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Management of urban organic waste in Minas Gerais

Action Plan

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Dutch Waste Management

Virida

UFMG

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1. Introduction

The state of Minas Gerais in Brazil (see figure 1) faces major challenges concerning the collection and proper handling of organic municipal waste, towards utilization and value creation of its ingredients. Currently only a small percentage of the collected organic municipal waste gets separated and is aerobically composted. This is a pity because separation, treatment and re-use of organic matter could reduce environmental impacts, prevent loss of valuable nutrients and carbon sources and perhaps also provide financial benefits. In this project two Dutch SME companies (Dutch Waste Management, Virida) and two Research and educational institutes (Avans University of applied sciences and Universidade Federal de Minas Gerais-UFMG) decided to join forces and address the challenges of proper handling of municipal organic waste in Minas Gerais.

This led to the following main research question:

What is the current status of urban organic solid waste management in Minas Gerais and how can cooperation between Brazil and the Netherlands result in a win-win for both countries?

To answer this research question, a stepwise approach was followed. In a first step the current situation of handling of organic municipal waste was mapped. Chapter 2 of this document gives an overview of the main results of these activities. The full results can be found in two reports (see reference list, 1 and 2). Based on the gathered information, an action plan was made, including an overview of the possibilities for funding these actions. This action plan is described in chapter 3.

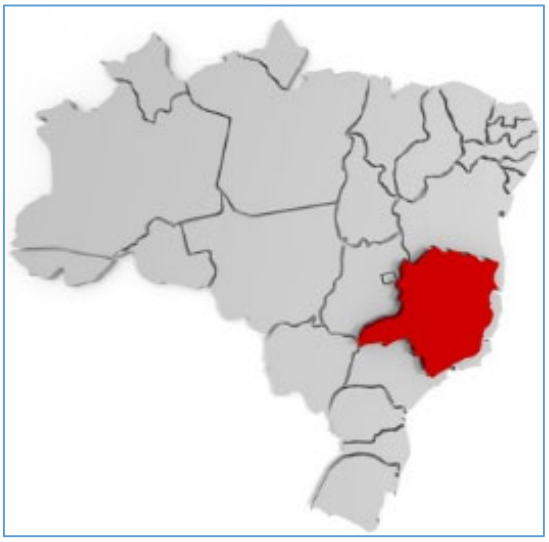

Figure 1: *state of Minas Gerais (in red) Brazil*

2. Organic waste management Minas Gerais – current status

This chapter gives a summary of the current situation of handling of urban organic municipal waste. In paragraph 2.1 the approach is described. Paragraph 2.2 gives an overview of the most important outcomes.

2.1 Approach inventory current status

Step 1: selection on representative cities
In step 1, a first diagnosis was performed of the cities in the State of Minas Gerais and the Belo Horizonte region about the situation of composting units in service. For this diagnosis, monitoring reports about municipal waste management from the State environmental agency were used. Based on selection criteria (for example: are local authorities enthusiastic about being involved in the project?), 8 to 10 representative cities were selected for further analysis (step 2).

Step 2: analysis of composting in selected cities
For the selected cities, a more thorough diagnosis was performed. Topics that were looked into are:

- Overview of current organic waste processing chain: disposers of organic waste – collectors – composting companies – end users of compost
- Infrastructure & operation of composting
- Administration of composting
- Finances for composting
- Problems in the composting chain

2.2 Main results current status organic waste management

The results of the inventory of the current status are described in 2 reports:

- Situation of Sorting and Composting Units (SCU) in Minas Gerais [1]
- AVANS/UFMG project on aerobic composting units [2]

Based on the following criteria a total of 20 suitable cities were selected that are suitable for a more detailed analysis of composting procedures [1]:

1. The availability of data in the monitoring reports of the State environmental agency
2. The presence of a waste sorting facility
3. The presence of aerobic composting facilities
4. The amount of waste that is collected

Based on the possible cooperation by the city, the number of cities was further reduced to 9 cities (see table 1).

Table 1: Overview of selected cities within de region of Minas Gerais

#	City
1	Cristiano Otoni
2	Divinésia
3	Guidoval
4	Jeceaba
5	Senador Firmino
6	São José do Goiabal
7	São Joaquim de Bicas
8	Santa Maria de Itabira
9	Senhora de Oliveira

These cities were visited for a more detailed analysis of composting practices [2]. The following aspects were studied:

1. Current chain of organic waste processing (disposers of organic waste – collectors – composting companies – end users of compost)
2. Infrastructure & operation of composting
3. Administration of composting
4. Finances for composting
5. Problems in the composting chain

It turned out that it is very difficult to get reliable and complete data. Either because the data is not available or because the cities do not have the capacity to provide the requested information.

Appendix 1 gives an impression of the sorting and composting units (SCUs) that were visited. The main conclusions of the analysis are:

Organisation

- Municipalities are responsible for the collection and handling of municipal waste at SCUs. Some cities have separate waste collection which means that they separately collect organic waste, recyclables (plastic, paper) (see figure 2). However, for most cities this is not the case.

Figure 2: *Separate waste collection*

- There is legislation about waste management but this legislation is not enforced. Whether SCUs (and CUs) are operated greatly depends on the political and economic support of the local government to maintain their activities, otherwise they close their operations.
- The handling of organic waste at this moment only costs money instead of generating money because the compost that is produced cannot be sold (in comparison to plastic and paper).Therefore municipalities do not invest in waste management. As a result, the proper equipment for composting is not available or (when available) often out of order.
- The state of Minas Gerais is also interested in the possibilities for anaerobic composting of organic waste to biogas (4).

Composting units

- Most of the composting units in Minas Gerais are located in small municipalities, which makes the management of composting manageable because of the relatively small volume of waste to be processed.
- There is a lack of training of the employees of the units. As a result, waste separation and composting are not optimal.

- The composting process is most of the times not properly monitored. Visual monitoring is used rather than monitoring based on defining parameters such as temperature, pH and humidity. This is due to a lack of proper equipment because of costs.
- The compost that is produced is usually only applied on the terrain of the SCUs itself. This is due to the relatively small quantities and the lack of quality monitoring and control of the produced compost (high costs, not locally available).

Perception

- Citizens, officials from municipalities, but also people working at SCUs often do not recognize the need for waste management. This is mainly because they do not see the relation between waste and environmental pollution / climate change.

3. Action plan

The main research question of this project was to find out the current status of organic solid waste management in Minas Gerais and how the cooperation between Brazil and the Netherlands can result in a win-win for both countries.

The inventory of the current status of organic solid waste management in Minas Gerais was described in chapter 2. Looking at the possibilities for cooperation between Brazil and the Netherlands it can be concluded from the results of the inventory that cooperation can be realized on:

- Knowledge exchange (which this project is already an example of) about successes and failures of the composting chain (see figure 3) concerning technical and organizational aspects and public awareness . In this matter it is important to take into account that the situation in Brazil is quite different from the Dutch situation;
- The investment in and marketing of (Dutch) techniques/equipment that enhances the separation of organic waste, the composting process and the quality control of the produced compost.

Figure 3: *Composting chain*

Looking at the next step, it is too early to realize a full-scale demonstration project. The main reason for this is the fact that it is not clear yet how the improvement of the composting chain can best be realized. First a feasibility study needs to be conducted that shows to the different stakeholders in the composting chain and possible investors that a successful composting chain (from collection to sales/application) is achievable and which activities need to be implemented to realize this.

Feasibility study

For the feasibility study, the following steps are suggested:

1. **Select a middle size city (20,000 – 50,000) or consortium of small cities** that wants to commit to an improvement of the composting chain and next to that in the realization of a demonstration project. A middle sized city because these cities have:
   - enough organic waste for (anaerobic) composting;
   - better infrastructure in relation to the composting chain;
   - more budget for participation in a possible demonstration project.
   - It might also have possibilities to apply the compost locally (to farmers or companies or municipal gardens) instead of leaving the compost at the composting facility itself.

   In a later phase it needs to be determined if a composting chain is also a feasible option for single small cities and/or large cities, and if these type of cities need a different type of approach.

2. **Define current situation** for the different steps of the composting chain in this city in more detail, using the data that was already gathered in this study and supplemented with information from interviews with responsible officials from the city. Parameters to determine are at least:
   - Stakeholders in the current composting chain;
   - Infrastructure & operation of composting (available equipment, working procedures etc.);
   - Administration of composting;
   - Finances for composting;
   - Already recognized problems in the composting chain.

For the interviews we can use the questionnaire that was developed bij Dutch Waste Management (see appendix 2). Besides interviews, also data from a project that is currently carried out by the state of Minas Gerais about the reinforcement of separate collection can be used.

3. **Organize a workshop** with Brazilian and Dutch experts to come up with knowledge gaps and points of improvement for each step of the composting chain (figure 3). These knowledge gaps and points of improvement should not only focus on technical aspects, but also on organizational aspects such as training of employees of SCUs and awareness of citizens and officials from cities about the usefulness and necessity of improved waste management. Again it is important to mention that it has to be taken into account that the situation in Brazil is quite different from the Dutch situation.

4. Define a **plan for a demonstration project** based on the outcome of the workshop. This plan should include:
   - Detailed description of knowledge gaps that still need to be researched (e.g. application of compost).
   - Detailed description of the measures to be taken (points of improvement selected in workshop in step 3, organizational – technical – public awareness). The state of minas Gerais is particularly interested in(4):
     - Separate collection of organic household waste;
     - Possibilities for anaerobic composting (digestion) of organic household waste to produce biogas and fertilizer;
     - Stimulation of consortium forming / cooperation of small municipalities to improve feasibility and efficiency of (anaerobic) composting.
   - The stakeholders that need to be involved in researching the knowledge gaps and executing the measures in the different steps of the composting chain. See figure 4 for an example. It is recognized that involving partners in the whole chain will be a real challenge since this is not common practice in Brazil. If it turns out that this cannot be realized on short term, the plan will focus on involvement of the local and regional government and universities.
   - Finances of the different measures and the possibilities for funding these costs.

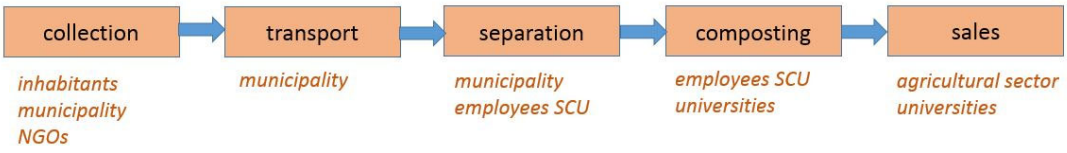

Figure 4: *Example of involvement of stakeholders in different steps of the composting chain*

5. Present plan for a demonstration project to officials of the selected city, to regional government in Brazil and to possible funding agencies and companies in Brazil and The Netherlands. Dutch Waste Management already made a first overview of possible Dutch Partners (see appendix 3).

Funding

Table 2 gives an overview of the subsidies and grants may be applicable for the feasibility study and follow-up demonstration project. The overview was based on information from the database on the website www.vindsubsidies.nl and additional info provided by Dutch governmental organization RVO. More information can be found in [3].

Table 2: Overview of the subsidies and grants which may be applicable for the feasibility study and follow-up demonstration project

Fund	Objective / remark	Who can apply?	Amount
1. SIA FAPEMIG tender	Joint research at universities (apll.sc.)	Universities Nl/Br	125 k€+125 k€
2. Dutch RVO SIB programme "Starters International Business"	Ministry wants to help companies who want to do business abroad	Dutch SMEs	50% of 2500 € (knowledge voucher)
3. Rabobank foundation	Fighting poverty and helping poor people to become self-supporting, helping farmers and farming cooperations.	Foundation / non-profit organisation	Unlimited
4. Multilateral investment fund (USA)	Fighting poverty and development, support for local SMEs. Climate smart agriculture, inclusive cities (spatial, social and economic etc)	Esp. NGO, non-profit private organisation	unlimited
5. RVO export & investing subsidies	Exporting of goods and services to Brazil	Dutch companies	<15 M€ for investments
6. RVO DHI feasibility studies	Demonstration, feasibility, investing preparation	Dutch companies?	200 k€ demo, 100 k€ feasibility
7. RVO Partners in Business	Partners for international business, some focus on waste management. No money for companies, only for government!?	5 partners	Max. 350 k€
8. MVO Nederland vouchers	Sustainable entrepreneurship	Dutch SMEs	50% subsidy < 10.000 €

Bibliography

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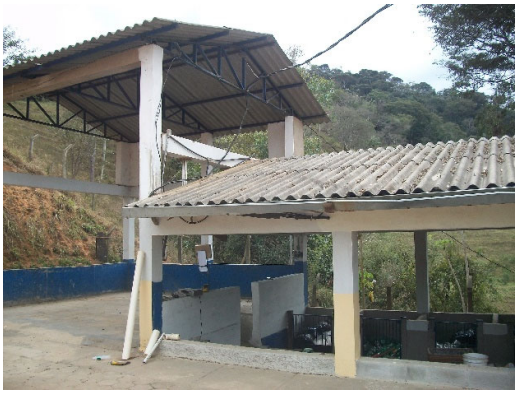
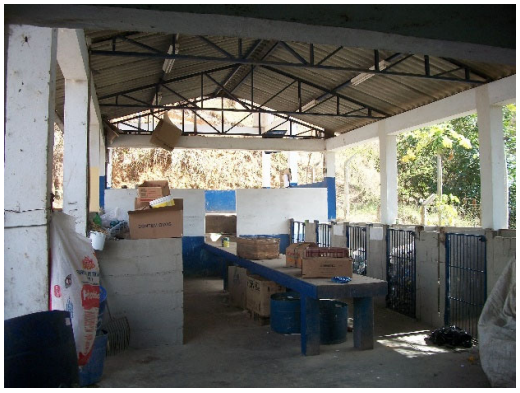
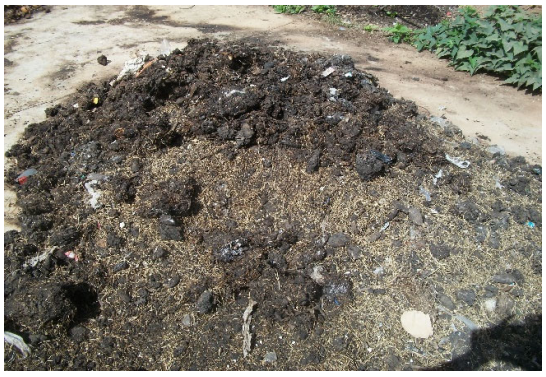
2. AVANS/UFMG PROJECT ON COMPOSTING UNITS, November 2018, Prof. Raphael T V Barros (DESA / UFMG), Mariana M. Bastos (UFMG), Barbara Barnabé (UFMG), Max Post (Avans University).
3. Memo: Possible funding options for project Best practices in urban solid waste management, November 2017, Alwin Hoogendoorn (Centre of Expertise Biobased Economy).
4. Sustainable regional management policy for organic waste and potentially recyclable materials for small municipalities of Minas Gerais, May 2018, FEAM.

Appendix 1: Impression of the visited sorting and composting units



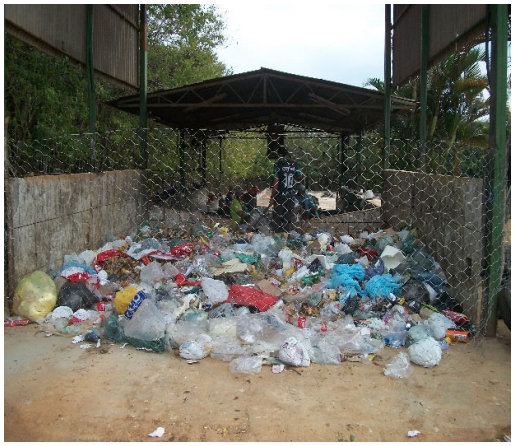


Photos 1 and 2 - reception and feeding area of the sorting table; perspective of the sorting table (and stalls)

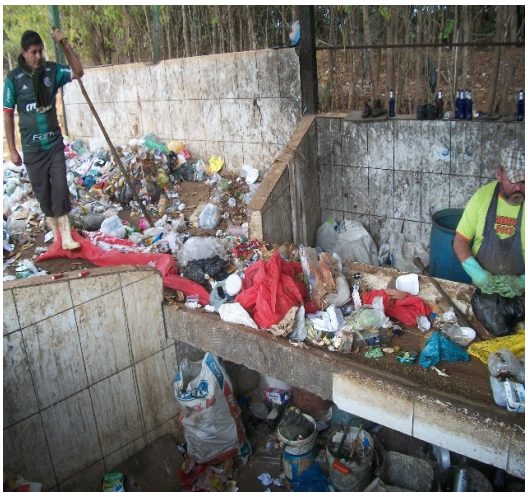


Photos 3 and 4 - overview of composting yard and compost pile

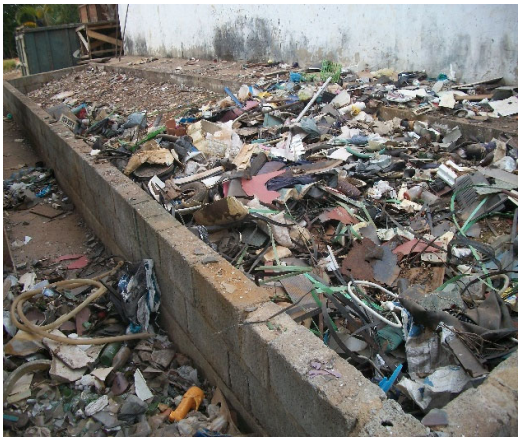
Photos 5 and 6 - Overview of facilities; ramp for waste disposal



Photos 7 and 8 - side and front view of the waste reception area



Photos 9 and 10 - feeding of the sorting table; perspective view of the sorting table



Photos 11 and 12 - view of the composting yard; view of adjacent area

Photos 13 and 14 - view of the storage area of the bales; view of the tailings dump and tailings landfilling area

Appendix 2: questionnaire waste management

Developed bij Dutch Waste Management

Dear Sir, Madam,

We kindly request you to answer the following questions as comprehensively as possible. The answers to these questions will be the base of the waste treatment project.

Please provide information on the source of the data as much as possible. Feel free to add additional information. Please fill out all questions, if you don't have the answer, please indicate so.

The goal of this questionnaire is to get a full insight in the present situation on the quantity and composition of the waste, the collection and the present treatment facilities.

General information

Name of the project:	
Location of the project:	
Name of the Union of Municipalities:	
Name of the municipality:	
Number of inhabitants in your municipality:	
Surface of your municipality (km^2)	

The questions underneath are to be answered by each municipality separately

Waste amount and composition

Please identify the types of waste and the volumes per day that is collected in your municipality and where it is treated.

	Ton/year M3/year	Treatment facility
Municipal Solid Waste		
Industrial Waste (non-toxic)		
Industrial Waste (toxic)		
Commercial Waste		
Building and demolition waste		
Hospital waste		
Sludge		
Packaging waste		
Green waste		

What is the composition of the Municipal Solid Waste?

- Organic fraction: %
- Paper: %
- Plastics: %
- Metals: %
- Glass: %
- Residue: %

What is the composition of (non toxic) industrial waste?

- Organic fraction: %
- Paper: %
- Plastics: %
- Metals: %
- Glass: %
- Residue: %

What is the composition of commercial waste?

- Organic fraction: %
- Paper: %
- Plastics: %
- Metals: %
- Glass: %
- Residue: %

What is the composition of building and demolition waste?

- Organic fraction: %
- Paper: %
- Plastics: %
- Metals: %
- Glass: %
- Concrete and bricks: %
- Sand: %
- Asbestos: %
- Residue: %

What is the composition of packaging waste?

- Paper: %
- HDPE: %
- PVC: %
- Metals: %
- Glass: %
- Residue: %

Other remarks concerning waste amount/ composition:

Waste collection

How is waste collected. Curb side collection or is it brought to a central transfer station or directly to the landfill. Who is the collection company.

	Curb side or bring system	Collection company	Treatment of transfer station
Municipal Solid Waste			
Industrial Waste (non-toxic)			
Industrial Waste (toxic)			
Commercial Waste			
Building and demolition waste			
Hospital waste			
Sludge			
Packaging waste			
Green waste			

Separate collection

- Is separate collection of waste stimulated?
- What waste streams are collected separately?
- What are the plans for the future concerning separate collection?

Other remarks concerning waste collection:

Waste treatment

What kind of waste treatment facilities are located in your area:

Activity	Kinds of waste	Capacity	Location
Controlled landfill			
Wild landfill			
Sorting plant			
Composting plant			
Sanitation plant			

Landfill

What kind of waste is being landfilled	
Location and name of landfill	
Owner of the landfill	
Controlled or uncontrolled landfill	
Are gate fees being charged? How high are these? Are they differentiated per waste type?	
How much are the transport costs per ton waste	
Short description of the landfill	
• What is the size of the landfill	
• How is the landfill constructed (lining, gas extraction, weighbridge, etc.)	
• What is the total capacity	
• What is the expected remaining lifetime of the landfill?	

Please describe briefly the construction of the landfill site? Is it an uncontrolled dump? Is it a controlled landfill (with lining and landfill gas extraction), does it have a weigh bridge? Etc.?

Waste treatment line (composting, sorting, etc.)

What kind of waste is being treated	
Location and name of the installation	
Owner of the installation	
Are gate fees being charged? How high are these? Are they differentiated per waste type?	
What kind of waste is treated	
What kind of products are made for recycling	
How is the market for these products	
What is the total capacity	

Other remarks concerning waste treatment:

Future for waste treatment and recycling

What is the main problem you would like to address.

Please give a short description of you how you would want to treat waste in your municipality.

What kinds of waste streams you would like to collect and treat separately

Thank you very much for filling-out this questionnaire. Please return the forms to:

Appendix 3: possible Dutch partners

- Van Gansewinkel Renewi
- Renewi Orgaworld
- IMC Sliedrecht
- Bakker Hydraulic Products
- Bakker Magnetics
- BOA Recycling Equipment
- Christiaens Group
- Daly Plastics
- DB Technologies
- DMT Milieutechnologie
- Gems Waste Technology
- HoST
- Membrane Systems Europe
- Pastoor Consult
- Sustec Consulting Contracting.
- MERIT Advisory
- GID Milieutechniek
- Sweco
- Witteveen+Bos,
- db Technologies,
- Royal Dutch Kusters Engineering
- DMT Milieutechniek
- Hofstetter
- Nexus Novus

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