



TECHNISCHE
UNIVERSITÄT
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INSTITUT FÜR WASSERGÜTE,
RESSOURCENMANAGEMENT UND
ABFALLWIRTSCHAFT

INSTITUTE FOR WATER QUALITY,
RESOURCES AND
WASTE MANAGEMENT

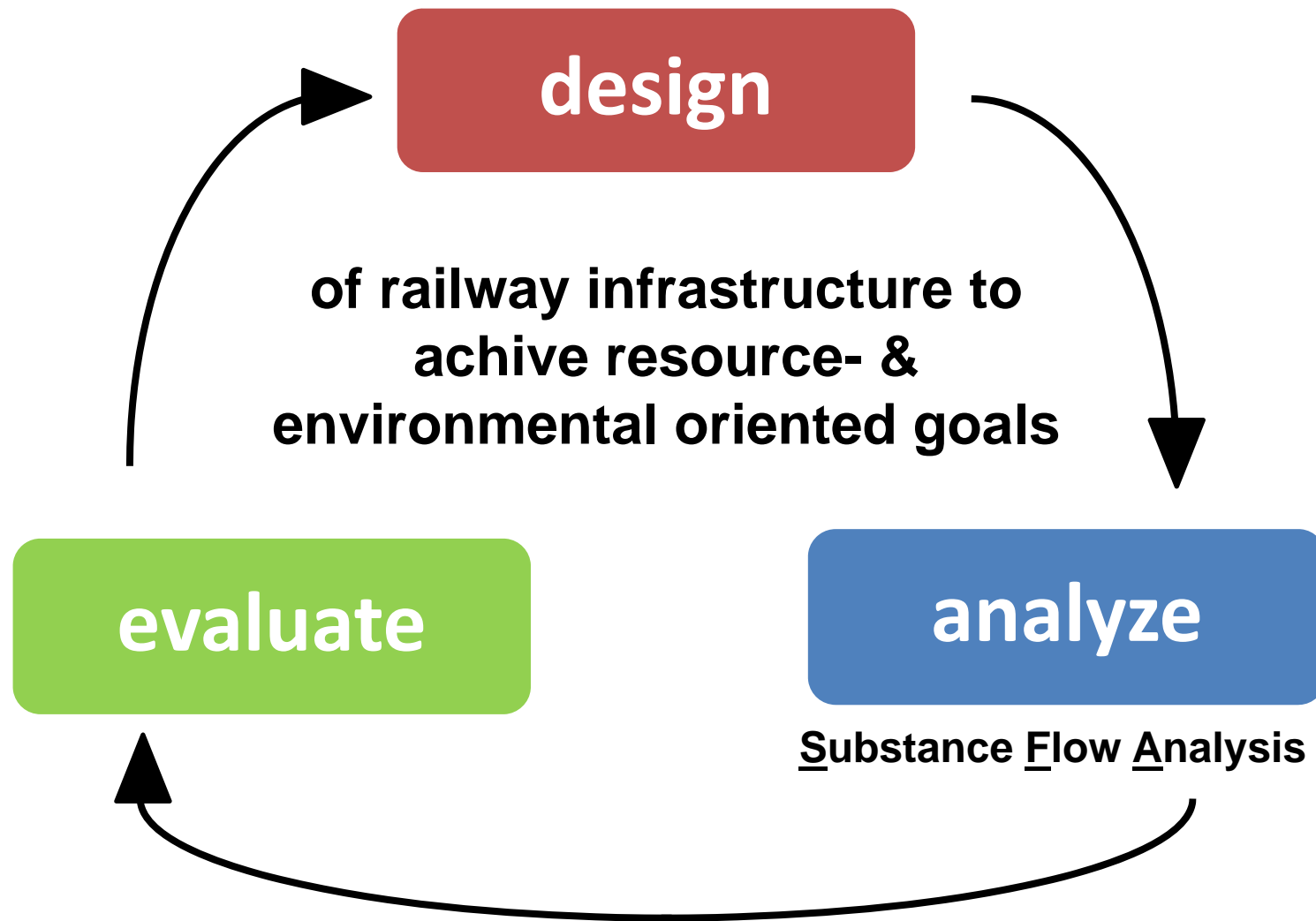


Effective handling of relevant information for environmental evaluation

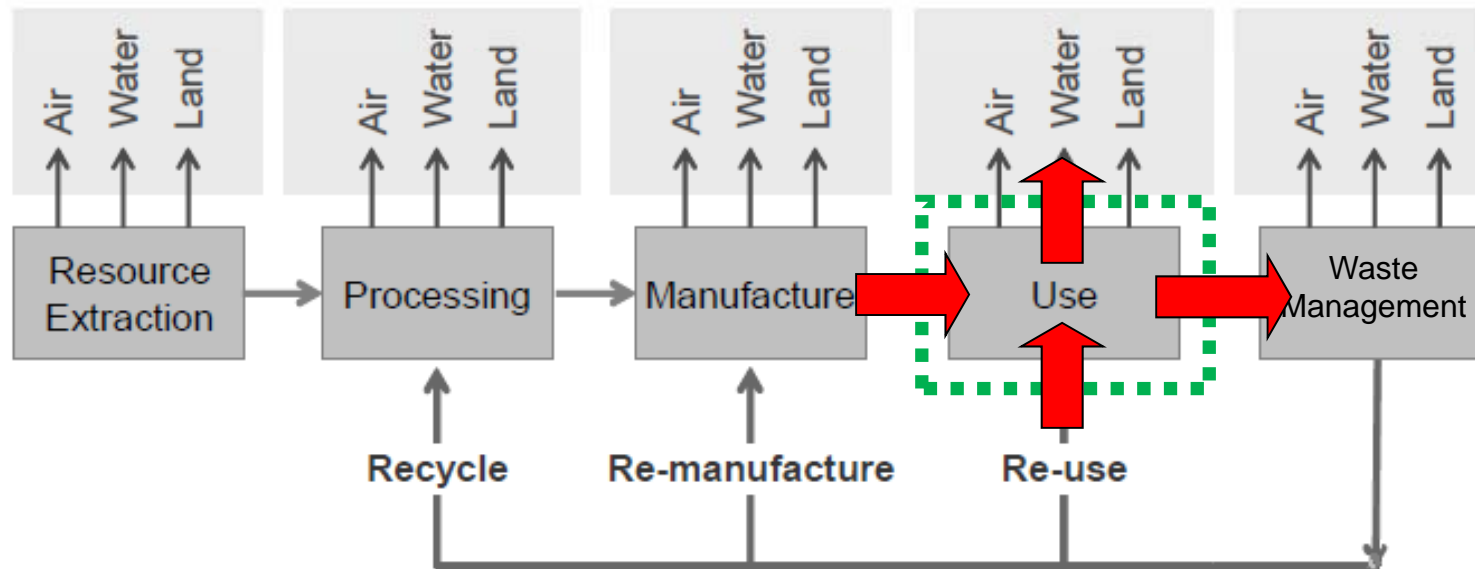


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Workshop „Opportunities and barriers for Eco-
procurement guidelines in Railway Infrastructures“
26. January 2010, UIC headquarter, Paris

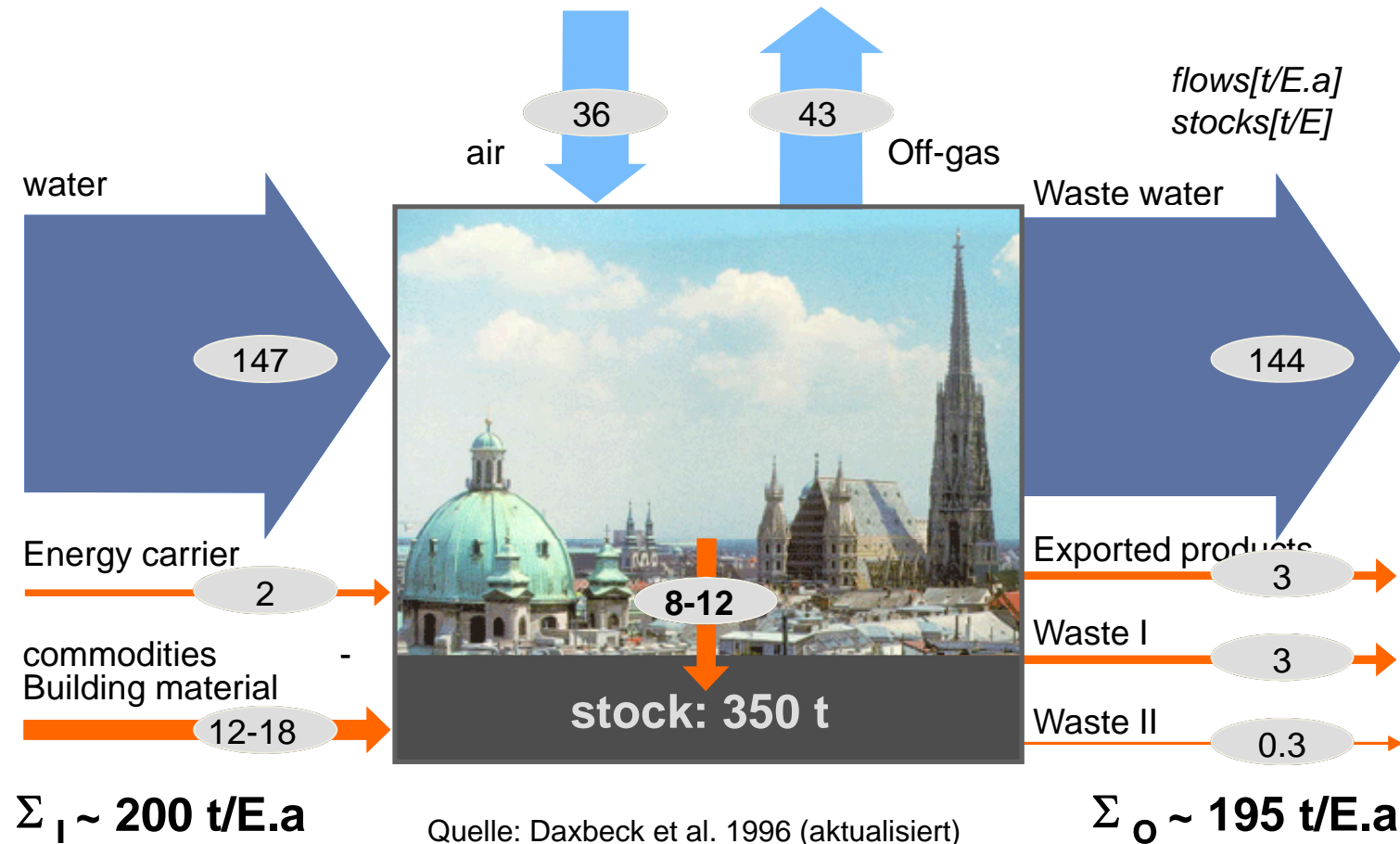


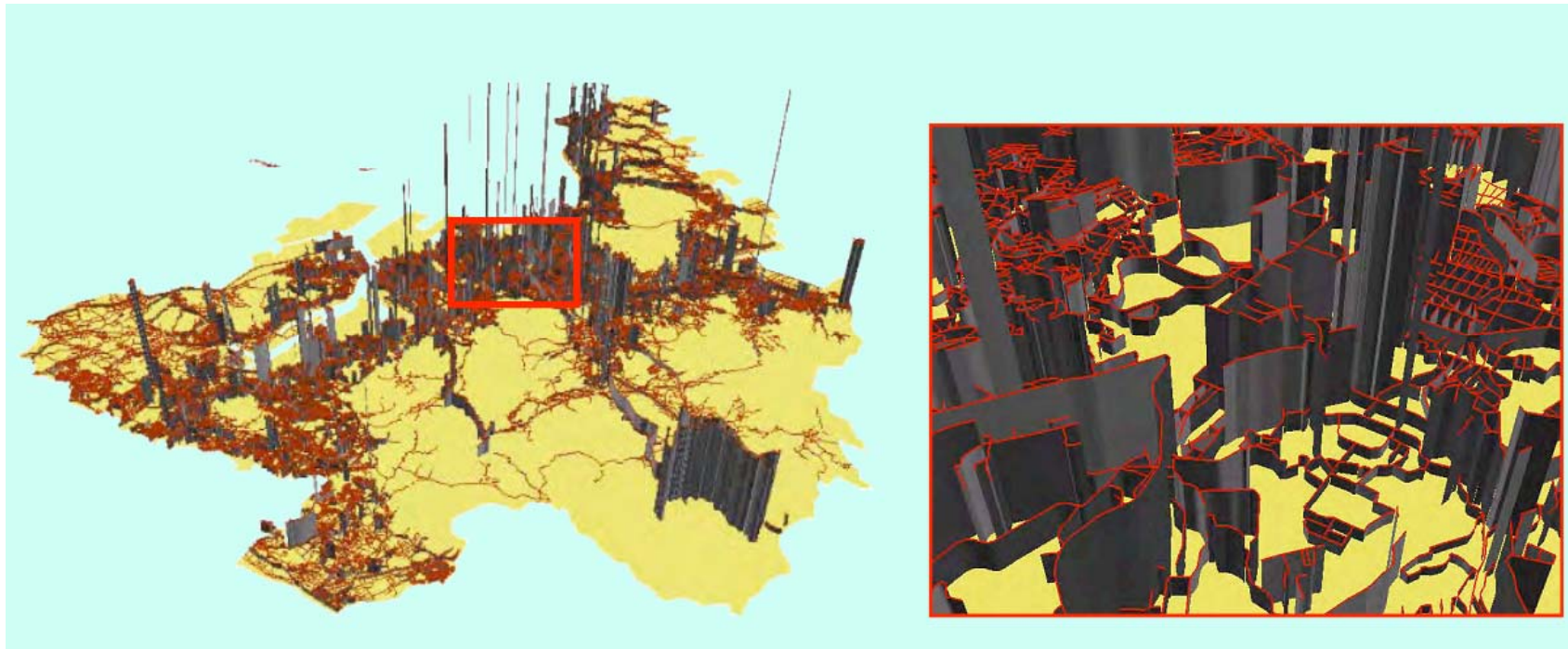
**Analyzing the
fate of materials through the whole life cycle**
is prerequisite
to evaluate environmental performance.



Schematic representation of material flows through the commercial life-cycle of products and InfraGuidER common system boundaries for MFA

Material flows of Vienna





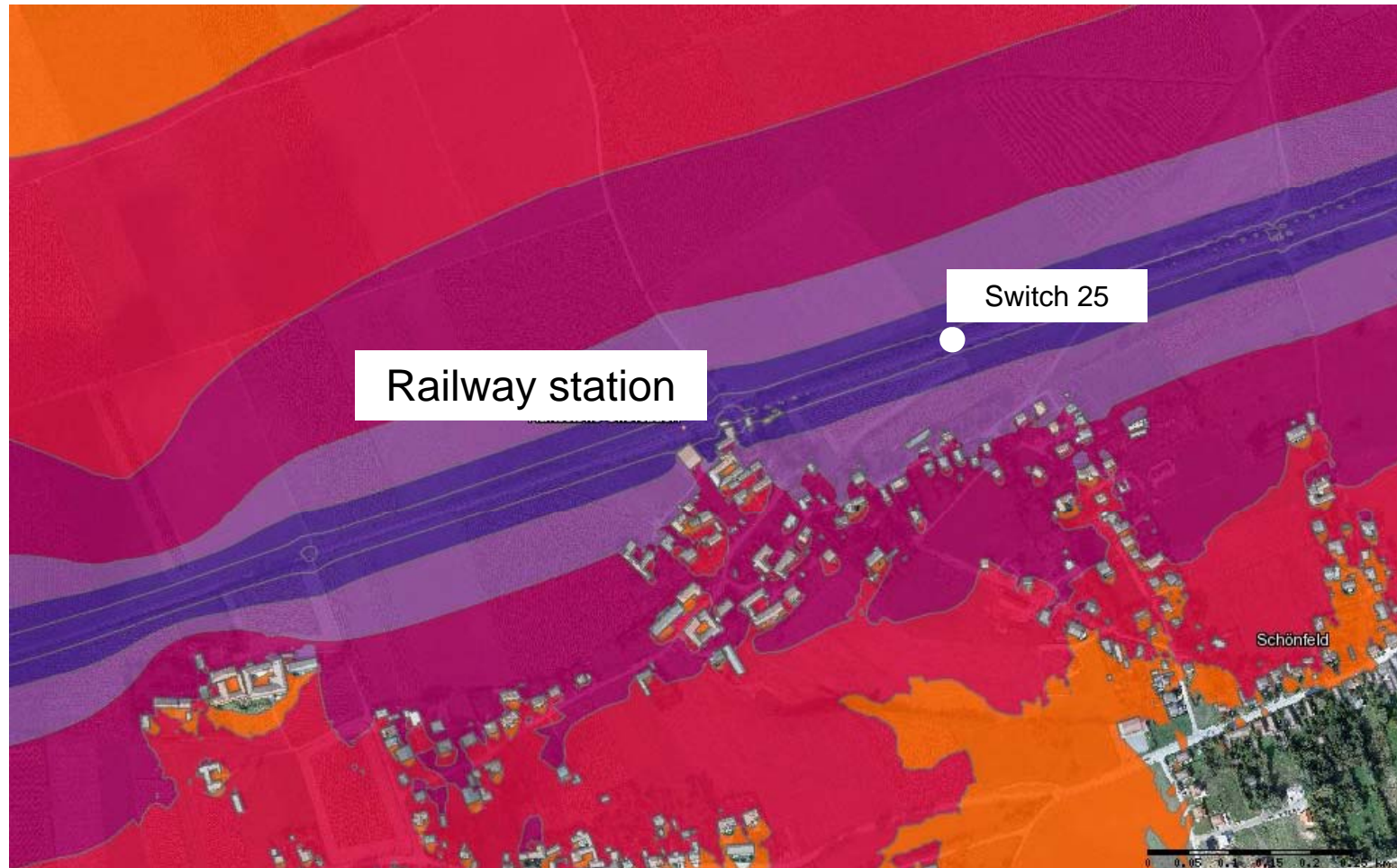
Source: Hiroki Tanikawa, Tatsunori Sakamoto, Seiji Hashimoto, Yuichi Moriguchi: Visualization of Regional Material Flow using Over-flow Potential Maps, Poster at Gordon Research Conference, Industrial Ecology, 01-06 Aug. 2004, The Queen's College, Oxford, UK

Application example:
Legal standards require dismantling of halon cables.

SUBSTANCE	EMISSION [t/a]	SOURCE
Iron	2'167.0	brake pads, rails, wheel
Copper	46.6	catenary wire, brake pads
	19.9	corrosion protection
	15.5	gray iron brake, rail, wheel
chrome		iron brake
nickel		
vanadium	0.06	wheel
lead	0.003	S-break
antimony	0.003	S-break
cadmium	0.002	Corrosion protection
Heavy metals	2'267.0	
hydrocarbons	1'357.0	Wooden sleepers, lubricants
Glyphosat	3.9	Vegetation control

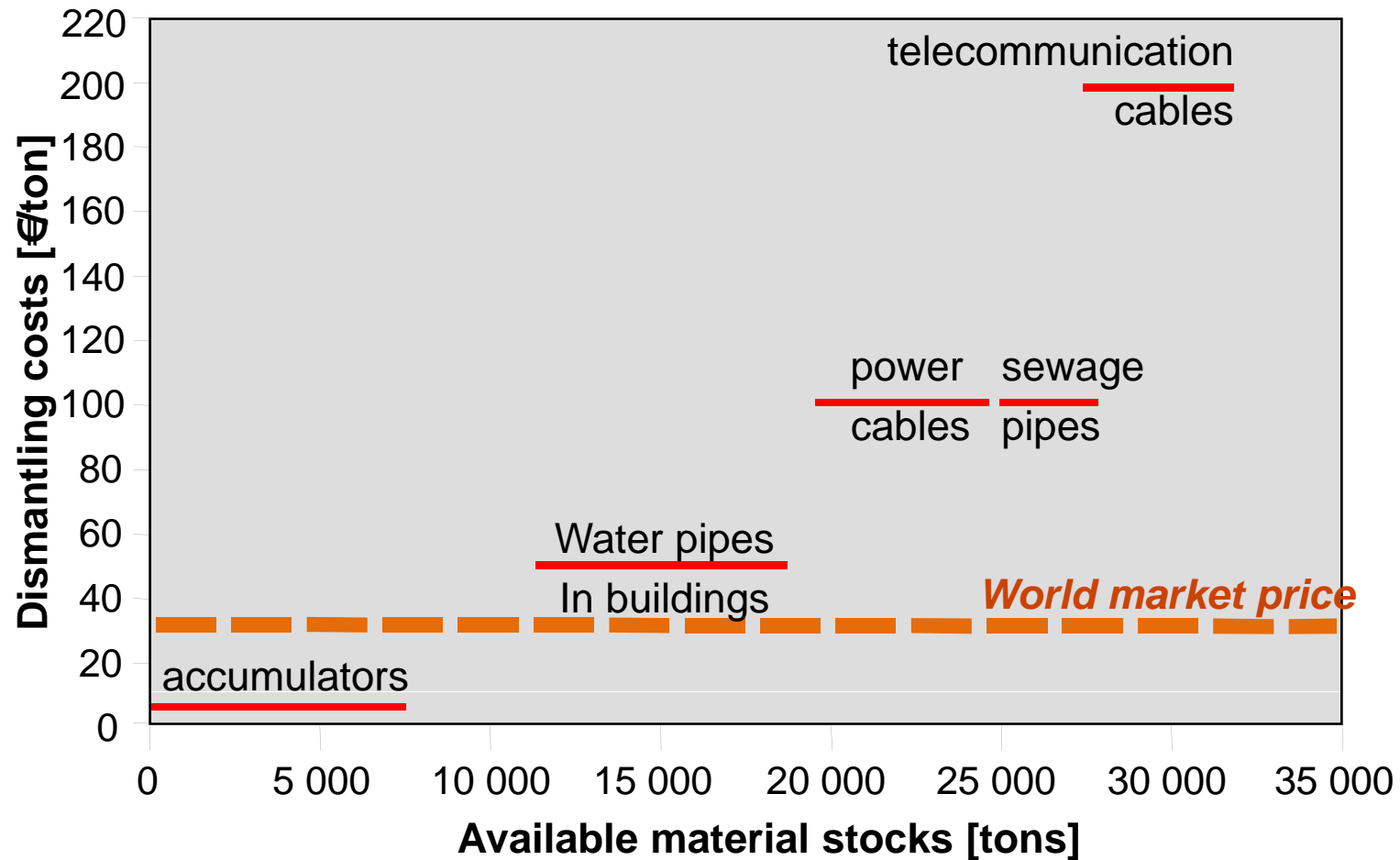
**Emission patterns:
Spatial & temporal distributed**

Source: Burkhardt, M.: Gewässerschutz bei Bahnanlagen, EAWAG, 2005



Source: www.lebensministerium.at

e.g.: hazardous substances



source: Lohm et al., 1998



Problem

High costs based on copper concentrations in the track ballast

- > no recycling is allowed
- > high costs for landfilling

Goal of the railway enterprise

Minimizing costs & improving environmental performance by long-term ballast management.



source: U. Kral

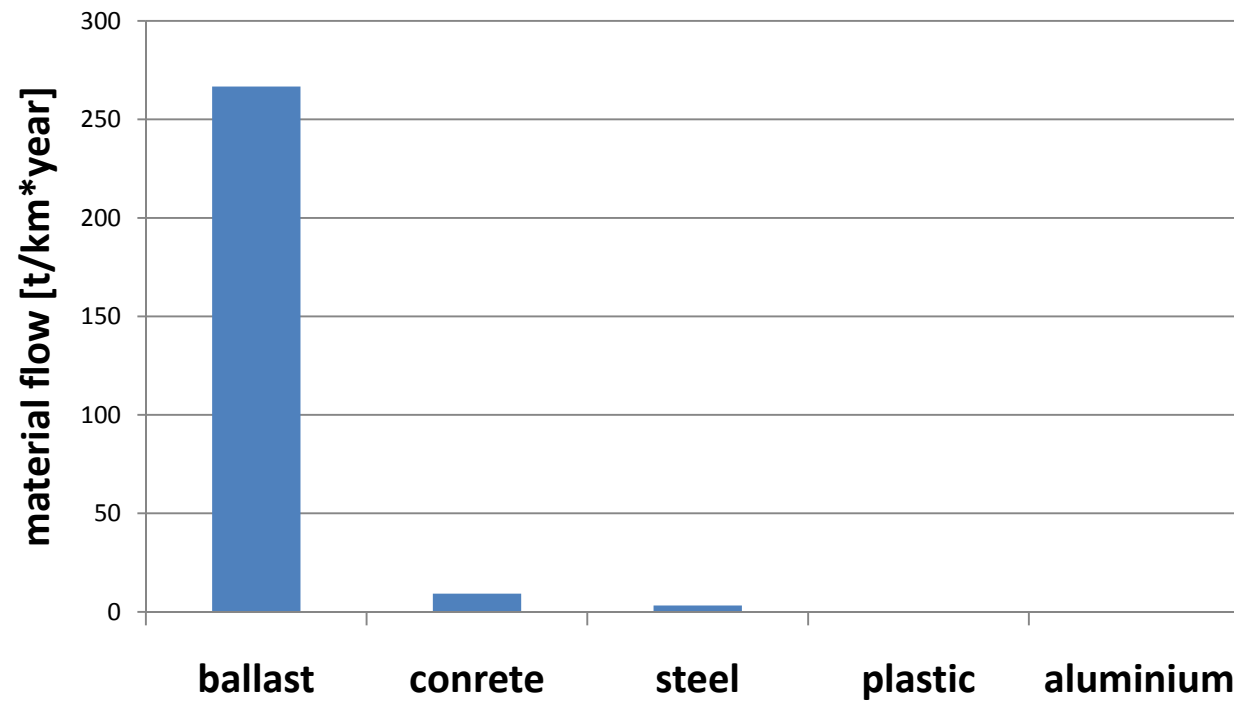


source: www.plassertheurer.at/

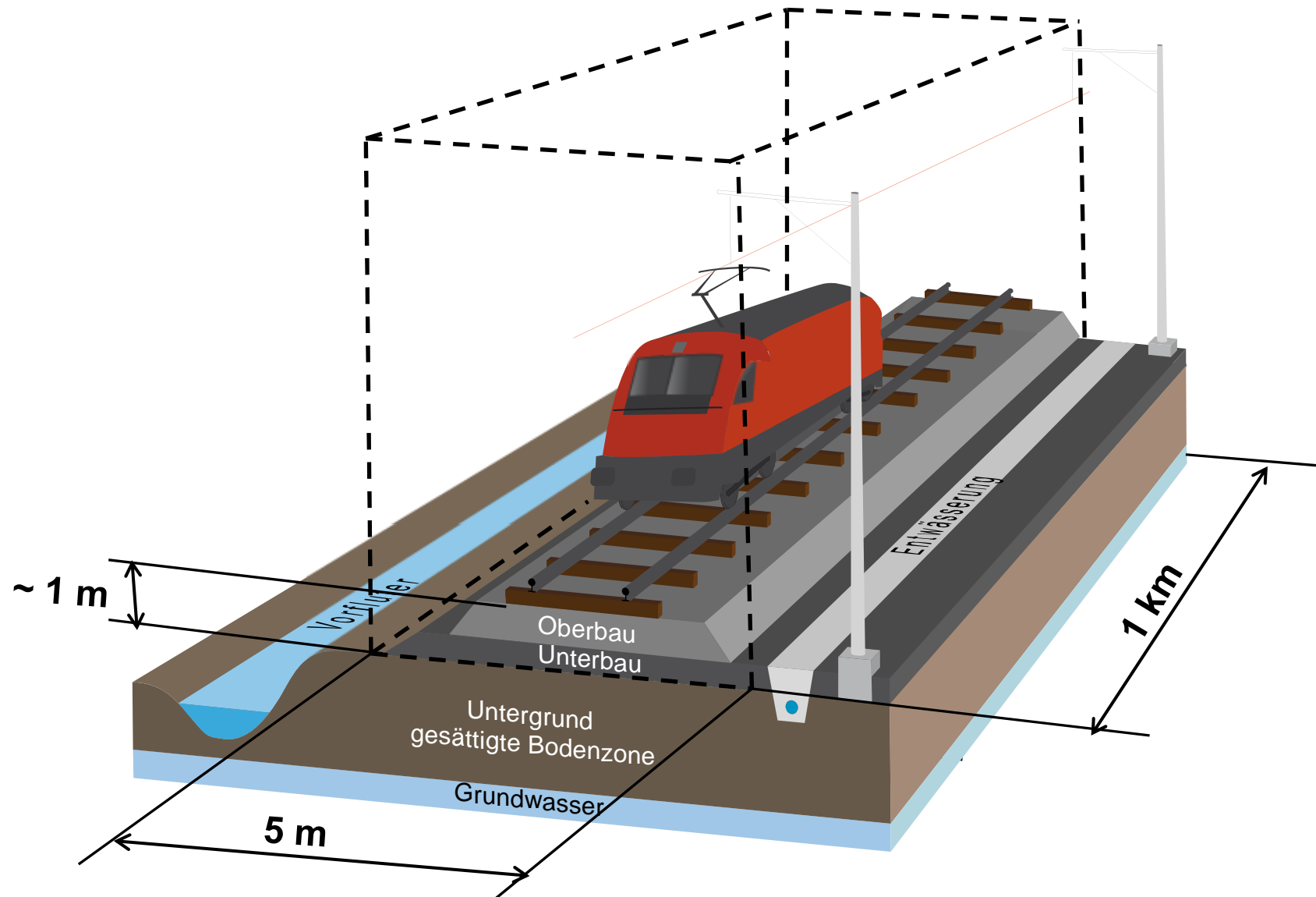


Source: www.jkoller.at/Deponie.htm

Material flows per lifetime



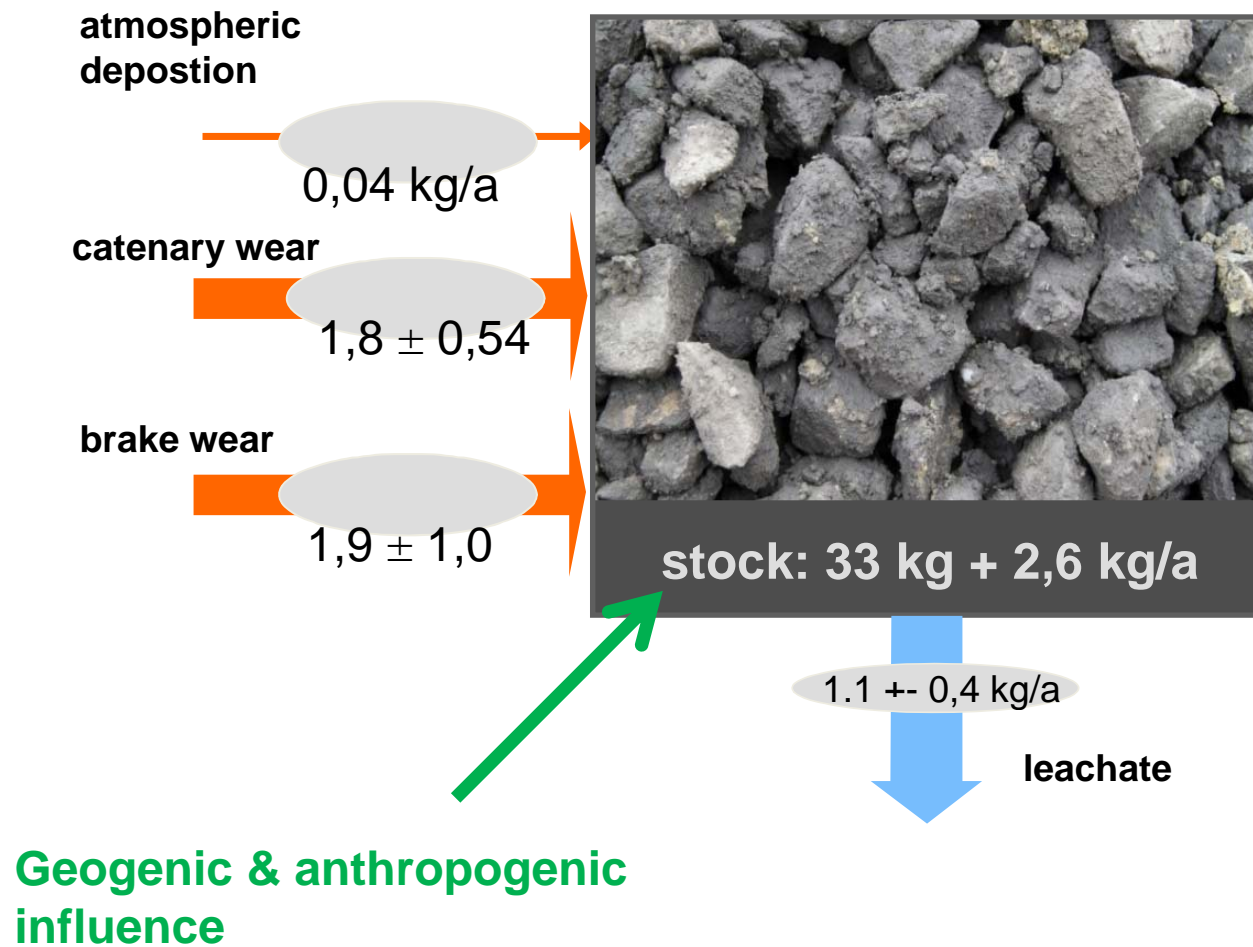
Source: Banverket, Superstructure of Bothniabana



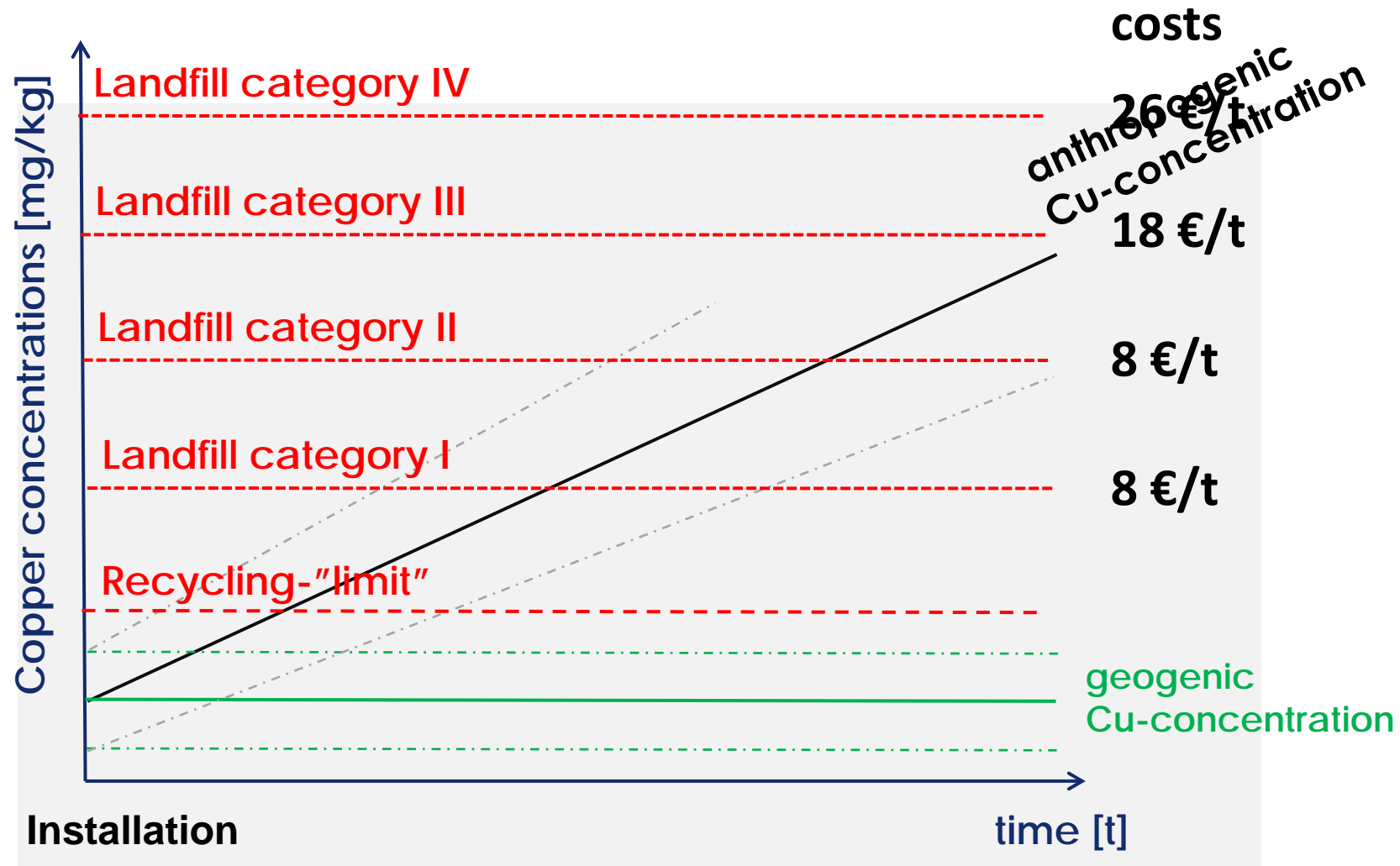


Bildquelle: [TU Wien (2007); www.bahnbilder.net]

Copper balance for track ballast



Flows [kg/km*a]
Stocks [kg/km*a]

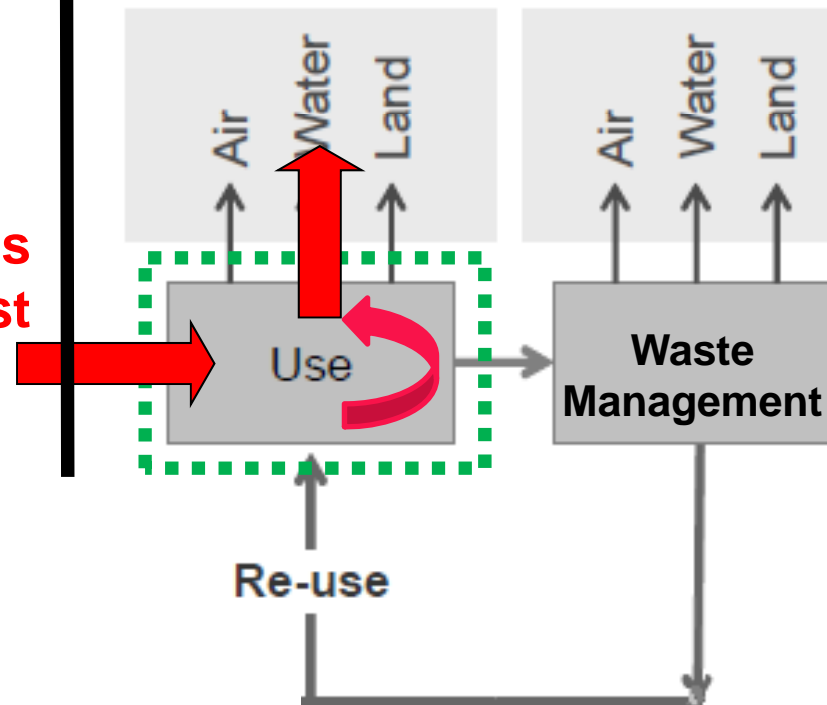


Procurement

= physical interface

= information interface

Operator: **brake pads**
Infrastructure Manager: **Ballast**



A proactive approach is needed to

- identify resource and pollution potentials of railway infrastructure.
- fulfil future legal compliance.
- benchmark the environmental performance of railway systems.

Development of an environmental/resource database respectively extension:

- Material accounting: Linking inflows (procurement), stocks and outflows (waste, diffuse emissions)
 - Identification of materials & substances
 - Additional material properties (lifetime, recyclability, costs, LCA data, etc.)
- Visualisation by GIS, localisation of:
 - resources within the railway system
 - diffuse emission and related loadings

An knowledge base addressing the fate of materials is key for evaluating environmental performance of railway infrastructure.



Thank you!

www.infraguider.eu

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