
MFA Case Studies for Industries

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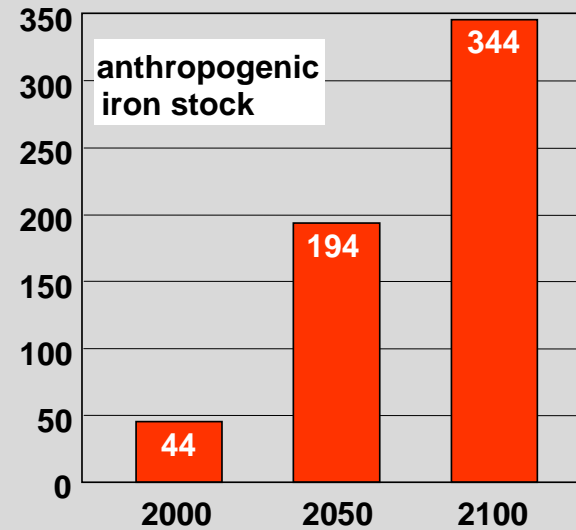
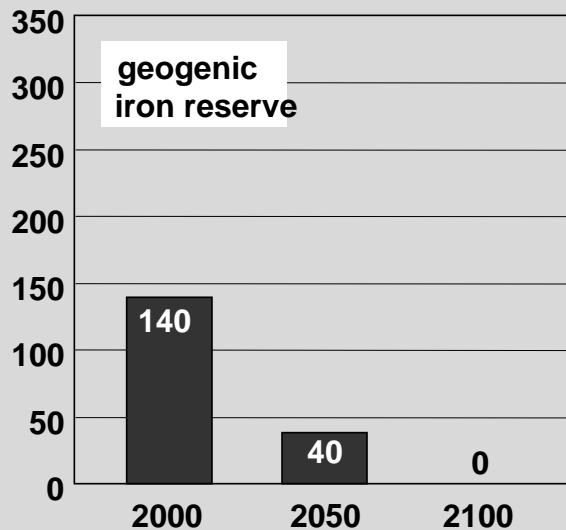
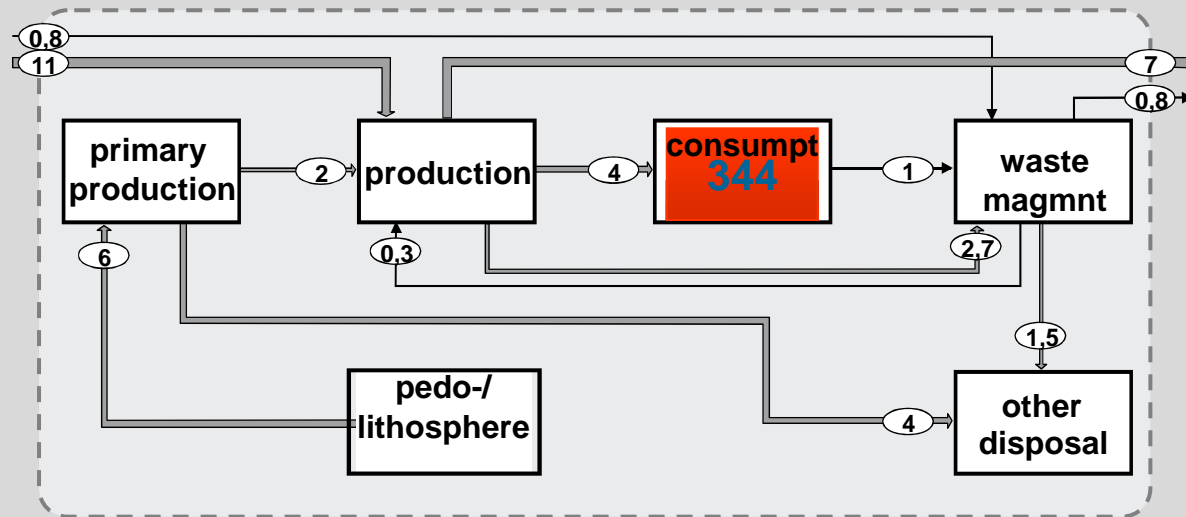
Vienna University of Technology

Institute for Water Quality, Resources and Waste Management

<http://www.iwa.tuwien.ac.at>



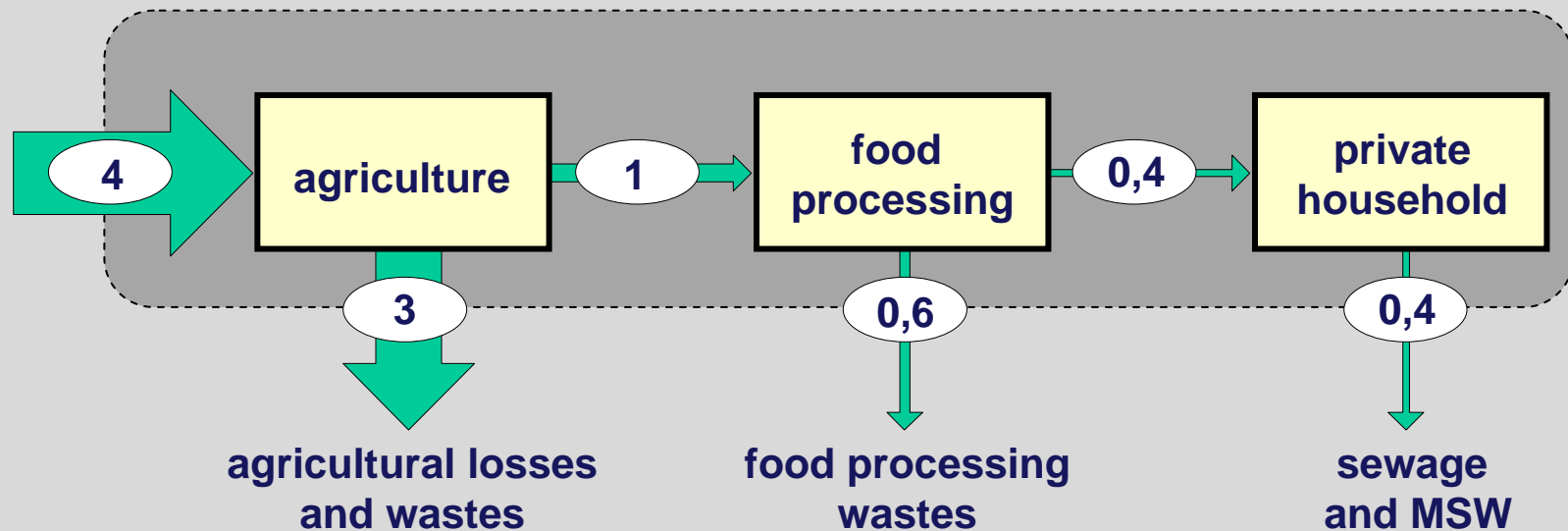
MFA for strategic resource management in the iron industry



MFA for strategic resources management: P and N

[kg phosphorous/c.a]

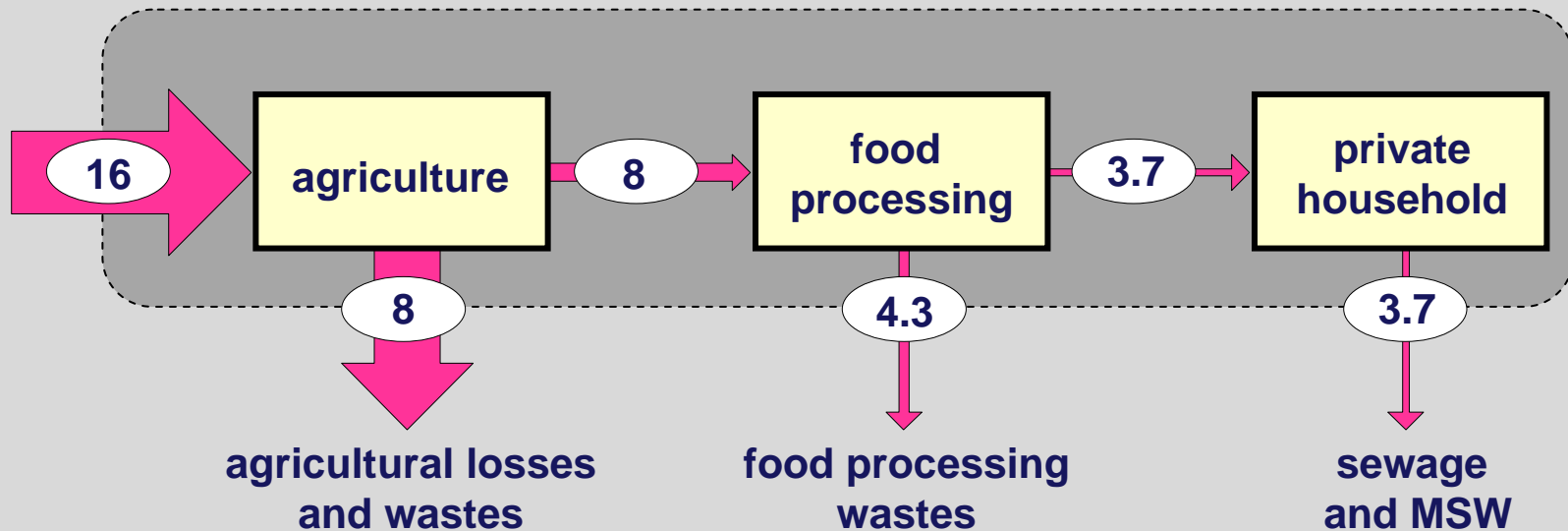
systems boundaries: national boundary/2000



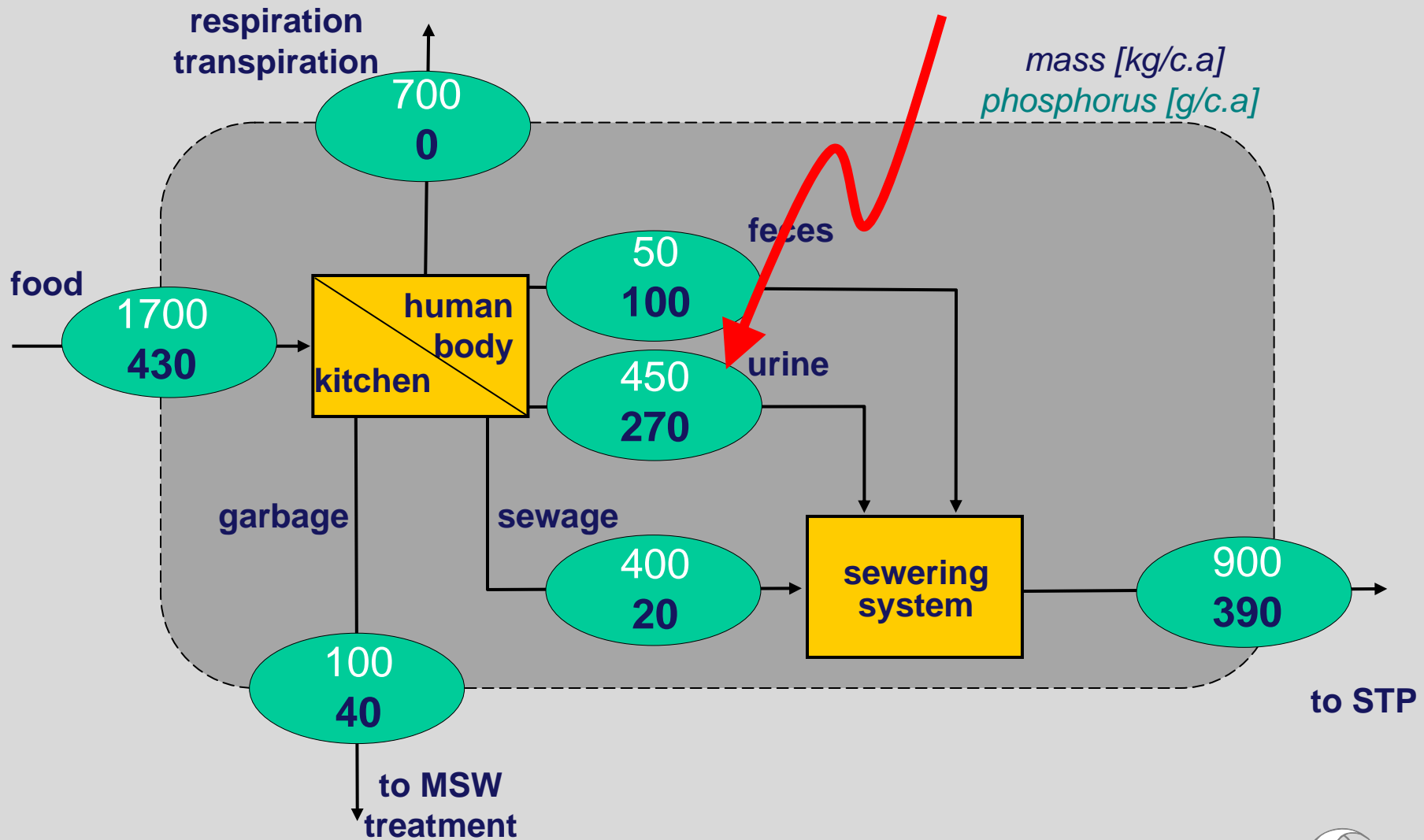
Total nitrogen flow due to nutrition

[kg nitrogen/c.a]

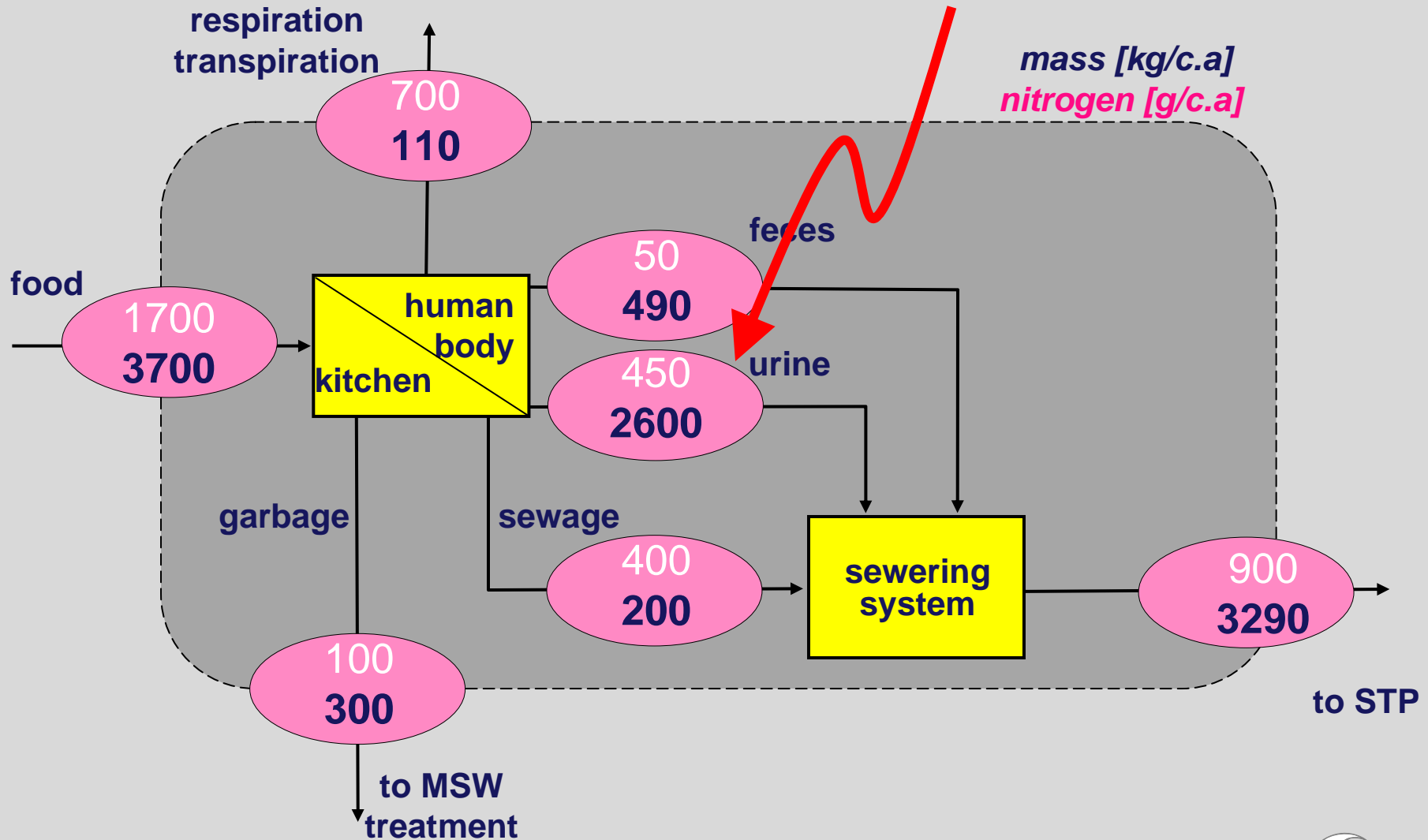
systems boundaries: national boundary/2000



Setting priorities for resource management by MFA



MFA reveals: urine >> feces > rest



Opportunities for industries

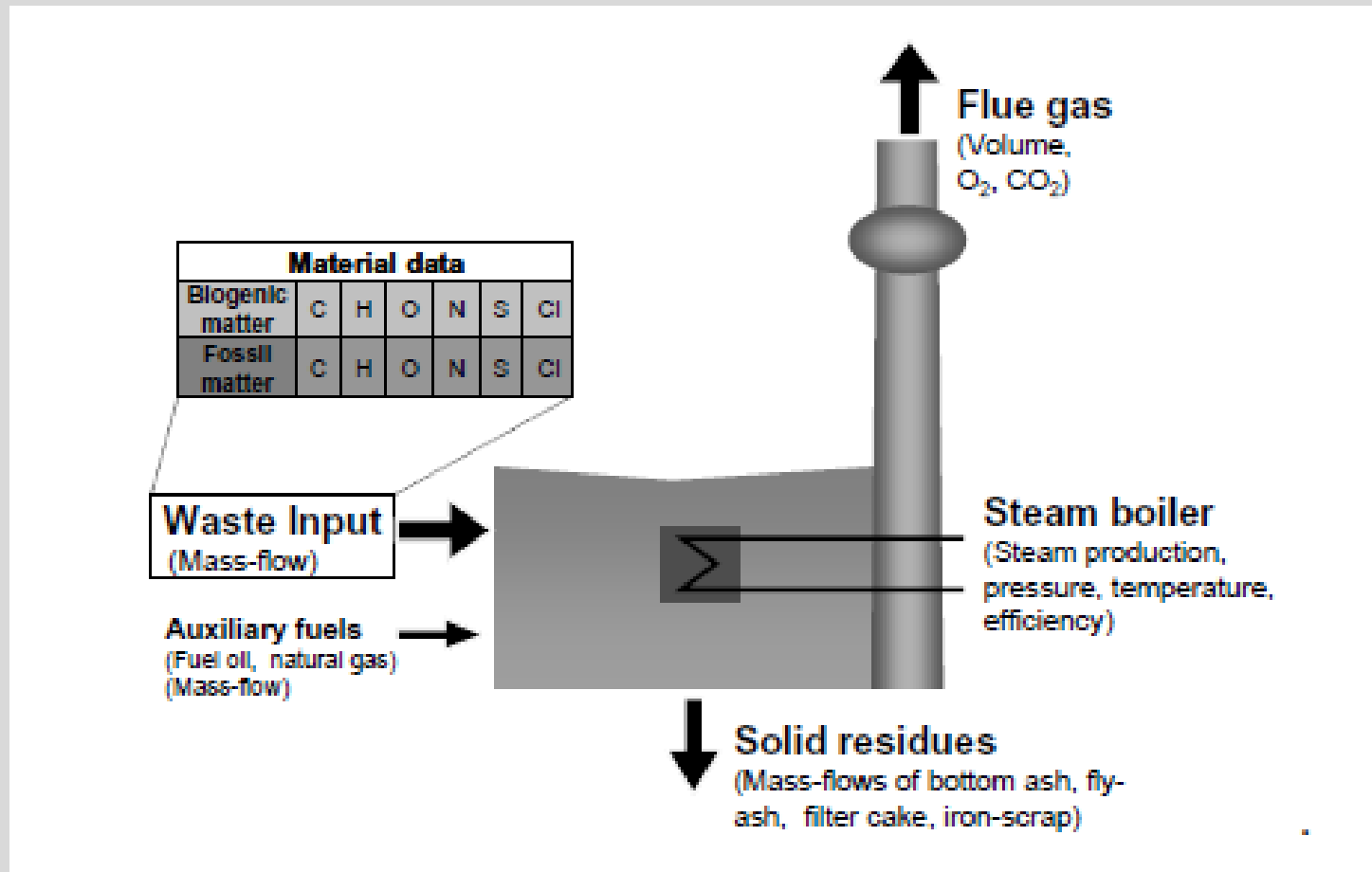
1. **New technologies based on MFA : No-mix toilets to recycle nutrients**



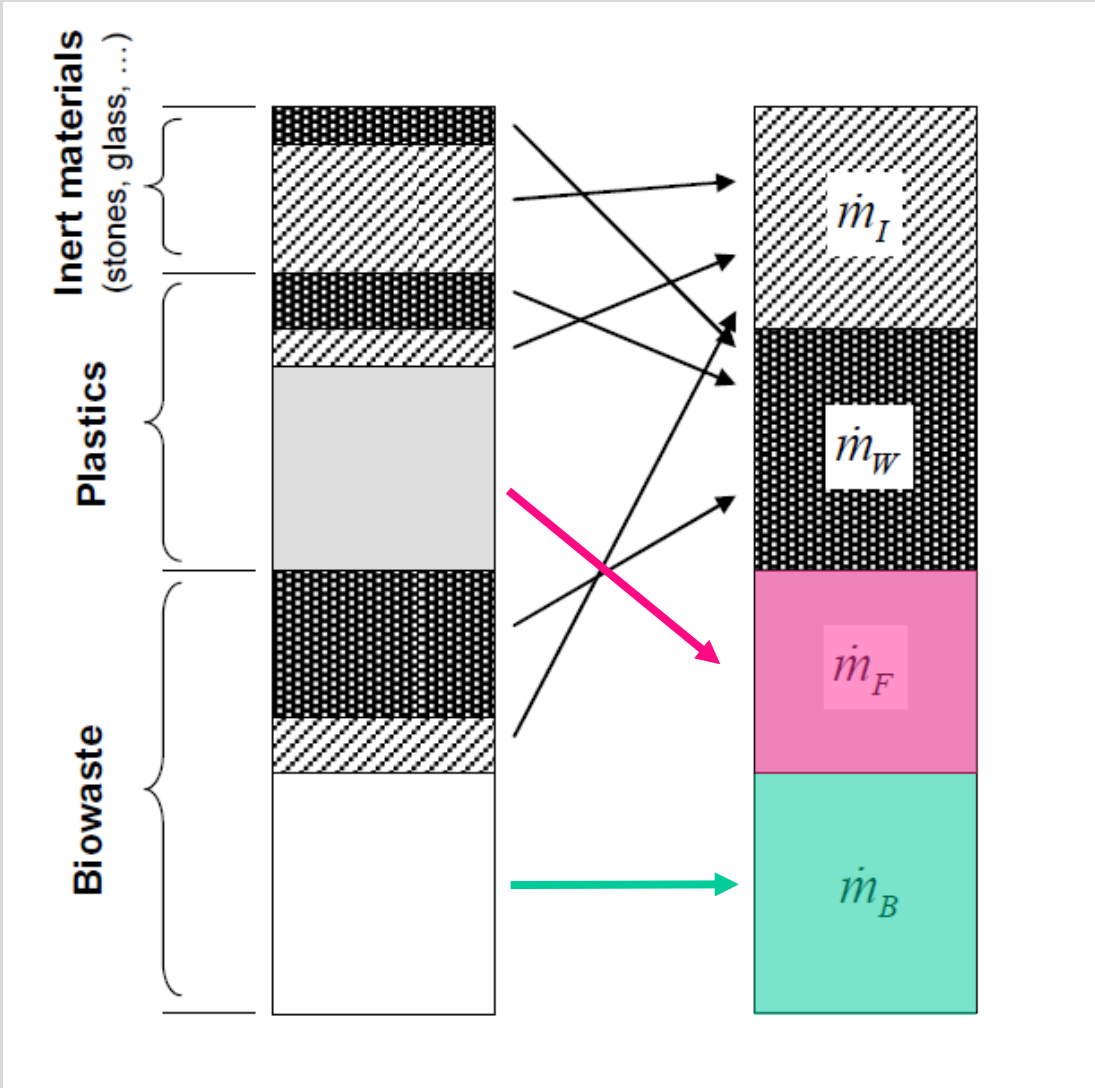
2. **Reconsider sewer as a nutrient collection system:
sewer -> wwtp -> sludge incineration -> ash extraction -> P-reuse**



MFA for greenhouse gas emission assessment



Sources of fossile carbon in waste



No additional measurements needed to determine fossil CO₂

Mass balance

$$m_B + m_F + m_I + m_W$$

$$= 1$$

"Ash"-balance

$$+ m_I$$

$$= a_{\text{waste}}$$

Carbon-balance

$$C_B \cdot m_B + C_F \cdot m_F$$

$$= C_{\text{waste}}$$

Energy-balance

$$HV_B \cdot m_B + HV_F \cdot m_F - 2,45 \cdot m_W$$

$$= HV_{\text{waste}}$$

O₂-consumption

$$O_{2,C,B} \cdot m_B + O_{2,C,F} \cdot m_F$$

$$= O_{2,C}^{\text{waste}}$$

Difference of

O₂-cons. + CO₂-prod.

$$\Delta OC_B \cdot m_B + \Delta OC_F \cdot m_F$$

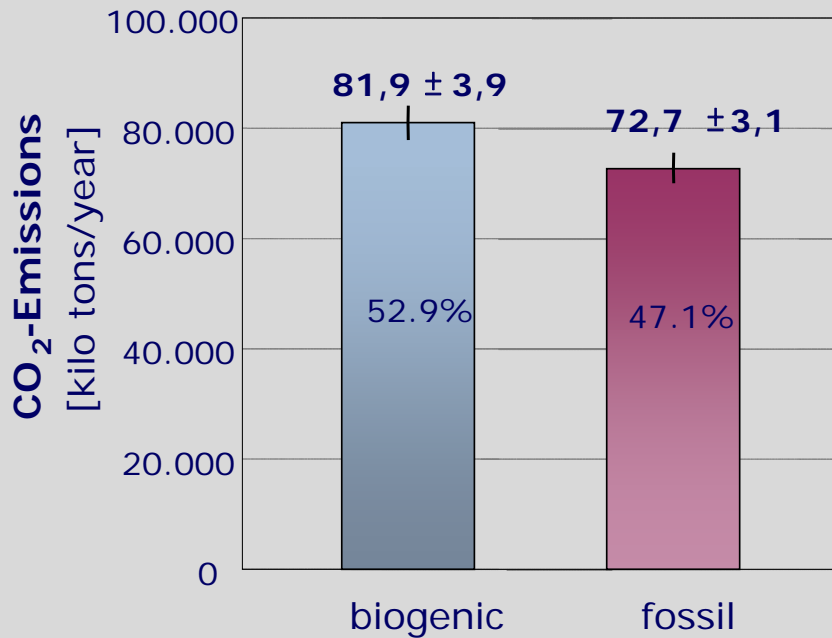
$$= \Delta oc_{\text{waste}}$$

Derived from operating data

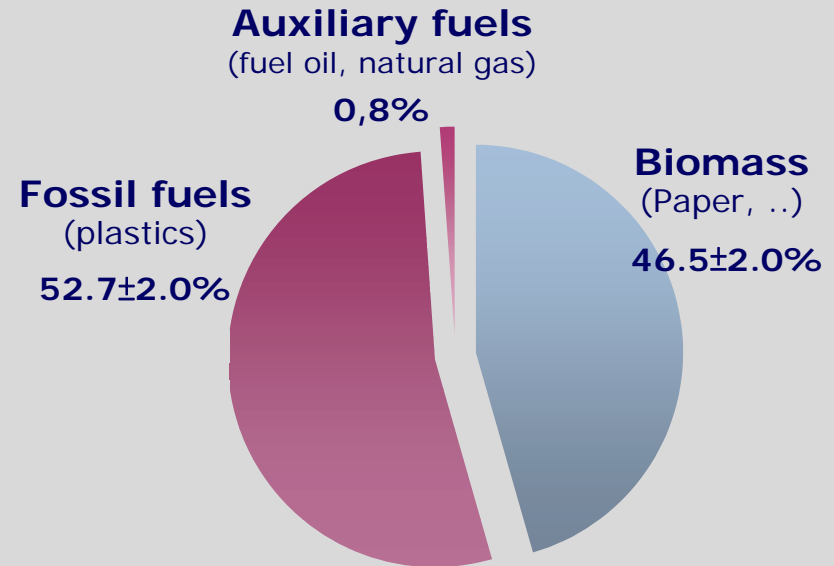


Results: 1 ton of CO₂ ~ 15 - 20.- €

CO₂ - Emissions



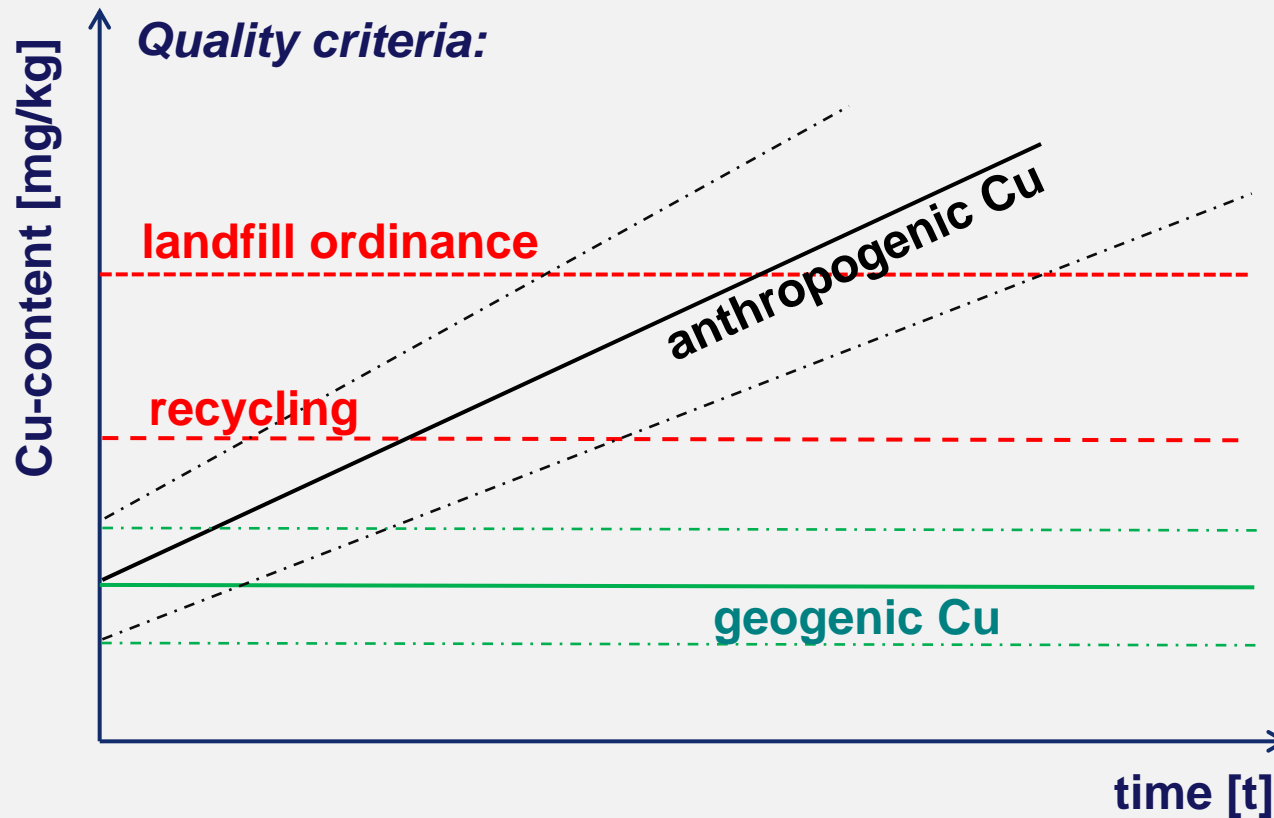
Energy sources



MFA to cut costs from railway maintenance



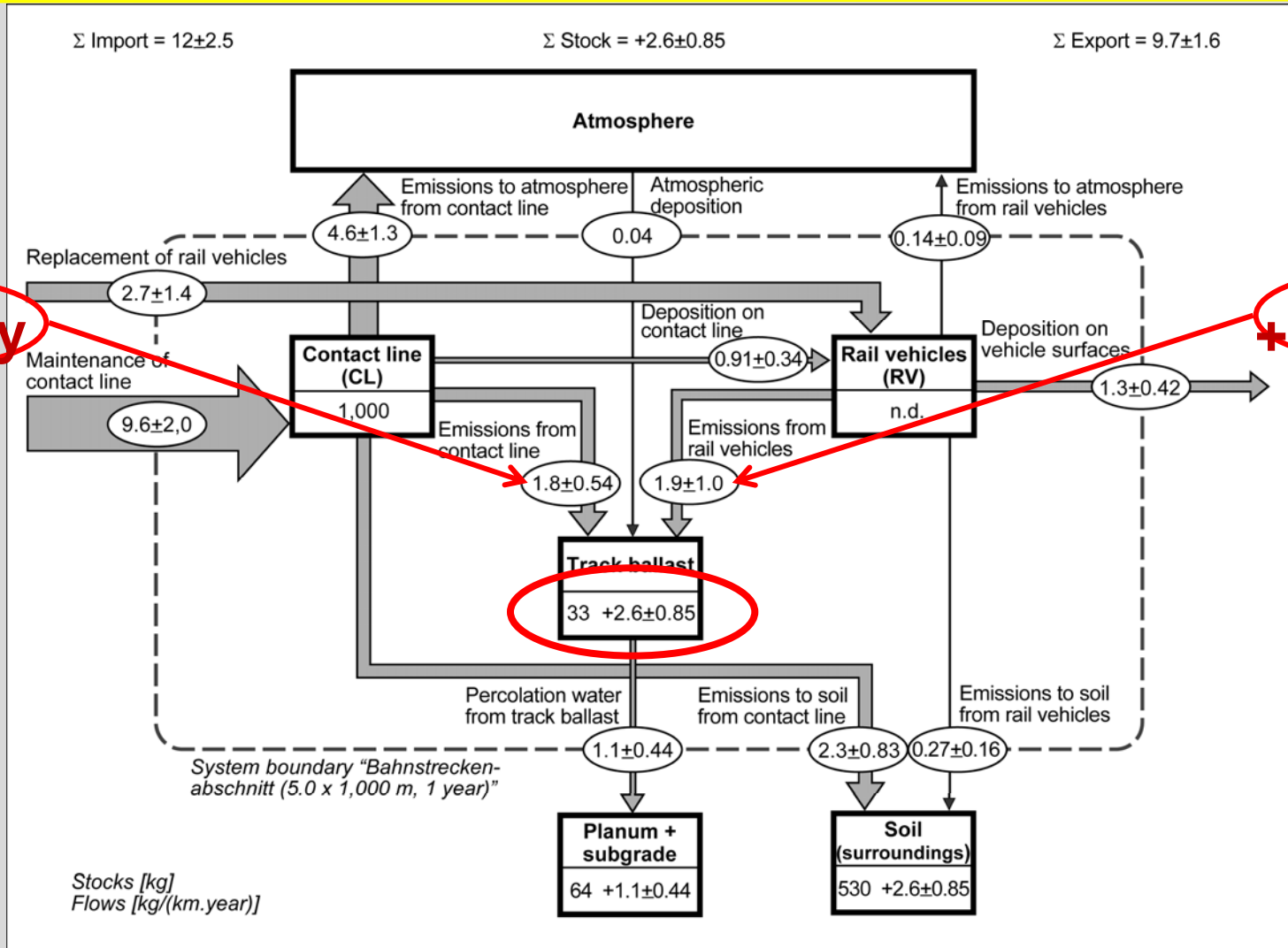
The problem: too much Copper in gravel from railroad



The method: MFA of Cu in track ballast



Result: brake system and contact line as main anthropogenic sources

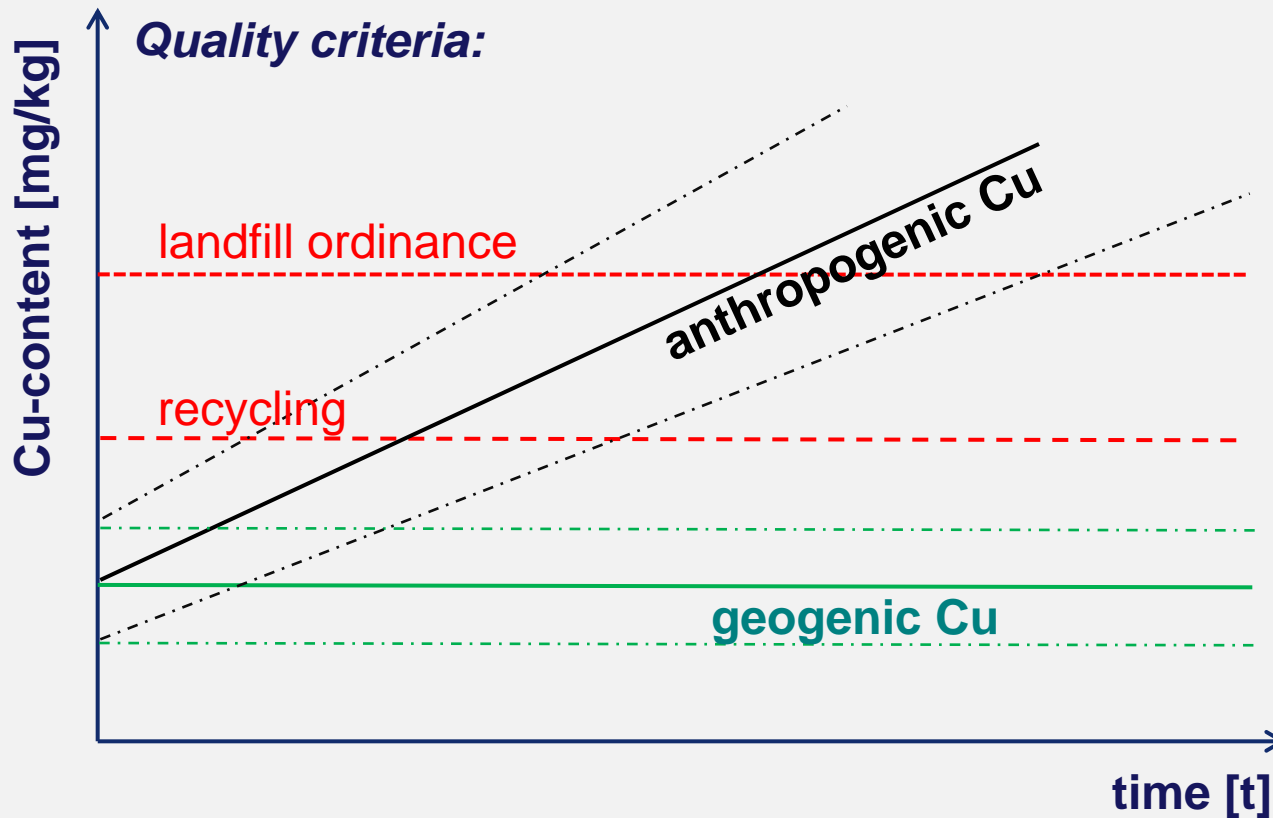


+1.8 kg/y

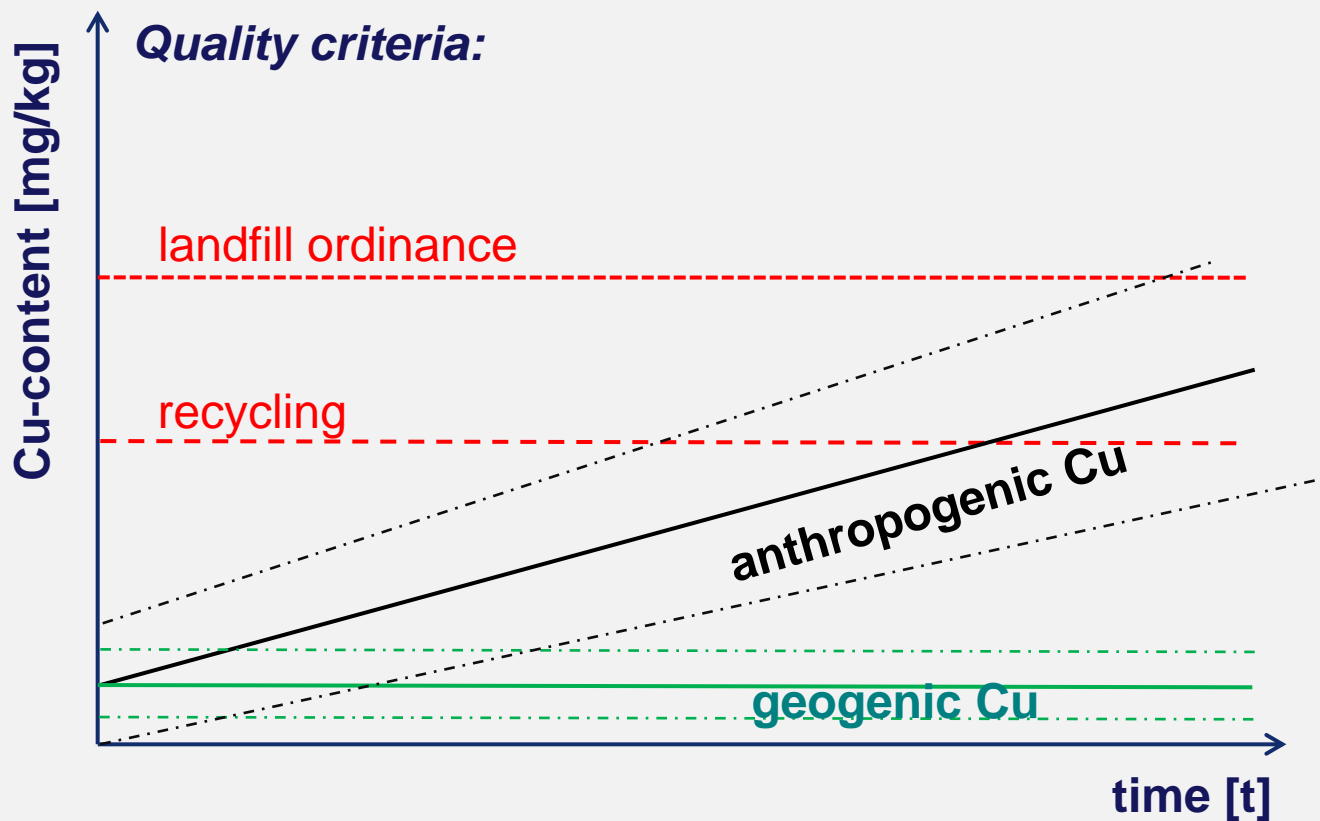
+1.9 kg/y



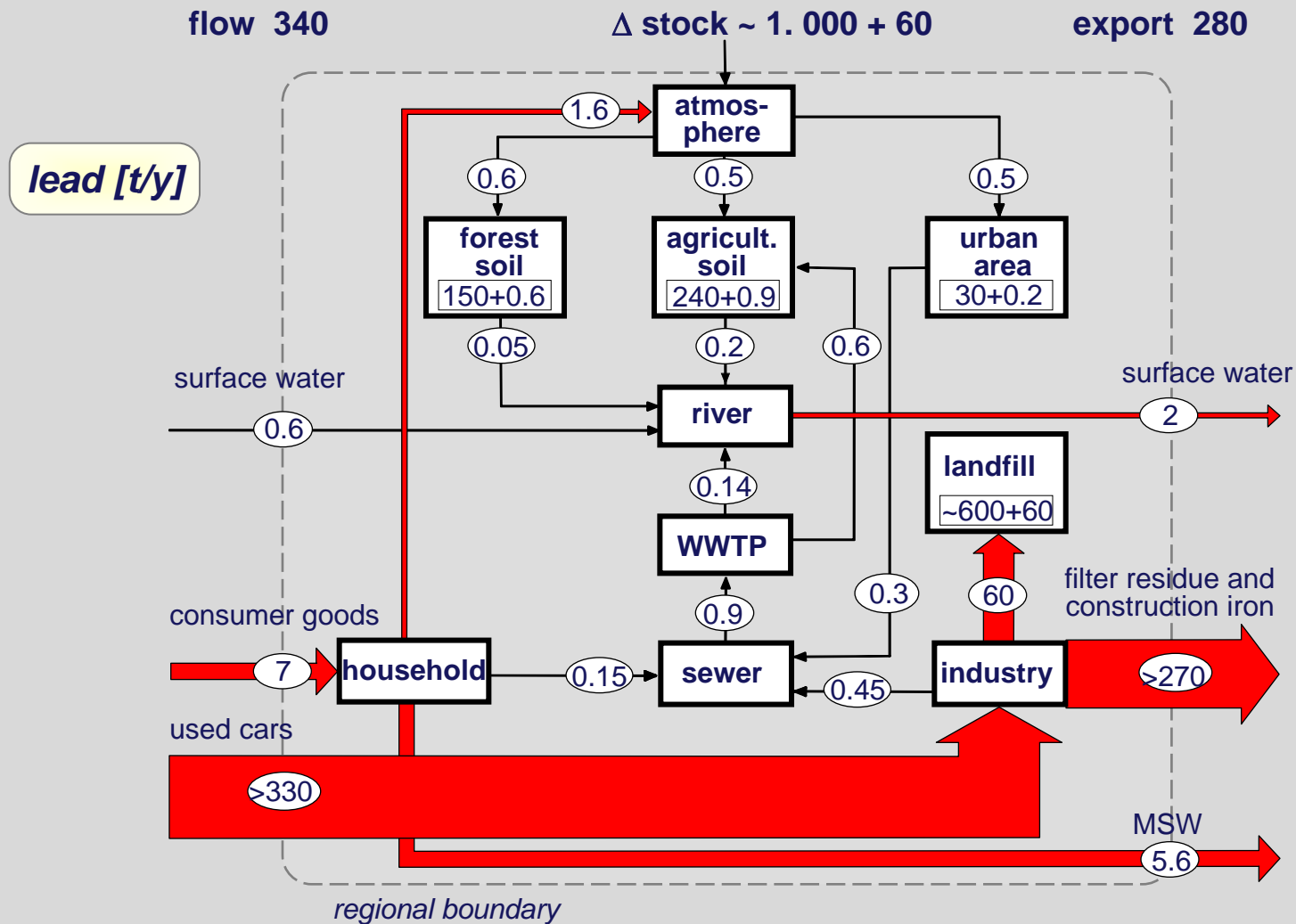
Solution: new material for brake pads, contact line (?), and low Cu gravel



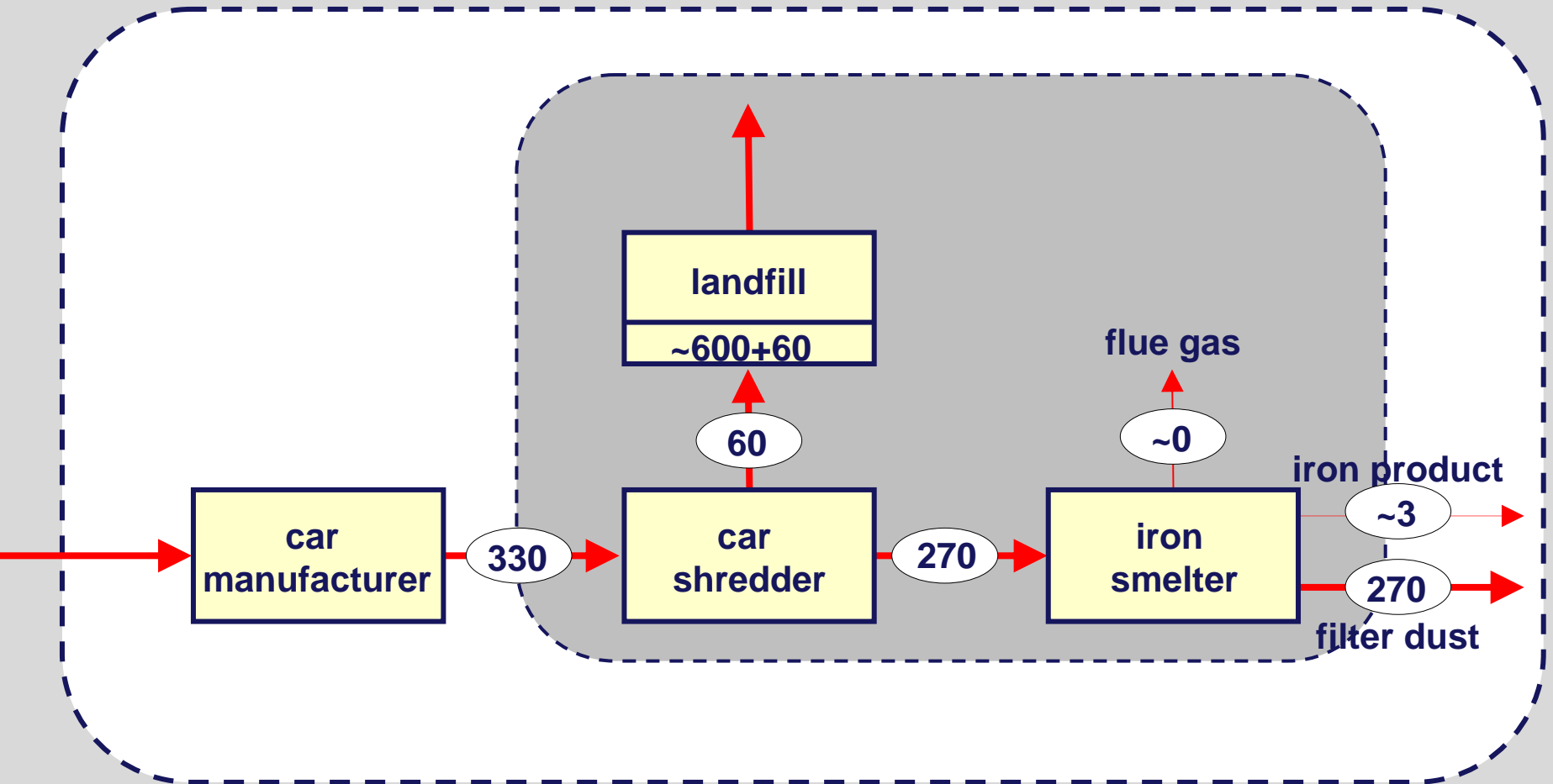
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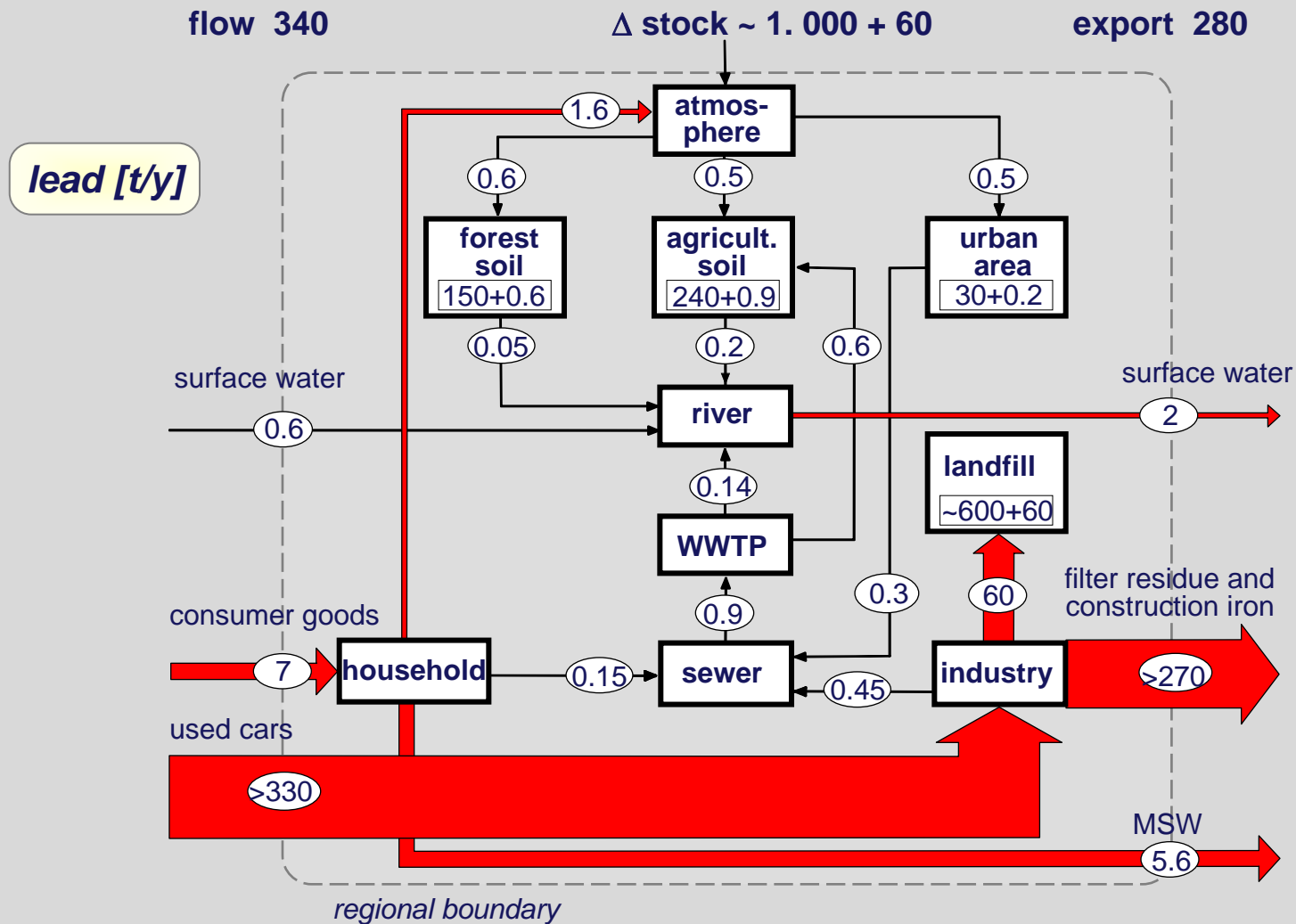
Case study: MFA of regional lead flows and stocks



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MFA for env. protection and resource management



Thank you

