

 **TKK LAHTI CENTER**  
FACULTY OF ENGINEERING AND ARCHITECTURE  
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## **Goals and challenges for recycling: clean cycles and safe final sinks**

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 **Content**

- **Goals and principles of waste management**
- **Understanding „urban metabolism“ as the source of wastes**
- **Examples of recycling and „urban mining“**
- **Clean cycles and safe final sinks as the ultimate goals for recycling**

2/24



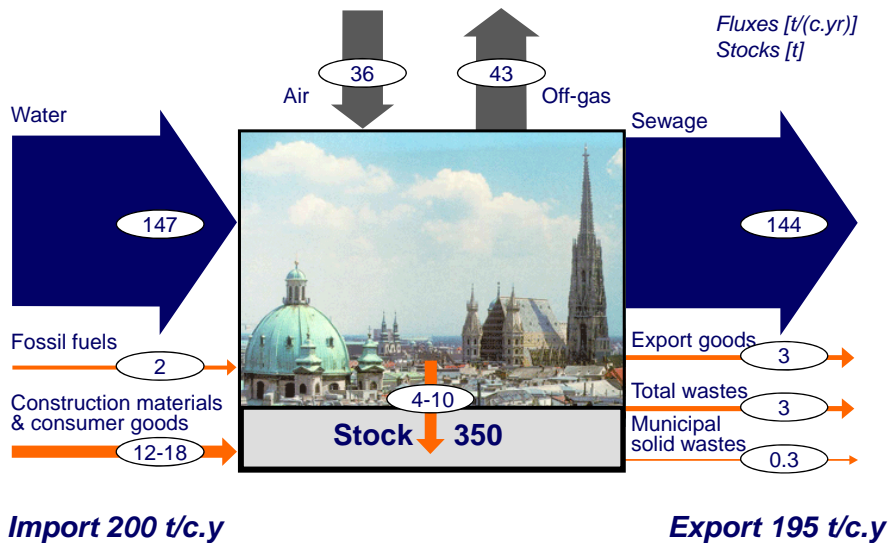
## Goals

- protection of men and environment
- conservation of resources
- after-care-free waste management (precautionary principle)

## Principles

- prevention
- recycling
- disposal

*hierarchy?*

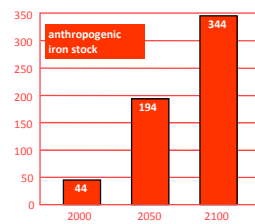
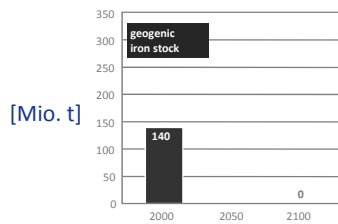
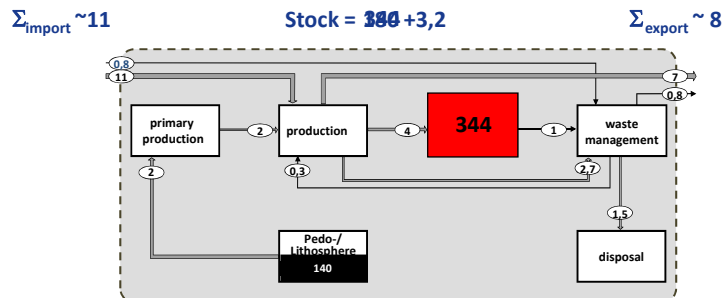


*Largest impact on environment: primary production (ore mining)*



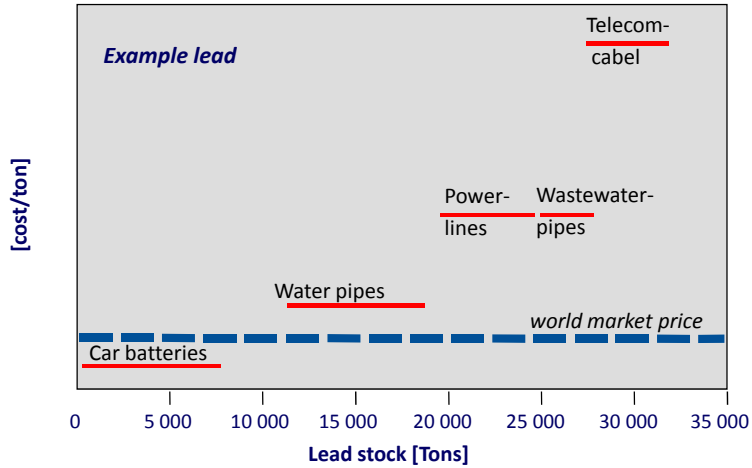
*Objectives of recycling and „urban mining“:*

- less impact on the environment
- conserves energy and materials



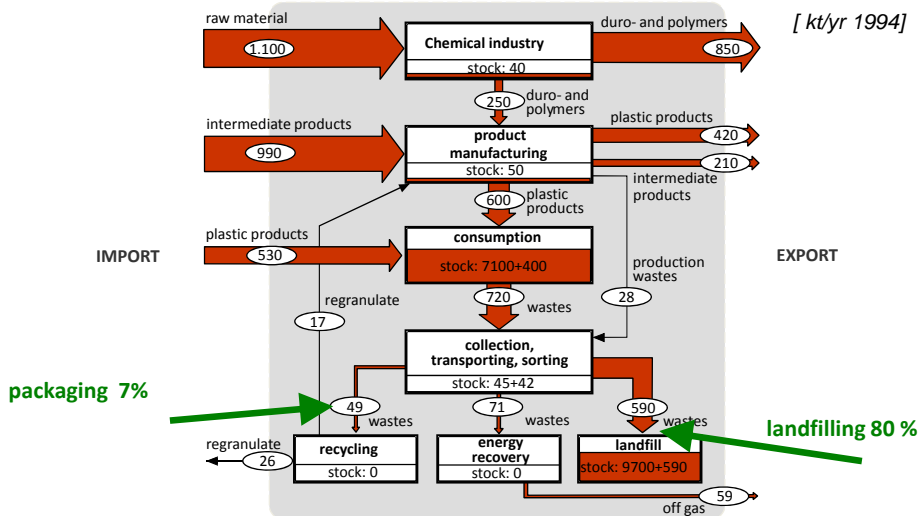
### 3. "Urban mining": example of lead

Where are our future resources?



7/24

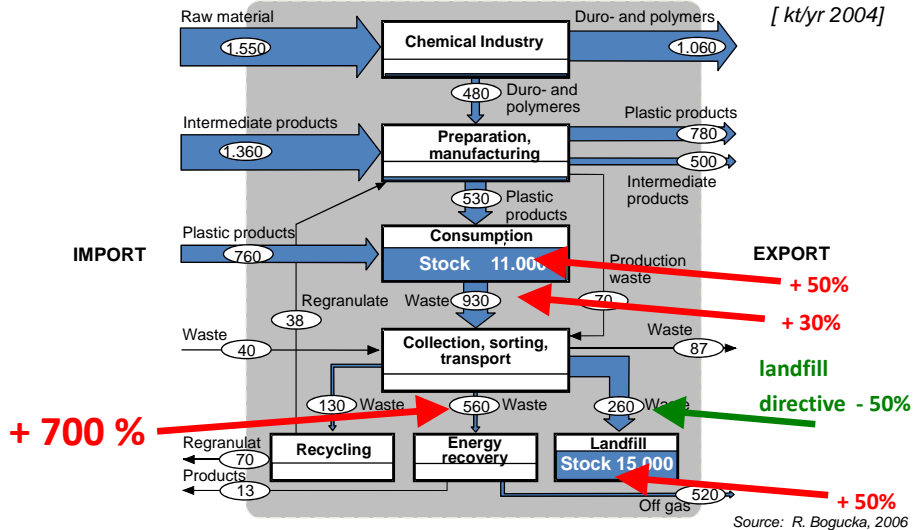
### 3. "Urban mining": example of plastics



Source: R. Fehringer, 1998

8/24

### 3. "Urban mining": example of plastics



9/24

### 3. "Urban mining": additives in plastics

#### Quantitative versus qualitative recycling goals

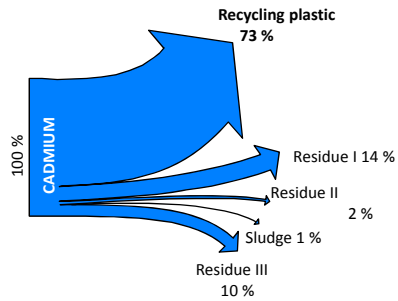
Additives in plastics	Total consumption	Total stock	Packaging material	
	in kt/yr	in kt	in kt/yr	in %*
Plastics	1,100	7,100	200	18
Softeners	14	140	0.2	2
Ba/Cd- stabilizers	0.27	2.7	0.0002	<1
Pb-stabilizers	1.8	18	0.002	<1
Fire retardants	2.3	23	0	-0

\* % of total consumption

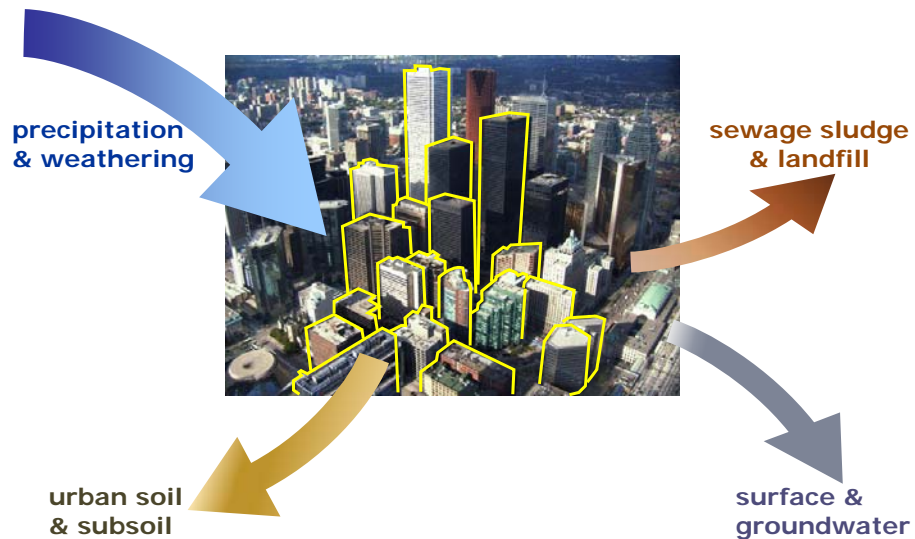
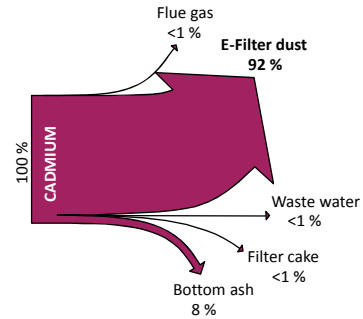
10/24

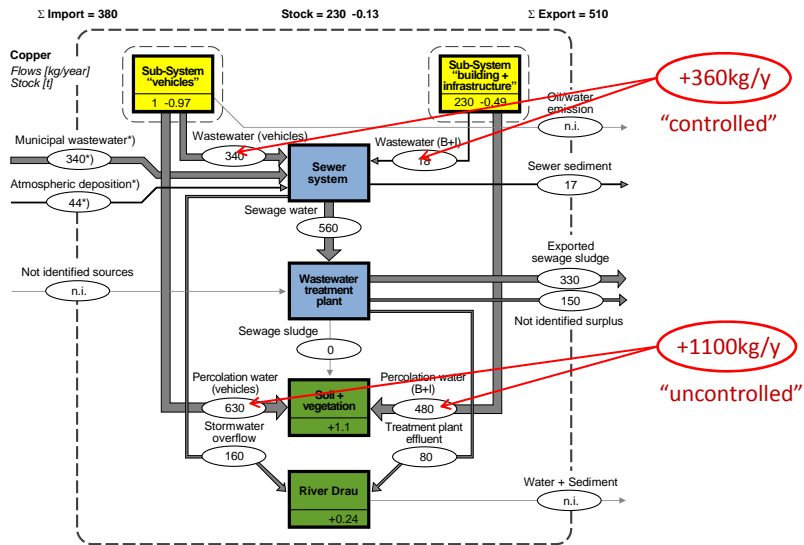
#### Clean cycles? - Partitioning of cadmium in waste plastics

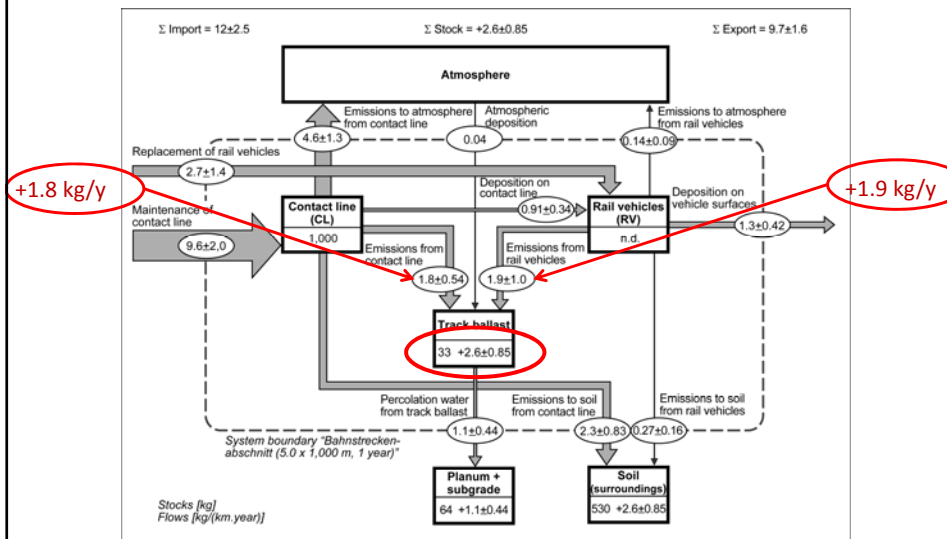
##### Plastic recycling



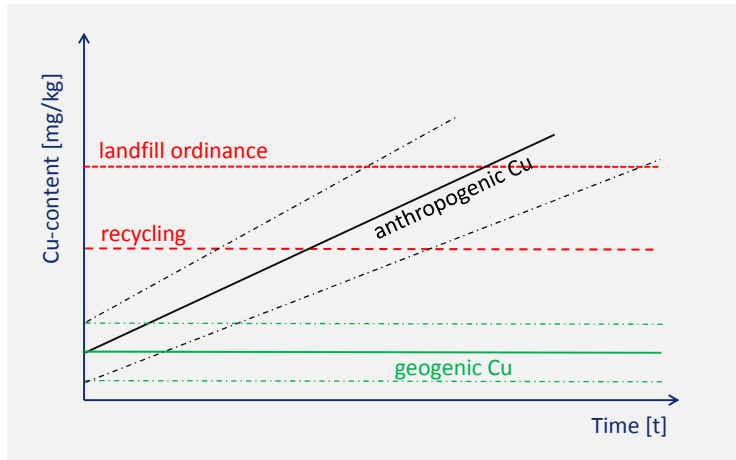
##### MSW incineration

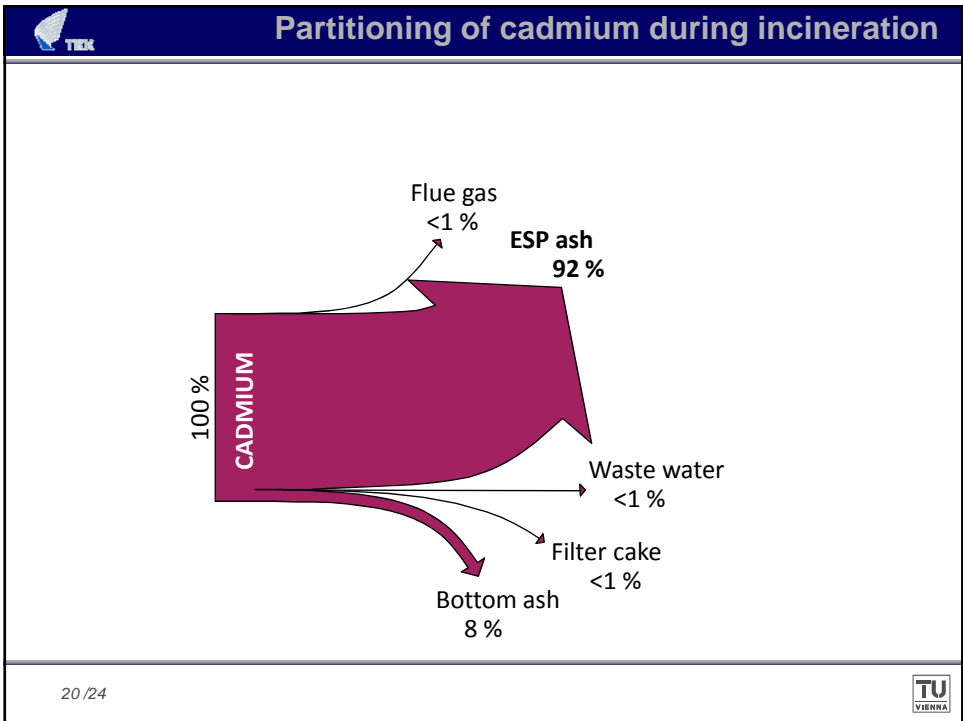
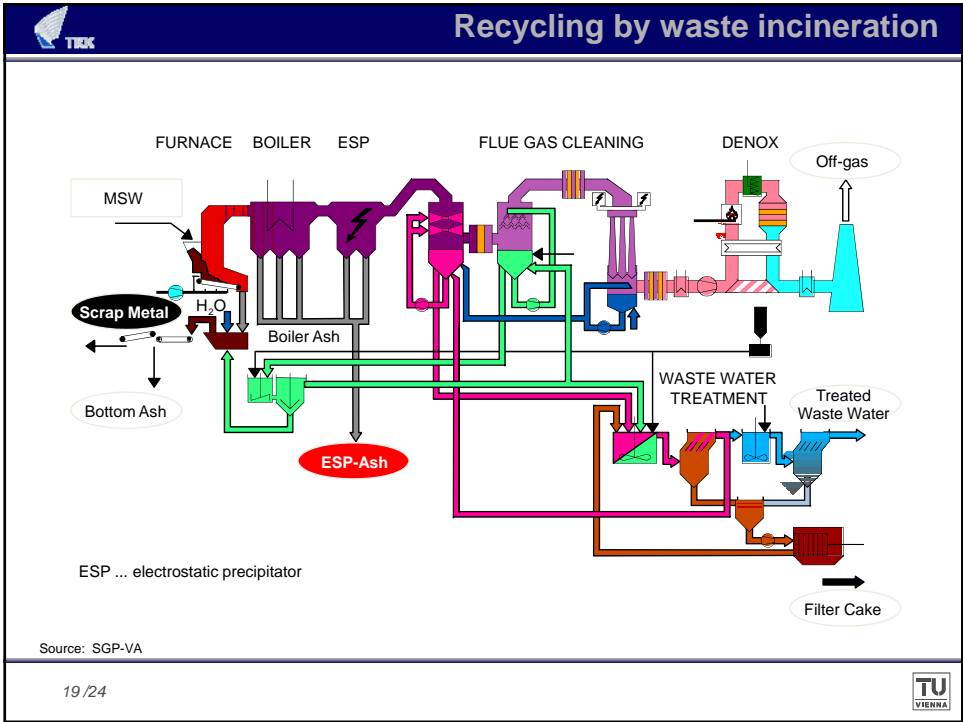


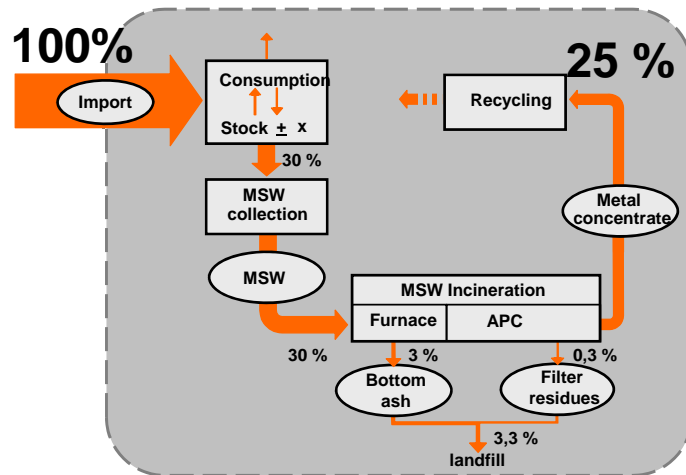












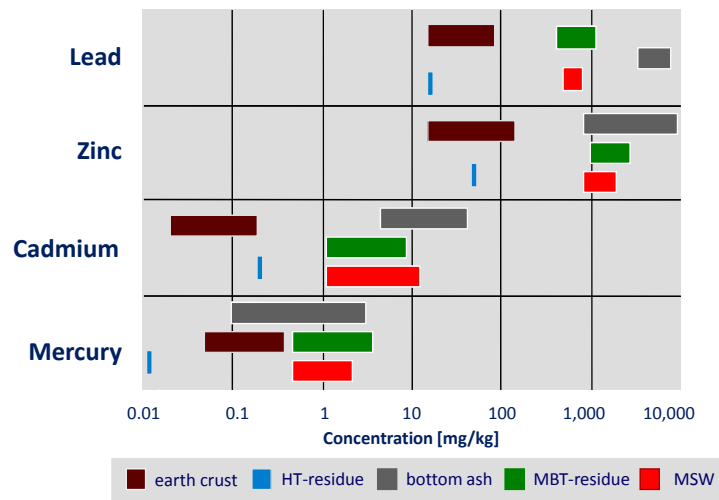
21/24

*„Place on the planet where materials have a very long residence time and a release rate similar to geogenic release rates“*

1. material property of waste material
2. property of „place“, e.g. landfill, soil, underground, sea etc.

22/24

## Properties of residues from WM and recycling



23/24

The main goals of recycling systems are:

- to separate valuable from hazardous materials,
- to produce clean and economic secondary resources,
- to direct hazardous materials to appropriate final sinks,
- to maximize qualitative as well as quantitative cycles

24/24

# Thank you

<http://iwa.tuwien.ac.at>