

# **SOLID WASTE MANAGEMENT IN BISSAU**



**TURIN SCHOOL FOR LOCAL REGULATION SUMMER SCHOOL**

# GUINEA-BISSAU

## BISSAU

- Bissau Population (2015): 432.000  
(30% country population)
- Annual growth rate: 2.3%
- Average households size:7
- N° households(2015):61.000
- Extension: 78 sqkm
- GDP per person: 500 PPP (2014)



# WASTE GENERATION

- **Waste generation:**

600 gr/cap/day

310 tons per day and 113.000 tones per year

- **Assumptions on waste generation trends**

Waste generation growth rate= population growth rate=2.3%

Economics trends are not going to affect waste quantity and waste composition

# **CURRENT MANAGEMENT AND PERFORMANCE (1)**

## **MUNICIPALITY**

- **Municipality collect the waste by using 4 rent trucks and about 80 operators per day**
- **Final disposal: Open Dumpsite managed by the Municipality**
- **Collected Tons per day: 23 tons (10% of the total produced amount)**
- **TOTAL COSTS 2015: 470.000 Euros per year (including costs of managing open dumpsite)**
- **Eur/ton/year: 55 Eur/ton**
- **NO REVENUES: NO WASTE TAX**

# CURRENT MANAGEMENT AND PERFORMANCE

## PRIVATE COLLECTORS: NO REGULATION IN PLACE

- ◆ Private Collectors: (Random) Informal Collectors and BLUFU
- ◆ Tariff: 0,30 Eur/sack or 15 Eur/month
- ◆ Collected Tons per day: 40 tons (20% of the total produced amount) disposed into the open dumpsite

## WASTE PICKERS

- ❑ Collected Ton per day per person: 40 kg
- ❑ Estimated numbers of waste pickers: 100


# STAKEHOLDERS ANALYSIS

Players	Information	Incentives	Key Relations
<b>Municipality</b>	Population size and waste generation per day/per person Real costs of the service Real costs of the investments	<ul style="list-style-type: none"> <li>Better livelihoods for the population;</li> <li>Revenues;</li> <li>City cleanness</li> </ul>	
<b>Incumbent Private enterprise of collection (BLUFU)/other private sectors players</b>	Waste generation and habits of wealthiest households They know well the operational and investment costs They are aware of the revenues and profits by applying their tariff	<ul style="list-style-type: none"> <li>Profit</li> <li>Social responsibility</li> <li>Market Power</li> </ul>	Municipality Households
<b>W-to-E Company</b>	They know the Investment costs in constructing and managing the WtE plant and the potential revenues	<ul style="list-style-type: none"> <li>Cheaper energy</li> <li>Effective waste treatment</li> <li>Economic efficiency</li> <li>Profit</li> </ul>	(Potentially) Municipality Government EAGB Waste Pickers
<b>Households</b>	They don't know how to properly manage the waste. They don't know the cost of the service (tariff). They don't know the impact (environmental and health) of an improper waste management	<ul style="list-style-type: none"> <li>Better livelihoods;</li> <li>City cleanness</li> <li>Access to waste collection service</li> <li>Affordable tariff</li> <li>Access to constant electricity</li> </ul>	Municipality BLUFU EAGB
<b>Waste Pickers</b>	They know how to select good materials. They know the structure of the population of the city. They know the value of the materials.	<ul style="list-style-type: none"> <li>Formal job</li> <li>Stable salary</li> </ul>	WtE
<b>EAGB (National Electricity Company)</b>	They know the number of households with access to the energy	<ul style="list-style-type: none"> <li>Stable energy supply</li> <li>Constant and certain inflows</li> </ul>	Municipality Government Households

# CHALLENGES

- 1. Expanding the coverage of the waste collection service to the whole population;**
- 2. Creating a proper final waste treatment;**
- 3. Assuring the financial sustainability of the system;**
- 4. Outlining a regulatory framework to regulate the sector.**

# 1. ENLARGING COLLECTION AND TRANSPORTATION: BENCHMARKING COSTS

- ✓ **PROPOSED WASTE COLLECTION SYSTEM: SECOND-CORNER STOPS AND COLLECTION POINTS (around 130 collection points)**
  - ✓ **ITEM'S COSTS**
    1. purchasing and maintenance of second-hand trucks (13 second hand trucks)
    2. manpower for collection and transport (4 operators per truck and 1 drivers + supervisors)
    3. depreciation and amortization along 10 years: 6% of the trucks value
    4. interest rate at 7%
    5. fuel for the daily transportation and collection
    6. Yearly cost increase according to waste growth: 2%
  - ✓ **The initial investment as a whole amounts to 2.028.457 Euros, which will be spread in 10 years.**
  - **Assumption: 5% of the total investment will be the administrative costs supported by the CMB for the supervision of the service**
-  **that the total prospected investment amount for the municipality to afford is 3.769.225 EUROS.**



# 1. ENLARGING COLL & TRANSP: INVESTMENT DATA

<b>Cost of investment/asset</b>	<b>3.769.225</b>
financed by equity	376.923
financed by loan	3.392.303
<b>Useful life**</b>	10
<b>Number of families accessing the service in the first year</b>	30.500
<b>Capital structure:</b>	100,00%
Equity	10%
Debt	90%
Tax rate	25%
Corporate tax	25%

# CREATING A PROPER FINAL WASTE TREATMENT

## **WASTE TO ENERGY PLANT**

Calculations based on some similar investments of Montevideo and other African countries (Nigeria, Kenya, South Africa)

Goals are:

- improve waste treatment,
- produce energy for the regional stakeholders
- reduce environmental damages

## **ASSUMPTIONS**

- Based on dimension of the Montevideo plant our plant would be about 1/6 of the other
- Technology/Productivity: 0,6 MgW/Ton
- 131.000 tons 2015 generated, but 70% to the WtE Plant (30% dumpsite)
- 48.340 MgW/year produced by assuming 2015 as baseline
- 8% of the total energy produced is used to run the WtE Plant
- The remaining 82% is sold to the National Energy Company at 100Euros per MgW
- Waste Pickers Integrated into the sector for waste selection

# WASTE TO ENERGY PLANT: INVESTMENT COSTS

Cost of investment/asset	64 615 385
financed by equity	9 692 308
financed by loan	54 923 077
Useful life	23
Operating start date	01.01.2018
Expected quantity sold p.a. as result of investment*	47 838
Capital structure:	100,00%
Equity	15,00%
Debt	85%
Tax rate	5%

## ***Special income factors:***

- Carbon credits
- Selling metal parts of ashes
- ~~Gate fee~~

## Special costs:

- Hazardous waste disposal  
(ashes)
- Gate fee at waste disposal
- $\Sigma c$

# REVENUES AND NPV

## WASTE COLLECTION AND TRANSPORT TARIFF SCENARIOS

% of paying families	Growth rate of paying population	Tariff fee per year per family	% Tariff on Family Income	NPV
80%	0	9	2%	-744.367 EUR
50%	2%	18	3,6%	153.726 EUR
100%	0	5	1%	-1.875.905 EUR
100%	0	8	1,5%	-332.898 EUR

### Waste to Energy plant

Investment period 23 years

NPV **10 395 078 EUR**

Growth rate selling price after 5 years 2%

Profit turn over after 10th year

# REGULATORY FRAMEWORK

- **Create a Waste Disposal Agency under the Bissau Municipality**
- **Waste collection contract with the major private player based on incentive regulated tariff system and creating economies of scale within the first 10 years of the regulated market.**
- **Develop by laws making it mandatory for households to own standardized waste disposal bins that will ease waste disposal**
- **Waste to Energy - Set up a waste to Energy company with Board of Directors and a Chief Executive to manage the envisaged investment**
- **Set up a contract mechanism that regulates the tariff of selling produced energy to the public Grid**

# REGULATION

Municipality will set a user tariff system based on Price Cap incentive rate. The choice of Price Cap is to achieve the following:

- Prevent exercise of market power
- Productive efficiency (No) Yes
- Allocative efficiency (No) Yes
- Dynamic efficiency (No) Yes

In order to increase service quality the regulator has already set some standards regarding environmental issues (see below).

# **ENVIRONMENTAL ISSUES**

## **MEASURES TO PROTECT QUALITY OF THE SERVICE**

- **Set health and safety standards for workers and operations**
- **Set emission standards in conformity with global standards**
- **Such standards to guide technology choice for waste to Energy operations, equipment procurement and waste disposal**
- **Develop bye laws making it mandatory for households to own standardized waste disposal bins that will ease waste disposal**

# NEGOTIATION ISSUES

- **Raising awareness of the population**
- **Raising awareness of municipal cancelers for supporting and providing solid waste management strategy**
- **Negotiation with:**
  - business to support the initiative financially and socially
  - government officials for further support the initiative
  - for service quality vs. regulated fee for the private company
  - waste pickers to collect and select waste.
  - landowners for Compensation.
  - creditors regarding the cost of capital.
  - citizens and landowners regarding location of the waste to energy plant and building supporting infrastructure
  - the National Energy Company to sell the energy at a profitable price



# LIMITATIONS OF THE ANALYSIS

**The social and economic characteristic of the population (difficult and complex to project the population behaviour)**

- **Lack of education (especially regarding environmental issues)**
- **Culture bounders**
- **Low income**
- **Low awareness of social, environmental and health impact of solid waste**
- **History of tax evasion**

**Difficulties on modelling some variables/assumptions due to no previous experience with providing this service in the municipality – partly should be set by assumptions.**

- **Expected tax revenues**
- **Tax rates and tariff rate (corporate tax, tariff for citizens, other penalties etc.)**
- **Cost of capital (sources of investment – having in mind the level of risk and uncertainty)**
- **Incentives for providing successful sustainable service**

**Grazie**

شكرا

**Dalu**

**BLAGODARAM**

**KOSZONJUK!**

شكريه