

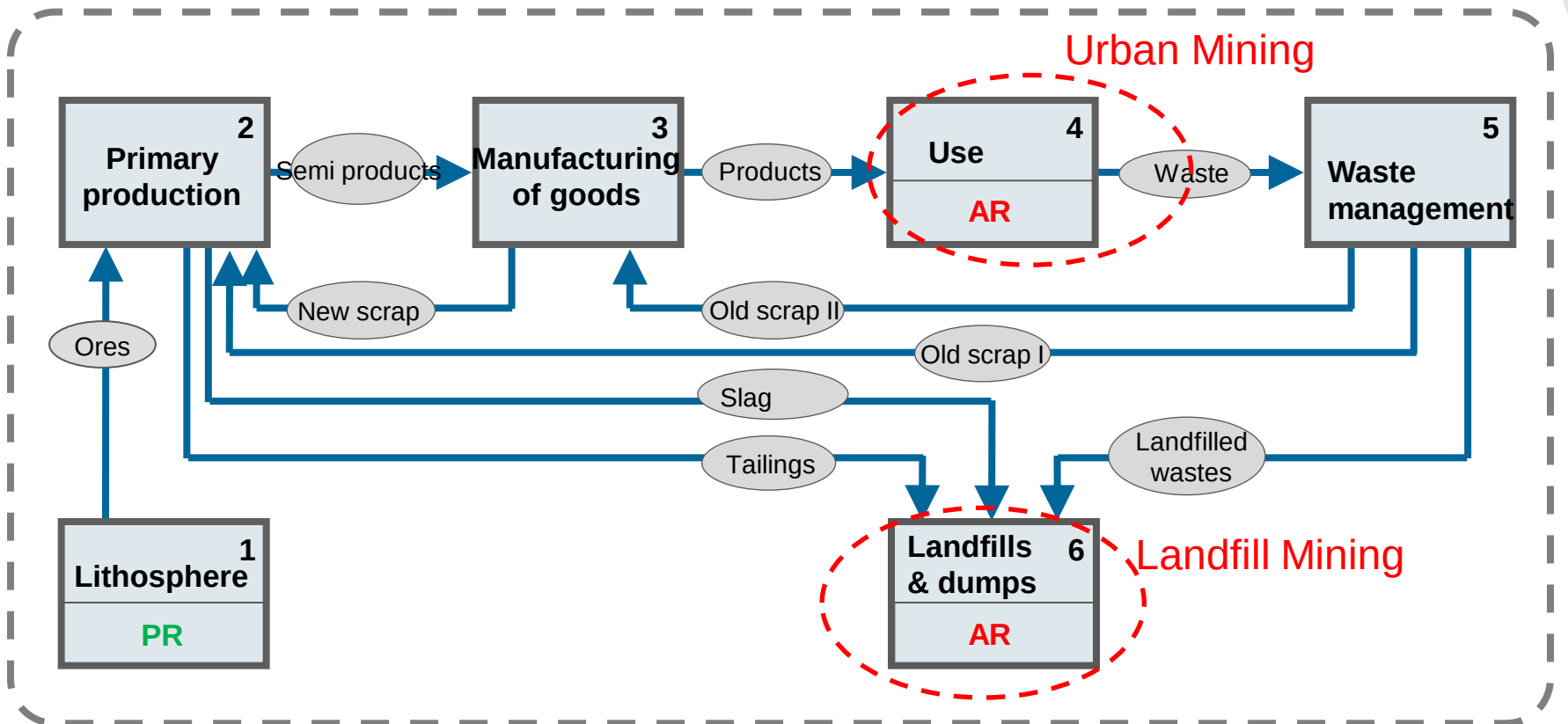
2nd Freiberg Resource Technology Symposium, April 17 2013

Urban Mining – Why and How?

Helmut Rechberger

Vienna University of Technology

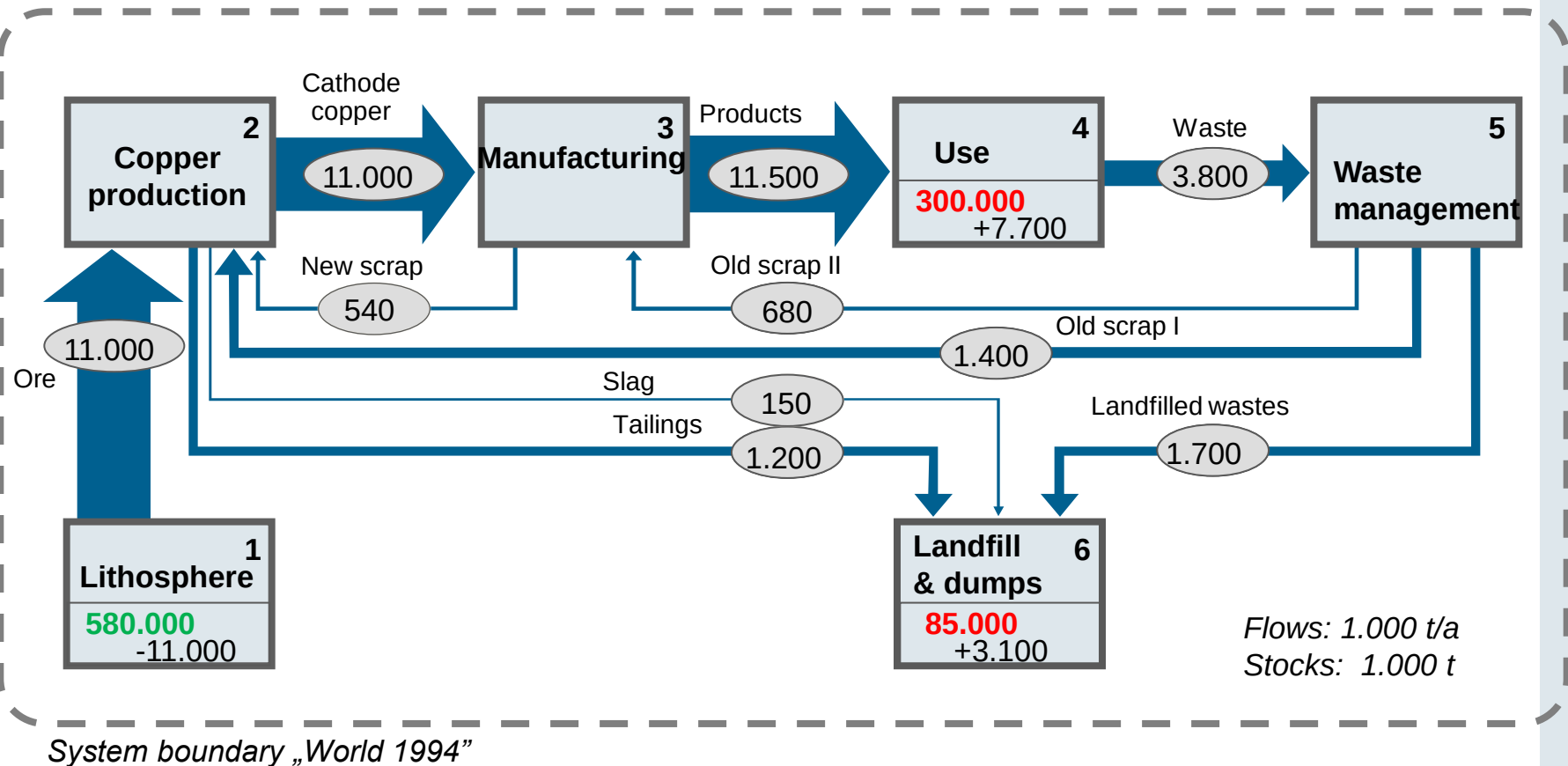
Institute for Water Quality, Resource and Waste Management



PR – Primary resources

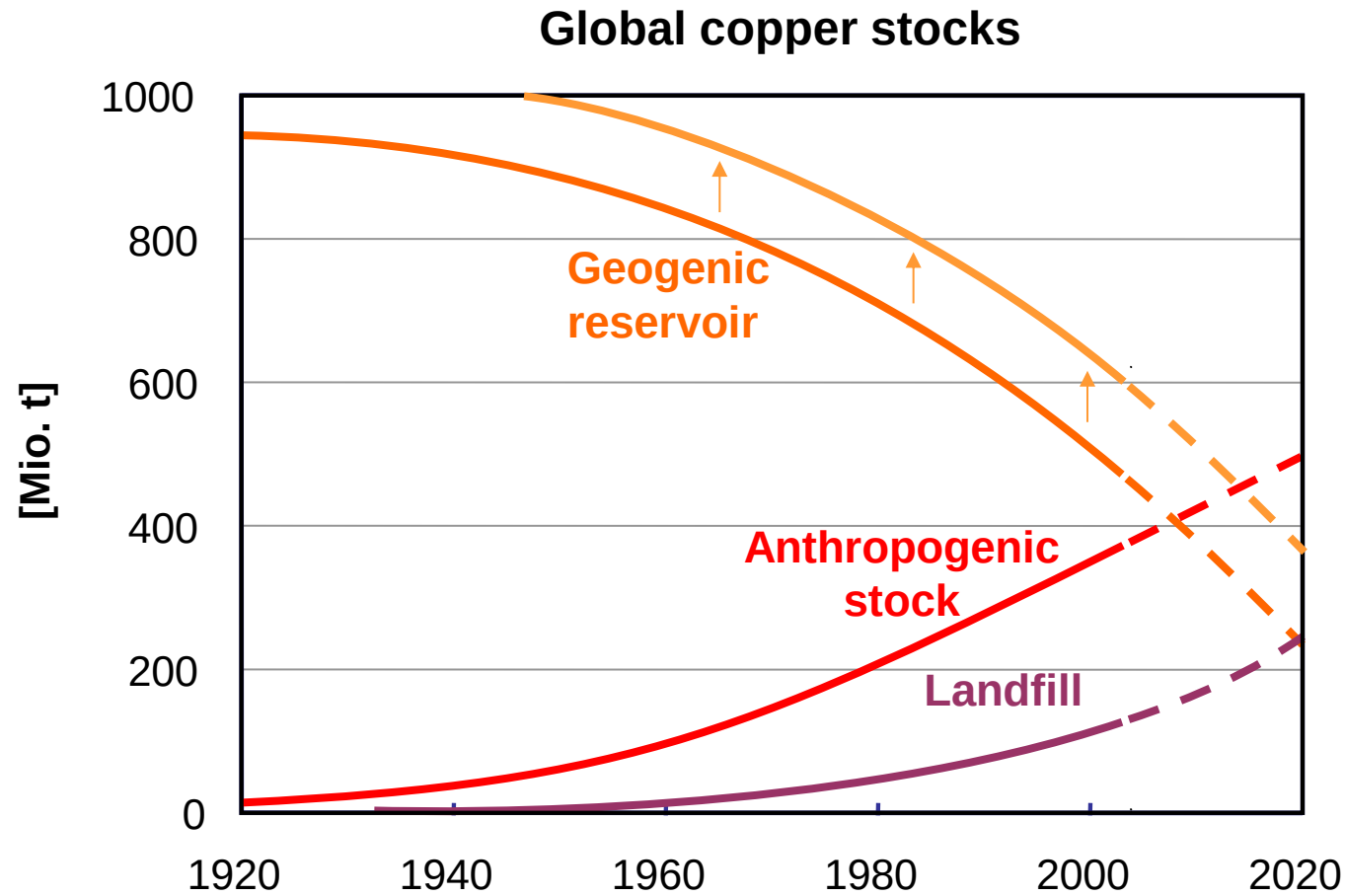
AR – Anthropogenic resources (secondary resources)

Primary and secondary deposits: example of copper

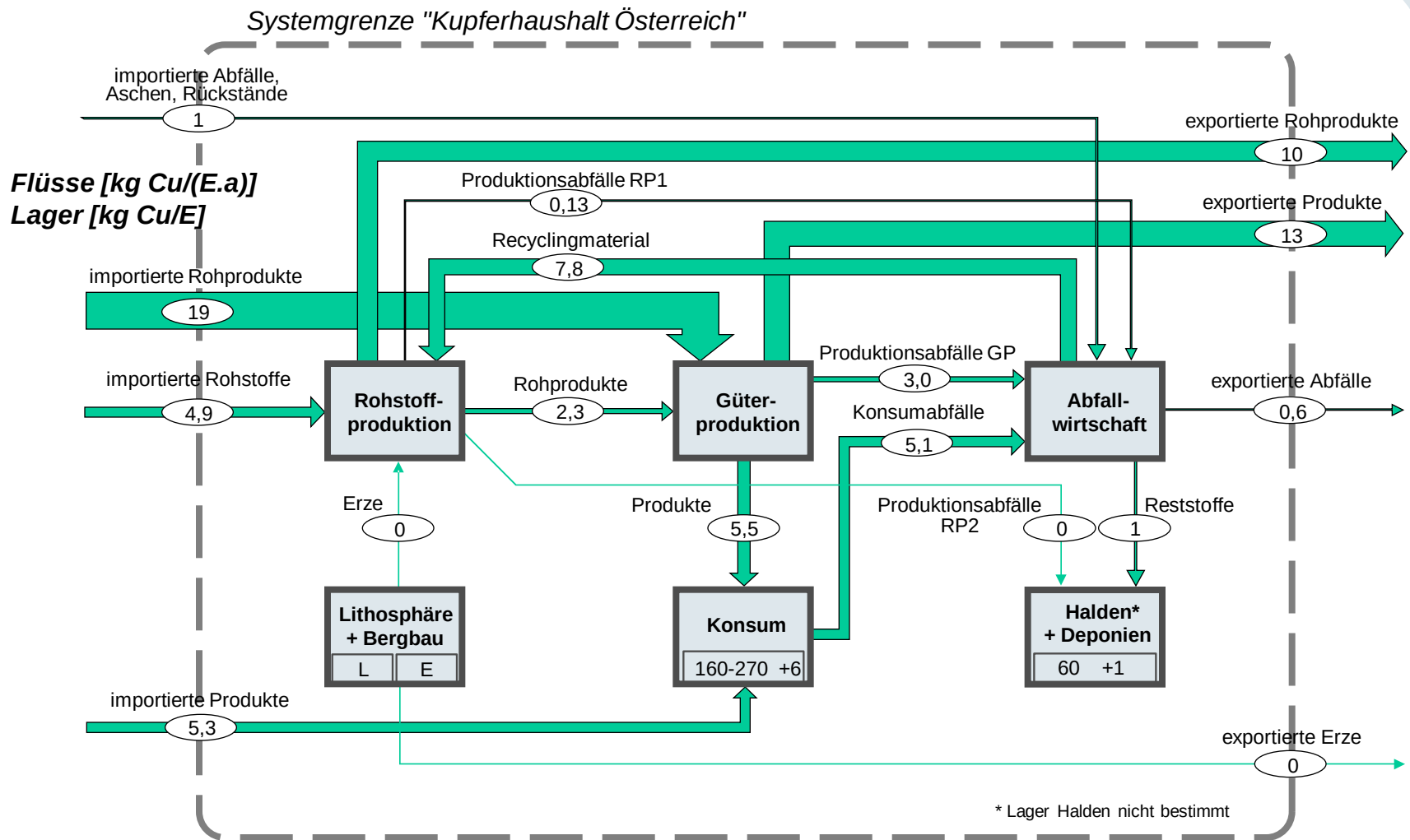


Source: Graedel et al. 2002 (adapted)

Stock changes: a dynamic system



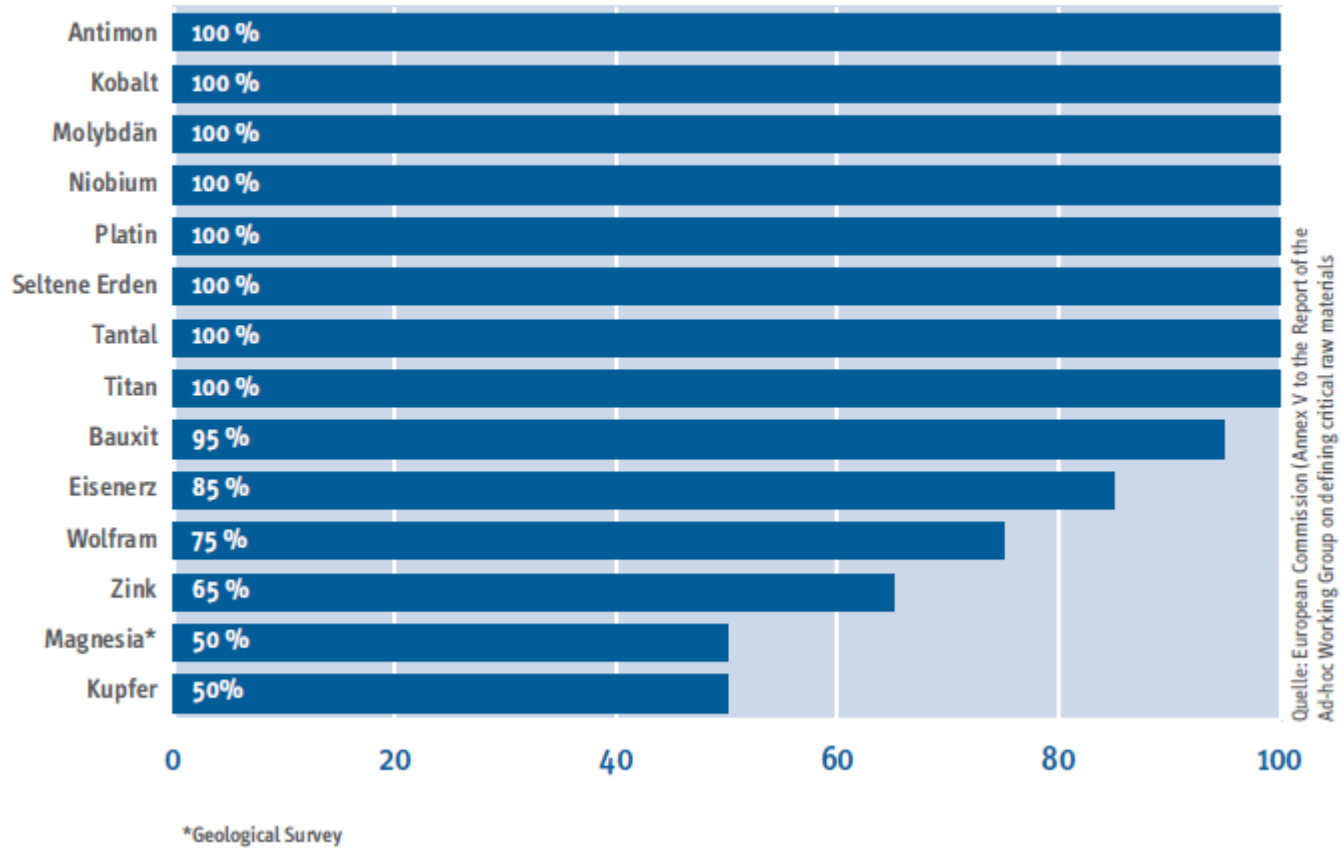
Copper budget of Austria



Source: Döberl et al. 2005

Urban Mining reduces import dependency

IMPORTABHÄNGIGKEIT DER EU, ROHSTOFFBEISPIELE



Austria raw materials cadaster

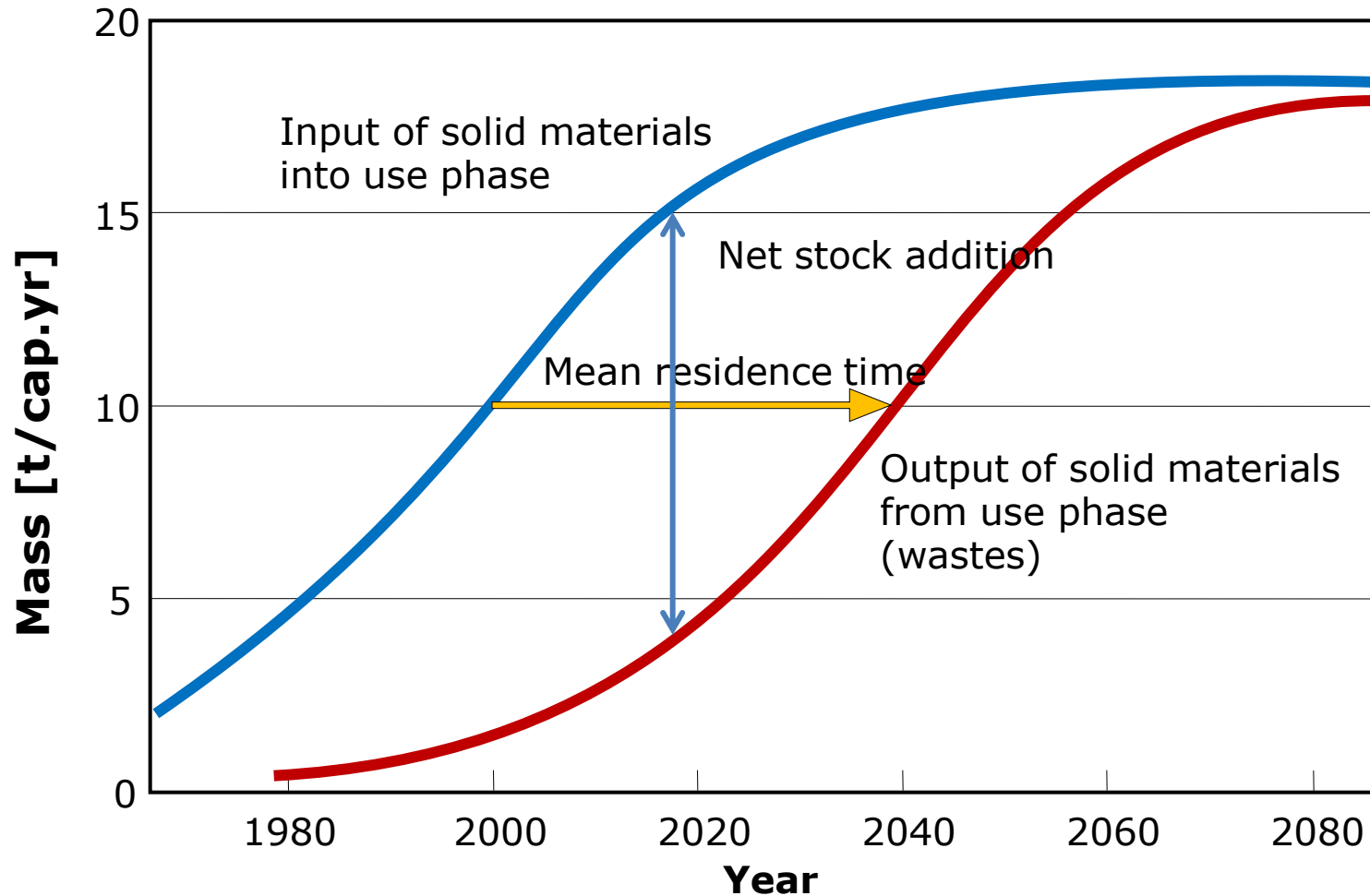


Geogenic raw materials

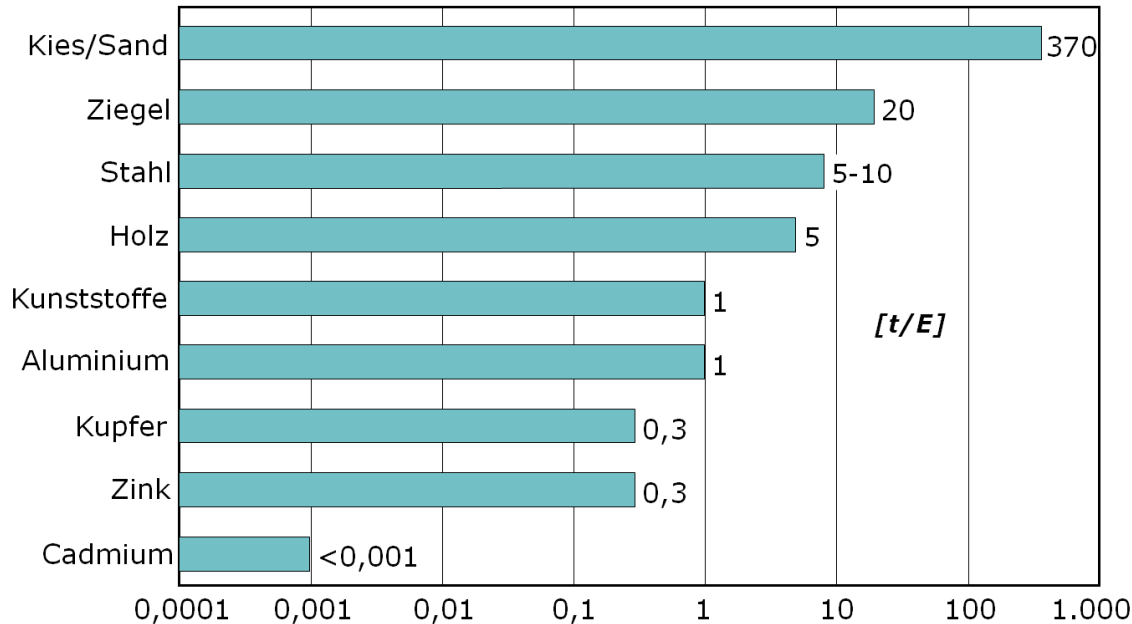


Anthropogenic raw materials

Urban Mining reduces shortage in landfill space



Urban stocks: size and relevance



ca. 400 t/cap

Source: Wittmer, 2007

Separate collection of

Plastic packaging: 18 kg/cap.yr
 Waste metal: 15 kg/cap.yr
 Waste wood: 23 kg/cap.yr

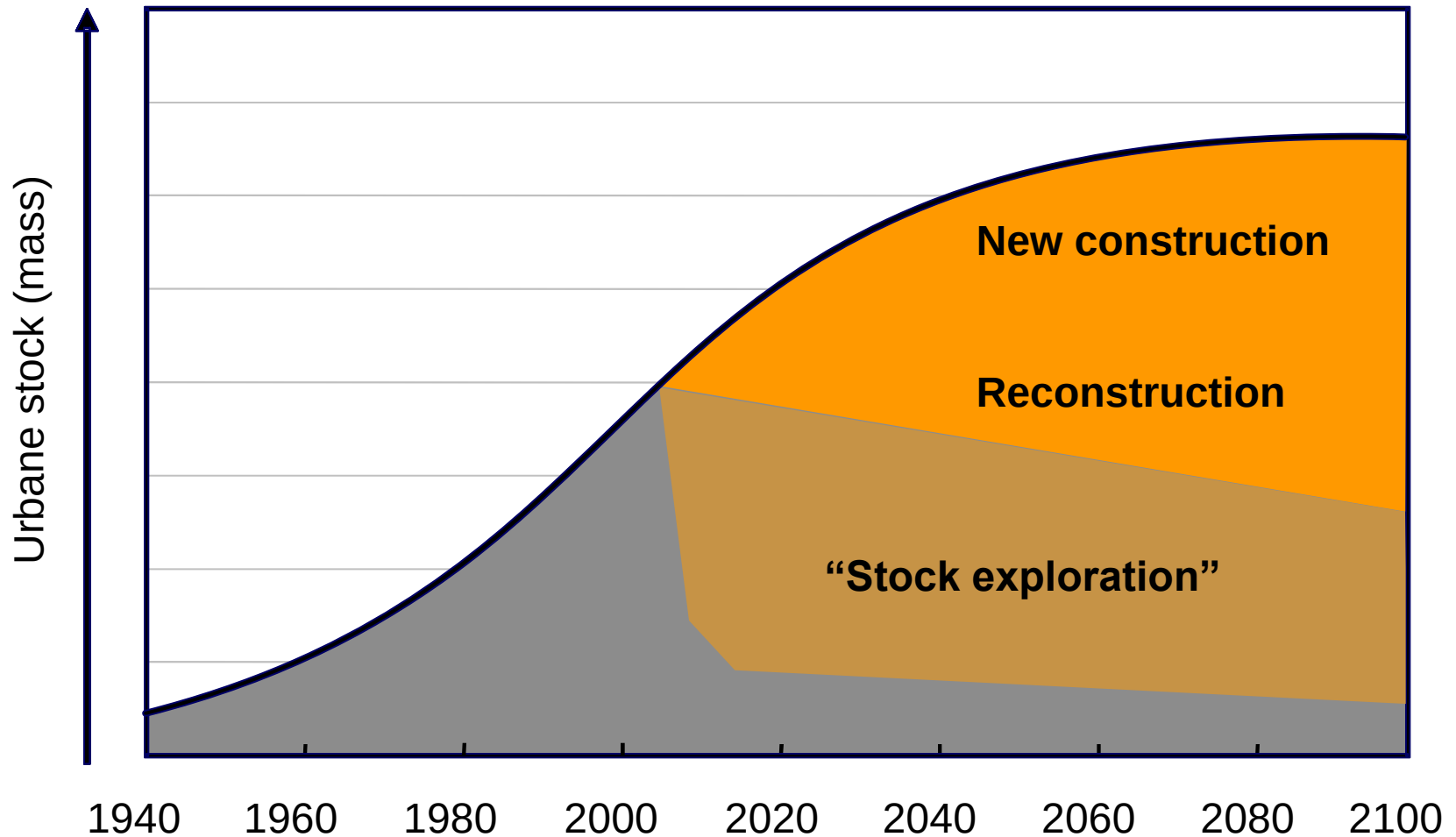
Source: BAWP 2011

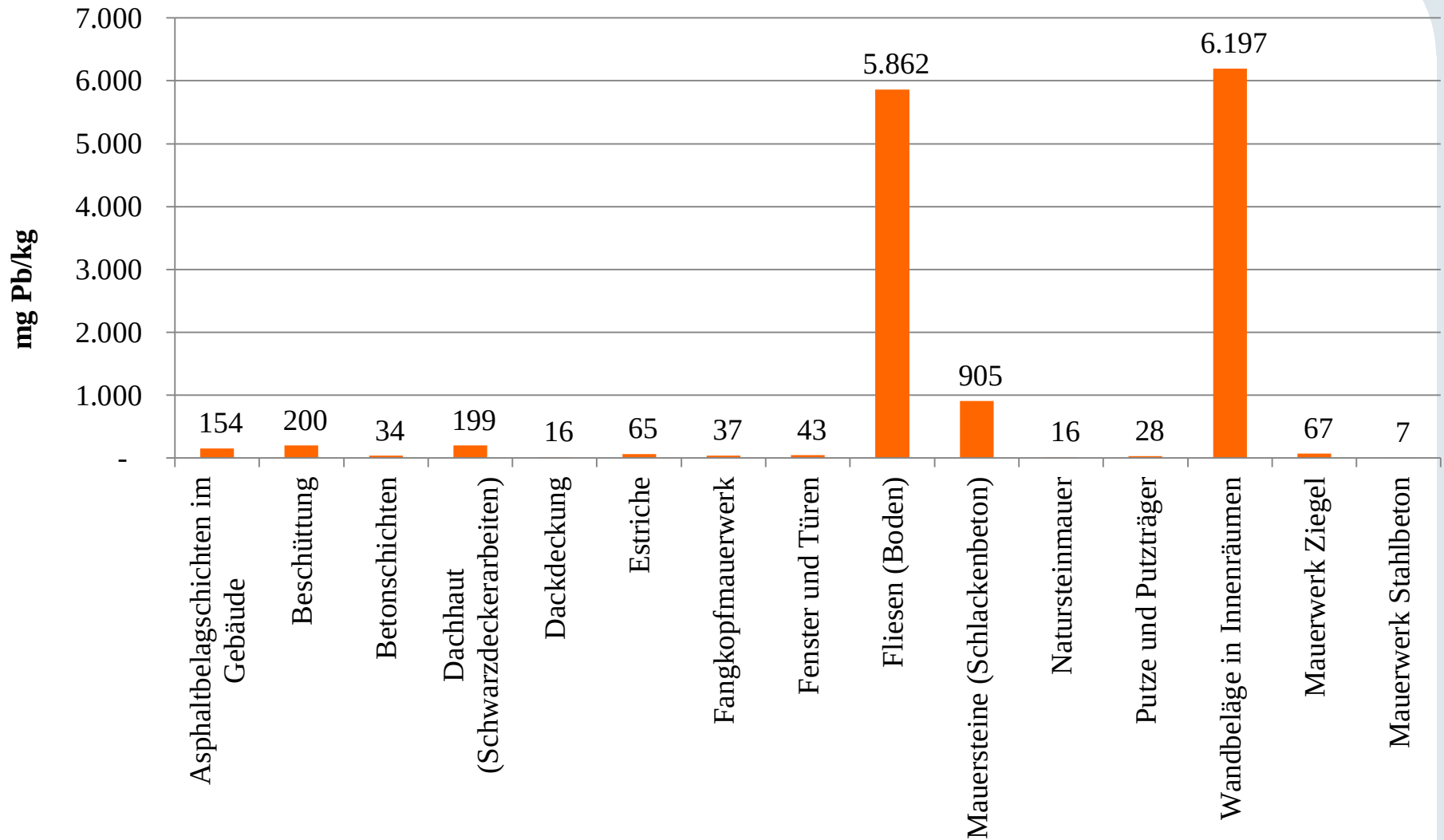
Comparison between urban stocks and reserves

Copper:	300 Mio. t	580 Mio. t
Iron:	14 800 Mio. t	77 000 Mio. t
Zinc:	205 Mio. t	200 Mio. t

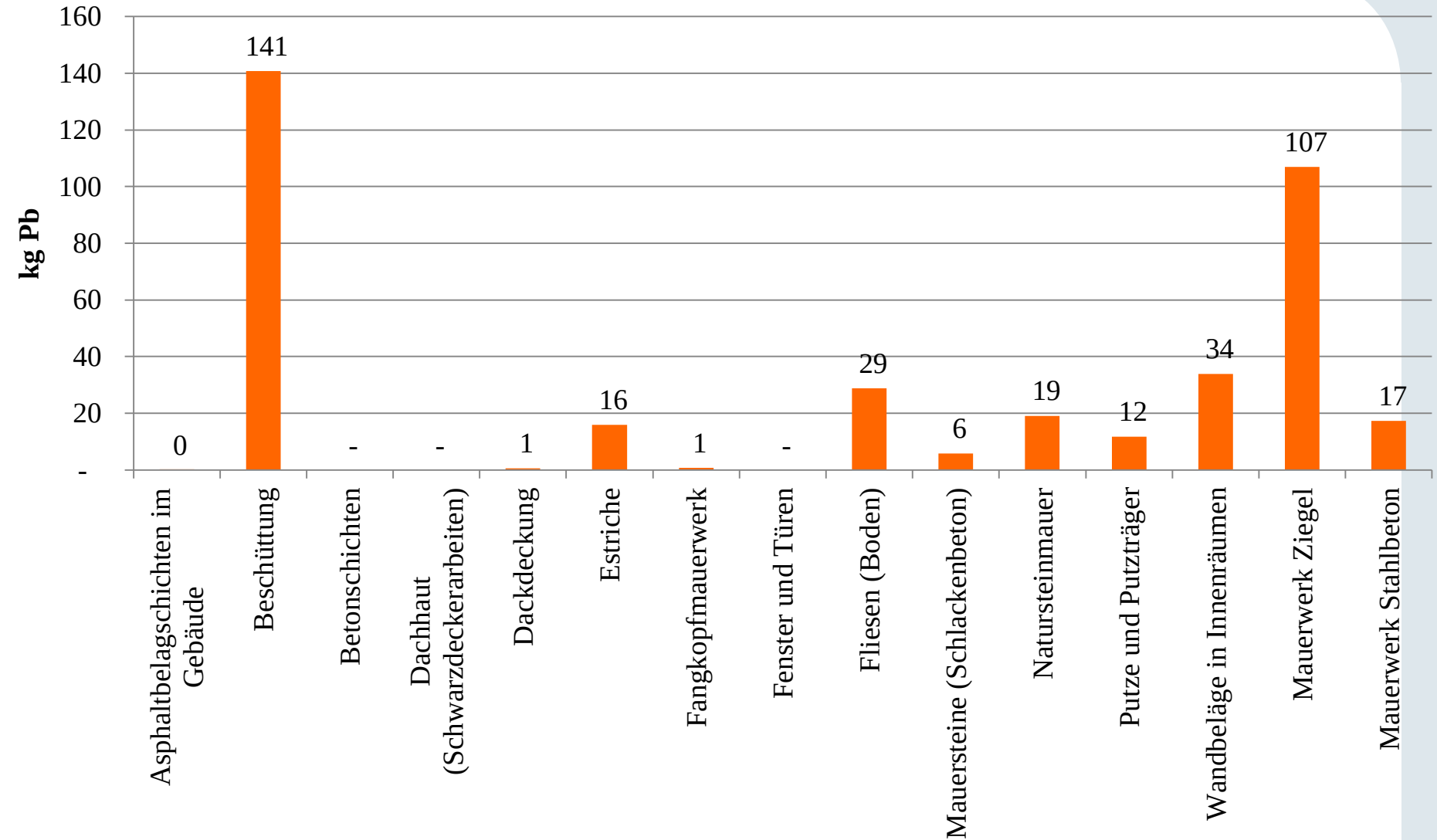
Source: Rechberger, 2004; Rauch 2009, USGS 2011

Exploration of anthropogenic stocks





Source: Clement et al. 2010

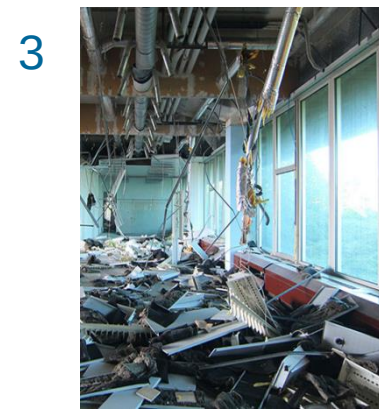
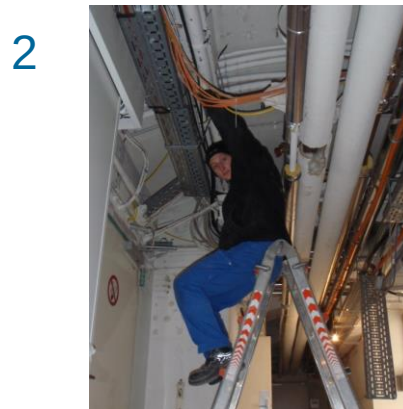
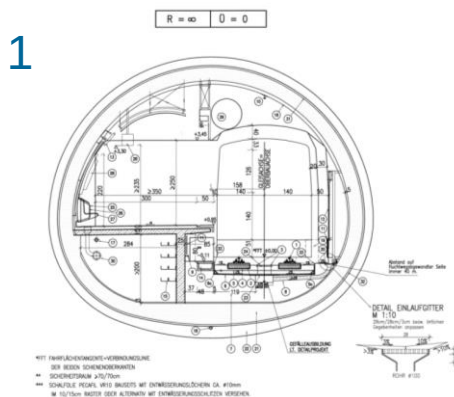


Source: Clement et al. 2010

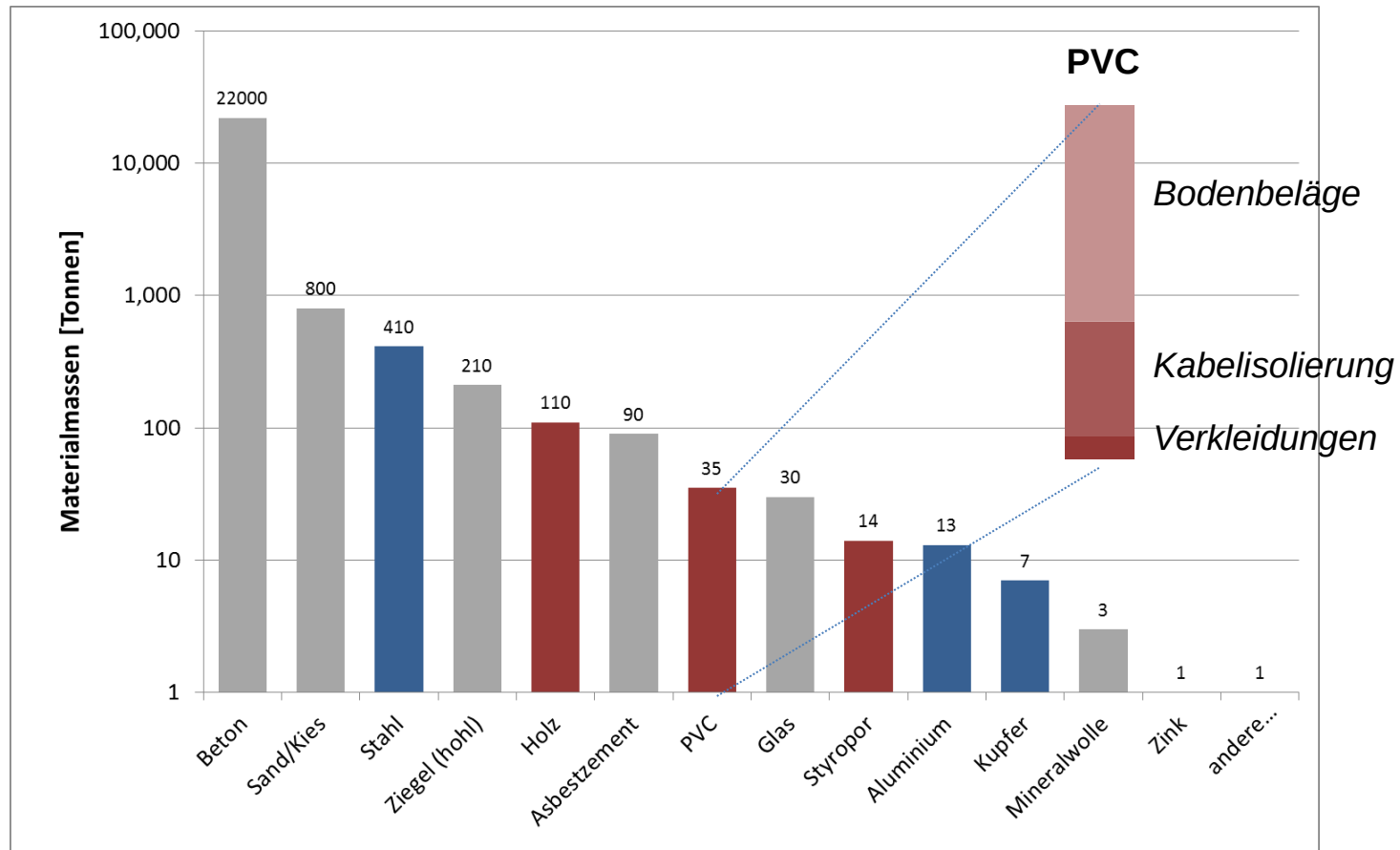
Three approaches, applied to single demolition objects:

1. Analysis of existing information/data mining (technical drawings, data from remote sensing, building standards,....)
2. Inspection of the object (inventory, taking samples, ...)
3. Indirect analysis through selective deconstruction and sampling of recycling facility

- Evaluation and „merging“ of approaches
- Finding out how far results can be used for the development of a resource cadaster (in Vienna)



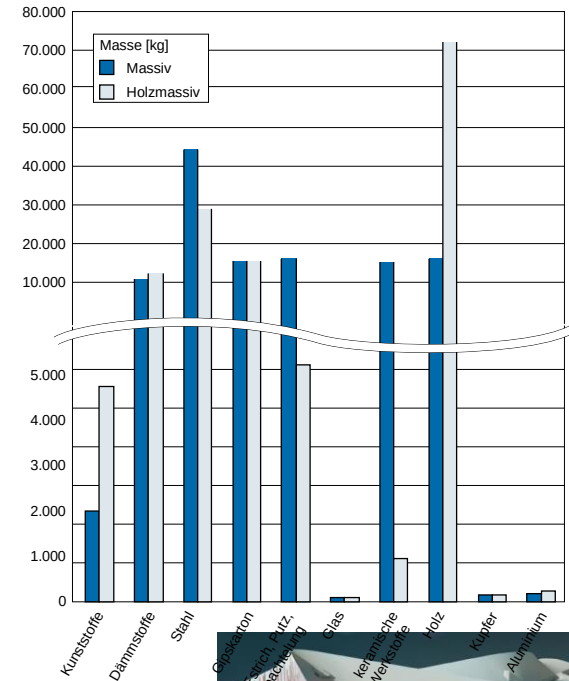
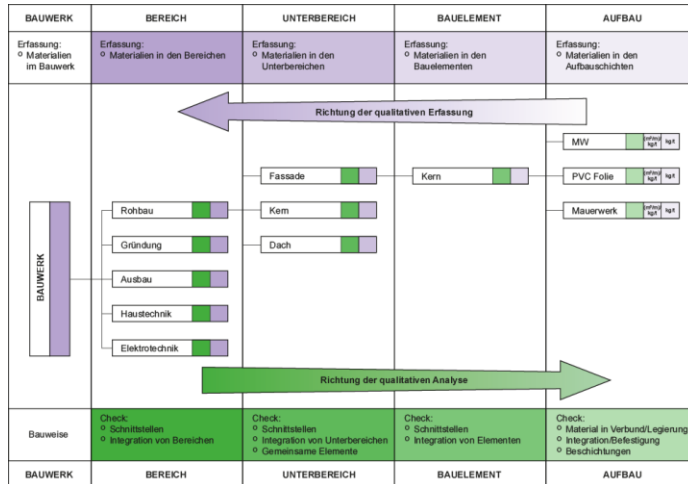
Material composition of a building



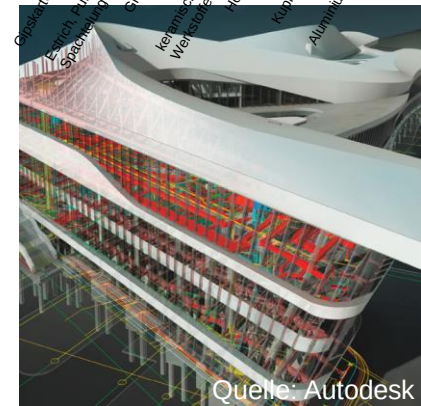
Source: Fahringer et al. 2013

Projekt EKON:

1. Prinzipielles Vorgehen zur Erstellung eines materiellen Gebäudepasses

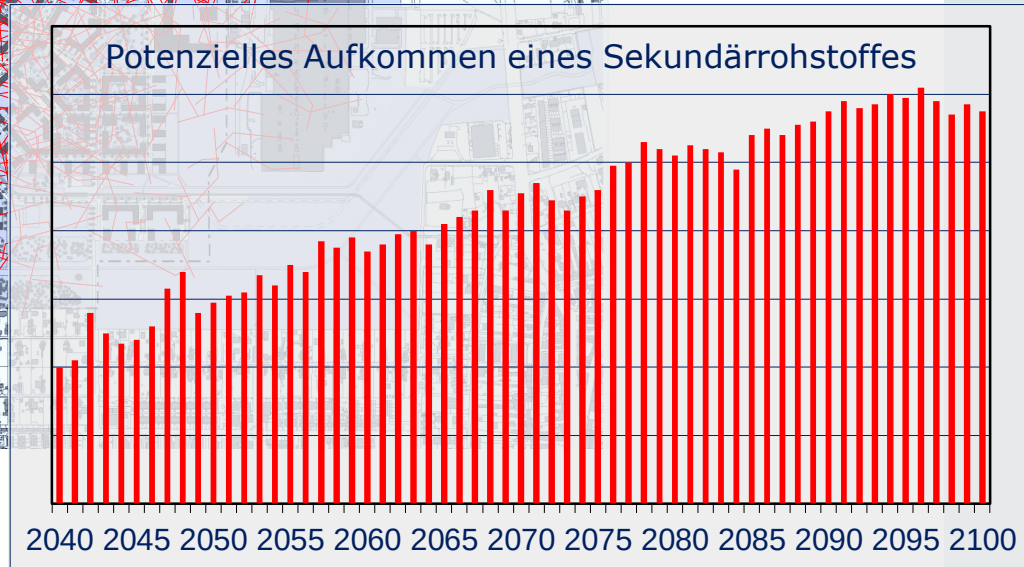
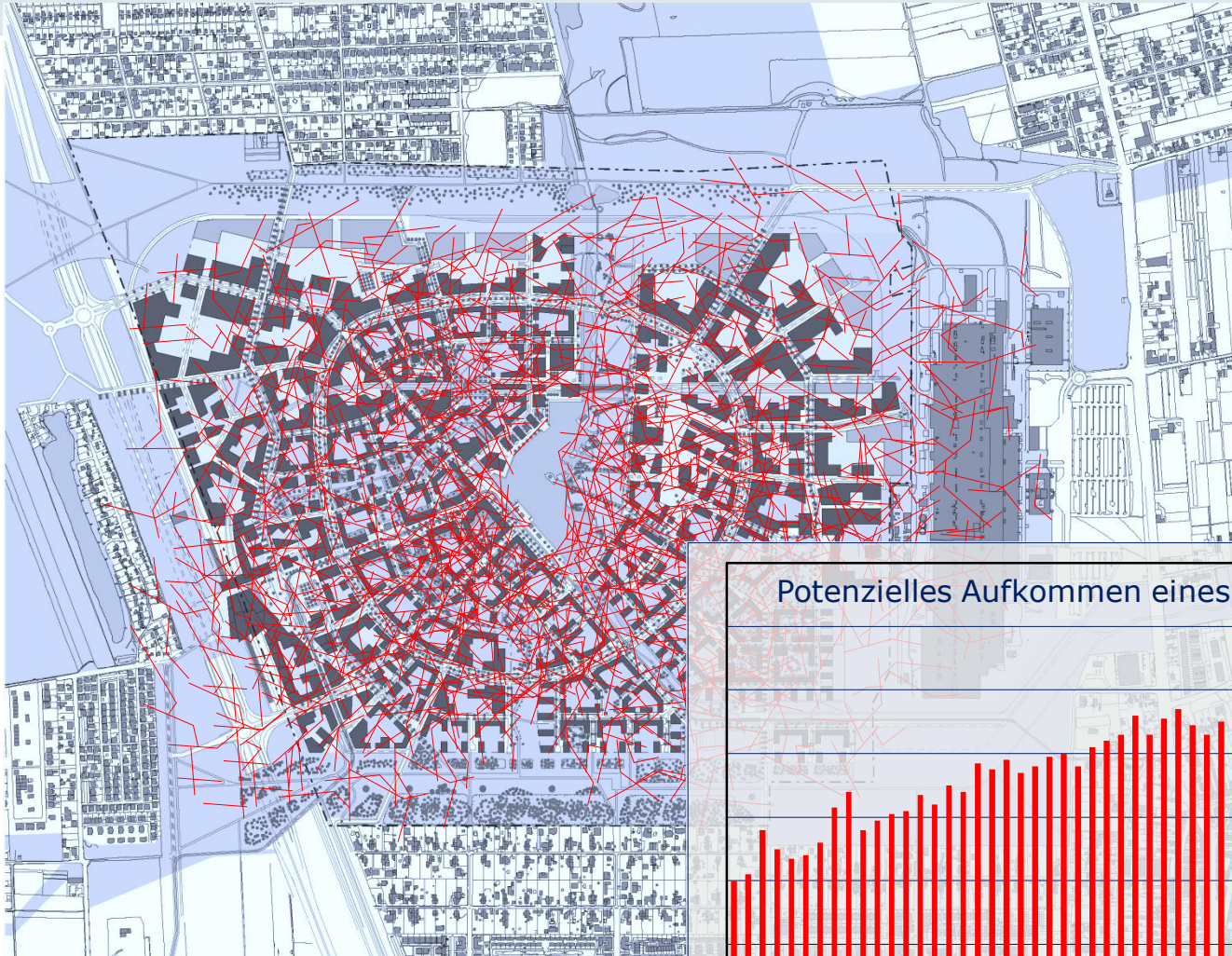


2. In der heutigen Praxis unmöglich: Lösung muss sein Building Information Modeling

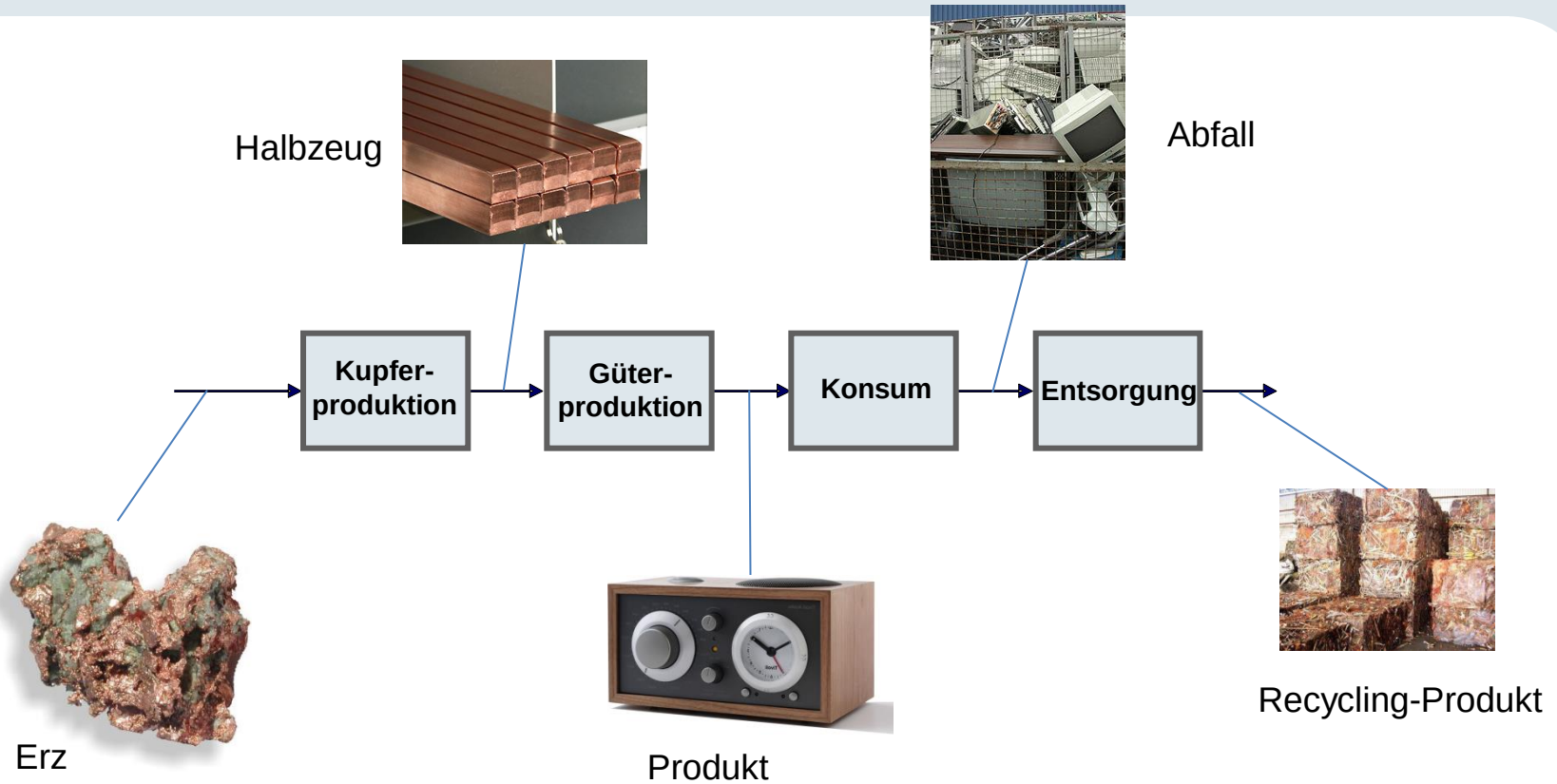


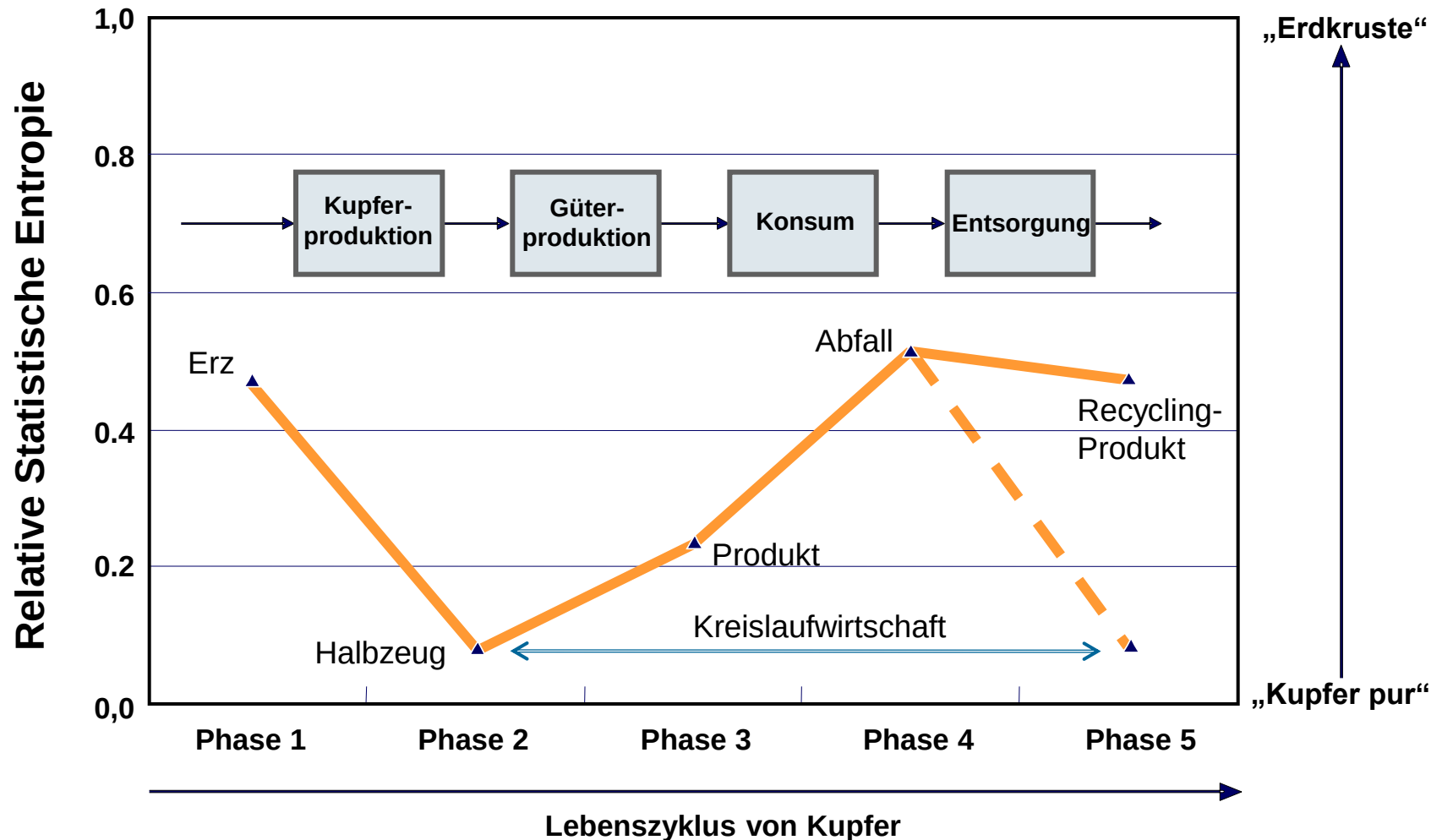
Quelle: Autodesk

Ziel: Ressourcenkataster



Materiallebenszyklus am Beispiel Kupfer





Quelle: Rechberger & Graedel, 2002

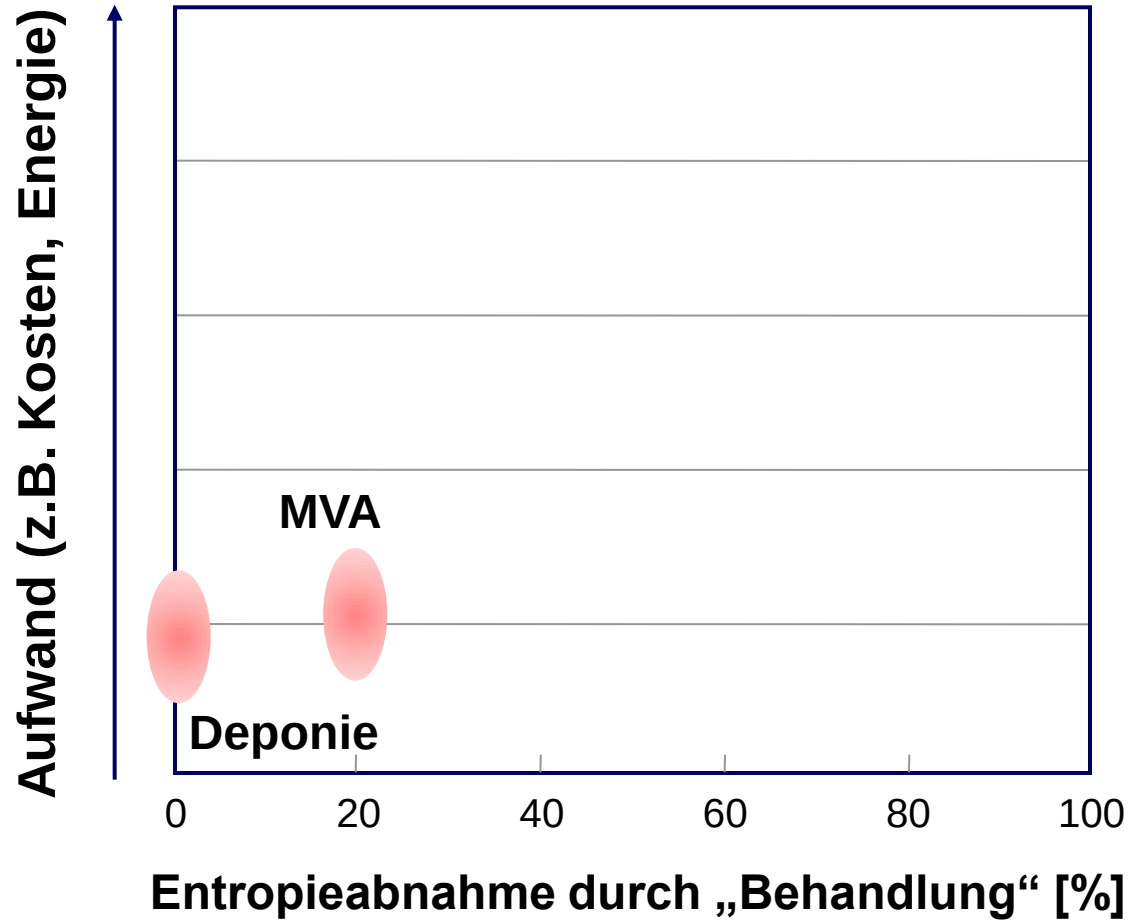
Produktion und Errichtung: Monate



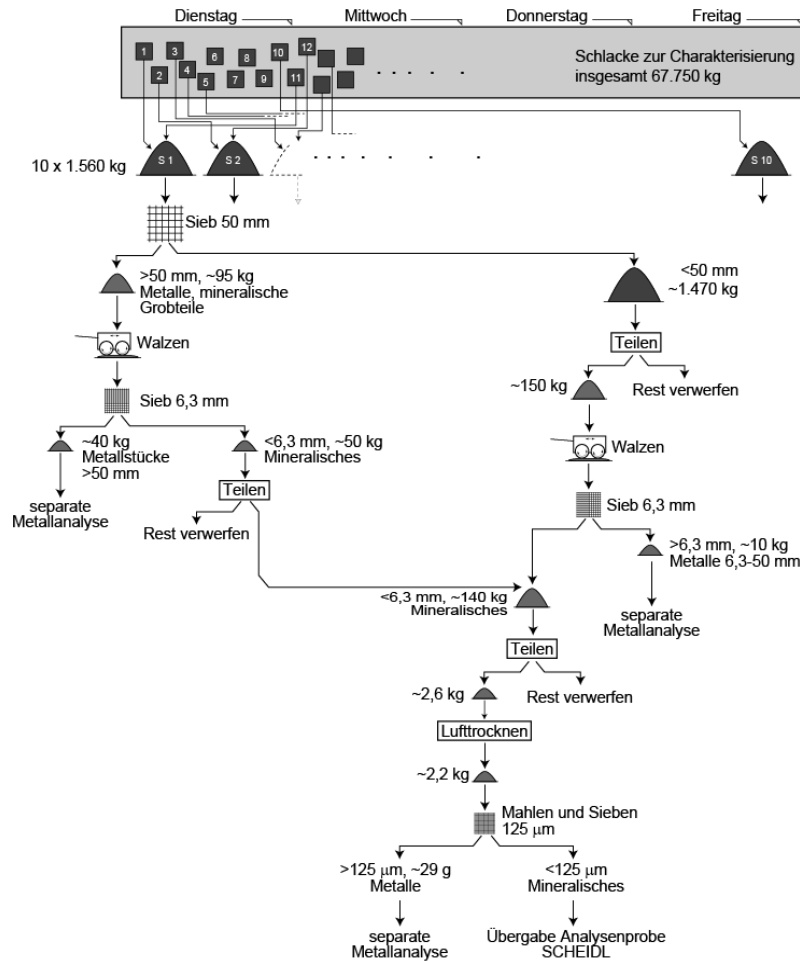
Fotos: A. Weinert

Entsorgung: Tage – Wochen?

Entropiereduktion: Beispiel Hausmüll und Cu₁



Quelle: Rechberger, 2002



Skutan & Rechberger 2007

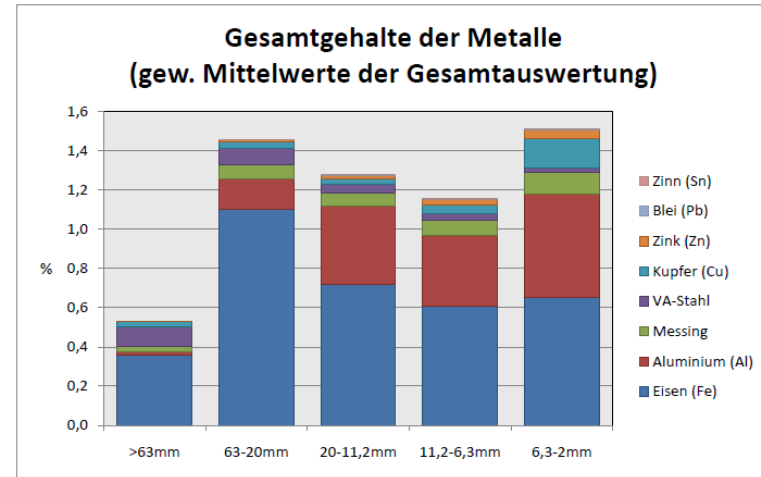
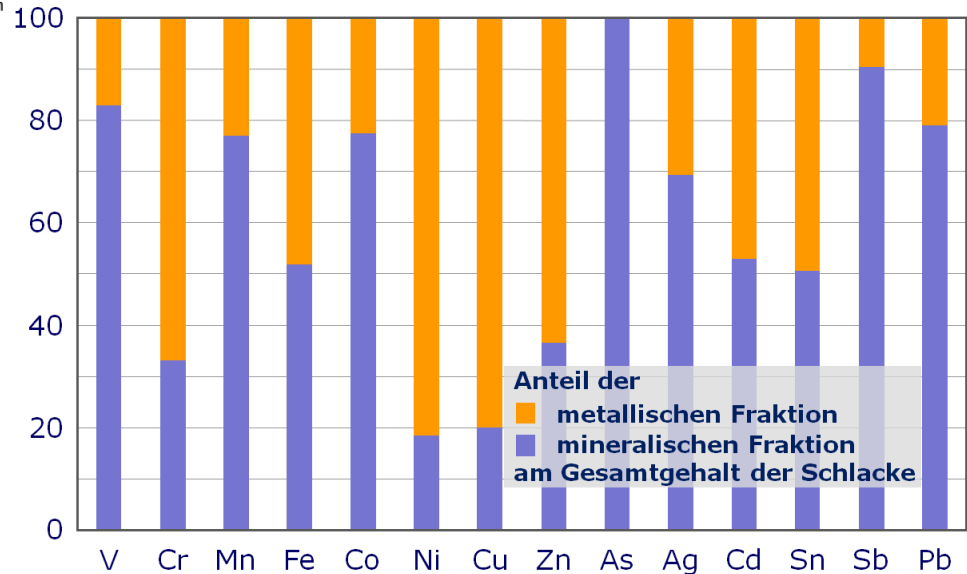
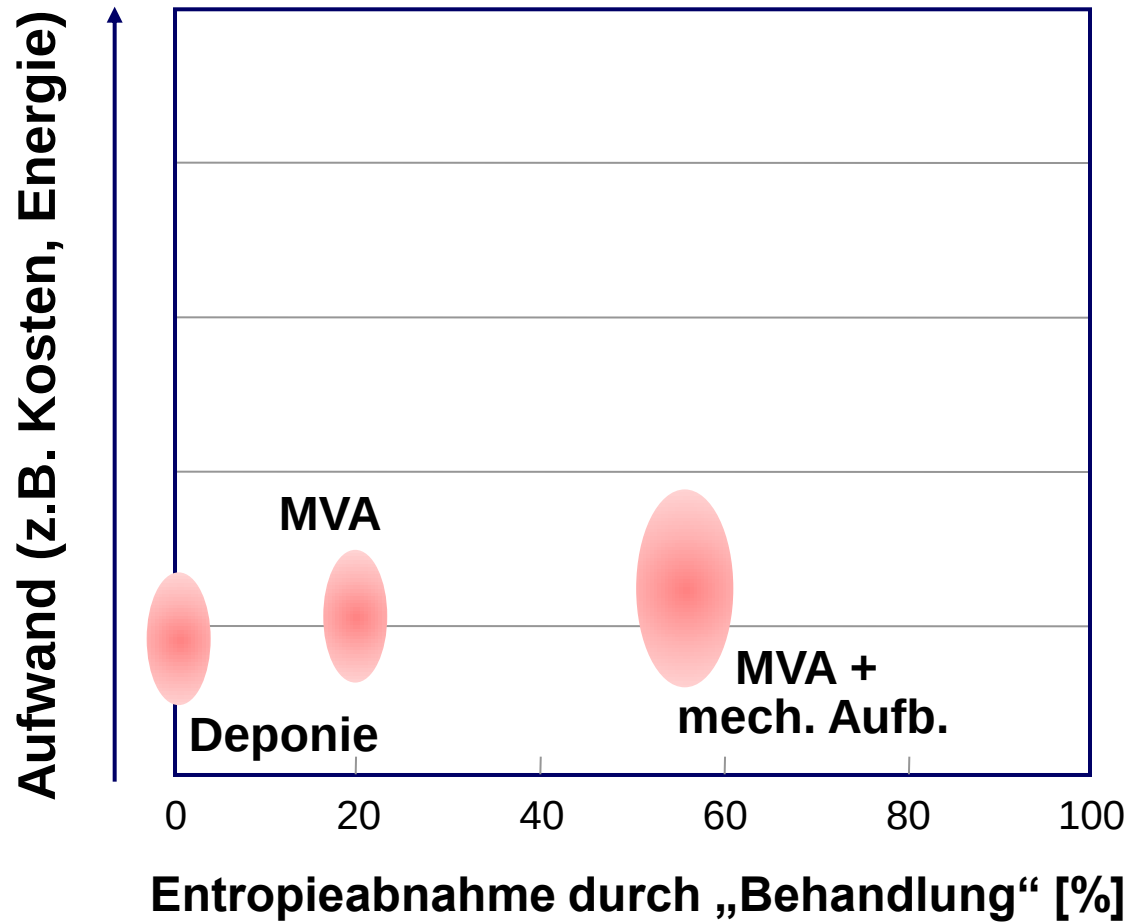


Abbildung 86: Gesamtgehalte der Metalle (gewichtete Mittelwerte aus der Gesamtauswertung) - aufgesplittet in die Metallgehalte in den verschiedenen Korngrößenklassen (ad Tabelle A)

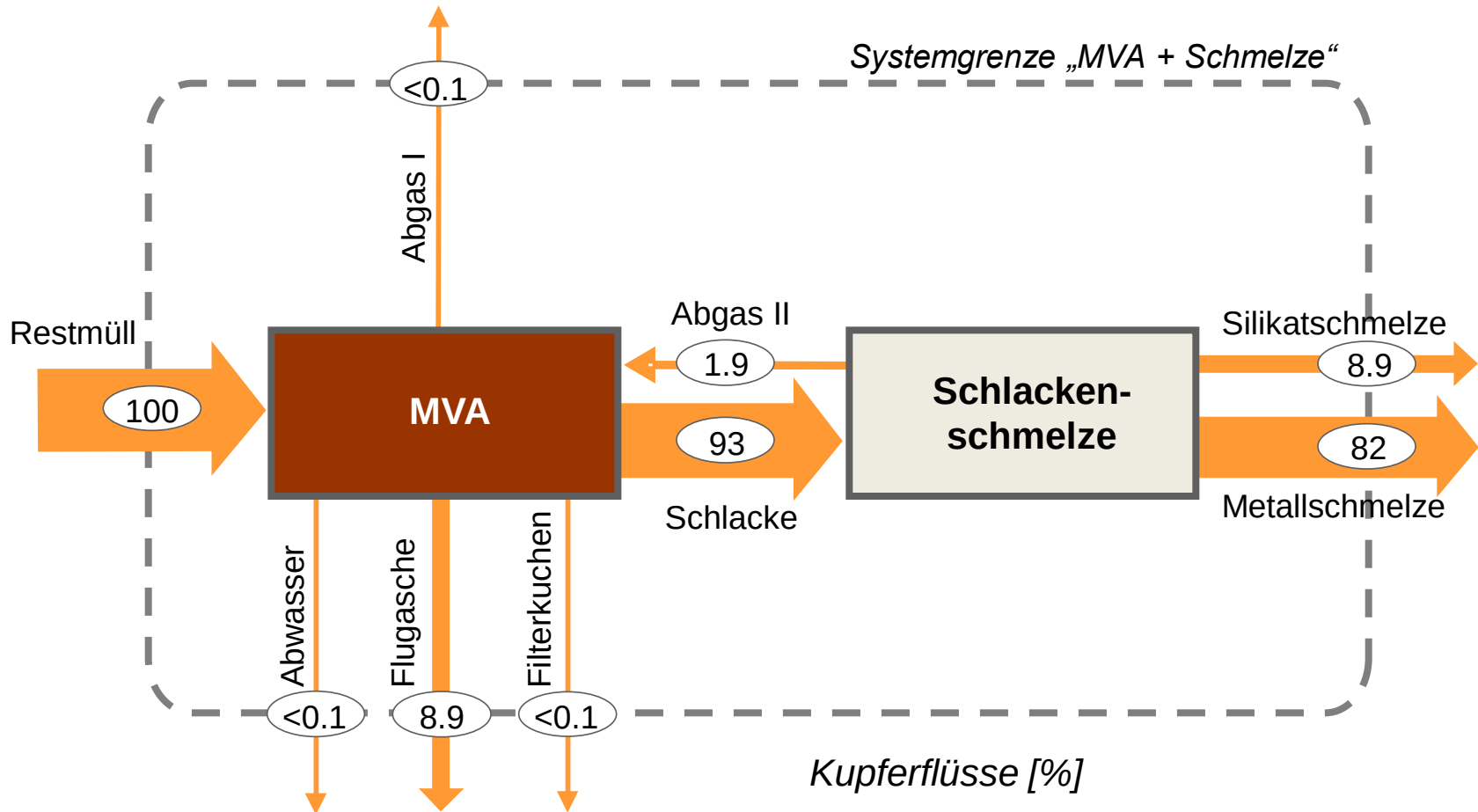


Entropiereduktion: Beispiel Hausmüll und Cu₂



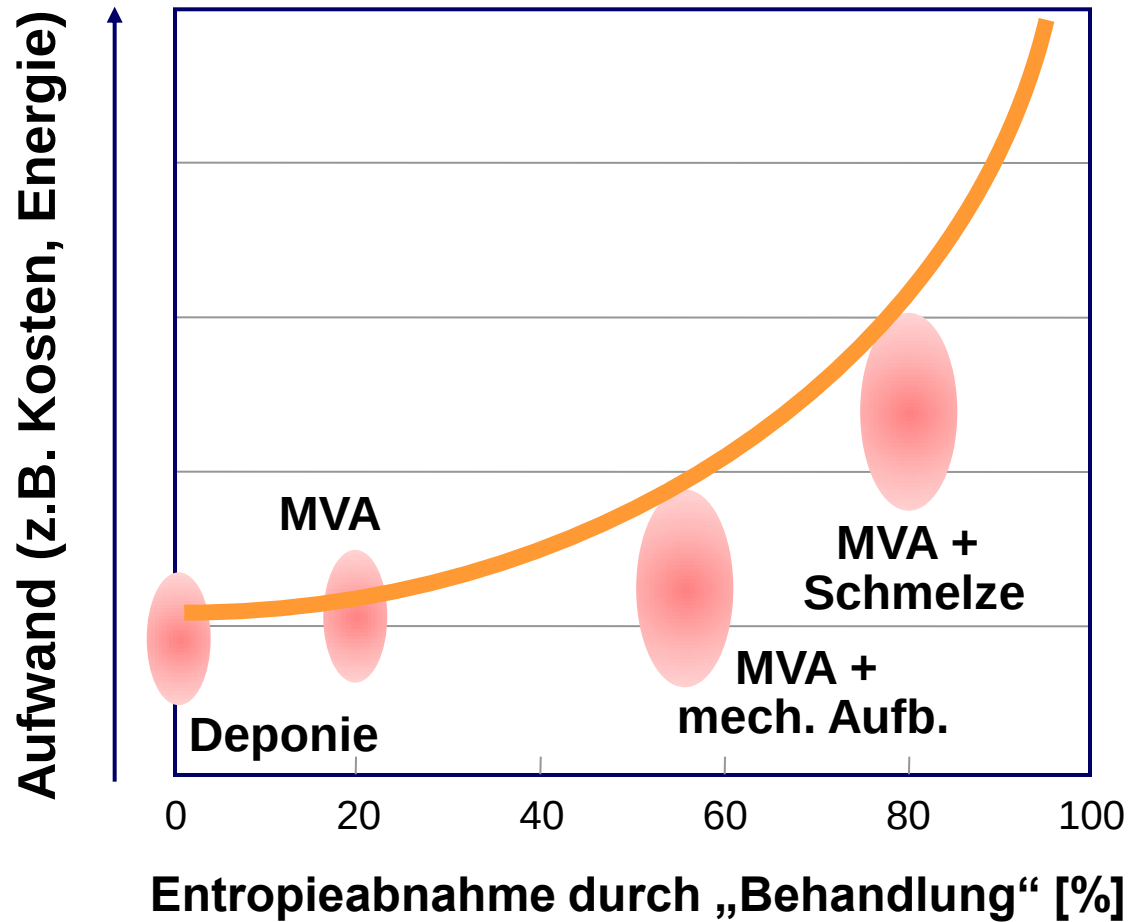
Quelle: Rechberger, 2002

Rückgewinnung von Kupfer aus Restmüll

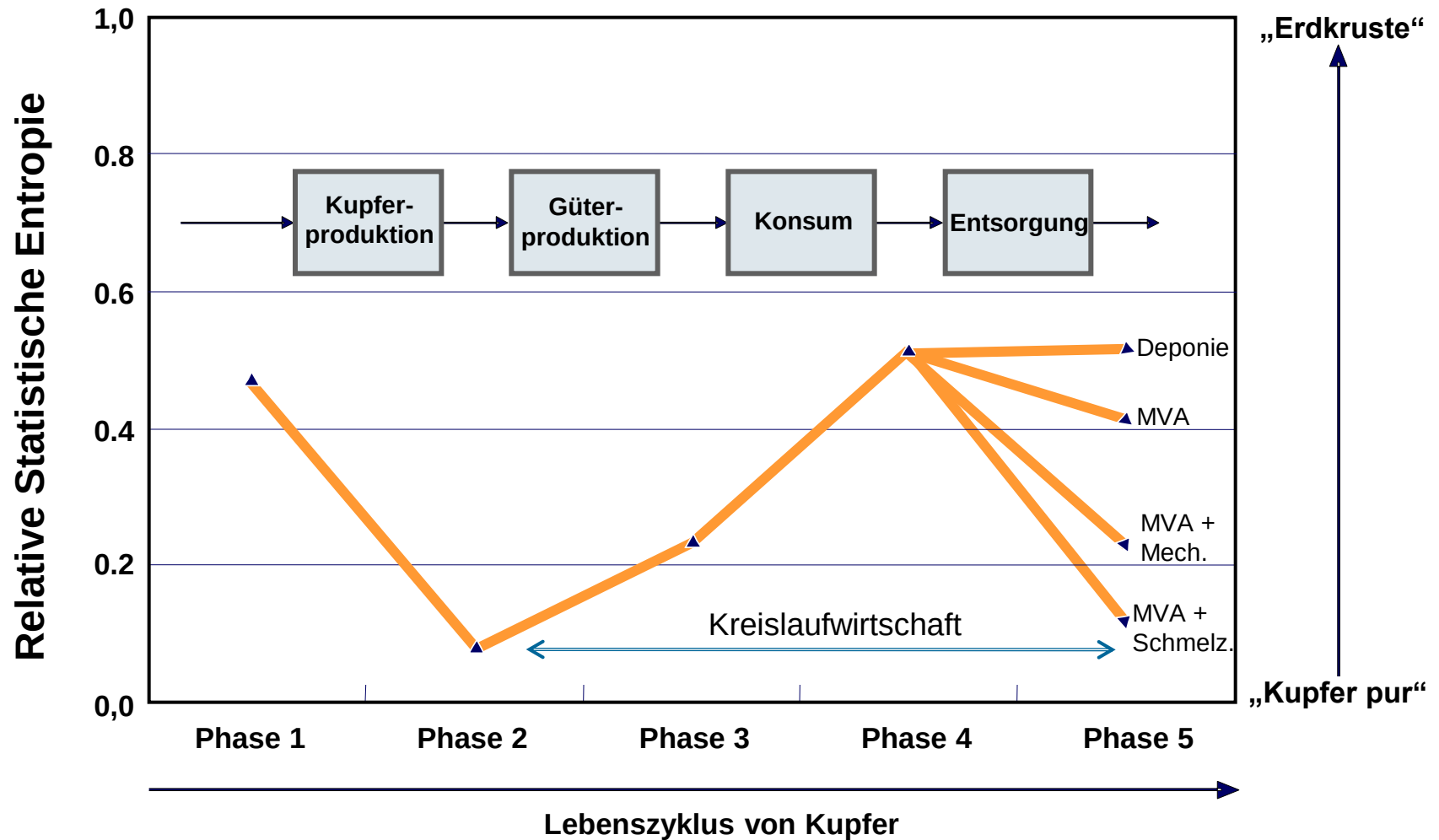


Quelle: Zeltner and Lichtensteiger, 2002

Entropiereduktion: Beispiel Hausmüll und Cu₃



Quelle: Rechberger, 2002





90+% recyclebar

