CLEAN CYCLES & FINAL SINKS

Ulrich Kral
ulrich.kral@tuwien.ac.at

EcoKnowledge 2010: Graduate School Course for PhD Students
3. November 2010
Lahti, Finnland
clean cycles

Plastic recycling

Recycling plastic
93%

Recycling residue
7%

Cadmium

100%

http://www.chaoszone.de/blog/media/blogs/webnews/itm-recycling-symbol.jpg
Where do the off-flows end up?

- Dissipative losses
- Waste
Loss and dissipation

12 kg Cu/year is lost

20% Cu

80% Cu

ballast

environment
Approach > MFA

Mass conservation: \( \Sigma \text{import} = \Sigma \text{export} + \Delta \text{stock} \)

System boundary: environment, 1 year

System boundary: anthroposphere, 1 year

Diagram showing the flow of goods, emissions, and waste collection, recycling, and treatment.
Approach > Evaluation

Sink capacity

Quality criteria: threshold value

Time $[t]$
Solution

Providing safe sinks for all substances

Dissipative losses

waste

Soil, water, air

cumulative dissipative losses

incinerator

organic substances

landfill

inorganic substances
CLEAN CYCLES & FINAL SINKS

Today’s objectives of material management focus on quantitative recycling. Crucial effects are neglected: cycling of hazardous constituents, and loss and dissipation of substances during use phase.

1. Definition of type and capacity of sinks available for substance flows from anthropogenic metabolism.
2. Material flow analysis (MFA) of key substances through cities. Special emphasis is given on urban stocks and related off-flows.
3. Assessment if total loadings of all relevant anthropogenic sources exceed capacity of sinks.

Sustainable material management must provide safe sinks for all substances.

For organic substances, incinerators are appropriate sinks.
For inorganic substances, landfills are appropriate sinks.
Cumulative dissipative losses from anthropogenic sources must stay below threshold level.

Ulrich KRAL, MSc
Vienna University of Technology
Institute for Water Quality, Resource and Waste Management
Karlsplatz 13/226
A-1040 Vienna, Austria

Tel.: +43 (1) 58801 226 55
Fax.: +43 (1) 58801 9 226 55
E-Mail: ulrich.kral@tuwien.ac.at
Internet: http://www.iwa.tuwien.ac.at