

BIOGAS

A. Introduction

1. In the Port Vila Area and in Vanuatu generally, most of the liquid waste produced is disposed on the same site as its origin using either septic tanks or simple soak-away pits. This is generally the case for all classes of construction from informal housing to luxury villas in residential areas.

2. Sludge collection and disposal, not only for Port Vila but for all Efate Island, is done by three commercial operators. The collected sludge is transported by tankers and discharged into a pit within the Bouffa sanitary landfill to the east of Port Vila. Tanker owners charge from Vatu 15,000 to Vatu 25,000 per load. This will depend on the tanker capacity and the location of the customer. Tanker owners are charged a fixed rate for collecting and transporting sludge in the sanitary landfill.

3. Records available from operators show about 60 cubic meters (m³) of sludge disposed in the landfill each week. The operators estimate about 25 m³ of this total is generated by households within the planning area. The remaining volume is from hotels, restaurants, some industries, etc. and from the population living elsewhere on Efate Island.

4. During the project inception stage, a rapid review and analysis was completed on the current sanitation situation. The focus was on identifying the key issues and constraints to be addressed by the Master Plan and investment project. During the remainder of Phase I, more detailed studies were undertaken to determine feasible and affordable options for the delivery of safer sanitation services to all the residents of greater Port Vila.

5. After wide ranging consideration of technically viable solutions for sanitation, the project preparatory technical assistance (PPTA) team refined this down to two principal options:

- Option 1: A basic, least-cost option preserving the current practice of on-site wastewater collection but with substantial improvements to common facilities, sludge disposal, and management.
- Option 2: An enhanced option comprising construction of a gravity and pumped wastewater collection system and a wastewater treatment plant, which will serve most developed parts of Port Vila but preserving on-site wastewater collection for periurban and some other areas where measures similar to Option 1 will still be required.

6. In order to respond to the project requirements and to cope with the decision of stakeholders in the light of the Master Plan findings, a “progressive or incremental type solution” for sanitation issues will be implemented in two or three phases, which can be summarized as follows:

- Phase I: Treatment of sludge collected from on-site treatment facilities (target year 2020)
- Phase II: Sludge treatment continuation with the development of a wastewater reticulation system and treatment facilities. The latter will be on the same site as the

already operated sludge treatment works. Population to be served by the wastewater reticulation system will be reaching 15,000 inhabitants (target year 2025)

- Phase III: Extension of the wastewater reticulation services to 30,000 inhabitants (target year 2030)

7. The sludge treatment process will not incorporate biodegradable products of agricultural and industrial activities, for the first stage of implementation.

B. Biogas Development Component

8. Under option 1, the biogas development component will include:

- improving, increasing, and streamlining sludge collection activities by private tankers; and
- replacing the existing highly unsatisfactory sludge disposal method by installing a well-designed and properly managed anaerobic sludge treatment facility with biogas-based electricity generation at a new site to be purchased, close to Port Vila Golf and Country Club.

9. The biogas project proposed to be implemented under the first phase is based on the option recommended by stakeholders to address the issue of the most critical sanitation problems in Vanuatu. It reinforces and modernizes on-site sanitation for the coming 10 years by the provision of more sludge transportation facilities to the disposal area, where it will be treated anaerobically to generate biogas, and digested sludge disposed of appropriately. Agricultural wastes, if any, would be codigested along with the sludge based on the data assessment on availability of agricultural waste to be carried out.

10. By 2015, and for hauling a sludge volume averaging at 130 m³/week, not less than five sludge tankers of 5 m³ capacity each, will be required including one standby unit. Assuming that peak requirements for sludge hauling reach 200 m³/week for the same target year, it would be more convenient to have available six tankers of 5 m³ capacity each.

11. The estimated sludge quantities to be hauled to the treatment site from all over Efate Island are 6910, 9090, and 8650 m³ for 2015, 2020, and 2025, respectively.

12. As mentioned in the Master Plan Report and recommended by parties concerned, the large pasture area in Mele between the Port Vila Golf and Country Club, along the Mele Bay shore line, and the country's abattoirs will be used for developing public wastewater and sludge treatment facilities for Port Vila and its periurban area.

13. Based on analysis of existing documents and site inspection and taking into consideration the project area context (characterized by high electric power tariff rates, and the absence of a sludge treatment plant for septic tank and pit latrine wastes), the process of treatment will involve anaerobic digestion of sludge from septic tanks and night soil from pit latrines with agricultural wastes as available.

14. Anaerobic sludge treatment requires less energy than aerobic treatment while also producing biogas, which can be recovered and utilized for energy generation. The anaerobic and mesophilic digestion of the sludge at 35°C with a retention time of 18-25 days in the sludge digester will destroy a large part of pathogen germs (bacteria, viruses, and parasites). As for the

thermophilic anaerobic digestion with 55°C and 10-12 days of retention time, it is to be considered as much more efficient and comprehensive to hygienize sludge, allowing its use in agriculture without sanitation risks.

15. The estimated volumes of biogas generation based on the estimated sludge quantities for 2015, 2020, and 2025 are 110,667, 144,260 and 158,745 m³ per year, respectively. Based on the above biogas volumes, the estimated potential electricity generation is 221333, 288519, and 317490 kilowatt-hours per year for 2015, 2020, and 2025, respectively. On an average, it is estimated that 138,000 m³ of biogas will be generated annually, which is estimated to generate 275 megawatt-hours of electricity per year.

C. Clean Development Mechanism

16. As detailed in the biogas development section, the biogas project is one subcomponent under sanitation in the proposed Vanuatu: Port Vila Urban Development Project, which aims to install an anaerobic sludge treatment facility and biogas plant as a Clean Development Mechanism¹ (CDM) project.

17. The project, a methane capture and utilization project and the first of its kind in Vanuatu, will play a role model function that will have a major impact on the development of similar and other potential renewable, environmentally benign projects eligible under CDM and future emission reduction schemes for revenues from emission reduction.

18. The project also avoids venting of methane, a greenhouse gas (GHG) with very high global warming potential (GWP), into the atmosphere, resulting in environmental protection of the region and at the global level as a whole.

19. The project will address the immediate concerns raised by the local population and communities in terms of improving the local environmental hygiene by eliminating obnoxious odors and air pollution in the project vicinity and surroundings. This will benefit the local communities in terms of improved living and working conditions.

20. The project will reduce methane, resulting in increased revenue to the national government from the sale of carbon credits. The additional revenue is envisaged to be used for the implementation of urgently needed developmental activities in the country.

21. The initial CDM assessment was carried out by ADB during the loan fact-finding mission from 16-20 May 2011. The assessment is based on the relevant documents prepared by the project preparation consultants.

D. Eligibility

22. The proposed project was assessed against key eligibility criteria for CDM projects, and a summary of the results is shown in the Table 1.

¹ *Clean Development Mechanism* allows emission-reduction projects in developing countries to earn certified emission reduction credits, each equivalent to one ton of CO₂.

Evaluation of Key CDM Eligibility Criteria

Eligibility Criteria	Result
GHG involved in the Kyoto Protocol	Yes
Host country is a party to the Kyoto Protocol	Yes
Additionality	Likely
Non diversion of official development assistance	Likely
Contribute to sustainable development objectives	Likely
Measurable emission reductions	Likely
Project type	Likely
Eligible organization	Yes

23. The project meets most of the eligibility criteria. It is envisaged that the demonstration of additionality will be done by showing that the proposed project activity is first of its kind in the host country and cannot be implemented in the absence of the CDM by carrying out barrier analysis and/or investment analysis as appropriate. Projects should be additional compared with the business as usual scenario to qualify for CDM. Another important issue is the use of official development assistance (ODA) in the project. The project will also have some grant contributions from the Government of Australia as ODA and thus needs to demonstrate that there is no diversion of ODA.

24. The proposed biogas project might also benefit from “Guidelines for Demonstrating Additionality of Micro-scale Project Activities” EB 60 (version 2). As per the guidelines, project activities up to 5 megawatts that employ renewable energy as their primary technology are additional if the geographic location of the project activity is in least develop countries/small island developing states. According to the United Nations, Vanuatu is classified as a least developed country and can benefit from this guidelines.

25. The most appropriate methodologies for the proposed biogas project are CDM Methodology AMS III.AO; methane recovery through controlled anaerobic digestion in combination with AMS I.F; renewable electricity generation for captive use and mini-grid and/or AMS I.D; and grid connected renewable electricity generation.

E. Assistance from ADB's Carbon Market Programme

26. It is estimated that the project will reduce 4,200 tons of CO₂ per year. These estimates will be revised once the detailed baseline and project emission study is carried out. The total carbon-derived revenue is estimated at \$30,000–\$40,000 per year for 10 years considering a carbon price of \$9 per ton of CO₂. The project has the potential of receiving up-front cofinancing from the Future Carbon Fund for up to 50% of the credits generated until 2020, part of ADB's Carbon Market Program.

27. ADB, through the Credit Marketing Facility, can further assist the project entity in selling the additional credits on a pay-on-delivery basis to enhance the financial viability of the project. The required CDM documentation for the project can be developed with grant assistance from the Technical Support Facility (TSF).

28. The TSF team will work closely with the project entities in preparing the necessary CDM documentation noting that successful CDM registration will depend highly on verifiable data/information availability.