

Current challenges in municipal solid waste management



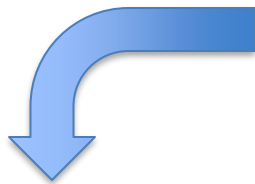
Prof. Dr. JAVIER RODRIGO-ILARRI
jrodrigo@upv.es

Atmosphere

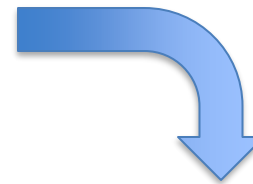


Pollution

Soil



Water





Solid wastes are defined as all the discarded solid materials from municipal, industrial, and agricultural activities.

Solid wastes are simply defined as any solid material which have reached its end of life or discarded by its owner.

Municipal solid waste (MSW) commonly known as trash or garbage, refuse or rubbish.

Hazardous waste is waste that poses substantial or potential threats to public health or the environment.



Industrial
activity



- Household waste that is normally termed as **Municipal Solid Waste**.
- Industrial waste is termed as a **Hazardous waste**.
- Hospital waste or **Biomedical waste** that is infectious.

Urban
activity

Solid Waste

Agricultural
activity



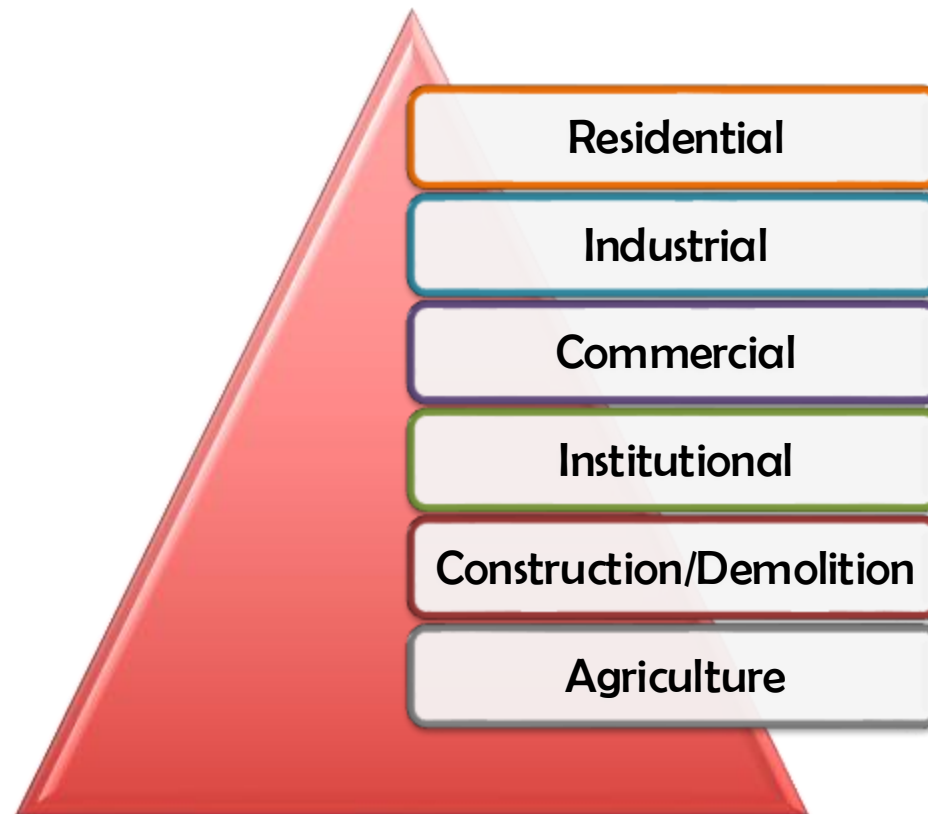


Bridging the Gap in Solid Waste Management

Governance Requirements for Results

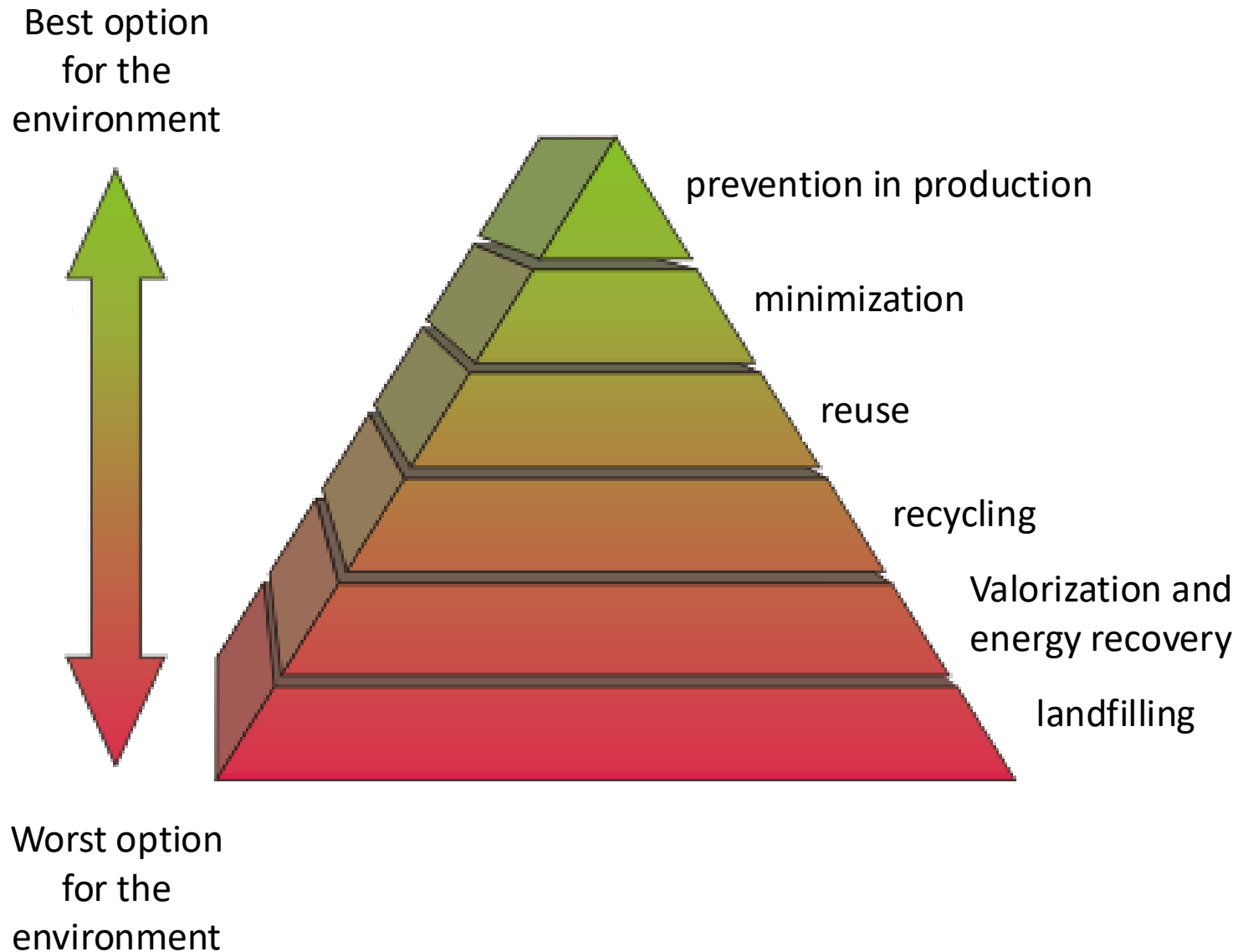


Sources Of Solid Wastes



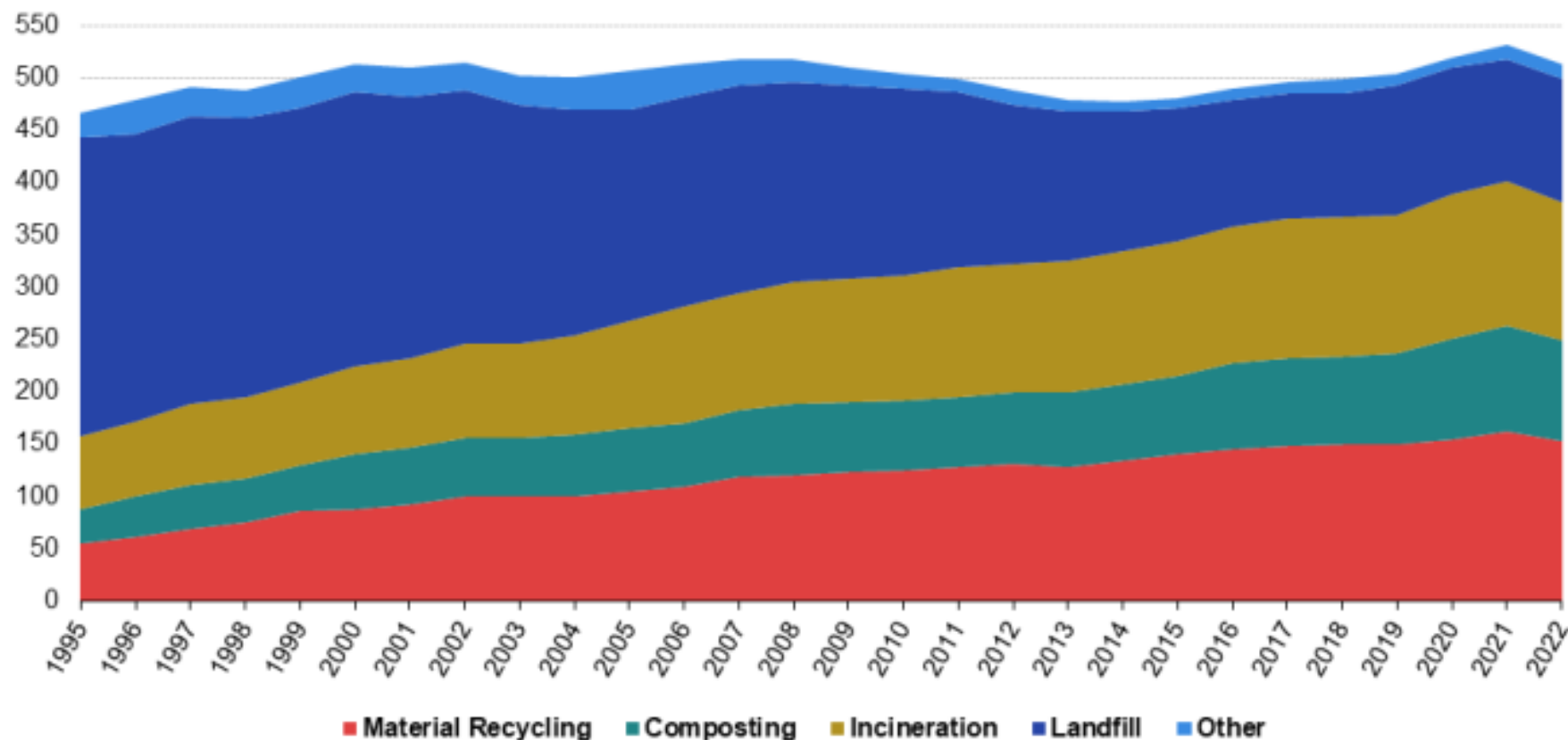
4.8 tonnes of waste were generated per EU inhabitant in 2020.

- **Biodegradable waste:** food and kitchen waste, paper(can also be recycled).
- **Recyclable material:** paper, glass, bottles, cans, metals, certain plastics, fabrics, clothes etc.
- **Inert waste:** construction and demolition waste, dirt, rocks, debris.
- **Electrical and electronic waste (EEW)** - electrical appliances, TVs, computers, screens, etc.
- **Hazardous waste** including fabrication remnants, light bulbs, fluorescent tubes, spray cans, fertilizer and containers.
- Toxic wastes including pesticides, herbicides, fungicides.
- Medical Waste.



Municipal waste treatment, EU, 1995-2021

(kg per capita)

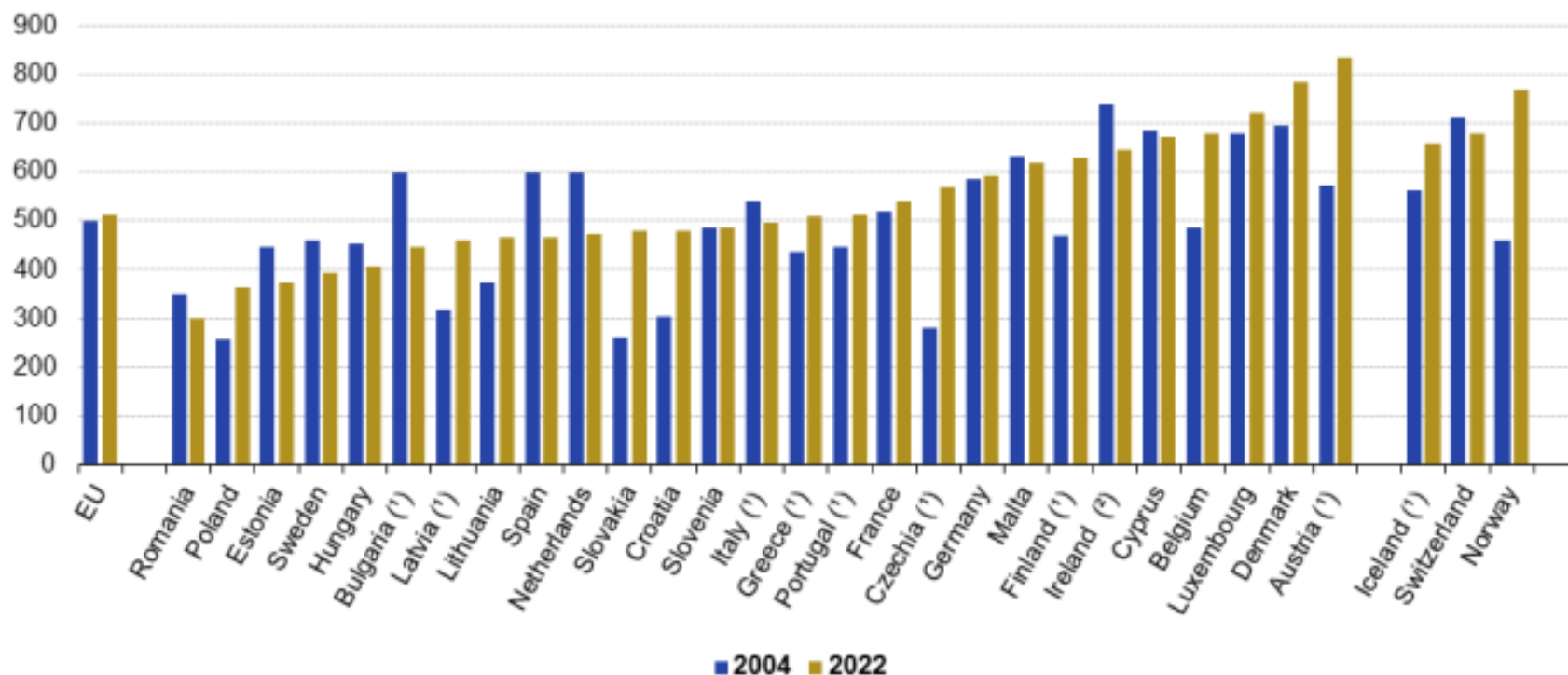


Note: estimated by Eurostat.

Source: Eurostat (online data code: env_wasmun)

Municipal waste generated, 2004 and 2022

(kg per capita)



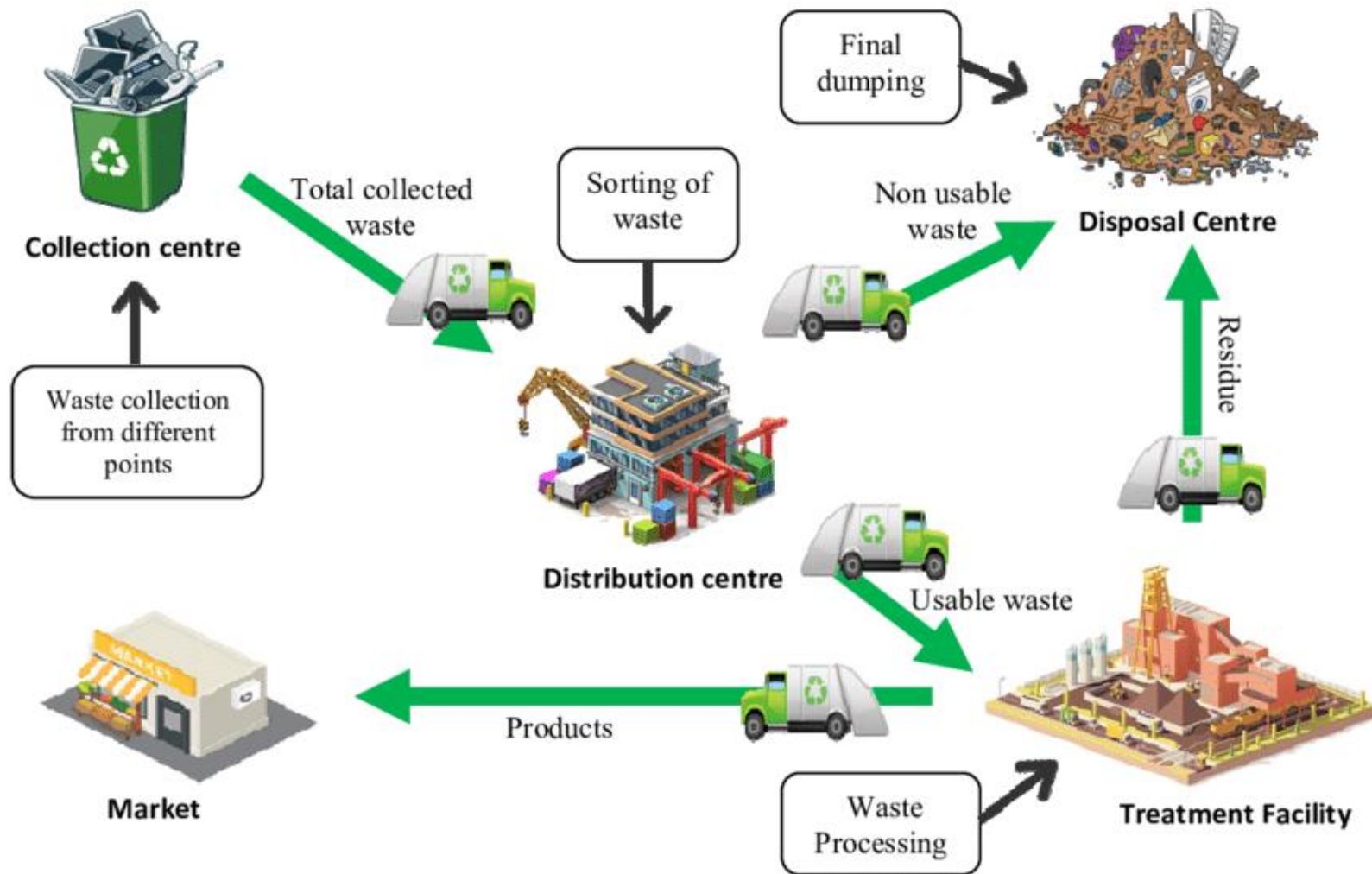
Note: countries are ranked in increasing order by municipal waste generated in 2022.

(¹) 2021 data.

(²) 2020 data.

Source: Eurostat (online data code: env_wasmun)

The municipal solid waste management system



The municipal solid waste management system



PAPER & CARDBOARD



GLASS



PACKAGING WASTE



MIXED WASTE



ORGANIC WASTE

The municipal solid waste management system



PAPER & CARDBOARD



**AUTHORIZED WASTE
MANAGERS: VALORIZATION**



GLASS



PACKAGING WASTE



**PACKAGING WASTE
CLASSIFICATION FACILITY**



MIXED WASTE



**MIXED WASTE
TREATMENT FACILITY**



ORGANIC WASTE



The municipal solid waste management system



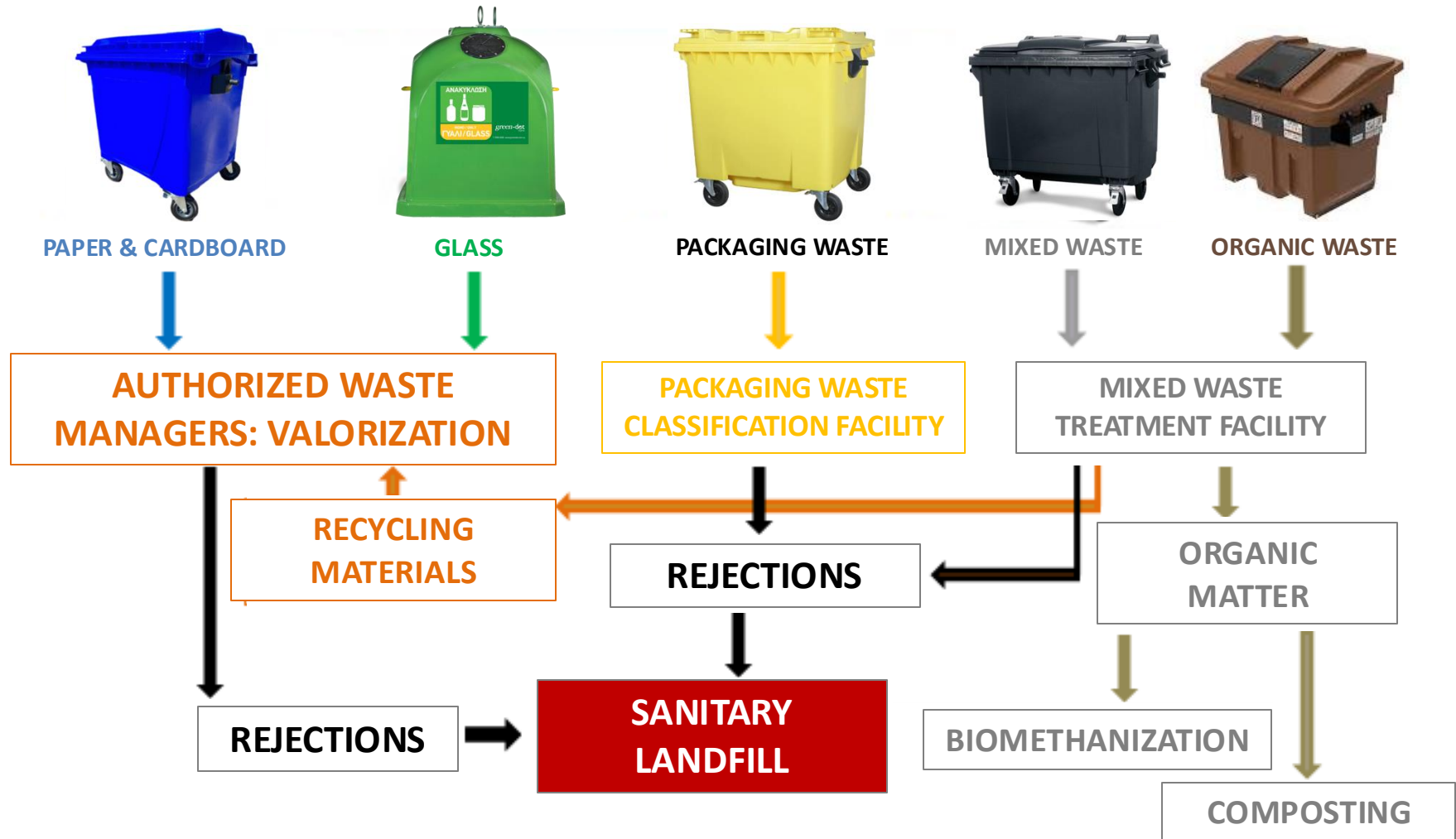
The municipal solid waste management system



The municipal solid waste management system



The municipal solid waste management system



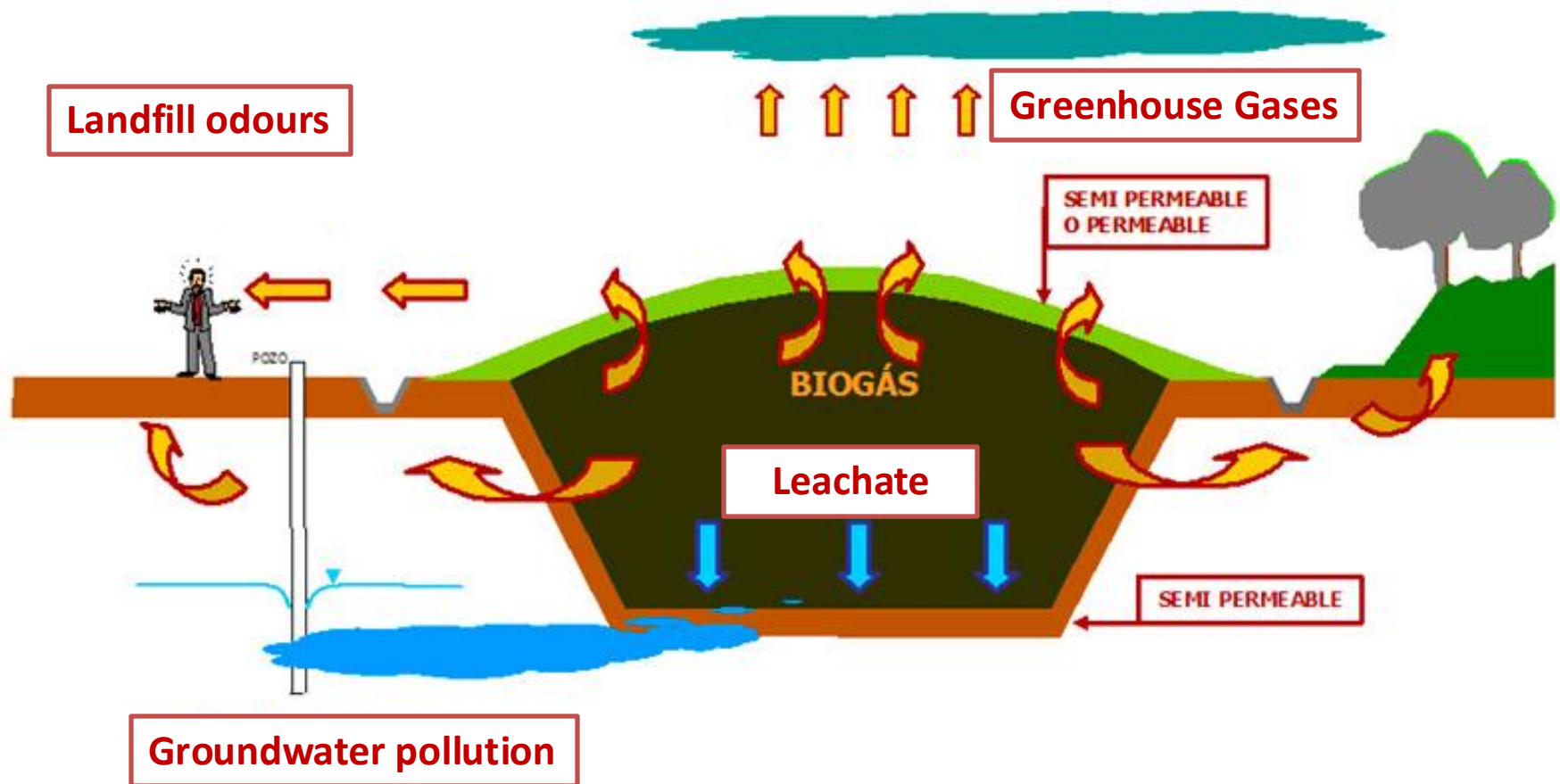
The problems of landfilling





Leachate springs





Dos Aguas Landfill (Valencia)

Total volume = 5,621,000 m³

200.000 t/year

Soild waste type: Rejection from composting plant





Initial state

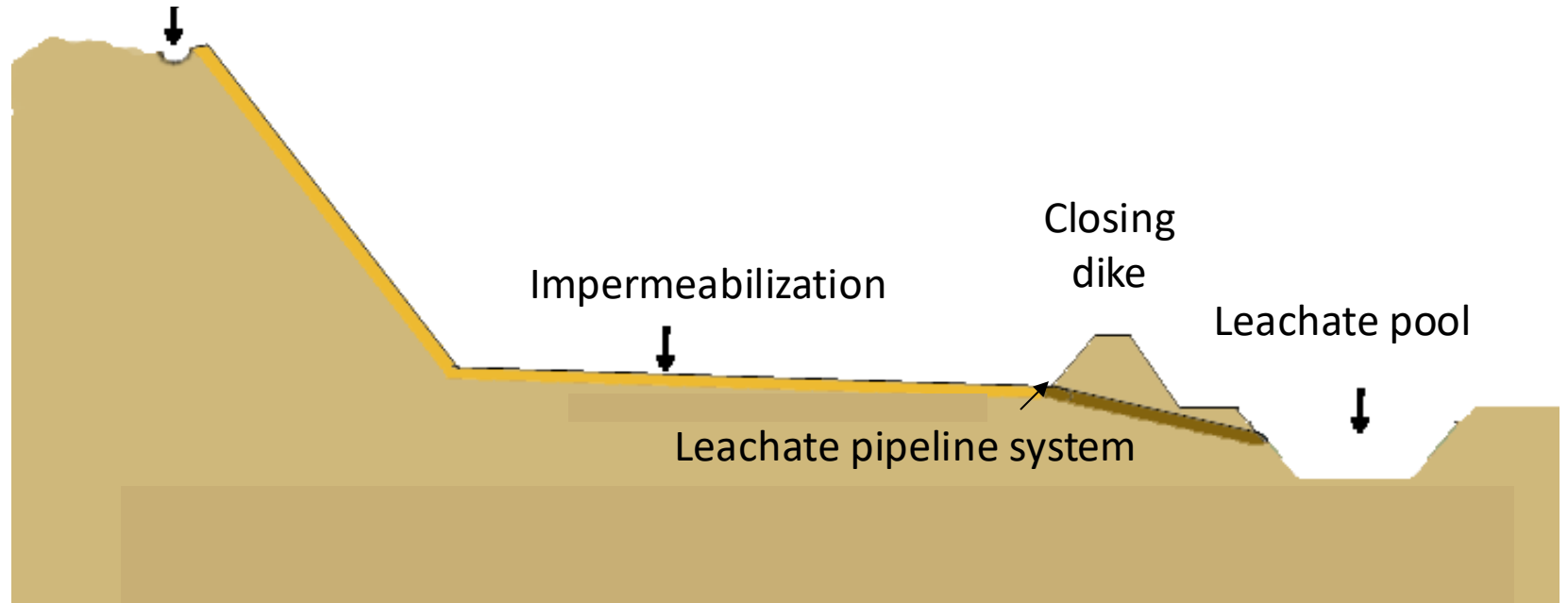


Excavation: movement of a great amount of soil

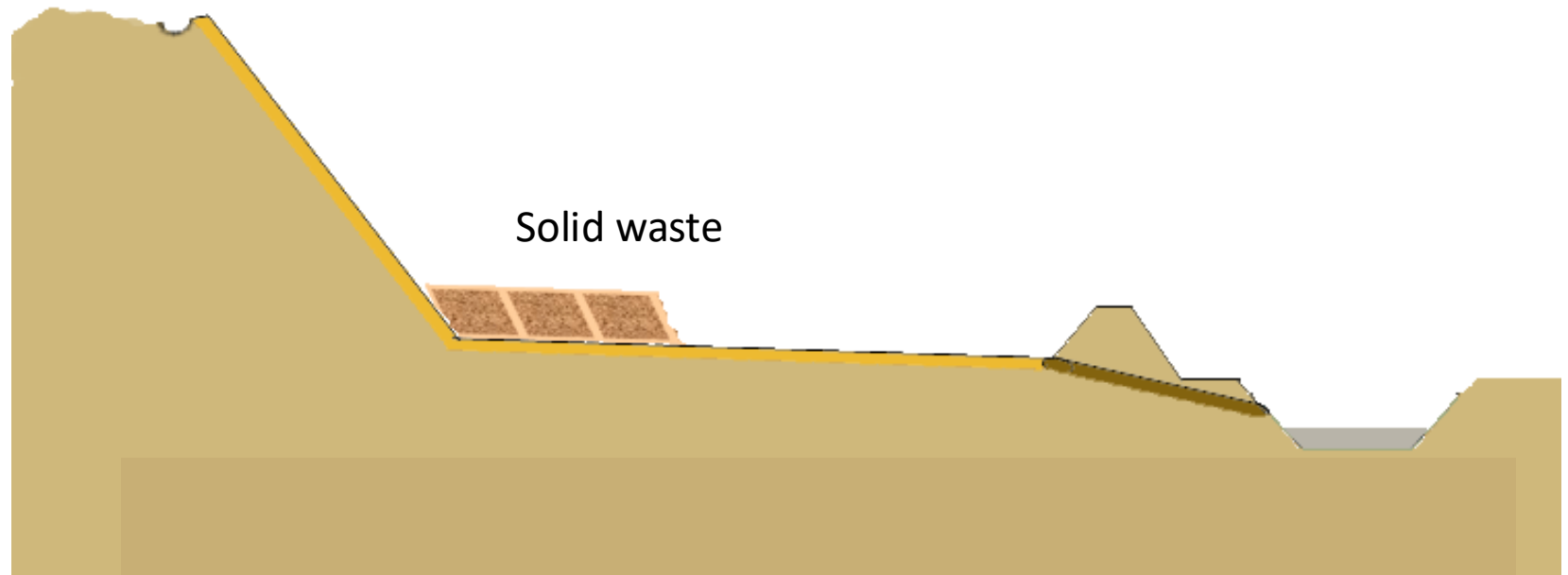


Impermeabilization of the landfill vase

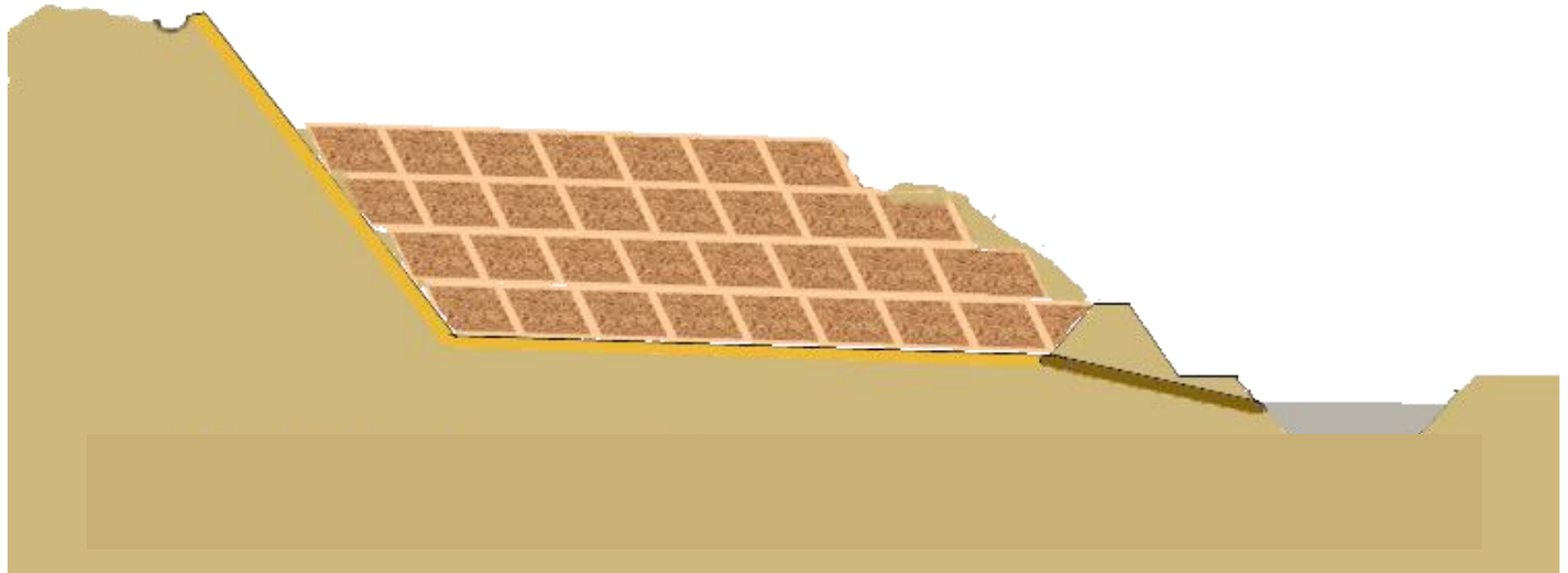
storm water diversion



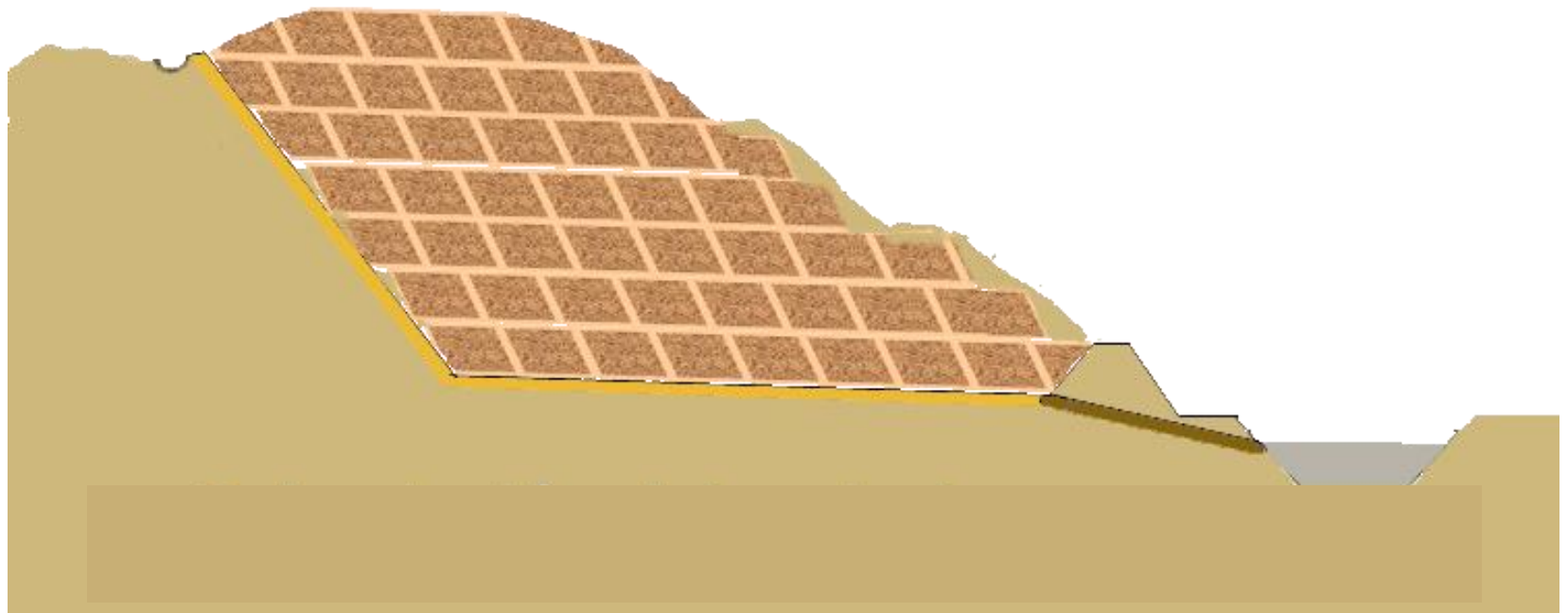
Operation (Filling) phase



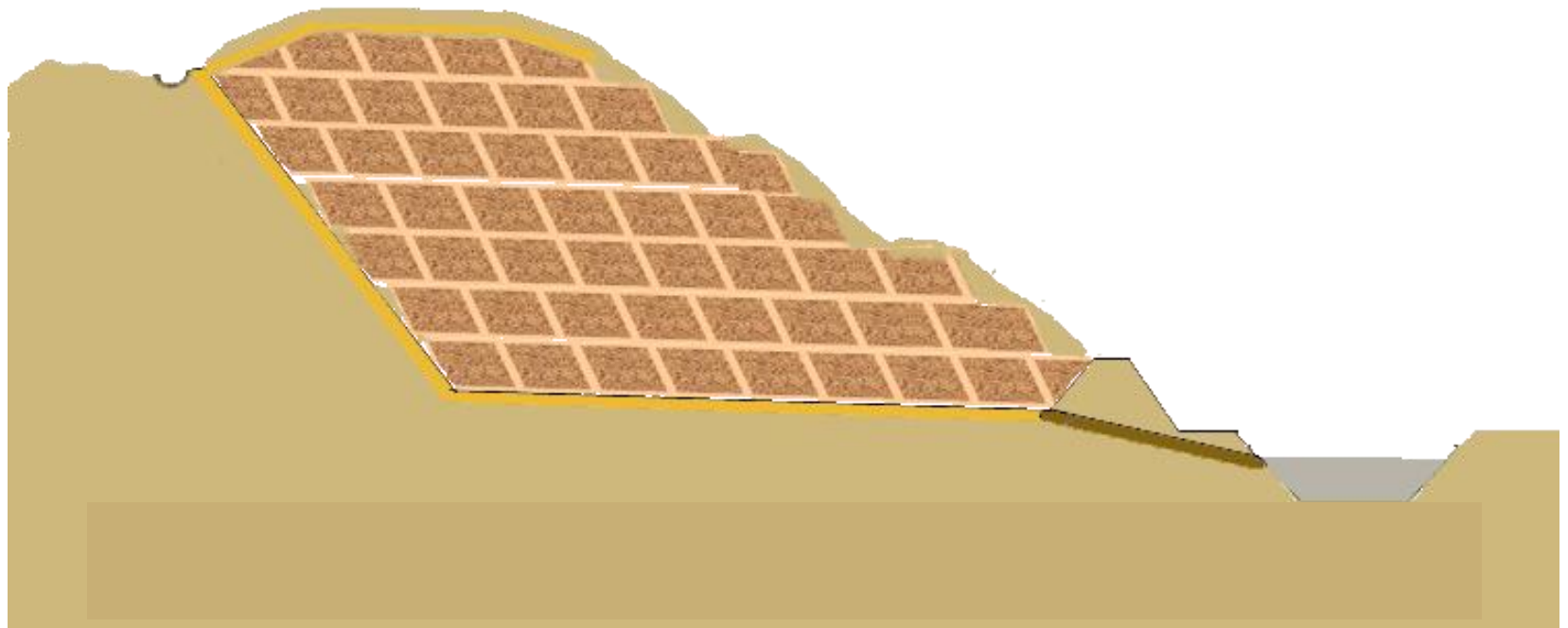
Operation (Filling) phase



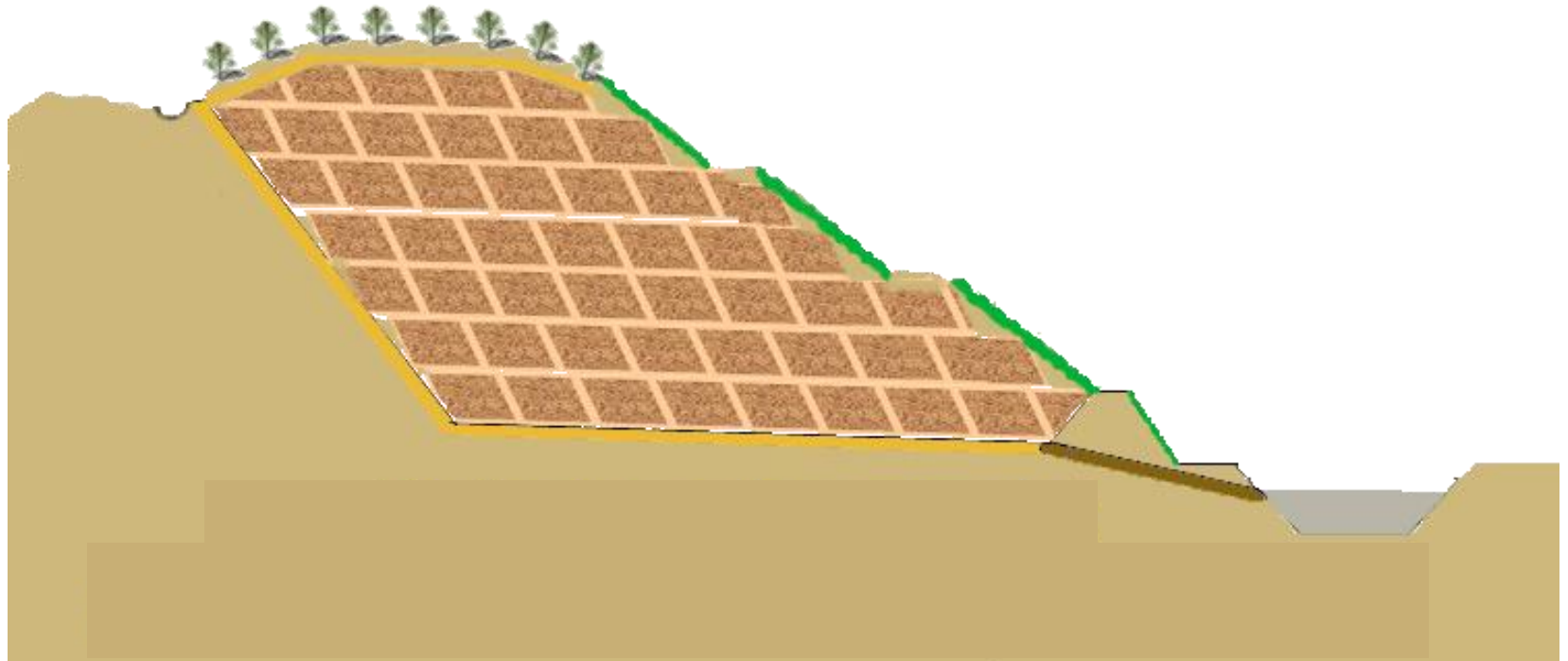
The landfill is filled up



Closing of the landfill (impermeabilization)



Post-closure phase (30 years)



MSW management in Valencia Region (Spain)

Valencia Region is divided in 13 management areas



Planes Zonales PIR1998	Áreas de gestión PIR1998	Planes Zonales PIR2013	Áreas de gestión PIR2013
Plan Zonal - Zona I	-	Plan Zonal 1	C1
Plan Zonal - Zonas II, IV, V	-	Plan Zonal 2	C2
Plan Zonal - Zonas III, VIII	AG 2	Plan Zonal 3	C3/V1
Plan Zonal - Zonas III, VIII	AG 1	Plan Zonal 3	V2
Plan Zonal - Zonas VI, VII, IX	-	Plan Zonal 4	V3
Plan Zonal - Zonas X, XI, XII	AG1	Plan Zonal 5	V4
Plan Zonal - Zonas X, XI, XII	AG 2	Plan Zonal 5	V5
Plan Zonal de las Zonas XV	-	Plan Zonal 6	A1
Plan Zonal de las Zonas XIV	-	Plan Zonal 7	A2
Plan Zonal de las Zonas XIII	-	Plan Zonal 8	A3
Plan Zonal de las Zonas XVI	-	Plan Zonal 9	A4
Plan Zonal de las Zonas XVIII	-	Plan Zonal 10	A5
Plan Zonal de las Zonas XVII	-	Plan Zonal 11	A6

ÁREAS DE GESTIÓN

Castellón

- C1
- C2
- C3 / V1

Valencia

- C3 / V1
- V2
- V3
- V4
- V5

Alicante

- A1
- A2
- A3
- A4
- A5
- A6

Zonal Plan 3 (management area V2)



Their core competence is the provision of services for the recovery and disposal of urban waste, in accordance with the objectives set by the Generalitat, through sectoral regulations and in compliance with the planning instruments provided therein.

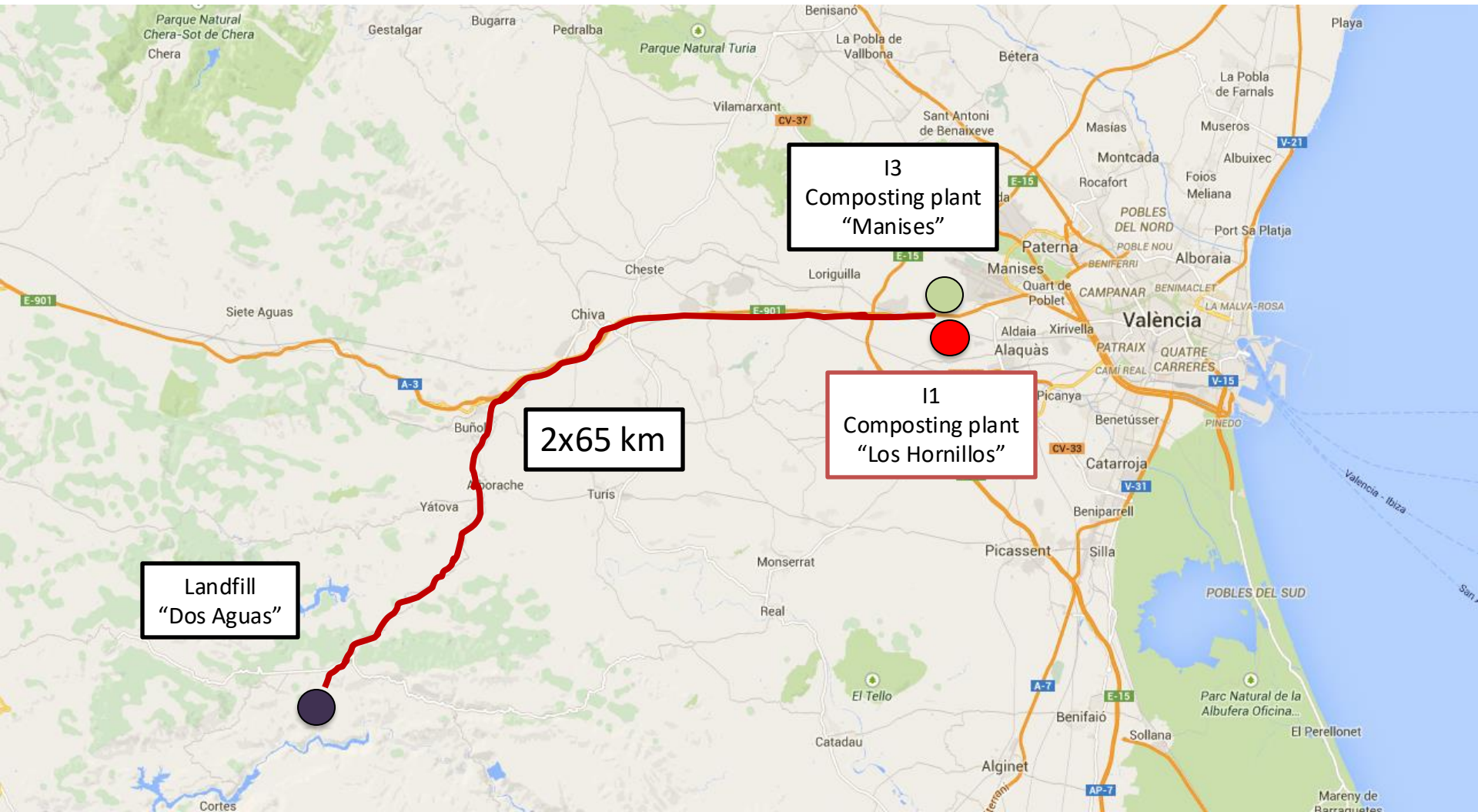
The scope of action of EMTRE includes the following municipalities: Alaquàs, Albal, Albalat dels Sorells, Alboraya, Albuixech, Alcàsser, Aldaia, Alfafar, Alfara del Patriarca, Almàssera, Benetússer, Beniparrell, Bonrepòs i Mirambell, Burjassot, Catarroja, Emperador, Foios, Godella, Lugar Nuevo de la Corona, Manises, Massalfassar, Massamagrell, Massanassa, Meliana, Mislata, Moncada, Museros, Paiporta, Paterna, Picanya, Picassent, la Pobla de Farnals, Puçol, El Puig de Santa María, Quart de Poblet, Rafelbuñol, Rocafort, San Antonio de Benagéber, Sedaví, Silla, Tavernes Blanques, Torrent, Valencia, Vinalesa y Xirivella.

Population = 1,500,000 people

MSW production = 600,000 t/year

MSW management in Valencia Region (Spain)

- **Installation 1** (Los Hornillos recycling and composting plant): 400,000 t/year
- **Installation 2** (Dos Aguas landfill site): Rejections of I1 and I3
- **Installation 3** (Manises recycling and composting plant): 300,000 t/year



Installation 1 – MSW recycling and composting plant “Los Hornillos” (Quart de Poblet)

- Treatment capacity: 400,000 t/year
- Waste type: mixed waste, organic waste, garden, hospital waste type I and II
- Four processing lines (25-30 t/h each)



Approximate cost = 105,000,000 €

Instalación 3 – MSW recycling and composting plant “Manises”

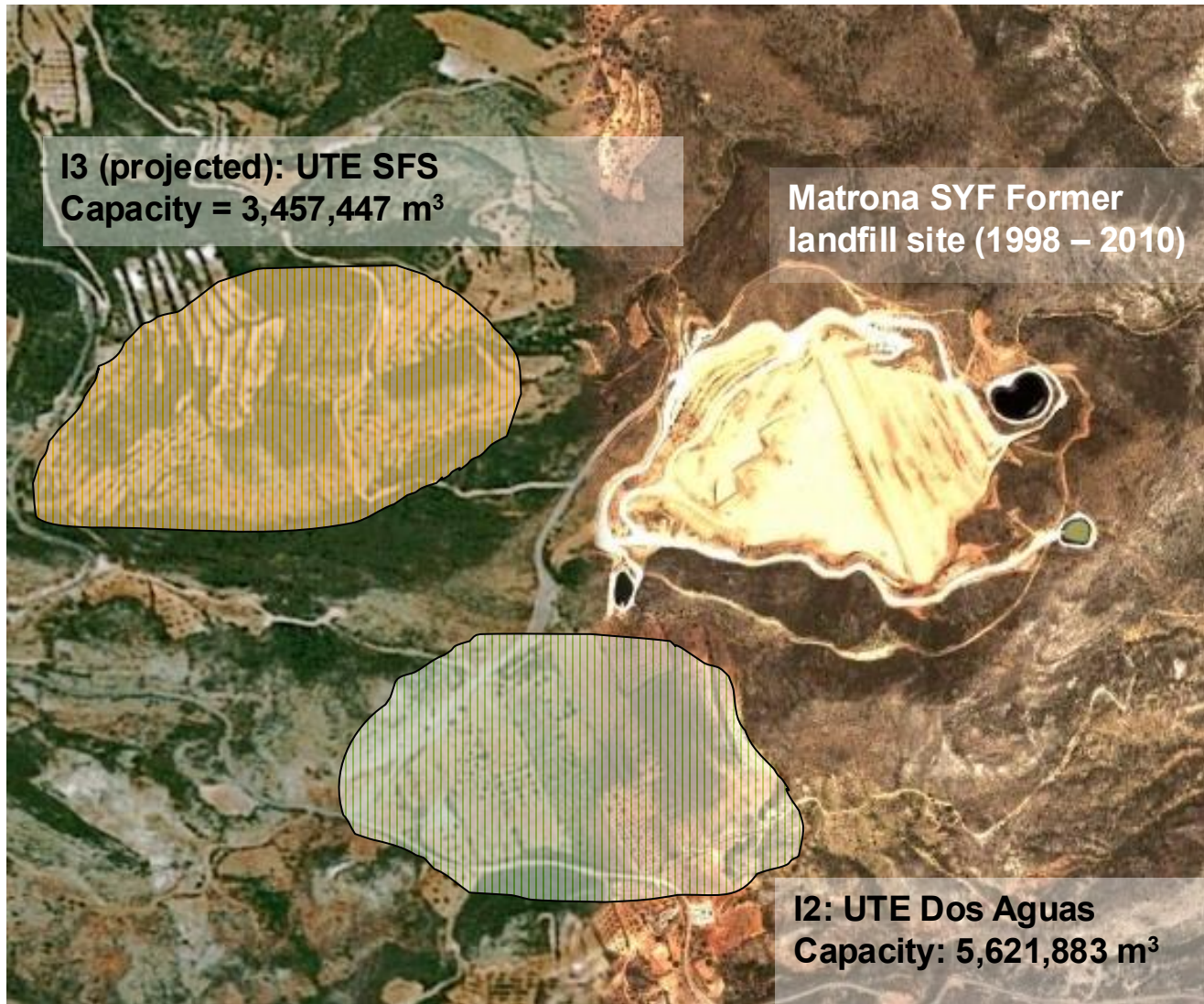
- Treatment capacity : 300,000 t/year
- Waste type: mixed waste, organic waste, garden
- Three processing lines (30 t/h each)



Approximate cost = 65,000,000 €

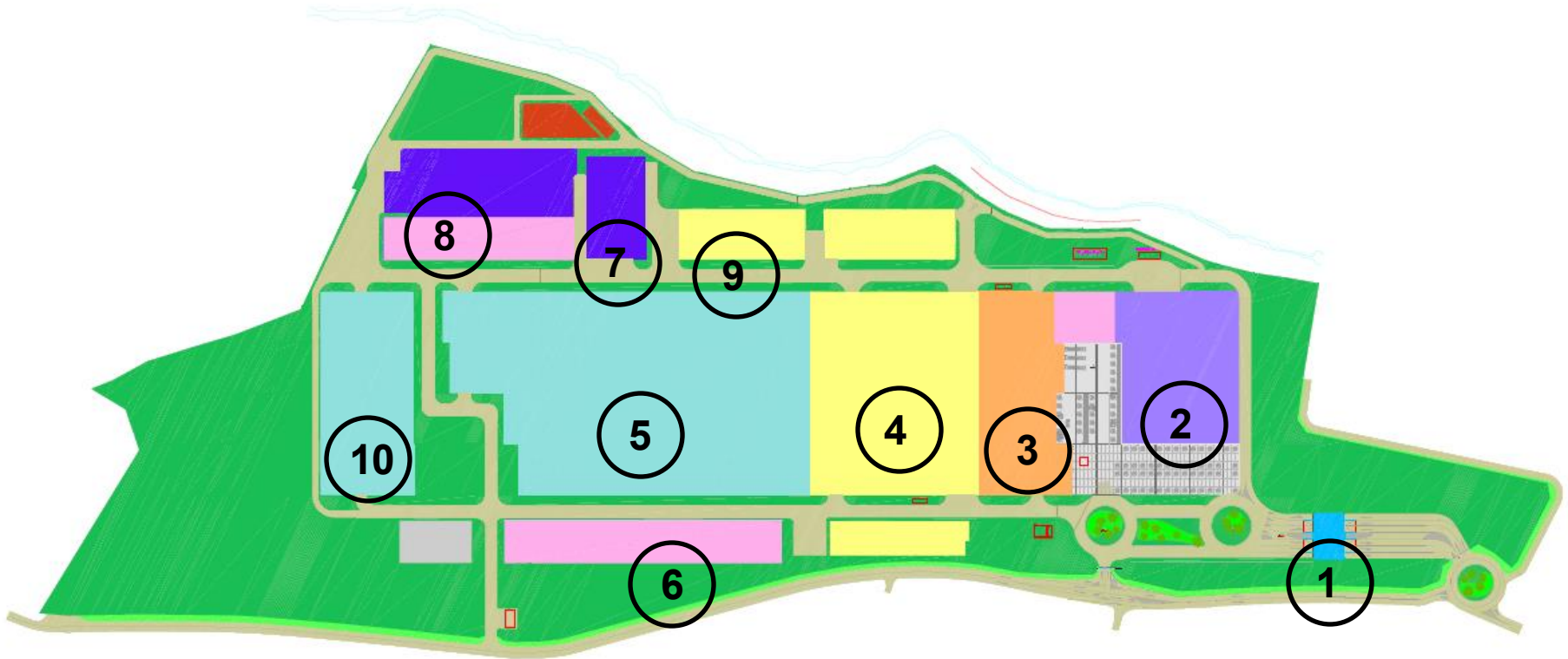


REJECTION WASTE to send to landfill site



DOS AGUAS LANDFILL SITE

What is a MSW treatment plant?



1.- CONTROL and WEIGHING

2.- AUXILIARY AREAS

3.- MSW RECEPTION

4.- PRETREATMENT (classification)

5.- COMPOSTING AREA

6.- BIOFILTERS

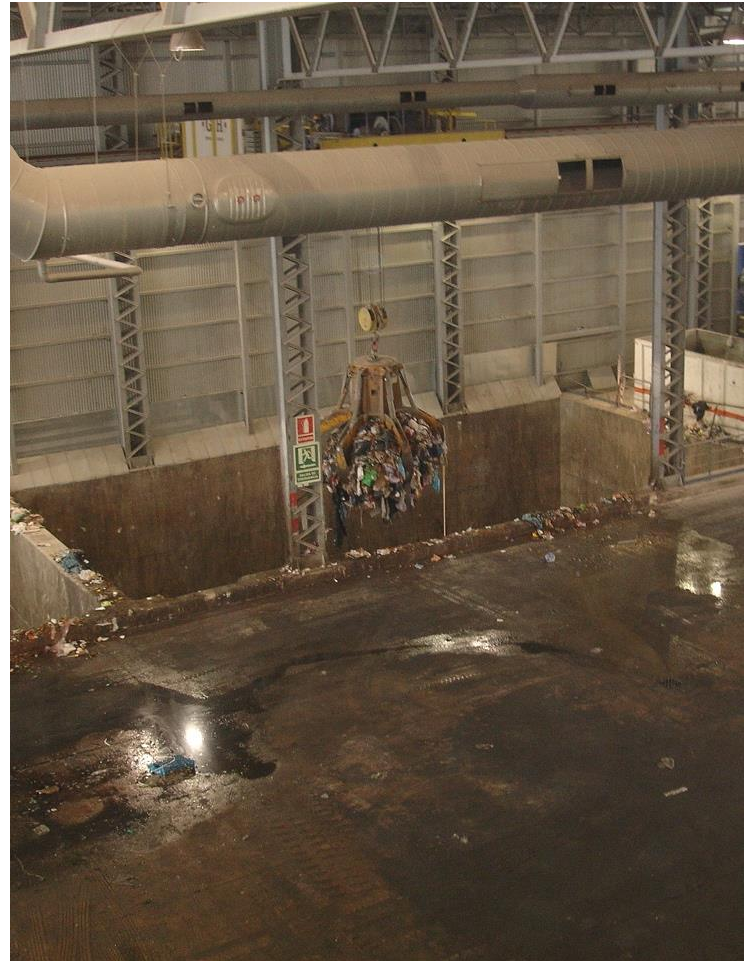
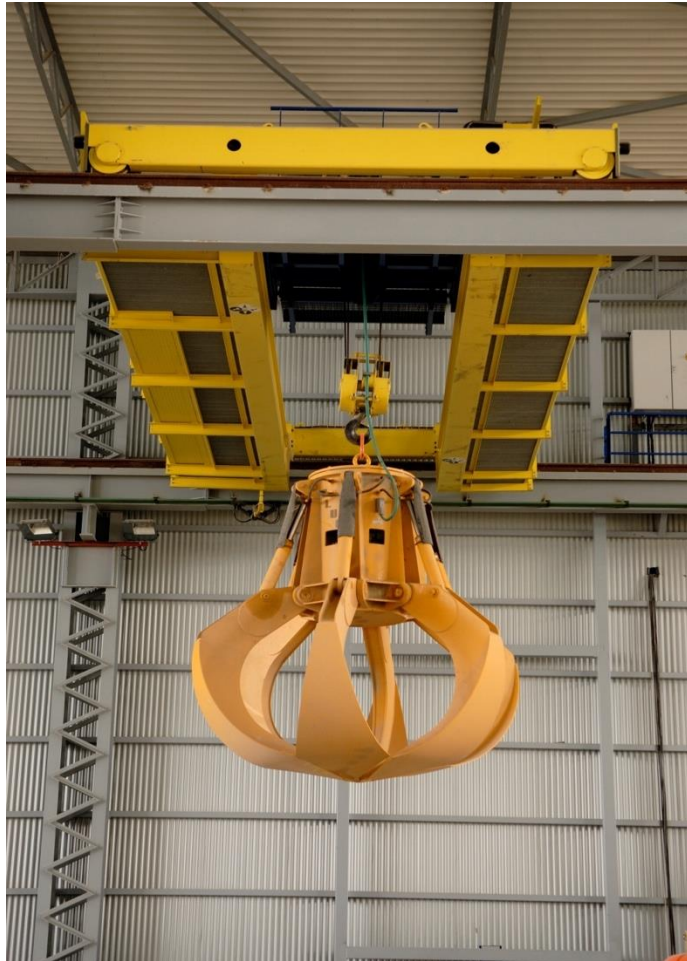
7.- BIOESTABILIZATION

8.- WATER TRESTMENT PLANT

9.- GARDEN WASTE STORE

10.- COMPOST STORE

What is a MSW treatment plant?



ARRIVAL OF WASTE TO THE FACILITIES

What is a MSW treatment plant?



ENTERING THE CLASSIFICATION LINES



LOS HORNILLOS

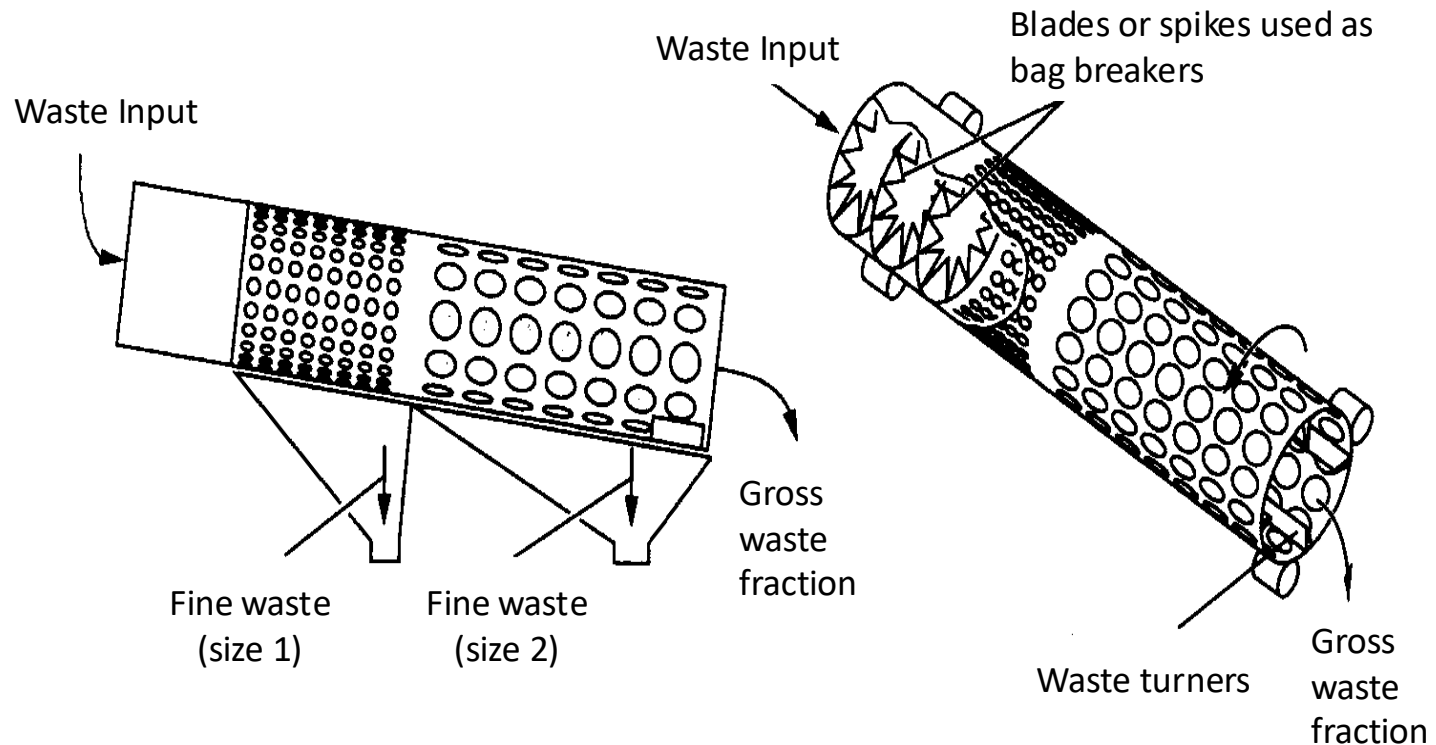
tratamiento y valorización de residuos urbanos



MANUAL SORTING OF WASTE

Trommel screens

- They are used :
 - ✓ To protect shredders (separation of large materials).
 - ✓ To separate paper and cardboard in material recovery facilities.



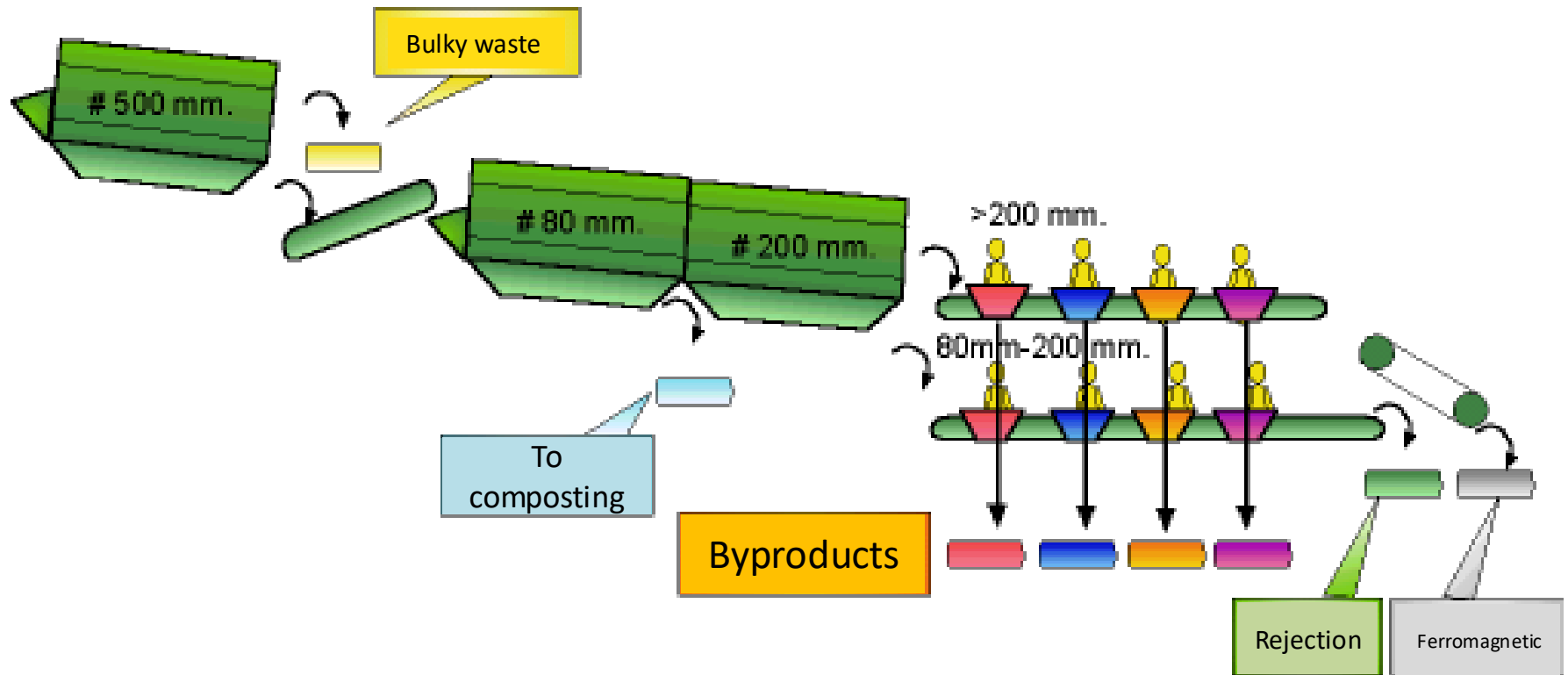


TROMMEL SCREENS or ROTARY SCREEN



TROMMEL SCREENS or ROTARY SCREEN

What is a MSW treatment plant?





Classification by density: BALLISTIC SEPARATOR

What is a MSW treatment plant?

 PET	 HDPE	 PVC	 LDPE	 PP	 PS	 OTHER
POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	OTHER
WATER BOTTLES; JARS; CAPS	SHAMPOO BOTTLES; GROCEY BAGS	CLEANING PRODUCTS; SHEETINGS	BREAD BAGS; PLASTIC FILMS	YOGURT CUPS; STRAWS; HANGERS	TAKE-AWAY AND HARD PACKAGING; TOYS	BABY BOTTLES; NYLON; CDS
						

Several types of plastic materials are used as common packaging

OPTICAL CLASSIFIERS: separate different types of plastic





PACKAGING OF BYPRODUCTS IN A PRESS



FILM PLASTIC (LDPE)



MIXED PLASTIC



HDPE PLASTIC



PET PLASTIC



PAPER AND CARDBOARD



GLASS



TETRABRIK PACKAGING

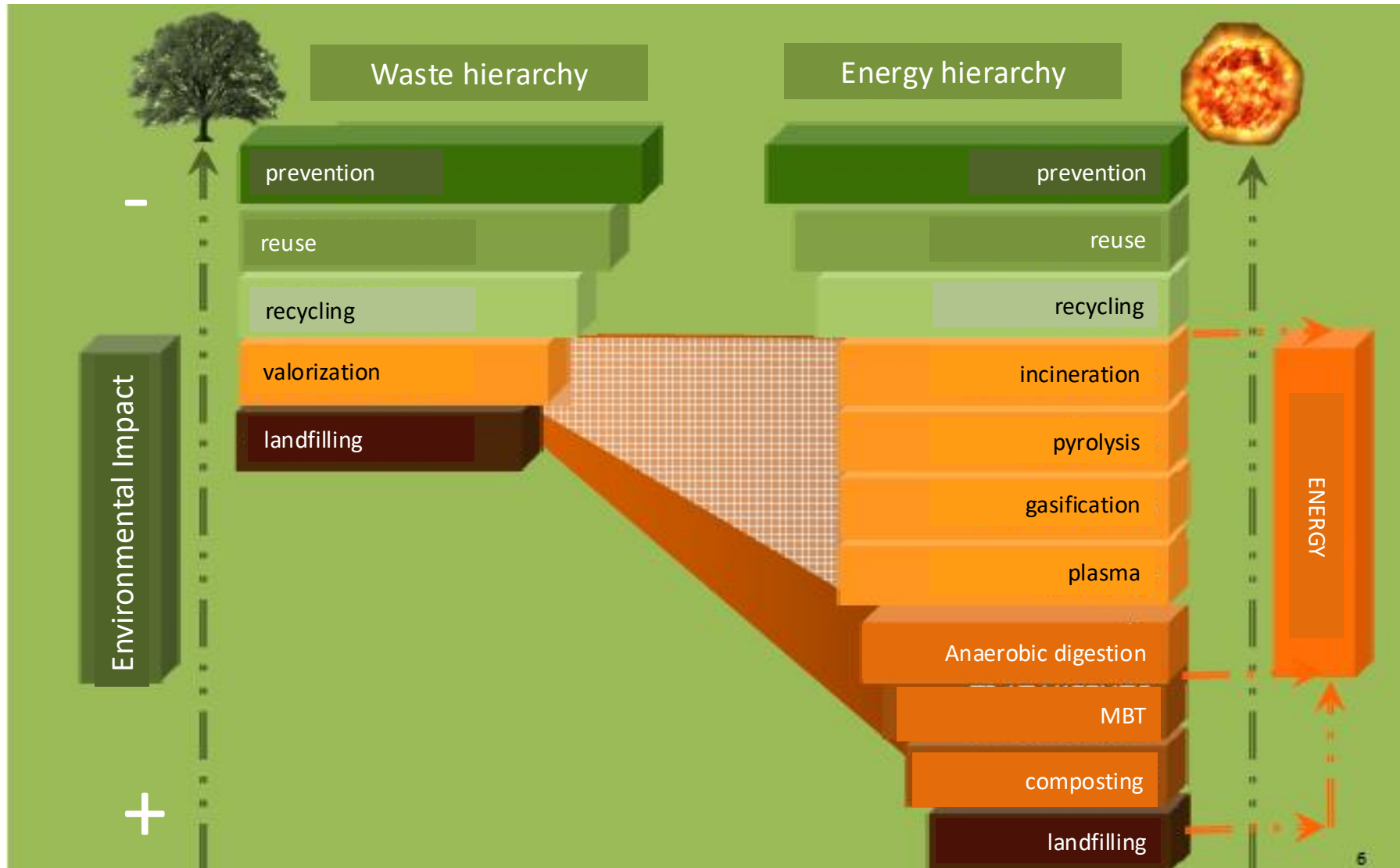


FERROUS AND NON-FERROUS METALS



FINAL COMPOST READY TO BE PACKED AND SOLD

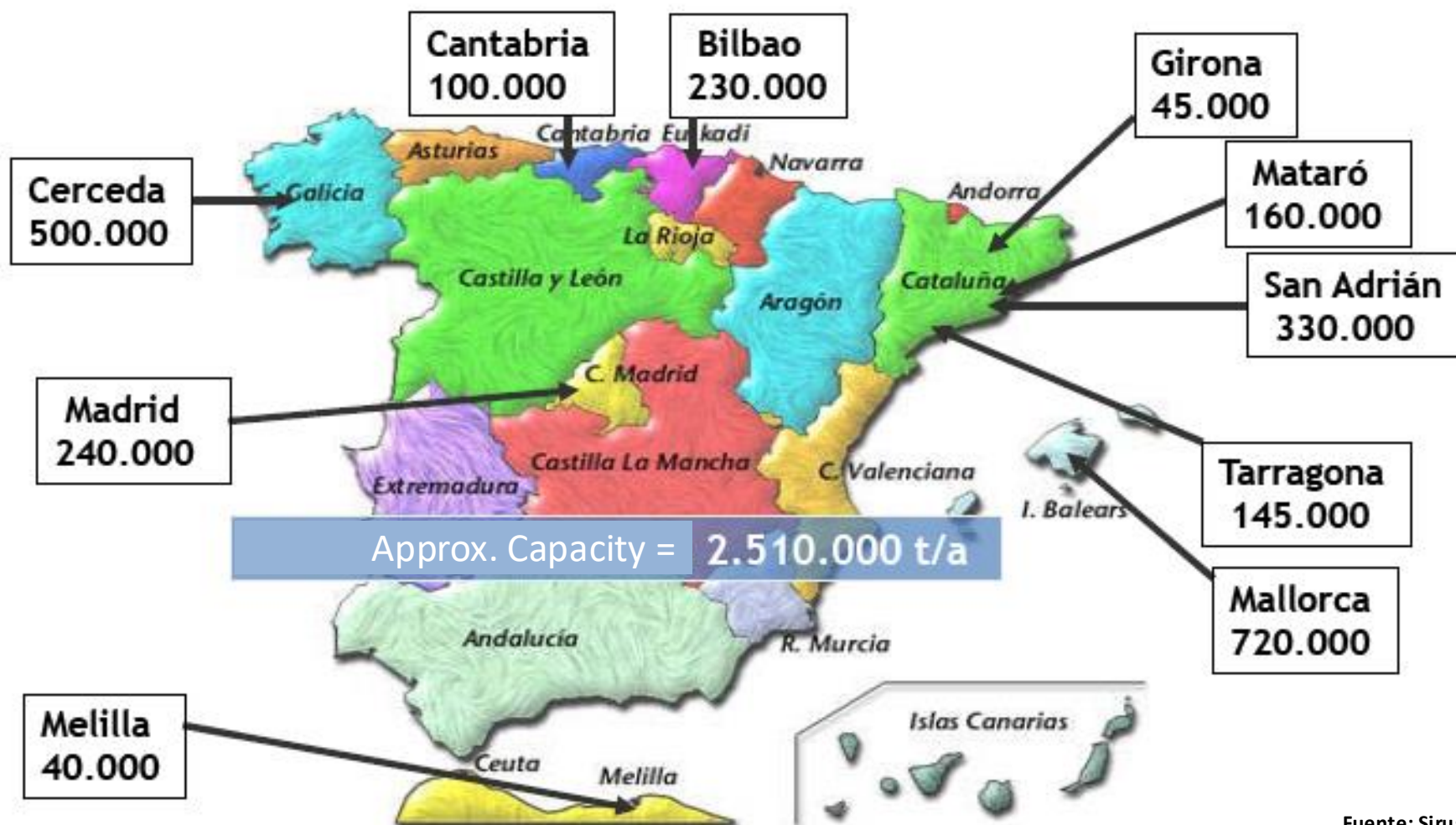
Other valorization techniques different from composting




Tarragona's incineration plant





Location of the Spanish MSW incineration plants



<https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Category:Waste>





**eurostat**
Statistics Explained



Search Statistics Explained 

NAVIGATION ▾ ONLINE PUBLICATIONS ▾ TOOLS ▾

Category:Waste


Translate

The category Waste contains all articles in the [statistical theme Environment](#) on waste.

Pages in category "Waste"

The following 12 pages are in this category, out of 12 total.

C

- [Consumption of plastic carrier bags - estimates](#)

E

- [End-of-life vehicle statistics](#)

F

- [Food waste and food waste prevention - estimates](#)

M

- [Municipal waste statistics](#)

P

- [Packaging waste statistics](#)

R

- [Recycling – secondary material price indicator](#)

S

- [SDG 12 - Responsible consumption and production](#)

W

- [Waste management indicators](#)
- [Waste shipment statistics](#)
- [Waste statistics](#)
- [Waste statistics - electrical and electronic equipment](#)
- [Waste statistics - recycling of batteries and accumulators](#)

Category: [Environment and energy](#)

Category

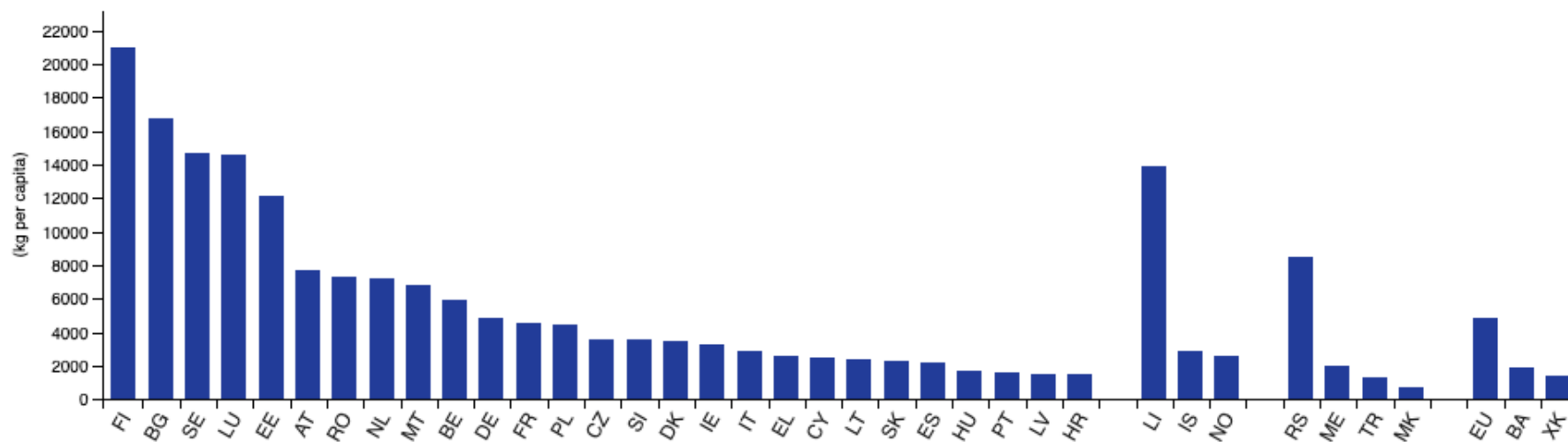
Discussion

History

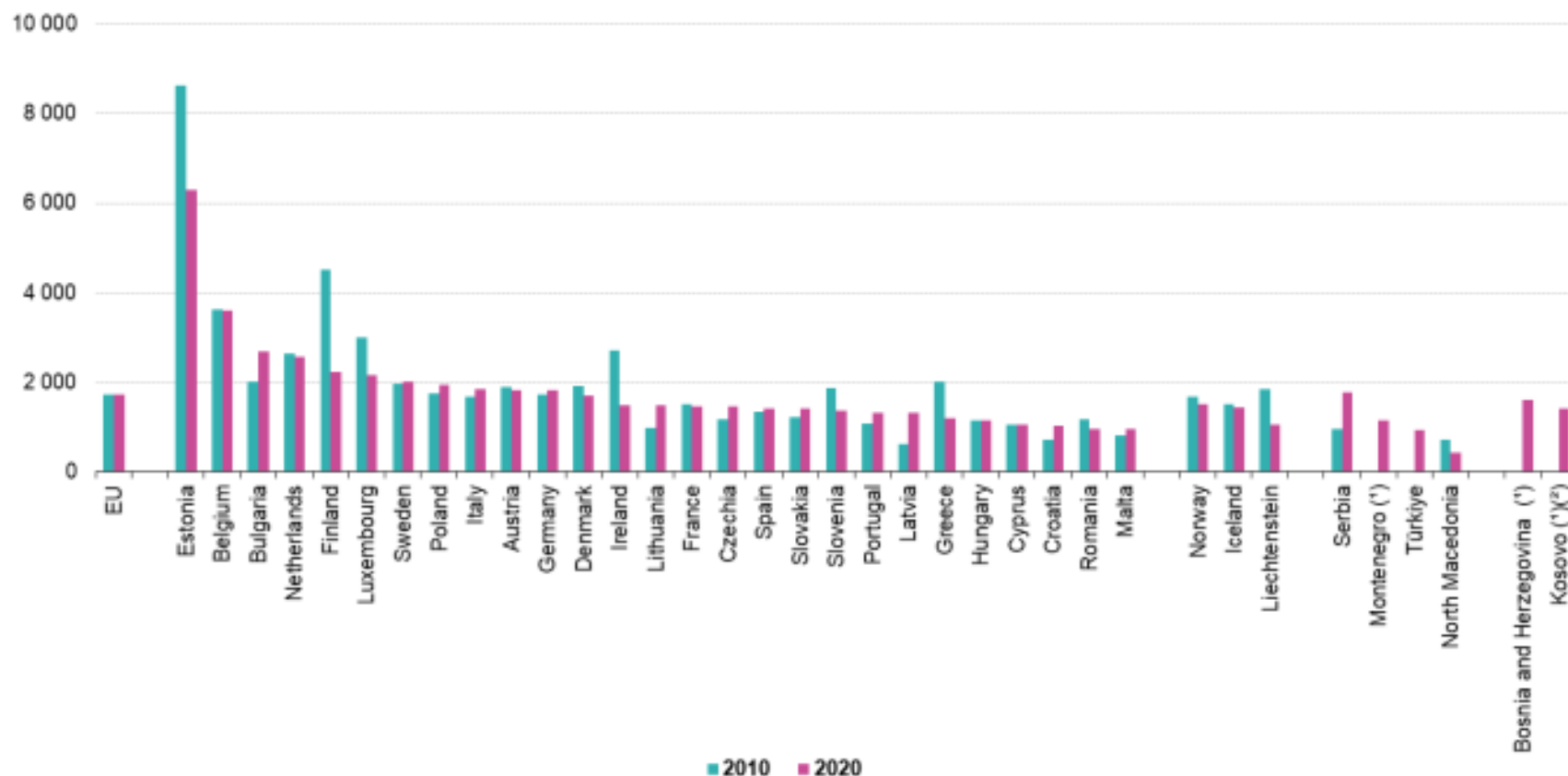
ISSN 2443-8219

This page was last edited on 2 August 2023, at 16:07. [1 watching user](#) [Cookies](#) [Privacy policy](#) [Accessibility](#) [About Statistics Explained](#) [Disclaimers](#)

Waste generation, 2020



Waste generation, excluding major mineral waste, 2010 and 2020 (kg per capita)



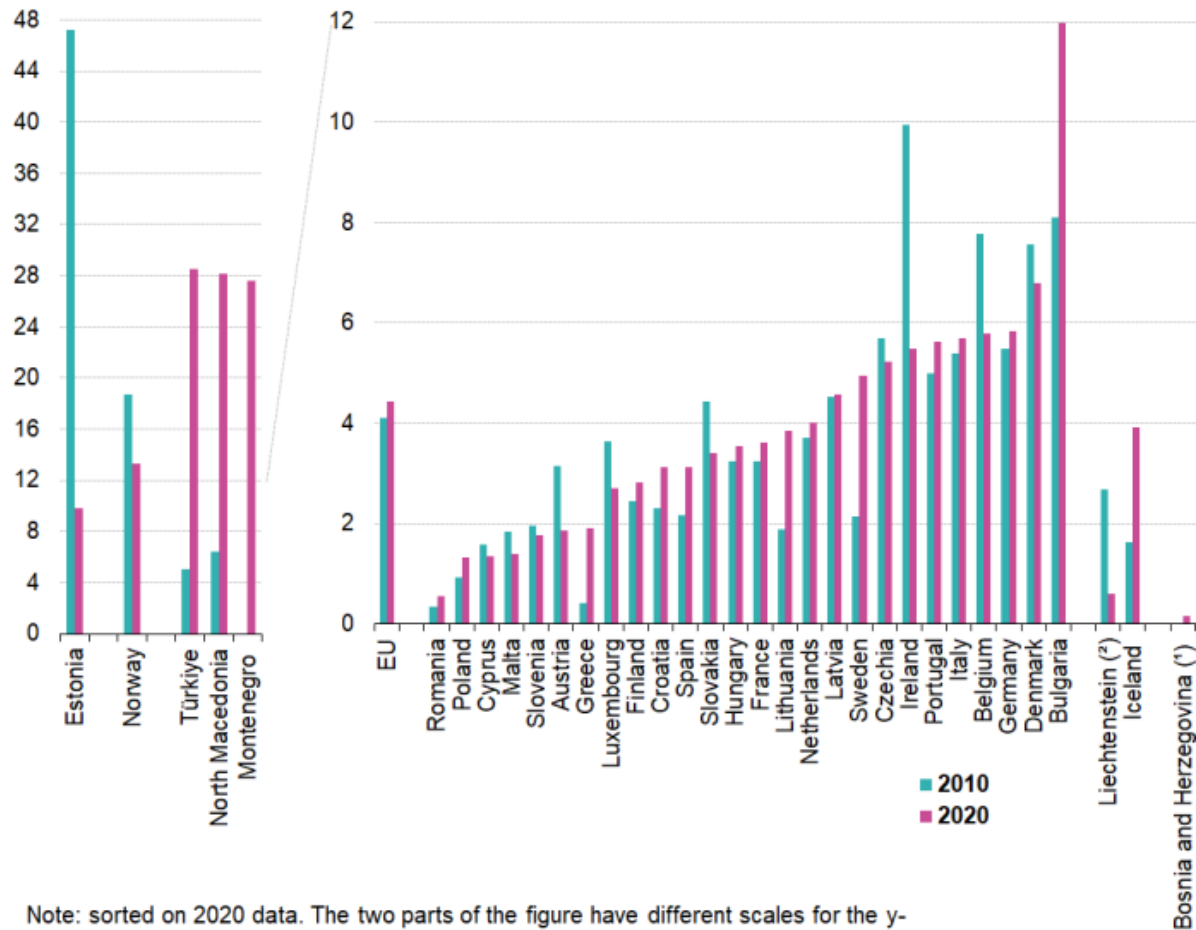
Note: sorted on 2020 data.

(*) 2010: not available.

(²) This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: env_wasgen)

Hazardous waste generated, 2010 and 2020
(% share of total waste)



Note: sorted on 2020 data. The two parts of the figure have different scales for the y-axis

⁽¹⁾ 2010: not available.

⁽²⁾ 2018 value

Source: Eurostat (online data code: env_wasgen)

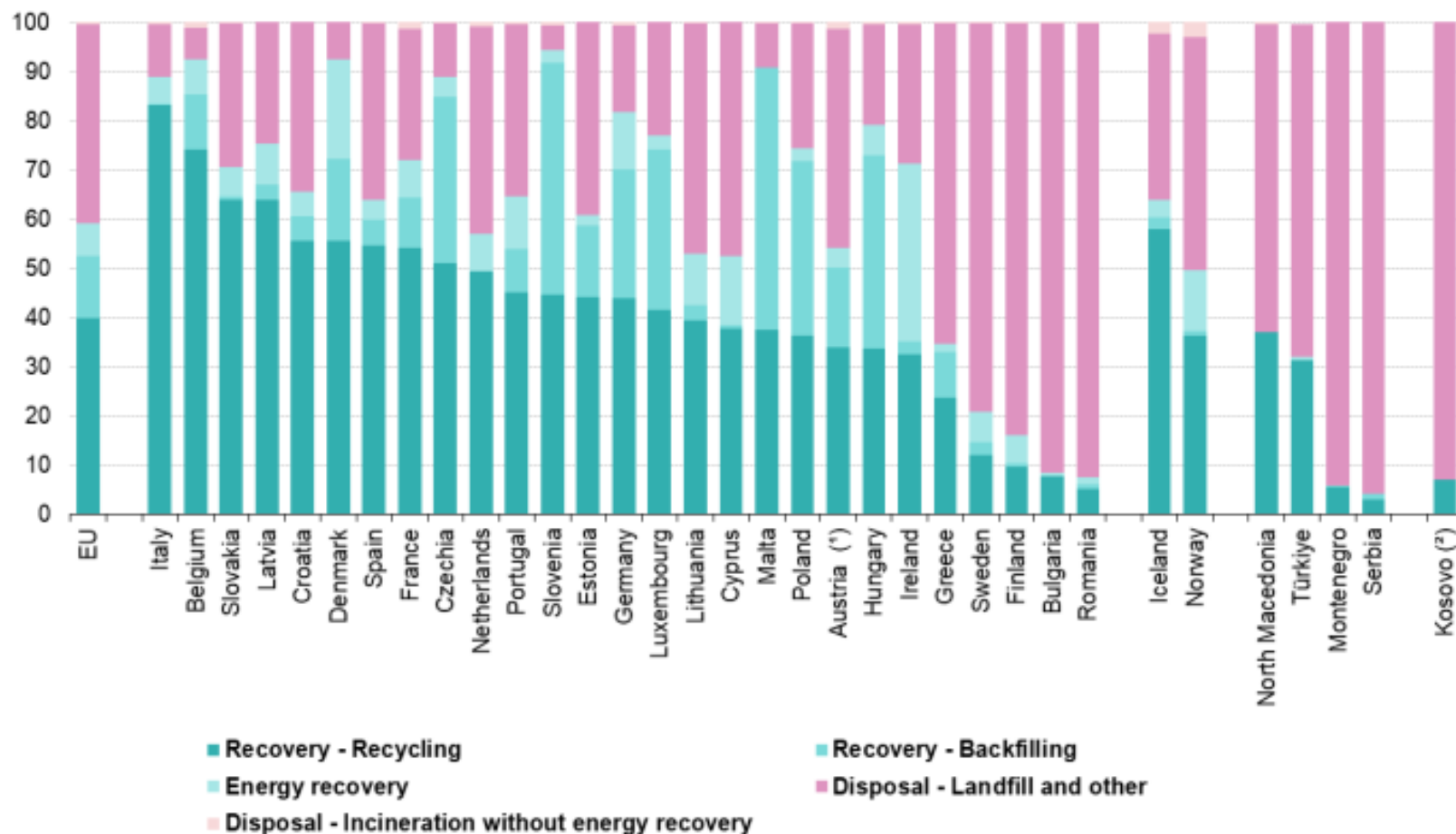
Waste treatment, EU, 2004-2020

(Index 2004 = 100)



Waste treatment by type of recovery and disposal, 2020

(% of total treatment)



⁽¹⁾ Value of incineration for Austria estimated by Eurostat.

⁽²⁾ This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data code: env_wastrt)

1. **Balancing Recycling and Contamination:** Europe prioritizes recycling, but contamination of recyclables with food waste or wrong materials can ruin entire batches. Educating residents and improving sorting systems are crucial
2. **Infrastructure Gaps:** While some countries excel in recycling infrastructure, others lack facilities for efficiently collecting, separating, and treating different waste streams, hindering progress
3. **Reliance on Incineration:** Incineration reduces landfill use but raises concerns about air pollution and greenhouse gas emissions. Finding the right balance and exploring cleaner waste-to-energy options is a challenge
4. **Market Fluctuations for Recycled Materials:** The economic demand for recycled materials can be volatile. Price drops can disrupt the economic viability of recycling programs
5. **Public Participation:** Effective MSW management depends on citizen engagement in sorting waste correctly. Encouraging consistent participation and proper waste disposal methods remains an ongoing effort

Current challenges in municipal solid waste management



Prof. Dr. JAVIER RODRIGO-ILARRI
jrodrigo@upv.es