Sustainable Waste Management Policy -Development in Germany-

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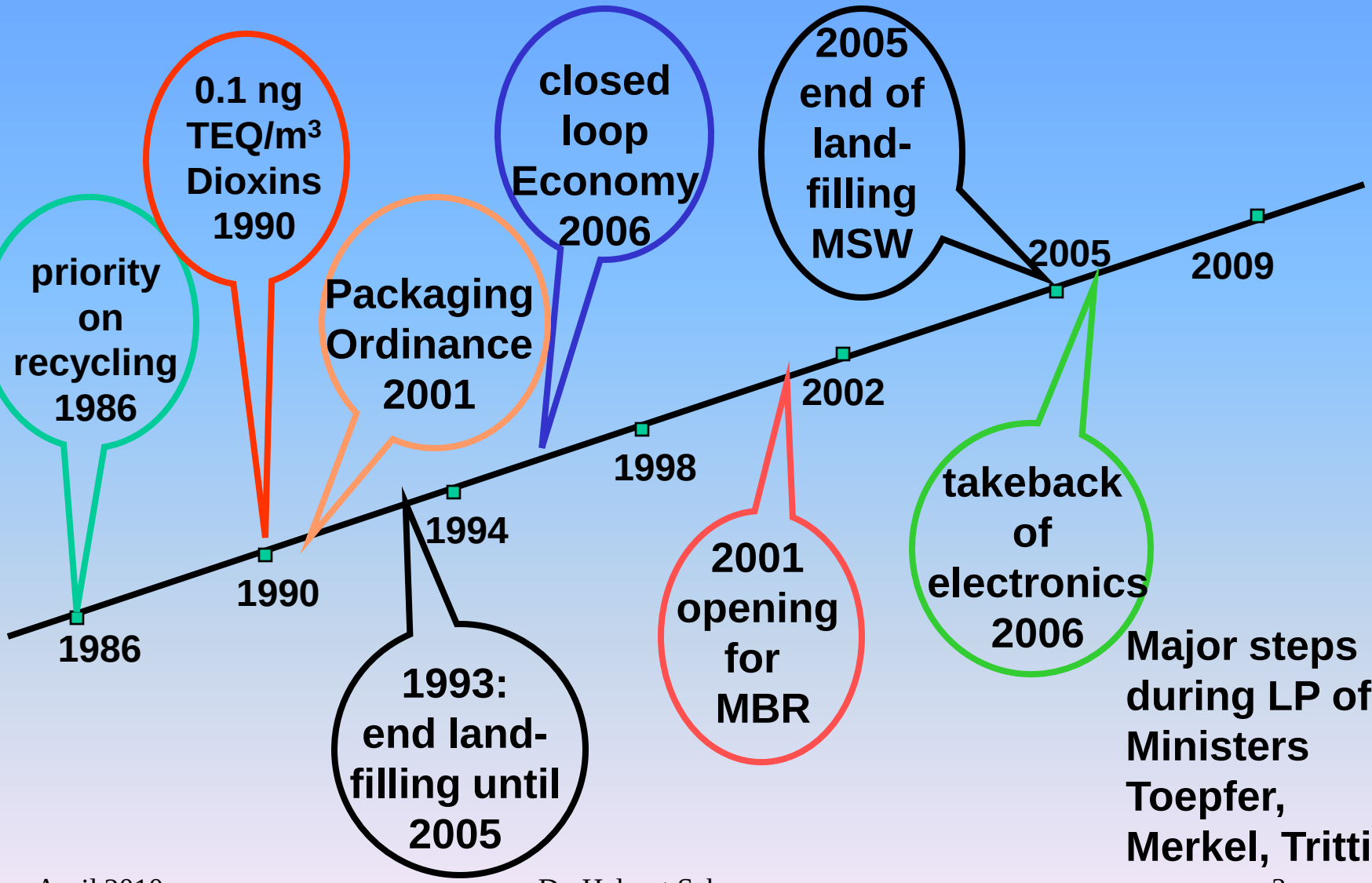
since then: exchange of information and co-operation as

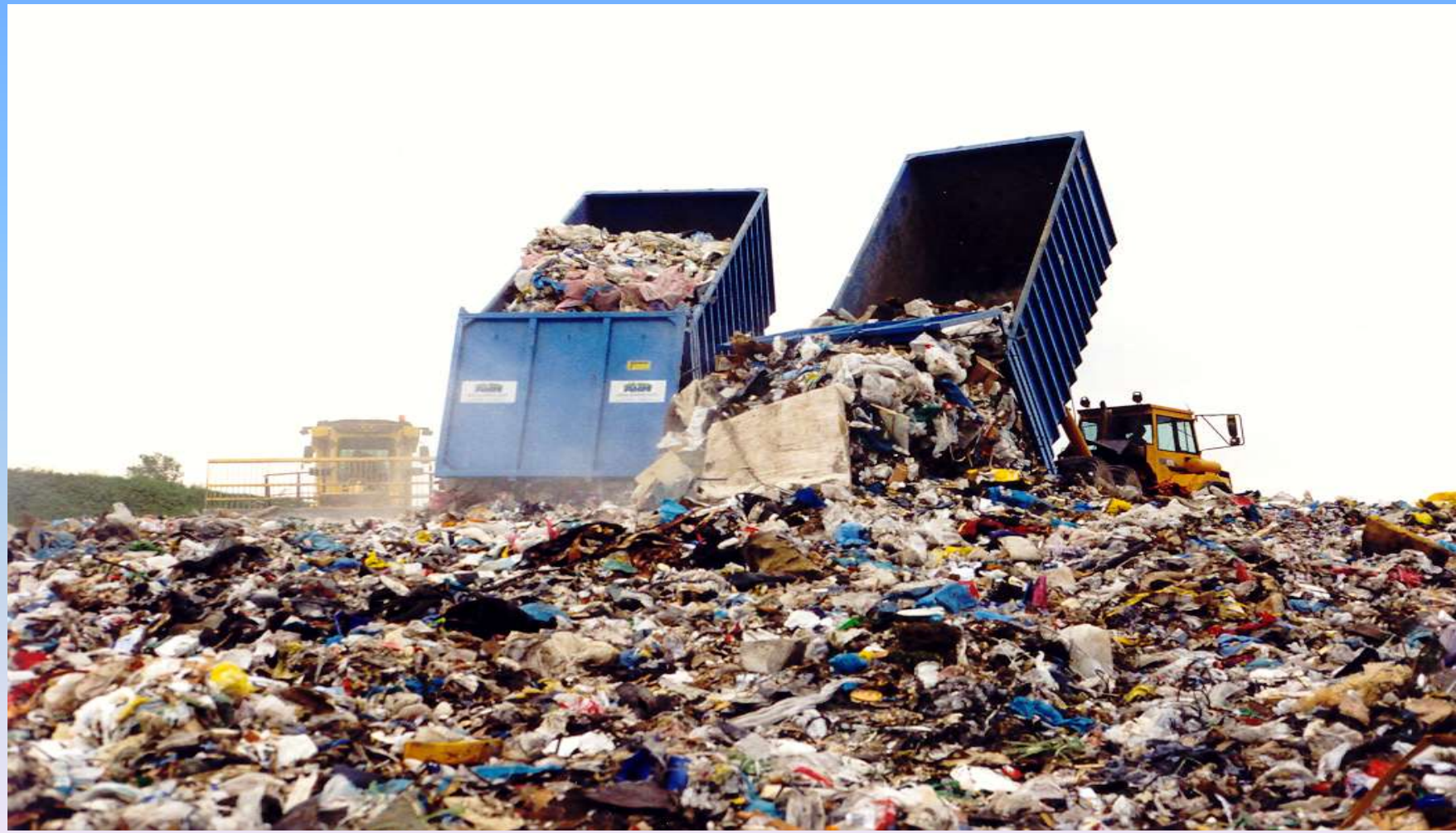
- **Advisor in EU-Twinning projects with new EU-Member States in Malta, Czech Republic, Lituania, currently in Bulgaria**
- **Member of OECD-delegations in Environmental Performance Reviews in P.R. of China, Japan**
- **Advisor in bilateral projects in Malta, Poland, Russia, Italy, USA a. o.**

Major Steps in WM-Development



Major steps during LP of Ministers Toepfer, Merkel, Trittin

We did it like that for a long time

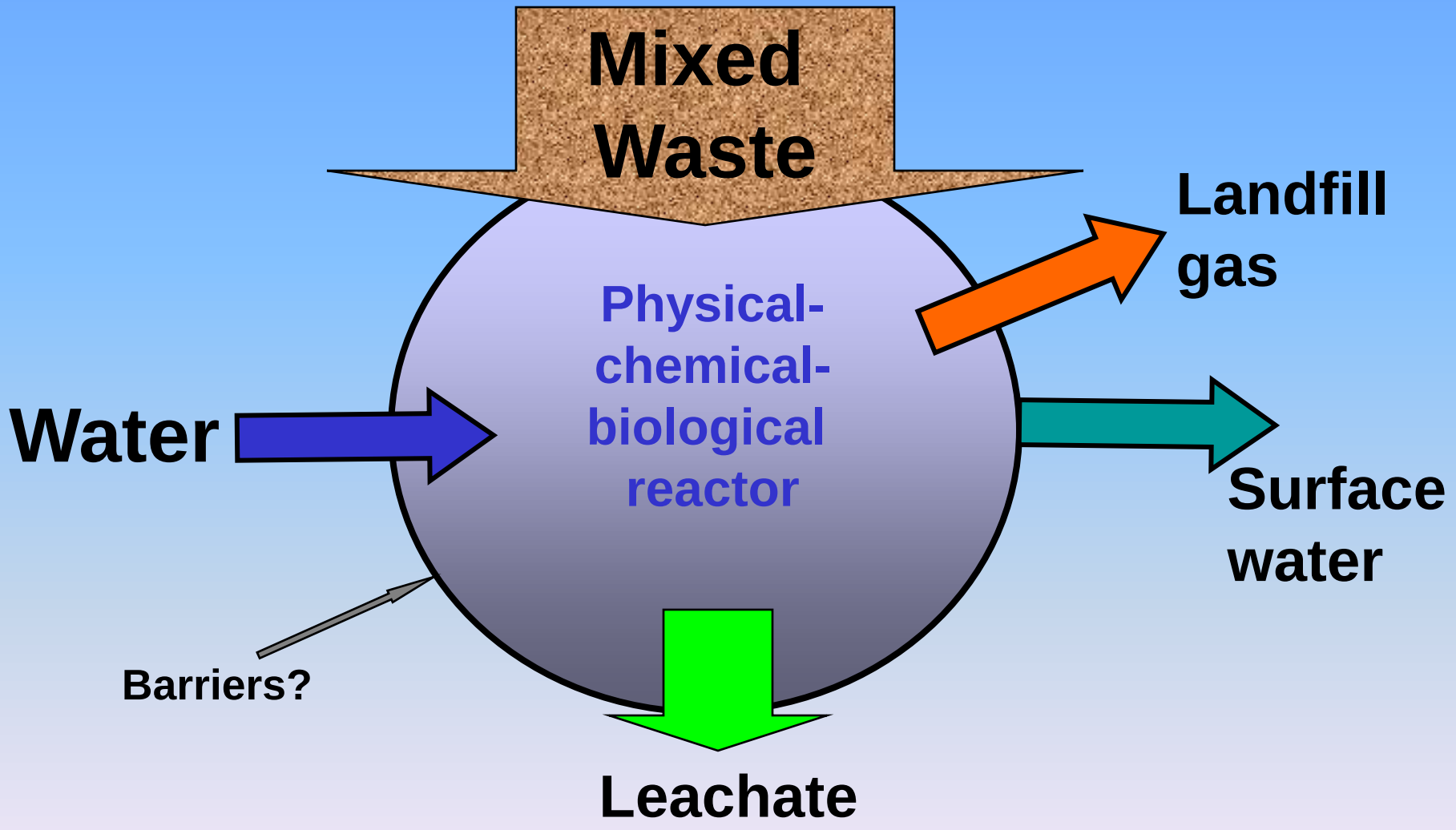


Situation up to the 80ties in Germany

- Increasing amounts of waste
- Opposition against new landfills
- Increasing costs
- Export to distant regions created political problems
- Environmental problems
- Landfilling avoids recycling

Can dumping of waste be a sustainable solution?

Problems with Landfilling



Why did we abandon land filling?

- In order to protect the environment we would need a sophisticated lining system with a long term reliability
- Long term reliability does not exist
- The leachate control is not perfect
- The collection of landfill gas is not efficient (<50%)
- ➔Landfills are harmful to groundwater and climate
- Need for longterm control and maintenance (centuries)
- Landfills shift ecological and economical burdens to future generations
- High-tech landfills became similar expensive than many recycling techniques or waste incineration

Landfills are not sustainable

The first alternatives to landfilling?

- **Avoid waste by reuse of waste products (e.g. refillable packaging)**
- **Reduce waste for disposal by increasing separate collection and recycling of waste from MSW like:**
  - **Packaging (glass, metal, paper and board, plastic)**
  - **Bio waste for composting or anaerobic digestion**
  - **Waste paper (newspaper etc.)**
  - **Textiles, shoes**
  - **Bulky waste**
  - **Waste wood**
  - **Construction and demolition waste**
  - **Return electric and electronic equipment, batteries to producers, importers, retailers (Extended Producer Responsibility = EPR)**
- **Use of economic instruments (landfill tax in many European countries)**
- **Motivate people for separate collection**


Recycling can be very interesting!!!

But, not all waste can be avoided or recycled, and

Zero Waste is not possible

What should be done with the remaining residual waste?

?

Regulation in Germany (1993)

Restrictions for landfilling: All MSW has to be pre-treated (deadline for implementation was May 2005)

Regulations do not define the way – but the results:

- ➔ **Specifications for waste to landfill**
- ➔ **Stringent requirements to reduce and avoid emissions into air and water from treatment facilities and from landfills**

Specifications for MSW
(which may be landfilled in Germany after 2005)

- **Avoid and mineralize organic substances (TOC <= 3%)**
- **Extract soluble hazardous substances (a.o. heavy metals) or transfer them into insoluble chemical form**

➔Residual MSW does not cope with such requirements, but must be pre-treated

- **Requirements can be fulfilled by thermal treatment of MSW**
- **Most residues from thermal treatment go for recycling (bottom ash, metals, gypsum, hydrocloric acid)**
- **Only small amounts (fly ash, filter residues) have to be extracted and disposed of (underground storage)**
- **Energy must be used (heat and/or electric power)**

Similar approach in Europe:

EU-Landfill Directive [1999/31/EG]: reduce landfilling of bio-degradable waste by 50% in 2009 and by 65% in 2014

New German emission standards
(became later the EU Waste Incineration Directive [2000/76/EG])

- **Very stringent emission limits for waste incineration have been decided in Germany already in 1990**
- **Boundary values for dust and noxes are more stringent compared to industrial thermal plants**
- **New boundary value: <=0.1 ng TEQ /m^3 for dioxins and furans in the off gas of waste incinerators**
- **Consequences are sophisticated flue gas cleaning systems at MSWI (including active carbon filter ➔police filter)**
- **Actual emissions in MSWI‘s are significantly lower than the legal limit values**

  ➔Significant increase in public acceptance of MSWI

  ➔ The Green Party in Germany accepts modern MSWI for residual waste as an environmentally friendly solution

Advantages of W2E

- **Waste incineration has developed since >100 years, is a mature technology with high availability**
- **Waste incineration can be used for very different waste streams (also for bulky waste, sewage sludge etc.)**
- **Grate firing can be seen as an „omnivore“**
- **Other thermal treatment processes are only adequate for special wastes**
  - **fluidized bed for homogenious wastes**
  - **rotating kiln for mixed hazardous wastes**
  - **co-incineration in power stations and cement kilns for pre-treated waste with little contents of noxes**

MSWI at Nuremberg:

- Close to the city
- Very low emissions
- Steam for district heating and adjacent power plant
- Transport of waste by truck and rail
- Modern architecture = better public acceptance

Opening for an Alternative: MBT

- **A political decision for an alternative to waste incineration has been made in Germany in 2001 ➔ Mechanical-Biological-Treatment (MBT)**
- **Different techniques are used to separate**
  - **recyclables by mechanical sorting (mainly metals),**
  - **water by biological process,**
  - **in some facilities a low caloric fraction (<6 MJ/kg), which can go for landfilling,**
  - **a high caloric fraction, which has to go for W2E (co-incineration in cement kilns or power stations or MSWI)**
- **Municipalities had to make operable until May 2005 either a MSWI or a MBT + landfill + W2E**

Disadvantages of MBT

- **MBT is only an upstream facility and needs incineration for RDF and landfill for the inert waste (➔ complex system)**
- **Efficiency for mineralization of organics is much lower compared to W2E (TOC hardly below 18%, compared to <3% for incineration)**
- **Mechanical-biological processes consume energy instead of energy recovery**
- **MBT has to pay for for incineration of RDF (no revenue but costs due to limited market)**
- **MBT-technology is immature ➔ many flops / failures / poor availability / increases in costs / shut down of facilities**
- **MBT has been accepted in Germany (only) as a transitional model (➔ achieve 100% recycling and energy recovery after 2020)**

Other alternative Techniques ?

During the last 20-30 years in Germany and elsewhere many so called „alternative techniques“ have been proposed from their developers as a „better alternative to proven technologies (like MSWI)“:

- **pyrolysis**
- **gasification**
- **plasma techniques**
- **catalytic depolimerisation**
- **and others, including combined processes**

But most commercial scale facilities failed due to one or several reasons:

- **No continous operation could be achieved**
- **No reliability to manage the municipal waste could be guaranteed**
- **Higher costs/stranded investment (>500million $ allone in one case)**
- **Specifications for RDF/residues/emissions could not be achieved**
- **Breakdown and shut down of whole facilities occurred**

Most technologies don‘t work with MSW ➔ MSW = chamelion

Results in Germany

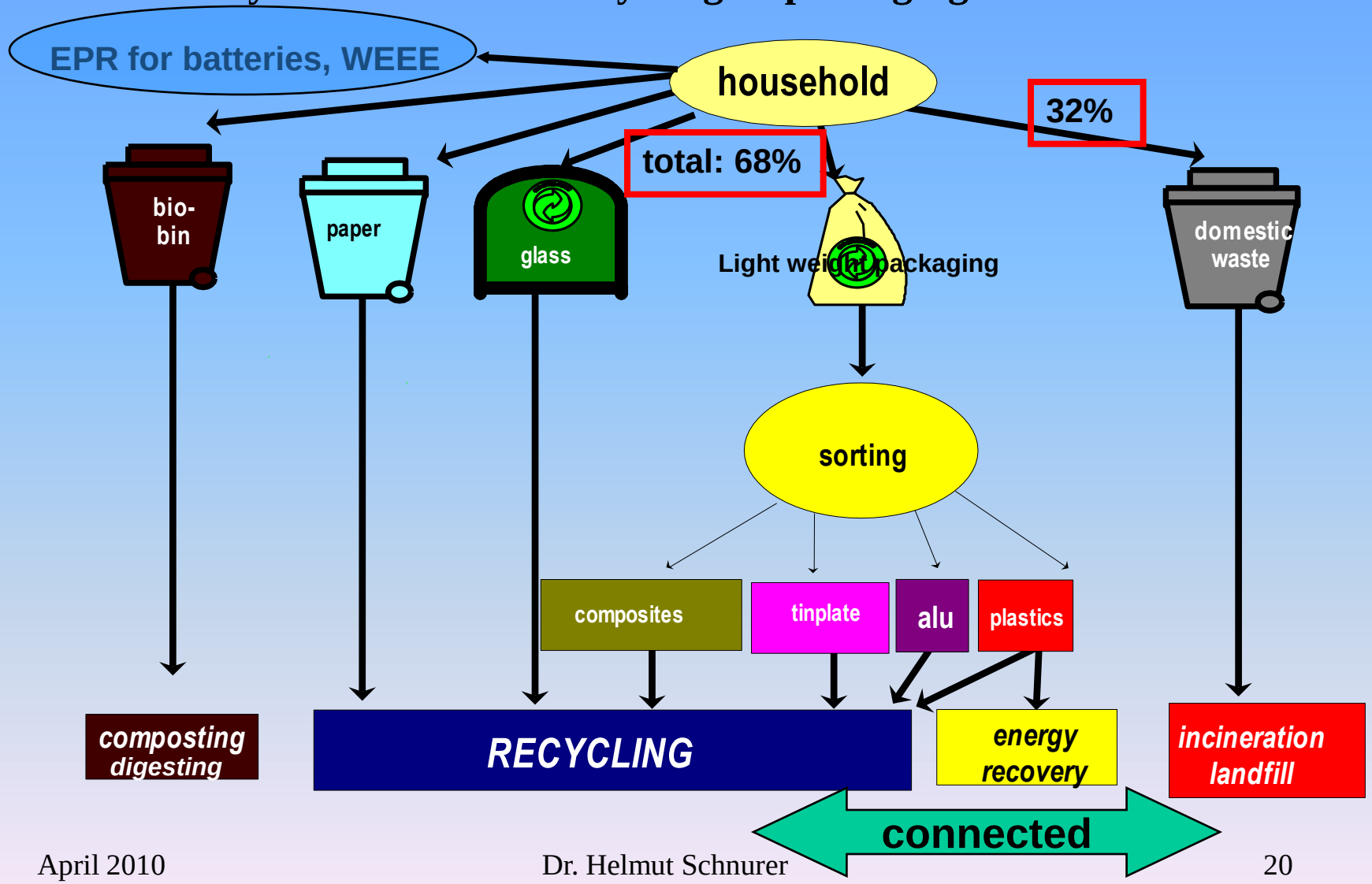
Public and private operators

- **rely mainly on proven technology: Municipal Solid Waste Incineration (MSWI, mainly grate, a few fluidized bed), one small pyrolysis plant**
  - **73 MSWI facilities are operating presently**
  - **Total capacity of 17.9 million tons per year ➔ (65%)**
- **others use Mechanical-Biological-Treatment (MBT)**
  - **72 facilities with 7.2 million tons per year ➔ (26%)**
- **RDF from MBT substitutes fossil fuels in coal fired power plants, cement kilns and special RDF power plants**
  - **presently 2.3 million tons per year ➔ (8%)**

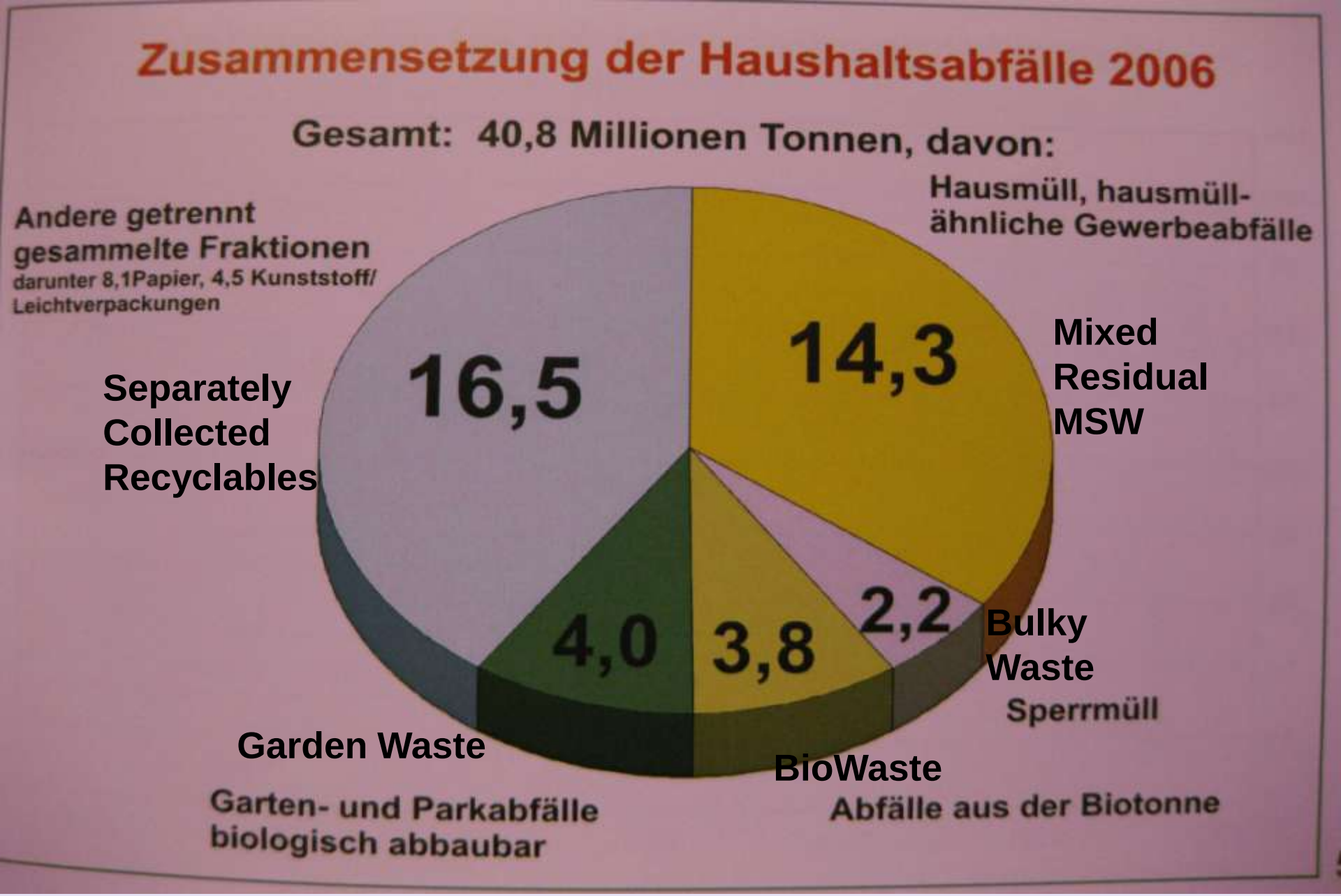
[Situation is similar in some other European countries, like A, CH, DK, F, NL, S]

Germany's Approach to Resource Recovery

Todays collection and recycling of packaging and domestic waste

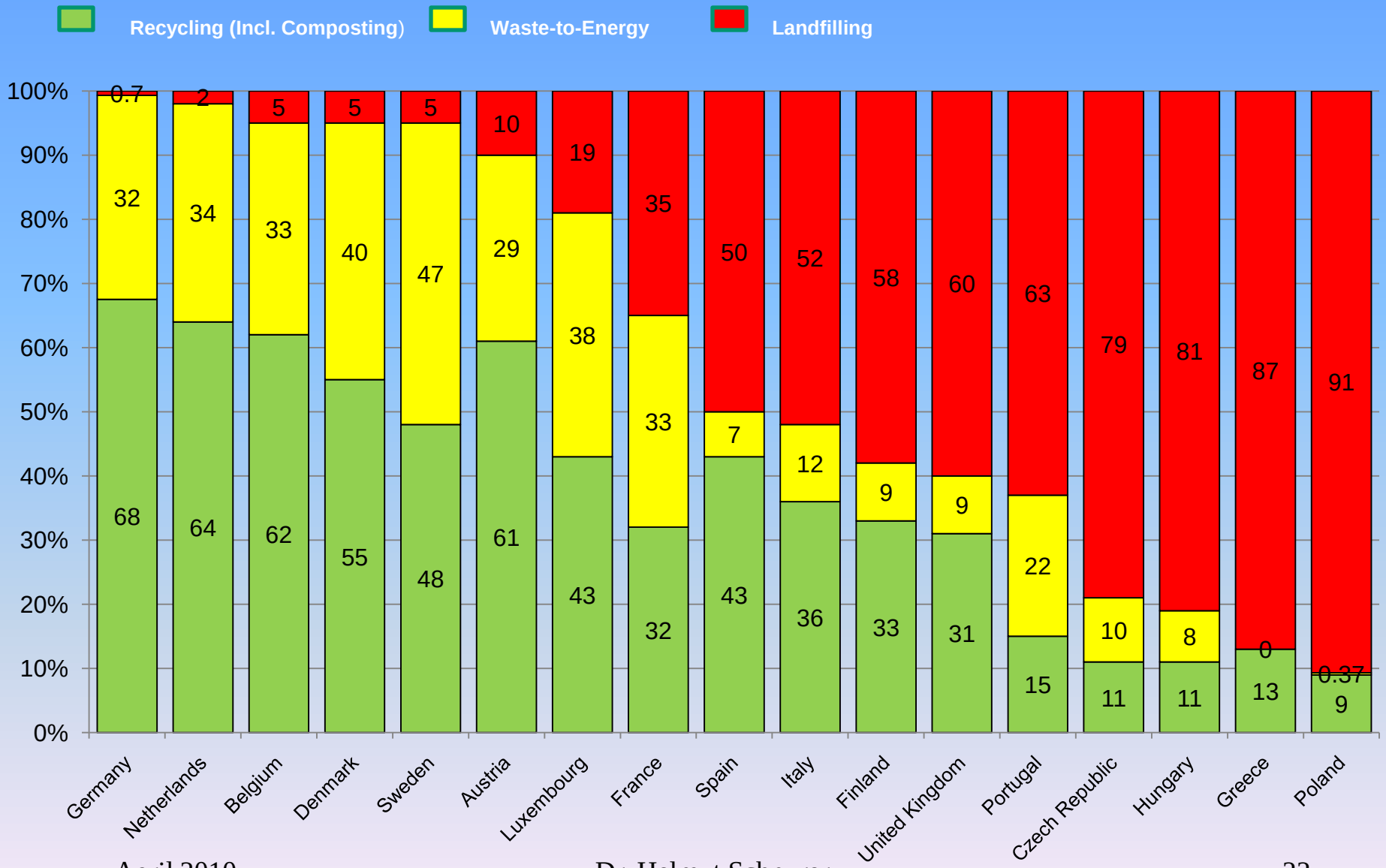


Zusammensetzung der Haushaltsabfälle 2006



Treatment of MSW in the EU 27 in 2006

Source: EUROSTAT



A new Experience: Waste Management contributes to Climate Protection

(Research report from BMU/UBA/Oeko-Institut/ifeu, January 2010)

- **In 1990 methane-emissions from dumps caused 38 million tons of CO_2e/y in Germany**
- **Out phasing landfilling of MSW in Germany until 2005 has reduced such gas emissions significantly**
- **Incineration of organic waste has no impact on climate change but substitutes fossil fuel**
- **Major other contributions for reduction of GHG emissions are:**
  - **Substitution of fossil fuel by incineration : -2,300 million tons CO_2e/y**
  - **Recycling of separately collected waste:**
    - **Paper, cardboard: -6,000 million tons CO_2e/y**
    - **Glass -900 million tons CO_2e/y**
    - **Light weight packaging -2,300 million tns CO_2e/y**
    - **Bio waste, garden waste -130 million tons CO_2e/y**
    - **Waste wood -6,500 million tons CO_2e/y**
- **Total reduction until 2006: -17,800 million tons CO_2e/y**
- **Out phasing landfills + increased recycling and recovery activities have contributed to a total reduction of 56 million tons CO_2e/y**

THANK YOU FOR LISTENING

More information on
www.bmu.de
and
http://europa.eu.int