

16 November 2017, Mogilev, Belarus

# Waste Management in the EU:

facts, trends and approaches for  
implementation of EU Directives  
in East-European countries



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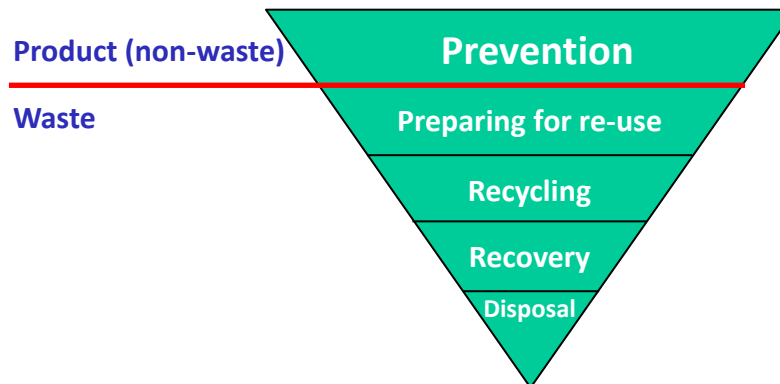
**Hamburg University of Technology**

Germany

# Directive 2008/98/EC on waste (Waste Framework Directive)

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- Basic **concepts** and **definitions** related to waste management;
- Waste management **principles** (e.g. "polluter pays principle")
- Introduction of the **waste hierarchy**:



# Directive 2008/98/EC on waste (Waste Framework Directive)

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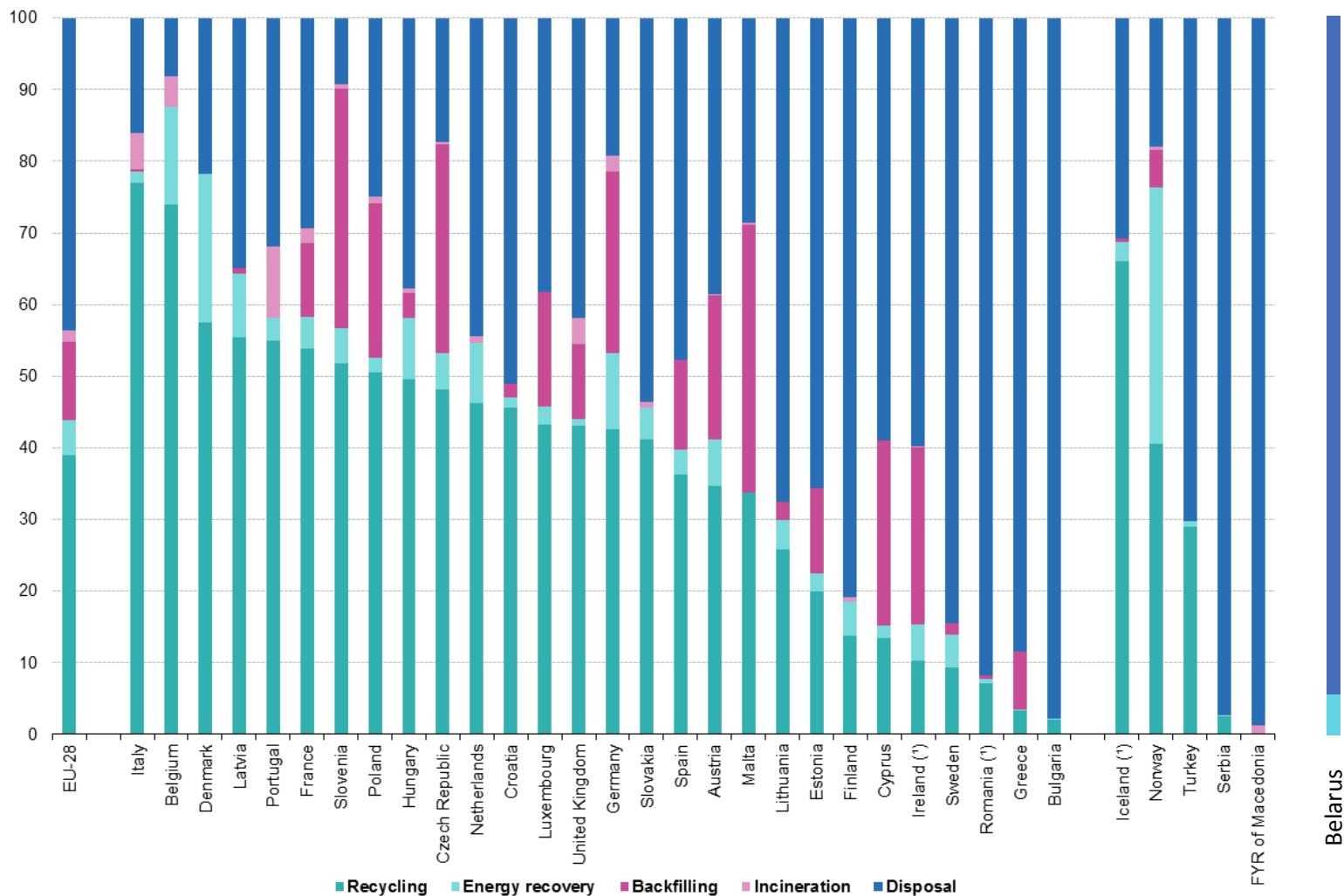
## Objectives:

- move towards a **European recycling society** with a high level of **resource efficiency**;

## Targets:

- by **2020**, the preparing for re-use and the recycling of waste materials (e.g. **paper, metal, plastic and glass**) shall be increased to a minimum of overall **50 %** by weight;
- by **2020**, the preparing for re-use, recycling and other material recovery ... of **non-hazardous construction and demolition waste** ... shall be increased to a minimum of **70 %** by weight.

# Waste treatment in EU28 (2014)



Note: Ranked on the share of recycled waste.

(\*) 2012.

Source: Eurostat (online data code: env\_wastrt)

# Review of Waste Policy and Legislation (Circular Economy Package)

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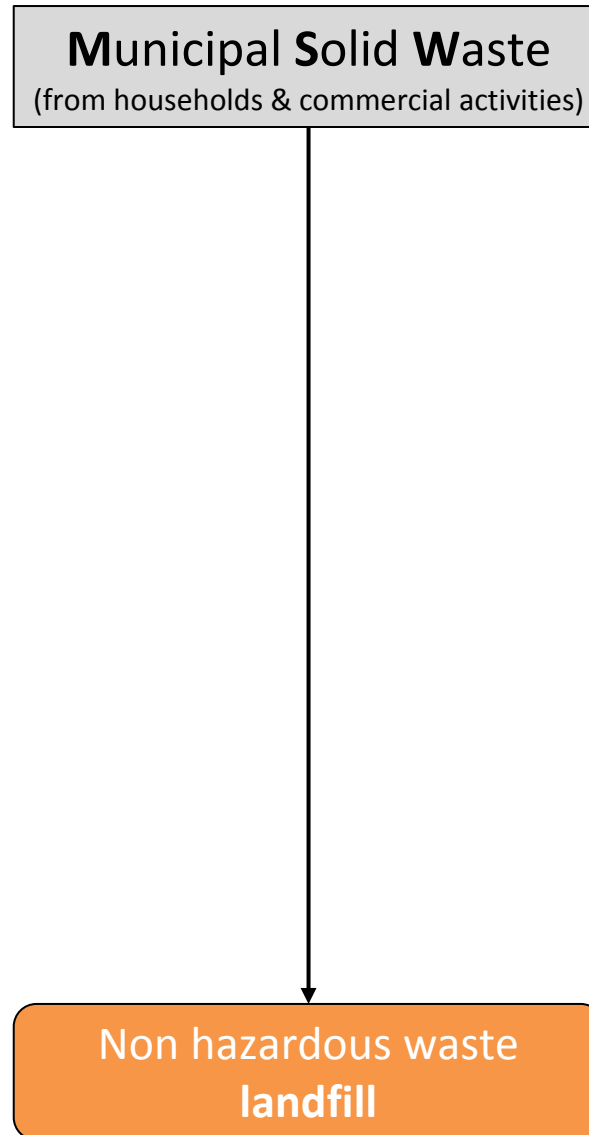
## Key elements (beside others):

- A common EU target for recycling **65% of municipal waste by 2030;**
- A common EU target for recycling **75% of packaging waste by 2030;**
- A binding **landfill target** to reduce landfill to maximum of **10% of municipal waste by 2030;**
- A **ban on landfilling** of separately collected waste;

# Waste Management in Europe

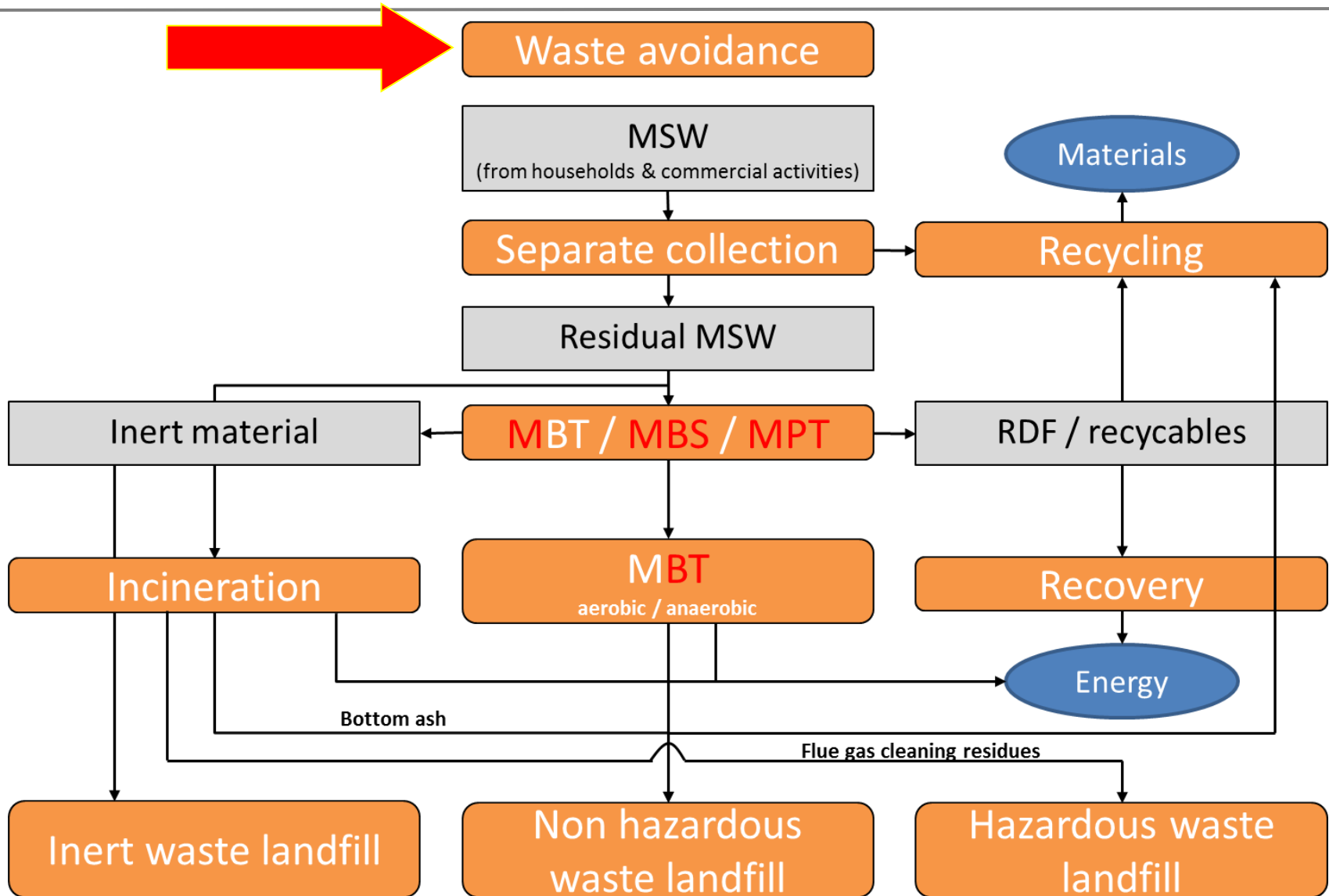
## - General concept of MSW management (old) -

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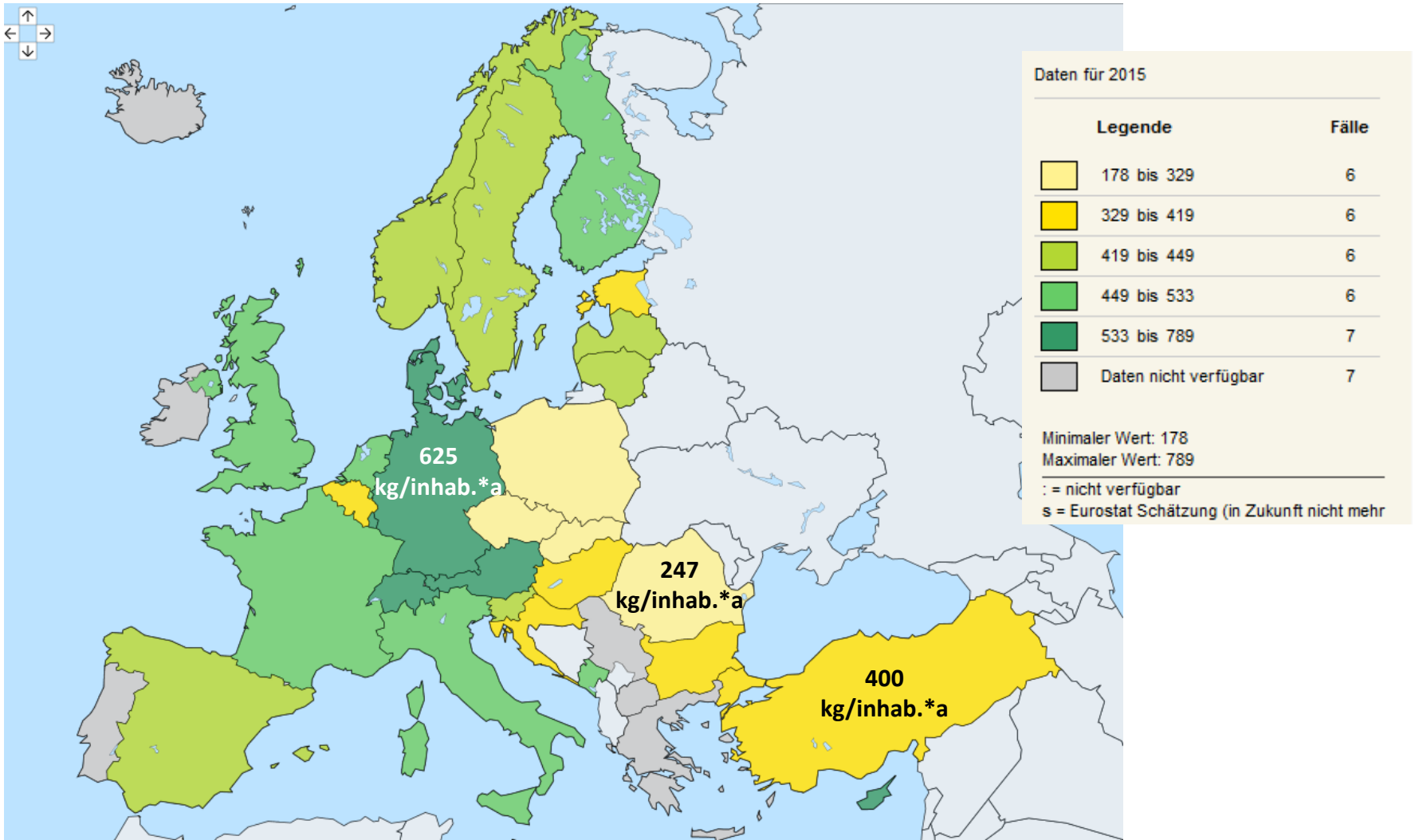


# Waste Management in Europe

## - General concept of MSW management -



# Amount of MSW (2015)





# Waste Management in Europe

## - “Polluter pays” principle -



- Application of **waste lock** for collection systems in residential areas
- Aim is a better **fairness of fees & the reduction of waste mass**
- **Chip Card and Pay by volume**



# Waste Management in Europe

## - Waste avoidance & collection -



Reducing costs by choosing appropriate waste bin sizes

➤ Encouraging recycling

Example: Hamburg (2017)

**Residual waste**

240 l (14 days): € 15.07

120 l (14 days): € 9.55

**Organic waste**

240 l (14 days): € 2.86

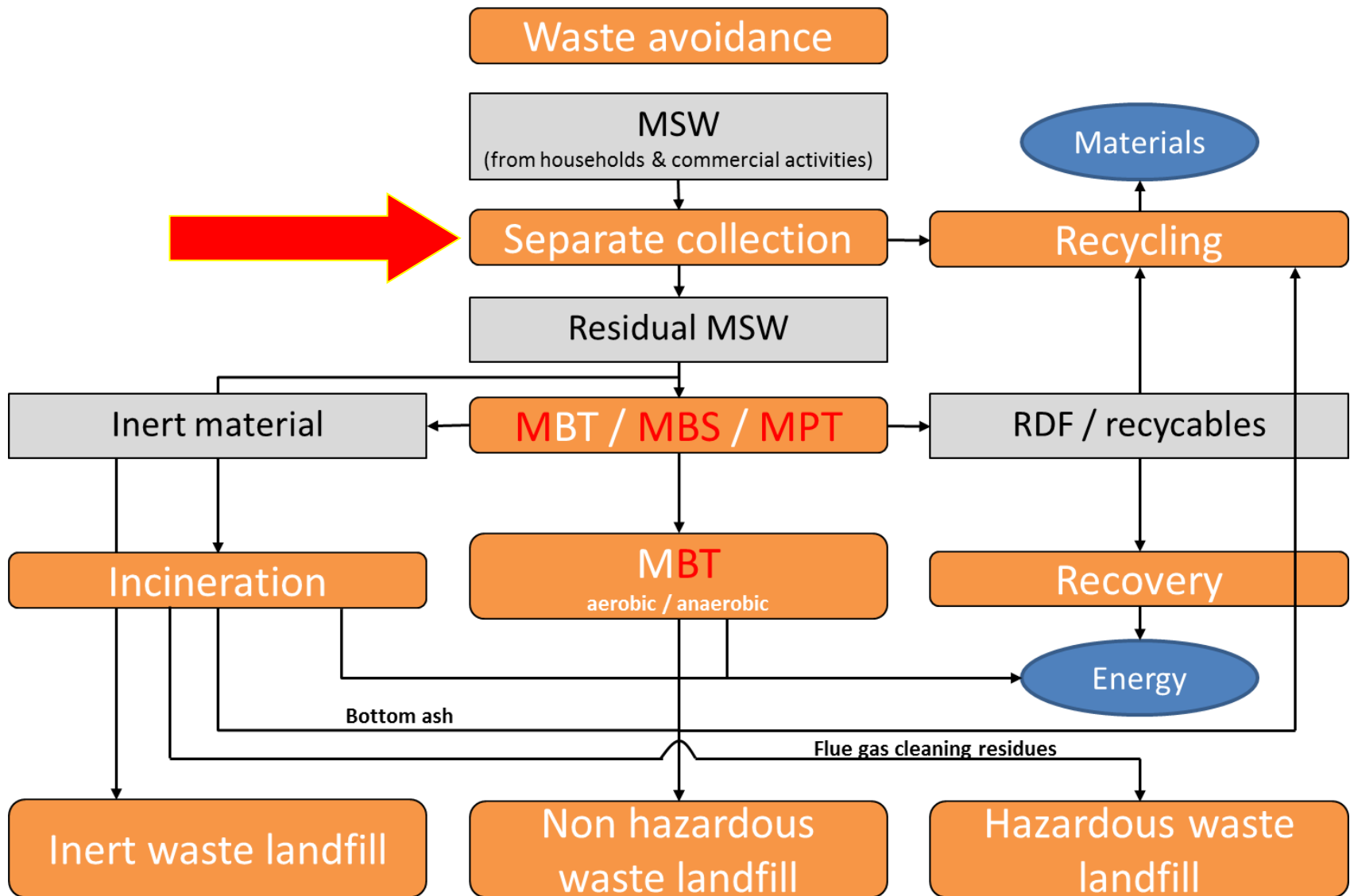
120 l (14 days): € 1.81

**Paper & packaging**

(4 weeks): free of charge

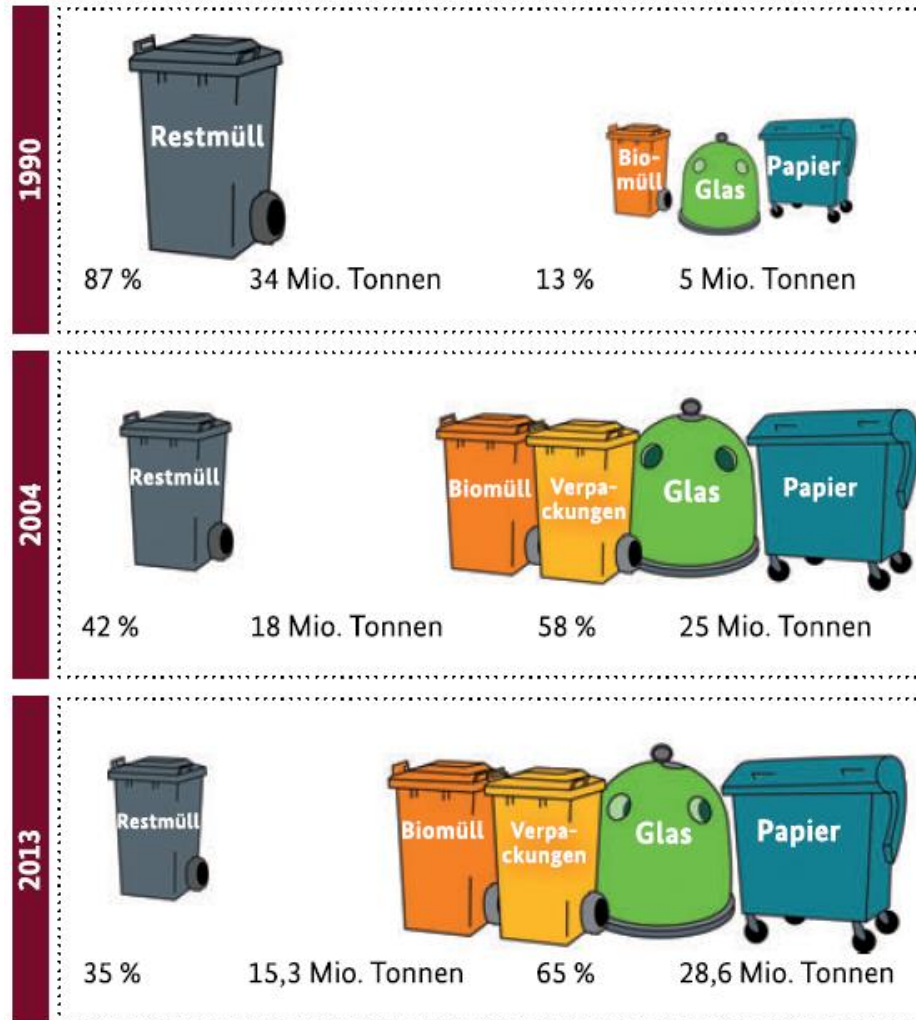
# Waste Management in Europe

## - General concept of MSW management -



# Waste Management in Europe

## - Separate collection, Example Germany -



# Waste Management in Europe

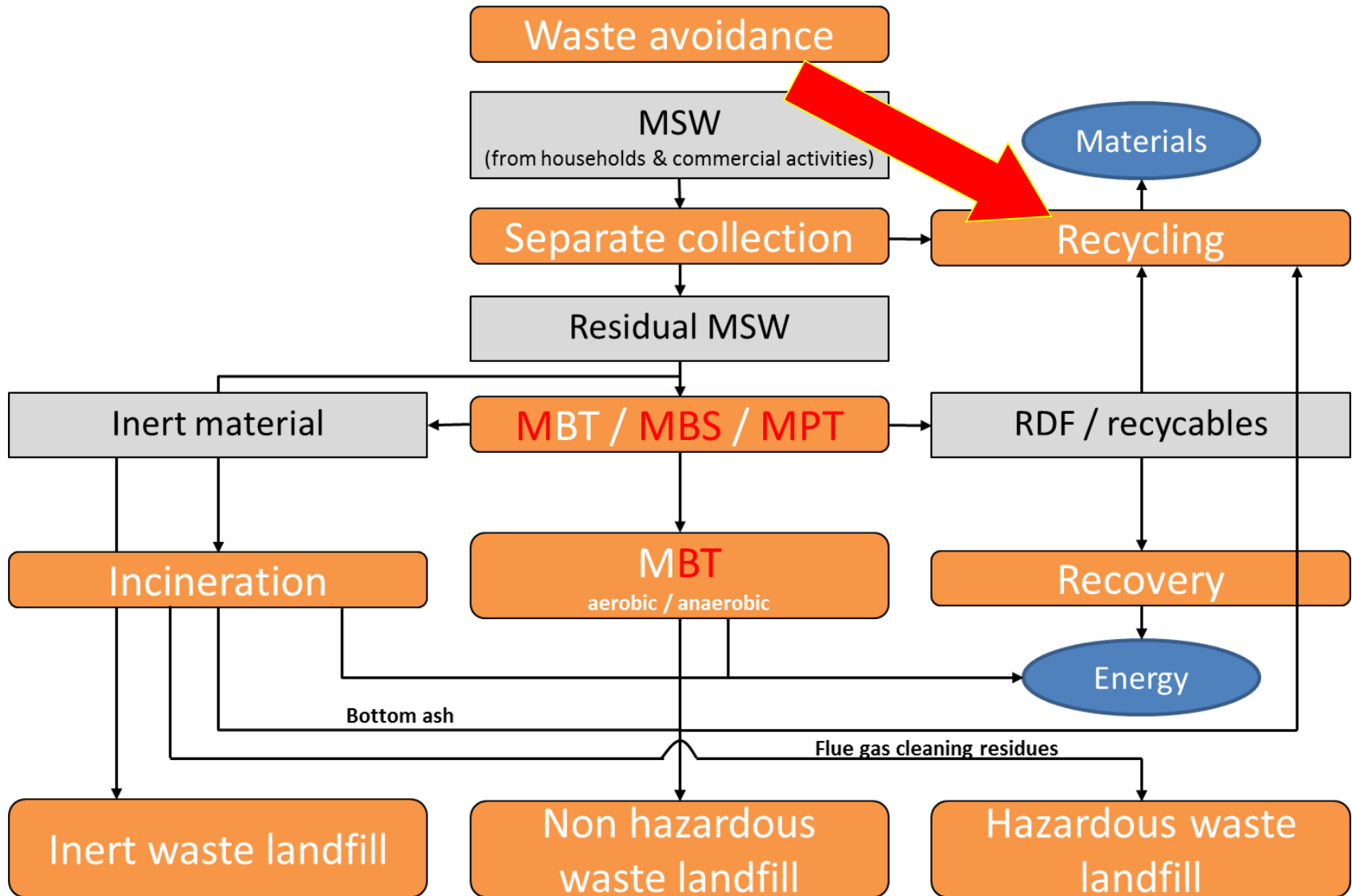
## -funding schemes for waste collection in 28 EU capital cities-

	PAYT	Fixed fee + PAYT	Flat rate	N/A
	Berlin, Budapest, Dublin, Helsinki, Ljubljana, Tallinn, Vienna	Copenhagen, Stockholm, Warsaw	Amsterdam, Brussels, Lisbon, London, Luxembourg, Paris, Vilnius	Athens, Bratislava, Bucharest, Madrid, Nicosia, Prague, Riga, Rome, Sofia, Valetta, Zagreb
<b>Average collection rate</b> (separate collected/generated MSW quantities)	<b>35 %</b>	<b>17 %</b>	<b>17 %</b>	<b>10 %</b>

PAYT: pay as you throw

# Waste Management in Europe

## - General concept of MSW management -



# Waste Management in Europe

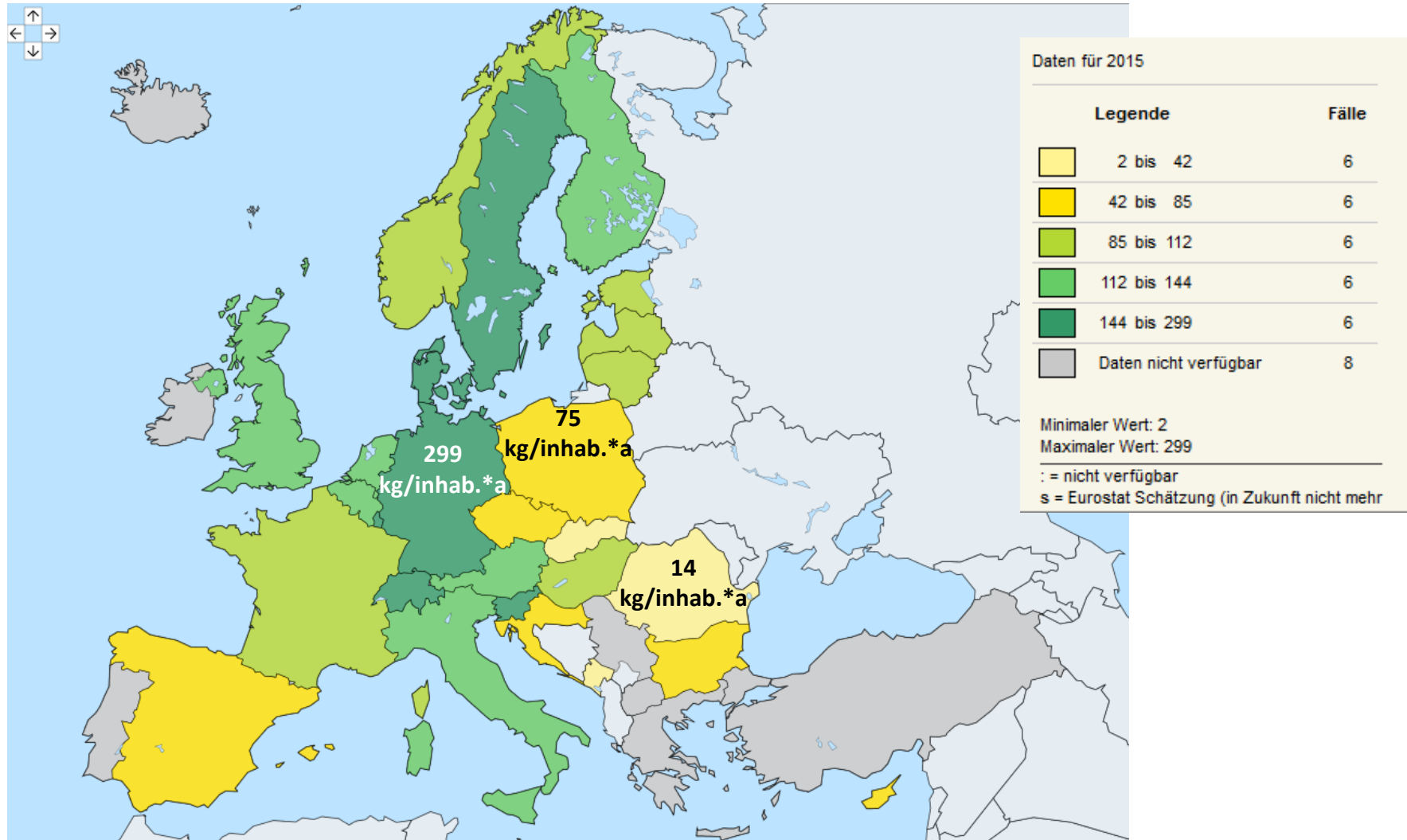
## - Waste recycling (i.e. material recycling) -

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### Principles:

- Introduction **only when ecological feasible**
- Recycled material should have **good quality**
- Recycled material should be **constantly available** for industry
- **Markets** have to be developed
- Market **prices fluctuate**

# Amount of MSW to be recycled (material recovery)





# Waste Management in Europe

## - Waste recycling → **packaging material** -

### Problematics of plastic material recycling

- mixed plastics (often) result in **low value products**
- separation of different plastic materials from mixed plastic is state-of-the-art (but costly)
  - NIR sorting
  - In many cases energy recovery from mixed plastic material seems to be favourable (RDF)



# Waste Management in Europe

## - Waste recycling → **organic wastes** -

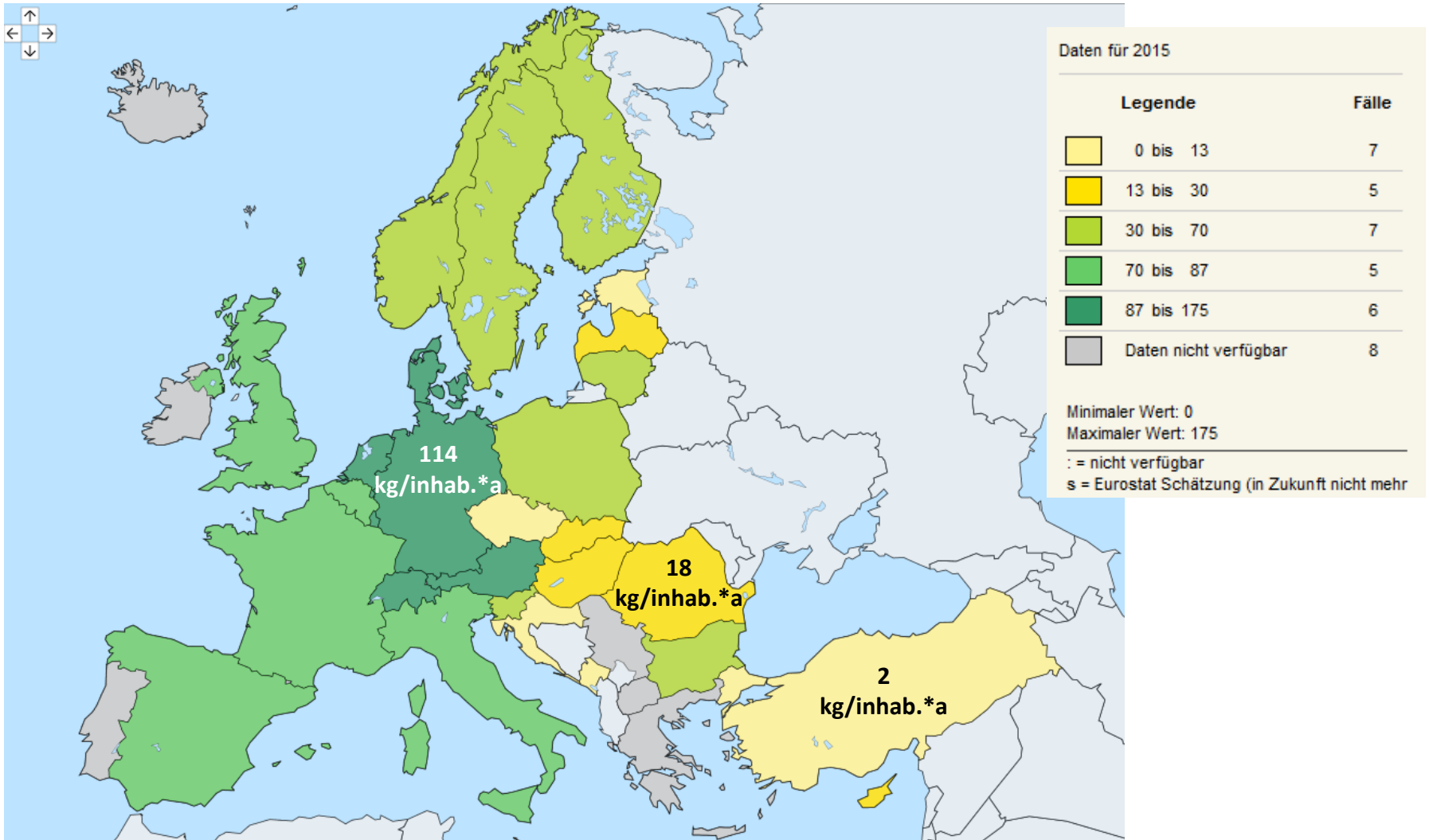
- **Bio-waste (Europe): 30 – 40% of household waste**
- **Annual amount of bio-waste in EU: ca. 110 M tons**
- **Today, only 20% are separately collected and utilised**



### *Example Germany:*

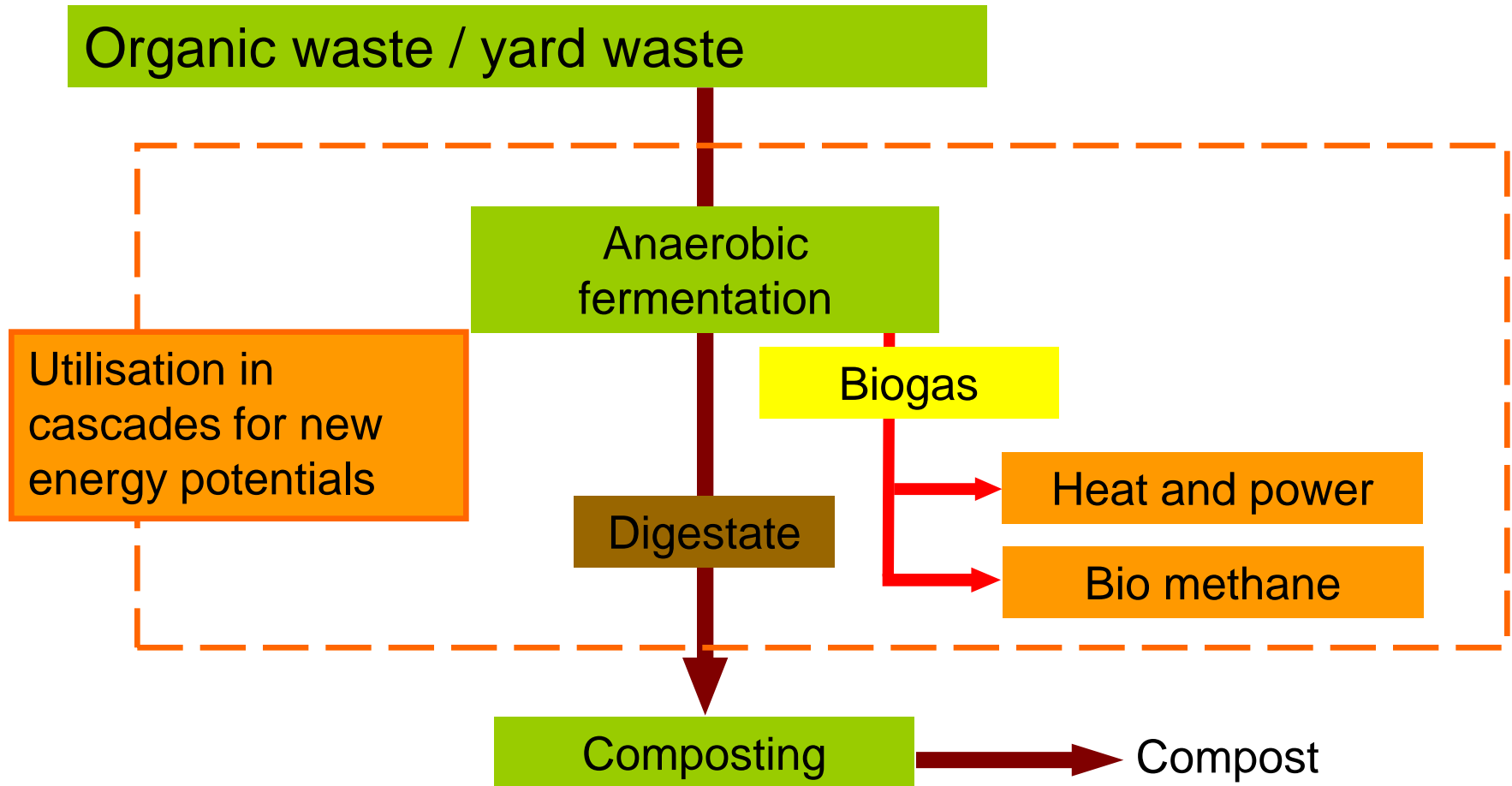
- ca. 105 kg bio and green waste per capita and year are separately collected (potential approx. 40% higher\*)
- Out of these ca. 9.2 M tons bio and green waste approximately 4.3 M tons of compost are produced
- **In Europe, up to 10% of the fertilizers currently used in agriculture could be substituted following the German example...**

# Amount of organic waste for **composting** and **anaerobic fermentation**



# Waste Management in Europe

## - Waste recycling → **Composting** -



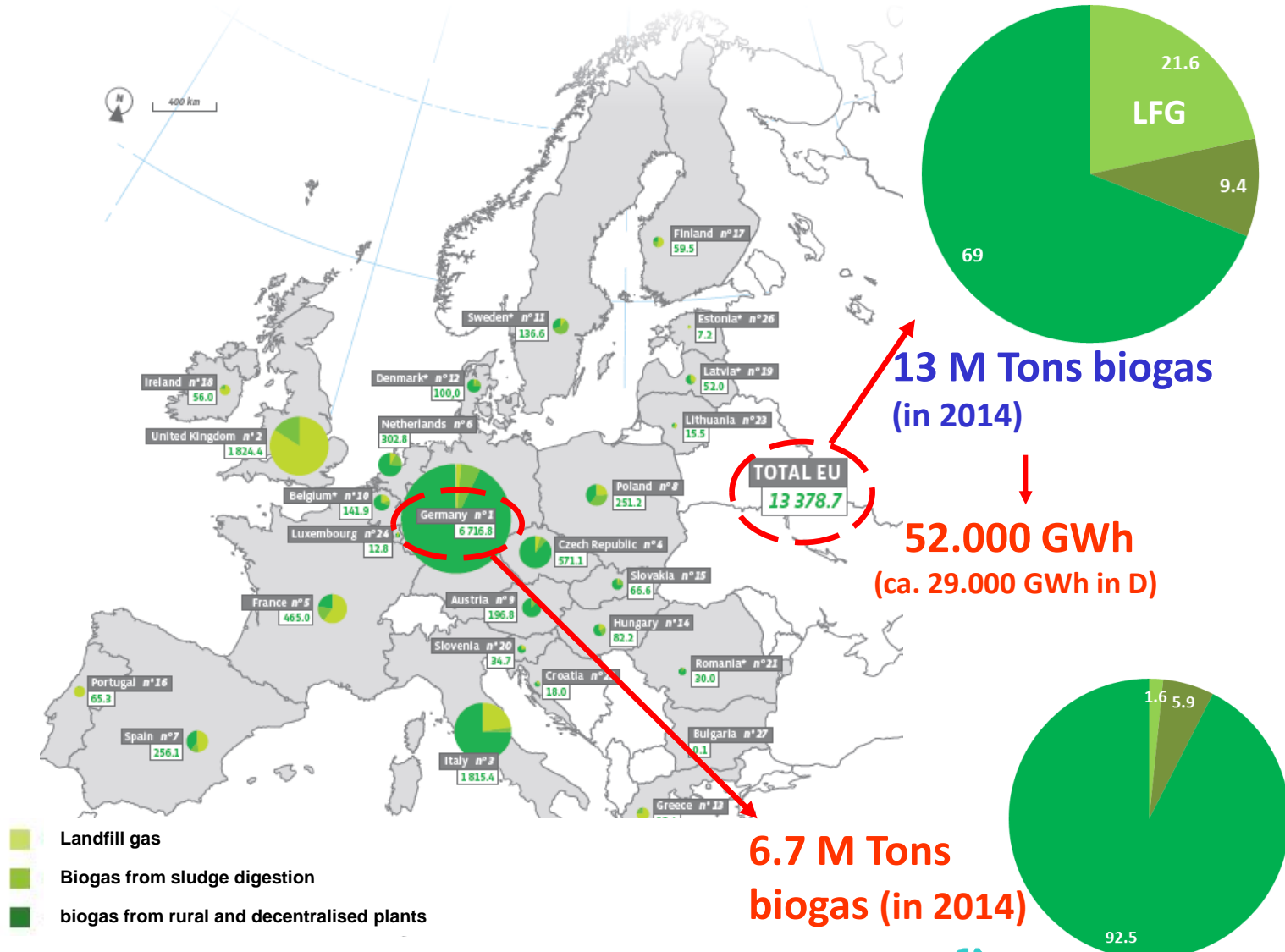
# Waste Management in Europe

- Waste recycling → **Anaerobic fermentation** -



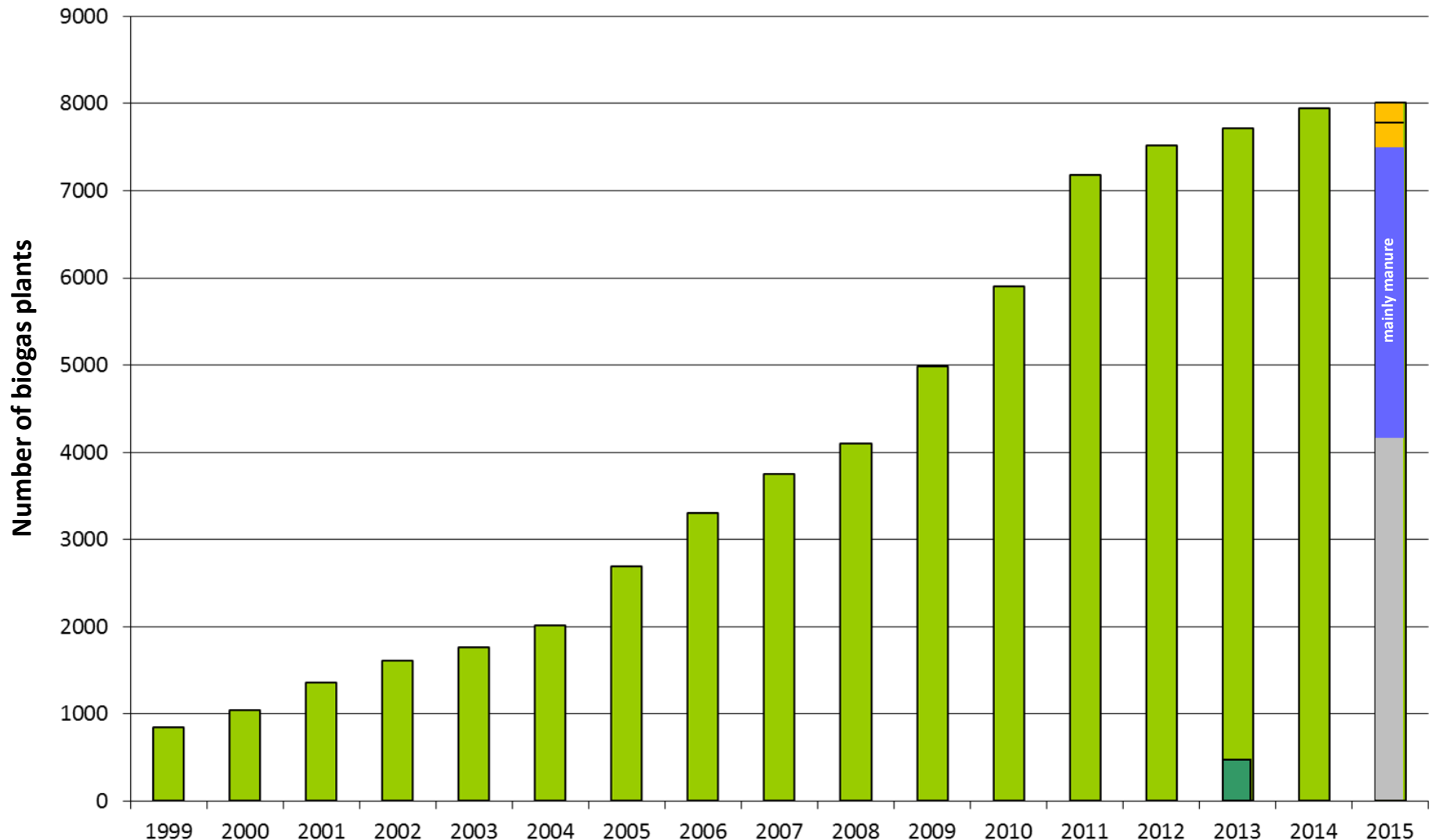
# Waste Management in Europe

- Waste recycling → **Bio gas production** -



# Waste Management in Europe

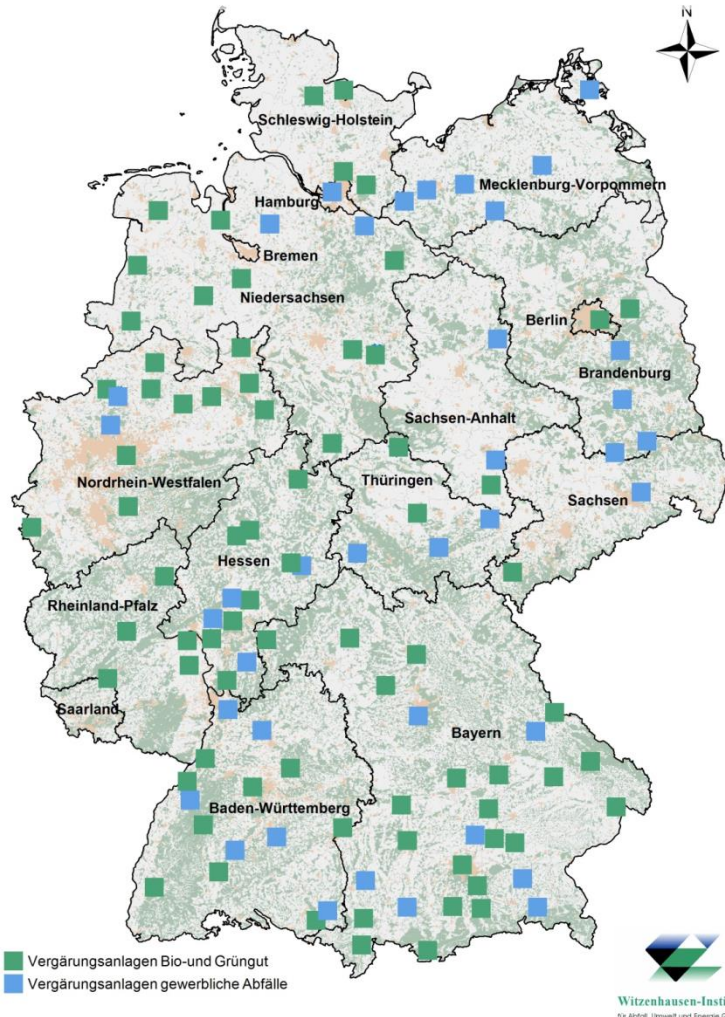
- Waste recycling → **Bio gas plants in Germany** -



Daten: DBFZ (2010); Fachverband Biogas (2010); statista.com (2015)

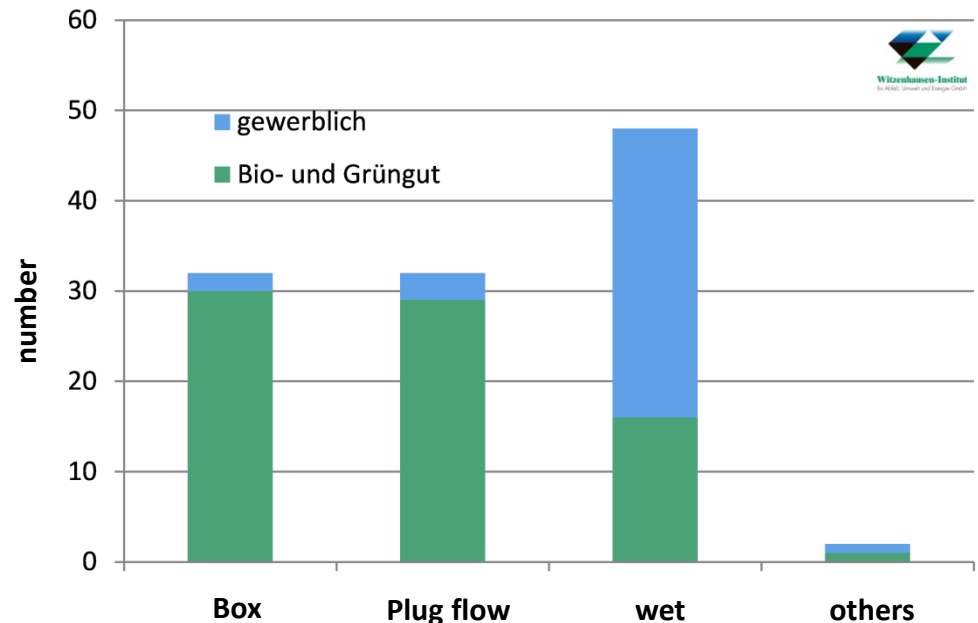
# Waste Management in Europe

- Waste recycling → **Biowaste Digestion plants in D** -



113 plants with a capacity of >5.000 Mg/a biowaste input according to BioAbfV.

## Fermentation technology





# Waste Management in Europe

## - Waste recycling → **C&D-Waste** -



Recycling quota approx. **90%**



# Waste Management in Europe

## - Waste recycling → **End-of-life vehicles** -

- End of life vehicles generate between **8 and 9 million tonnes of waste**
- **EU End-of-Life-Vehicle Directive (2000/53/EG)**

### Aims:

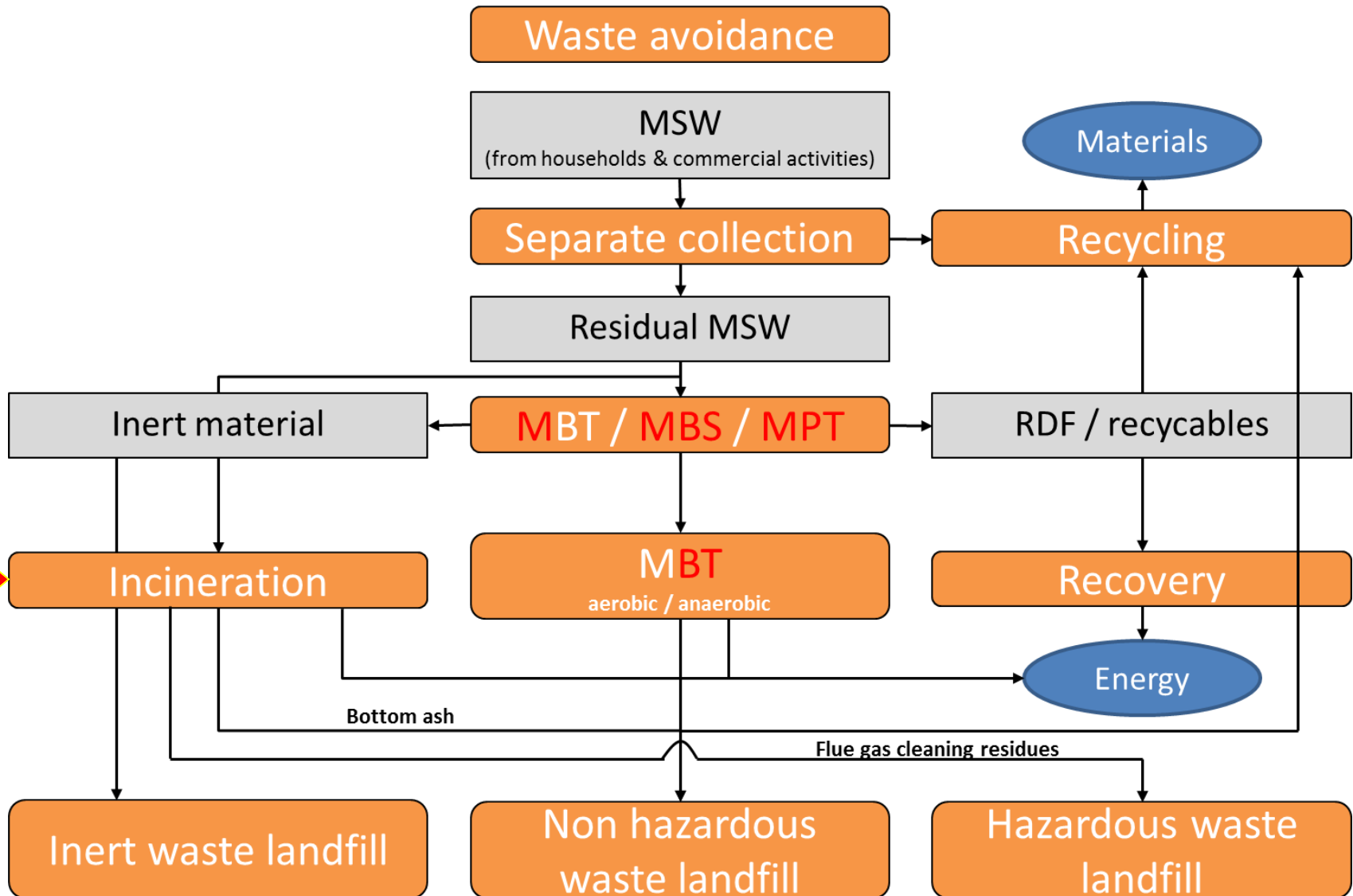
- More **environmentally friendly** vehicle dismantling and recycling;
- **Quantified targets for reuse, recycling and recovery** of vehicles and their components;
- Pushes producers to manufacture new vehicles with a view to their **recyclability**.



**Recovery quota: 95%**  
since 2015, from this max.  
10 % energy recovery

# Waste Management in Europe

## - General concept of MSW management -

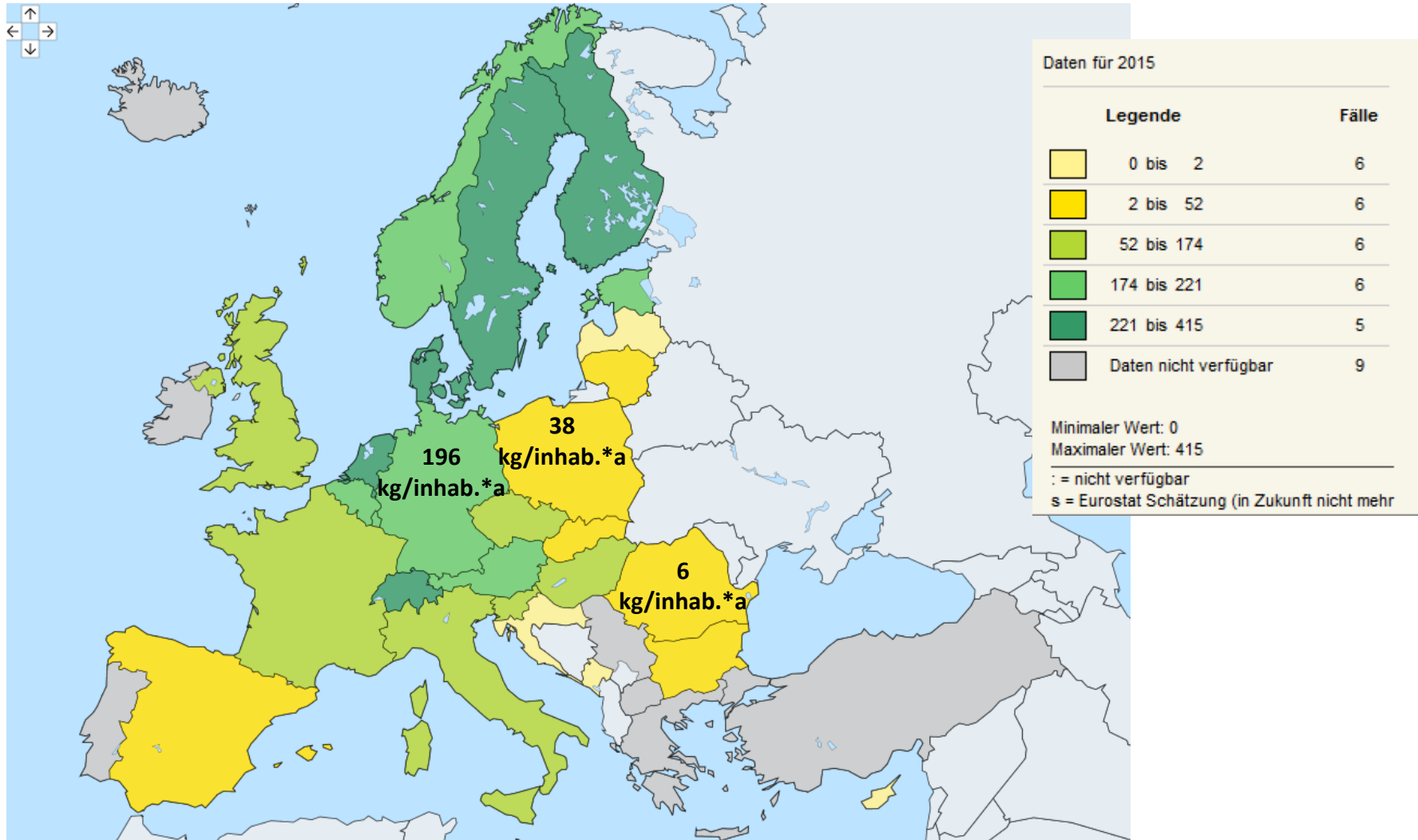


# Directive 2000/76/EC on the incineration of waste (WI Directive)

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- Aims to **prevent or reduce** as far as possible **negative effects on the environment** caused by the incineration and co-incineration of waste;
- Contains **operational conditions, technical requirements, and emission limit values** (NO<sub>x</sub>, SO<sub>2</sub>, HCl, HF, heavy metals and dioxins and furans);
- **public consultation, access to information and participation in the permitting procedure.**

# Amount of MSW for Incineration



# Waste Management in Europe

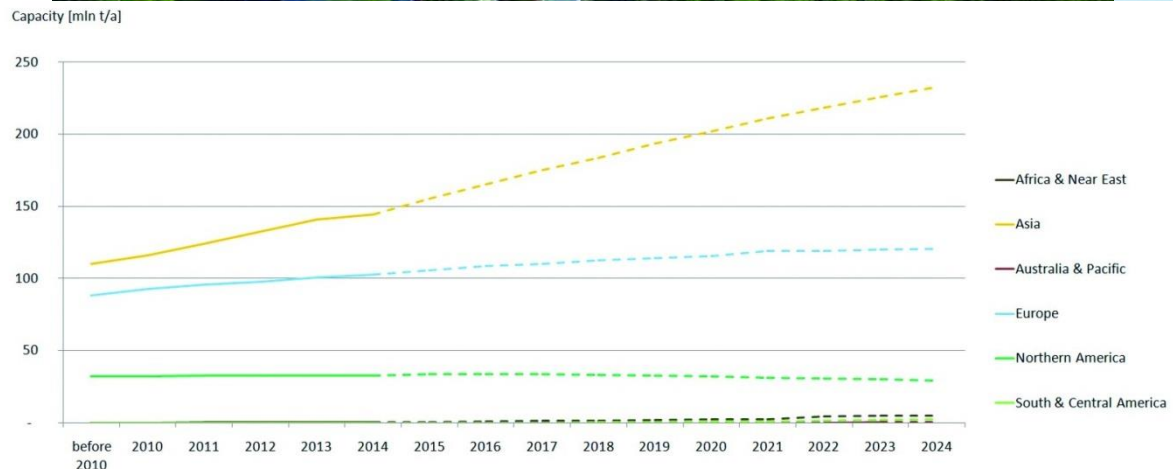
## - Incineration – today -

**Efficiency (net):**

Electr.: 13% → 18%

Heat: 32% → 42%

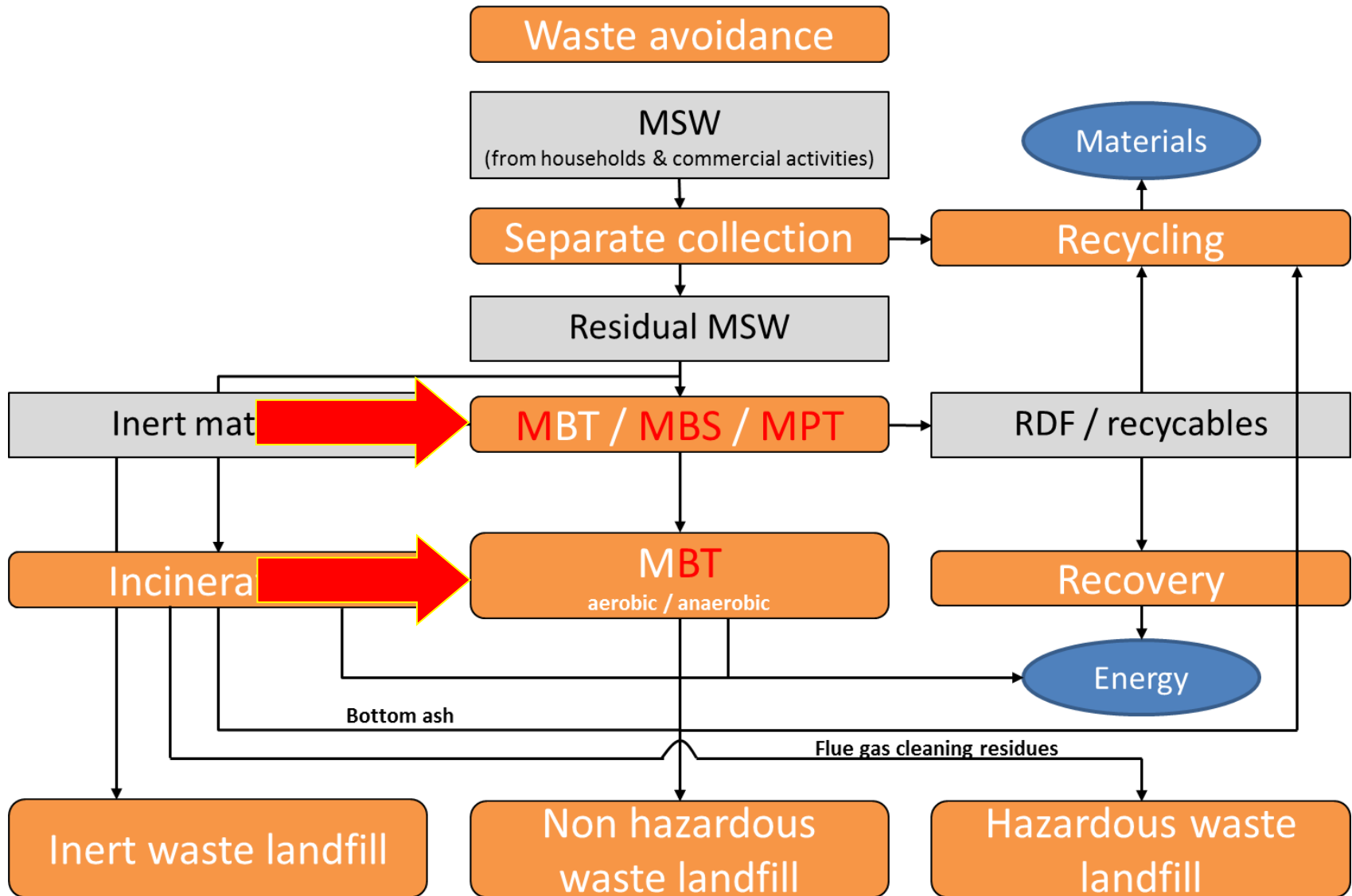
High standards for flue gas cleaning



Data partly estimated up to 2014, from 2015 on forecasted, Source: ecoprog

# Waste Management in Europe

## - General concept of MSW management -



# Waste Management in Europe

## - MBT -



Photo: B. Schulte, MBA Polsche Heide



Photo: TUHH (MBA Lübeck)



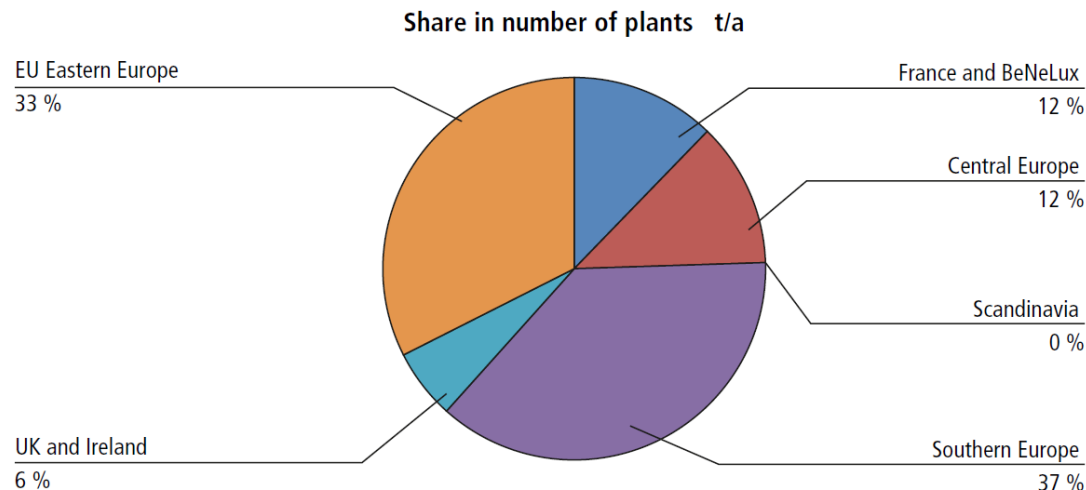
Photo: TUHH



# Waste Management in Europe

## - MBT -

- More than **490 plants in operation** with an annual capacity of **47 M tons (2015)**;
- About **50%** of all MBT plants are operated in **Italy** and **Poland**;
- **France** and **Germany** are operating ca. **50 plants** each;
- In **Spain, France** and **partly Italy** some of the MBT material is applied in **agriculture**.



# Waste Management in Europe

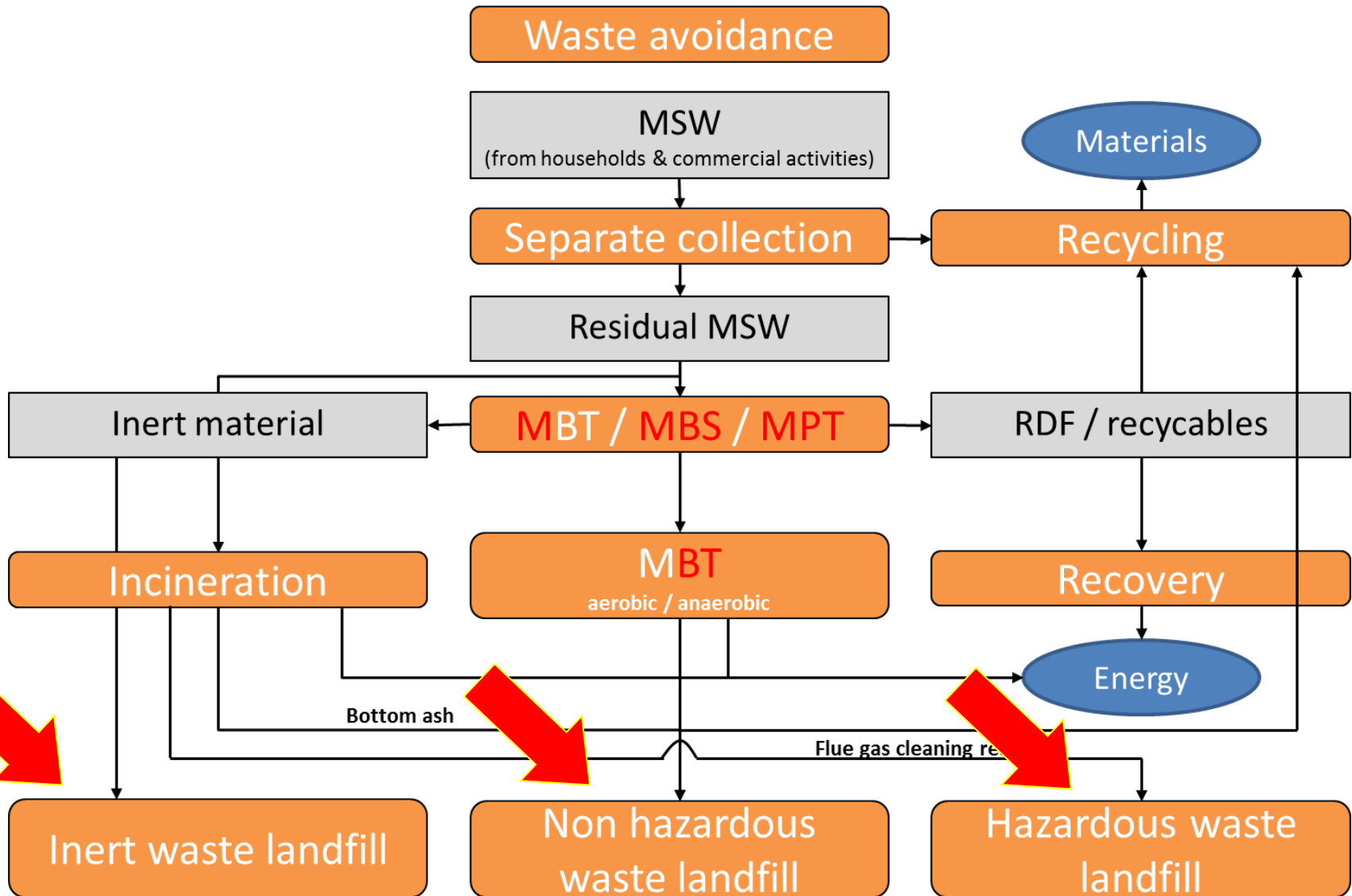
## - MBT → costs -

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- **Average waste acceptance prices at MBT plants: 120 Euro/Mg\***  
(depending on (long term) contracts and capacities in the individual federal states; range is 80 to 180 Euro/Mg)
- **Average acceptance prices for RDF at power plants or cement kilns: 50 Euro/Mg\***  
(significant differences between the individual federal states: 20 to 120 Euro/Mg)
- **Compensation for electricity fed into the grid: 5.7 – 13.3 ct/kWh°**
- **Average waste disposal costs at class II landfills: 80 – 100 Euro/Mg<sup>°°</sup>**

# Waste Management in Europe

## - General concept of MSW management -



# Council Directive 1999/31/EC on the landfill of waste (EU Landfill Directive)

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- **prevent or reduce** as far as possible **negative effects on the environment**, in particular on surface water, groundwater, soil, air, and on human health from the landfilling of waste;
- Contains **stringent technical requirements** for waste and landfills
- defines the different **categories** of waste (hazardous waste, non-hazardous waste and inert waste)
- Member States must ensure that existing landfill sites may not continue to operate unless they **comply with the provisions of the Directive.**

# Council Directive 1999/31/EC on the landfill of waste (EU Landfill Directive)

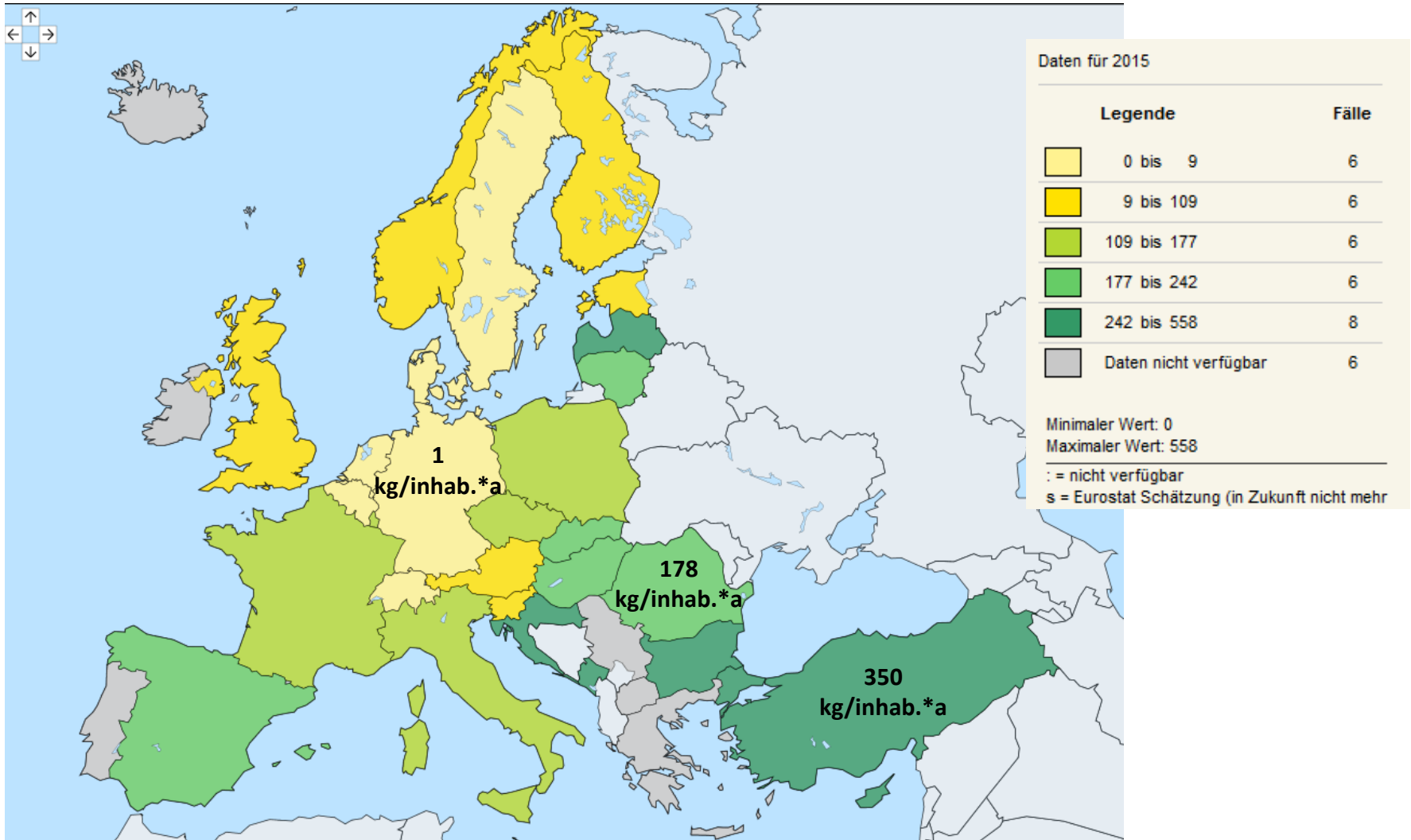
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Reduction of the **biodegradable fraction** in waste in three steps:

- 25% (  $\leq 5$  years after 1999 )
- 50% (  $\leq 8$  years after 1999 )
- 65% (  $\leq 15$  years after 1999 )

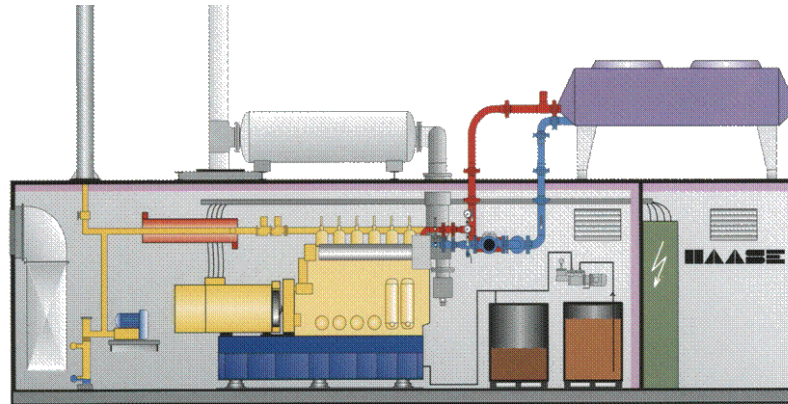
*Percentage of reduction related to MSW composition in 1995*

# Amount of MSW for disposal / landfilling



# Waste Management in Europe

## - Landfills: Emissions control & monitoring -



# Waste Management in Europe

## - MBT Landfills -





# Waste Management in Europe

## - Fees & costs -

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- Household waste management is a **service for citizens**
  - **Municipalities are responsible** for safe collection, transport and disposal of household waste
  - **Waste producer has to pay** for this service
  - Municipality demands **fees from waste producer** (= citizen)
- *Business objective of a fee-financed company is not to make high profits, but to work wise with the budget in favour of the citizens*

# Waste Management in Europe

## - Fees & costs -

- Up to **80%** of total costs for household waste management are **fixed costs**
- Main cost factors: **Employees & treatment plants** (~30% each)
- Price comparison (€/ton) in different areas of Germany (December 2013) (prices to be paid by waste owner for treatment)

	<b>North</b>	<b>East</b>	<b>South</b>
Incineration (municipal)	75 – 180	40 – 140	70 – 190
MBA (municipal)	50 – 165	80 – 190	110 – 140

# Waste Management in Europe

## - Conclusions -

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**Prediction of future waste management is difficult (new laws, economical situation, possible epidemics, scandals etc.). Some trends are:**

- On demand waste collection in subsurface containers
- Intensification of the „producer pay“ principle
- Further optimization of paper and glass collection in bring containers
- Increased automatic separation of metals and different kinds of plastic from waste (substitution of hand sorting)
- Separation of the RDF-fraction (thermal recovery)

# Waste Management in Belarus

## - Perspectives -

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**Starting point:** It took approx. 40 years to reach the current high waste management standard in Germany and some other EU countries;

What are the **main driving forces**?

- Legal and organisational framework
- Financial framework
- Education (schools and universities)
- MBT and Incineration are the main treatment options
- Separate collection proved to be essential (organic waste, WEEE, glass, paper, cardboard, packaging)

**However,**

- Landfills will remain being the most important waste disposal option for many decades to come.

16 November 2017, Mogilev, Belarus

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**Thank you very much for your attention!**

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