ROADMAP

FOR RECYCLING ORGANIC WASTE

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CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

Ecomark composting plant in Elias Fausto, Brazil. Picture by ABRELPE, 2016

ROADMAP

FOR RECYCLING ORGANIC WASTE

In Brazil, the organic fraction represents around half of the total municipal solid waste (MSW) generated, and managing this increasing volume is a challenge to municipalities: although it has a recovery potential, treatment initiatives are still incipient and most of this waste is sent to landfills and dumpsites, increasing emissions of short-lived climate pollutants, especially methane, which has a great impact on global climate.
This roadmap was conceived for municipalities that are willing to adopt a sustainable MSW management system in which the organic waste receives the required attention and occupies a more relevant role, providing possible strategies and suggestions of technological routes for the recycling of this important fraction.

1. WHAT IS ORGANIC WASTE?
2. HOW MUCH ORGANIC WASTE IS PRODUCED?
3. WHAT TO DO WITH IT? POSSIBLE TREATMENT OPTIONS
4. DOES THE CITY NEED TO HAVE SEPARATE COLLECTION OF ORGANIC WASTE?
5. SELECT TECHNOLOGIES THAT ARE BASIC
6. START FROM SMALL-SCALE
7. QUALITY FIRST
8. TRUST YOUR CITIZENS!
9. ASSESS YOUR FINANCIAL NEEDS AND CAPABILITIES

1

WHAT IS ORGANIC WASTE?

Mixture of both cooked and raw leftovers from households, restaurants, hotels and shopping malls

Leaves, branches and grasses from the maintenance of squares and gardens

Fruits and vegetables leftovers from markets and street markets

HOW MUCH ORGANIC WASTE IS PRODUCED?

2

Assessing the amounts is the first step and relies on waste composition analysis and "surveys on the ground". Composition analysis requires to set up a team, choose a paved and ventilated location with adequate lighting, set the time period and the sampling criteria: seasonality, type of housing, socioeconomic class, among other steps. You do not need a perfect, but a reliable assessment!

Do not forget: The MSW that is received at the landfill or dumpsite may not entirely reflect what is generated in the city or town (depends on the collection coverage). So, you will also need to research other facilities (Material recovery facilities; drop off points, etc.)

[1]And there are many. As an important step in this roadmap, please take a time to research available methodologies and techniques from reliable sources. One suggestion is accessing the Waste Initiative platform: www.waste.ccacoalition.org to find out from case studies and materials.

3 WHAT TO DO WITH IT? POSSIBLE TREATMENT OPTIONS

The first thought of a destination for organic waste will probably be an engineered landfill, which is not wrong, because it is considered an environmentally safe facility and is recognized as an adequate disposal option according to the Brazilian National Solid Waste Law. However, it is important to point out that landfills are the third anthropogenic source of methane, and the decomposition of one tonne of organic waste in the landfill, results in the following emissions:

LANDFILL WITHOUT LFG COLLECTION → 47 kg CH_4/TONNE
LANDFILL WITH LFG COLLECTION → 33 kg CH_4/TONNE

Why not divert the organic fraction from disposal and give it a more valuable treatment? Take a look at the three alternatives[2] below:

TECHNOLOGY	CHARACTERISTICS	EMISSIONS OF METHANE
 COMPOSTING	Biological process that converts municipal organic waste into a valuable solid organic fertilizer that complies with legal compost standards.	3 kg CH_4/TONNE
 ANAEROBIC DIGESTION (AD)	Decomposition of biodegradable materials under controlled anaerobic conditions. Aims to recover a "biogas" suitable for being further exploited for renewable electrical power generation and heating requirements for the treatment facility.	2,3 kg CH4/TONNE[3]
 MECHANICAL BIOLOGICAL TREATMENT (MBT)	Integration of a wide range of techniques for processing MSW, including the recovery of dry recyclables within the mixed amount. The biological treatment phase of MBT can be either aerobic, with a compost-like product, or anaerobic with biogas production.	Low Tech[4]: 13 kg CH_4/TONNE Hight Tech: 9 kg CH_4/TONNE High Tech with AD: 3 kg CH_4/TONNE

[2]More details about the general design of these plants can be found in the "Technical guidance on the operation of organic waste treatment plants"[(1)] and, a case study for the city of São Paulo with regard to its management of organic waste can be found in the "Strategy for organic waste diversion - collection, treatment, recycling and their challenges and opportunities for the city of São Paulo"[(2)].

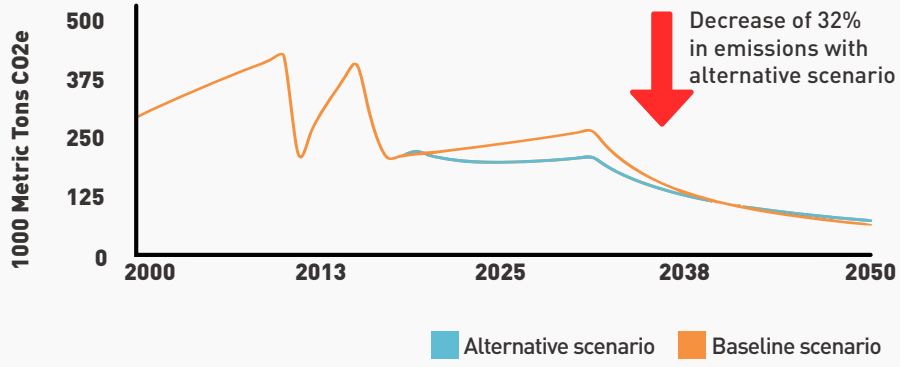
[3]More details about emissions of these plants can be found in IFEU 2009: Manual SWM GHG Calculator.

[4]Low tech means low capex and high tech means high capex.

The Solid Waste Emissions Estimation tool (SWEET®)[3] can support your city in estimating the emissions from the MSW sector and comparing the emissions reduction benefits of different waste management scenarios, with graphics and tables. We present below a graphic of emissions with data from the city of Curitiba, Paraná, Brazil, comparing the baseline and alternative scenario proposed.

BASELINE SCENARIO IN CURITIBA 608,352 TONNES OF MSW (2016)	25,544 TONNES OF DRY RECYCLABLES DELIVERED TO A RECYCLING FACILITY
	26,718 TONNES OF GREEN WASTE FROM HOUSEHOLDS SENT TO COMPOSTING
	556,000 TONNES OF MIXED WASTE SENT TO A SANITARY LANDFILL
ALTERNATIVE SCENARIO FOR THE SAME DATA	INCREASE OF 50% IN DRY RECYCLABLES SENT TO RECYCLING FACILITIES
	INCREASE OF 65% IN GREEN WASTE FROM HOUSEHOLDS SENT TO COMPOSTING
	50% OF FOOD WASTE FROM PRIVATE GENERATORS AND HOUSEHOLDS SENT TO ANAEROBIC DIGESTION

Total emissions by scenario including CO_2, NO_x, Black Carbon, CH_4 and Organic Carbon



4

DOES THE CITY NEED TO HAVE SEPARATE COLLECTION OF ORGANIC WASTE?

The intrinsic advantage of biological treatment technologies for organic waste is that these can be applied both to feedstock collected separately at source or separated mechanically.
Hence starting, for example, with a MBT facility keeps the "system" flexible enough and allows using part of the facility capacity also for treating feedstock from separate collection.
However one must remember that source separated feedstock have a much better quality and produces much better results in terms of outputs (i.e. compost, biogas) depending on the selected technological system.

TECHNOLOGY	SEPARATE COLLECTION
COMPOSTING	Preferable, because it guarantees better product quality of compost to be used in agriculture.
ANAEROBIC DIGESTION	Separate collection is preferable so to maximize the biogas yield. There are technical solutions that can recycle waste from different sources, like wastewater and sewage sludge from the food industry.
MECHANICAL BIOLOGICAL DIGESTION	To be used on unsorted, mixed MSW or on the residual waste fraction. It can apply aerobic and anaerobic tecnologies or both. The biostabilised organic fraction (MBT-compost) has generally a low-quality and limited possibility of use.

5 SELECT TECHNOLOGIES THAT ARE MORE BASIC:

Starting from the basics can be the key for an overall success in the long term. Managing a recycling or treatment process for organic waste can be more complex than assumed during the planning phase. Hence, low CAPEX solution, relying on more labor-force may be the right option to start.

6 START FROM SMALL-SCALE:

Most technologies for organic waste treatment are scalable, so you can start by promoting home and community composting initiatives, which do not need costly infrastructure or facilities and rely mainly on the capacity to involve local communities and a good technical support from educating, starting and tutoring the initiative. This "simple" approach works better in small communities and in areas with a limited availability of garden or green spaces. Moreover, they enhance public acceptance for larger and more "industrial-scale" plants.

7 QUALITY FIRST:

When diverting organic waste from disposal towards recycling, the importance of a clean "feedstock" becomes evident. Impurities affect the functioning of machinery at composting and AD-facilities and raise the cost for disposing rejects; they also reduce the amounts of recycled outputs (i.e. compost and/or biogas) and thus the revenues of the facility.

8 TRUST YOUR CITIZENS!

Communication and awareness initiatives are generally more effective than local decision makers may think. Home-composting, separate collection of organic waste, among other intensive sorting schemes for other recyclables are running effectively in a large range of settlements and cities, worldwide. Involving the local community into recycling and separate collection gains benefits that go beyond environmental performances: reinforce the sense of community, creating better living condition at neighborhoods, and thus reducing the footprint of human civilization on the global and local environment.

For a short guideline about how to realize communication initiative for the MSW sector, please consult "Handbook on communication and engagement for solid waste management"[4].

9 ASSESS YOUR FINANCIAL NEEDS AND CAPABILITIES:

Implementing recycling or treatment facilities for organic waste needs money as well as paying a gate-fee for a public and/or privately-owned plant.

Assess the current municipal budget for MSW management and evaluate if there is a need to raise revenues in order to fulfill the demands for the improvements determined by current regulations. A waste tax or fee is the basic instrument of every public service, and MSW management cannot be an exception.

Define the current expenditure (for example in R$/person/month) and compare it to that of successful initiatives/municipalities or with other costs of living in the city, such as water, sewage, electricity, cable TV or public transportation. The Organic Waste Management Cost Estimation Tool (OrganEcs®)[5] can support the decision-making process by providing an estimation of costs, from Capex to Opex, for different recycling technologies, based on local conditions and costs.

ABOUT THE PROJECT

This roadmap is part of the scope for the technical assistance project for solid waste management in Curitiba/Brazil. The project was carried out by ABRELPE with the financial resources by the Climate and Clean Air Coalition through its Municipal Solid Waste (MSW) Initiative.

TECHNICAL PROFILE

Coordination: ABRELPE - Brazilian Association of Public Cleansing and Waste Management Companies (abrelpe@abrelpe.org.br)

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(1) Technical guidance on the operation of organic waste treatment plants: The document aims at providing technical guidelines to local authorities, plant suppliers and plant managers in order to help them manage the organic waste fraction in a proper way both from a processing as well as from an environmental protection point of view.
Access: https://goo.gl/xZDEPZ

(2) Strategy for organic waste diversion - collection, treatment, recycling and their challenges and opportunities for the city of São Paulo: The document has technical guidance on the operation of organic waste treatment plants, such as composting, anaerobic digestion and MBT plants, aiming to help the city of São Pauto to formulate a strategy for organic waste diversion.
Access: https://goo.gl/TT29Tt

(3) SWEET tool: Tool developed by CCAC aiming to support users in estimating the emissions and comparing the emissions reduction benefits of different waste management scenarios.
Access: https://goo.gl/GANxTa

(4) Handbook on communication and engagement for solid waste management: presents a set of best practices to make a strategic development of public waste projects, as well as innovative and state-of-the-art tools that can be used to raise the level of engagement of society with this matter.
Access: https://goo.gl/fg8H8k

(5) OrganEcs tool: Tool developed by CCAC aiming to estimate the range of investment cost for composting and anaerobic digestion facilities based on a key-set of data and information used for modeling the tool.
Access: https://goo.gl/E8fgE7

Cover image: Picture by Marco Ricci

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AD & Composting plant in Italy. Picture by Sogliano Ambiente

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