

The present and future landfill policy in Germany

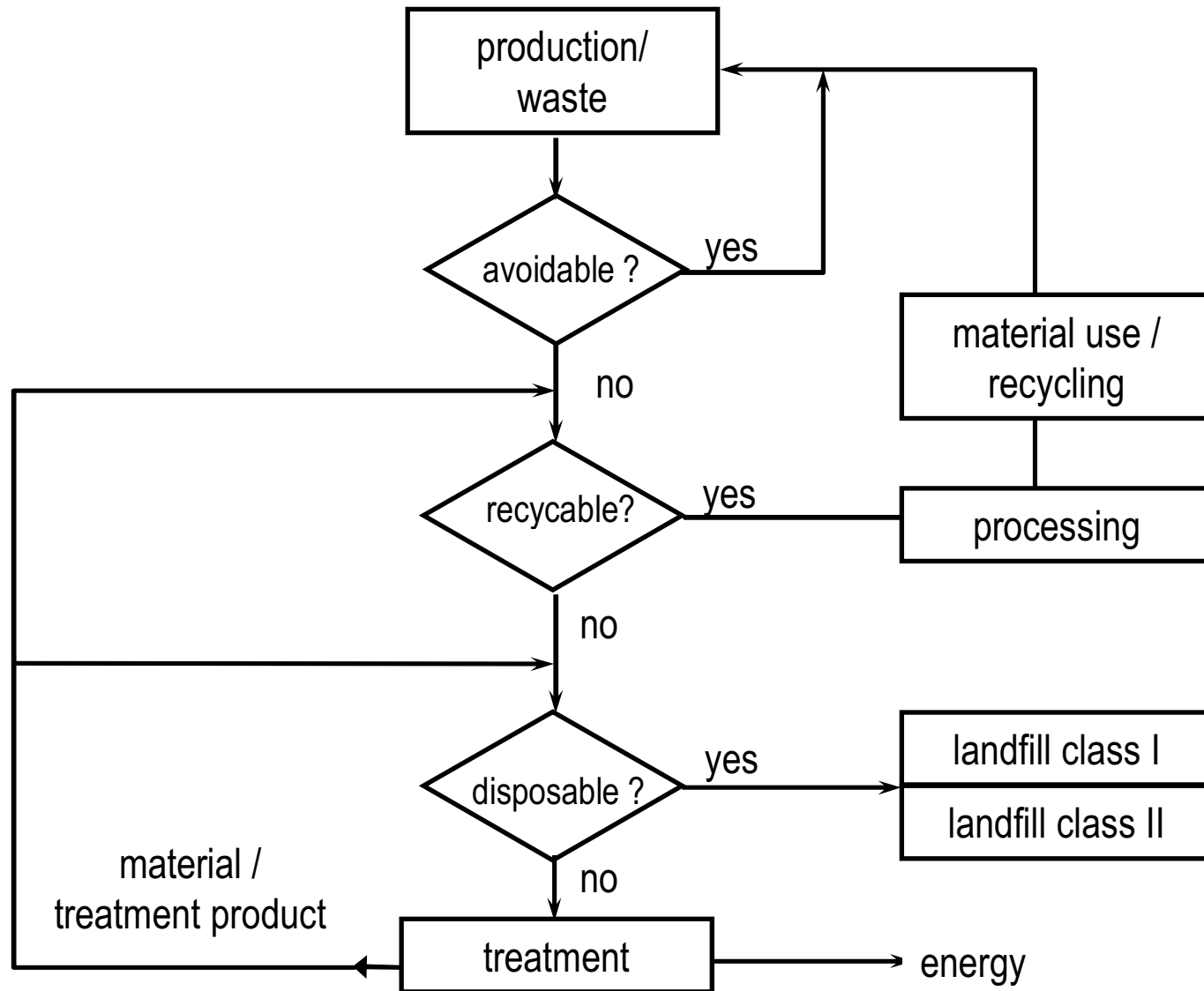
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German: Kühle-Weidemeier

Important steps of German waste management

- 1986: Waste law prescribes, that avoiding of waste has to be preferred to recycling.
- Based on this, rules for product responsibility were created; e.g. used mineral oil can be returned priceless to the industry.
- 1991: Packaging ordinance. Producers and sellers are responsible for product packages and have to collect and recycle used packages.
- 1993: Landfill guideline with high standards for landfill construction and input (most still valid and equal or higher than EC-standards)
- 1996: Closed loop recycling management and waste law enforces avoiding and recycling of waste and opens the waste market partly for private enterprises.

Closed loop recycling management



Aim: End of
landfilling in 2020
= loop closed

Municipal waste management in Germany

- Separate collection of (municipal waste):
 - Paper (to be recycled)
 - Glas (to be recycled)
 - "Bio-waste" (fruits, vegetables, plants and garden products...) 8 mio. Mg/a composted and used in agriculture
 - Packing material (plastic boxes, plastic bottles, cans, ...) to be recycled or used for high calorific incineration
 - "The rest" (residual waste)

Treatment of the residual waste

- Incineration
- Mechanical-biological-treatment (MBP)
- Direct disposal on landfills (limited until May 2005)

Landfill (class 2) input after May 2005

- Incineration ashes
- MBP - output
- Waste that meets legal standards without treatment
- Mixed landfilling of ashes and MBP-output might be unfavourable

Landfill classification

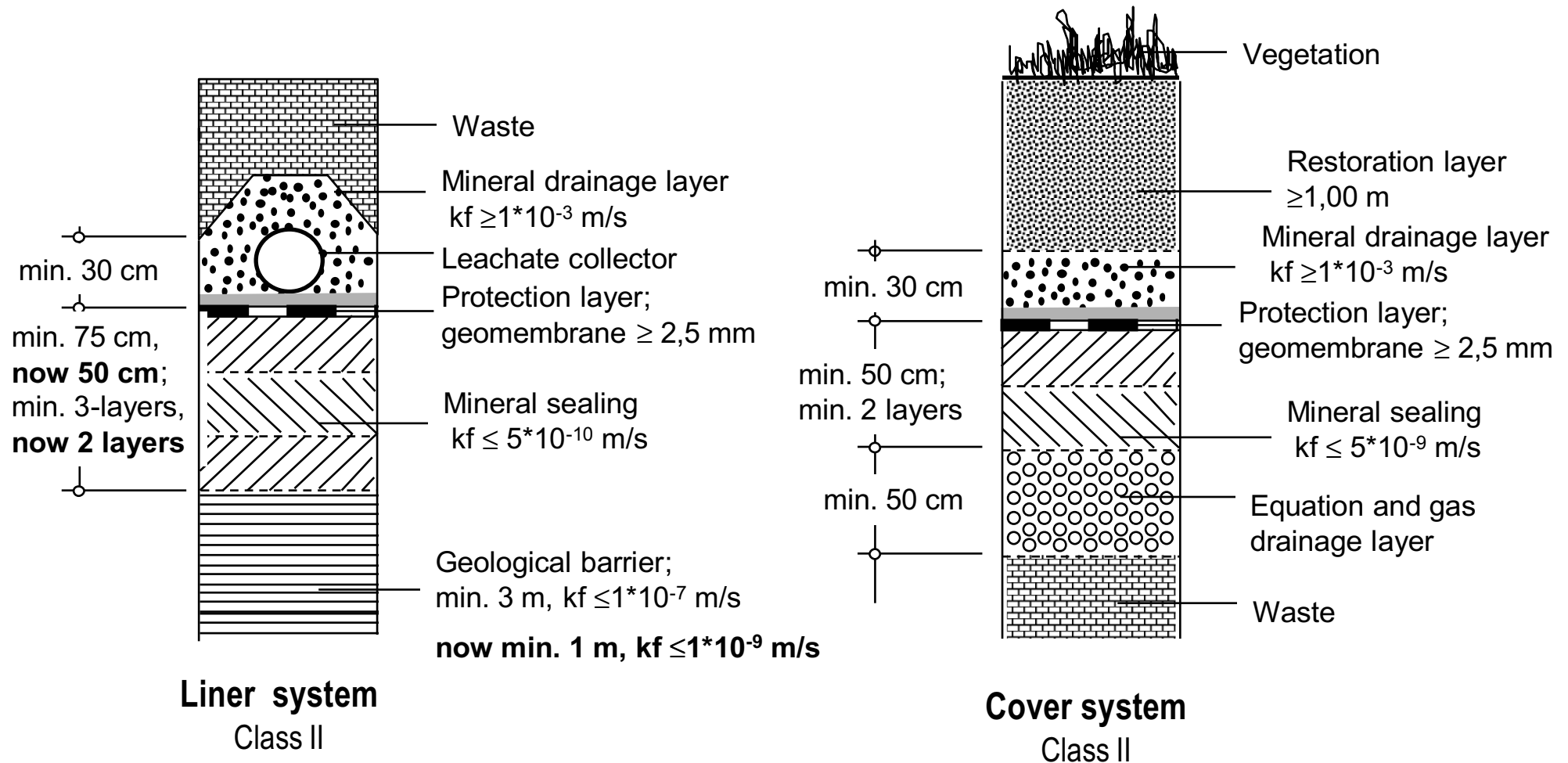
- Class 0: Inert waste
- Class I: Quite inert municipal waste (e.g. some incineration ashes)
- **Class II: Municipal waste**
- Class III: Hazardous waste
- Class IV: Underground disposal site
 - Inert waste
 - Hazardous / nuclear waste in salt caverns

Waste has to meet chemical / biological and mechanical requirements specific to the class to be landfilled

The multi-barrier-concept

- Geological barrier
- Landfill liner
- Inner barrier (waste properties)
- Landfill cover

Requirements to newly built class II landfills (defined 1993 in TA-Siedlungsabfall)



Requirements to landfill liner systems

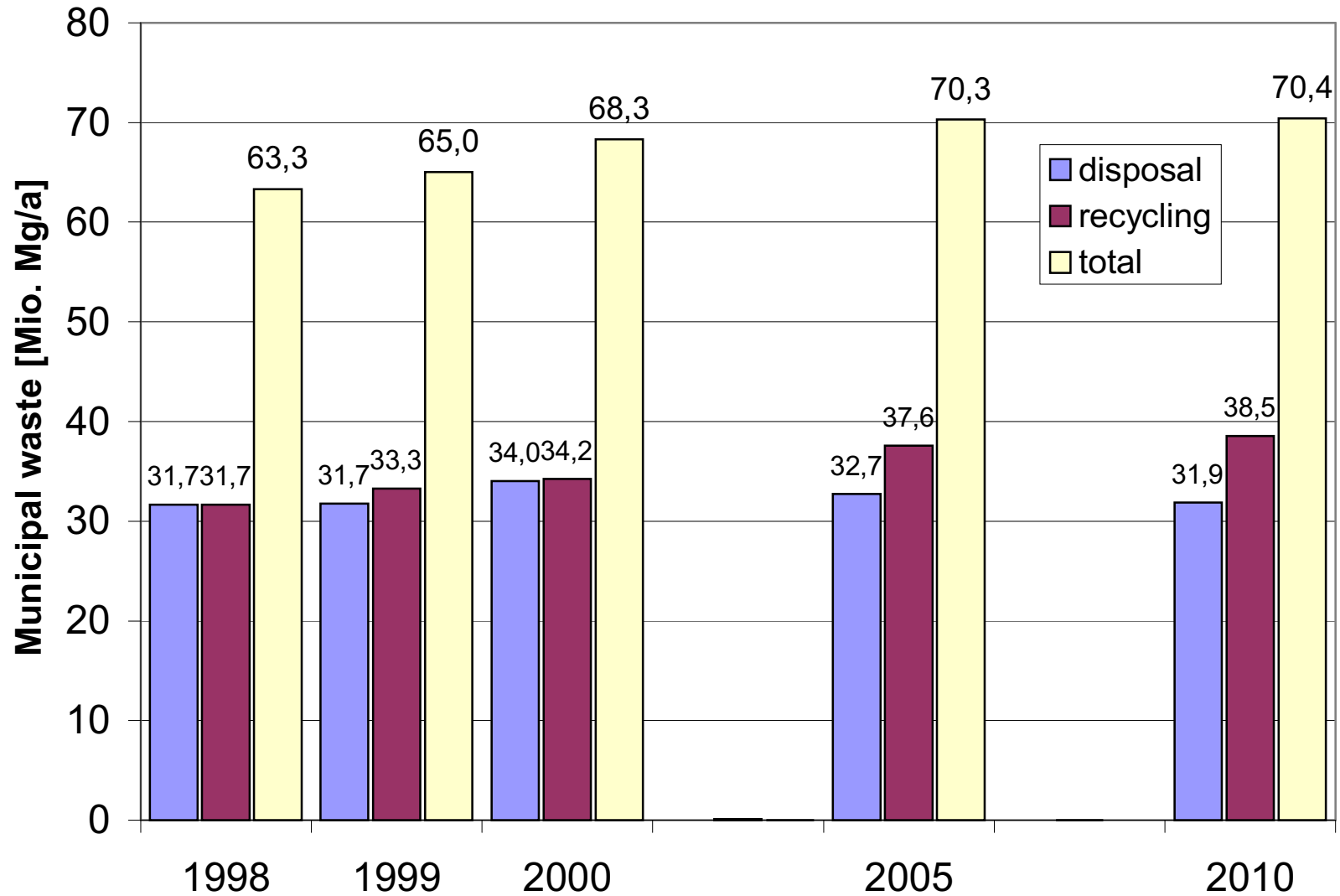
System component	Class 0	Class I	Class II	Class III
Geological barrier ¹⁾	$k \leq 1 \cdot 10^{-7}$ m/s $T \geq 1,0$ m	$k \leq 1 \cdot 10^{-9}$ m/s $T \geq 1,0$ m	$k \leq 1 \cdot 10^{-9}$ m/s $T \geq 1,0$ m	$k \leq 1 \cdot 10^{-9}$ m/s $T \geq 5,0$ m
2 layers mineral sealing	—	—	$T \geq 0,50$ m $k \leq 5 \cdot 10^{-10}$ m/s	$T \geq 0,50$ m $k \leq 5 \cdot 10^{-10}$ m/s
Geomembrane PE-HD $T \geq 2,5$ mm	—	yes	yes	yes
Protection layer for geomembrane	—	yes	yes	yes
Mineral drainage layer	$T \geq 0,3$ m $k \leq 1 \cdot 10^{-3}$ m/s	$T \geq 0,5$ m $k \leq 1 \cdot 10^{-3}$ m/s	$T \geq 0,5$ m $k \leq 1 \cdot 10^{-3}$ m/s	$T \geq 0,5$ m $k \leq 1 \cdot 10^{-3}$ m/s

1) Geological barrier can be completed or enhanced by technical measures

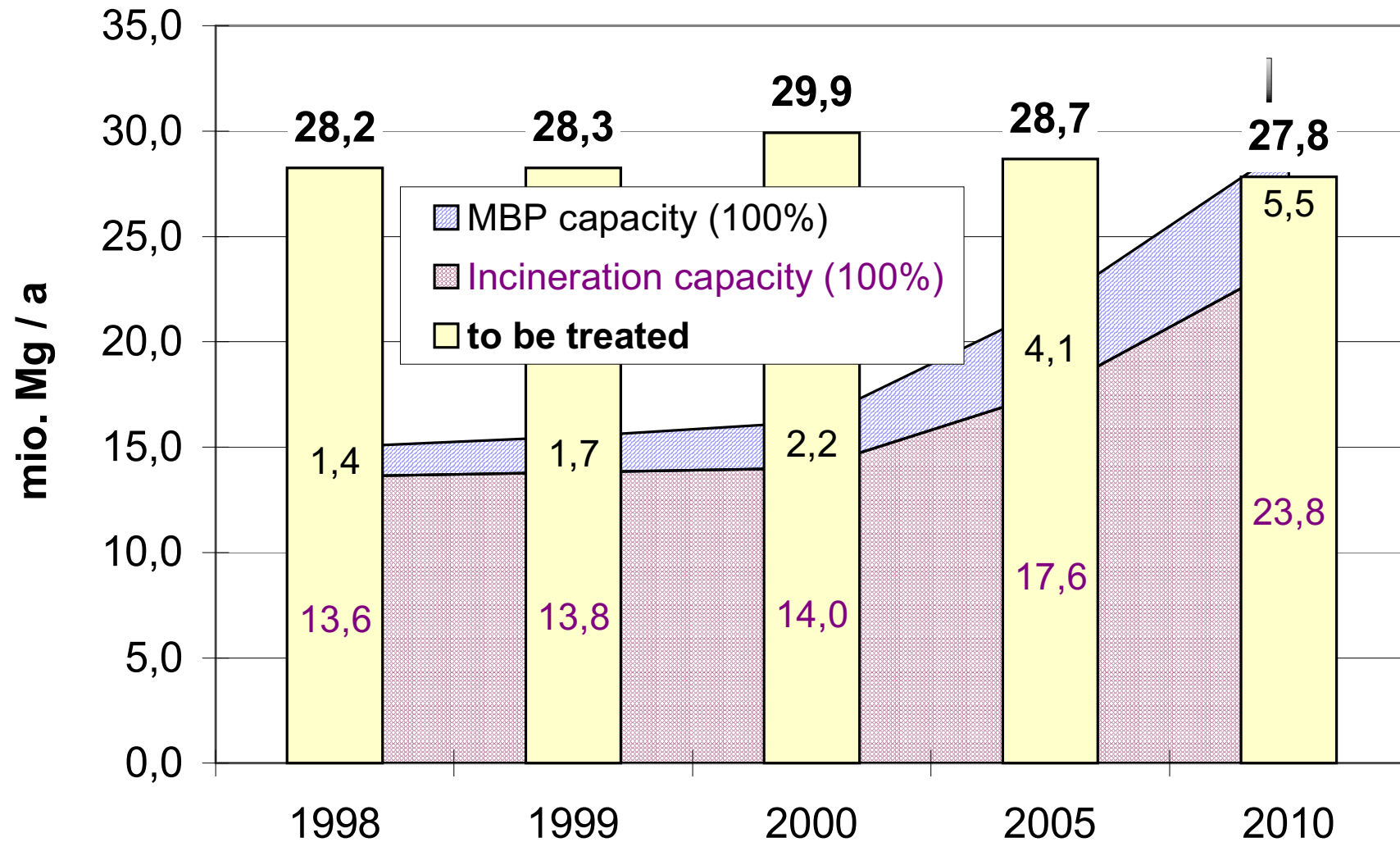
Transition periods

To be kept by operating landfills after:	Requirements to			
	Location (general)	Geological barrier	Distance to groundwater table	Liner system 10.4 TASI
May 31, 2005	no (on application) else: yes	no (on application) else: yes	yes	yes
July 16, 2009	yes	yes	yes	yes

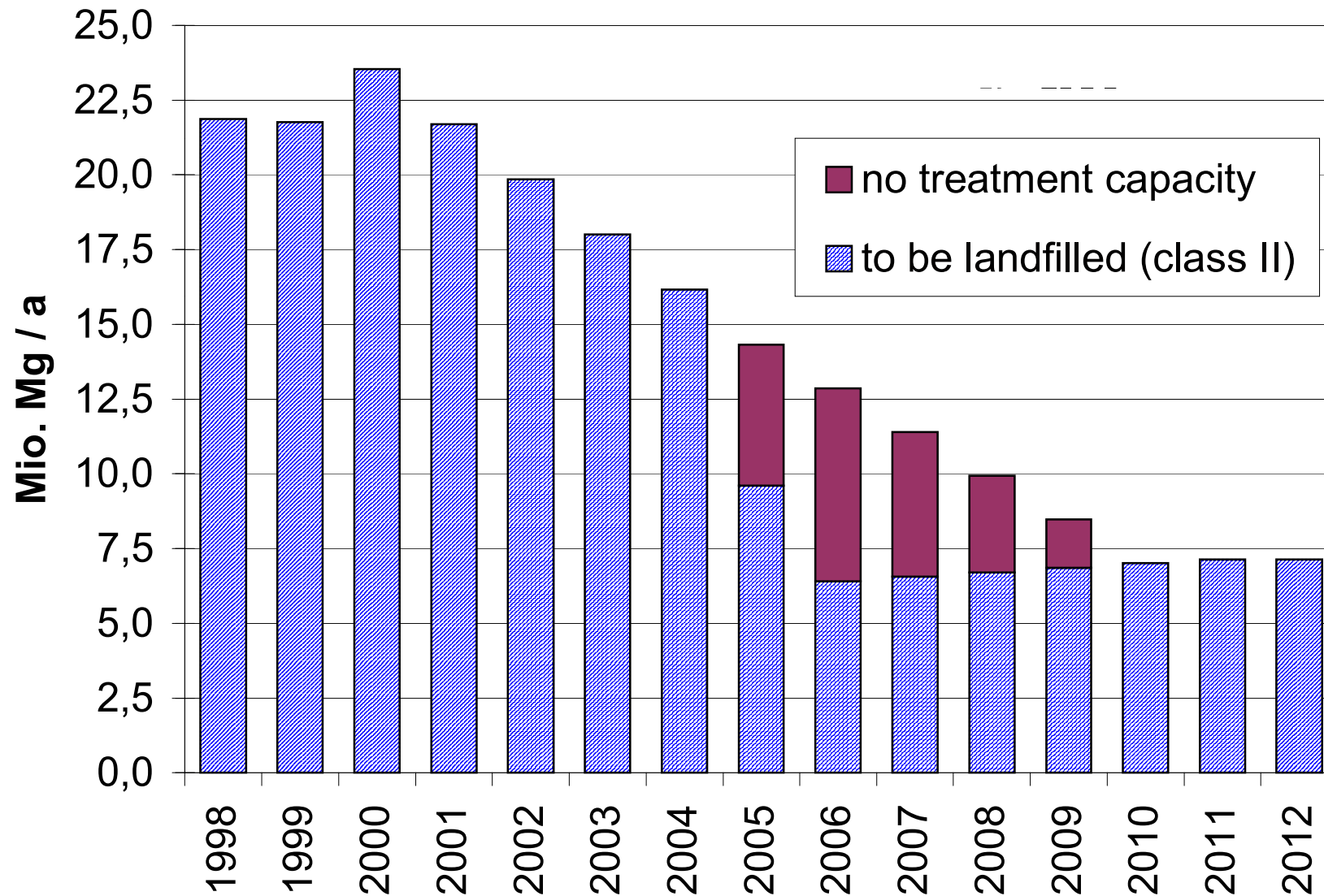
Amount and destination of municipal waste



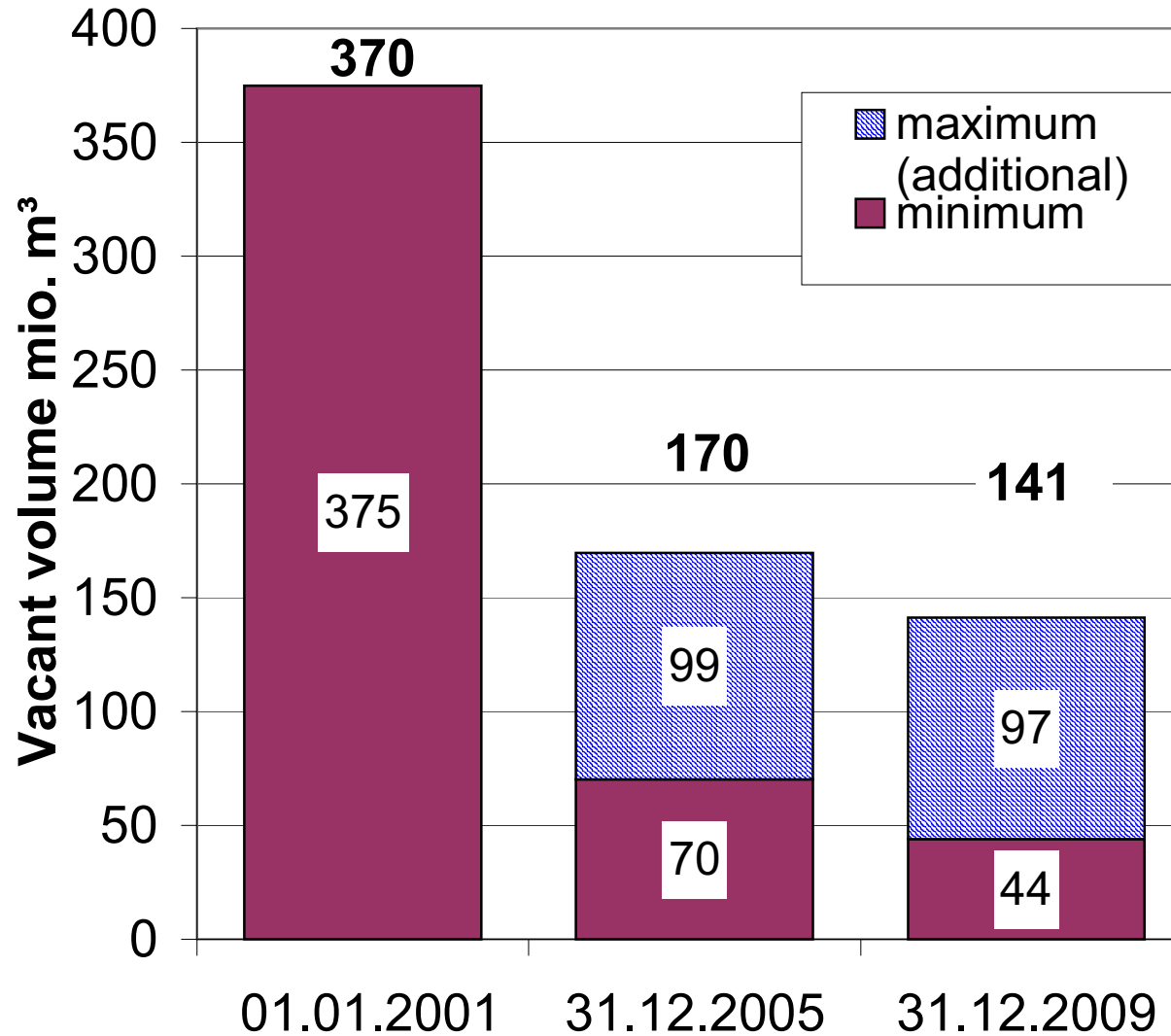
Waste treatment capacity



Amount of waste to be landfilled (class II)



Inventory and expected development of landfill capacity



Political aims of the environmental agency

- In 2005 sufficient treatment capacity should be available (nearly impossible).
- In 2020 the landfilling of municipal waste should be finished. All municipal waste or treatment products should be recycled or used for energy production (incineration).
- Harder restrictions for the use of sludge and bio-waste compost as fertilizers are in discussion, which would lead most of the sludge and the compost to incineration, although there is (and won't be within the next 5-10 years) no capacity available.