

REPORT

NS 65 - FEASIBILITY STUDY FOR TREATMENT OF SOLID WASTE IN THE MUNICIPALITY OF DOUALA

Executive Summary – February 2019



**FEDERAL MINISTRY
OF FINANCE**

IMPRESSUM:

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19.02.2019

Summary

The aim of the feasibility study is to evaluate different waste treatment concepts and technologies comparatively, based on diagnosis of the current and expected municipal solid waste situation in Douala. This includes the analysis of the waste management in Douala (sources and amount of waste, composition, collection system, institutional aspects), the assessment of possible waste treatment facilities (comparison of concepts) and the economic and financial assessment of selected waste treatment option.

Waste management in Douala

Since 1969, waste collection and landfilling in Douala has been carried out by HYSACAM. The costs for the waste collection amount to the equivalent of 18,0 EUR, for disposal 5,80 EUR (Period 2013-2017)

In 2017 698.780 tons of domestic waste were generated, the amount of collected waste was about 540.200 tons. There is currently no separate waste collection in Douala. The most recent waste analyzes date from 2018. Comparing the 2010 results with the current waste analysis (mean of all samples), organic content has decreased by about 20% to 55%. The proportion of plastics has increased significantly (from approx. 3.5% to approx. 15%) as well as the share of paper and board (from 3.7% to approx. 11%). The proportion of metals was about 2.2% according to the 2018 waste analysis. The informal sector focuses mainly on the collection of metals and plastics, paper and organic waste (feed) are also collected and recycled to a lesser extent.

There are already some companies in the Douala, which deal with the processing of recycled materials. The companies deal with the recycling of metals, plastics, paper and cardboard and biogenic waste.

Assessment of possible waste treatment facilities (comparison of concepts)

The following waste treatment options were assessed in this report

- Option 1: Mechanical treatment with a focus on resource recovery (recycling)
- Option 2: Mechanical biological treatment with a focus on recycling and producing bio-stabilized material for landfilling
- Option 3: Mechanical-biological treatment with a focus on recycling and on producing a soil improver
- Option 4: Mechanical-biological treatment with a focus on compost production
- Option 5: Mechanical-biological treatment with a focus on Refuse-Derived Fuel Production
- Option 6: Anaerobic treatment with a focus on producing biogas

The multicriteria assessment showed that Option 3: Mechanical-biological treatment with a focus on recycling and producing a soil improver performs best economically and ecologically (Option 5 is not realizable at the moment). The main goals of waste treatment with Option 3 can be summarized as followed:

- Extraction of recyclables by manual sorting
- Removal of dangerous waste
- Reduce the environmental impact by producing soil improver (quality of the soil improver depends on the quality of the input material). Typical use of soil improver:
 - As landfill cap
 - For landscaping during road construction and similar civil engineering projects
 - Green areas (parks etc.)
 - On brownfield (contaminated land) sites
- Reduction of annual landfill volume consumption

If there are customers for refuse derived fuel Option 5: Mechanical-biological treatment with a focus on Refuse-Derived Fuel would also be an interesting alternative. Option 2: Mechanical biological treatment with a focus on recycling and producing bio-stabilized material for landfilling is to be favoured if there is no need for soil improvers in Douala and especially if it is intended to use the stabilized organic fraction for the operation of the landfill in Ngombe or for PK10 (for daily and final cover). Option 1: Mechanical treatment with a focus on resource recovery (recycling) cannot be favoured due to its poor environmental performance (no bio-stabilization) and high economic risk. Option 1 is most vulnerable to the risk of price volatility and competition from the informal sector. Option 6: Anaerobic treatment with a focus on producing biogas is basically an interesting alternative, but because of the high investment costs, only a plant with very low throughput could be installed (not relevant for overall waste management in Douala). To successfully implement Option 4: Mechanical-biological treatment with a focus on compost production, it is necessary to introduce a separate waste collection.

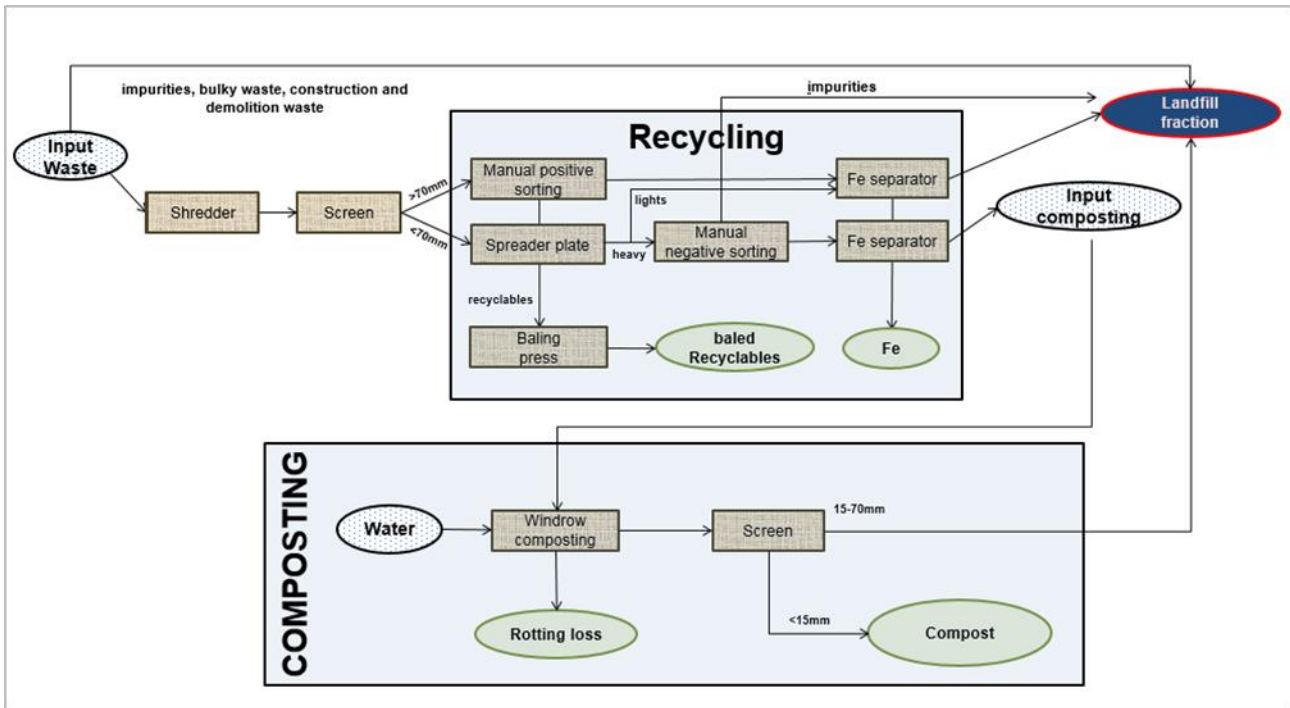
Option 3 was selected by CUD for the more detailed economic and financial assessment:

Economic and financial assessment of Option 3.

The assessment is performed for a mechanical-biological waste treatment plant for domestic solid waste with an annual capacity of 100.000 tons. The following flowchart illustrates the proposed treatment processes. This includes the following treatment steps:

- Waste pre-treatment: shredding (shredder) followed by sieving
- Manual sorting of recyclables (positive sorting -fraction > 70 mm) and Fe-separation
- Manual sorting out the impurities (negative sorting -fraction <70 mm) and Fe-separation
- Windrow composting (fraction <70 mm)
- Fine screening of the compost (fraction <15 mm use as soil improver, fraction > 15 mm bio stabilized material - us as intermediate landfill cover)

The space requirement for the processing hall and intermediate storage of the recyclables is approx. 3.500 m² (mechanical waste treatment). The area required for composting (biological waste treatment) is approx. 8.000 m² (paved areas).



The investment costs (aggregates, transport vehicles, halls, paved areas) can be estimated at about 6.000.000 EUR, the annual operating costs (staff cost, energy cost, maintenance costs, depreciation) with about 1.400.000 EUR. The waste treatment costs can be estimated at about 14 EUR/ton.

The economic efficiency of the operation of a waste treatment plant depends strongly on many diverse factors. Some of them can be assessed quite exactly (e.g. investment costs for waste treatment facilities, expected energy demand, personnel requirements). Other factors like (future) waste composition and quality, earnings from recyclables and soil improver etc., are much more difficult to evaluate, but they are decisive for the economic assessment.

In order to better assess the impact of these factors on the profitability of the waste treatment plant, sensitivity analyses were performed. In addition, the annual capital requirement over the entire term of the soft loan was calculated for 4 scenarios.

The capital requirement to operate the waste treatment plant during the time of soft loan repayment is about 1.000,000 EUR/year for the Baseline Scenario with conservative development, in the case of the Optimistic Scenario with conservative development the capital requirement is about 500.000 EUR/year, for the Negative Scenario with progressive development 1.500,000 EUR/year.

Taking into account the savings due to reduced landfilling costs (approximately 36.000 tons/year, costs for landfilling 10 EUR/ton), capital requirement for the Baseline Scenario with conservative development is about 600.000 EUR/year during the soft loan repayment period and for the Negative Scenario with progressive development about EUR 1.200.000/year. No additional capital is required for Optimistic Scenario with conservative development.

Conclusions

- The implementation of a waste treatment plant in accordance with Option 3 reduces the environmental impact of domestic waste significantly:
 - Reduction of greenhouse gas emissions.
 - Production of soil improver (compost like output)
 - Production of stabilized material for the intermediate dump of the landfill
 - Sorting out hazardous waste
 - Recovery of valuable materials.
 - Reduction of annual landfill volume consumption
- The operation of the waste treatment plant creates jobs for unskilled as well as for highly qualified employees.
- The examined Option 3 - one treatment line with an annual capacity of 100.000 tons - allows to treat about 20% of the collected waste of Douala in the year 2017.
 - However, the proposed concept can be extended by introducing additional preparation lines.
 - The necessary space requirement has to be designated at Ngombe
- Nevertheless, the implementation of initially only one treatment line seems to make sense for economic reasons:
 - Business models and business relationships need first to be established for the marketing of recyclables and soil improver
 - It is difficult to evaluate if and to what extent soil improver can be sold on the open market. There is no relevant market for compost in Cameroon at the moment. According to CUD experts, there is a need for soil improver in both landscaping and agriculture. However, it would be reasonable that public authorities buy fixed quantities of soil improver to fixed prices (for landscaping etc.) until a market for soil improver has developed
 - Utilization and marketing of soil improver and recyclables is crucial for the economic operation of the waste treatment plant
- The following aspects should be considered in the detailed planning of the waste treatment plant:
 - Consideration of the option to extend the waste treatment plant with an additional “module” for RDF production
 - Consideration of the option to implement additional waste treatment lines (space requirement)
 - Consideration of the option to adapt the waste treatment plant in case of the introduction of separate waste collection in Douala (space demand for additional aggregates like additional bag opener, screen etc.)
- Looking at the results of the baseline scenario, the annual costs for treating 100,000 tonnes of waste will be about 1.400,000 EUR. This corresponds to about 9% of the total waste disposal costs in 2017. Taking into account potential revenues and the reduction of landfill costs, the annual additional costs in the baseline scenario amount to about € 400,000. This represents approximately 2.6% of the total costs for waste disposal in Douala in 2017.

- An economically balanced operation of the waste treatment plant is possible (see positive scenario):
 - If the reduction of landfill costs is included in the overall economic balance.
 - If soil improver can be produced in appropriate quality and sold with profit (> 7 EUR / ton).
 - If energy and labour costs do not increase in the future more than the selling prices for recyclables and soil improver.
 - If higher revenues from recyclables can be achieved
 - If the plant is operated very efficiently (staff costs, energy costs, regular maintenance).