Scarce Metal Resources:

estimating global societal stocks and flows using EEIO

Sebastiaan Deetman
deetman@cml.leidenuniv.nl

eFrame workshop Groningen, 18-19 July

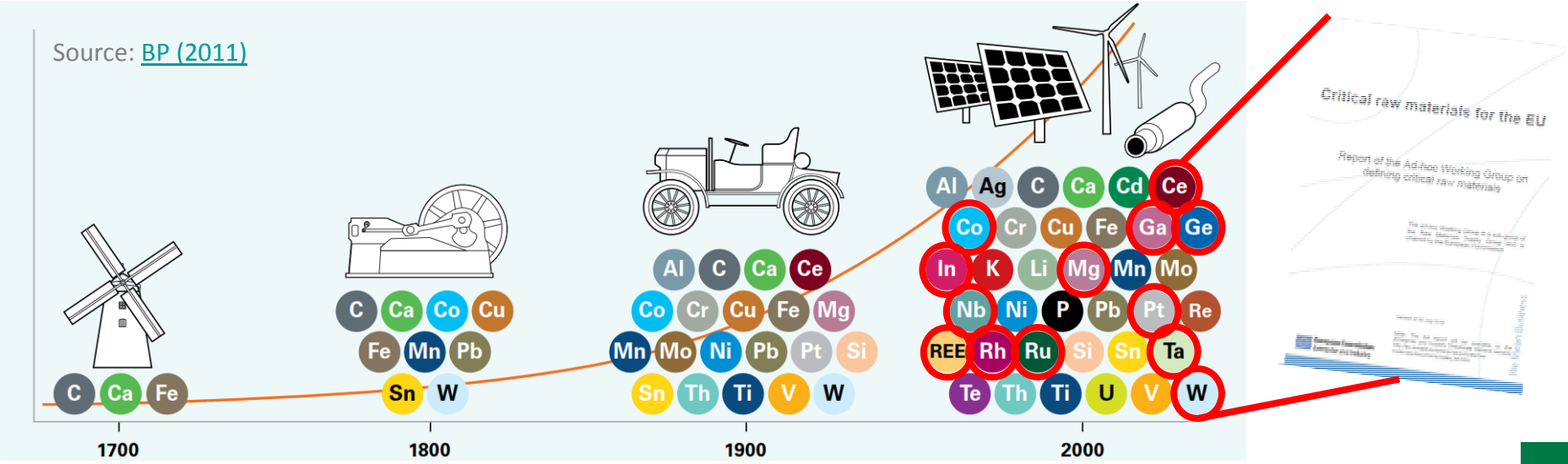
Universiteit Leiden
The Netherlands

CML
Institute of Environmental Sciences
Department of Industrial Ecology

Introduction

EU FP7 – DESIRE: Indicators for resource-efficiency

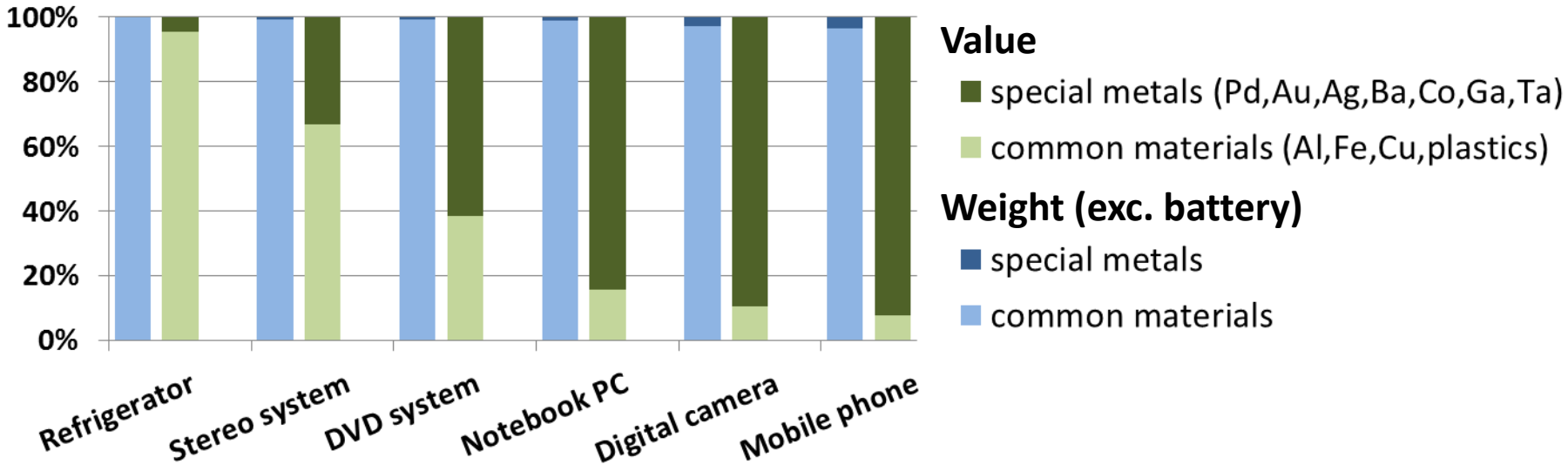
CML (Rene Kleijn): Critical material indicators



"Understanding, quantifying and estimating the ways metals flow through economies is part of the solution to better managing their impacts and their benefits" – UNEP 2010

How to assess scarce metal flows?

Scarce metals: **high value**, but **low volume**.



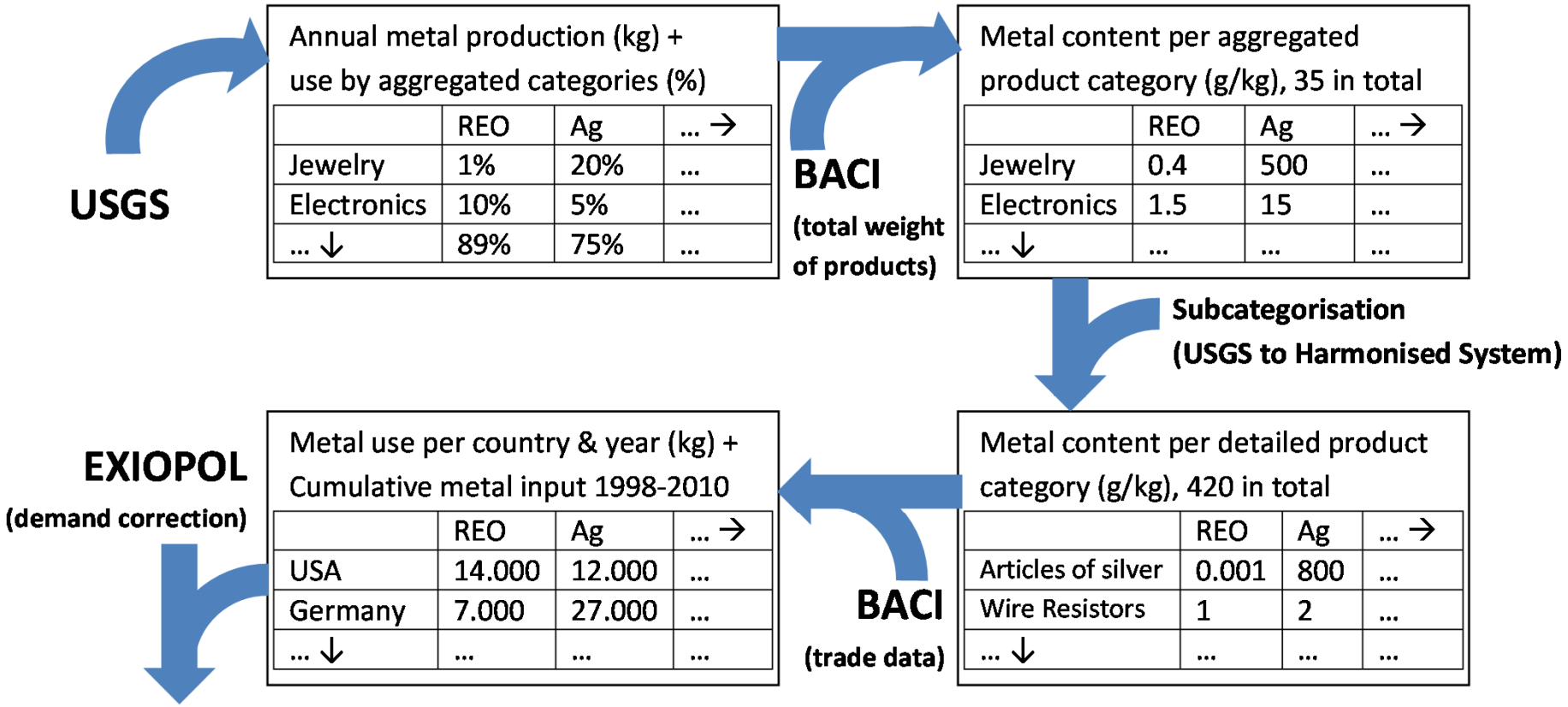
Scarce metals missing in Environmentally Extended Input Output Tables

AERTOs (TNO, Elmer Rietveld, Ton Bastein, Arnold Tukker):
"global Material Flow Analyses featuring detailed product information"

data in figure from : Oguchi 2011

How to assess scarce metal flows?

AERTOs method:



	REO	Ag	… →
Jewelry	1%	20%	…
Electronics	10%	5%	…
… ↓	89%	75%	…

	REO	Ag	… →
Jewelry	0.4	500	…
Electronics	1.5	15	…
… ↓	…	…	…

	REO	Ag	… →
Articles of silver	0.001	800	…
Wire Resistors	1	2	…
… ↓	…	…	…

	REO	Ag	… →
USA	14.000	12.000	…
Germany	7.000	27.000	…
… ↓	…	…	…

How to assess scarce metal flows?

AERTOs method:

- Regional use & cumulative inputs (1998-2010)
  - Rare Earths, Silver, Cobalt, Indium and Gallium.

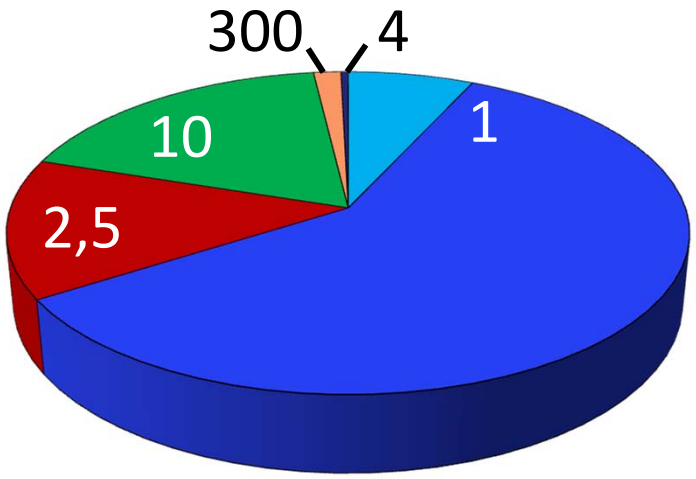
DESIRE & PhD research:

- Expand the number of metals (based on the EU 2010 report)
  - Tantalum, Rhodium, Niobium, Tungsten, Platinum, Magnesium, Germanium
- Enhanced stock & waste estimations by including product life-times
- Literature, case-studies & real-life benchmarks
- **Demand scenarios for 2030**

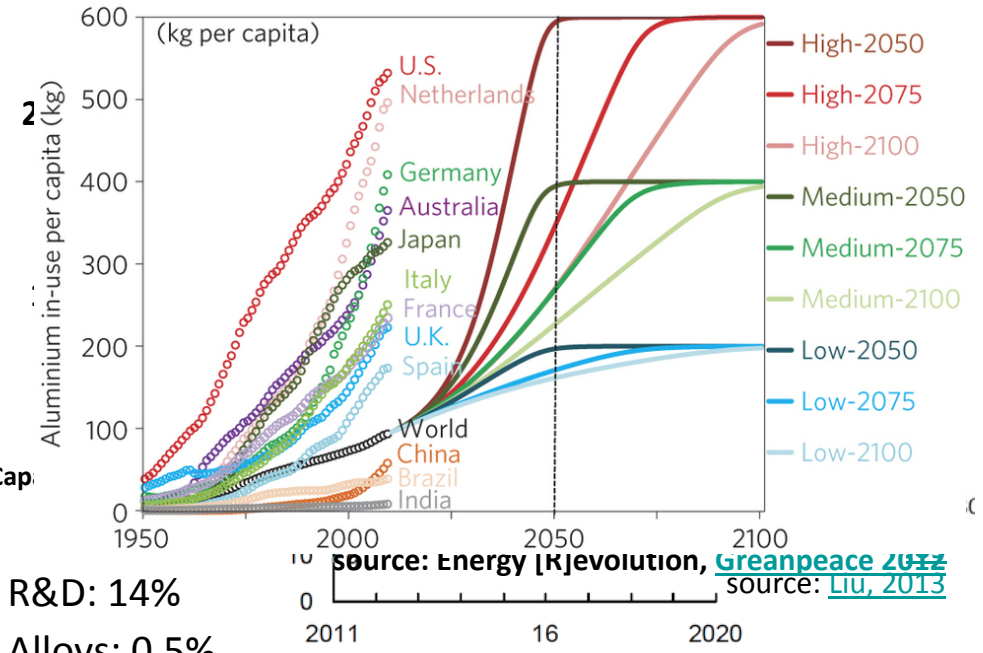
Demand Scenarios for 2030: Gallium

Gallium use in 2006

148 ton



- IC's (Digital): 7%
- IC's (Analog): 59%
- R&D: 14%
- LED's & diodes: 18%
- detectors & PV: 1,5%
- Alloys: 0,5%



source: Energy [R]evolution, Greanpeace 2012

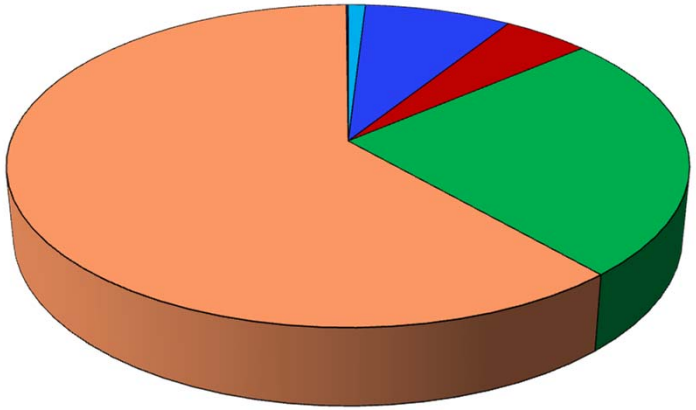
source: Liu, 2013

source: McKinsey 2012

data in figure from : ISI Fraunhofer 2009

Demand Scenarios for 2030: Gallium

Gallium use in 2030 **1350 ton**

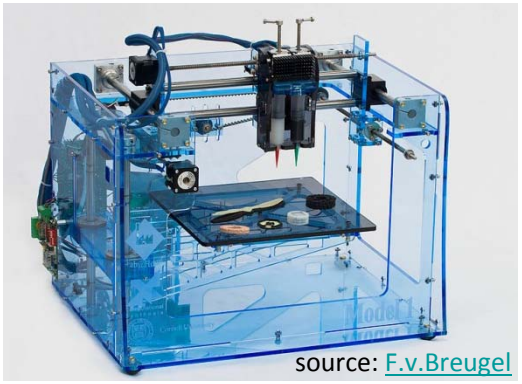


- IC's (Digital): 1%
- IC's (Analog):8%
- R&D: 5%
- LED's & diodes: 25%
- detectors & PV: 61%
- Alloys: 0,1%

7-fold increase in annual demand by 2030

source: Sprout.nl


source: Dan Little


source: F.v.Breugel

Thank you!

Leiden University, Institute of Environmental Sciences,
Department of Industrial Ecology

http://cml.leiden.edu/