



Waste Management in the EU

- Landfill Ban and the Issue of Biogenic waste -

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Bioenergy NoE

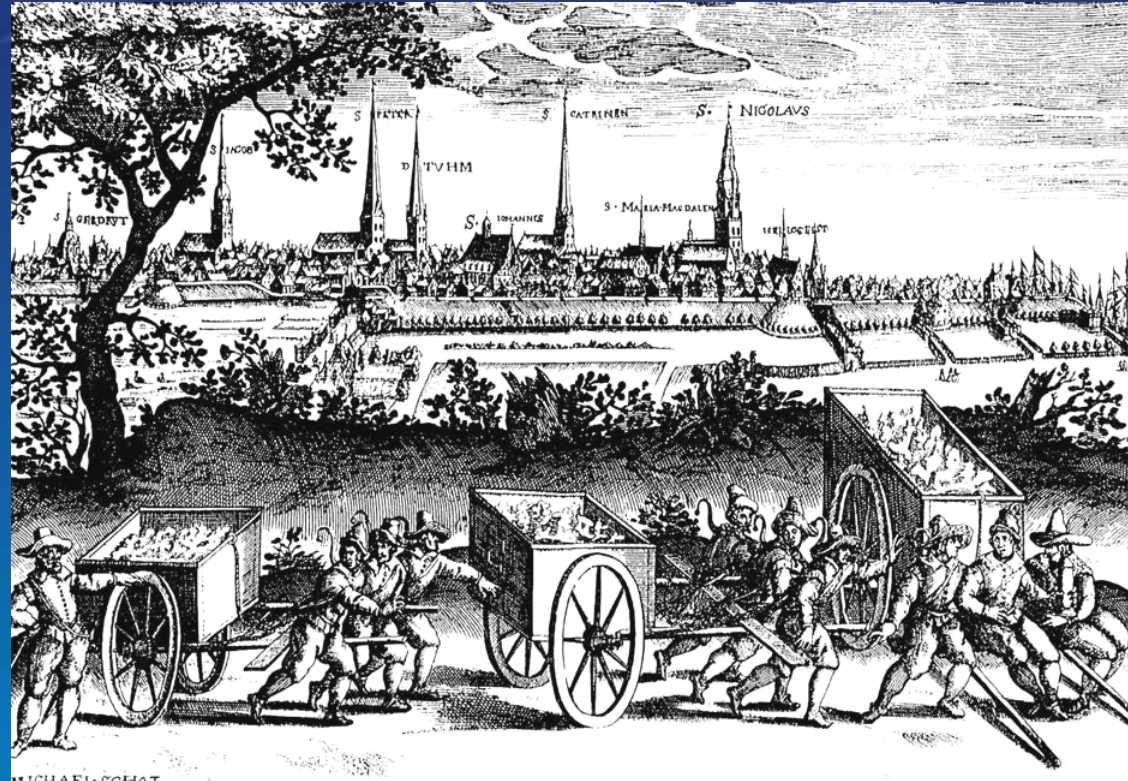
what is our historical background?



waste disposal
in
Europe
around 1350



Amsterdam ($\approx$ 1600)



prisoners collecting waste (Hamburg 1609)

waste disposal around 1600



sorting and utilisation on a landfill (Vienna 1910)



paper, glass,
textiles, metals

ashes,
garbage

kitchen
waste

three Container System in Berlin (1907)

products

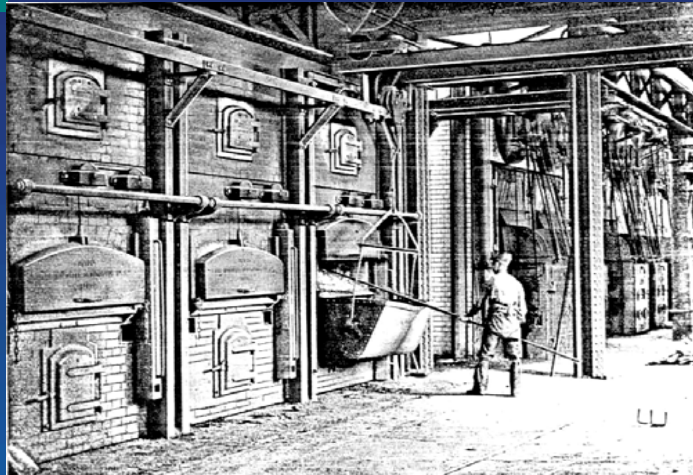
green glass
white glass
bones
paper
textiles
iron
brass
cans
copper
tin
leather
wood



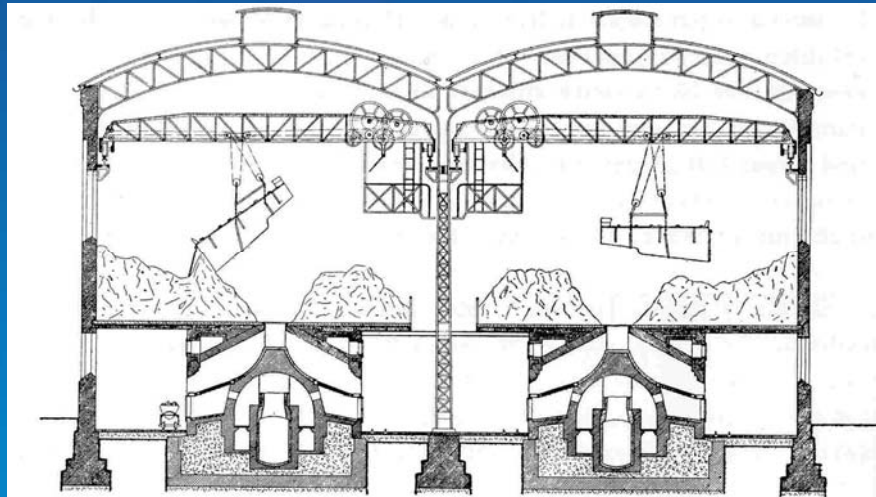
and in 2000

hand sorting of waste in 1907

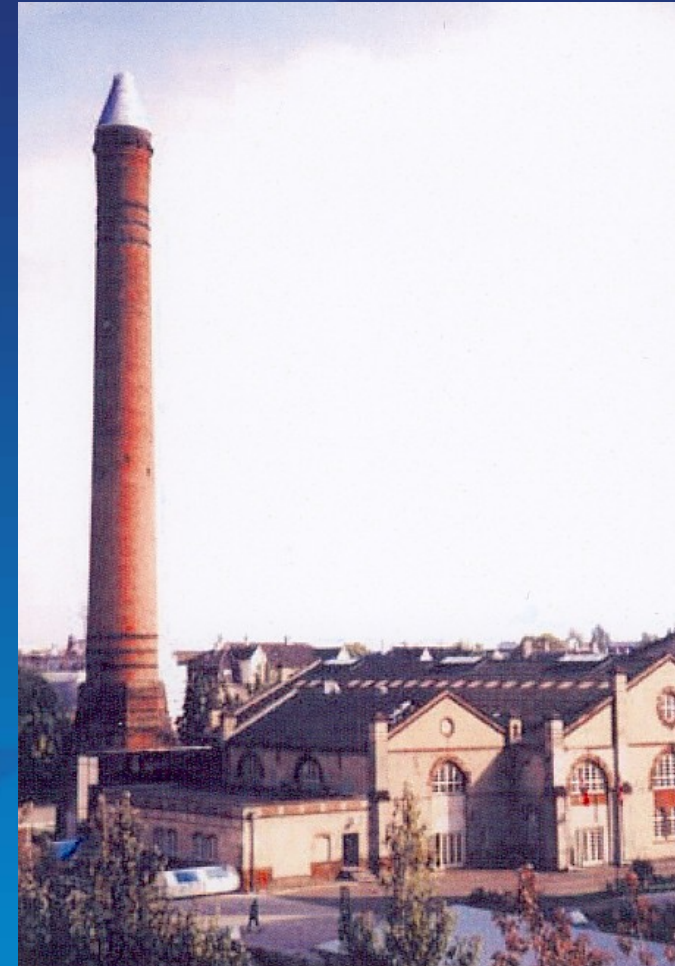
Frederiksberg (DK)



Fulham (UK)



Hamburg (D)



MSW incineration around 1900

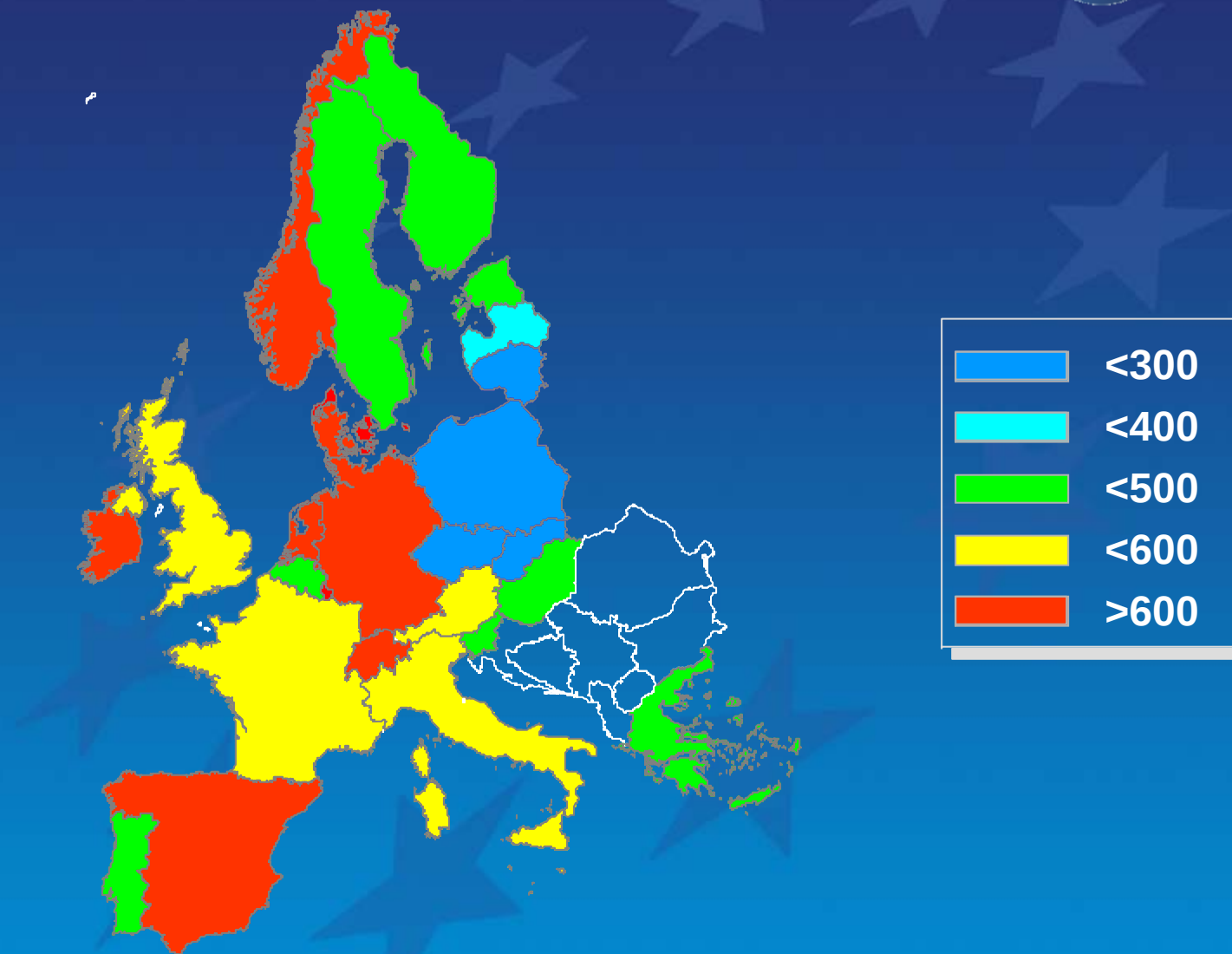


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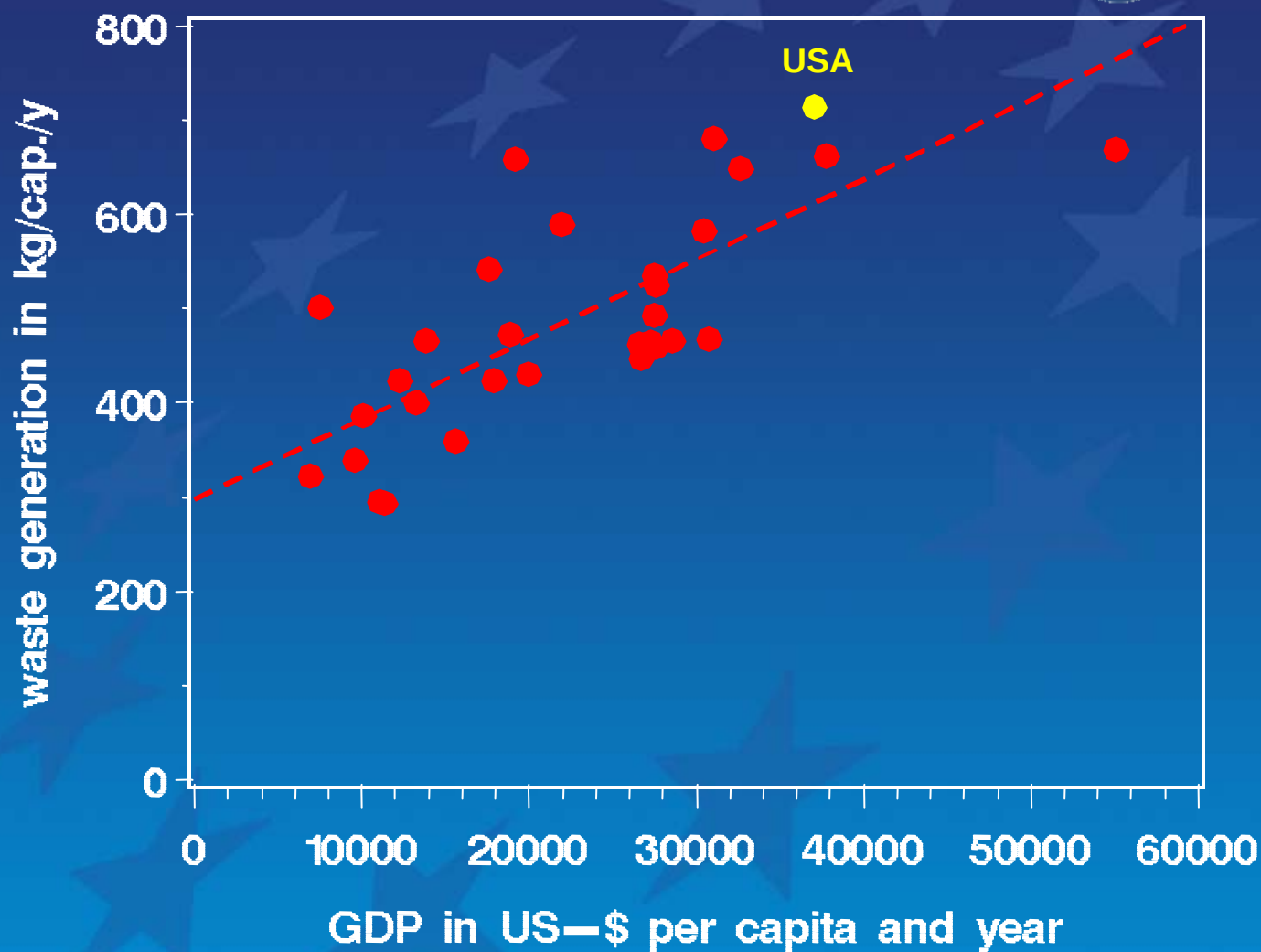


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*where are we
today?*



waste generation in kg/cap/y



waste generation and GDP



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how do we manage our waste problem?



avoidance



waste

benefits saving of resources
by recovering of
- materials
- energy

reuse

recycling

problems

health risk
emissions
economy

inertisation & energy recovery

landfill

waste management strategies



Waste Framework Directive 75/442/EEC

Landfill Directive
1999/31/EC

Waste Incineration
Directive 2000/76/EC

Hazardous Waste
Directive 1999/31/EC

Dec. 2000/532/EC
List of Wastes

Regulated waste streams

waste
oils

sewage
sludge

batteries
accumulat.

packaging
waste

ELV

PCBs

WEEE

EU legislative framework on waste



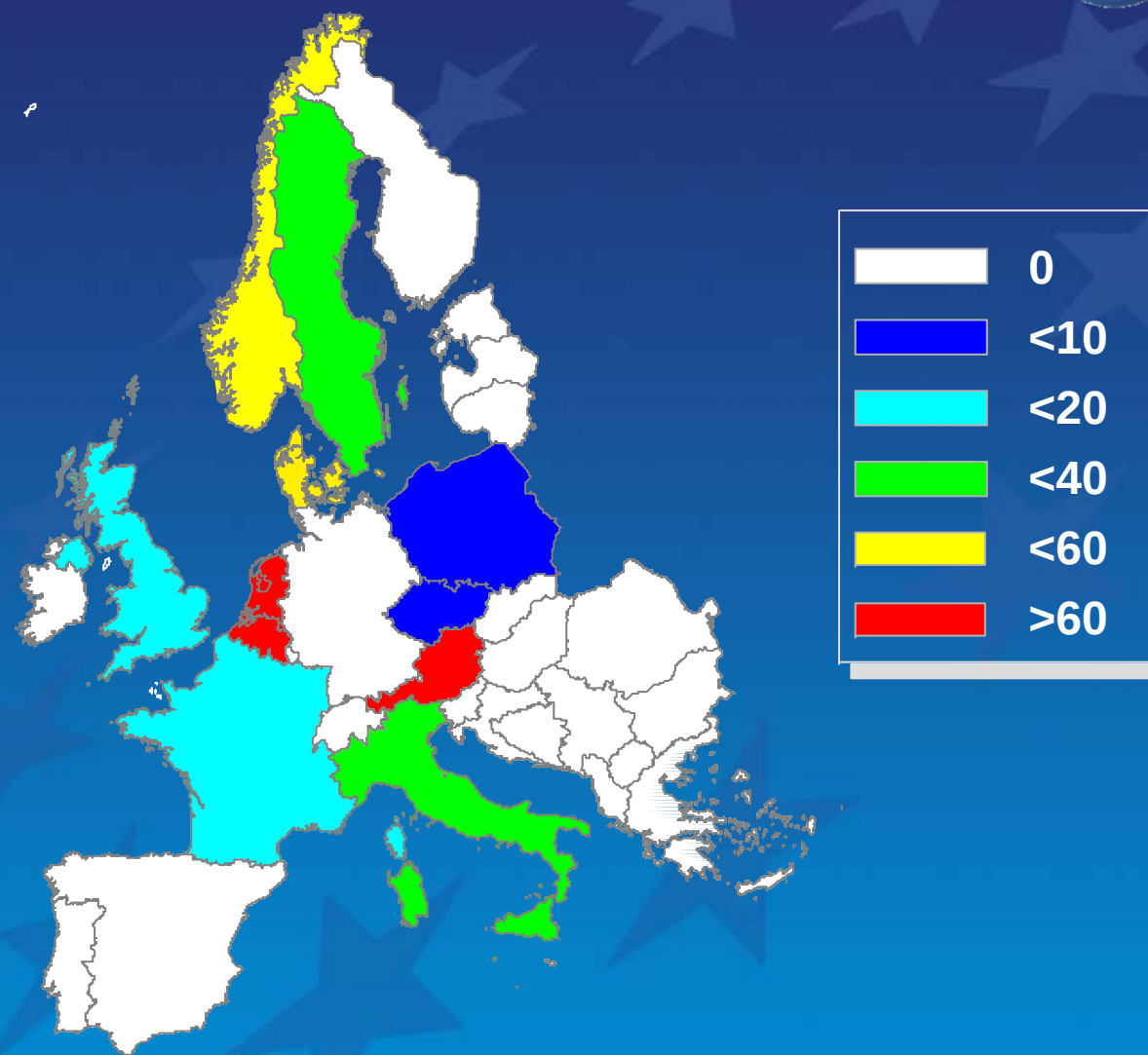
consequences

- **harmonisation of national regulations**
 - technical standards
 - emission standards

main targets

- **reduction of biodegradable waste disposal (standard 1995)**
 - 25 % in 2006
 - 50 % in 2009
 - 65 % in 2016

landfil ban in some countries



landfill tax for organic MSW in Europe in €/Mg

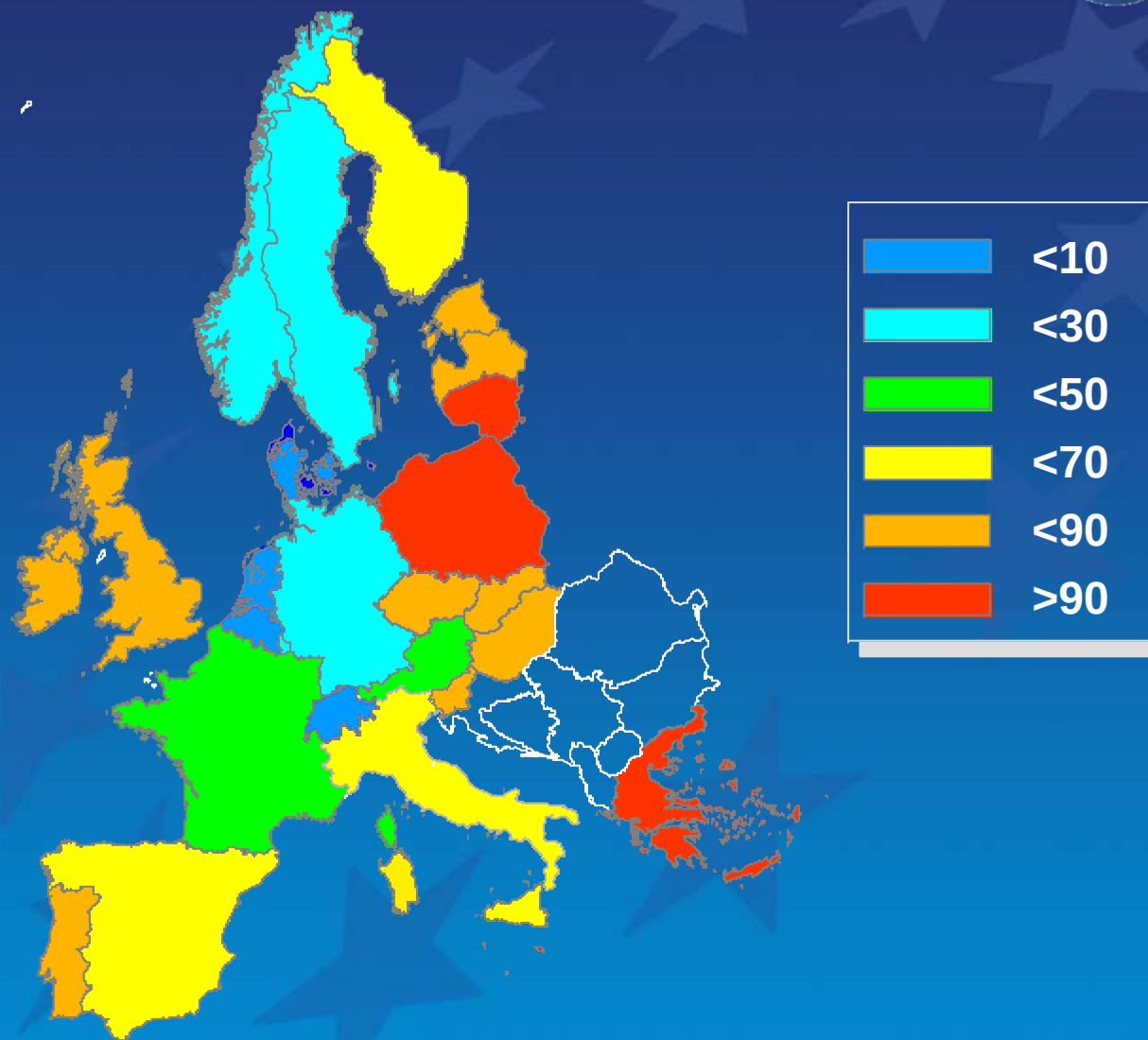


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status of waste management in 2002 - 2004



direct landfilling of MSW in %



material recycling in %



waste composting in %

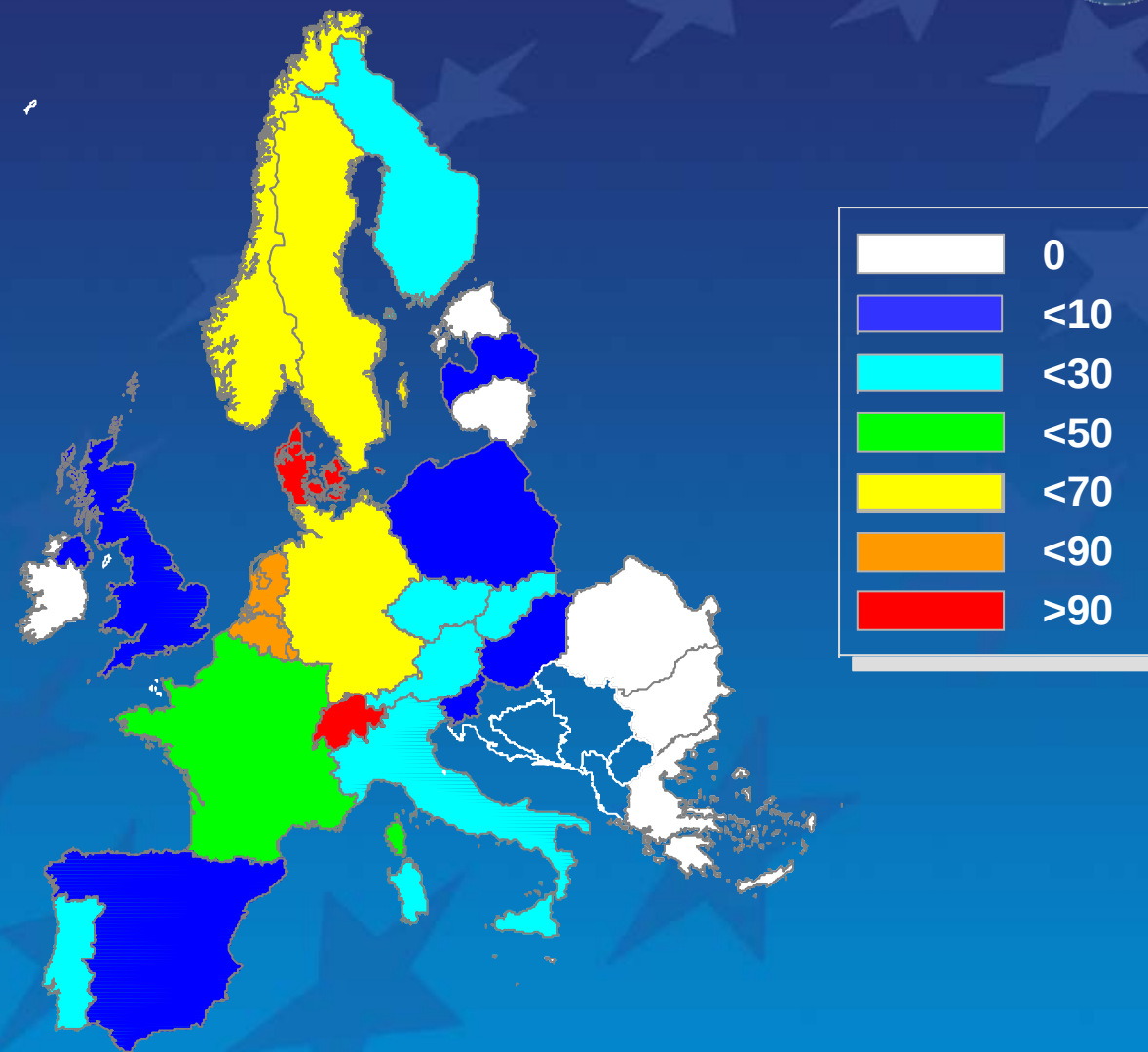


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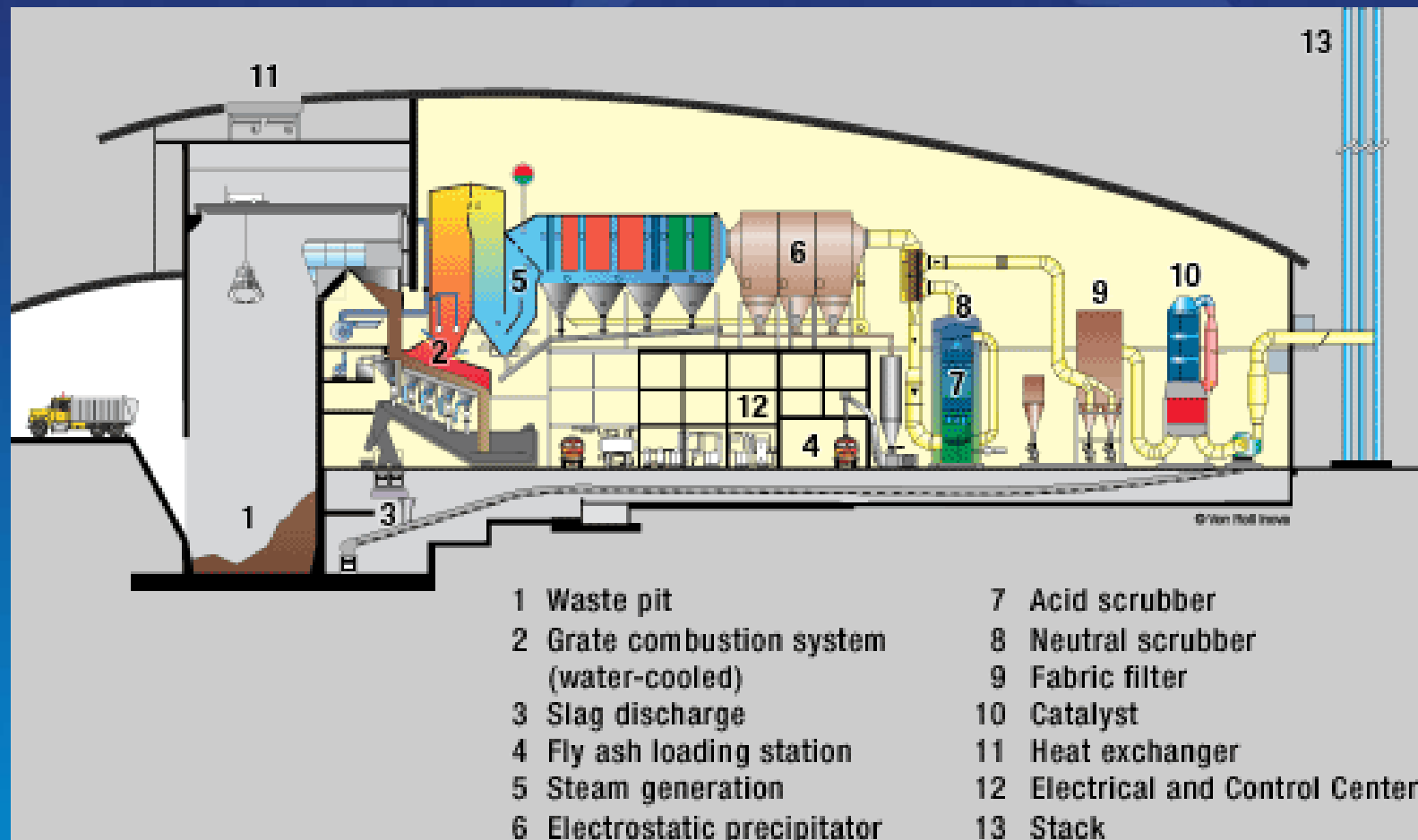


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waste incineration technology and its today's environmental impact



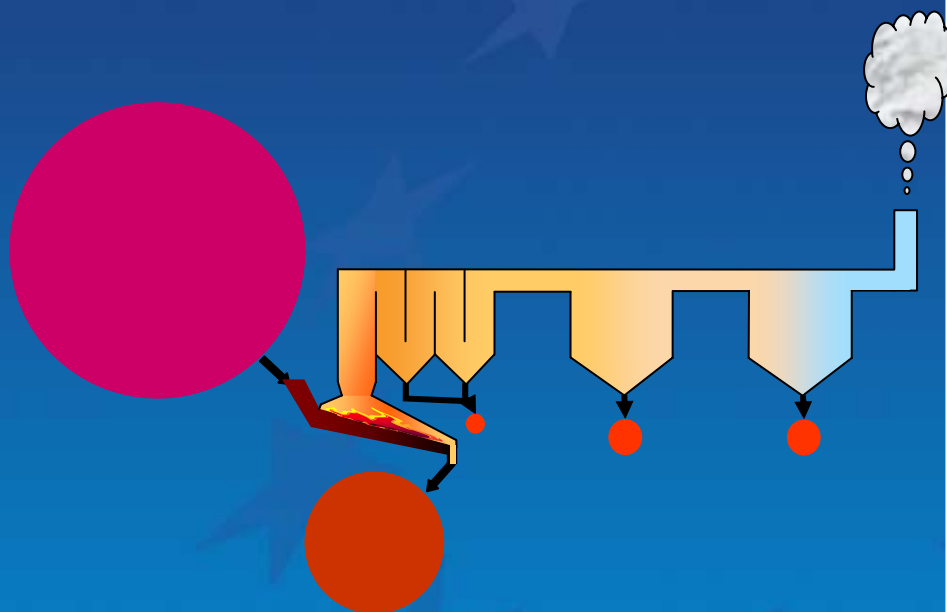
waste incineration in Europe in %



municipal solid waste incineration plant



flue gas 5000 m³/Mg of waste



	EU	D	NL
dust	10	10	10
HCl	10	10	10
HF	1	1	1
SO ₂	50	50	50
NO _x	200	200	70
CO	10	10	10
Hg	0.05	0.03	0.05
Cd + Tl	0.05	0.05	0.05
Σ HM	0.5	0.5	0.5
TOC	10	10	10
Dioxins [ng(TE)/m ³]	0.1	0.1	0.1

emission limits in mg/m³



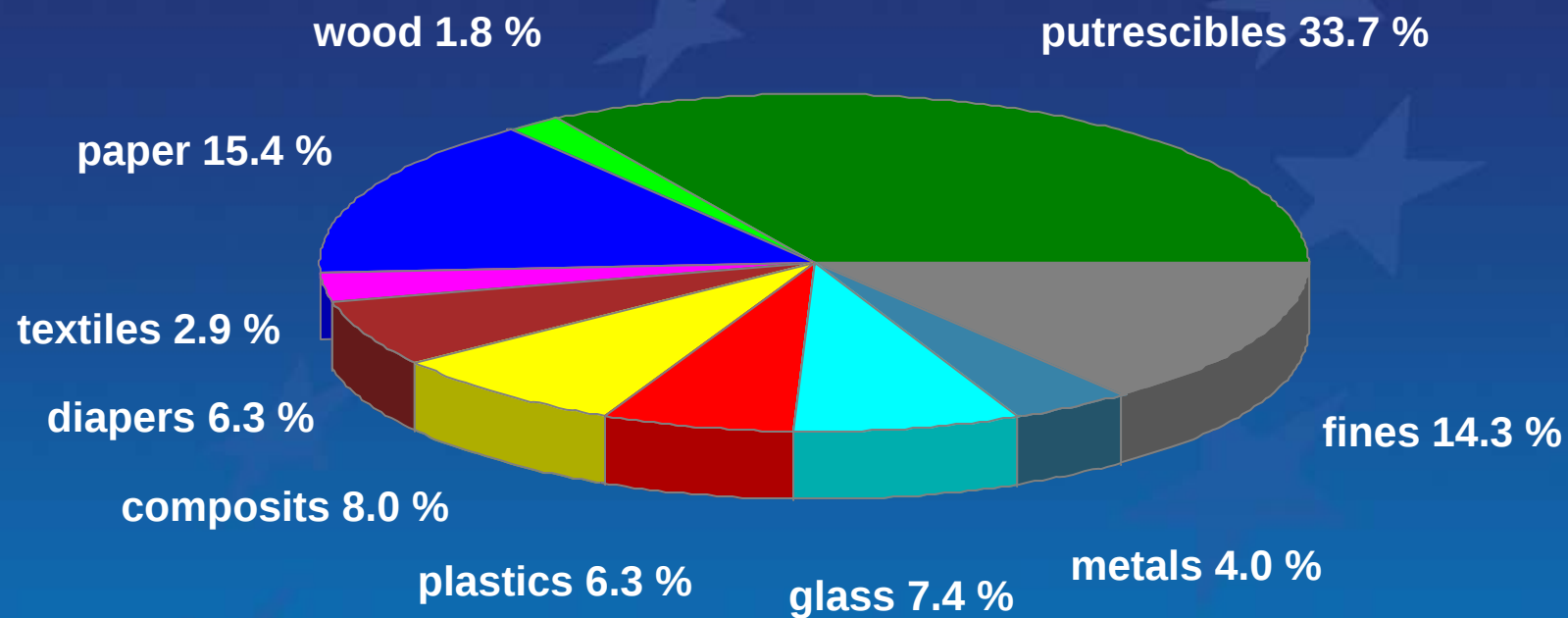
PCDD/F emission sources in Germany

sources	emission per year in g I-TEQ		
	1990	1994	2000*
metal industry	740	220	40
sintering plants	575	168	< 20
iron- & steel production	35	10	< 5
waste incineration	400	32	< 0,5
municipal solid waste	399	30	0,4
hazardous waste		2	0,04
medical waste		0,1	0,0002
sewage sludge		< 0,1	0,03
power plants	5	3	< 3
industrial combustion facilities	20	15	< 10
domestic stoves	20	15	< 10
traffic	10	4	<1
crematoria	4	2	< 2

source: www.umweltbundesamt.de



***what is the
biogenic energy inventory
and what are the
consequences for
energy recovery?***

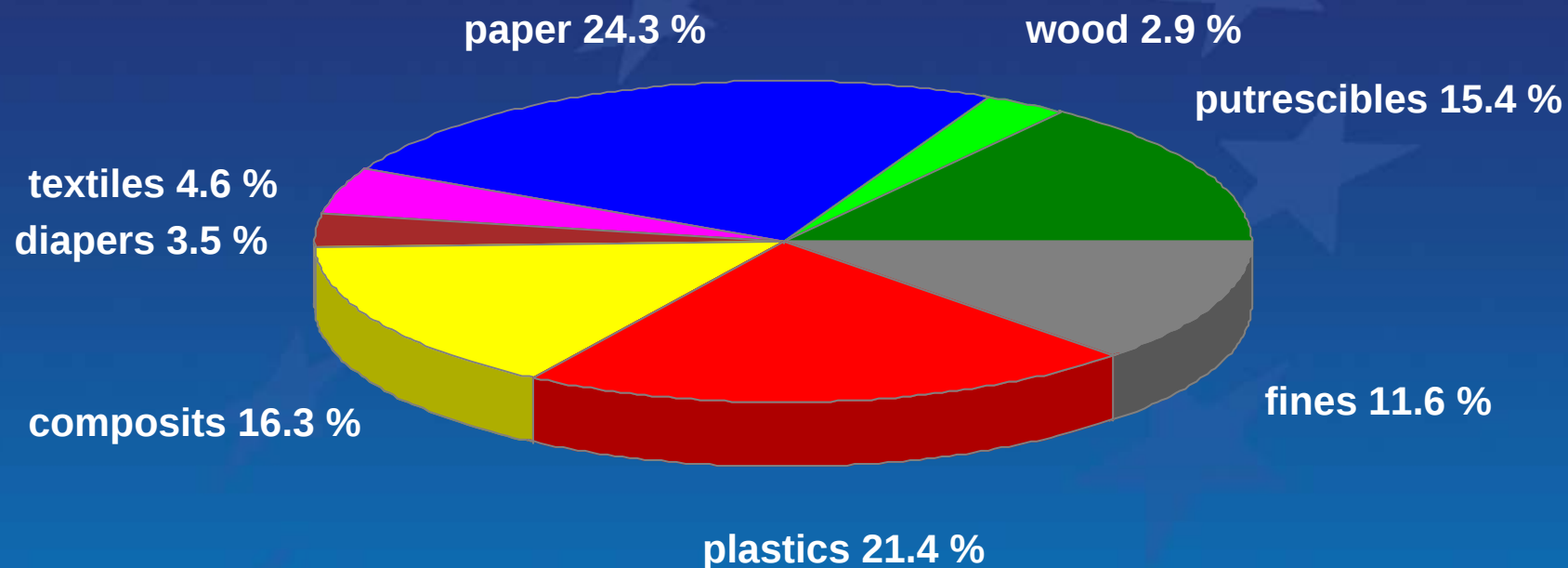


MSW = 310 kg/cap./d

source: Abfallbilanz der Länder 1998

MSW composition

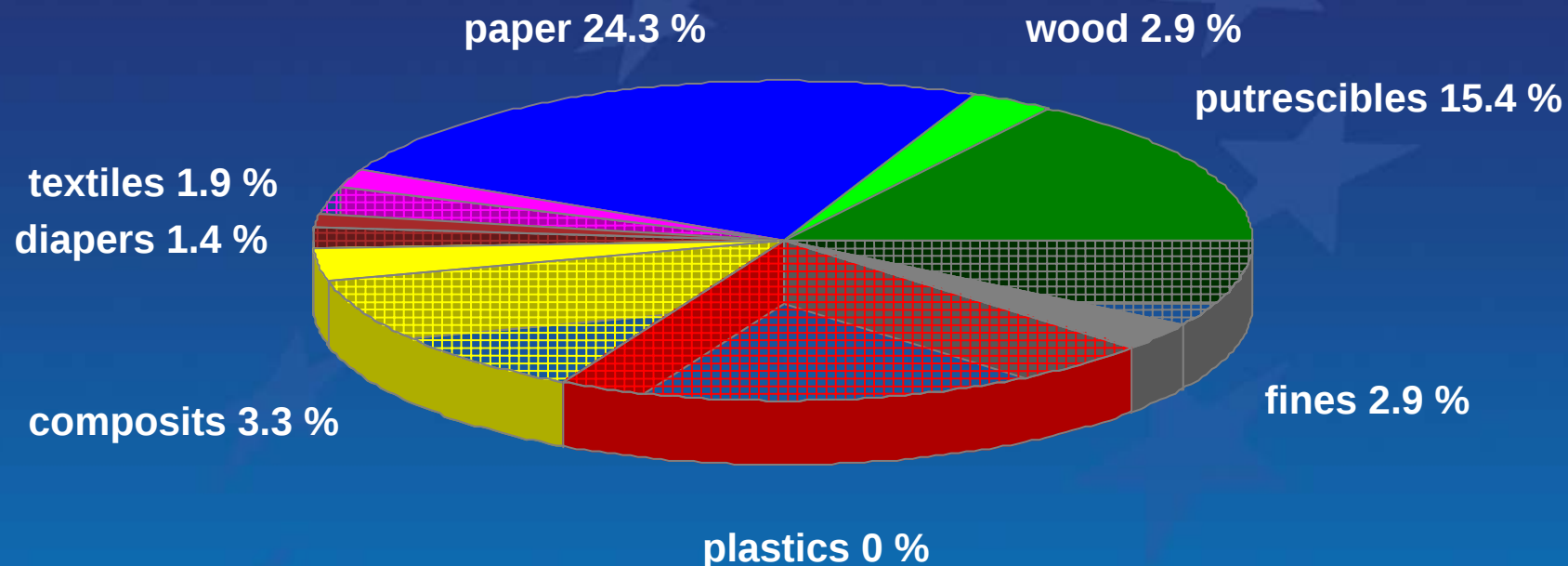
(Hassia, Germany)



LHV_{total} = 10 MJ/kg

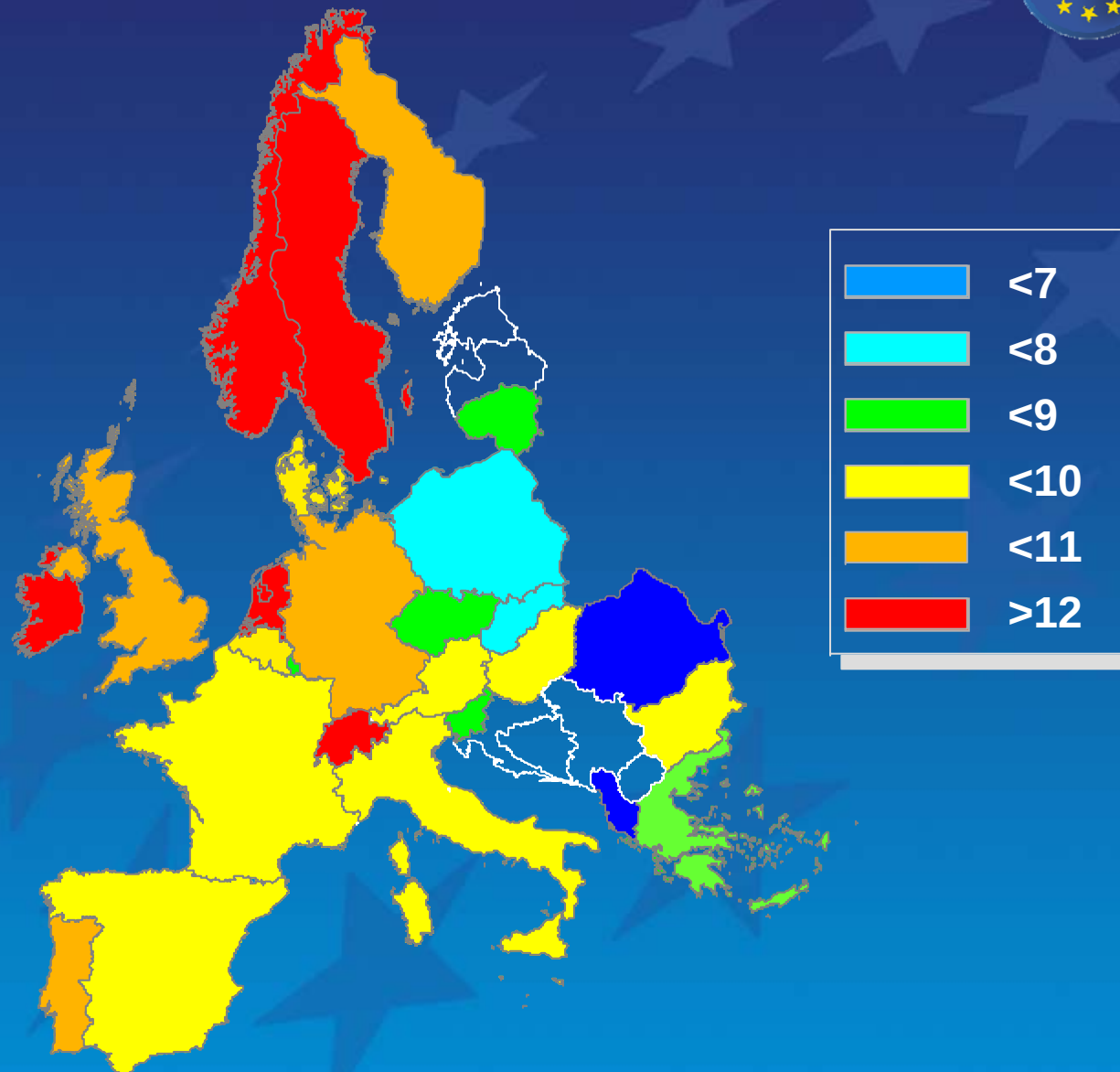
LHV of total MSW in MJ/kg

(Hassia, Germany)

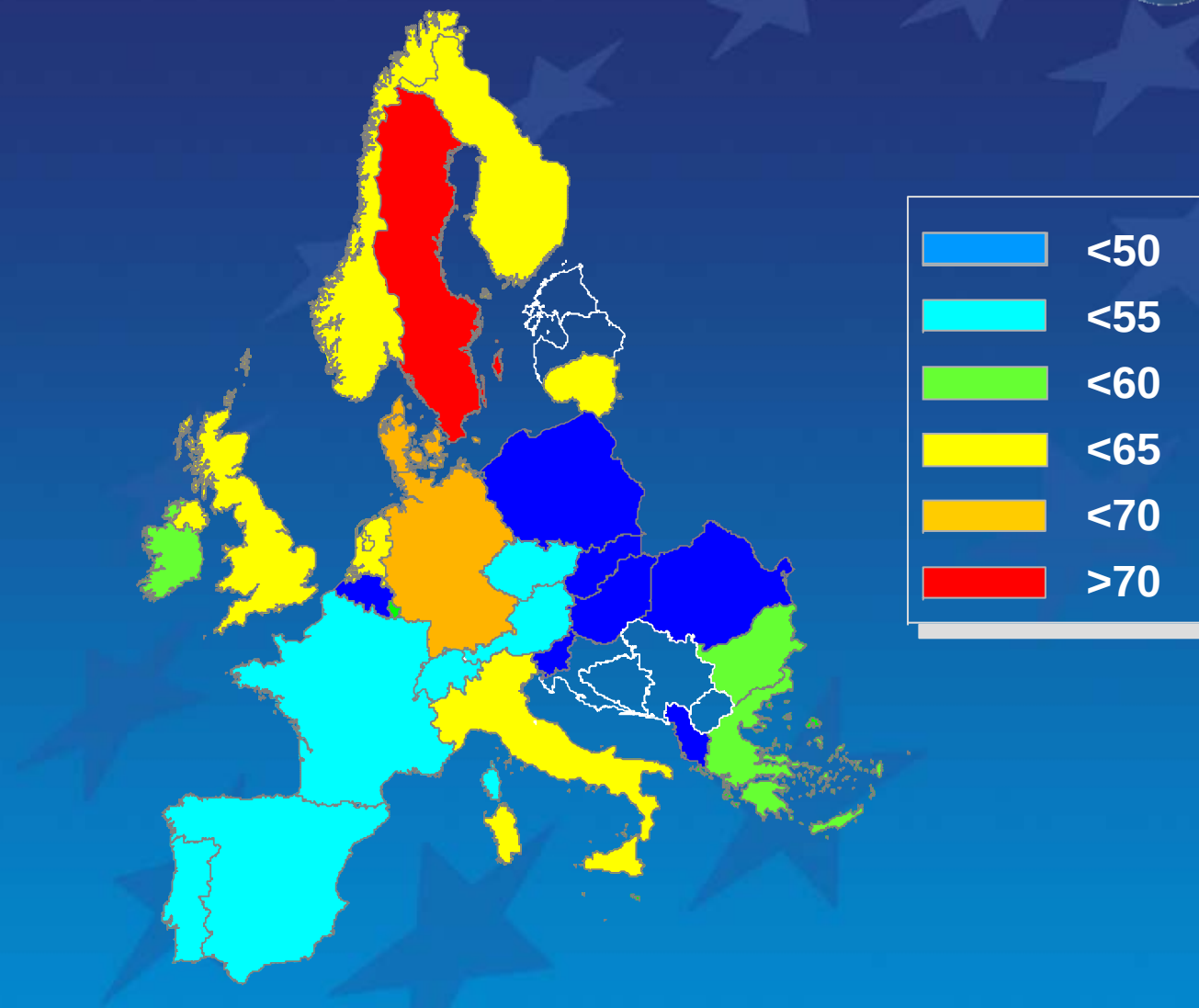


$LHV_{reg.} = 5.2 \text{ MJ/kg}$

LHV of regenerative MSW in MJ/kg (Hassia, Germany)



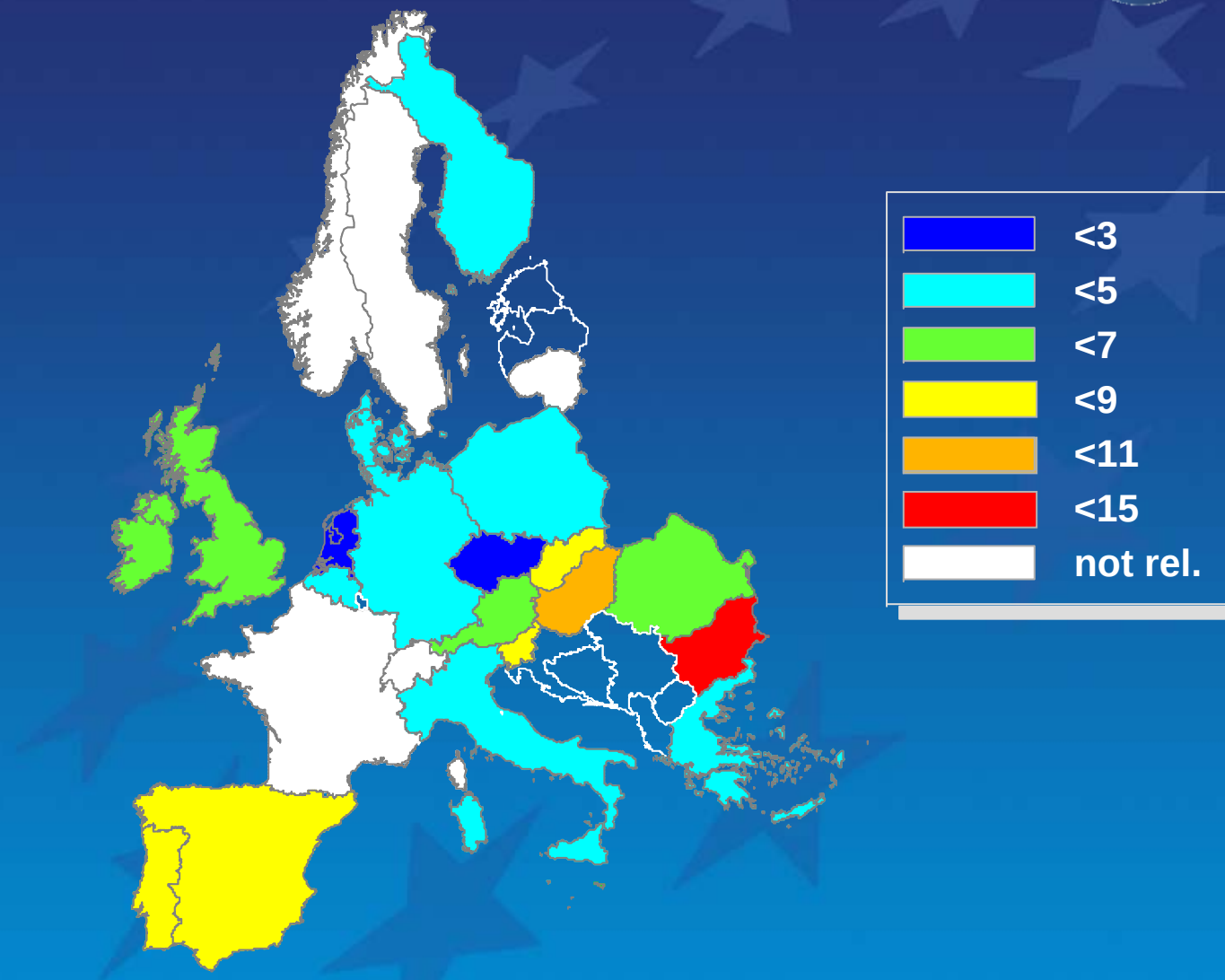
lower heating value of MSW in MJ/kg



biogenic energy inventory in MSW in %



substitution of primary energy by total MSW in %



substitution of fossil power by residual MSW in %



CO₂ from regenerative waste in % of total CO₂



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conclusions



status in the EU

- **recycling established, still increasing**
- **MBT and biogas potential not yet exhausted**
- **waste incineration will be mandatory and is partly accepted as biogenic energy source**

challenges

- **costs (especially for decentralised systems)**
- **environmental impact of MBT**
- **management of residues from thermal treatment**
 - bottom ash utilisation
 - APC residue management and disposal