

# LCA as a tool or philosophy for integrated waste management: opportunities in Portugal

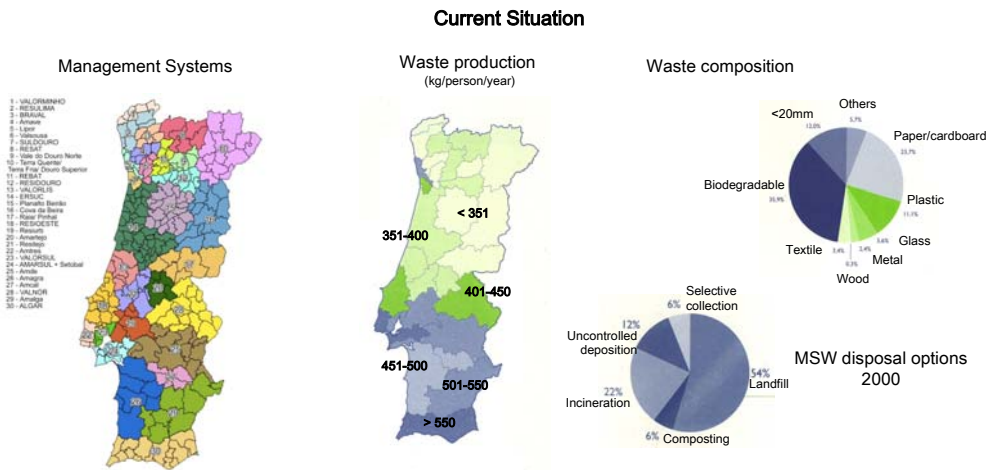
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## OBJECTIVE

Life Cycle Assessment (LCA) is seen as an important tool or philosophy to clarify, improve and gather reliable and systematic information on the scope of waste management, helping on several ways and at different stages of decision-making. The systematization of data obtained in the life cycle inventory phase is recognized as the main advantage of this approach. The subjectivity inherent to the impact assessment phase, which is frequently seen as a weak point of this methodology, is considered as an opportunity to ponder and evaluate different sensibilities and different opinions about environmentally critical aspects. The possibility of evaluating the contribution of each unit process within a system to the overall environmental burdens of that system, identifying the worst step and also main options for systems improvement, is also considered an important positive feature of LCA. The objective of this paper is to present and discuss specific topics within the subject of solid waste management identified in Portugal as potential targets for the use of Life Cycle Assessment both as a technical tool and a philosophy.



## MUNICIPAL SOLID WASTE



### Challenges LCA can help answer

#### Strategy level - National

- Evaluation of total environmental burdens associated with current portuguese MSW management strategy and disposal options
- Quantification of contribution of each regional management system to total environmental burdens
- Identification of main contributors of environmental burdens for each impact category of interest
  - Possible contributors:
    - Geographical region, management system
    - Waste circuit operations (collection, treatment and disposal option - landfilling, incineration, biological treatment, recycling)
    - Specific components of waste stream
- Influence of MSW composition/amount on total environmental burdens
- Evaluation of total environmental burdens associated with forecasted and/or possible alternative treatment and disposal options for MSW management
- Evaluation of total environmental burdens associated with forecasted and/or possible alternative management strategies for MSW, including specific targets of recycling and/or diversion of waste or waste components (example: packaging, organics)

#### Management level - Regional

- Evaluation of total actual environmental burdens associated to each management system
- Evaluation of environmental burdens resulting from changing a municipality from one management system to another
- Influence of forecasted and/or possible alternative treatment and disposal options for MSW treatment on total actual system environmental burdens
- Evaluation of national strategy changes on system environmental burdens
- Identification of main contributors of environmental burdens for each impact category of interest
  - Possible contributors:
    - Specific municipality
    - Waste circuit operations within a municipality (collection, treatment and disposal option - landfilling, incineration, biological treatment, recycling)
    - Specific components of waste stream
- Influence on environmental burdens resulting from changes on operations location

#### Waste circuit operations

- Evaluation of environmental burdens resulting from changes on forecasted and/or possible changes on waste circuit operations or changes on technology
  - Changes on:
    - Collection circuits, collection vehicles
    - Technologies - incineration, landfilling, biological treatment, recycling

## BATTERIES

### Current Situation:

Voluntary selective collection of mixed spent batteries implemented for some years at a local level  
Batteries stored and occasionally sent to another country to recover/recycle  
Tax system for systematic collection and management at national level recently implemented

### Questions/challenges to LCA

Evaluation of environmental burdens and potential environmental impact associated with batteries management alternatives based on:

- batteries composition
- treatment, recovery and recycling plants
  - existent/forecasted/possible
- management system design

## PACKAGING

### Current Situation:

Integrated management system operating from 1998 including actually:

89 % of municipalities  
96 % of population

### Recycling rates in 2002:

Glass - 24.1%	Metal - 25.0%
Plastic - 4.8%	Wood - 5.3%
Paper/cardboard - 15.9%	

### Questions/challenges to LCA

Evaluation of environmental burdens and potential environmental impact associated with packaging management alternatives according to:

- actual/forecasted and possible infrastructures
- waste composition

for each management system, in order to define rates of recycling and valorisation for each management system

## MSW BIODEGRADABLE FRACTION

### Current Situation:

No separate collection  
4 composting units (2002) operating with mixed waste  
New biological treatment plants (composting and biogasification) foreseen

### Questions/challenges to LCA

• Evaluation of environmental burdens and potential environmental impact from different schemes of allocating technological solutions to systems/regions within the country based on:

- biodegradable waste amounts generated by MSW management system/region
- of other sources of biodegradable waste as agrofood industry