



Sustainable Waste Policy

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Saving resources and protecting climate – waste policy concept of Alliance 90 / The Greens in Germany

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Vita

- **Senior advisor for climate policy to the Greens**
 - **Working fields: Climate policy, waste, chemistry policy and renewable resources**
 - **Doctorate in groundwater remediation technology**
 - **Diploma in biology at the Technical University Aachen, Germany**
 - **Practical experience in biological waste treatment**
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Content

- **Who the greens are**
 - **What is waste?**
 - **Where to start in Germany**
 - **Germany's waste policy today**
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 - **Green measures for "closing the loop"**
 - **How to deal with the leftovers?**
 - **Discussion of landfilling, pyrolysis, MBT, waste to energy**
 - **Conclusions**
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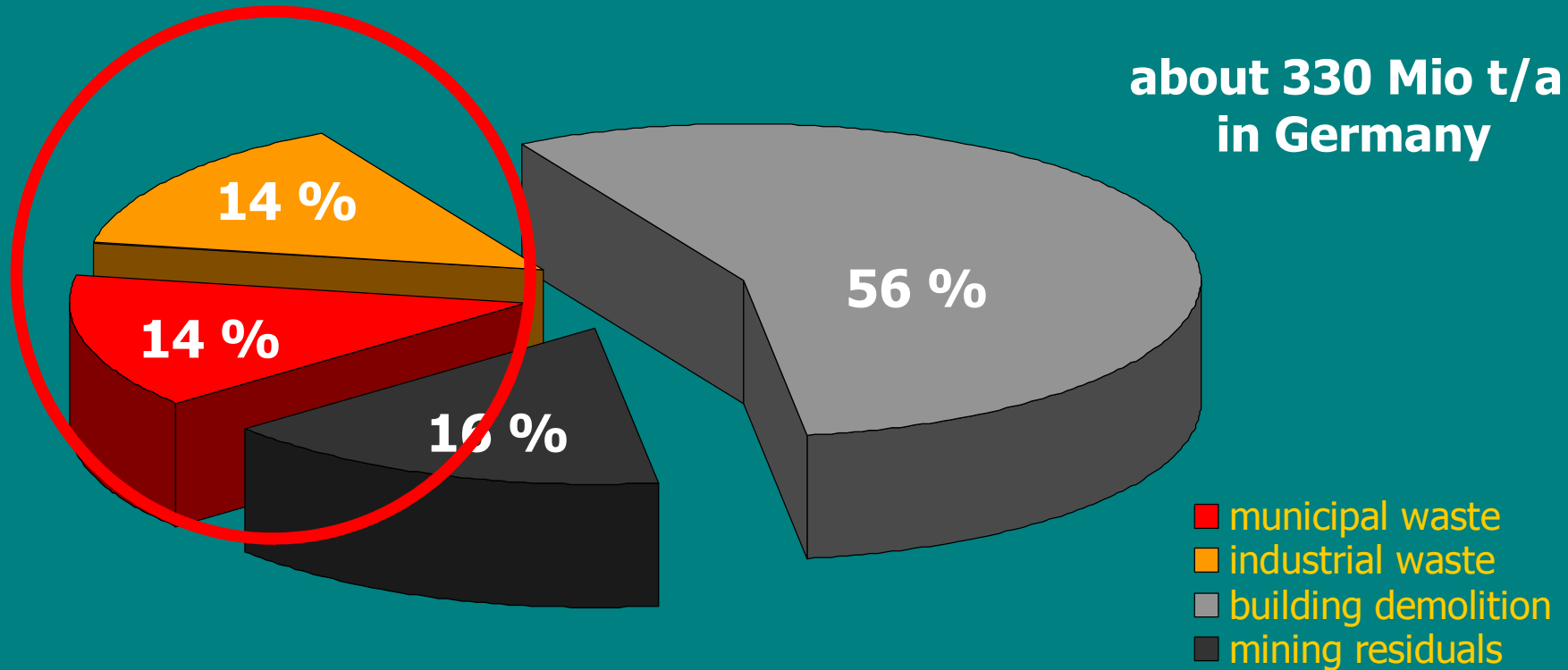
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Who the Greens are

- **Self-esteem of Alliance 90/The Greens: party of peace, social fairness, protection of the environment and a sustainable development.**
 - **They are a constituent part of the German Parliament for 25 years now. National election results up to 10.7 %.**
 - **From 1998 – 2005 Alliance 90 / the Greens were part of the government and Mr. Jürgen Trittin was the first “green” Federal Minister for environment.**
 - **Green accomplishments were: phasing out of nuclear power, passing the Renewable Energy Act and implementation of CO₂ emission trading.**
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What is waste?

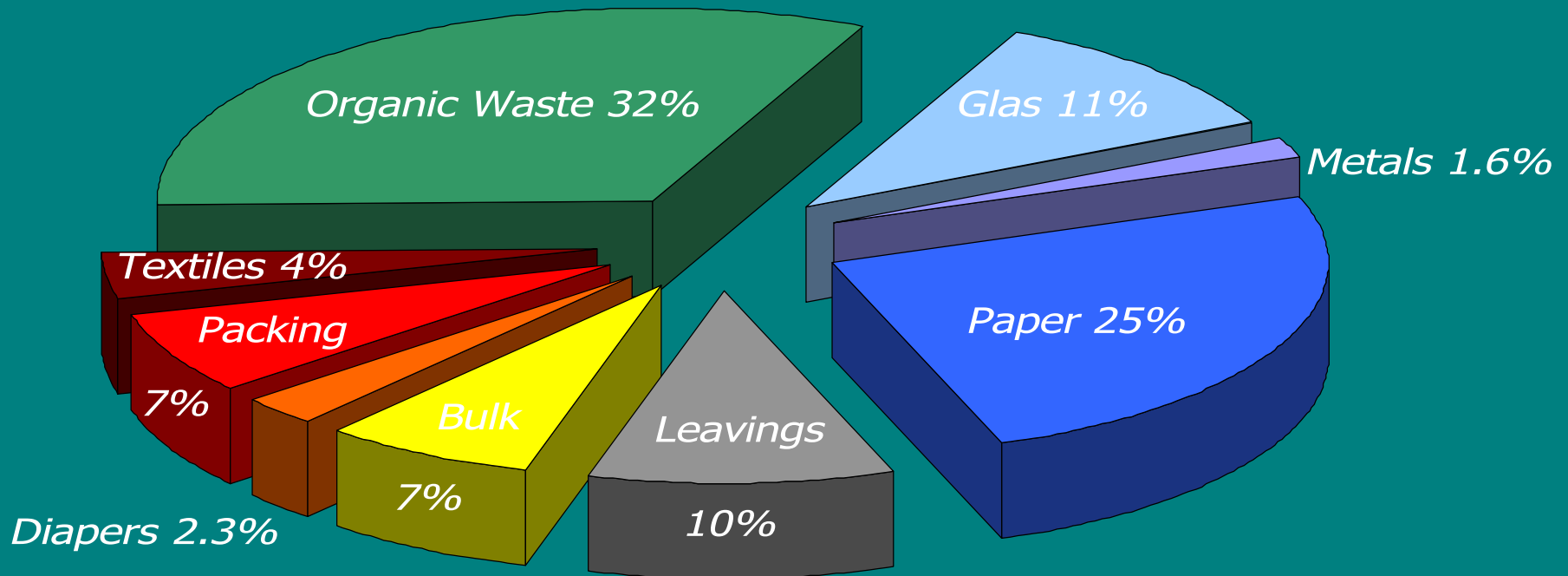


- **Waste from human settlements is not the largest segment, but because of its inhomogeneous consistence it is responsible for the main part of the problem.**

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Waste as a resource



Where to start in Germany

- The “waste problem” was a central point of green environmental policy - right from the beginning.
 - Most important problem in the past:
 - a lot of waste but very low standards for handling.
 - The situation that time:
 - waste avoidance was a unknown thing
 - even hazardous waste was filled in unsecured dumps
 - incineration was – if practised at all - known as an “dioxin slingshot”
-



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“Milestones” in waste regulations since the 90’s

- **Technical guidance for municipal solid waste 1991**
 - **Packaging Regulation 1992 (light weight packaging)**
 - **17. Regulation to the Clean Air Act for waste incineration plants 1992**
 - **Law about „Cycle-Economy“ and Waste Management 1996**
 - **Regulation on Bio waste 1998**
 - **Regulation on Disposal of Waste 2001 (“treat before landfillig”)**
 - **Regulation on Waste Electrical and Electronic Equipment 2005**
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year	Private investments in environmental protection [mio. Euro]	Investments in waste economy	
		[mio. Euro]	[%]
1996	2 597.8	232.9	12.5
1997	1 855.4	261.0	14.1
1998	1 681.0	240.8	14.3
1999	1 807.3	333.7	18.5
2000	1 624.2	213.6	13.2
2001	1 612.0	213.1	13.2
2002	1 675.1	275.4	16.4
2003	1 580.1	190.8	12.1
2004	1 654.7	204.6	12.4
2005	1 240.3	186.5	15.0
...			



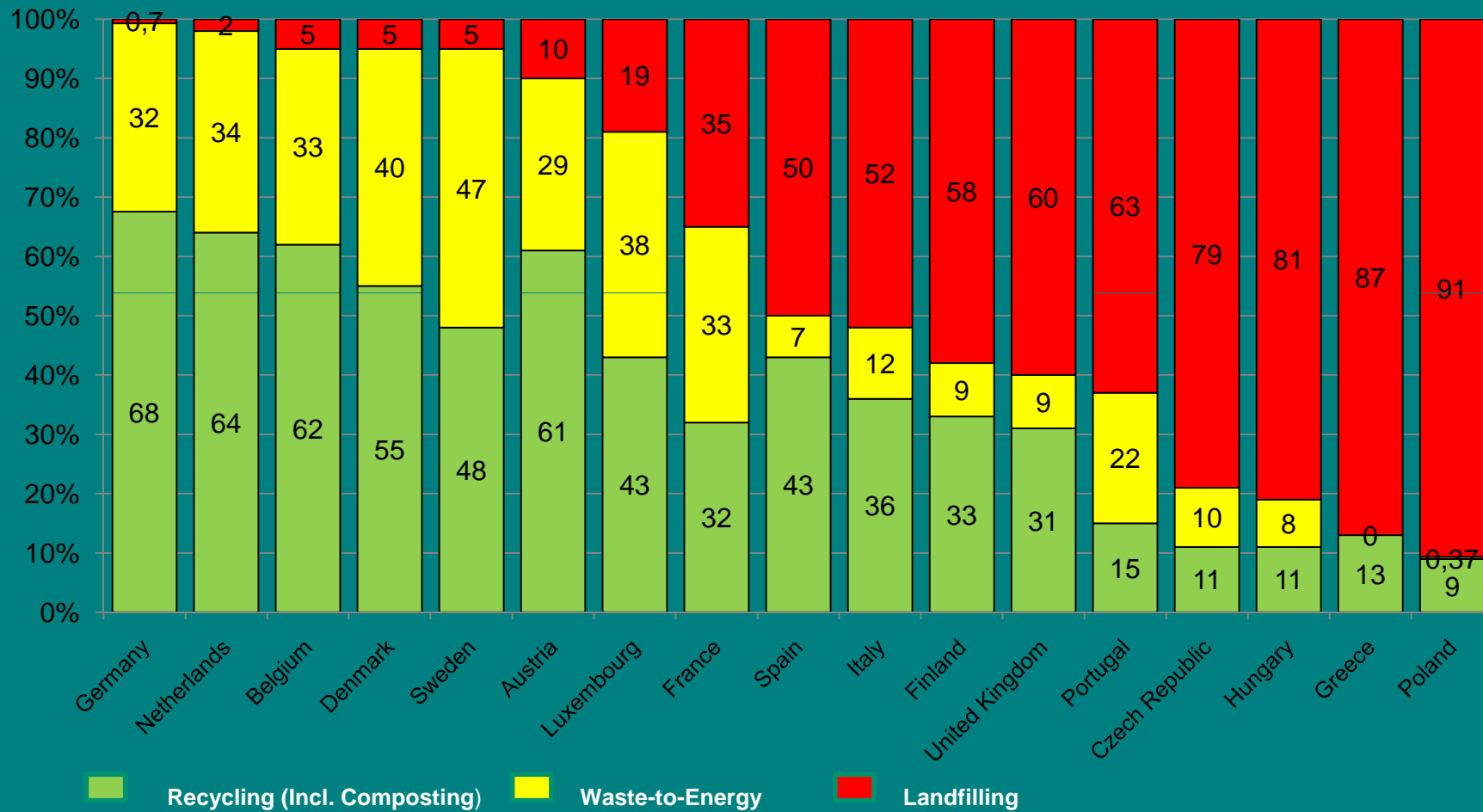
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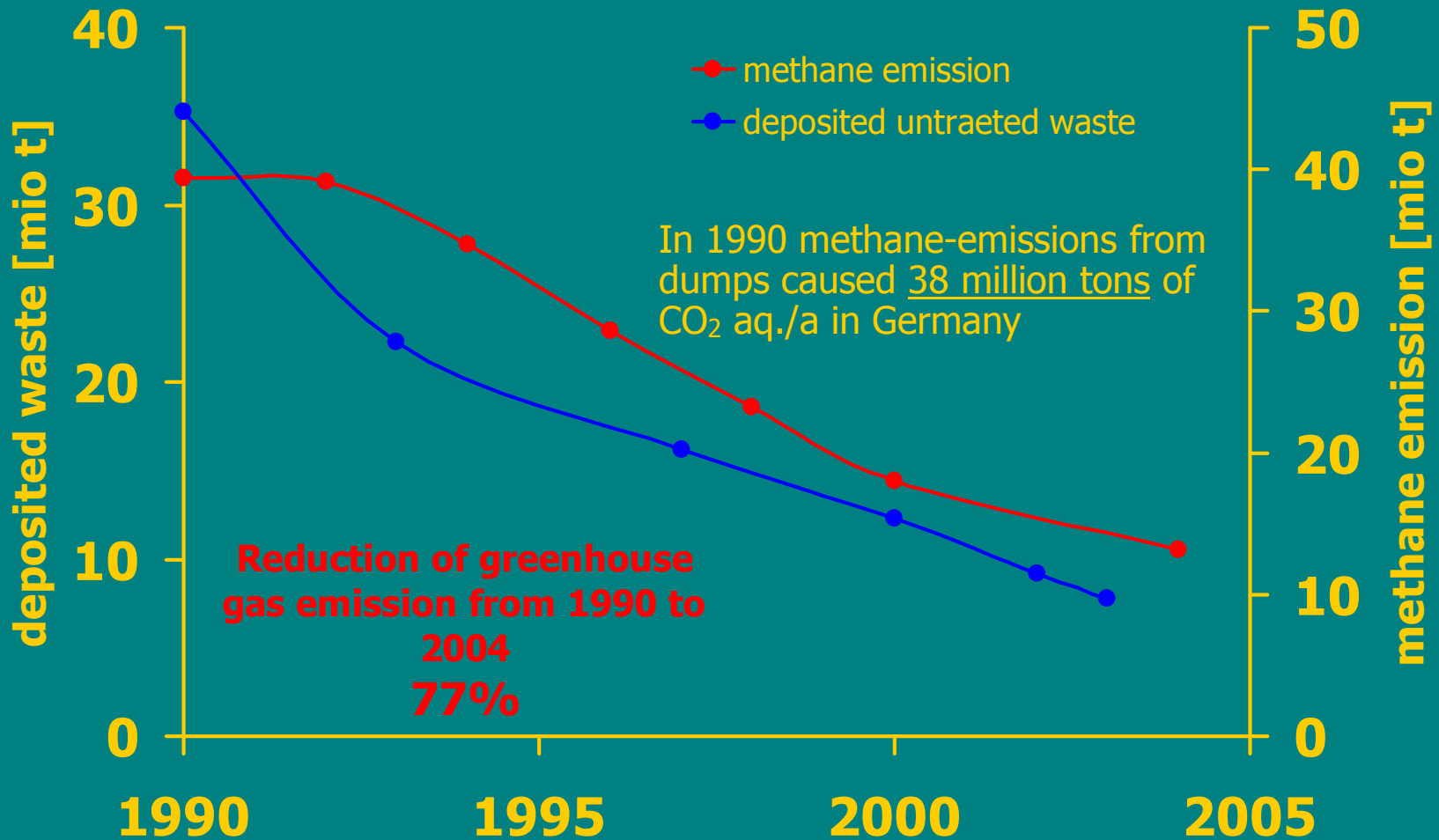
Situation in Germany today

- today waste avoidance has become a central policy target,
 - high readiness in the society for separating and collecting of waste,
 - high quotas on recycling,
 - multi way packaging is promoted,
 - strong legal emission-limits for waste incineration,
 - **no more untreated waste in landfill sites since June 2005 (directive under green government).**
-

Treatment of MSW in the EU 27 in 2006



Benefit for the climate by treating waste before landfilling



Benefits of separately collection and recycling

1990

2004



**- 130 Mio. tons
CO₂ eq./a**

2 Mio. tons/a

8 Mio. Tons/a

Bio waste, garden waste

0 tons



**- 2,300 Mio. tons
CO₂ eq./a**

4.7 Mio. tons/a

Light weight packaging

Benefits of separately collection and recycling

1990

2004



**- 6,000 Mio. tons
CO₂ eq./a**

1.6 Mio. tons/a
Paper, cardboard

7.7 Mio. tons/a (recycling quota of 80 %)



**- 900 Mio. tons
CO₂ eq./a**

1.3 tons/a

3.1 Mio. tons/a (recycling quota of 80 %)

Glass

Benefit for the environment and the economy

Waste treatment

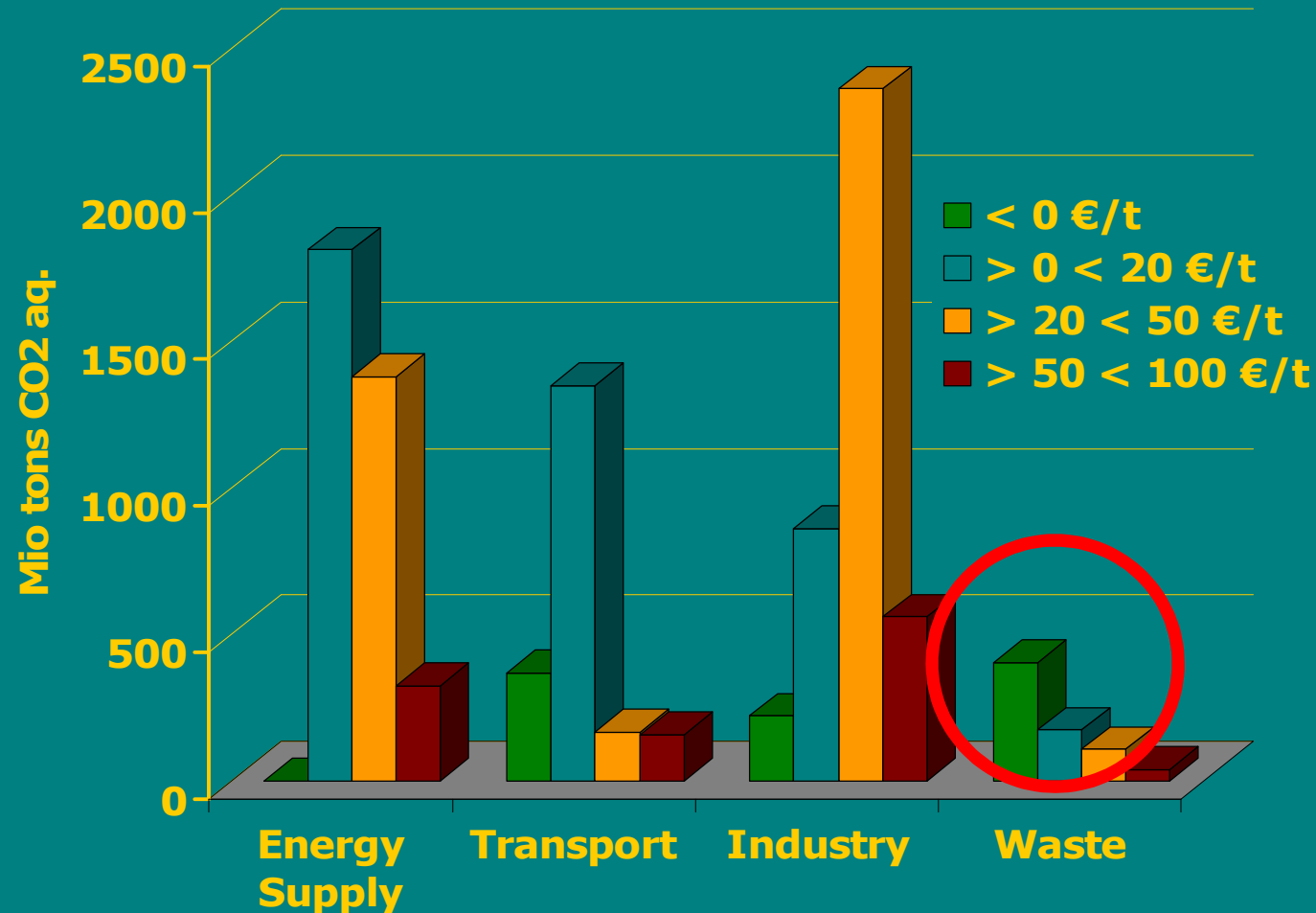
- **is climate protection:**
 - **collection und recycling is responsible for savings of 17,000 Mio. tons CO₂ eq.,**
 - **in Germany 4.5 % reduction of greenhouse gas emissions since 1990 (56 Mio. tons CO₂ eq.)*,**
- **is a job generator, in Germany 250.000 employees in waste economy in 2006,**
- **business with a turnover of 50 Bill. Euro a year in Germany,**
- **is a lead market for environmental technologies and technology transfer.**

* witch outphasing landfills + increased recycling and recovery activities

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Steps ahead in waste policy

Waste treatment means low costs for climate protection



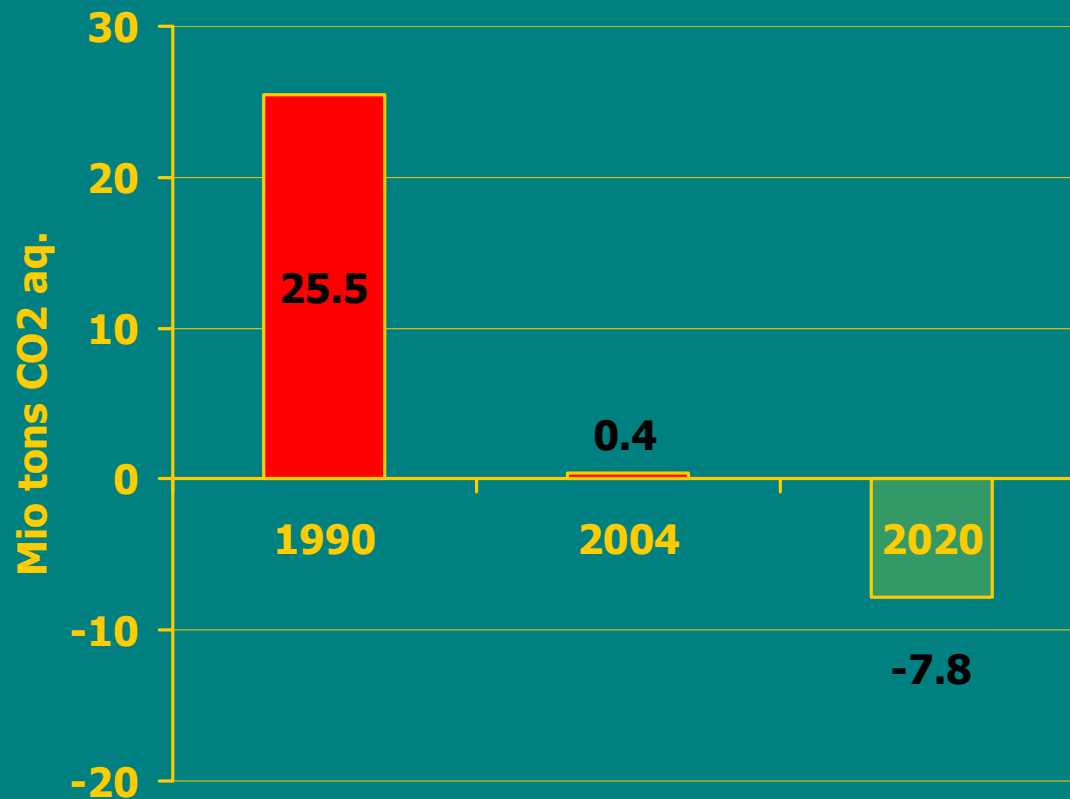


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Steps ahead in waste policy

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There are still benefits to achieve



Burden



Benefit





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So is everything going well?

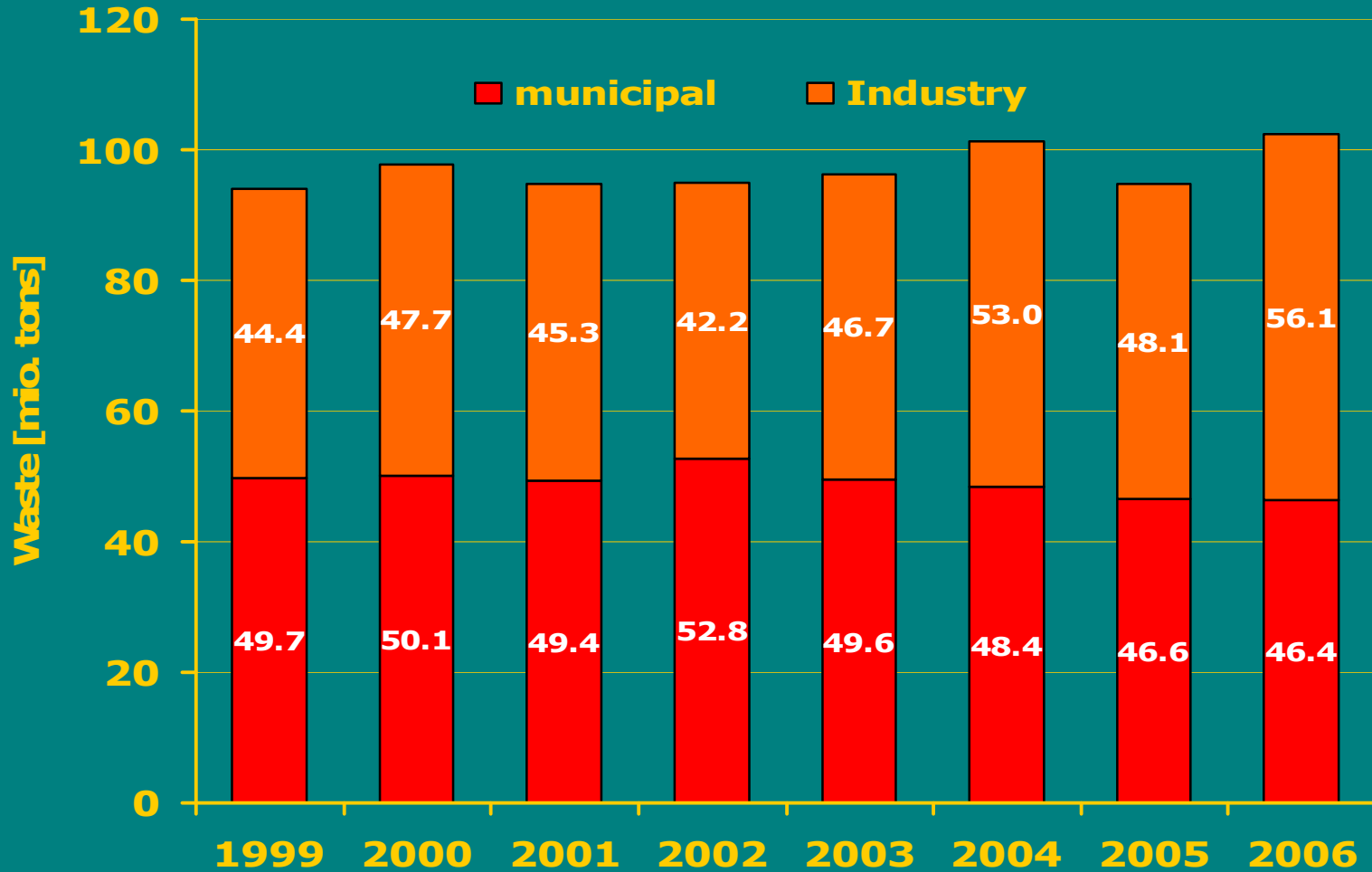
Can we lay back now?

No, there is still a lot do to!

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What's still unattended



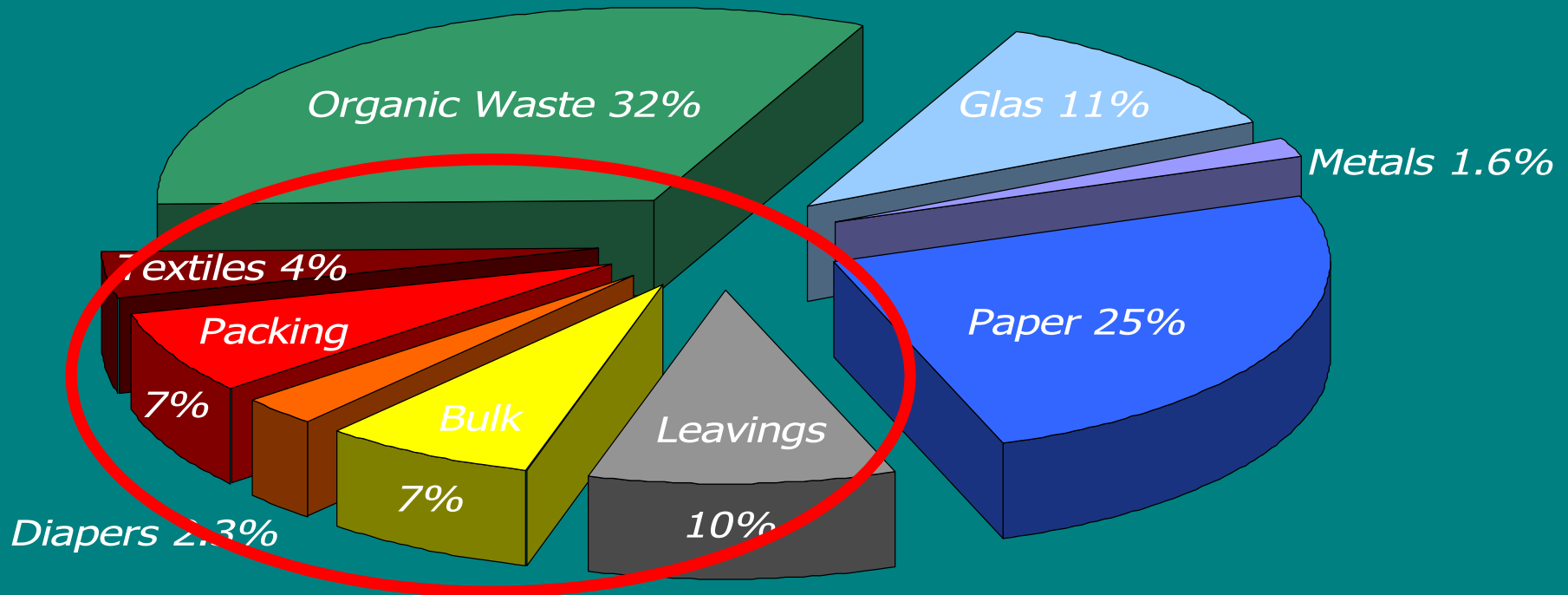
No avoidance of waste (!)

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What's still unattended

Problem child's in the recycling process



Plastic as one of the problems

In Germany “only” 20 % of plastic waste is recovered by recycling, mostly it is going the way of Waste to Energy .

- reasons:
 - “the smell of waste lasts for ever”
 - strong technical limits of using plastic as recycling material
 - during capture and processing up to 50 % sorting rests!
 - sooner or later even recycling materials become a not recyclable waste!



Reasons for unsolved problems

- There is not really an incentive to save raw materials, primary raw materials are often cheaper than secondary raw materials
- Product design is focused on the period of use and usually the behaviour as waste is not taken into account
- The producers are mostly not responsible for their products after the products have become waste
- Recycling means in reality almost “downcycling” (a plastic package becomes usually not a package again)

Green 2020 Concept tries to “tackle” this problems

Closing the loop in 2020

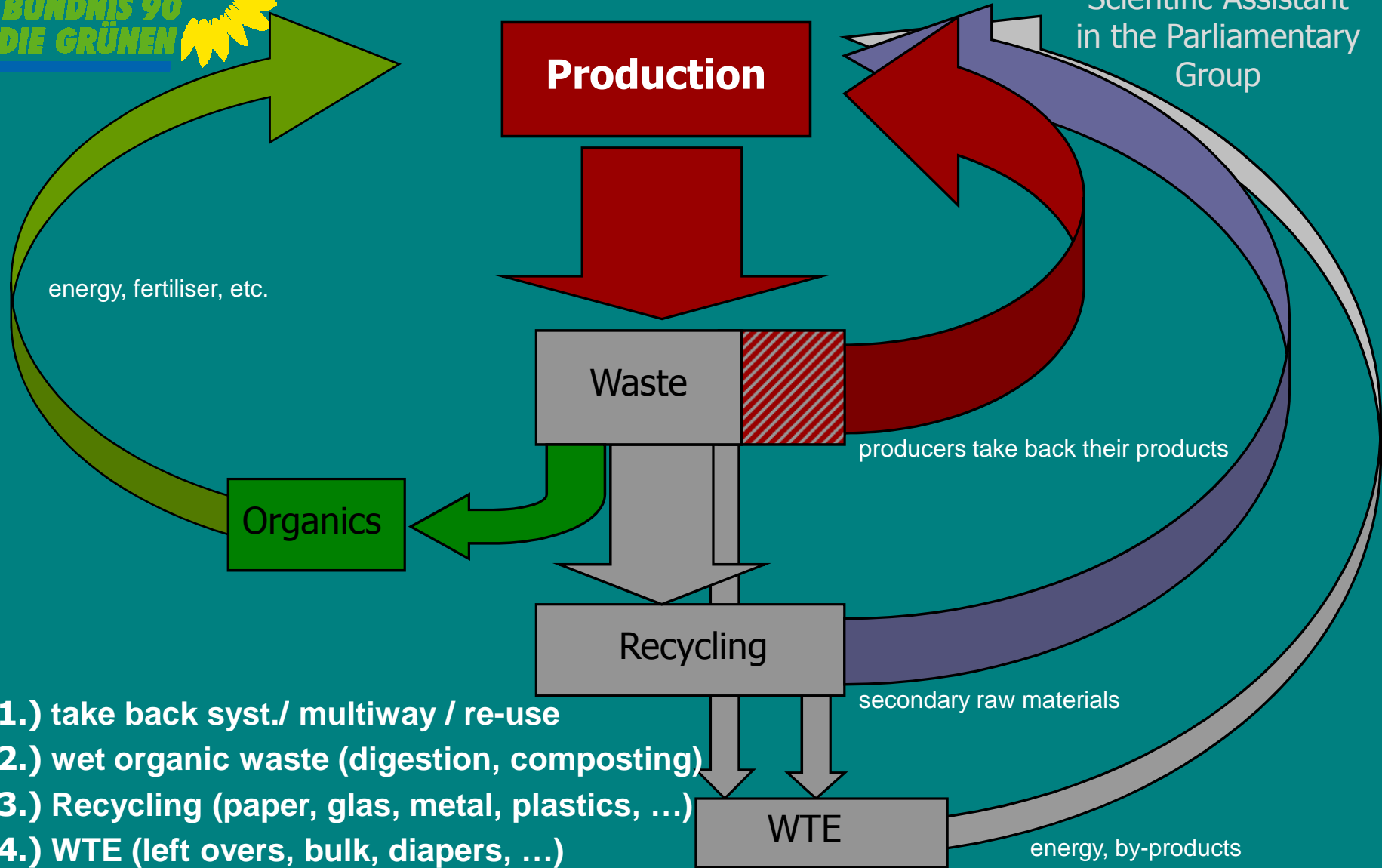
Implementation of the green 2020 concept

- 1.) much more waste avoidance by "*taxes on raw materials*",
 - 2.) more production of reusable, renewable and recyclable products by "*implementing a producer responsibility*" to push an integrated product design, "*taxes on unsustainable products*",
 - 3.) automatically sorting of the residual waste and recover of all valuable substances by "*high recycling quotas*" and a "*complete ban on landfilling in 2020*"
 - 4.) residues that are left over should be used to generate energy by a "*duty to use the best available technology*"
-



The Greens 2020 concept

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- 1.) take back syst./ multiway / re-use
- 2.) wet organic waste (digestion, composting)
- 3.) Recycling (paper, glas, metal, plastics, ...)
- 4.) WTE (left overs, bulk, diapers, ...)

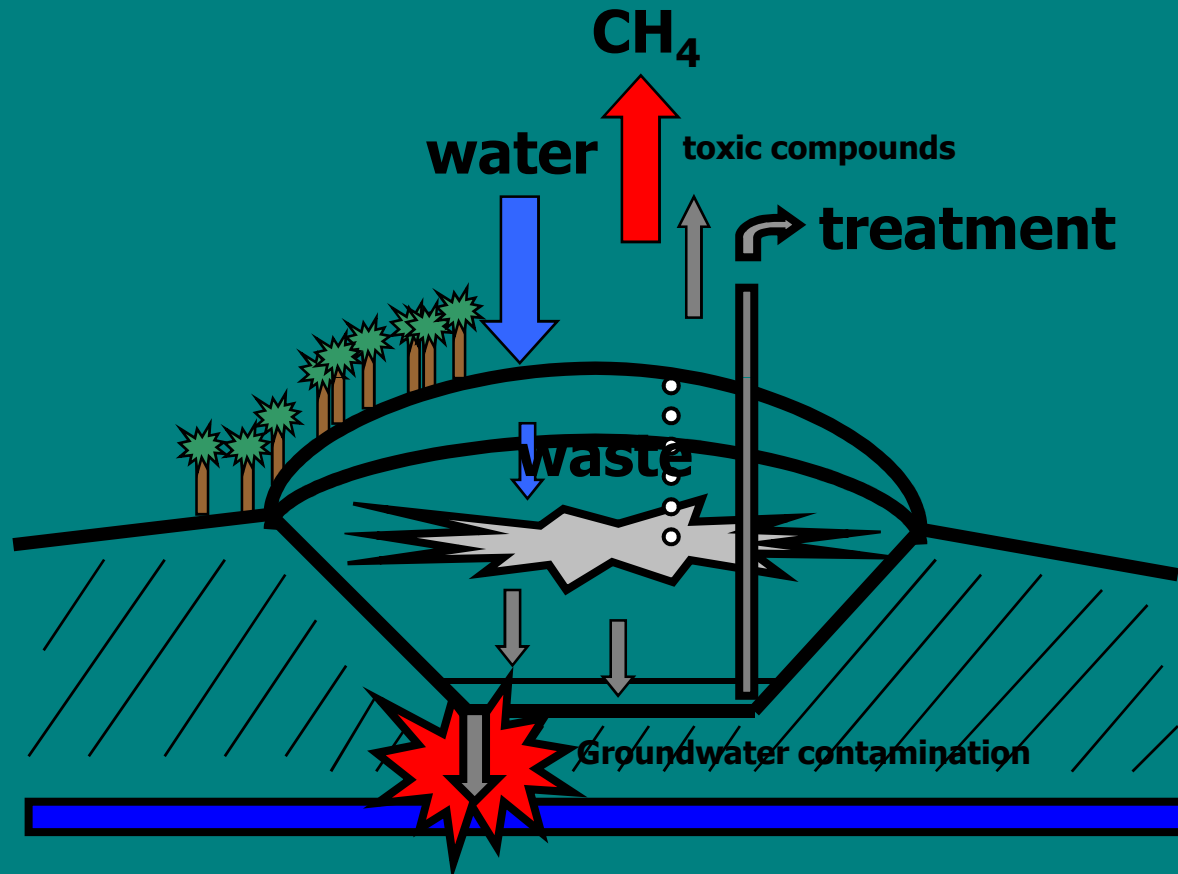
no landfilling anymore

How to deal with the leftovers? Alternatives

- Landfilling / landfilling with methane recovery?
- Pyrolysis, gasification and others?
- Mechanical Biological Treatment?
- Incineration?

Waste to energy or landfilling?

Landfilling as a shift of problems



“Landfill-methane” as the major climate problem

- Landfills are the single largest anthropogenic source of methane (US EPA)
 - they account for 34% of all methane emissions in the U.S.
 - Methane has a 23 times greater warming potential than CO₂ (!)
 - Methane accounts for 16% of global greenhouse gas emissions from human activities
 - **Landfills are a significant emitter of greenhouse gas emissions and a serious climate change problem (!)**
-

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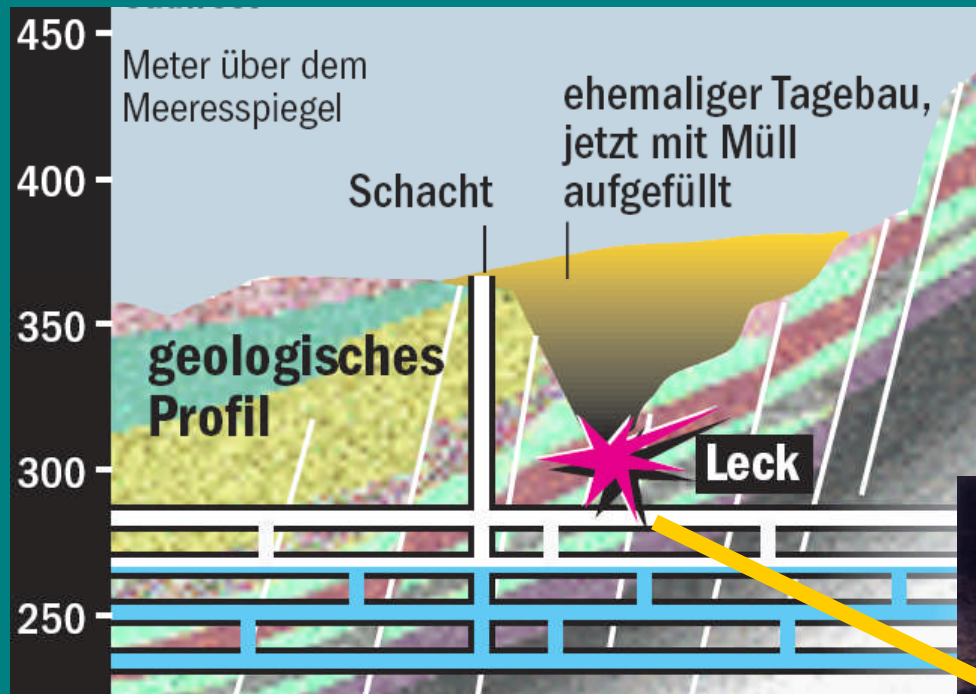
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Other compounds of landfill gas

Methane	CH ₄	up to 65 Vol.%
Carbon Dioxide	CO ₂	up to 65 Vol.%
Carbon Monoxide	CO	up to 2,8 Vol.%
Ammonia	NH ₃	up to 0,35 ppm
Hydrogen Sulphide	H ₂ S	up to 700 ppm
Acetaldehyde	CH ₃ CHO	up to 150 ppm
Benzene	C ₆ H ₆	up to 800 ppm
Vinyl Chloride (VC)	C ₂ H ₃ Cl	up to 72 mg/m ³
Dichlormethane	CH ₂ Cl ₂	up to 2400 mg/m ³
Chloroforme	CHCl ₃	up to 11 mg/m ³
Trichloroethylene	C ₂ HCl ₃	up to 251 mg/m ³
Tetrachloretylene	C ₂ Cl ₄	up to 182 mg/m ³
...		

Landfills: Danger for water and the environment

Leaching, example "Mechernich" Germany 1996



**barrier: plastic layer
of 2.5 millimetre**



**Leaching of heavy metals!
+waste and even plastic bags**



Toxic compounds of leaching water

Lead	Pb	up to 1.0 mg/l
Arsenic	As	up to 1.0 mg/l
Cadmium	Cd	up to 0.1 mg/l
Mercury	Hg	up to 0.05 mg/l
...		
AOX		up to 3.5 mg/l

In samples of an MSW – Landfill site

AOX: Organic halogens subject to absorption. This is a measure of the amount of chlorine (and other halogens) combined with organic compounds.

Landfilling as a shift of problems

- Landfill sites are black boxes, with uncontrolled biological and chemical processes.
- They need intensive care for generations, leaching water has to be treated for years.
- Permanent danger of leaks and rents, with heavy consequences for groundwater and soil. Such problems are usually more or less not reparable.
- Therefore Greens are campaigning to end the disposal of waste from human settlements on landfill sites by 2020 completely.



Landfilling with Methane recovery

- **Methane capture /recovery is only a practical way of dealing with existing old landfills. Reasons:**
 - Capture of methane only up to a maximum of 50% possible
 - ever lasting costs for landfill security
 - problem of leaches and danger of groundwater contamination is not solved
 - no sustainable solution black box
 - probably later need for remediation
- This technology is not for the future!**



Pyrolysis, gasification and others

Bad experiences in the past in Germany.

- **High costs with poor results:**
 - **“Babcock- pyrolysis” capacity only 26.000 t/a in the 80’s**
 - **“Schwel-Brenn-Verfahren” pilot plant never worked regular**
 - **“Thermoselect” only one facility end in 2004, loss of 400 Mill. €**
 - **“PKA –process” since 2007 off duty**
 - **“black pump” 2004 sold for one Euro, since 2007 using coal**
 - **...**

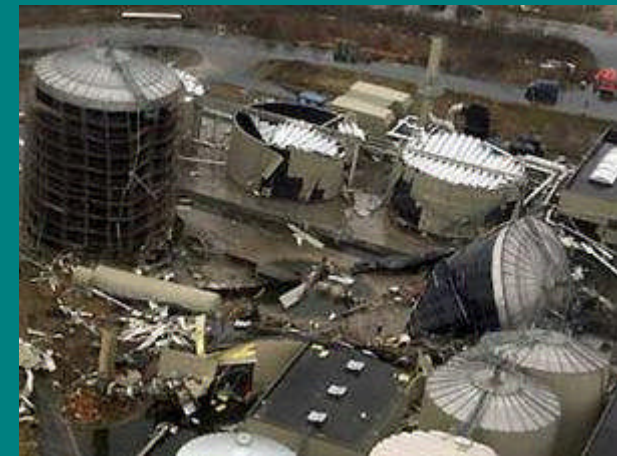
These technologies have not shown reliability so far!

Mechanical Biological Treatment

Mechanical Biological Treatment:

- separation of waste stream in a recycling chain (metal, wood), a solid fuel strain (paper, plastics) and the biological treatment of the almost organic rest with a following landfilling.
 - Campaigned by the Greens in the early days, but there are still technical problems, no market for solid fuel, landfilling is still necessary

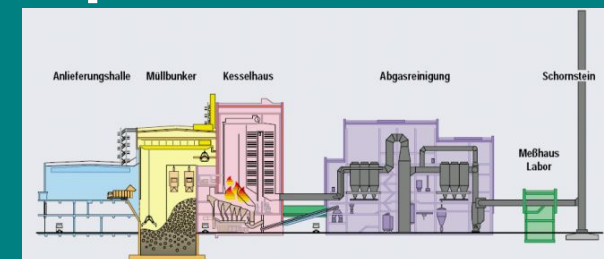
This technology is an intermediate!



Explosion in MBA in Göttingen 2006

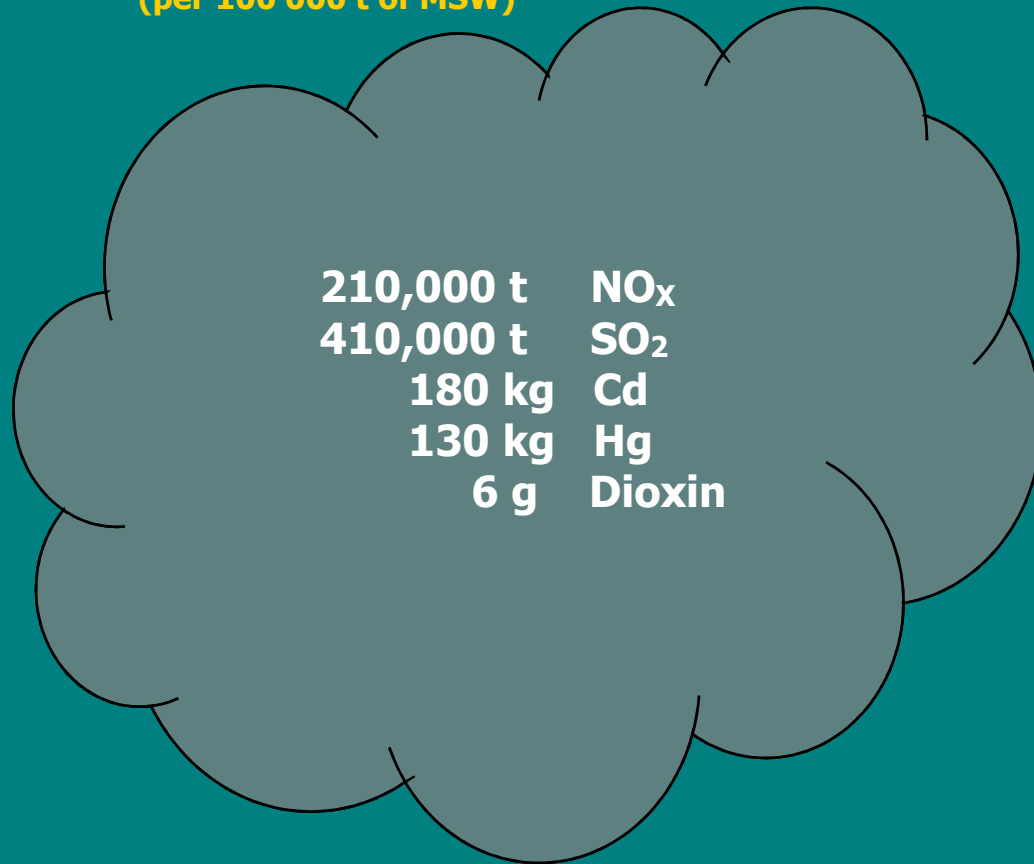
Incineration

- **Advantage: proven technology for many years**
- **When using a facility with best available technology very low environmental impact:**
 - high efficiency in recovering of heat and electricity,
 - very low emissions,
 - use of different by-products by producing acid and gypsum
 - use of ashes e.g. in the construction industry
 - no landfilling, only small amount of the input has to be left over to be deposited in the subsoil

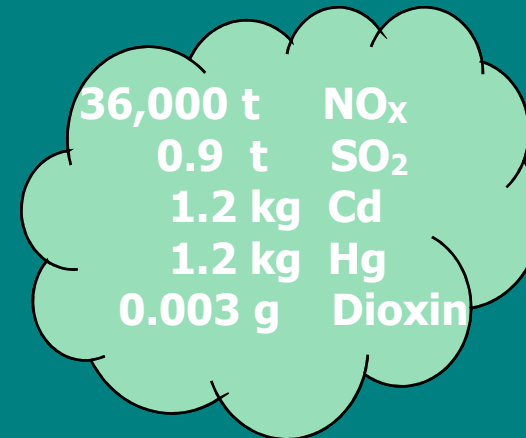


Emissions from waste incineration in Germany

(per 100 000 t of MSW)



before 1990



today



Very important: reliability!

Missing it is definitely the worst case for our environment!

– examples: Napoli, Italy and not working MBT Technology



Conclusions

Lessons learned

- **Waste avoidance and recycling quotas are not the solution, they are just a part of it,**
 - **Recycling has limits, e.g. diapers, plastics!**
 - **Even recycling products become waste after use,**
 - **Using best available technology for the incineration of residual waste means less impact to environment and to climate than landfilling.**
 - *although many members of the green party started their "career" in action groups against incineration plants, incineration with low emission levels, energy and material recovery is accepted today.*
-

Conclusions

There are still challenges to meet!

A sustainable handling of waste is a central element of environmental and climate protection.

- 1. Establishing of re-use and take back systems**
 - 2. Closing the loop for raw materials by an integrated product-design and an increasing of recycling**
 - 3. Ending of landfilling as soon as possible.**
 - 4. Leftovers should be used to generate heat and electricity by using the best available and reliable technology.**
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**Thank you for your
attention.**
