TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

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The incorporation of the “final sink” concept into a metric for sustainable resource management

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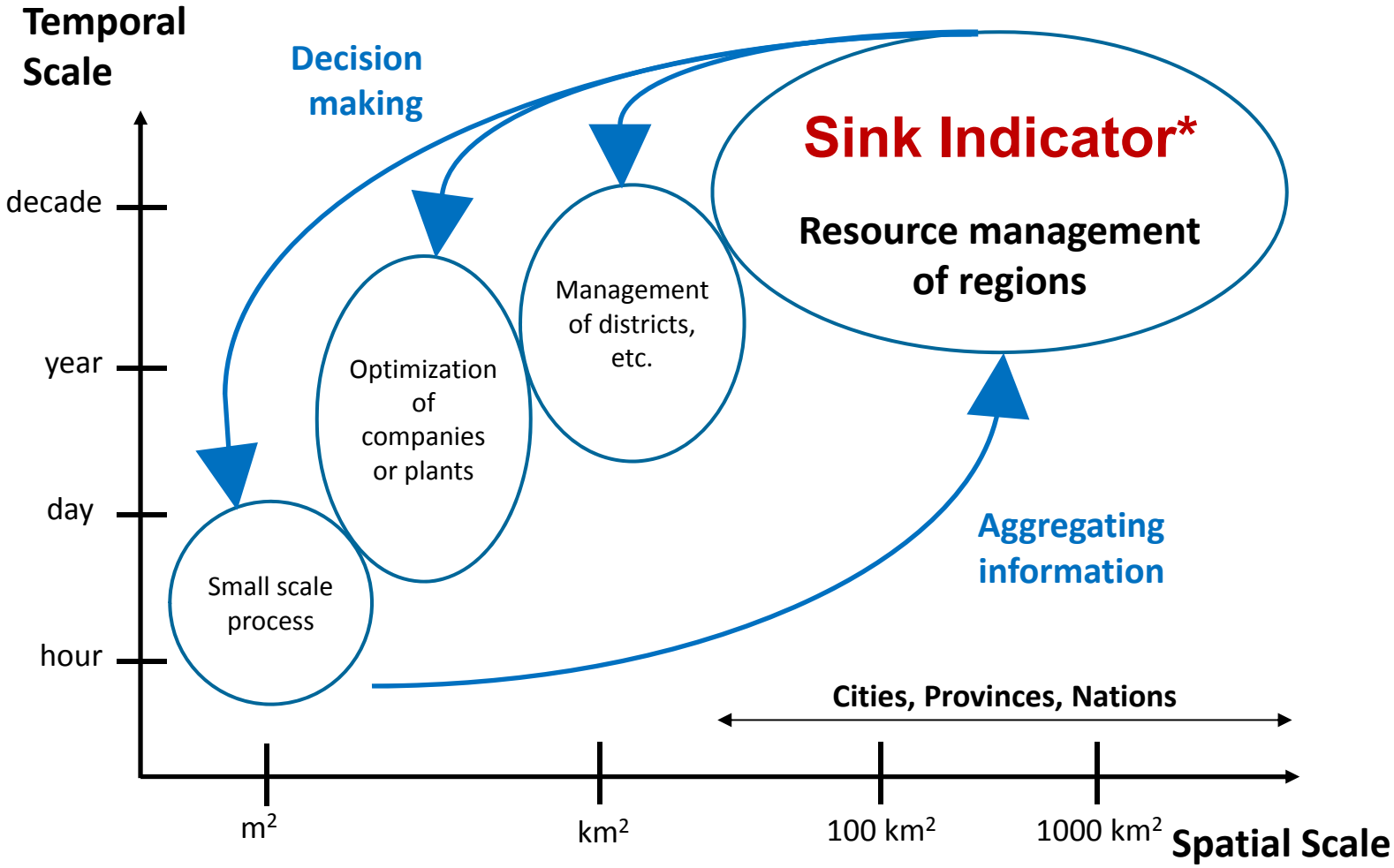
Paul H. BRUNNER

2nd International Conference on Final Sinks, 16.5.2013, Espoo, Finland.

Resource management…

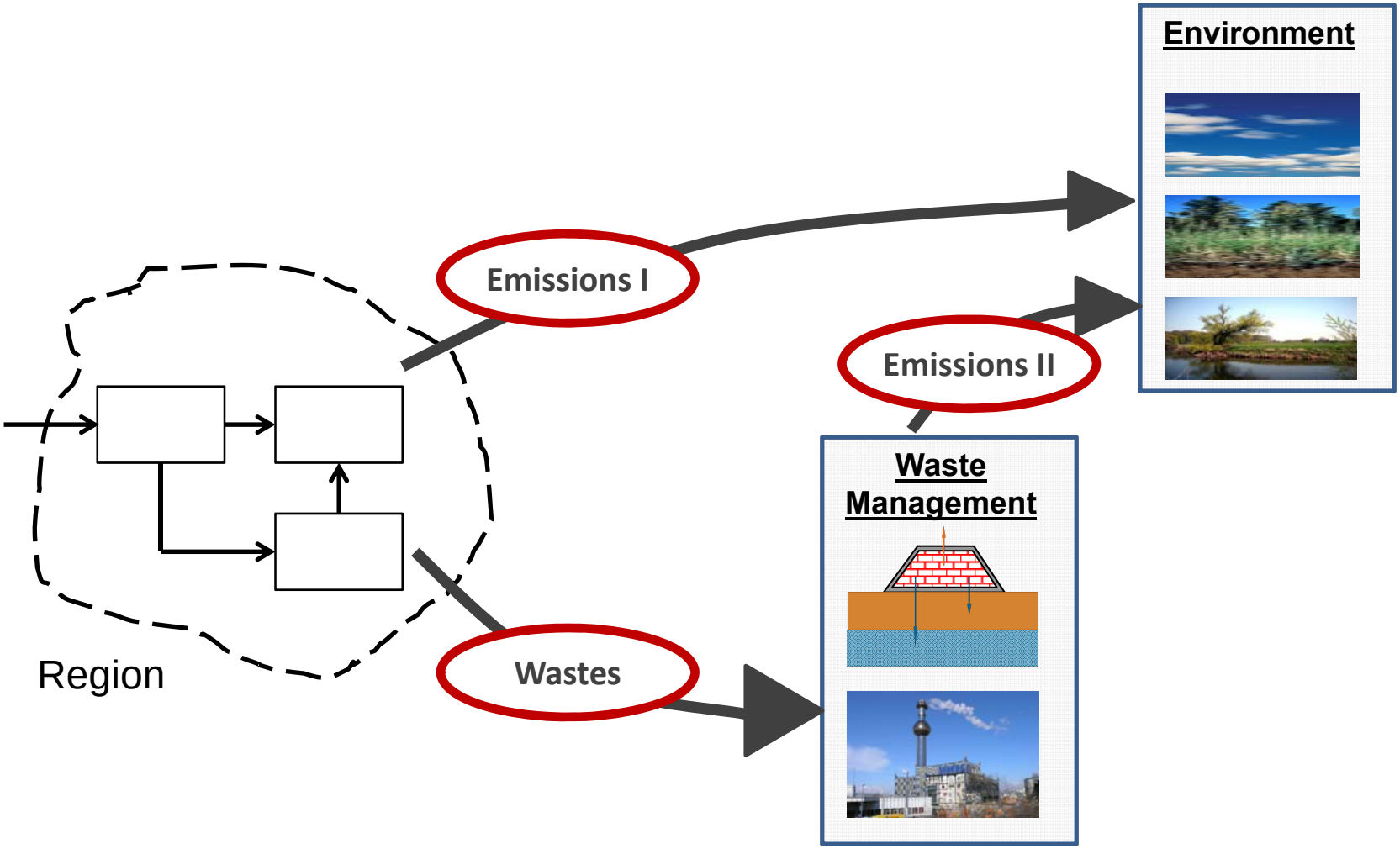
…with respect to sink capacities.



*) Döberl, G. and P. H. Brunner (2004). Substances and their (final) sinks - a new indicator for monitoring sustainability Indicators for Evaluating Sustainable Development - The Ecological Dimension. Berlin.

Which fraction of a substance…

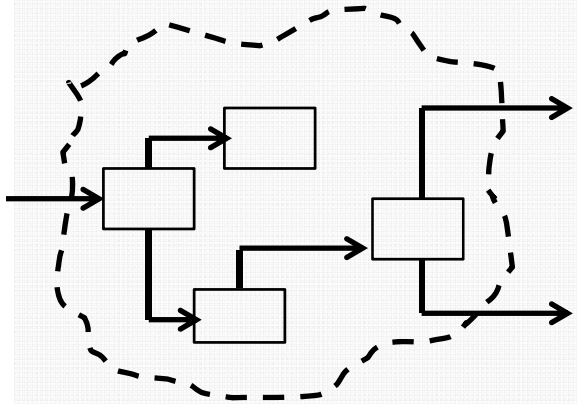
…enters appropriate sinks?



Indicator Framework

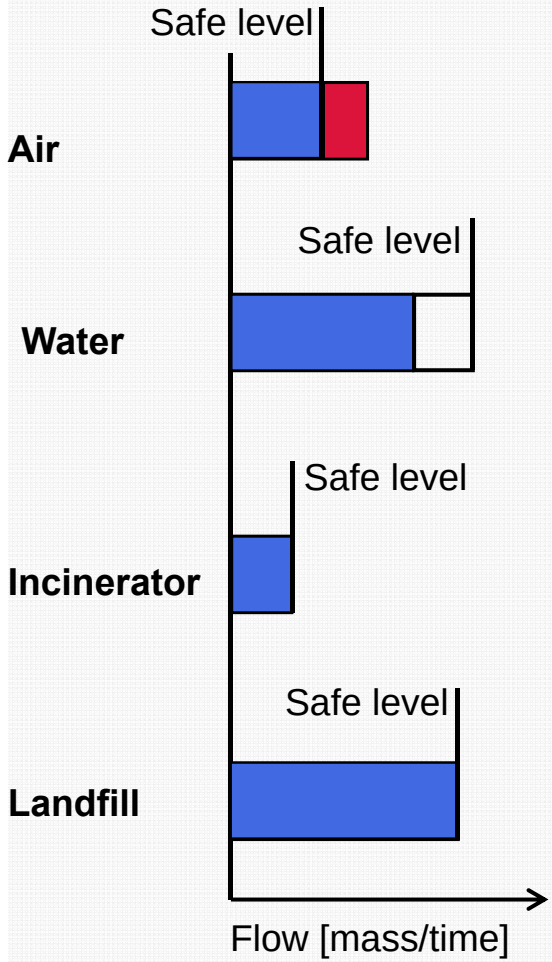
1. Inventory
(substance flow analysis)

Flows into sinks:



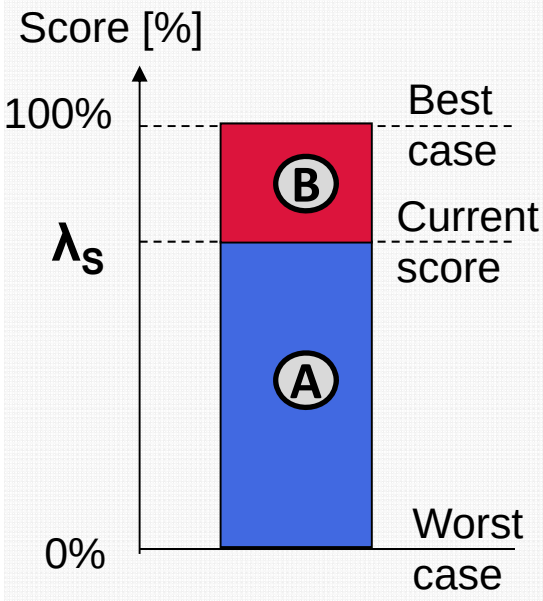
Region
e.g. Helsinki

2. Impact assessment
(e.g. Risk assessment)



3. Sink Indicator calculation

$$\lambda_S = \frac{A}{A+B} * 100$$

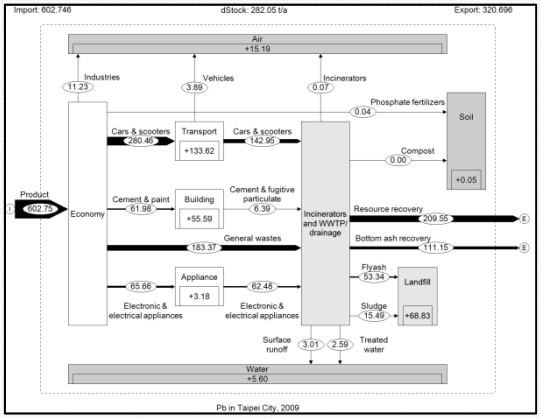


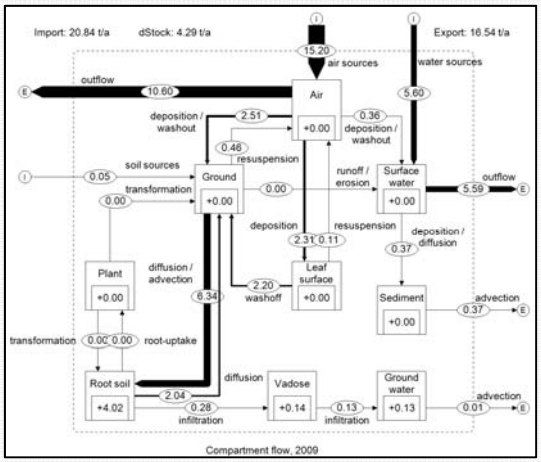
Case Studies

(1)	Lead	Taipei (Taiwan)
(2)	Copper	Vienna (Austria)
(3)	c-OctaBDE	Vienna (Austria)
(4)	PFOS	Switzerland

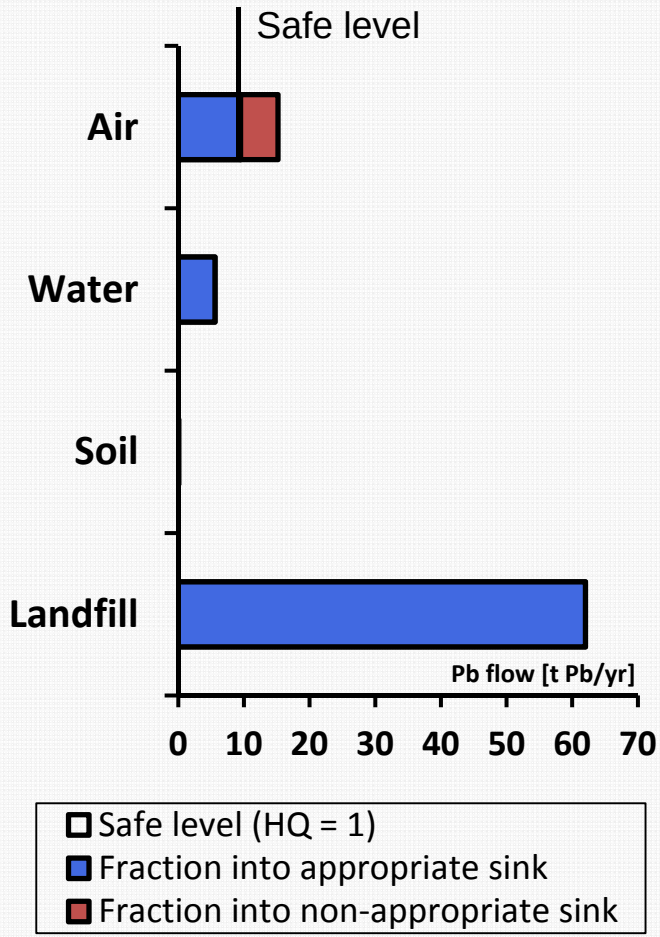
Pb in Taipei

1. Inventory
(Pb flow analysis)





2. Impact Assessment
(Health Risk Assessment)



3. Sink Indicator

$$\lambda_{Pb} = 93\%$$

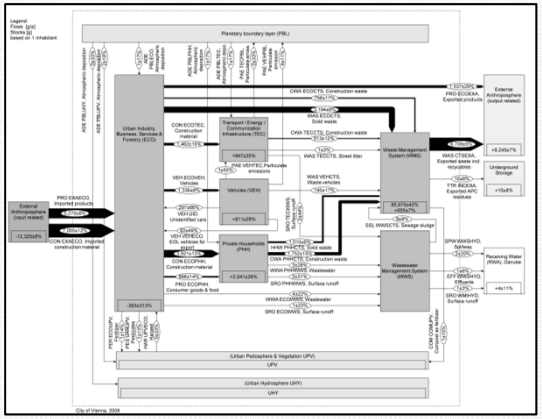
4. Measurements

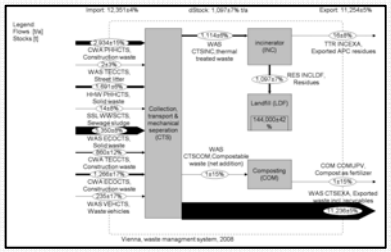
Reducing airborne emissions by 40%

Data source: Chen, S., H.W. Ma (2013): Human Health Risk Assessment for Urban Sink Management , Conference Proceedings, 2nd Conference on Final Sinks, Espoo, Finnland.

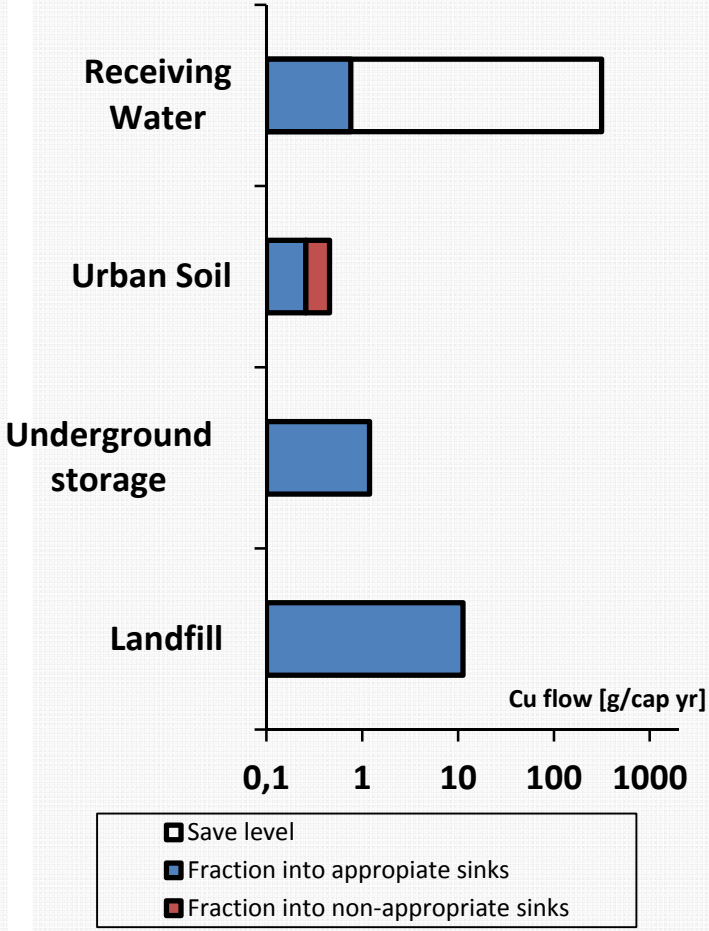
Cu in Vienna

1. Inventory
(Cu flow analysis)





2. Impact Assessment
(Critical flow method)



3. Sink Indicator

$$\lambda_{Cu} = 99.9\%$$

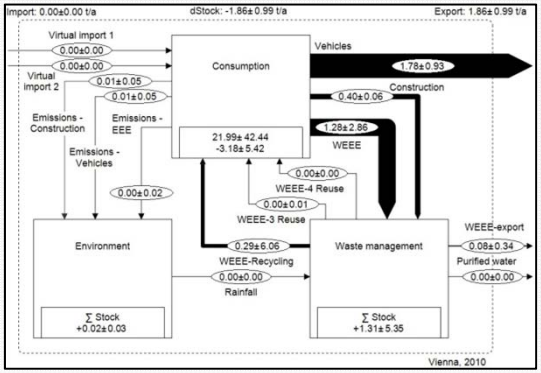
4. Measurements

- Elaborating legal threshold for heavy metals in urban soils
- Monitoring loads to urban soil

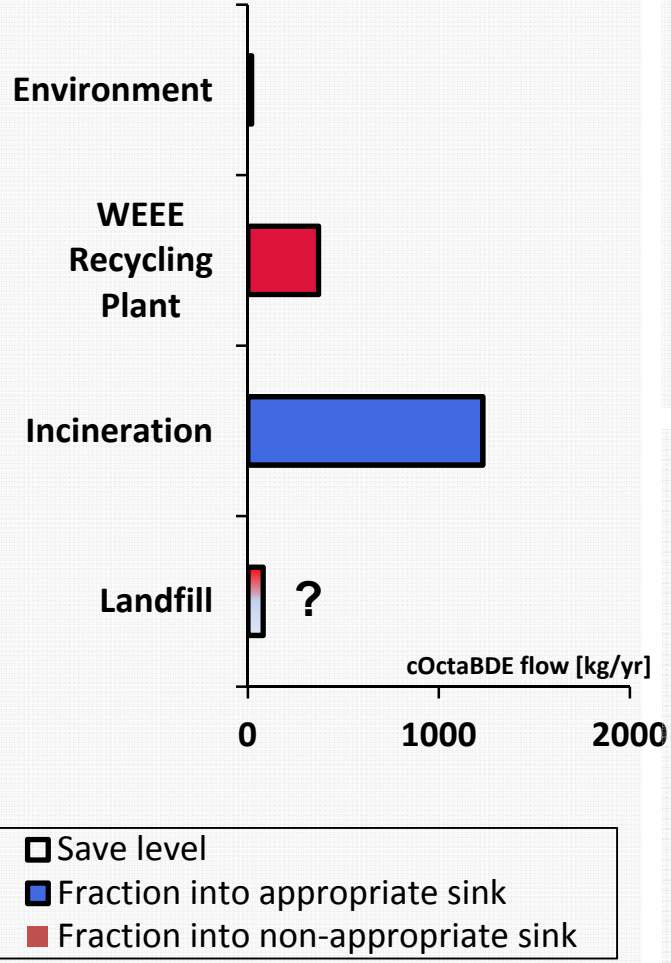
Data source: Kral, U., et al. (2013). "The copper balance of cities: Exploratory insights into a European and an Asian city." Journal of Industrial Ecology, submitted

c-OctaBDE in Vienna

1. Inventory
(c-octaBDE flow analysis)



2. Impact Assessment
(Critical flow method)



3. Sink Indicator

$$\lambda_{cOctaBDE} = 72\%$$

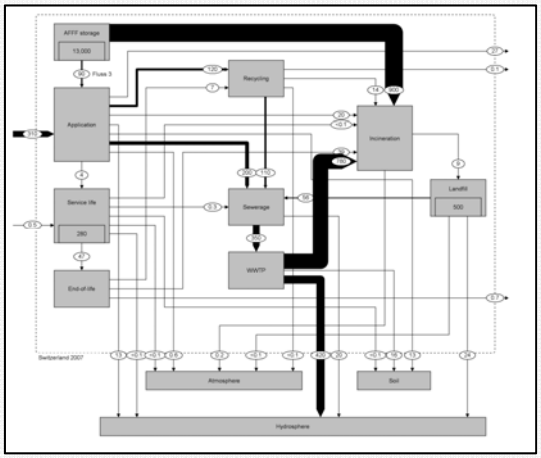
4. Measurements

- Improving inventory data
- Directing c-octaBDE to appropriate sinks

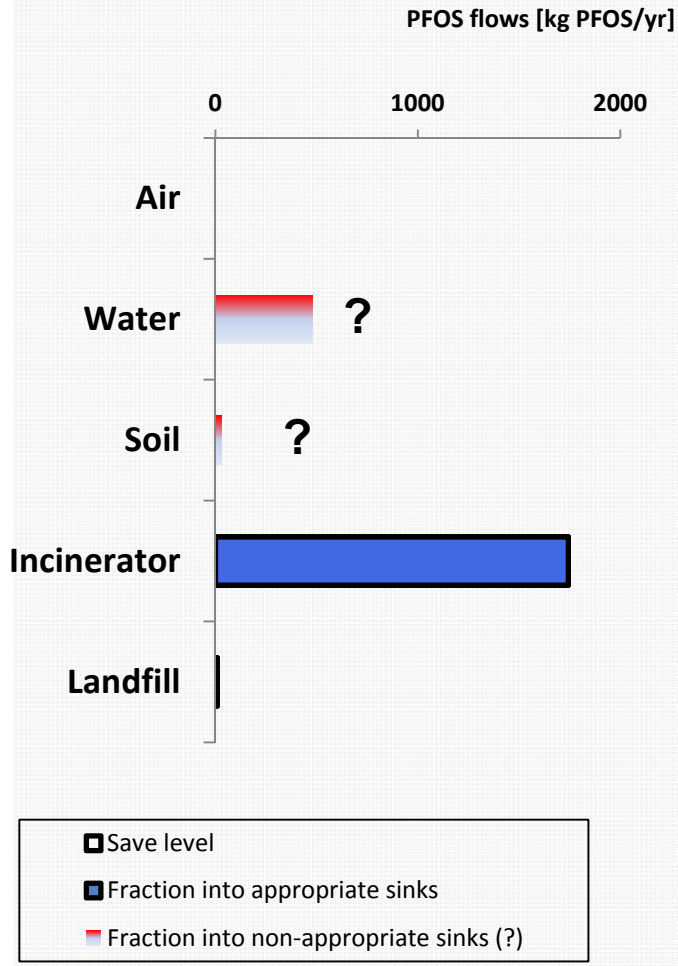
Data source: Vyzinkarova, D, P.H. Brunner (2013). SFA of Wastes Containing Polybrominated Diphenyl Ethers: The Need for More Information and for Final Sinks. Journal of Industrial Ecology, accepted for publishing

PFOS in Switzerland

1. Inventory
(PFOS flow analysis)



2. Impact Assessment
(Critical flow method)



3. Sink Indicator

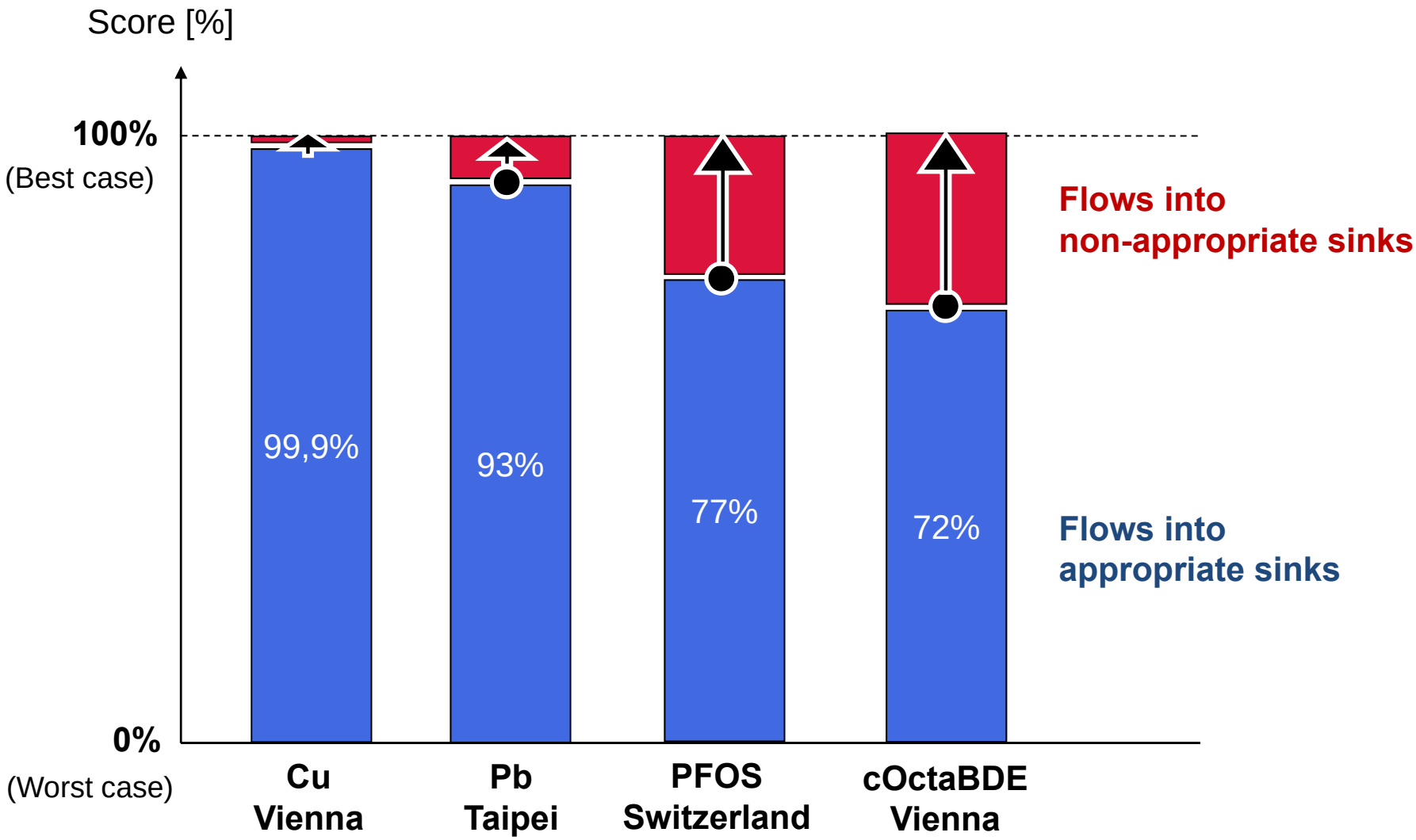
$$\lambda_{PFOS} \geq 77\%$$

4. Measurements

- Managing the stockpiles
- Minimize and eliminate emissions
- Monitoring

Data source: Buser, A. and L. S. Morf (2009). Substance flow analysis for Switzerland: Perfluorinated surfactants perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA). Environmental studies no. 0922. Bern: 144.

Indicator scores



Influencing the score…

…without changing reality:

- Improving the inventory (SFA data quality) and/or the impact assessment method
- Selecting another impact assessment method

…with changing reality, e.g.:

- Reducing flows into sinks
- Routing wastes and emissions into appropriate sinks
- Enhancing the appropriate sink capacity
- Restricting the use of the substance

Summery and conclusions

Basic idea

- Supporting regional resource management with a new indicator that respects sink capacities.
- Making the final sink function of WM technologies explicit.

Sink Indicator λ

- determines the fraction of a substance entering appropriate sinks.
- is high aggregated information, including the analysis and assessment of regional substance flows.

Benefits

- Performance monitoring over time.
- Benchmark of different regions.
- Integration of substance flow analysis and various assessment methods (e.g. RA, CF).