPII are presented in Annex…

71. Procurement *Plan*: During appraisal MLGRD-PCU and the respective MAs developed a procurement plan which took into consideration the World Bank guidelines as well as the Public Procurement Act (2003), Act 663.

Table 3.1: Procurement Arrangement and Schedule for Goods under Components 1

1	2	3	4	5	6	7	8
No.	Contract (Description)	Estimated Cost (€)	Procurement Method	P-Q	Domestic Preference (Yes/No)	Review by Bank (Prior/Post)	Expected Bid Opening Date
1	Procurement of 2No. Vehicles for Project Management	70,000	NCB	No	No	Prior	
2	Procurement of Office Equipment and Furniture	40,000	NCB	No	No	Post	

Table 3.2: Procurement Arrangement and Schedule for Consultancy Services under Components 1

1	2	3	4	5	6
No.	Description of Services	Estimated Cost (€)	Selection Method	Review by Bank (Prior/Post)	Expected Proposals Submission Date
1	Detailed Designs, Tender Documents & Working Drawings	200,000	QCBS	Prior	
2	Conduct Environmental and Social Impact Assessment	200,000	QCBS	Prior	
3	CDM related services	800,000	QCBS	Prior	
4	Construction Supervision	300,000	QCBS	Prior	

3.3.2 Disbursement Modalities

72. The disbursement will be based on the special account principle. The account will be established with the PCU according to details laid down in the grant agreement between the Ministry and NDF. The disbursement requests to NDF will meet the Fund's requirements concerning progress documentation and accounting. The size and schedule of each transfer will eventually be determined by the procurement of goods and services tentatively as shown in Annex 7.

3.4 Implementation Schedule

73. During appraisal discussions were held with the PCU and the World Bank to initiate the announcement and short-listing of consultancy services. The schedule in Table 3.4 anticipates that signing of consultancy contract and mobilisation can take place by 1 August 2011. The detailed-design assignment for the two digester plants will be delivered as one consultancy contract. The implementation period for the design part of the project is estimated to be 8 months up to March 2012. The total estimated time for tendering and implementation of the structural works and commissioning of the schemes is 15 months from May 2012 to end of November 2013. The proposed closing date for the project is end of December 2013.

74. The summary implementation schedule is shown in Table 3.4

Table 3.4: Implementation Schedule

Activity	2011	2012	2013
Procurement of Consultancy Services and Activities up to Grant Effectiveness			
Phase 1: Implementation Consultancy Design			
Phase 2: Construction, Supervision and Commissioning of Digester Plants			
Closing			

3.4.1 Performance Plan

75. Based on the critical activities to be accomplished a performance plan for the GAMA Anaerobic Digesters Project is summarized in Table 3.5 below.

Table 3.5: Performance Plan

Result	Critical Measurable Indicators	Targets

Mobilization, Launching Workshop	Project Start-up Workshop successfully completed	M
Procurement and consultancy award	Consultancy contract awarded	M+2
Inception Report	Conditions Report Approved	M+3
Component I:Detailed Designs	Submission of Detailed Design + Tender documentation	M+8
Component II: Construction Supervision	Construction commenced and executed on schedule	M+23
Monthly Progress Reports	Reports submitted and accepted	Monthly
Project Completion Report	Draft final report and annexes (as built drawings, Facilities Operation and Maintenance Plan etc.)submitted and presented in workshop, revised and approved	M+24

Note: Assumed Project Start date = May (M) 2011

3.4.2 Monitoring and Supervision

76. The series of performance indicators of the performance plan and indicators of the logical framework will be the basis for project performance monitoring and supervision. The LFA matrix will form part of the grant agreement. In order to fast-track the implementation of the project to meet the anticipated closure by the end of December 2013 it is essential that entities with key roles in oversight and management be given adequate resources.

77. The roles of the MLGRD-PCU in the timely coordination of downstream activities and regular performance appraisal by the GPSCC will enhance the responsiveness of MAs and delivery of the project.

4. PROJECT BENEFITS

4.1 Effectiveness and Efficiency

78. The value-for-money (effectiveness, efficiency and economy) of the project is derived, on one part from the project planning and preparation activities carried out by the MLGRD-PCU as well as the special focus on CDM given during pre-appraisal. Further analysis of roles of regional-coordination during appraisal also attribute to the project effectiveness in achieving the outcomes stated of the LFA Matrix. In conclusion, the proposed GAMA Anaerobic Digesters Project is likely to be implemented with the necessary efficiency required by NDF.

4.2 Environmental Sustainability

79. The Project design places specific emphasis on environmental sustainability issues by considering environmental and social safeguards by means of the Environmental and Social Impact Assessment. The emphasis on biogas harvesting and CDM investments will also enhance the mainstreaming of environmental sustainability issues in the design of similar projects.

4.3 Institutional and Management Viability

80. The establishment of the GPSCC and the continued roles of the PCU and Environmental Health and Sanitation Directorate (EHSD) as well as the MAs will ensure the continued management of the planned investments as is the case for all GoG projects.

4.4 Economic and Financial Viability

81. As indicated in earlier sections of this report, the Ghana Shared Growth and Development Agenda (GSGDA, 2010 – 2013) anticipate a low-carbon growth for Ghana in order to avert the potential economic loss due to environmental degradation. The proposed project contributes to this higher level goal. The burden of diseases on the health of low-income communities due to indiscriminate discharges of septage and nightsoil will also be reduced as well as reduced cost on the National Health Insurance Scheme (NHIS). All these translate to economic benefits.

82. The potential of incremental revenues from tipping fees at designated treatment facilities under viable Public-Private-Partnership (PPP) arrangements constitute an important means of securing financial viability of the plants. In addition, preliminary estimated indicate that the total baseline emission from the two digesters is about 7,800 tons CO2 equivalents/year. This figure also represents the potential annual emission reductions to be earned assuming no leakages. Applicable potential revenues in the range of EUR 475,000 per year provides a revenue stream essential for instituting a viable operation and maintenance management regimen that will assure the continued functionality of the digesters.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

83. The Government of Ghana (GoG) has taken steps towards addressing the challenges of effective management of septage and nightsoil sludges and the effect on the general well-being of residents of poor communities. The GAMA Anaerobic Digesters Project is aligned with GoG's strategic objectives, policies, and investment plans for shared growth and poverty alleviation as well as mechanisms for reducing vulnerability to climate variability and change. The project is also in compliance with the objectives of the NDF's Mandate on Climate Change.

84. The Project is an important and well justified initiative for NDF Grant funding. The anticipated value-for-money and sustainability issues concerning the project found to be within acceptable limits.

5.2 Recommendations

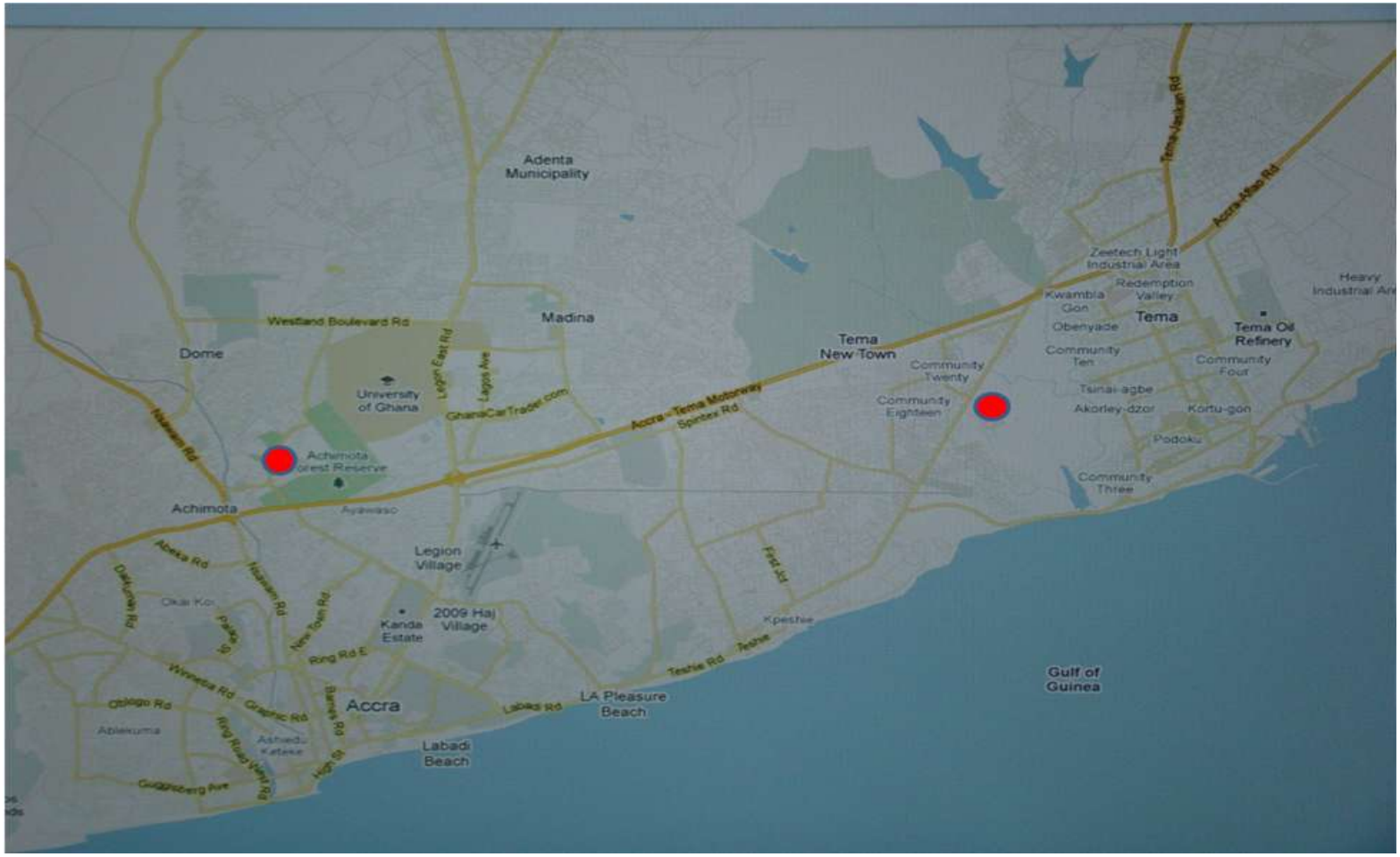
85. Based upon a critical assessment of the relevance, value-for-money (effectiveness, efficiency and economy), viability and the sustainability of the Project, as well as the credibility and capacity of the Recipient, it is recommended that a grant not exceeding €2,250,000 from the NDF to the Governments of the Republic of Ghana.

86. The signature of the Grant Agreement will subject to the signing of the Memorandum of Understanding (MoU) between NDF and the Government of Ghana (represented by the MoFEP) specifying the roles of MLGRD, Regional Coordinating Council (RCC), the Metropolitan and Municipal Assemblies (MAs), the PCU and other entities in the oversight and management of the project.

87. The first disbursement will be made subject to the following: (i) the opening of special accounts for the disbursement of the NDF Grant and the designation of signatories acceptable to the NDF. Other conditions for subsequent disbursement are: (ii) evidence of transfer of funds from the GoG (MoFEP) to the Project account.

ANNEXES

ANNEX 1: GAMA – Location of facilities under the GAMA Anaerobic Digester Project

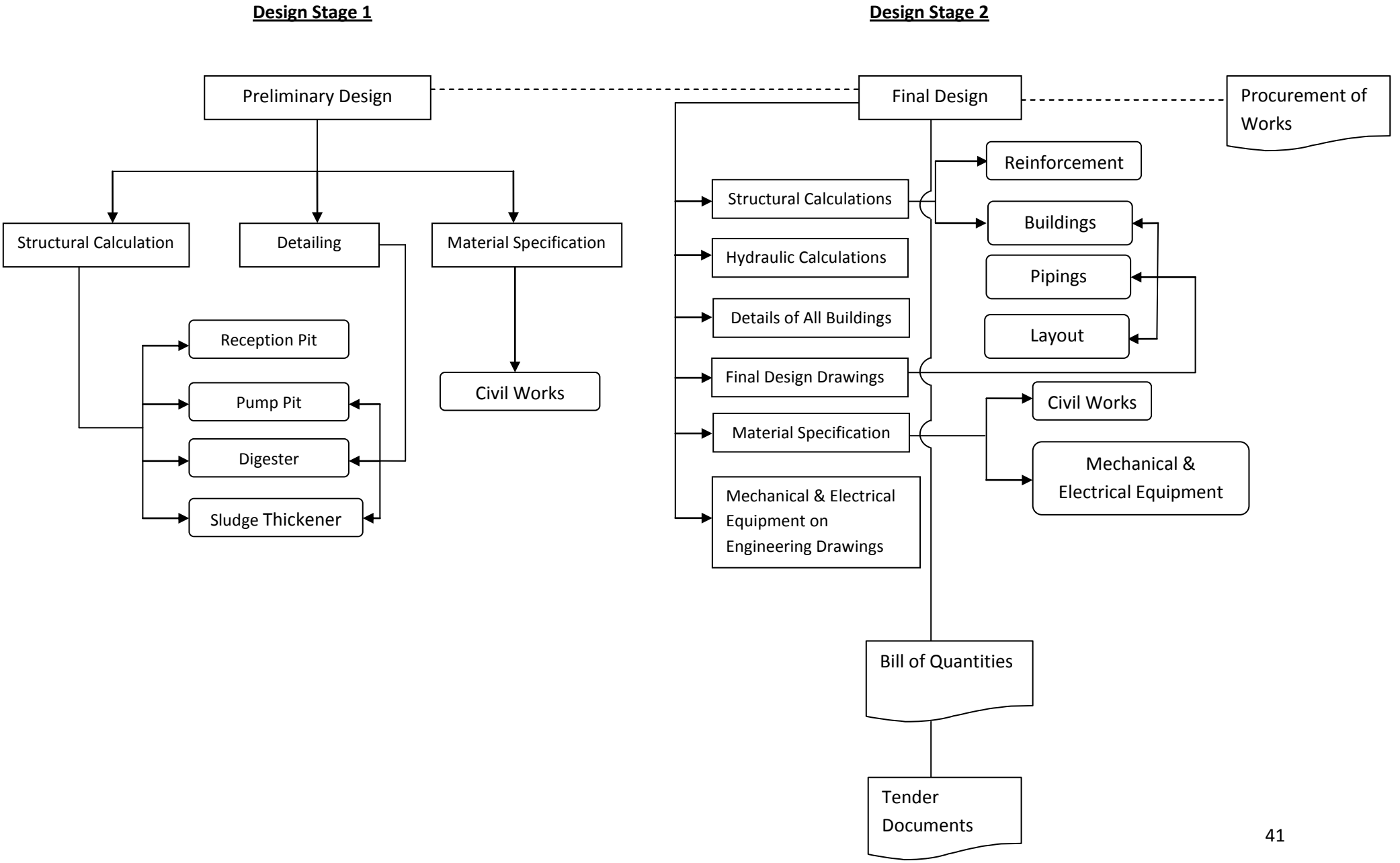


ANNEX 2: Cost Estimates for Digester System and CDM Related Costs

1	CONSTRUCTION COST	No.	Unit	Unit Cost	Costs	Total (EUR)	Related to GHG Managem.
1.1	**Site Works**						
	Demolishing Exist. Structures	1	LS	2 000	2 000		
	Site Clearing	1	LS	3 000	3 000		
	Piping	1	LS	12 000	12 000		
	Roads and pavement	2 500	m2	75	187 500		
	Fencing	1 000	m	35	35 000		
	Shaping old dump site & landscaping		LS		25 000		
	Sub Total Site Works					**264 500**	**29 095**
1.2	**Reception System for Septage and Night Soil**						
	Geotechnical and foundation	250	m3	150	37 500		
	Reinforced concrete incl. Formwork	200	m3	165	33 000		
	Metal Covers	4	m2	400	1 600		
	Equipment	1	LS	2 000	2 000		
	Pumps	3	unit	25 000	75 000		
	Sub Total 1.2					**149 100**	**0**
1.3	**Sludge Thickener**						
	Earth works	600	m3	20	12 000		
	Sludge Thickener	750	m3	150	112 500		
	Mechanical and electrical	1	unit	75 000	75 000		
	Sludge Pumps	2	unit	25 000	50 000		
	Sub Total 1.3					**249 500**	**0**
1.4	**Digester**						
	Construction	2 500	m3	150	375 000		
	Mechanical (mixers) + electrical	4	unit	30 000	120 000		
	Sub total 1.4					**495 000**	**49 500**
1.5	**Aerob Pond**						
	Earth Works	5 000	m3	2	10 000		
	Bottom and slope protection	450	m2	20	9 000		
	In- and outlet structure	2	unit	800	1 600		
	Floating aerator + electrical	2	unit	30 000	60 000		
	Sub Total 1.5					**80 600**	**0**
1.6	**Sludge Drying Beds**						
	Total surface of sludge drying beds, incl piping	25 000	m2	30	750 000		
	Sub Total 1.6					**750 000**	**0**
1.7	**Operate and Maintenace Building**						
	Total Volume	150	m2	60	9 000		
	Ventilation and lighting	1	LS	800	800		
	Sub Total 1.7					**9 800**	**4 900**

1.8	**GHG Managment System**						
	Pipework gas pumps etc.		LS		50 000		
	Biogas treatment		LS		40 000		
	Power Generation Station		LS		300 000		
	Flare system		LS		30 000		
	Sub Total 1.8					**420 000**	**420 000**
1.9	**Contractor Costs**	**12 %**				**290 220**	**10 019**
	TOTAL 1.A TESHIE NUNGUA					**2 708 720**	**513 514**
	TOTAL 1.B ACHIMOTA					**2 708 720**	**513 514**
	TOTAL 1: CONSTRUCTION COST 2 DIGESTER					**5 417 440**	**1 027 029**
	Total Annual O&M costs		***EUR/y***			***433 395***	**67 200**
2	**CONSULTANCY COSTS FOR 2 DIGESTER PLANTS**	**Number**	**Unit**	**Pr Unit**	**Costs**	**Total (EUR)**	**Releated to GHG Managment**
2.1	**Fees**						
2.1.1	***Engineering Design and Planning***						
	InternationalEngineers	5	staff-mo	15 000	75 000		
	Final Design Engineering (national)	30	staff-mo	4 000	120 000		
	Tender Documents (nat.)	5	staff-mo	4 000	20 000		
	SubTotal 2.1.1					**215 000**	**38 700**
2.1.2	***Construction Supervision:***						
	Civil Engineer, international	8	staff-mo	15 000	120 000		
	M&E Engineer, international	4	staff-mo	15 000	60 000		
	Civil + M&E Engineer, national	30	staff-mo	4 000	120 000		
	Sub Total 2.1.2					**300 000**	**75 000**
2.1.3	***Business Mgmt. CDM and O&M Related Services***						
	Political and Strategic Guidance	2	staff-mo	15 000	30 000		
	Business Plan, O&M Programme and CDM Training	3	staff-mo	15 000	45 000		
	Processing of CDM approval by UN CDM Executive Board.	4	staff-mo	15 000	60 000		
	SubTotal 2.1.3					**135 000**	**135 000**
	Sub Total 2.1 Fees					**650 000**	**248 700**
2.2	**Sub Total 2.2 Expences**					**390 000**	**149 220**
2.3	**Sub Total 2.3 Contingencies**					**104 000**	**39 792**
	TOTAL 2: CONSULTANCY COSTS FOR 2 PLANTS					**1 144 000**	**437 712**
	GRAND TOTAL					**6 561 440**	**1 464 741**

Annex 3: Schematic Work-Breadown Structure for Component 1 Activities



Annex 4: GHG Baseline Emissions and Reductions Modeling

Project: Accra Septage biodigester projects

Baseline emission from waste water treatment = $\sum_{1}^{10} Qww * BOD * Bo * MCF * UF_{bl} * GWP$

Input cells		Constant values, IPCC 2006				BEww trt, y (tons CO2e)	
Qww, y	BOD	B_0	MCF	UF	GWP		
328 500	0,0025	0,6	0,8	0,94	21		
Days/yr	Daily rate (m^3)						
365	900				=	7 782	tonne CO_2

Methane Production

328 500	0,0025	0,6	0,8	0,94	371	tonnes
Density of methane:		0,0007168	tCH_4/Nm^3 CH_4		516 948	m^3
					1 416	m^3/day

Energy heating value

Energy content of methane	39	MJ/Nm^3	20 160 954 MJ
Energy conversion factor	3600	MJ/MWh	5600 MWh

Electricity generating potential

Gas engine efficiency	30 %		
Electricity Generated annually			1680 MWh
Electricity Generated daily			4603 KWh

Explanation of formulae:

Where:

$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y* (m^3)
$COD_{removed,i,y}$	Chemical oxygen demand removed by baseline treatment system *i* in year *y* (tonnes/m^3), measured as the difference between inflow COD and the outflow COD in system *i*
$MCF_{ww\_treatment\_BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (MCF values as per table III.H.1)
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC lower value of 0.21 kg CH_4/kg COD)[7]
UF_{BL}	Model correction factor to account for model uncertainties (0.94)[8]
GWP_{CH4}	Global Warming Potential for methane (value of 21)

Project activities may use the default value of 0.6 kg CH_4/kg BOD, in case the parameter $BOD_{5,20}$ is used to determine the organic content of the wastewater. In this case, baseline and project emissions calculations shall use BOD instead of COD in the equations, and the monitoring of the project activity shall be based in direct measurements of $BOD_{5,20}$, i.e., the estimation of BOD values based on COD measurements is not allowed.

Source: UNFCCC methodology for recovery of methane from waste water

Annex 5: Economic and Financial Analysis

GAMA Anaerobic Digesters Project

Introduction

1. The proposed GAMA Anaerobic Digesters Project is a key intervention to improve the management of septage and faecal sludge in the Greater Accra Metropolitan Area. The GoG and the MMAs have over the years made efforts to mobilise funds for the management of faecal sludge and septage in the GAMA.

2. The economic and financial analysis examines the investment program, operation and maintenance costs, possible revenues, economic sustainability and viability, and the potential funding possibilities from the World Bank, NDF. GoG and from CDM investors or sales of CERs. The analysis simulates scenarios in which the cost and the benefits of project are analysed.

The intervention will be for 2No. digesters each with a capacity of between 400 and 450m3/day. The plants are to be located at existing sanitary sites at Teshie-Nungua in LEKMA and Achimota in AMA. Due to the lack of treatment plants in the GAMA, it is expected that both plants will be operating at full capacity within two months of commissioning. This is because the requirements for septage treatment in the GAMA is currently beyond the capacity of what this intervention will provide. The MMAs in the GAMA are currently seeking other investments to augment the facilities the project will cover.

Estimation of Investment Requirements

4. The investment requirements for undertaking to construct treatment plants in GAMA are estimated as follows:

Consultancy Services

- Consultancy Services for Design: euro 200,000
- Construction Supervision: euro 300,000
- CDM and GHG related services: euro 800,000
- Environmental and Social Impact Assessment (ESIA) euro 200,000

Total for Consultancy Services: euro1,500,000

Construction Costs

- Cost of 1No. Plant euro 2,750,000 (including 525,000 for GHG management components)
- Cost of 2No. Plants euro 5,500,000

Project Management

- Lump sum of euro 600,000 spread over the four years of investment.

5. The total investment required for all aspects of the 2No. treatment units for the GAMA is Euro 7.6 million. This amount includes environmental assessments, clean development mechanism costs, consultancy services for the design as well as construction supervision and the physical construction of the plants.

Benefits of the Intervention

6. The major benefit of the intervention will be the improvement of the health and well being of the populace in GAMA. As of March, 2011, there had been a cholera outbreak in Ghana with almost 7,000 cases with 67 deaths. Ninety percent of the cases as well as the fatalities were in the GAMA. Improper disposal of faecal matter has been identified as the major cause of the cholera outbreak.

7. Another major benefit of the intervention will be an improvement of the environment in the GAMA. Currently it is estimated that about 1,000 m3/day of septage/nightsoil is collected and disposed off at the authorised disposal sites (Colan Consult, March 2009). This does not include the illegal dumping at unauthorised places including drains and open spaces especially on the outskirts of the GAMA. The functioning installed capacity of septage/nightsoil treatment in the city is the Tema plant with a capacity of 200m3/day. The rest of the dumping, which forms the majority, therefore takes place directly into the sea at the Korle Gonno beach without any treatment. This very unhygienic practice will be significantly curtailed with the intervention.

8. Other benefits of the intervention will be the promotion of local and foreign tourism along the beaches of the GAMA. Improvement in the total well-being of the populace of GAMA is another benefit to be derived.

9. The project is also going to be one of the first major intervention in the country which is utilising Clean Development Mechanisms (CDM). The project will reduce Green House Gas (GHG) emissions as well as provide electricity from the gas generated from the plant. It is expected that the electricity generated will be sold into the national grid at Achimota since there is an electricity sub-station nearby. The electricity generated from the Teshie-Nungua plant will be used for the running of the plant as well as to serve the mini industrial area close to the plant.

10. The operation and maintenance costs for the facilities will be generated mainly from tipping fees at the plants. Currently tipping fees are GHS 20.00 per trip which is about Euro 10.00 per trip of about 7m3 capacity. The capacity of each plant is expected to be between 400 450m3/day. Each plant is expected to have an average of 60 trips per day which amounts to Euro 600 per day which in turn gives euro 15,000 per month and 180,000 euro per year per plant.

The total for tipping fees for the two plants in a year is euro 360,000. Tipping fees are expected to increase by five percent per annum over the period of the project.

Table 5.1: Tipping Fees

Item	Amount	Unit
Cost per trip (GHS)	20	GHS
Cost per trip (EUR)	10	EUR
Capacity of plant	420	m^3/day
Avg. vol per truck	7	m^3
Trips per day	60	
Average cost per day	600	EUR
Working days per month	25	
Cost per month	15,000	EUR
Cost per year	180,000	EUR
Cost for 2No. plants	360,000	EUR

11. The project is expected to produce electricity for sale. It is estimated in the first year electricity produced will be sold at EUR 50,000. The electricity sales are expected to increase at an annual rate of five percent per annum.

12. The Clean Development Mechanisms to be employed by the project are expected to yield a benefit of 100,000 EUR in the first year. With the experience to be developed over the period, it is expected that there will be annual increase in the CDM benefits of five percent per annum.

13. The project is expected to have a major health impact as well as other environmental and social benefits. These will have major socio-economic benefits to the 8 MMAs. This is due to the improvement in the health and social well being of the citizens of the MMAs. There will be a reduction in gastro-intestinal problems, worm infestations as well as mitigating the perennial cholera outbreaks in the GAMA. It will also improve the tourism potential especially along the beaches. There will also be the added benefit of improving foreign direct investments into the GAMA.

Summary of Cost and Net Benefit

14. The cost benefit analysis for a twenty year period is reported in Table 2. Ten percent for physical and price contingency was added to the cost of investment. The table gives the details of the investment costs for the various components of the project namely, design, construction supervision, ESIA, physical construction of the digesters and project management costs.

15. Table 2 also gives the benefits expected to be derived from the project. Revenues will be derived from tipping fees paid by trucks dumping septage/nightsoil for treatment. Other benefits in the table include from clean development mechanisms, sale of electricity. Environmental and social benefits have been estimated at EUR 1.5million per annum. Electricity sales are expected at 50,000 EURs in the first year after operations commence, increasing at a rate of five percent per annum. CDM benefits are estimated at 100,000 EURs in the first year also increasing at a rate of five percent per annum. The total benefits for the project are from the tipping fees, electricity sales, clean development and the environmental and social benefits.

16. The present value of the net benefits from the Cost-Benefit analysis is EUR 1.89 million. The corresponding Internal Rates of Return are 17.4 percent.
17. A sensitivity analysis is reported in Table 4. The baseline column is taken from Table 3. The changes examined in the table are a reduction by 15 percent or an increase of 15 percent in the following cost and benefit items: O&M, tipping fee, electricity fee, and clean development mechanisms. The internal rate of return remained above 13 percent in all the alternatives considered in Table 3 and the present value (calculated at 12 percent) is positive for all the above-mentioned alternatives. These findings thus augment the economic robustness of the project under the analyzed conditions.

Financial Summary

18. The financial flows of the project are reported in Table 3. The outflows are investment made on the project and, in the last five years of period in the table (from 2020 to 2025), repayment of the project amount (equal annual repayments of a EUR 8.36 million loan, at 2 percent interest, with a 10-year grace period). The inflows consist mainly of World Bank/NDF finance and the benefits explained above. For the fifteen years in the table, the present value of the financial inflow (at 12 percent interest) exceeds the outflow by EUR 2.8 million.

Table 2: Cost Benefit Analysis

Project year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Calendar year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
COSTS																				
Design	180	20				*200*														
Supervision		100	100	100		*300*														
ESIA	150	150				300														
CDM & GHG etc Cap. Build.	200	200	150	150		*700*														
Construction-GHG Related		350	350	350		*1050*														
Construction		1450	1500	1500		4450														
Project Management	150	150	150	150		600														
Investment cost	680	2,320	2,300	2,300		7600														
Physical contingencies (10%)	68	232	230	230		760														
Total Investment Cost	**748**	**2,552**	**2,530**	**2,530**	**0**	**8360**														
Operation and Maintenance																				
O&M	0	0	0	0	450	473	496	521	547	574	603	633	665	698	733	770	808	849	891	936
Total cost (Investment+O&M)				8,360	450	473	496	521	547	574	603	633	665	698	733	770	808	849	891	936
BENEFITS																				
Tipping Fees	0	0	0	0	360	378	397	417	438	459	482	507	532	558	586	616	647	679	713	748
Electricity Sales	0	0	0	0	50	53	55	58	61	64	67	70	74	78	81	86	90	94	99	104
CDM	0	0	0	0	100	105	110	116	122	128	134	141	148	155	163	171	180	189	198	208
Envt & Soc Benefits					1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total benefits	0	0	0	0	2,010	2,036	2,062	2,090	2,120	2,151	2,183	2,218	2,254	2,291	2,331	2,372	2,416	2,462	2,510	2,560
B - C (O&M)	0	0	0	8,360	1,560	1,563	1,566	1,569	1,573	1,577	1,580	1,584	1,589	1,593	1,598	1,603	1,608	1,613	1,619	1,625
IRR		17.40%																		
PV Net Benefits 12%		1,888																		

Table 3: Financial Analysis

Project year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Calendar year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cost																				
Investment	680	2,320	2,300	2,300	0	7,600														
O&M	-	-	-	-	450	473	496	521	547	574	603	633	665	698	733	770	808	849	891	936
Total cost	680	2,320	2,300	2,300	450	8,073	496	521	547	574	603	633	665	698	733	770	808	849	891	936
Finance						Total														
NDF	530	620	550	550		***2,250***														
World Bank & Other	150	1,700	1,750	1,750		***5,350***														
Total finance	680	2,320	2,300	2,300		***7,600***														
Other inflows																				
Tipping Fees	0	0	0	0	360	378	397	417	438	459	482	507	532	558	586	616	647	679	713	748
Electricity Sales	0	0	0	0	50	53	55	58	61	64	67	70	74	78	81	86	90	94	99	104
CDM	0	0	0	0	100	105	110	116	122	128	134	141	148	155	163	171	180	189	198	208
Envt & Soc Benefits	0	0	0	0	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total	0	0	0	0	2,010	2,036	2,062	2,090	2,120	2,151	2,183	2,218	2,254	2,291	2,331	2,372	2,416	2,462	2,510	2,560
IDA loan payment											339	339	339	339	339	339	339	339	339	339
PV of outlays 12%		4,172																		
PV of inflow 12%		7,007																		

Table 4: Sensitivity Analysis

		Baseline	O&M -15%	O&M+15%	T Fee - 15%	T Fee + 15%	Elec Fees - 15%	Elec Fees + 15%	CDM - 15%	CDM + 15%
IRR	O&M	17.40%	16.06%	13.54%	16.46%	18.33%	14.68%	14.96%	14.54%	15.10%
PV(Euro'000)	O&M	1,888	1,387	503	1,535	2,242	896	995	847	1,044

Annex 6: Procedure for Achievement of CDM Financing

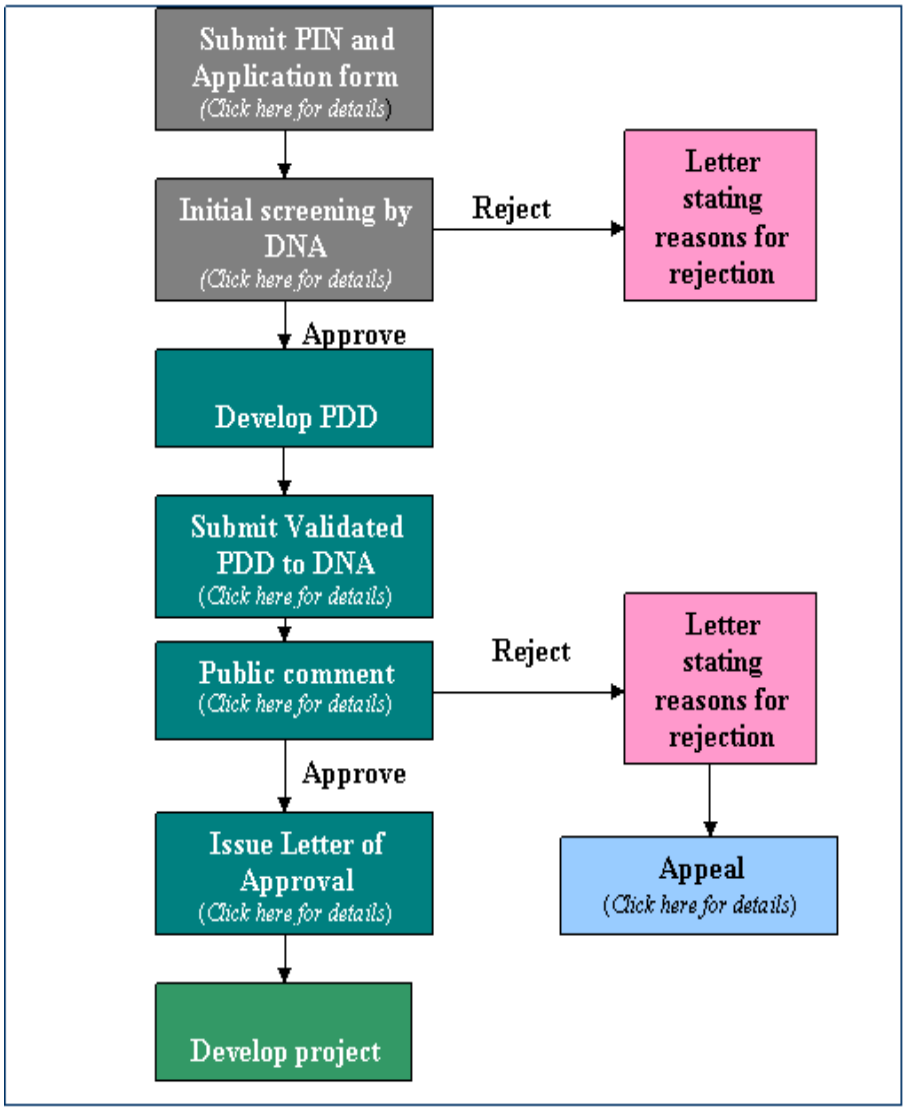
Criteria of CDM Projects in Ghana and Procedure for Achievement of CDM Financing

1. **Criteria for CDM Projects in Ghana**

In addition to successfully negotiating the above approval process, and meeting the CDM additionality criteria, proposed CDM projects in Ghana should also abide by the following sustainable development criteria;

- Social well being: The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to the people and hence leading to improvement in quality of life of, at least, the people within the community in which the project is sited;
- Economic well being: The CDM project activity should bring in additional investment that addresses the economic needs of the people;
- Environmental well being: This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general; and
- Technological well being: The CDM project activity should lead to development, deployment, diffusion and/or transfer of environmentally safe and sound technologies that are comparable to best practices in order to assist in developing the technological base of the country.

The achievement of CDM financing for the landfill gas capture and utilization investments following the proposed NDF project will be connected to the Country's national climate change policy. Ghana signed the United Nations Framework for Climate Change in 1992 and ratified it in 1995. It subsequently acceded to the Kyoto Protocol in 2002. The above political commitment is translated into the framework conditions for CDM projects in Ghana leading to the procedure for CDM project approval shown in Figure 1. NDF project will include support to the client to develop the projects up to preparation and execution of a CDM project approval by UN CDM Executive Board finance to the level of project registration in the UN CDM Registry.



Process for CDM project approval in Ghana

Annex 7: Procurement Guidelines

Procurement Arrangements to be managed by MLGRD-Project Coordinating Unit

Procurement for the components to be managed by MLGRD-PCU under the proposed project would be carried out in accordance with UESPII procurement procedures as provided in the World Bank's *"Guidelines, Procurement under IBRD Loans and IDA Credits"*, revised October 2006 and May 2010; and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, revised October 2006 and May 2010, and the provisions stipulated in the Legal Agreement.

Exceptions to National Competitive Bidding Procedures – For National Competitive Bidding (NCB) for goods and works, MLGRD will follow national procedures that are governed by the Ghana Public Procurement Act 663 of 2003, with the following exceptions noted below:

(i) Procuring entities shall use appropriate standard bidding documents acceptable to the Association

(ii) Foreign bidders shall be allowed to participate in National Competitive Bidding procedures and foreign firms shall not be required to associate with a local partner in order to bid as a joint venture, and joint venture or consortium partners shall be jointly and severally liable for their obligations.

(iii) Bidders shall be given at least 30 days to submit bids from the date of the invitation to bid or the date of the availability of bidding documents, whichever is later.

(iv) No domestic preference shall be given for domestic bidders and for domestically manufactured goods

(v) Each bidding document and contract financed out of the proceeds of the Financing shall include provisions on matters pertaining to fraud and corruption as defined in paragraph 1.14(a) of the Procurement Guidelines. The Association will sanction a firm or an individual, at any time in accordance with prevailing Association sanctions procedures, including by publicly declaring such firm or individual ineligible, either by indefinitely or for a stated period of time: (i) to be awarded an Association-financed contract; and (ii) to be a nominated sub-contractor, consultant, manufacturer or supplier, or service provider of an otherwise eligible firm being awarded an Association-financed contract; (g) in accordance with paragraph 1.14 (e) of the Procurement Guidelines, each bidding document and contract financed out of the proceeds of the Grant shall provide that: (i) the bidders, suppliers, contractors and subcontractors shall permit the World Bank, at its request, to inspect their accounts and records relating to the bid submission and performance of the contract, and to have said accounts and records audited by auditors appointed by the World Bank; and (ii) the deliberate and material violation by the bidder, supplier, contractor or subcontractor of such provision may amount to an obstructive practice as defined in

paragraph 1.14 (a) (v) of the Procurement Guidelines, and (h) The Association may recognize, if requested by the Borrower, provided that the debarment is for offenses involving fraud, corruption or similar misconduct, and further provided that the Association confirms that the particular debarment procedure afforded due process and the debarment decision is final

Procurement of Works: Procurement of works shall be based on the same guidelines and applicable thresholds of the Public Procurement Act, 2003 (Act 663).

Procurement of Goods: Goods procured under the under Components 1 and 2 would include office equipments, vehicles, etc. Contracts for goods estimated to cost US500,000 equivalent or more per contract shall be procured through ICB. Goods orders shall be grouped into larger contracts wherever possible to achieve greater economy. Contracts estimated to cost less than US$500,000 but equal to or above US$50,000 equivalent per contract may be procured through NCB. Contracts estimated to cost less than US$50,000 equivalent per contract may be procured using shopping procedures in accordance with Para. 3.5 of the Procurement Guidelines and based on a model request for quotations satisfactory to the Bank. Direct contracting may be used in exceptional circumstances with the prior approval of the Bank, in accordance with paragraphs, 3.6 and 3.7 of the Procurement Guidelines.

Selection of Consultants: **(a) Firm** – Consultancy services would consist of a number of studies, field work, surveys and technical assistance to be undertaken by both national and international consultants would be provided under Components 1 and 2. These would include the following categories: financial, technical and procurement audits, economic and technical feasibility studies, institutional studies, and technical assistance to the implementing ministries/agencies and would be selected using Request for Expressions of Interest, short-lists and the Bank's Standard Requests for Proposal, where required by the Bank's Guidelines. The selection method would include Quality and Cost Based Selection (QCBS) whenever possible, Quality Based Selection (QSB), Fixed Budget (FBS), Least Cost Selection (LCS), Single Source Selection (SSS) as appropriate. **(b) Individual Consultants** – Specialized advisory services would be provided by individual consultants selected by comparison of qualifications of at least three candidates and hired in accordance with the provisions of Section V of the Consultant Guidelines.

Assignments estimated to cost the equivalent of US$200,000 or more would be advertised for expressions of interest (EOI) on the Bank's Client Connection or Operations Portal and in United Nations Development Business (UNDB) online, EOI for specialized assignments may be advertised in an international newspaper or magazine. In the case of assignments estimated to cost less than US$200,000, but more than US$100,000 the assignment would be advertised nationally. The shortlist of firms for assignments estimated to cost less than US$200,000 may be composed entirely of national firms in accordance with the provisions of paragraph 2,7 of the Consultant Guidelines provided a sufficient number of qualified national firms are available and no foreign consultants desiring to participate has been barred.

Procedure for Single-Source Selection (SSS) would be followed for assignments which meet the requirements of paragraphs 3.9-3.13 of the Consultant Guidelines and will always require the Bank's prior review regardless of the amount. Procedures of Selection of Individual Consultants (IC) would be followed for assignments which meet the requirements of paragraph 5.1 and 5.4 of the consultant Guidelines. For all contracts to be awarded following QCBS, LCS and FBS, the Bank's Standard Request for Proposals will be used.

The use of civil servants as individual consultants or a team member of firms will strictly follow the provisions of Article 1.9 to 1.11 of the Consultants Guidelines.

Capacity Building, Training Programs, Workshops, Seminars and Conferences, etc.: Training activities would comprise workshops and training, based on individual needs as well as group requirements, on-the-job training, and hiring consultants for developing training materials and conducting training. Selection of consulting firms for training services estimated to cost US$100,000 equivalent or more would be procured on basis of QCBS or QBS as appropriate. Training services estimated to cost less than US$100,000 equivalent per contract may be procured through CQ method. When appropriate, training may also be procured on the basis of Direct Contracting subject to review and approval by the Bank. All training and workshop activities would be carried out on the basis of approved annual programs that would identify the general framework of training activities for the year, including: (i) the type of training or workshop; (ii) the personnel to be trained; (iii) the selection methods of institutions or individuals conducting such training; (iv) the institutions which would conduct the training; (v) the justification for the training, how it would lead to effective performance and implementation of the project and or sector; and (vi) the duration of the proposed training; (vii) the cost estimate of the training. Report by the trainee upon completion of training would be required.

Operating Costs: Operational costs would include project implementation-related expenditures such as in-country travel, office supplies, office rentals, utilities, communication costs, per diem for project supervision activities in the field, etc.

Prior-Review Thresholds: The Procurement Plan shall set forth those contracts which shall be subject to the World Bank's Prior Review. All other contracts shall be subject to Post Review by the World Bank. However, relevant contracts below prior review thresholds listed below which are deemed complex and/or have significant risk levels will be prior-reviewed. Such contracts will also be identified in the procurement plans. A summary of prior-review and procurement method thresholds for the project are indicated in the table below. All terms of reference for consultants' services, regardless of contract value, shall also be subject to the World Bank's prior review.

Expenditure Category	Contract Value (Threshold)	Procurement Method	Contract Subject to Prior Review
	US$ 000		US$ 000

Expenditure Category	Contract Value (Threshold)	Procurement Method	Contract Subject to Prior Review
1. Works	≥5,000	ICB	All
	<5,000	NCB	First contracts per IA
	<100,000	Shopping	None
2. Goods	≥500,000	ICB	All contracts
	<500,000	NCB	First contracts per IA
	<30,000	Direct contracting	None
	No threshold	Direct contracting	All contracts
3. Firms	No threshold	QCBS	All contracts of 200,000 and more
	<100,000	QCBS; LCS; CQ; Other	First 2 contracts per IA For contract below 200,000
Individuals	No threshold	IC	All contract below of 50,000 and more
	No threshold	Single Source (Selection Firms & Individuals)	All contracts
4. Training	Annual Plan		All Training

Procurement Plans: A draft procurement plan for project implementation under Components 1 summarise the procurement methods to be employed. This plan has been agreed between the MLGRD, PCU and participating MAs on 28 April, 2011 and is available in the PCU's projects database and made publicly available online. This plan will be updated annually to reflect the latest circumstances. It will also be available in the project's database and in the Bank's external website and also available in the Project's database.

Procurement Arrangement and Schedule for Goods under Component 1

1	2	3	4	5	6	7	8
No.	Contract (Description)	Estimated Cost (US$)	Procurement Method	P-Q	Domestic Preference (Yes/No)	Review by Bank (Prior/Post)	Expected Bid Opening Date
1	Procurement of 2No. Vehicles for Project Management	70,000	NCB	No	No	Prior	October 2011
2	Procurement of Office Equipment and Furniture	40,000	NCB	No	No	Post	November 2011

Procurement Arrangement and Schedule for Consultancy Services under Component 1

1	2	3	4	5	6
No.	Description of Services	Estimated Cost (US$)	Selection Method	Review by Bank (Prior/Post)	Expected Proposals Submission Date
1	Detailed Designs, Tender Documents & Working Drawings	200,000	QCBS	Prior	April 2012
2	Conduct Environmental and Social Impact Assessment	200,000	QCBS	Prior	June 2012
3	CDM related services	800,000	QCBS	Prior	June 2013
4	Construction Supervision	300,000	QCBS	Prior	April 2012

Publications of Procurement Notices, Awards of Contracts and Debriefing: MLGRD will prepare a General Procurement Notice (GPN) on behalf of the project which will be advertised on the Bank's Client Connection or Operations Portal and in United Nations Development Business (UNDB) online, in addition to local newspapers of wide national circulation and Ghana's PPA website, after the project is approved by the Board of the Association, and/or before effectiveness. Specific Procurement Notices for all goods and works to be procured under International Competitive Bidding (ICB) and Expressions of Interest (EOI) for all consulting

services costing the equivalent of US$200,000 and above would also be published in the above websites and newspapers.

Publication of contract awards of the bidding process and debriefing for all ICB procurements, Direct Contracting, and the Selection of Consultants for contracts exceeding a value of US$200,000 will be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated May 2004, revised in October 2006 and May 2010; the "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated May 2004, revised in October 2006 and May 2010. In addition, where prequalification has taken place, the list of prequalified bidders will be published. With regard to ICB and large value consulting contracts, the Borrower would be required to assure publication of contract awards as soon as the Bank has issued its "no objection" notice to the recommended award on the Bank's Client Connection or Operations Portal and in United Nations Development Business (UNDB) online, in addition to local newspapers of wide national circulation and Ghana's PPA website. All consultants competing for an assignment involving the submission of separate technical and financial proposals, irrespective of its estimated contract value, should be informed of the result of the technical evaluation (number of points that each firm received) before the opening of the financial proposals. The borrower would be required to offer debriefings to unsuccessful bidders and consultants should the individual firms request such a debriefing. Publication of results of other procurement activities below international competition or selections, including debriefing shall be subject to the stipulations in the Ghana Public Procurement Law of 2003, Act 663.

Monitoring & Evaluation

The monitoring and evaluation of the project will be the overall responsibility of MLGRD with strong support from the PCU, MoFEP and the RCC with regard to indicators related to the functionality of the implementation framework.

Currently, the PCU is managing and supervising the implementation of the UESPII including transfers, collating reports, managing procurement processes and tracking utilization of funds. The PCU has experienced several challenges and gained useful experience to the process, mainly due to delays in processing/transmission of reports and/or lack of adequate capacity at respective MAs to furnish information on timely basis for payments. Through Component 2, the project will provide support to participating MAs to strengthen their appreciation of pulic-private-partnerships and CDM investments in anticipation and preparation for the downstream operation and maintenance management of facilities.

The project will complement the UESPII in reforming and strengthening reporting systems at MAs. The project will also work in conjunction with other projects such as the implementation of social accountability interventions under the Local Government Capacity Support project funded by the World Bank and executed by the MLGRD.

Annex 8: Summary of Consultations- (National Workshops, FGDs and KPIs)

Name	Title Affiliation	Coordinates
Hon Ms. Sherry Ayitey	Minister MEST	
Hon. Nii Armah Ashitey	Regional Minister, Greater Accra Region	
Hon. Daniel Amartey Mensah	Municipal Chief Executive, LEKMA	
Ventura BENGOECHEA	Lead Water and Sanitation Specialist World Bank Accra	vbengoechea@worldbank.org Mob. 233 24-5230073
Daniel Amlalo	Executive Director, EPA	
A. OPOKU-BOAMAH	Director PBME MLGRD	233-20-81634662
Kofi. E. HOWARD	UESP II Technical Coordinator, PCU, MLGRD	khoward@lgpcu.org Off. 233-21-514740 Mob 233-24-43767789
Naa Demedeme Lenason	Ag. Dir. MLGRD/EHSD	
Robert Kwame Ansah	Technical Advisor, AMA	233-24-9488675
Maj (rtd) Awuah	Head, AMA Sewerage Division	233-24-3272068
Cosmas B. KOMBOZIE	UESP II PCU	
Edward MBA	Head of Waste Management Department TMA	233-24-4284795
Lydia ESSNA	Assistant Director (Desk Officer NDF projects) MLGRD	0244583489
Grace ADAATA	Head of Waste Management Department (LEKMA)	
Daniel Ohene AIDOO	Head Procurement Unit Accra Metropolitan Assembly (AMA)	0242849308 nanoahened@yahoo.com

Annex 9: References

NDF documents and forms

1. NDF: Climate Change Strategy 2010-2011, Nordic Development Fund, (December 2009)
2. NDF: Climate Change Screening, Selection of projects eligible for NDF support, Nordic Development Fund, (February 2010)
3. NDF: Format for Pipeline Proposal
4. NDF: Format for Final Approval

Landfill Gas Project Documents

5. NDF letter to GoG on Pipeline Approval of FS for LFG Project, 1 Oct 2009Letter from Ministry of Local Government & Rural Development to NDF, (covers also Anaerobic Digesters) (5th Jan 2010)
6. NDF: Pipeline Proposal for Ghana Landfill Gas Capture & Utilisation Project, (Sept 2009),
7. Ministry of Local Government and Rural Development & Environment, Ghana. Shama East Metropolitan Assembly. Second Urban Environmental Sanitation Project (UESP II) Sekondi-Takoradi Landfill and Septage Treatment Facility. Repackage Works. (July 2009)
8. Ghana UESP II (NDF 430 WB/IDA P082373). Possible Methane Capture and Utilisation Projects in Ghana. NDF Pre-Appraisal Report (Draft 11th June 2009)
9. Guidelines for Development and Management of Landfills in Ghana (EPA 2002)

Preparatory Studies and Project Documents

10. Liquid Waste Management in Accra, Assessment Report, Government of Ghana, Ministry of Local Government, Rural Development and Environment, Colan Consult, March 2009
11. Accra Sanitation Upgrade, Assessment and Upgrading of the Accra Sewage Treatment/Disposal Facility, Preliminary Engineering Design Report, Draft, DHV Group, July 2009

Government of Ghana Policies and Plans

12. Environmental Sanitation Policy (Revised, 2010), MLGRD, 2010
13. National Environmental Sanitation Strategy and Action Plan (NESSAP), MLGRD, 2010
14. Ghana Shared-Growth and Development Agenda, GSGDA (2010 – 2013), Vol. 1: Policy Framework. NDPC, 2010