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

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Resource management...

...with respect to sink capacities.

Temporal Scale
- decade
- year
- day
- hour

Spatial Scale
- m²
- km²
- 100 km²
- 1000 km²

Sink Indicator*

Optimization of companies or plants

Management of districts, etc.

Small scale process

Decision making

Aggregating information

Cities, Provinces, Nations

Which fraction of a substance…

…enters appropriate sinks?
1. Inventory (substance flow analysis)

Flows into sinks:

Region e.g. Helsinki

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

3. Sink Indicator calculation

\[ \lambda_S = \frac{A}{A + B} \times 100 \]

Score [%]

Flow [mass/time]

Safe level

Air

Water

Incinerator

Landfill

100%

Best case

Current score

\( \lambda_S \)

0%

Worst case

A

B
### Case Studies

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<th>Substance</th>
<th>Location</th>
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<td>Taipei (Taiwan)</td>
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<td>3</td>
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<td>PFOS</td>
<td>Switzerland</td>
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</table>
1. Inventory
(Pb flow analysis)

2. Impact Assessment
(Health Risk Assessment)

3. Sink Indicator

\[ \lambda_{Pb} = 93\% \]

4. Measurements

Reducing airborne emissions by 40%

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

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

PFOS in Switzerland

1. Inventory (PFOS flow analysis)

2. Impact Assessment (Critical flow method)

3. Sink Indicator

Indicator scores

Flows into appropriate sinks

Flows into non-appropriate sinks

Score [%]

100%
(Best case)

0%
(Worst case)

Cu Vienna
99.9%
Pb Taipei
93%
PFOS Switzerland
77%
cOctaBDE Vienna
72%
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 $\lambda$
• 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).