NATUR VÅRDS VERKET

SWEDISH ENVIRONMENTAL PROTECTION AGENCY

Sweden Sverige

Supporting Albanian Negotiations in Environment, Chapter 27 (SANE27)

Mbështetja e Negociatave Shqiptare në Mjedis, Kapitulli 27 (MNSHM27)

Stöd till Albanien i förhandlingar av miljökapitel 27

Tirana, 13.10.2020

REPUBLIKA E SHQIPËRISË
MINISTRIA E TURIZMIT
DHE MJEDISIT

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Title: Planning and Development of Integrated Waste Management Systems

Sub-chapter: Methodology for site allocation of waste management facilities

Waste treatment technologies: Principles for implementation - Pros & Cons

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Integrated Waste Management Strategic Policy Document and National Plan 2020 - 2035

Network of integrated waste management facilities (national/regional/municipal):

- Transfer stations – Temporary storage facilities – Civic Amenity Sites;
- **Material Recycling Facilities;**
- **Composting plants;**
- **Mechanical - Biological treatment plants;**
- **Waste Incinerators;**
- Sanitary landfills;

Critical Decisions

- Location of Facilities;
- Treatment Technologies;

SITE ALLOCATION METHODOLOGY

METHODOLOGY OVERVIEW

- Development of exclusion criteria;
- Preliminary identification of potential sites;
- Site visits;
- Development of selection criteria;
- Application of exclusion and selection criteria;
- Recommendations and Consultation;

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Step 1: Exclusion Criteria

In general, avoid:

- Areas of archaeological / cultural interest;
- Traditional areas;
- Protected natural areas (SPA, NATURA 2000, etc);
- Near residential areas;
- Forests;
- Areas with geological / hydrogeological constraints;
- Areas with specific land uses (urban development, sports and leisure, industrial zones, etc.);

Geological – Hydro geological – Hydrological criteria

- Criterion EC1 – Minimum distance from river bed or large ghylls - 1 km;
- Criterion EC2 - Minimum distance from water sources - 0,5 km;
- Criterion EC3 – Distance from seismic fault - 0.5 km;

Environmental criteria

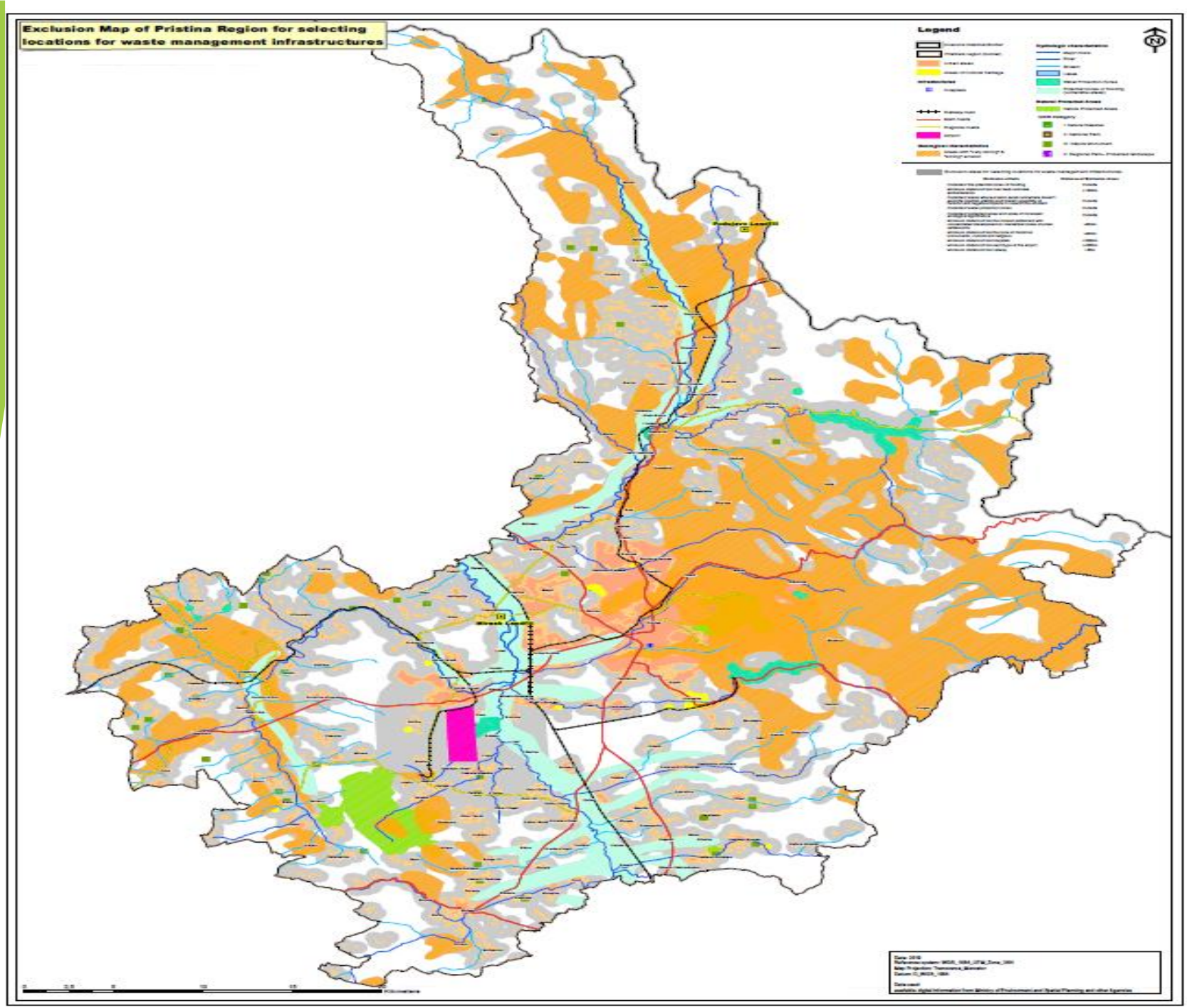
- Criterion EC5 - Exclusion of forests;
- Criterion EC6 - Exclusion of agricultural areas of high intensity and area with specific land uses;
- Criterion EC7 - Exclusion of areas characterized as RAMSAR, SPA, NATURA, National Parks and other protected areas;

Physical planning criteria

- **Criterion EC8 - Minimum distance from residential areas 0,5 km;**
- **Criterion EC9 - Minimum distance from archaeological and cultural monuments 0.5 km** (also not be visible);
- **Criterion EC10 - Minimum distance from military installations 1 km;**
- **Criterion EC11 - Minimum distance from airports 3 km;**

Implementation of Exclusion Criteria

- Exclusion map;
- Exclusion of sites not fulfilling criteria;
- List of sites / areas to be further examined;


Exclusion Map of Pristina Region for selecting locations for waste management infrastructures
Legend

Step 2: Preliminary identification of potential sites

- Maps (exclusion map), visits
- Existing studies (spatial plans, technical studies, etc.);
- **Proposals from stakeholders;**

Step 3: Site visits / Site profiling

- Site's general information;
- Road accessibility;
- Topography / Geomorphology;
- Land use;
- Hydrological characteristics / Water Uses;
- Geological / Hydrogeological characteristics;
- Other environmental characteristics;
- Infrastructure;
- Archaeological and touristic interest;
- Additional information;

Site Visit Checklist

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Step 4: Selection Criteria (1/4)

Geological – Hydro geological criteria

- Criterion A1 - Permeability of the underlying layer ;
- Criterion A2 - Tectonic structure ;
- Criterion A3 - Position of hydrant works- Great water works;
- Criterion A4 - Usage of underground water;
- Criterion A5 - Ground Erosion – Stability of the slope;
- Criterion A6 - Active Tectonics;
- Criterion A7 - Protection of surface waters;
- Criterion A8 - Protection underground water;
- Criterion A9 - Geomorphology of Area;
- Criterion A10 - Covering demands;

Step 4: Selection Criteria (2/4)

Environmental criteria

- Criterion B1 – Green areas, Ecological characteristics, Landscape;
- Criterion B2 - Visual Isolation;
- Criterion B3 - Annoyance by smells;
- Criterion B4 - Annoyance from biogas;
- Criterion B5 - Annoyance during access;

Step 4: Selection Criteria (3/4)

Physical Planning criteria

- Criterion C1 - Distance from settlements;
- Criterion C2 - Agricultural activity;
- Criterion C3 - Forage activity within < of 1.000m;
- Criterion C4 - Industrial activity;
- Criterion C5 - Proximity to conflicting uses;
- Criterion C6 - Tendency to residential/ tourist development;
- Criterion C7 - Network access to the final area;

Step 4: Selection Criteria (3/3)

Operational criteria

- Criterion D1 – Climatic conditions;
- Criterion D2 - Adequacy of the available area - Expansion Capabilities;
- Criterion D3 - Adequate cover material;

Financial criteria

- Criterion E1 – Size/magnitude of infrastructure works;
- Criterion E2 - Land Value;
- Criterion E3 - Availability networks of common utilities;
- Criterion E4 – Estimated cost of transport;

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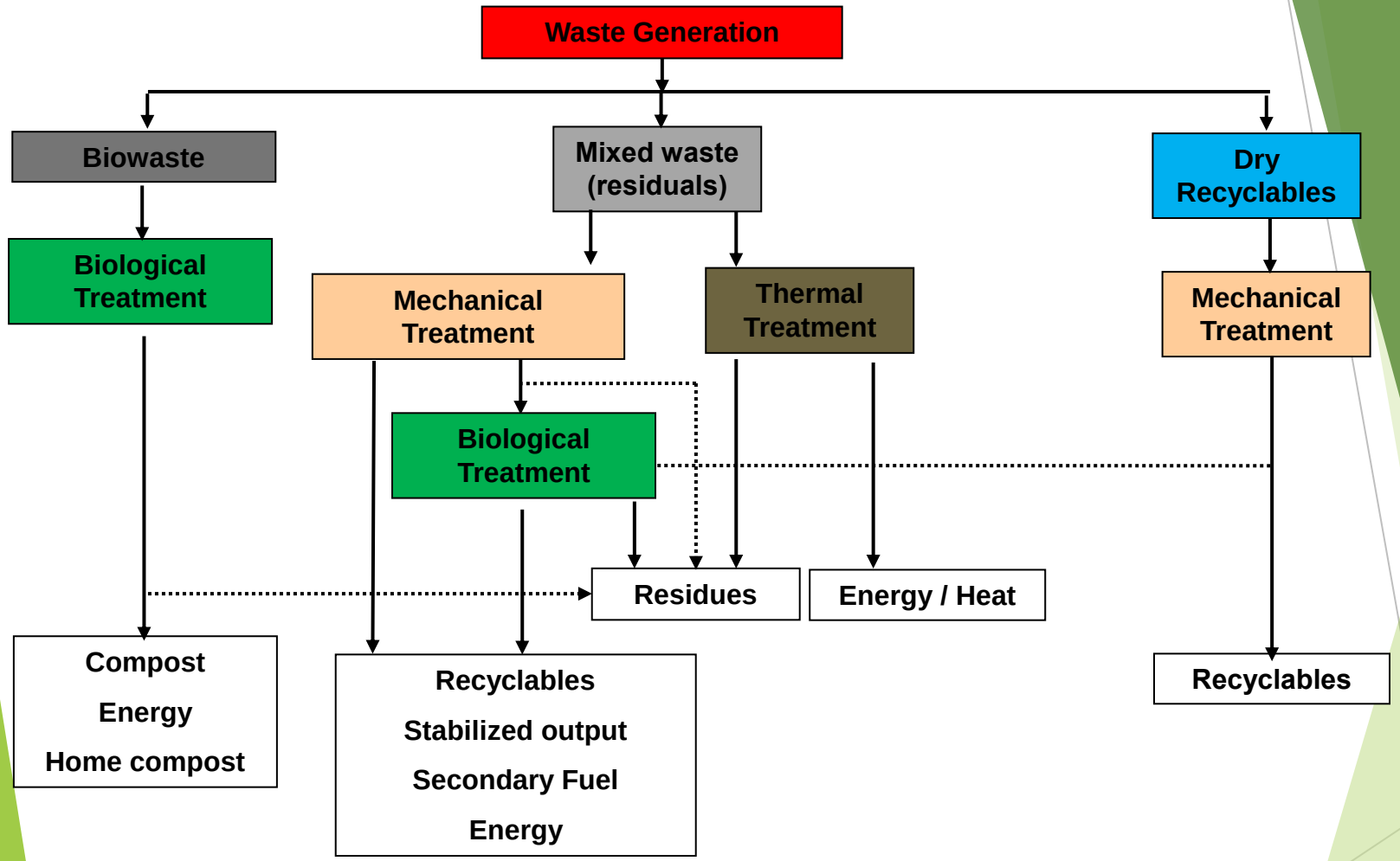
Implementation of Selection Criteria

Criteria	Weighing (%)
Geological - Hydrogeological	20 – 30
Environmental	20 – 25
Physical planning	15 – 30
Operational	10 – 20
Financial	10 – 20

Step 5: Recommendations / Consultation

- Hierarchy of sites under examination;
- Sensitivity analysis;
- Presentation to stakeholders – Discussions;
- Final Decision – Initiation of EIA Procedure;

Waste Treatment Technologies



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Waste treatment configurations

- Separately collected recyclables:
  - Material Recycling facilities – MRF;
- Separately collected biowaste:
  - Aerobic digestion – composting;
  - Anaerobic Digestion;
- Mixed / Residual waste:
  - Mechanical – Biological Treatment:
    - ✓ Mechanical pre-treatment + Aerobic digestion – biostabilization;
    - ✓ Mechanical pre-treatment + Aerobic digestion – biodrying;
    - ✓ Mechanical pre-treatment + Anaerobic digestion;
  - Thermal treatment:
    - ✓ Incineration;
    - ✓ Advanced technologies (gasification, pyrolysis);

Principles of selection

- Upstream waste management activities;
- Waste Quantity and properties;
- Commercial Status - Reliability (numbers of existing plants);
- Simplicity;
- Political & regulatory acceptability + public perception;
- Utilization of end products – market issues;
- Environmental effects – Meeting of targets;
- Costs & Gate Fees;

Mechanical treatment

- Recyclable materials are sorted by type or grade to meet specific quality standards:
  - Clean MRF;
  - Dirty MRF;

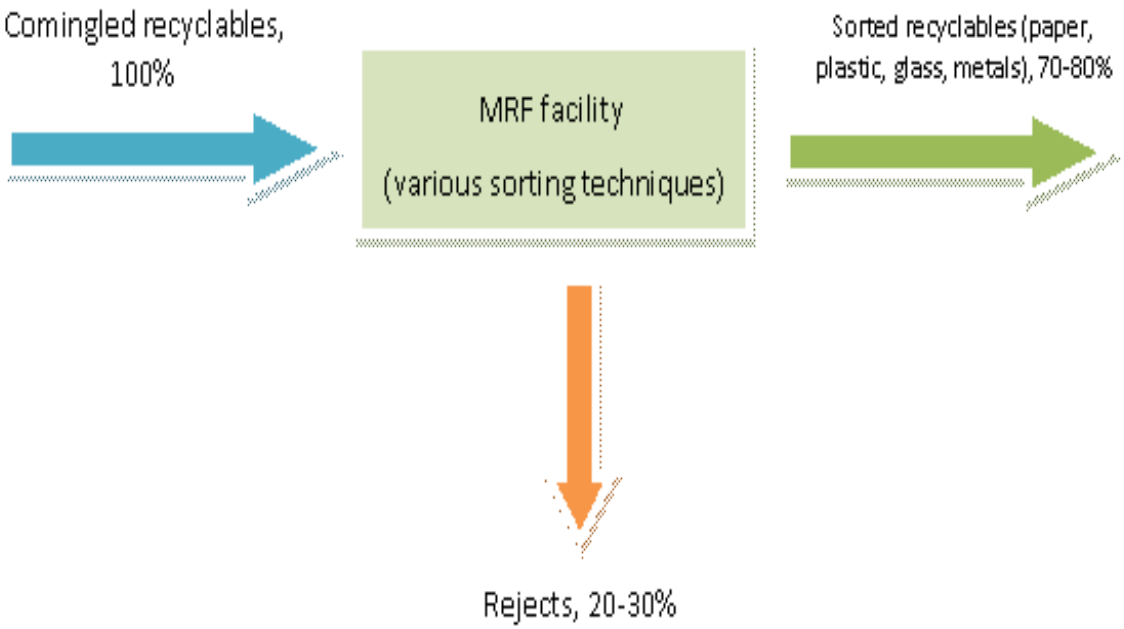
Sorting configurations

- low mechanical intensity (automated recovery of ferrous metals);
- high mechanical intensity (automated recovery of multiple recyclables);

Recovery Technologies

	Separation Technique	Separation Property	Materials targeted	Key Concerns
1	Trommels and Screens	Size	Oversize – paper, plastic Small – organics, glass, fines	Air containment and cleaning
2	Manual Separation	Visual examination	Plastics, contaminants, oversize	Ethics of role, Health & Safety issues
3	Magnetic Separation	Magnetic Properties	Ferrous metals	Proven technique
4	Eddy Current Separation	Electrical Conductivity	Non ferrous metals	Proven technique
5	Wet Separation Technology	Differential Densities	Floats - Plastics, organics Sinks - stones, glass	Produces wet waste streams
6	Air Classification	Weight	Light – plastics, paper Heavy – stones, glass	Air cleaning
7	Ballistic Separation	Density and Elasticity	Light – plastics, paper Heavy – stones, glass	Rates of throughput
8	Optical Separation	Diffraction	Specific plastic polymers	Rates of throughput

Typical Mass flow



Biological treatment

- Aerobic digestion – Composting / biostabilization;
- Aerobic digestion – biodrying;
- Anaerobic digestion;

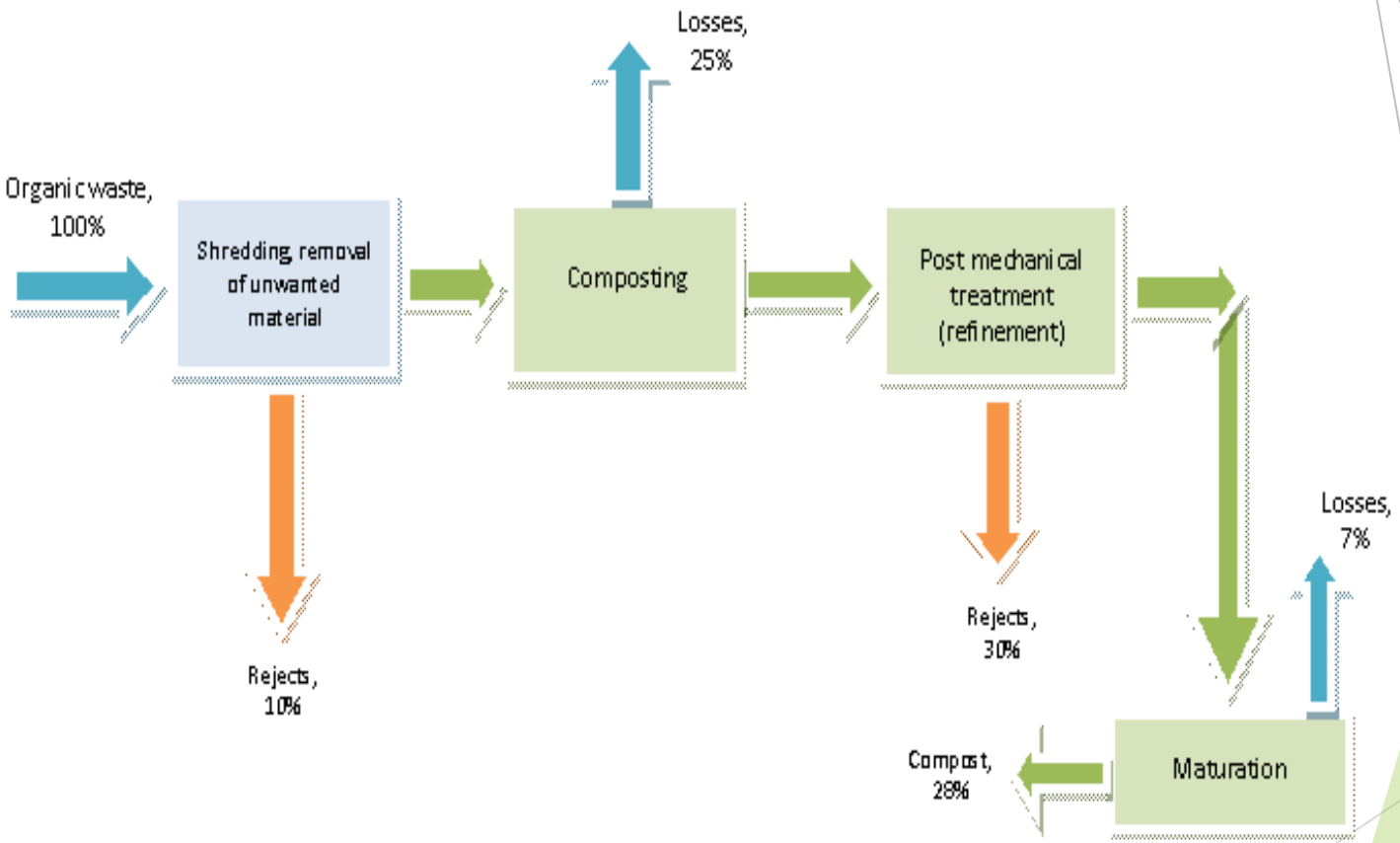
Aerobic Digestion – Composting / biostabilization

- Windrow Composting (Open System);

- Covered windrows;

- Closed composting:
  - Tunnels;
  - Boxes;
  - Halls;

Typical Mass flow



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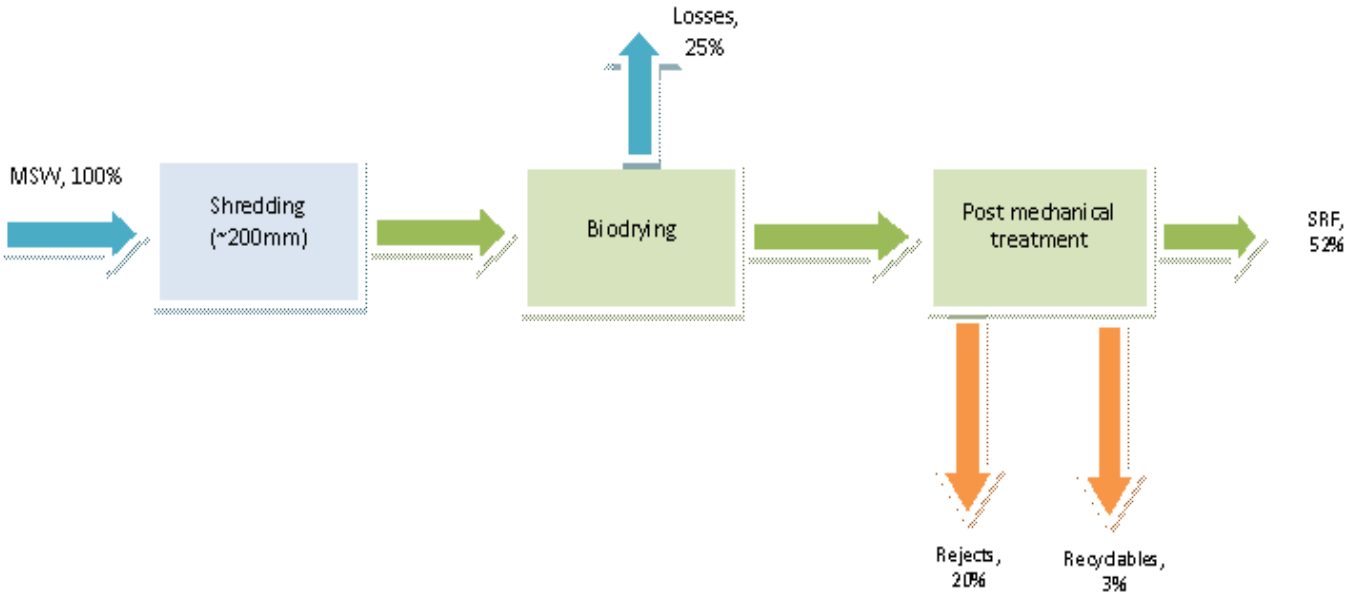
Aerobic Digestion – biodrying



Anaerobic Digestion

- Dry AD;

- Wet AD;

1 *delivery*
2 *sanitation*
3 *reservoir*
4 *mixing tank*
5 *digester*
6 *gas storage tank*
7 *pump house*
8 *chimney*

- Dry fermentation;

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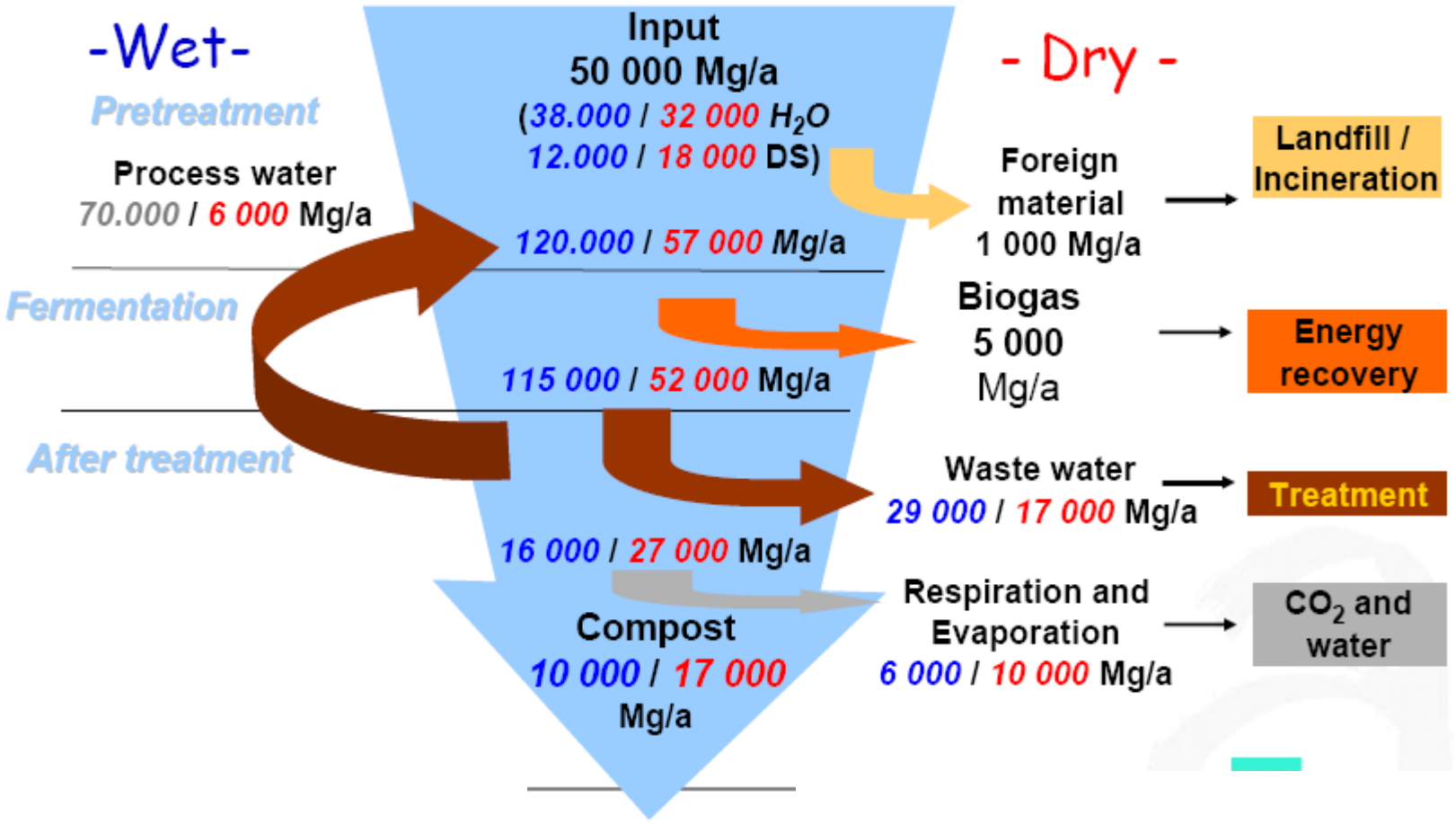
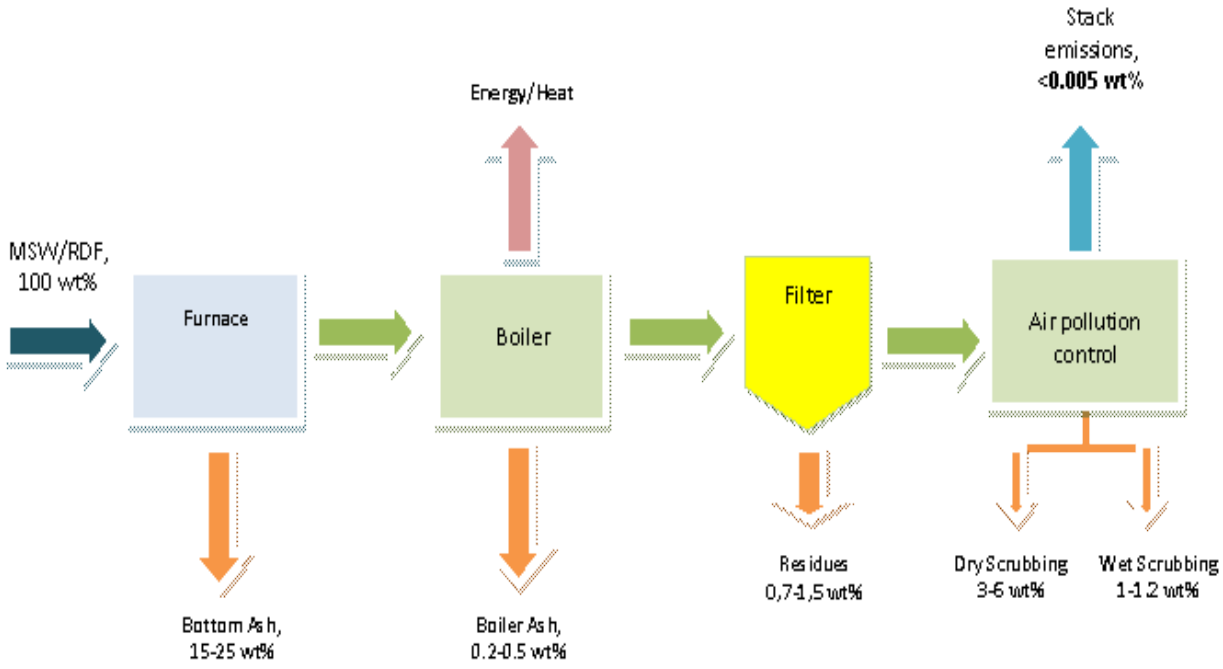
Typical Mass flow



Thermal treatment

- Incineration:
  - Grate;
  - Fluidized bed;
- Advanced technologies:
  - Gasification;
  - Pyrolysis;

Incineration



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Preliminary assessment (1/5)

	Upstream activities	Waste Quantity and properties
Clean MRF	-- Requires separate collection of recyclables	++ Dependent on the success of separate collection system
Dirty MRF / mechanical pre-treatment	+++ No problem with mixed waste collection	+++ No problem
Composting / biostabilization	++ No problem with mixed waste collection Better results with separate collection of biowaste Requires mechanical pre-treatment in the case of mixed waste	++ Additional quantities require additional land
AD	++ No problem with mixed waste collection Better results with separate collection of biowaste Requires mechanical pre-treatment in the case of mixed waste	- Sensitive to organic input and inert material Additional quantities requires additional land
Biodrying	- No problem with mixed waste collection Sensitive to separate collection schemes diverting high calorific value material Requires mechanical pre-treatment in the case of mixed waste	+ Sensitive to calorific value of material
Thermal treatment	- No problem with mixed waste collection Sensitive to separate collection schemes diverting high calorific value material	-- Economies of scale require large waste quantities of mixed waste with high calorific value

Preliminary assessment (2/5)

	Commercial Status - Reliability	Simplicity
Clean MRF	+++ Well established	+++ No operational challenges
Dirty MRF / mechanical pre-treatment	+++ Well established	+++ No operational challenges
Composting / biostabilization	+++ Well established	+++ No operational challenges Allows gradual development Potential for treatment of organic waste from multiple sources
AD	+++ Well established	++ More complex than other technologies Advanced know how Sensitive to various parameters Potential for treatment of organic waste from multiple sources
Biodrying	+++ Well established	+ More complex than other technologies Advanced know how Sensitive to various parameters
Thermal treatment	++ Incineration well established Advanced technologies not many refs for munic. waste	- Complex operational aspects Advanced know how Does not allow gradual development Potential for treatment of multiple waste streams

Preliminary assessment (3/5)

	Political & regulatory acceptability + public perception	Environmental effects - Meeting of targets
Clean MRF	+++ Well perceived Increase awareness amongst householders on the importance of quality recycling Potential for Informal sector integration in WM	++ Contributes to recycling targets Preservation of resources Low contribution at diversion of biodegradable waste from disposal Low environmental footprint
Dirty MRF / mechanical pre-treatment	++ Well perceived Concerns may appear in case secondary fuel generated Strict regulations for utilization of secondary fuel Reduced motivation for recycling Potential for Informal sector integration in WM	+ Contributes to recycling targets Preservation of resources Low contribution at diversion of biodegradable waste from disposal Potential generation of secondary fuel is competitive to recycling Low environmental footprint

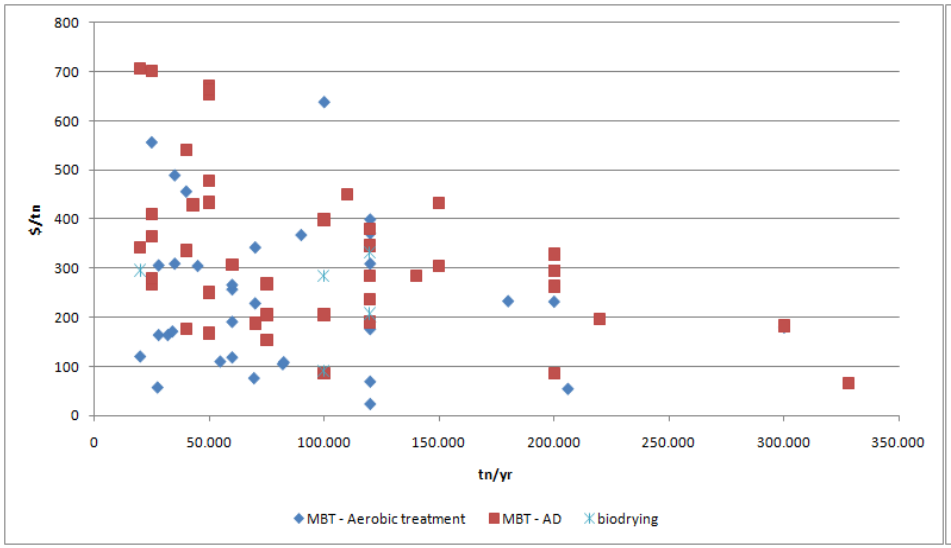
Preliminary assessment (4/5)

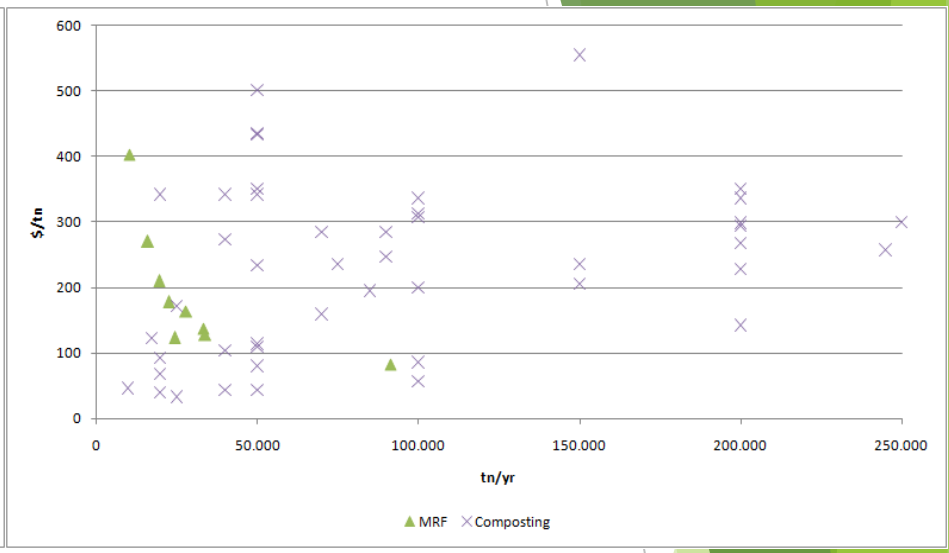
	Political & regulatory acceptability + public perception	Environmental effects - Meeting of targets
Composting / biostabilization	+++ Well perceived	+ Large space needed Contributes to diversion of biodegradable waste from disposal - lower extend on overall diversion – CLO may end up in landfill Positive GHGs balance compared to landfill Reduced pollution in leachate – Significant odours especially in open systems
AD	+++ Well perceived	++ Significant space needed Contributes to diversion of biodegradable / total waste from disposal - CLO may end up in landfill Very positive GHGs balance compared to landfill Generation of energy from renewable sources Reduced pollution and quantity in leachate Easy abatement of air emissions
Biodrying	- Concerns may appear in relation secondary fuel generated Strict regulations for utilization of secondary fuel	++ Significant space needed Contributes to diversion of biodegradable / total waste from disposal Positive GHGs balance compared to landfill Generation of secondary fuel is competitive to recycling Reduced pollution in leachate Easy abatement of air emissions
Thermal treatment	-- Frequent oppositions Strict regulations	+ Maximum contribution to diversion of biodegradable / total waste from disposal Competitive to recycling Significant mitigation measures needed to avoid air emissions Reduced pollution and quantity in leachate Need to manage hazardous waste generated

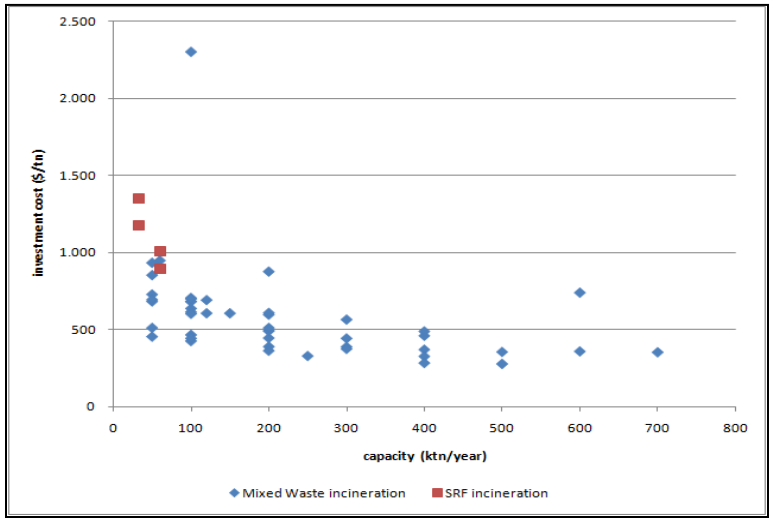
Preliminary assessment (5/5)

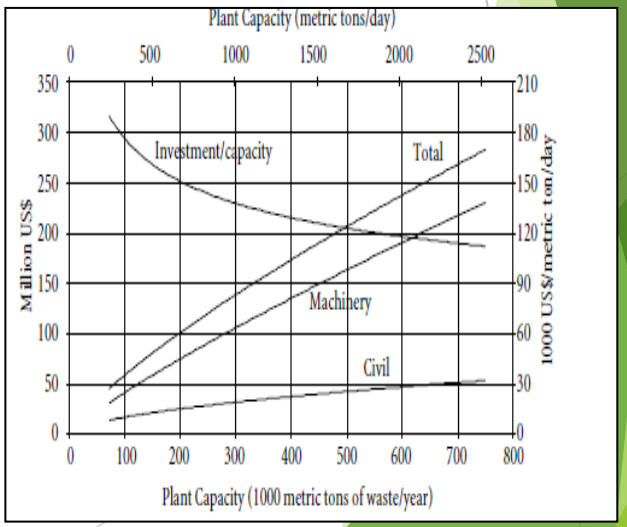
	Market issues	Costs
Clean MRF	++ Recyclables easily absorbed Concerns with glass and some plastics	++ Additional costs for separate collection Higher cost in high mechanical intensity configurations Revenues from recyclables
Dirty MRF / mechanical pre-treatment	+ Recyclables easily absorbed Concerns with glass and some plastics Lower level of purity	++ Higher cost in high mechanical intensity configurations Revenues from recyclables
Composting / biostabilization	- CLO – stabilized material not easily absorbed Compost for separately collected biowaste easily absorbed	+++ Lower investment and O&M costs than other biological treatment plans
AD	++ Energy easily absorbed CLO – stabilized material not easily absorbed Compost for separately collected biowaste easily absorbed	++ High investment cost – relatively low O&M Cost Revenues from energy
Biodrying	- Fuel may be absorbed in energy intensive industries Might need to develop dedicated facility for utilization	+ High investment and O&M costs Additional cost for management of secondary fuel
Thermal treatment	+++ Energy easily absorbed Heat may be absorbed if district heating available	-- Very high investment cost Revenues from energy

Indicative investment costs









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To Conclude….

- There are no global solutions:
  - Priorities;
  - Availability of funds;
  - Capacities of authorities;
  - Site restrictions;
- Technical solutions are always available, but:
  - Need to secure funds;
  - Need to develop an institutional setup (public / private) to provide the necessary services;
  - Need to educate and motivate citizens;

Solid Waste Management

It‘s about people - not waste!

THANKS FOR YOUR ATTENTION

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