Establishment of organic waste treatment facilities

Selection of technologies

Montréal

SECTION 1

Context

Establishment of organic waste treatment facilities
Selection of technologies

1.1 Québec Waste Management Policy 2011-2015 Action plan

(an update of the Québec 1998-2008 Waste Management Policy)

- Calls on one and all to follow **the 3 RV-E hierarchy**
  - Reduction at the source
  - Reuse
  - Recycling
  - **Valorization (enhancing the value of waste)**
  - Elimination (disposal)

- **Sets a target of 60% for the proportion of putrescible organic materials that** Québec MRCs and metropolitan communities will have to valorize by 2015.

- **Prohibits** the landfilling of organic materials after 2020.

- **Determines** the technologies through the implementation of an infrastructure program to reclaim organic materials through **biomethanation and composting**.

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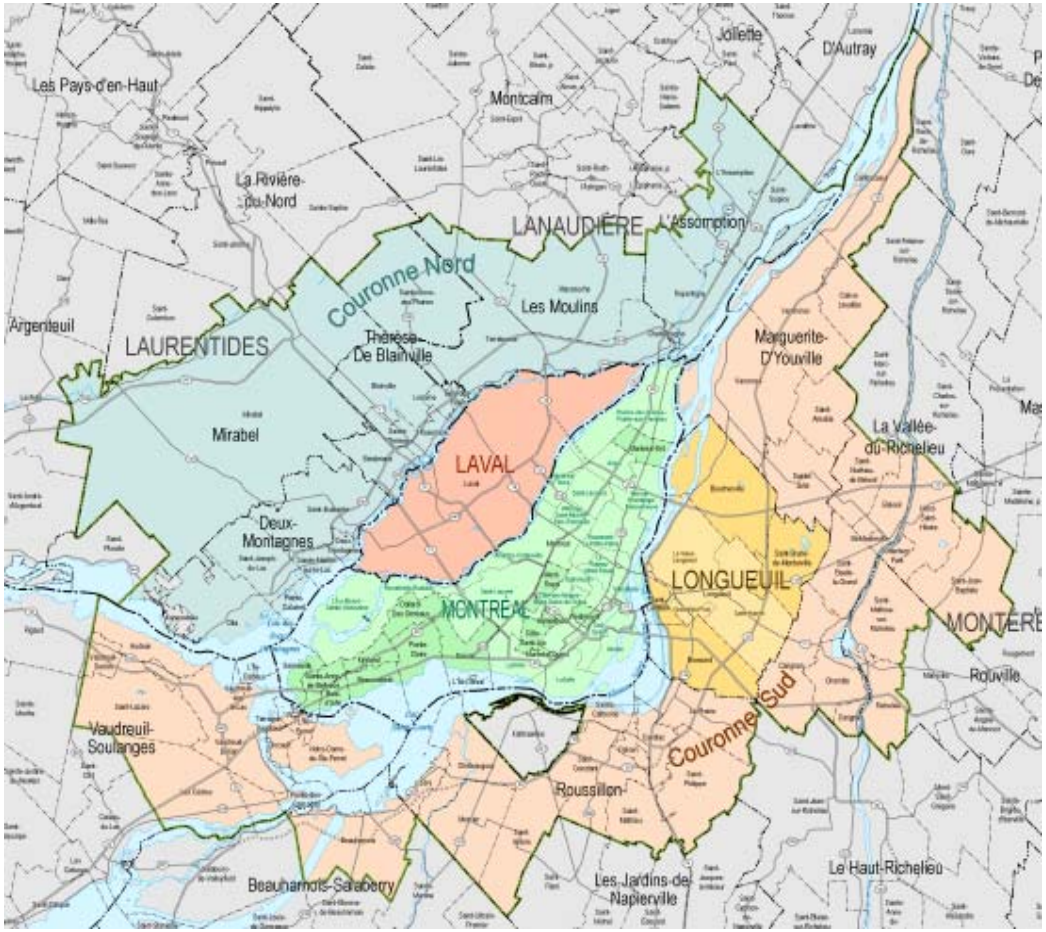
1.2 Metropolitan Waste Management Master Plan for the Communauté métropolitaine de Montréal (CMM)



- Approved by the Ministère du Développement durable, de l'Environnement et des Parcs on August 22, 2006
- Complies with the Québec Policy and its Action Plan
- Objective: regional autonomy of the 5 CMM territories (the residual waste of each territory must be treated within its territory):
  - Agglomeration of Montréal
  - Agglomeration of Longueuil
  - Laval
  - North Shore
  - South Shore

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1.3 Waste Management Master Plan for the Agglomeration of Montréal 2010-2014

- Adopted unanimously by the Agglomeration Council in August 2009.

- The organic material treatment facilities are to be implemented according to a principle of **territorial equity**.
  - A fair and just distribution of the infrastructures on the territory of the island
  - Treatment of materials near their production locations
    - Reduction in transportation and GHG

- Considering the quantities of organic materials produced by each sector on the island, the City has opted for the following infrastructures:
    - **2 composting facilities**
    - **2 biomethanation facilities**

- On the basis of the residual household waste left after its sorting at the source, we intend to assess the potential for the valorization of the organic, recyclable and combustible materials contained in this household waste. This assessment will be conducted through the implementation of a **pre-treatment PILOT centre**.

SECTION 2

Determination of technologies by sector

2.1 Two key principles determine the technological choices

The infrastructures are **designed to meet the needs of the agglomeration** while focusing on regional autonomy.

The **technologies** and the treatment options must be **adapted to the Montréal context** (more specifically our climate and the nature of our residual materials). **Also, they must be proven technologies**, i.e. used effectively in similar conditions elsewhere in the world.

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2.2 Descriptions of organic material valorization technologies

Technology	Process category	Products obtained
COMPOSTING (presence of oxygen)	**Open area** Windrows on open areas. Mechanical turnover to ensure the homogeneity and aeration of the waste. **Semi-closed process** Windrows covered by a gas permeable and waterproof membrane. Forced aeration to accelerate the biological decomposition thereby reducing the risk of odors. **Closed process (corridor or tunnel)** Total containment throughout the process. Capture and treatment of odorous air and recirculation of part of the air. Forced and controlled aeration.	Compost
ANAEROBIC DIGESTION (BIOMETHANATION) (absence of oxygen)	**Humid or dry process in a closed facility** Biodegradation containment of organic materials (KW) in a digester.	Biogas Digestat which will be dried then composted

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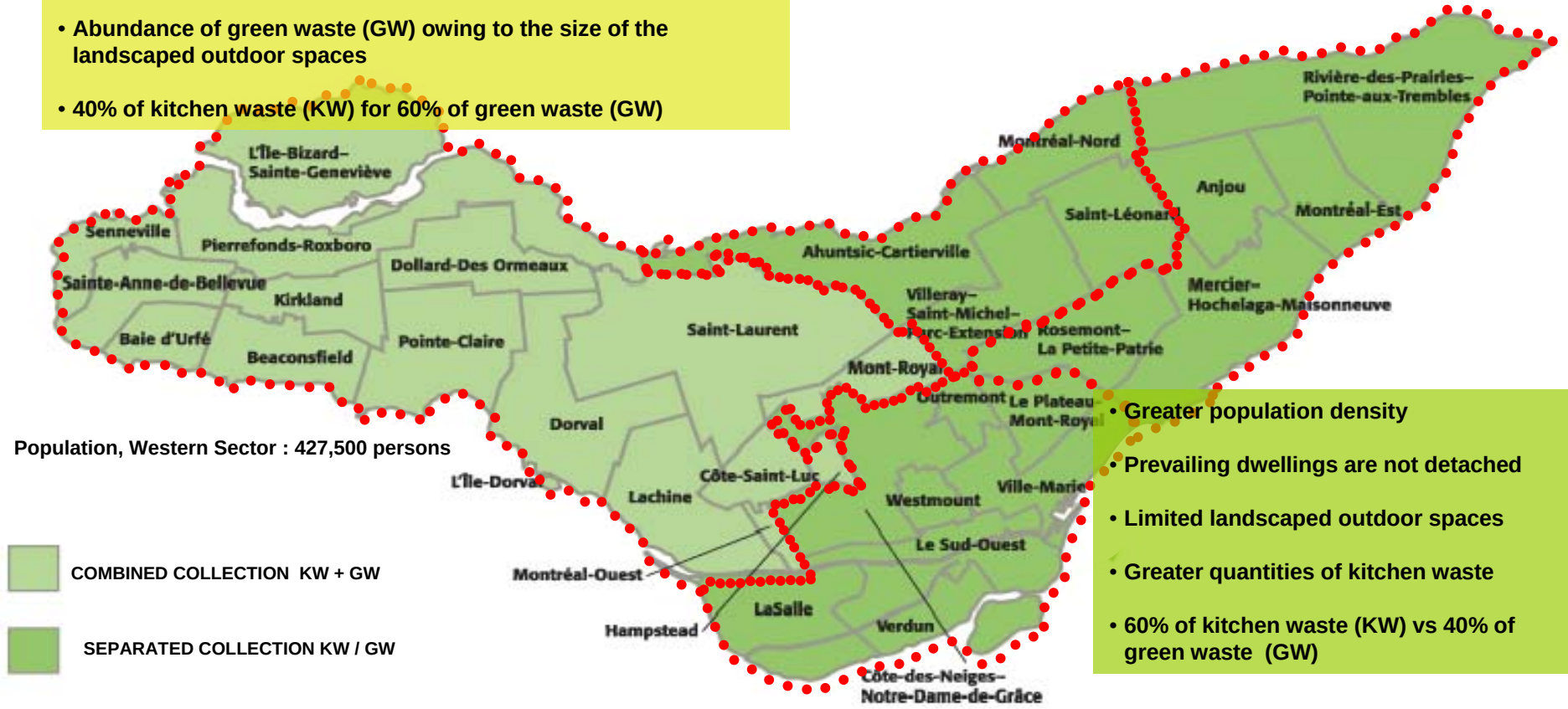
2.3 Two zones with distinct profiles

- Lesser population density
- Prevailing type of dwelling is single-family or detached (95%)
- Abundance of green waste (GW) owing to the size of the landscaped outdoor spaces
- 40% of kitchen waste (KW) for 60% of green waste (GW)

Population, Northern, Eastern and Southern Sectors: 1,473,000 persons



Population, Western Sector : 427,500 persons

- Greater population density
- Prevailing dwellings are not detached
- Limited landscaped outdoor spaces
- Greater quantities of kitchen waste
- 60% of kitchen waste (KW) vs 40% of green waste (GW)

COMBINED COLLECTION KW + GW

SEPARATED COLLECTION KW / GW

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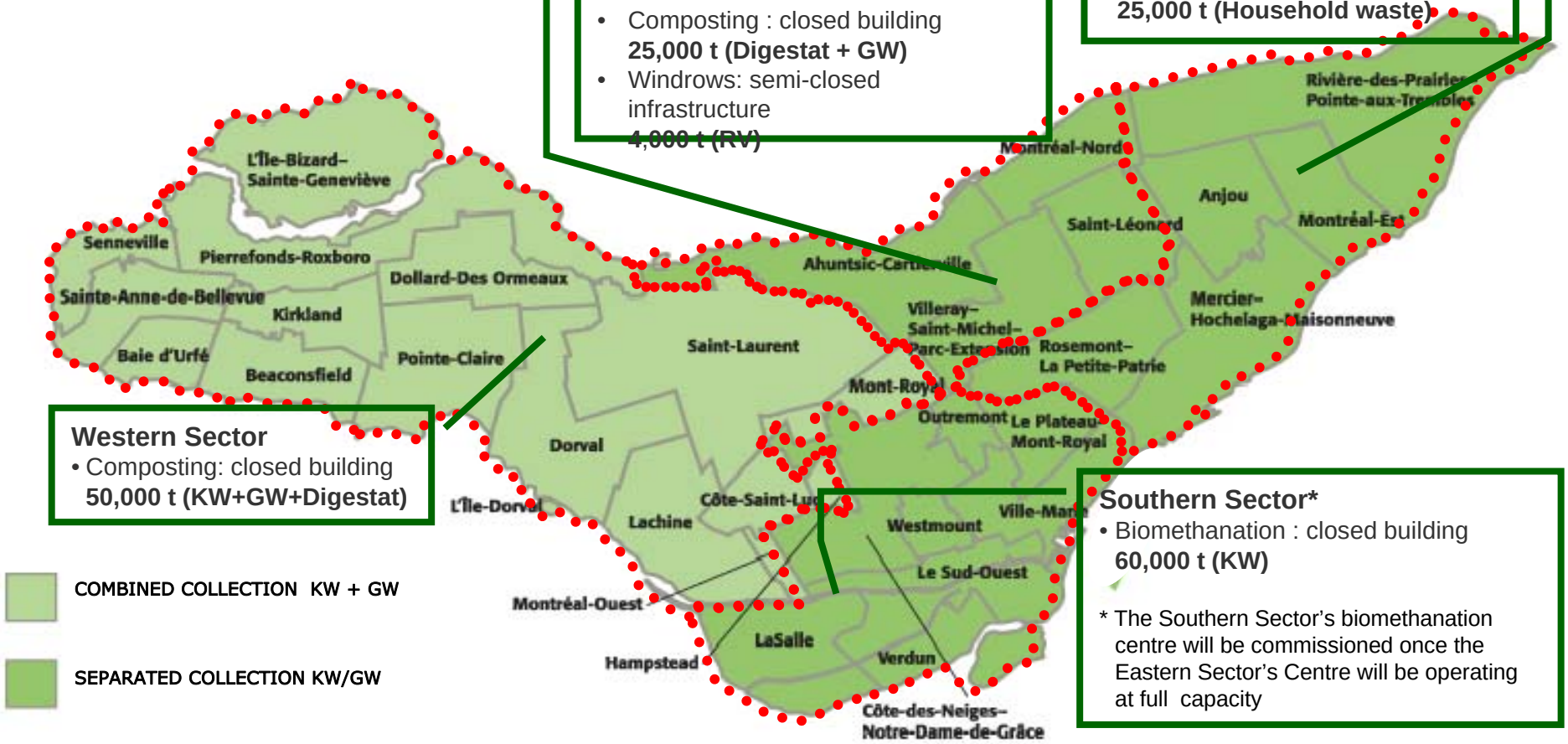
2.4 Infrastructures adapted to the nature of the organic waste collected

Eastern Sector
- Biomethanation: closed building **60,000 t (KW)**
- Pre-treatment pilot centre: closed building **25,000 t (Household waste)**

Northern Sector
- Composting : closed building **25,000 t (Digestat + GW)**
- Windrows: semi-closed infrastructure **4,000 t (RV)**



Western Sector
- Composting: closed building **50,000 t (KW+GW+Digestat)**

COMBINED COLLECTION KW + GW

SEPARATED COLLECTION KW/GW

Southern Sector*
- Biomethanation : closed building **60,000 t (KW)**

* The Southern Sector's biomethanation centre will be commissioned once the Eastern Sector's Centre will be operating at full capacity

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2.5 Explanations re. the selection of infrastructures by sector

<table>
<tr><th>Western Sector</th><th>Northern Sector</th><th>Eastern Sector</th><th>Southtern Sector</th></tr>
<tr><td rowspan="2">The GW / KW ratio (60% vs 40%) justifies a combined collection and resorting to composting.

It also allows for the treatment of pre-compost (digestat) originating from the biomethanation centres.</td><td rowspan="2">The closed infrastructure is justified by the composting needs for the precompost (digestat) from the biomethanation centres.

The semi-closed infrastructure of covered windrows is justified by its low construction and operating cost. It represents an improvement over the actual uncovered windrows.
The existence of a GW composting activity and compliance with the CESM’s mission and master plan justify the establishment of a composting centre which will also act as a showcase of environmental technology and education.</td><td colspan="2">The important quantities of KW in the Southern, Northern and Eastern Sectors justify the separated collection of KW and GW and the establishment of two biomethanation centres of a capacity of 60,000 tons/year each. This type of valorization produces biogas, a substitute for fossil energies and a quality compost.
Ratio GW / KW ratio (40% vs 60%)</td></tr>
<tr><td>Compliant with the MDDEP guidelines and belonging to the city, this site will host the first biomethanation centre and the organic material pre-treatment pilot centre.</td><td>Strategically located in terms of the distance to a second biomethanation centre.</td></tr>
<tr><td>The closed infrastructure of the composting centre is justified by the presence of KW and allows for an optimal management of odors.</td><td>A closed infrastructure optimizes the control of the potential nuisances of a digestat composting.</td><td colspan="2">Initially, the Eastern biomethanation centre will treat the KW from the Southern, Northern and Eastern Sectors. Once it will have attained its maximum capacity (60,000 t/year), the Southern centre will be commissioned.</td></tr>
</table>

2.6 Effective infrastructures in terms of odor control

CLOSED COMPOSTING CENTRE

- Building under negative pressure
- Treatment of atmospheric releases using filters

SEMI-CLOSED COMPOSTING SECTION

- Windrows on platform with forced aeration
- Air permeable and waterproof cover canvas

ANAEROBIC DIGESTION CENTRE

- Building under negative pressure
- Treatment of atmospheric releases with filters

3. Pre-treatment of household waste

Nature of project : Operate on the Eastern site a household waste pre-treatment pilot centre and assess the valorization potential for:

- Recyclable materials
- Organic materials (anaerobic digestion and composting)
- Combustible materials (alternative energy)

Objective: Further reduce the waste volumes to be landfilled

Approach: Pre-treat and valorize the organic material fraction (biomethanation and composting) and the combustible fraction (thermal treatment) in order to only landfill the reduced volumes of ultimate residuals.

Potential benefits:

- Valorization in the guise of energy and compost production, otherwise lost.
- Reduction of many landfilling related impacts.
- Extension of the useful life of sites that are still available for landfilling, the volumes to be landfilled being greatly diminished.
- Assessment of management options (costs, feasability and environmental aspects) related to the operations of the pre-treatment centre.

3.1 Household waste pre-treatment pilot centre

FEATURES

- Location: Eastern Sector site (DEMIX)
- Biological mechanical treatment process (BMT)
- Capacity of 25,000 tons/year
- Outputs: recyclable materials, organic materials for the anaerobic digestion or composting, combustible materials, a substitute to the traditional fossil combustibles
- Concept known in Europe, but new in North America

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4. Studies conducted within the framework of the Waste Management Master Plan for the Agglomeration of Montréal and relevant to the treatment of organic materials

- Feasibility study of the organic material treatment technologies applicable to the territory of the agglomeration of Montréal, SOLINOV Inc., November 2006

- Assessment of the technological choices for the treatment of residual materials for the agglomeration of Montréal, Dessau-Soprin Inc., August 2006.

- Analysis of the agglomeration's organic material technology scenarios for the purpose of the simplified LCA of the CIRAIG, SOLINOV Inc., July 2007

available on line: WWW.ville.montreal.qc.ca/pdgmr

END