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Waste Management in the EU:

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



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

- 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)

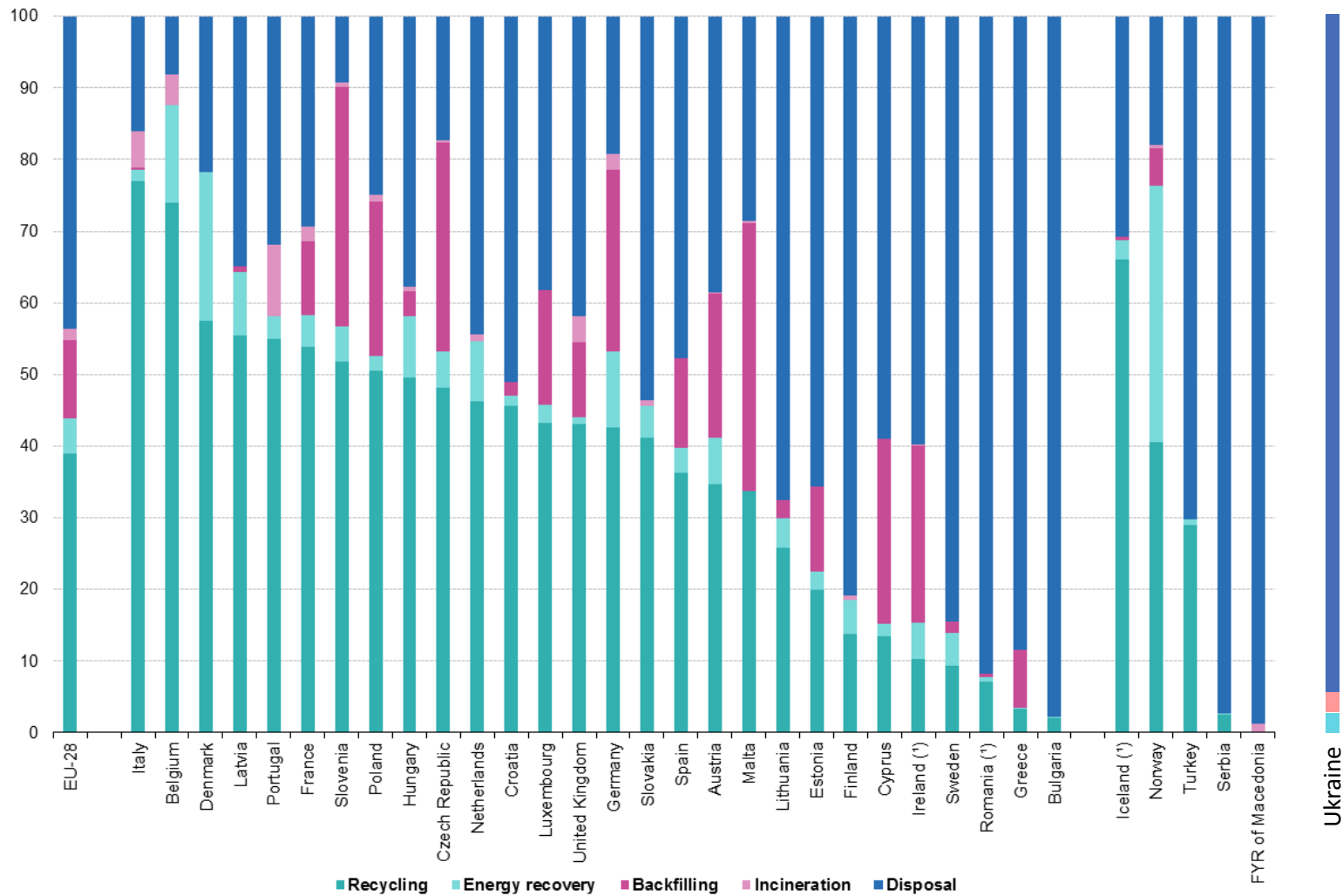
Objectives:

- 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)

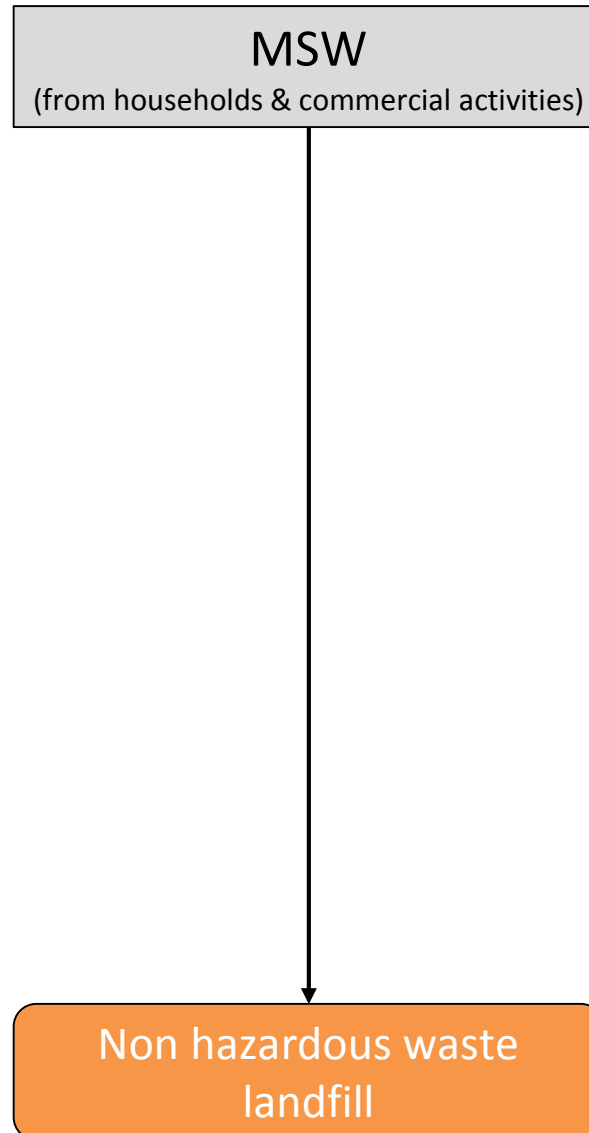
Review of Waste Policy and Legislation (Circular Economy Package)

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;

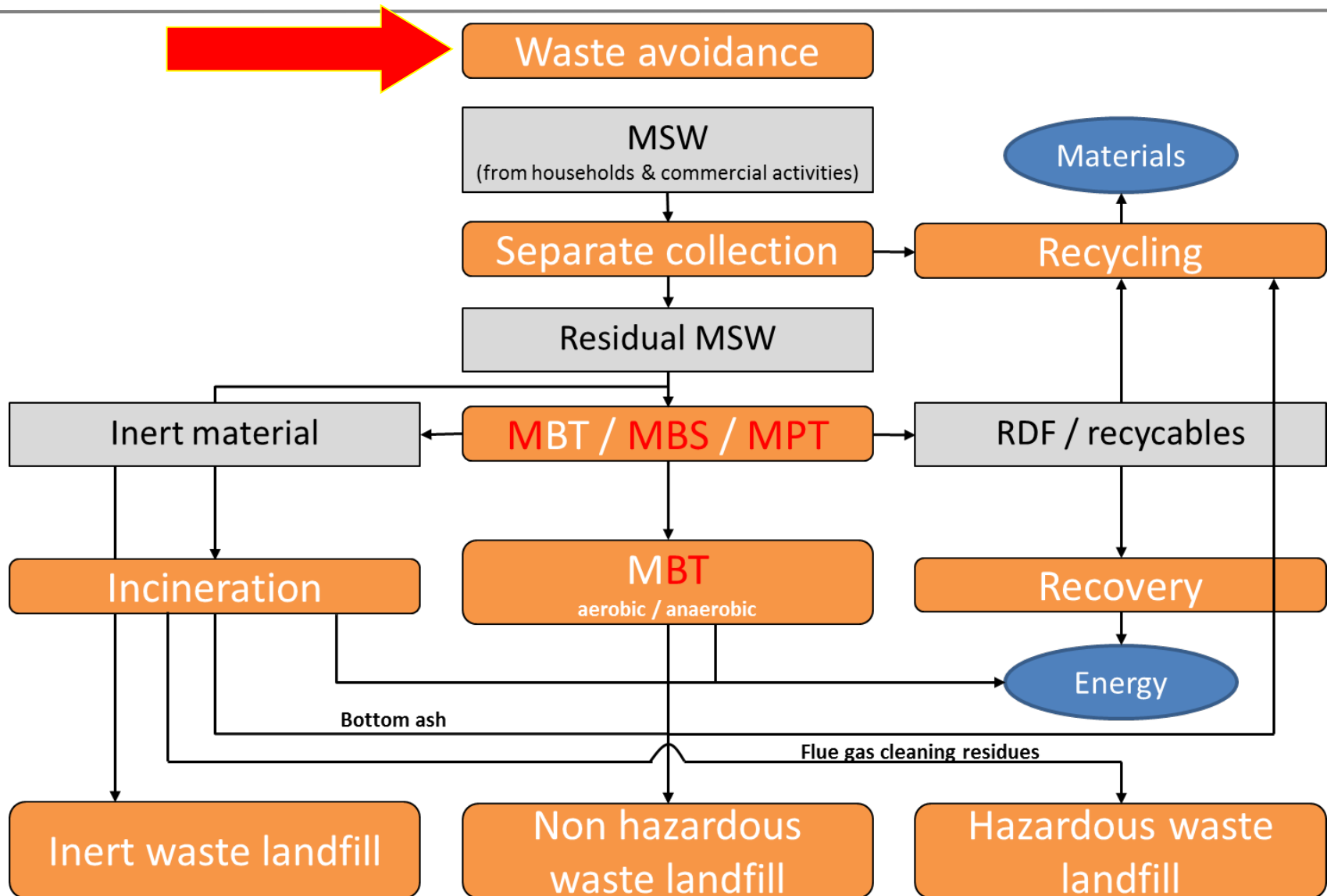
Waste Management in Europe

- General concept of MSW management (old) -

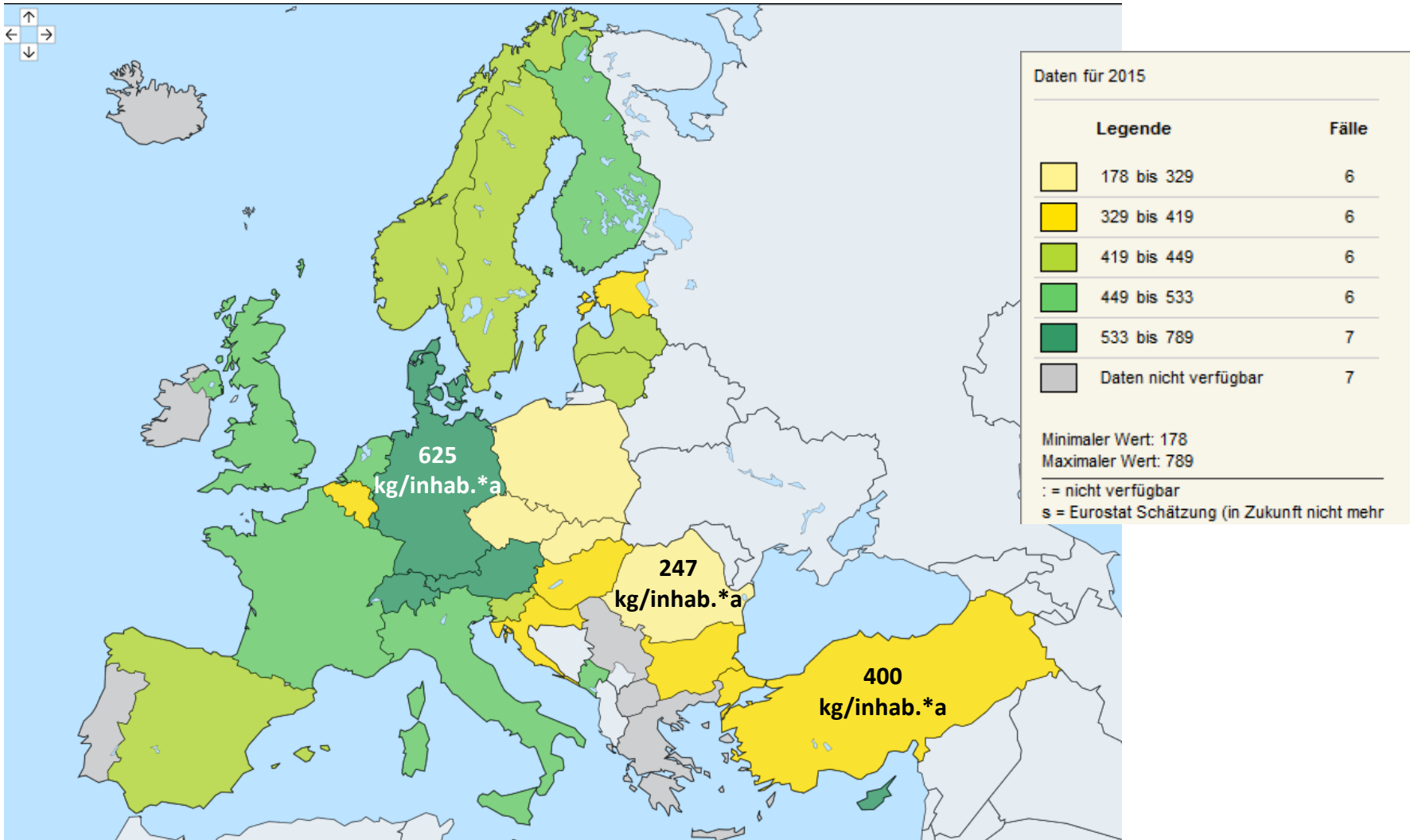


Waste Management in Europe

- 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

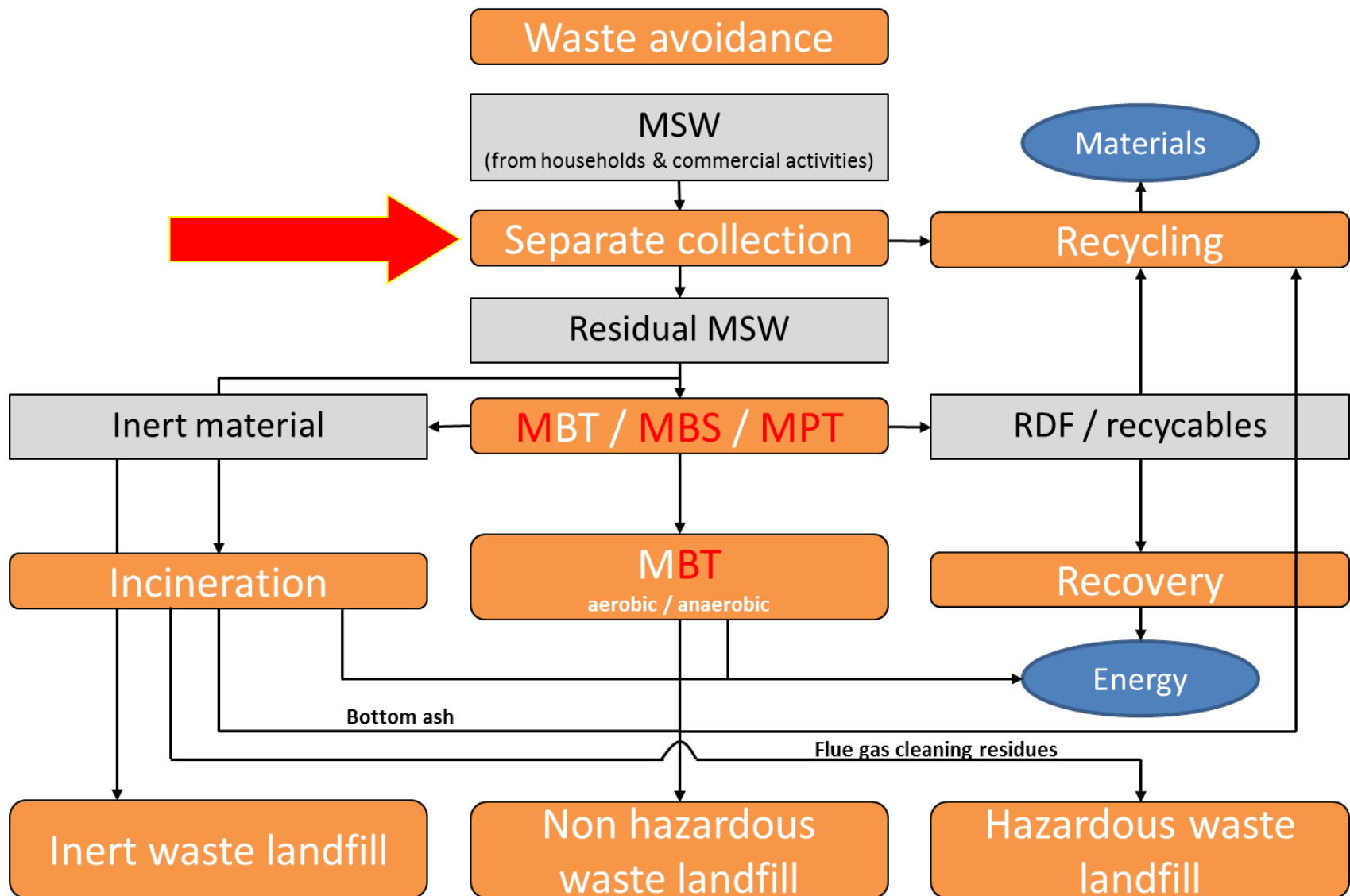
120 l (14 days): € 1.81

Paper & packaging

(4 weeks): free of charge

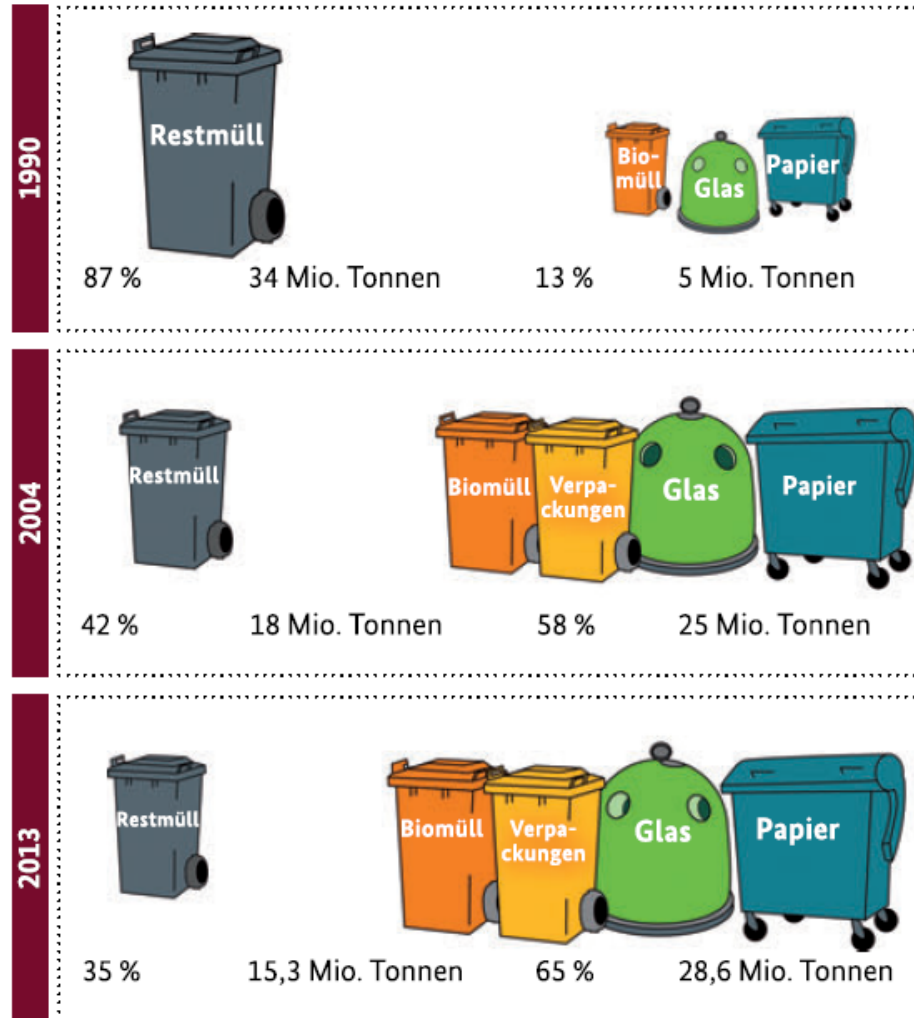
Waste Management in Europe

- General concept of MSW management -



Waste Management in Europe

- Separate collection, Example Germany -



Waste Management in Europe

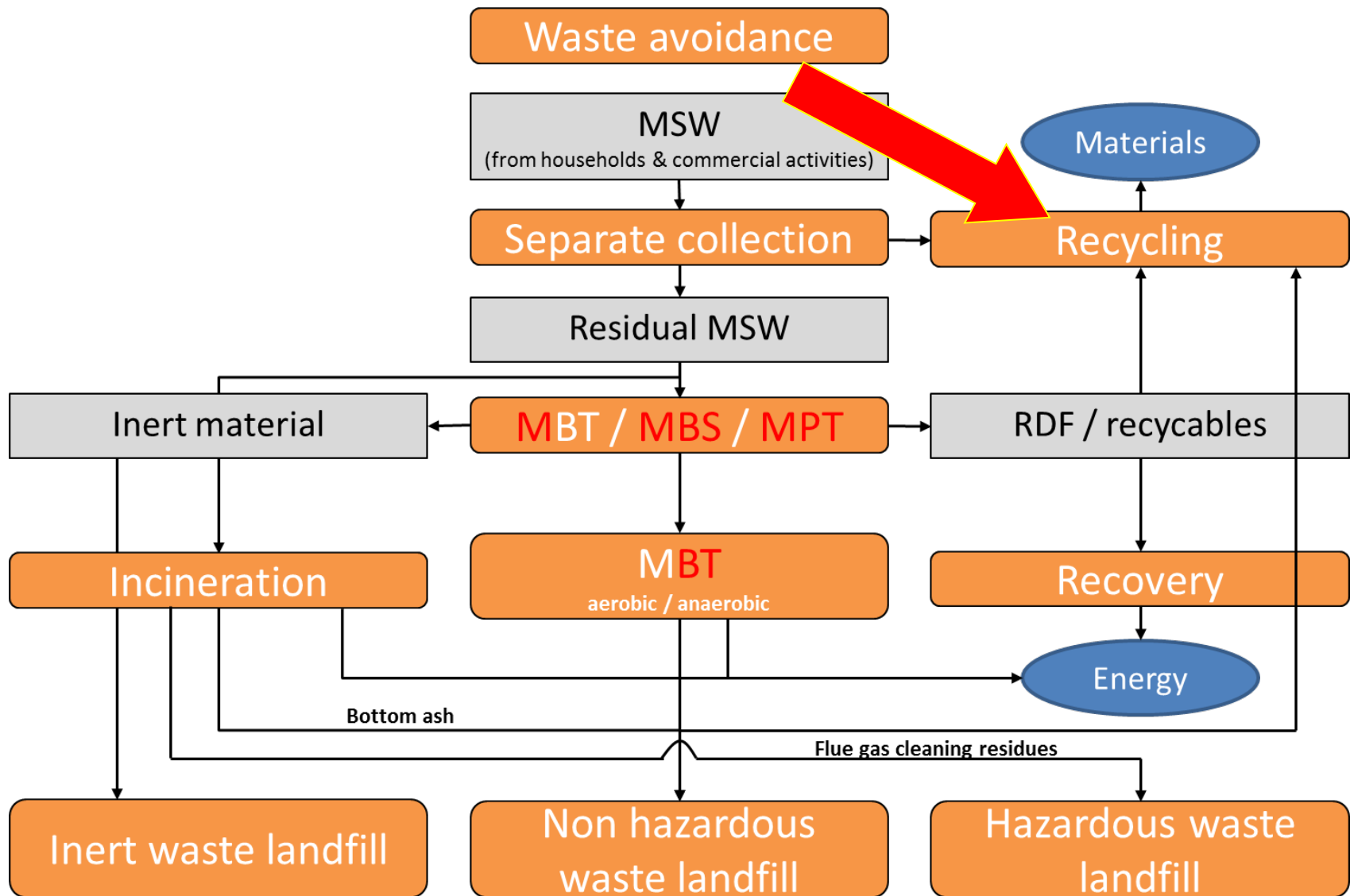
-funding schemes for waste collection in 28 EU capital cities-

	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
Average collection rate (separate collected/generated MSW quantities)	35 %	17 %	17 %	10 %

PAYT: pay as you throw

Waste Management in Europe

- General concept of MSW management -



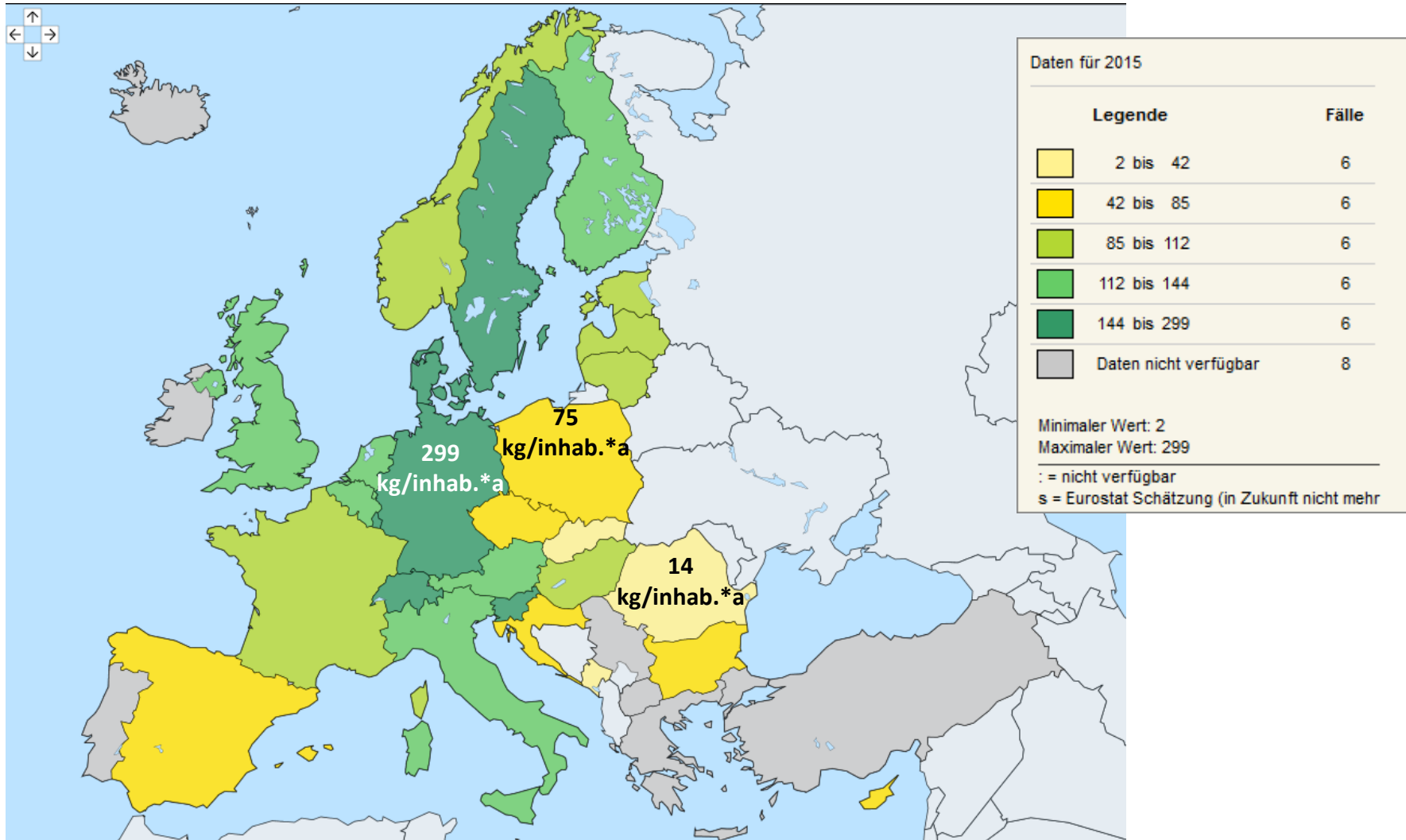
Waste Management in Europe

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

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** -

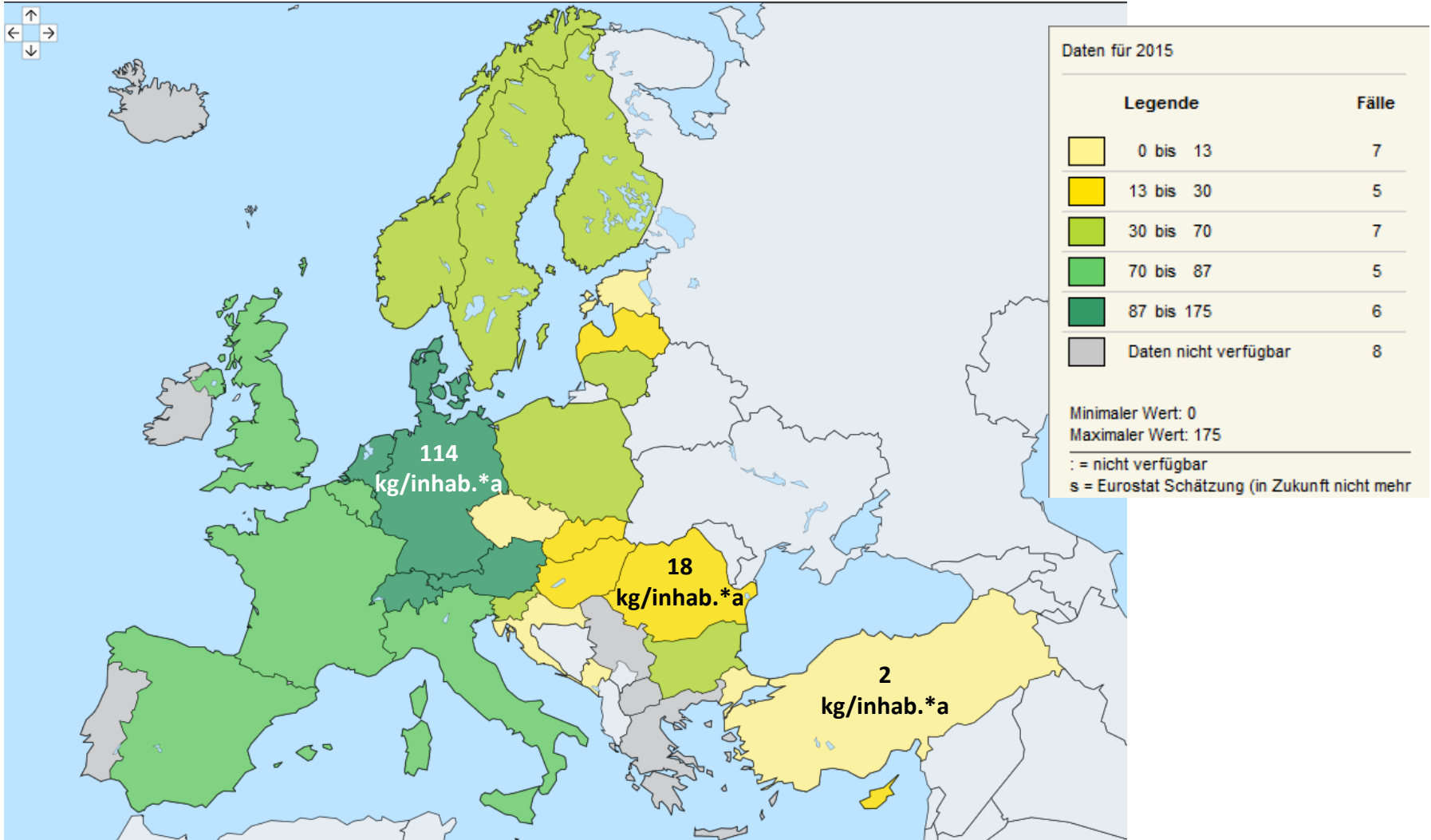
- **Bio-waste (Europe): 30 – 40% of household waste**
- **Annual amount of bio-waste in EU: ca. 110 M tons**
- **Today, only 20% are separately collected and utilised**



Example Germany:

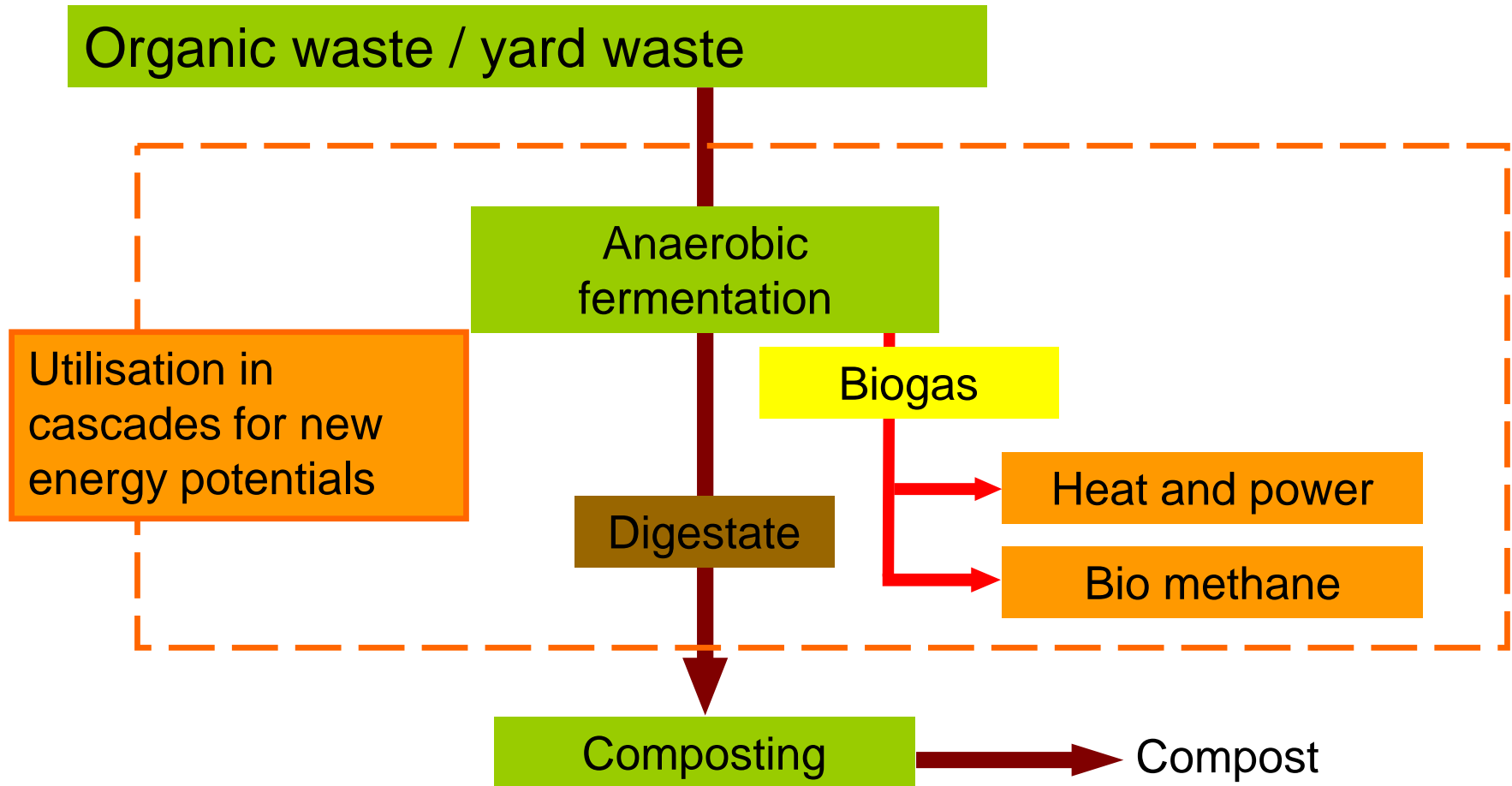
- ca. 105 kg bio and green waste per capita and year are separately collected (potential approx. 40% higher*)
- Out of these ca. 9.2 M tons bio and green waste approximately 4.3 M tons of compost are produced
- **In Europe, up to 10% of the fertilizers currently used in agriculture could be substituted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

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



Waste Management in Europe

- Waste recycling → **Composting** -



Waste Management in Europe

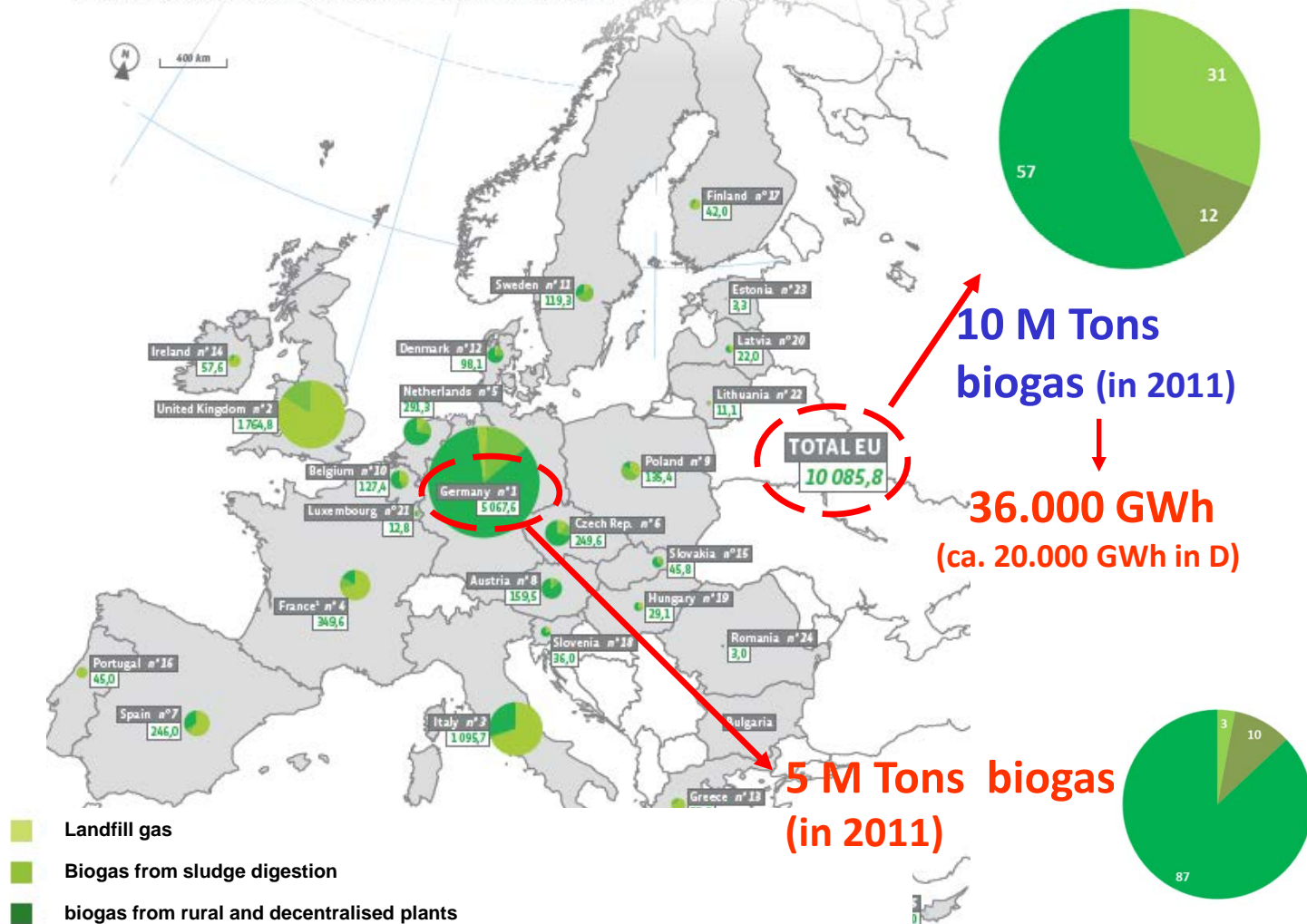
- Waste recycling → **Anaerobic fermentation** -



Waste Management in Europe

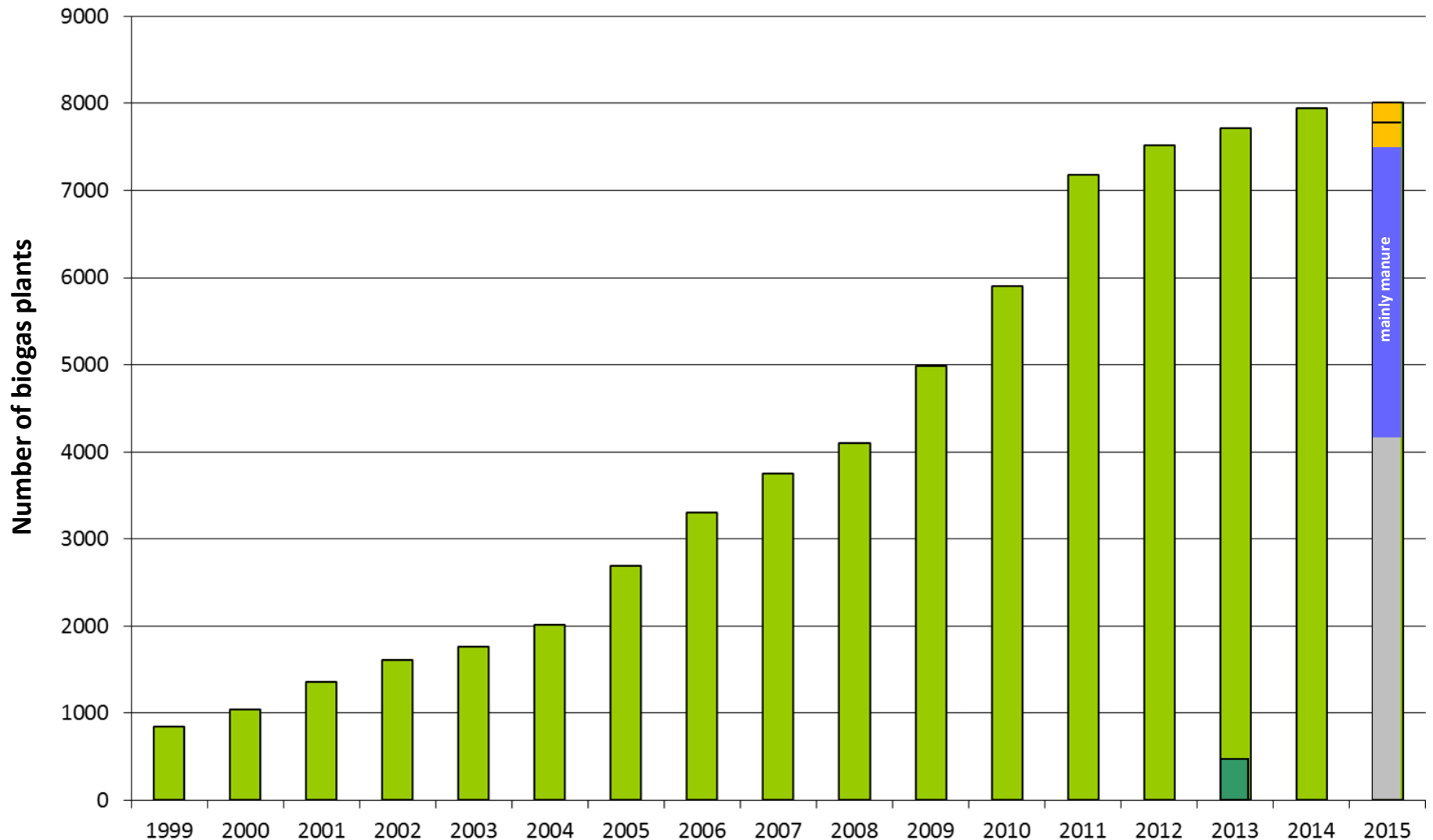
- Waste recycling → **Bio gas production** -

Primary energy production of biogas in the European Union in 2011* (ktoe) with respective shares of each sector



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 → **C&D-Waste** -



Recycling quota up to 100% (!)



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:

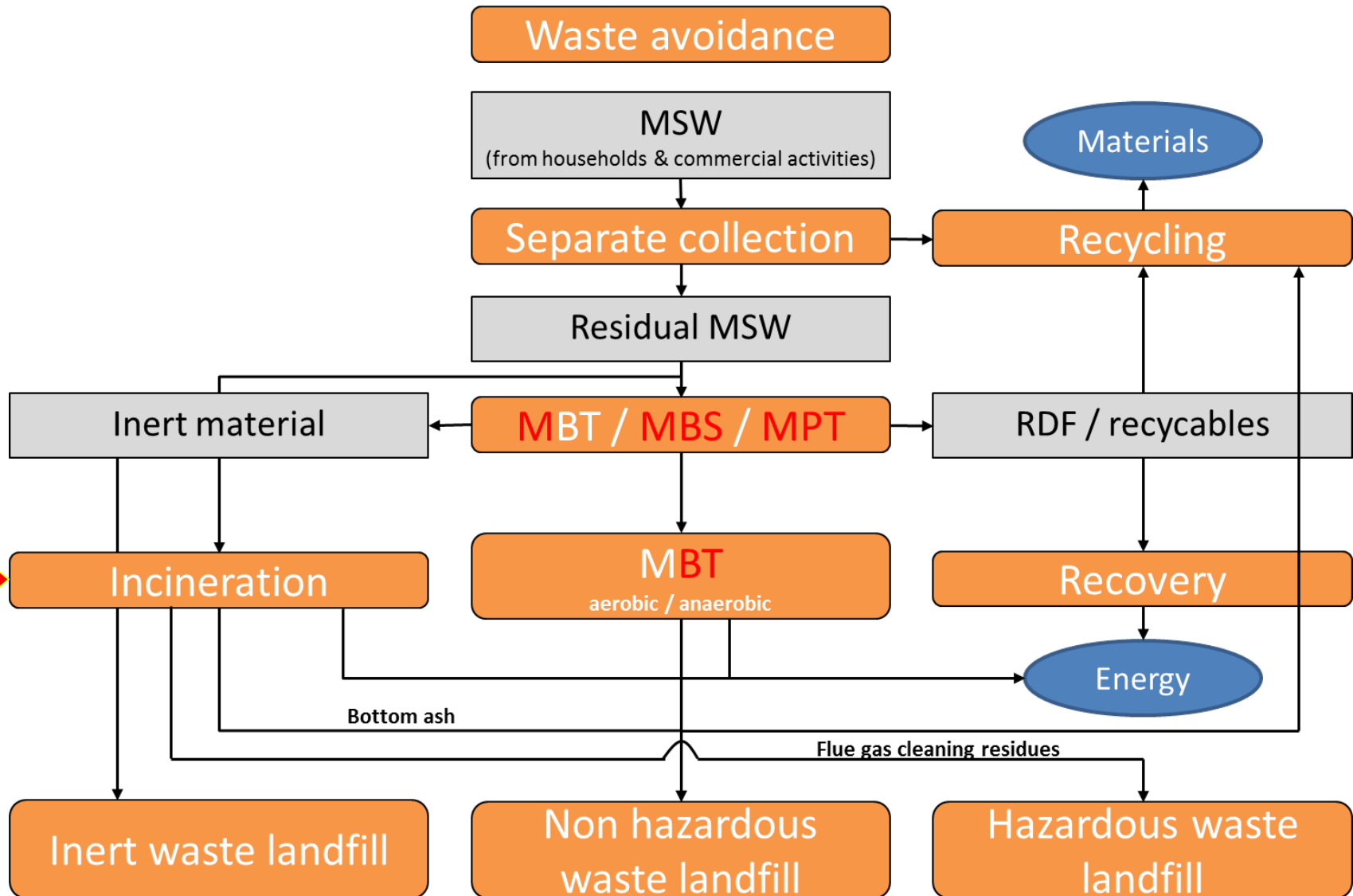
- More **environmentally friendly** vehicle dismantling and recycling;
- **Quantified targets for reuse, recycling and recovery** of vehicles and their components;
- Pushes producers to manufacture new vehicles with a view to their **recyclability**.



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

Waste Management in Europe

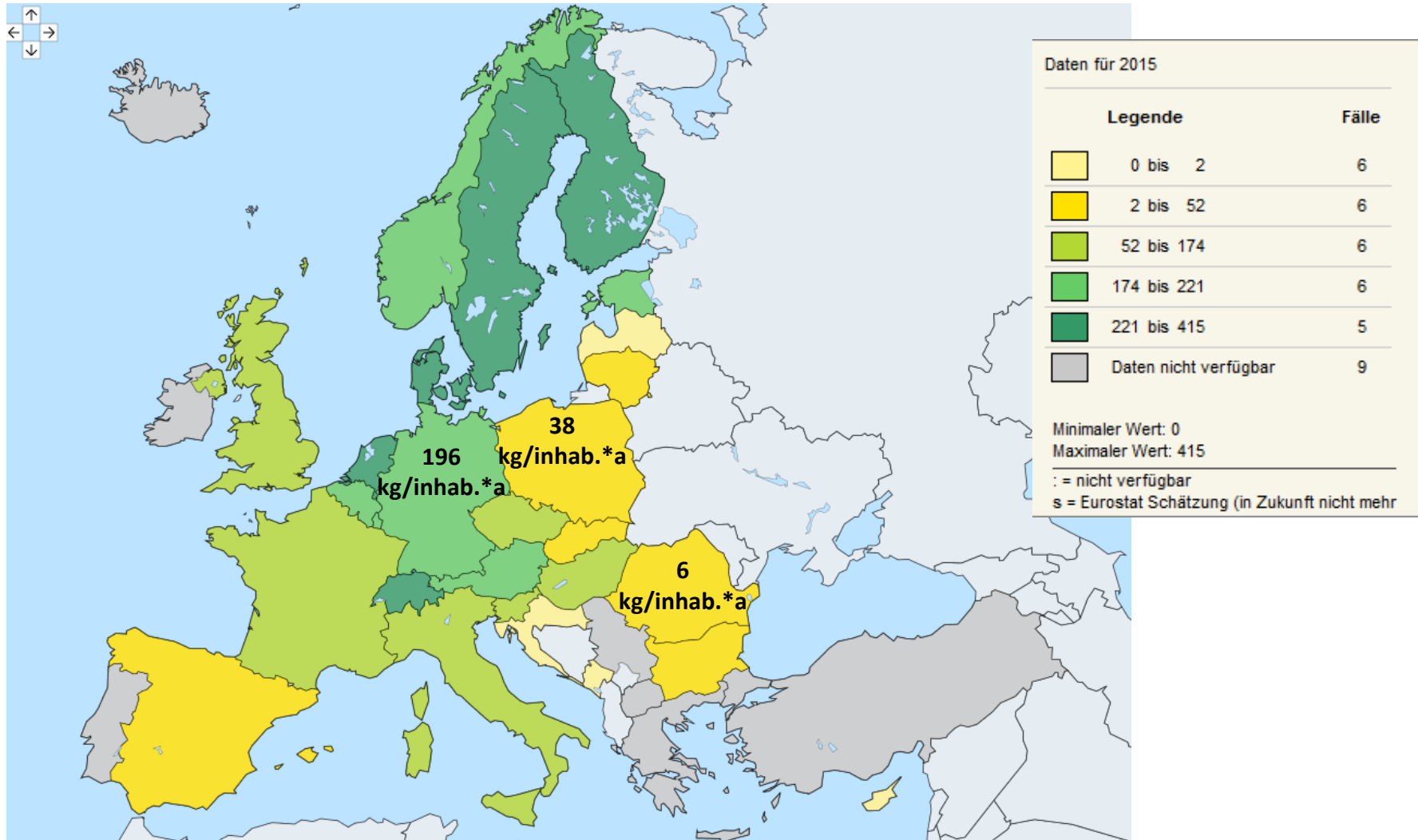
- General concept of MSW management -



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

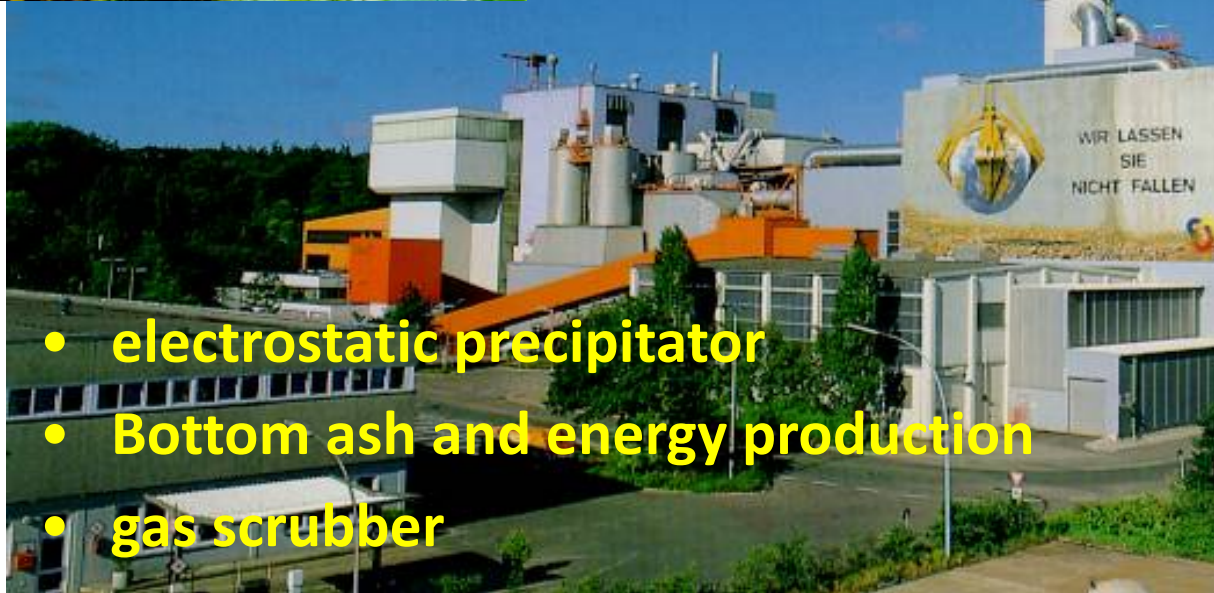
- Aims to **prevent or reduce** as far as possible **negative effects on the environment** caused by the incineration and co-incineration of waste;
- Contains **operational conditions, technical requirements, and emission limit values** (NO_x, SO₂, HCl, HF, heavy metals and dioxins and furans);
- **public consultation, access to information and participation in the permitting procedure.**

Amount of MSW for Incineration



Waste Management in Europe

- Incineration – today -

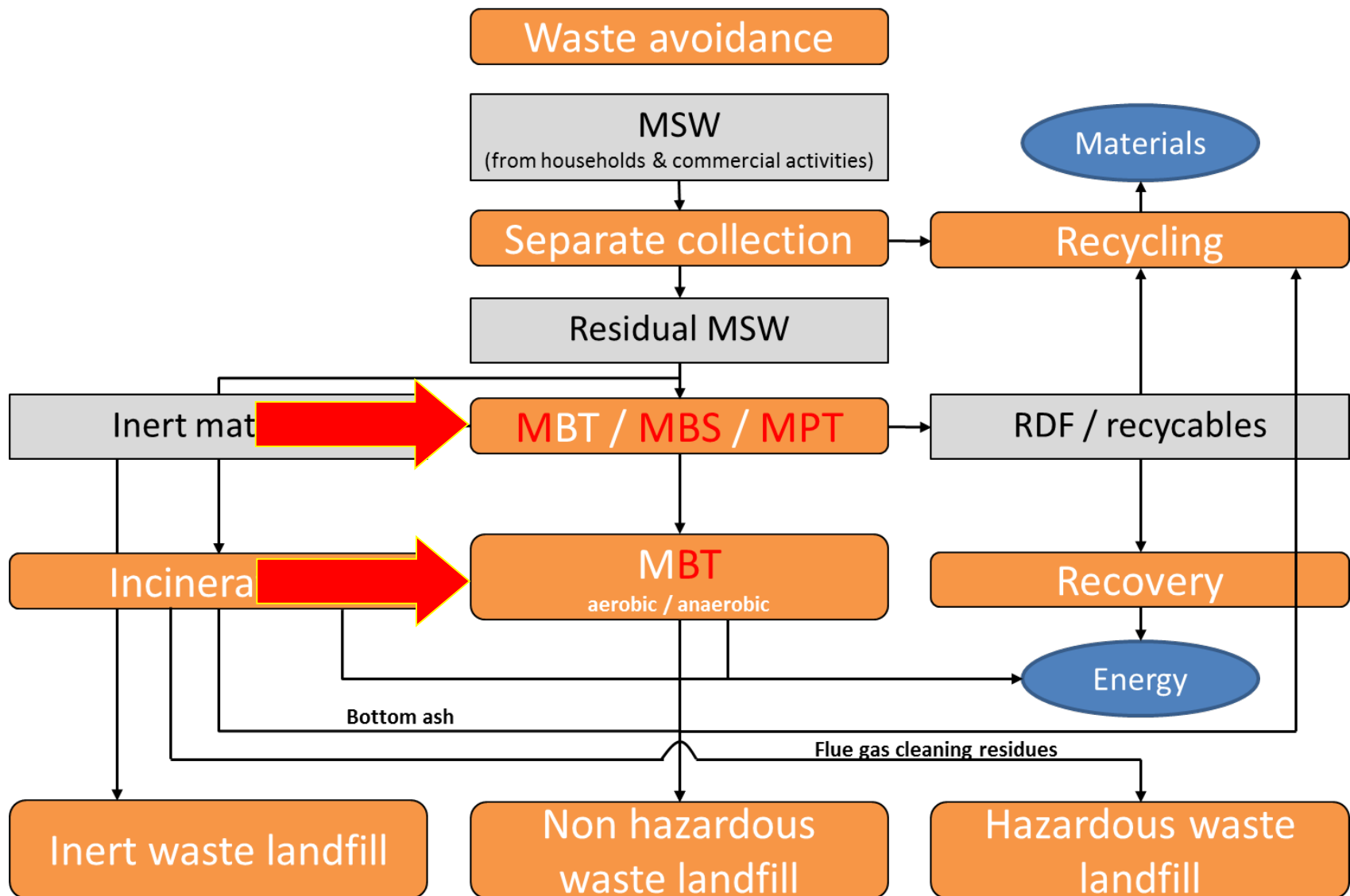


- electrostatic precipitator
- Bottom ash and energy production
- gas scrubber



Waste Management in Europe

- General concept of MSW management -



Waste Management in Europe

- MBT -



Photo: B. Schulte, MBA Polsche Heide



Photo: TUHH (MBA Lübeck)

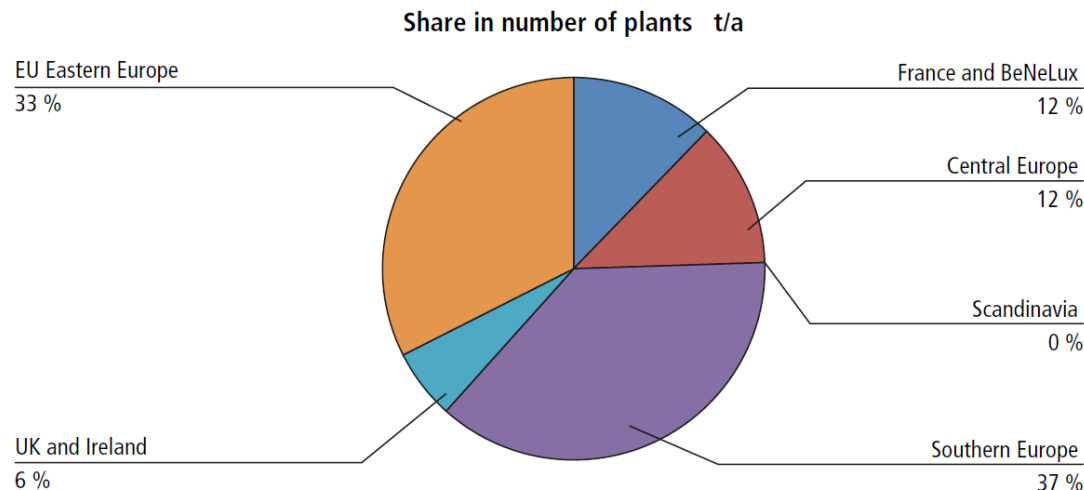


Photo: TUHH

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**.



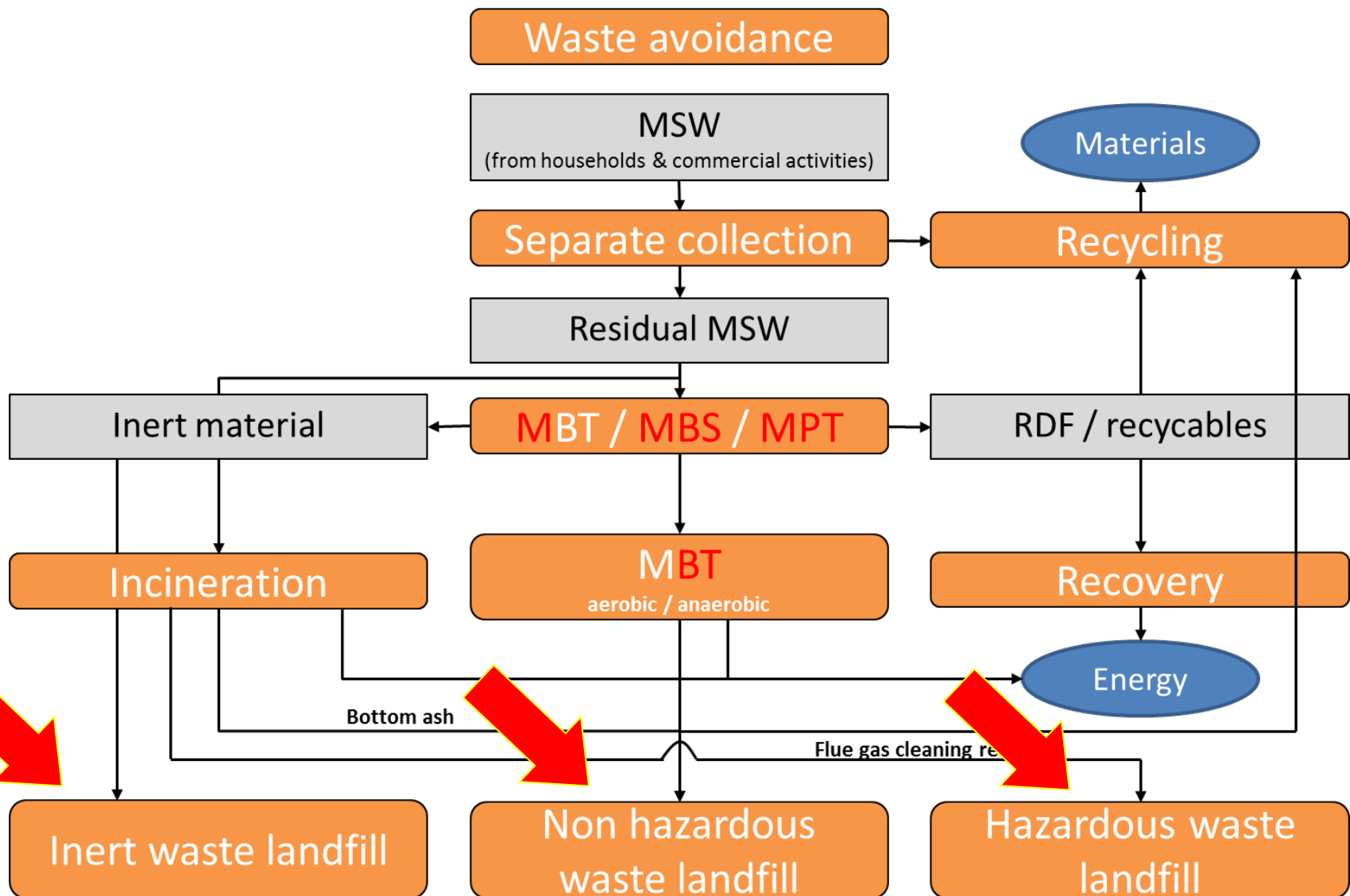
Waste Management in Europe

- MBT → costs -

- **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^{oo}**

Waste Management in Europe

- General concept of MSW management -



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

- **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.**

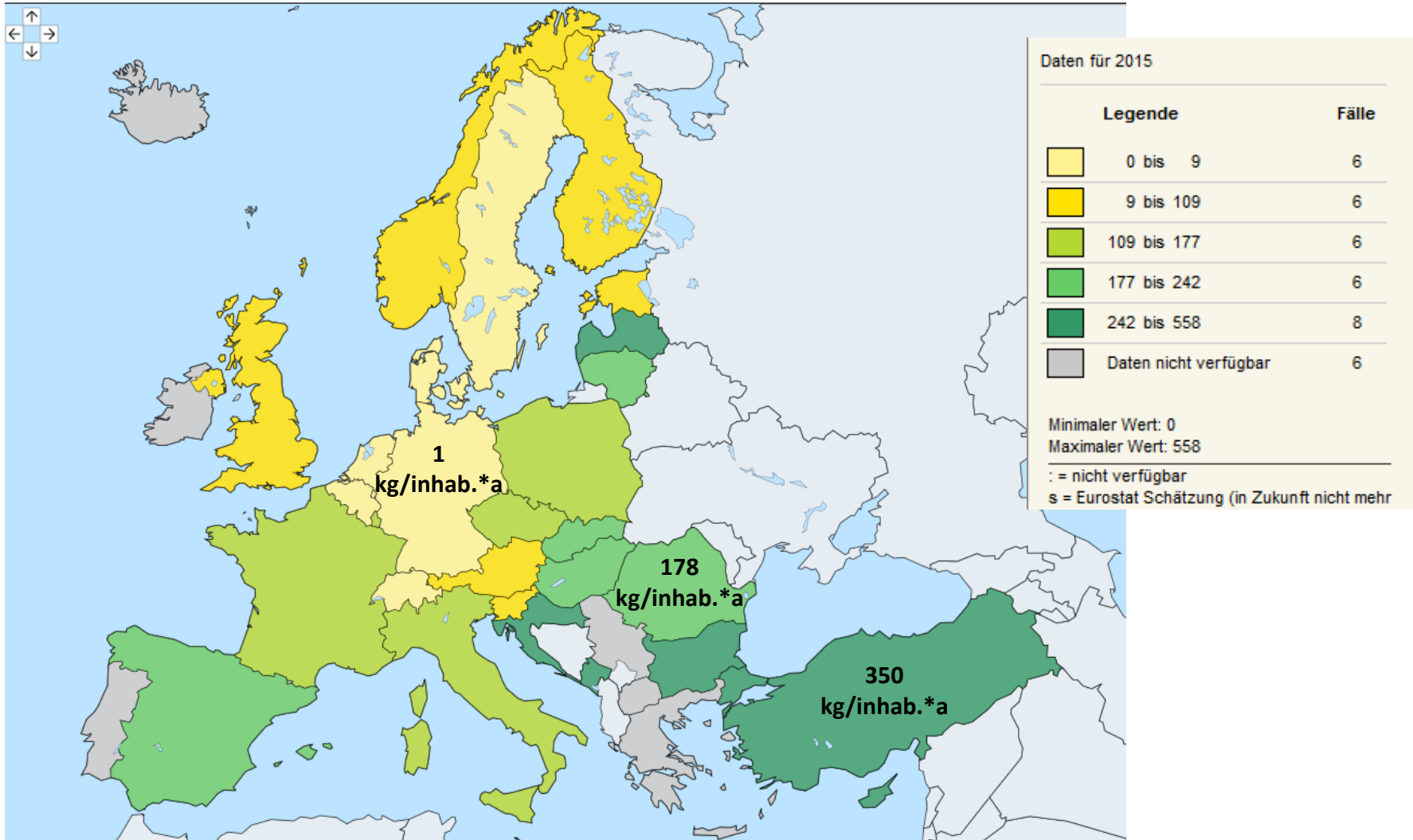
Council Directive 1999/31/EC on the landfill of waste (EU Landfill Directive)

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)

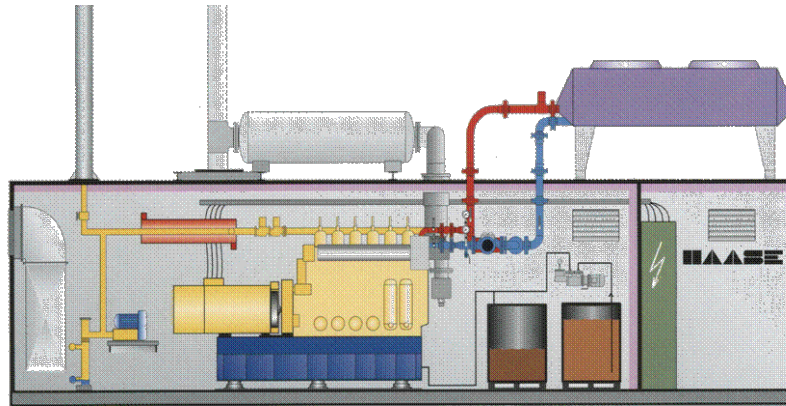
Percentage of reduction related to MSW composition in 1995

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 -

- 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)

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

Waste Management in Europe

- Conclusions -

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 the Ukraine

- Perspectives -

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.

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Thank you very much for your attention!

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