Status and Perspective of

Application of Material Flow Analysis (MFA)

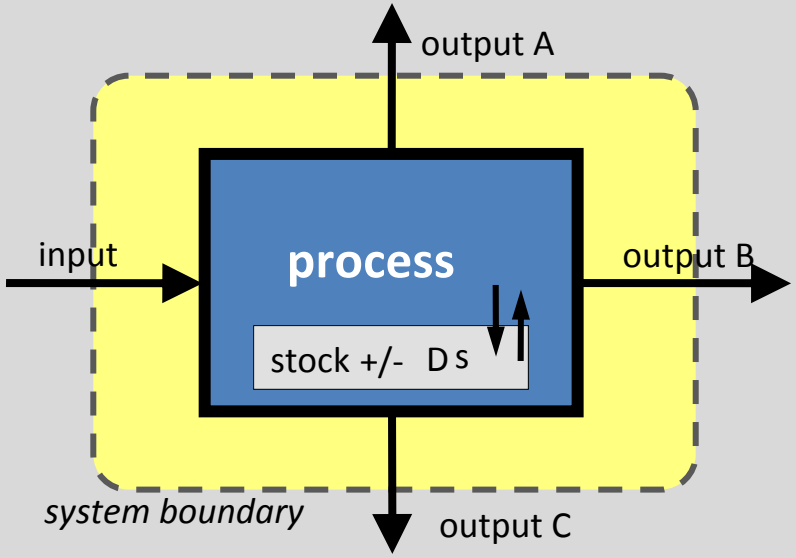
Paul H. Brunner
Vienna University of Technology
Institute for Water Quality, Resource and Waste Management
www.iwa.tuwien.ac.at

Cities: high turn-over of materials and energy

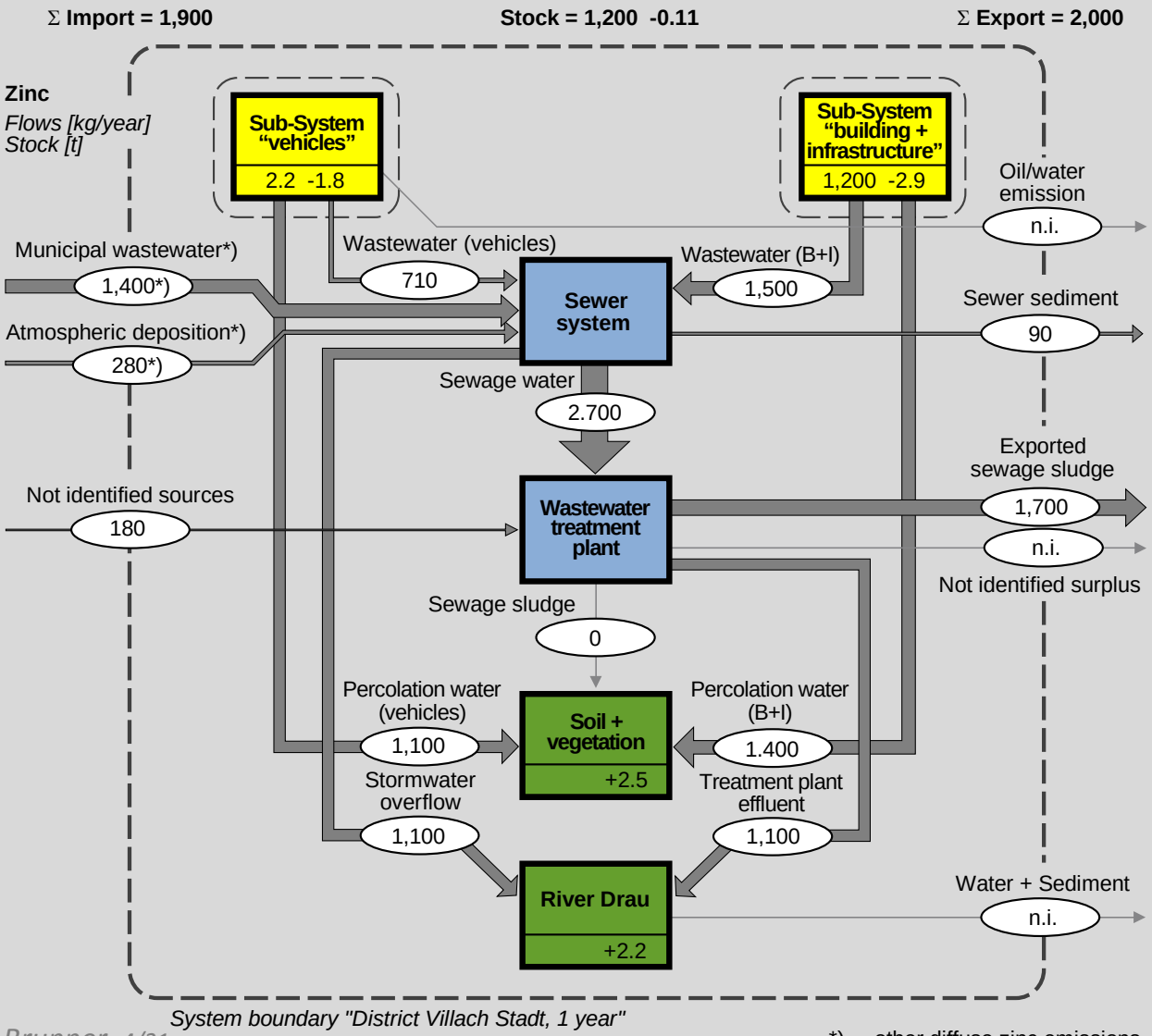
Goals for sustainable urban metabolism

- Provide affordable service to the citizens
- Conserve resources
- Protect the environment
- consider the need of future generations

-> Material Flow Analysis (MFA) supports decision regarding these goals

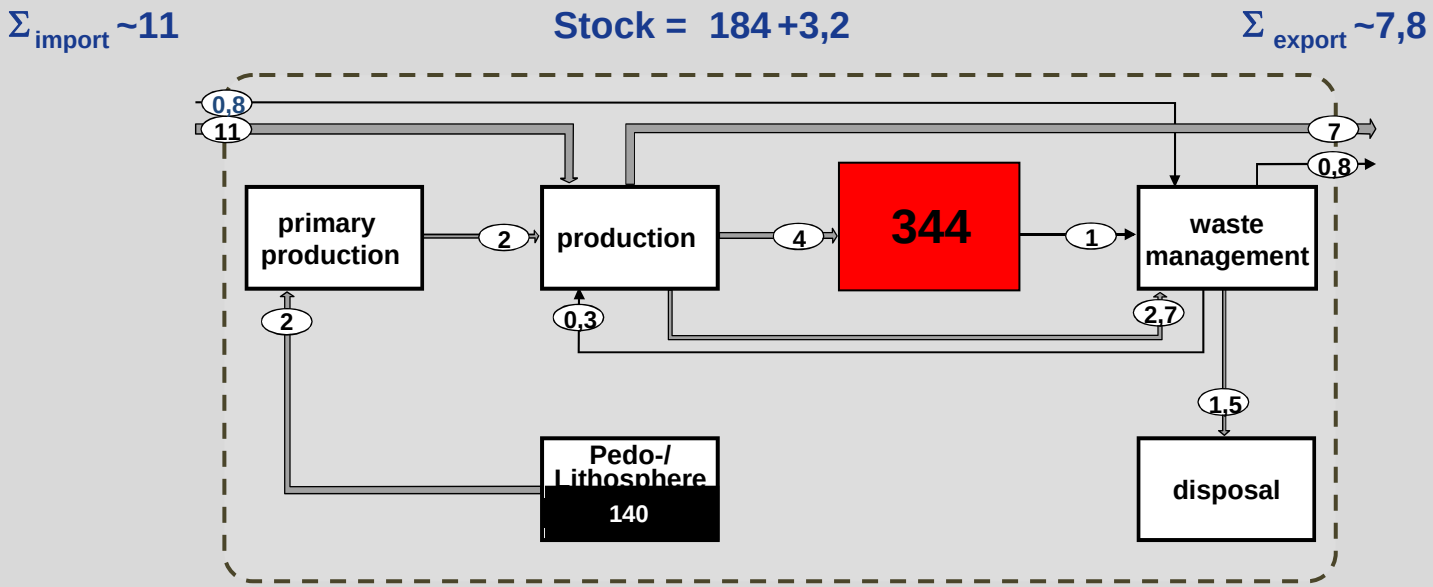


MFA allows modeling of complex systems

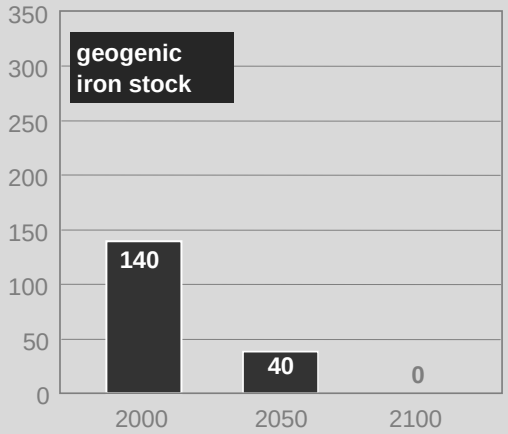


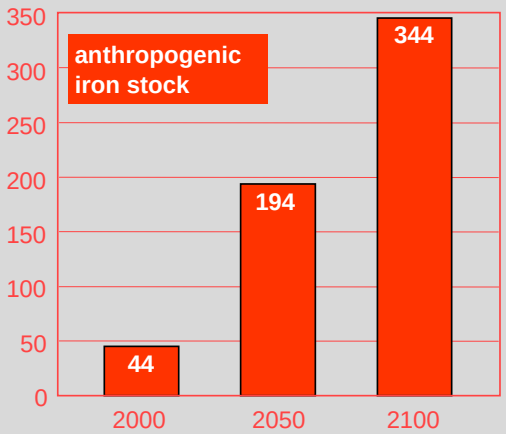
Cities as material stocks, accumulating resources

From natural resources to man made resources

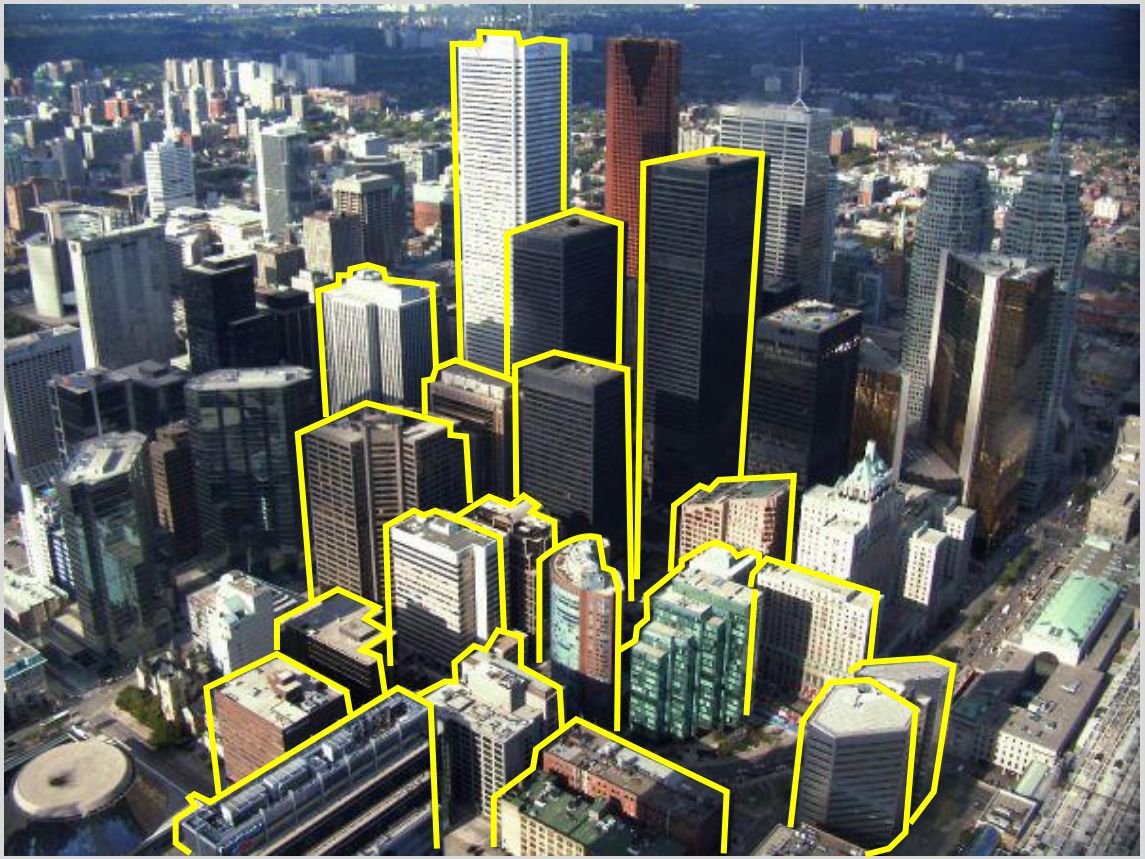


[Mio. t]

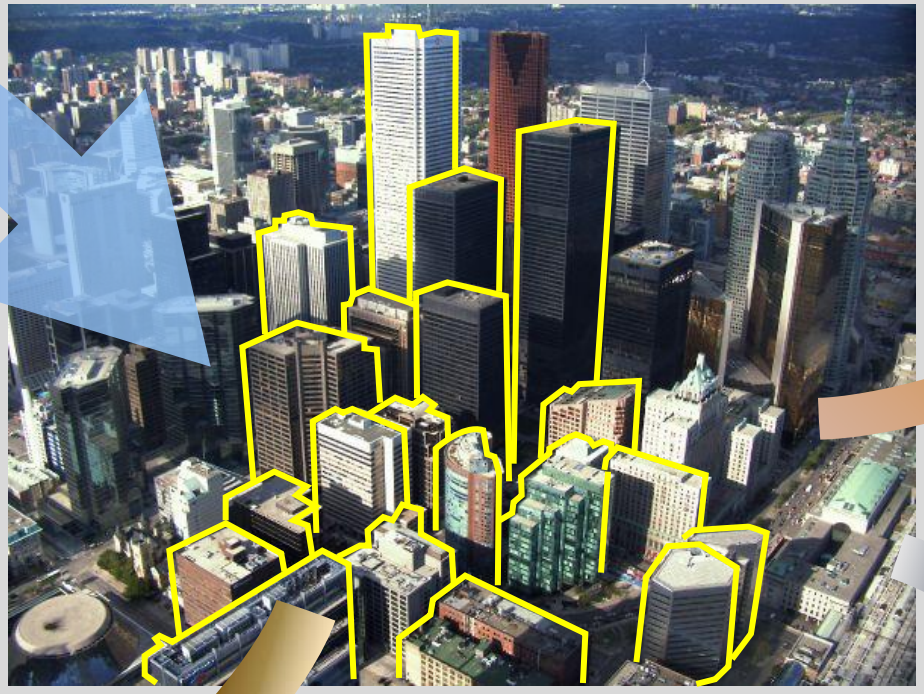




The city surface: protecting the urban stock



Flows from surfaces - what is the best sink?



precipitation & weathering

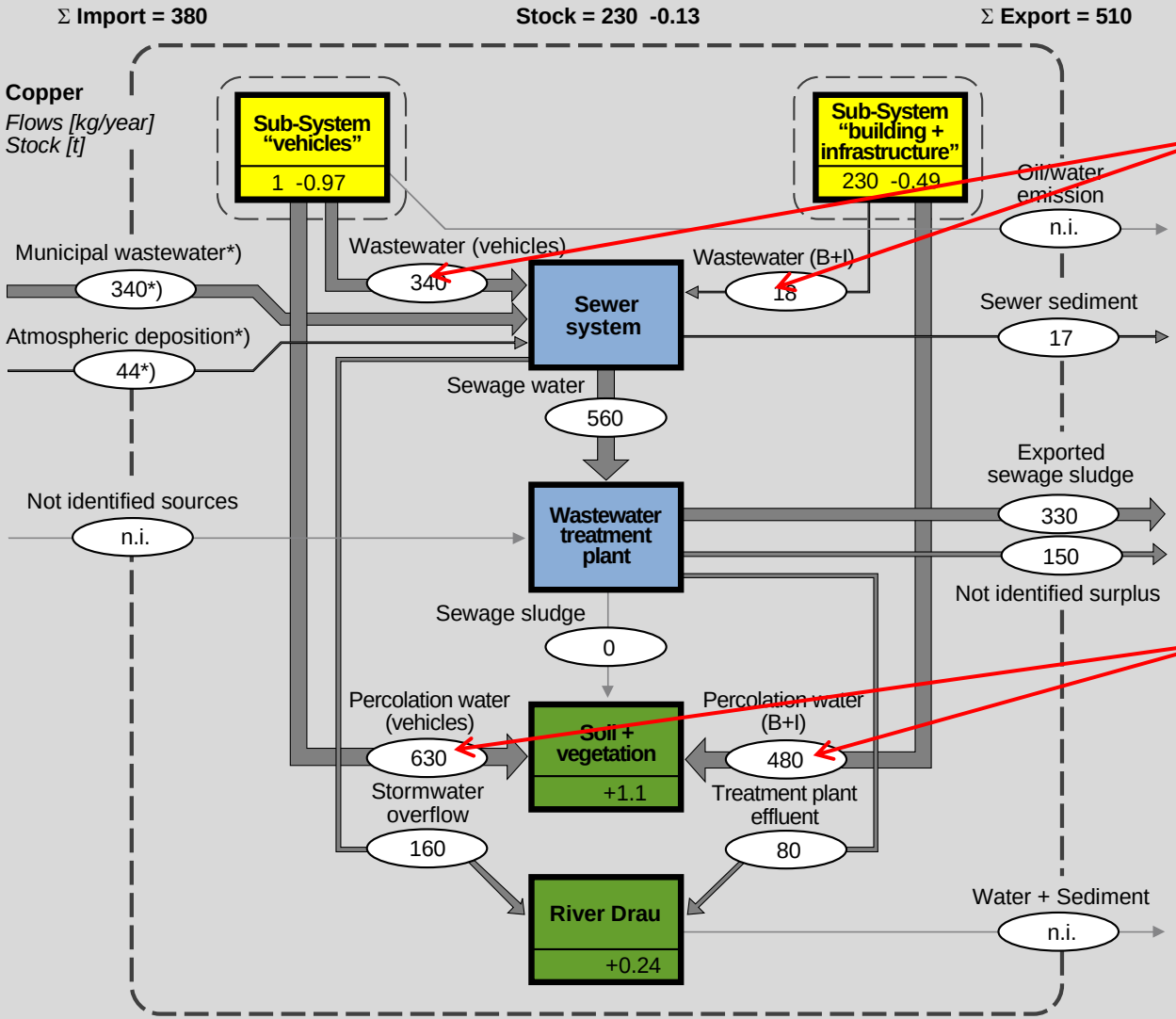
sewage sludge & landfill

urban soil & subsoil

surface & groundwater

What is an „urban surface“?

Copper emissions from urban surfaces

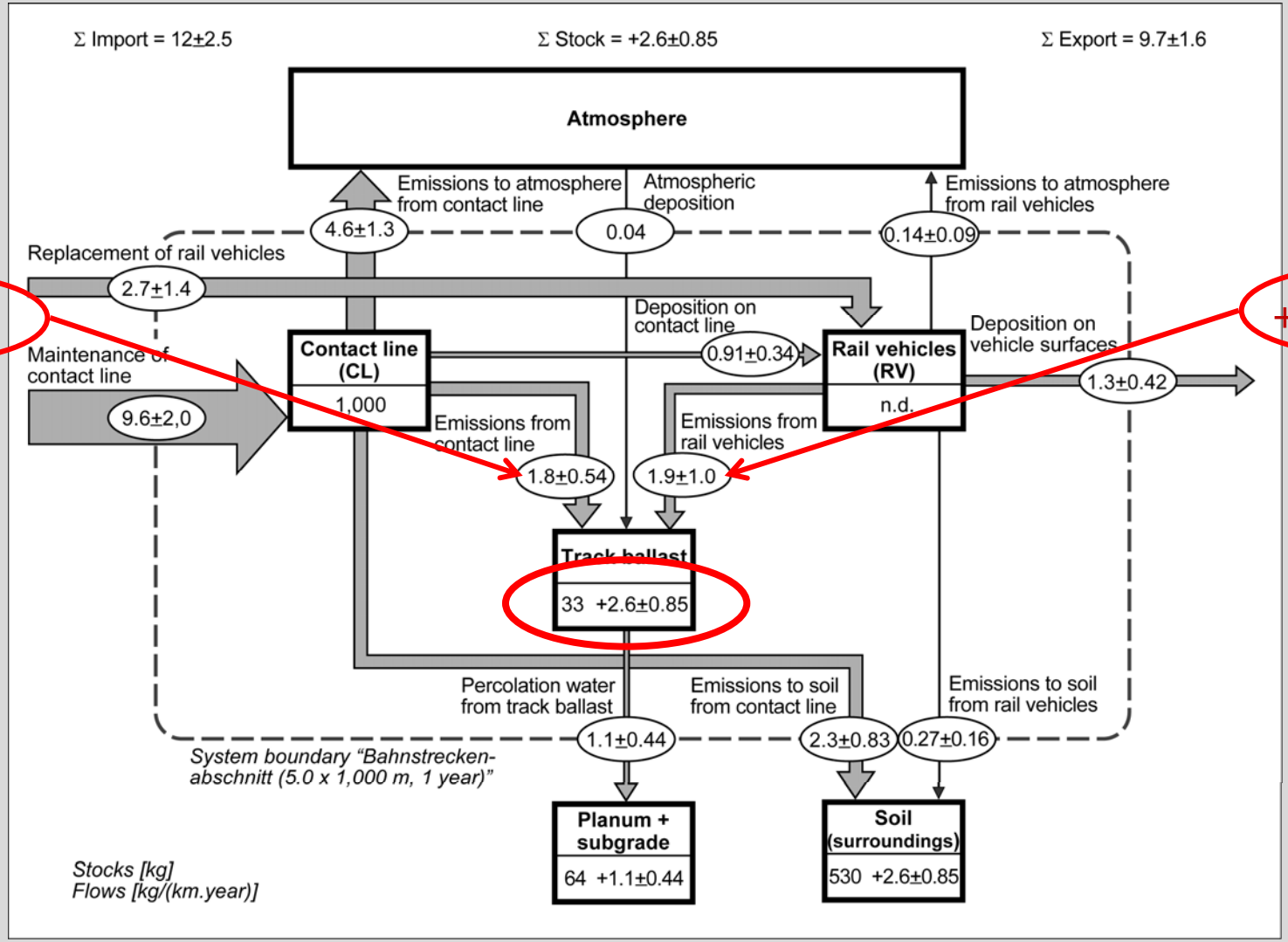


System boundary "District Villach Stadt, 1 year"

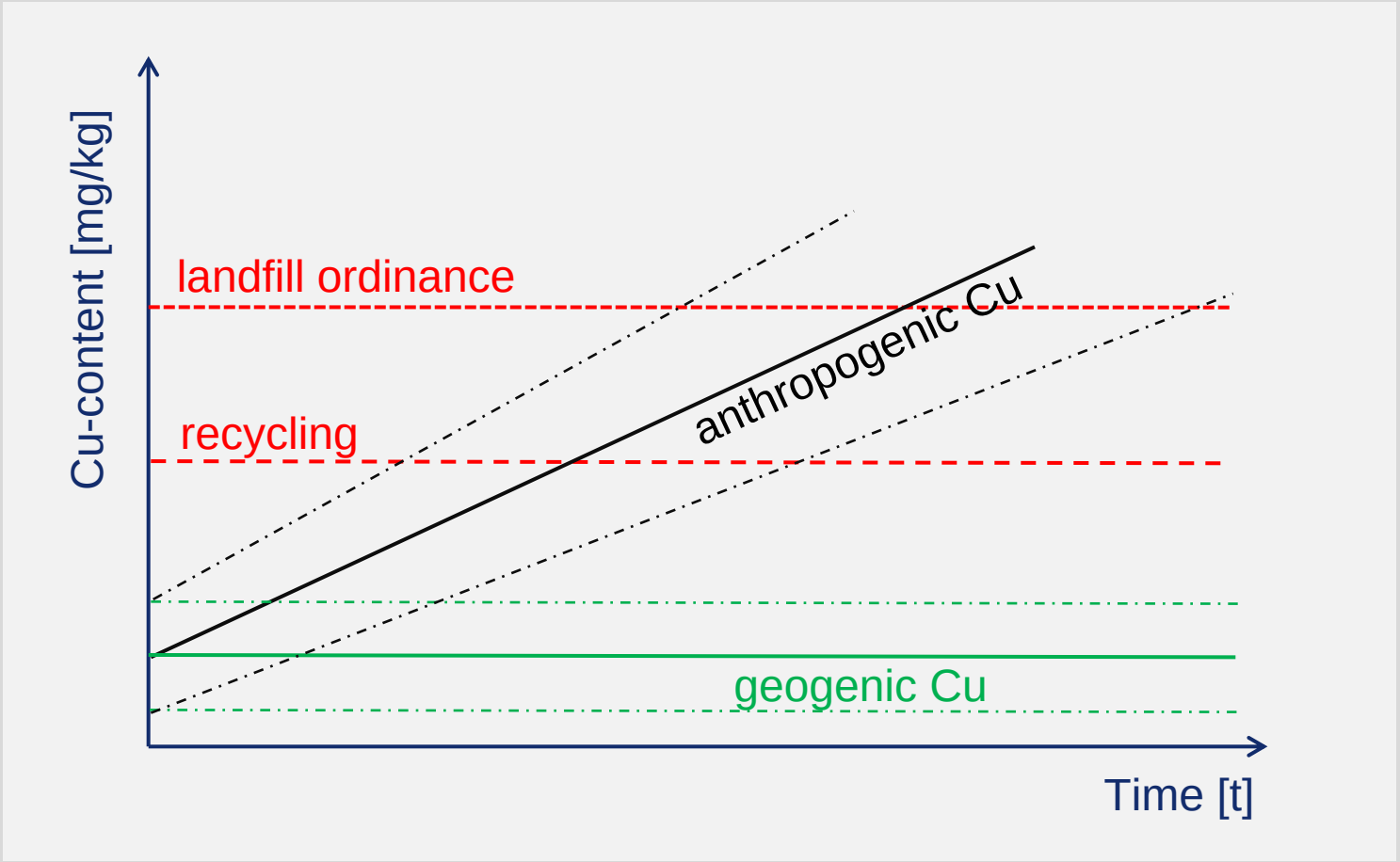
*) ... other diffuse copper emissions

Railroad gravel contains too much copper – why?

MFA of Copper use for railroad transportation



Copper in gravel from railroad



Cities as flow-through reactors

147
water

36
air

12-18
invest & consumer goods

2
fuel

144
waste water

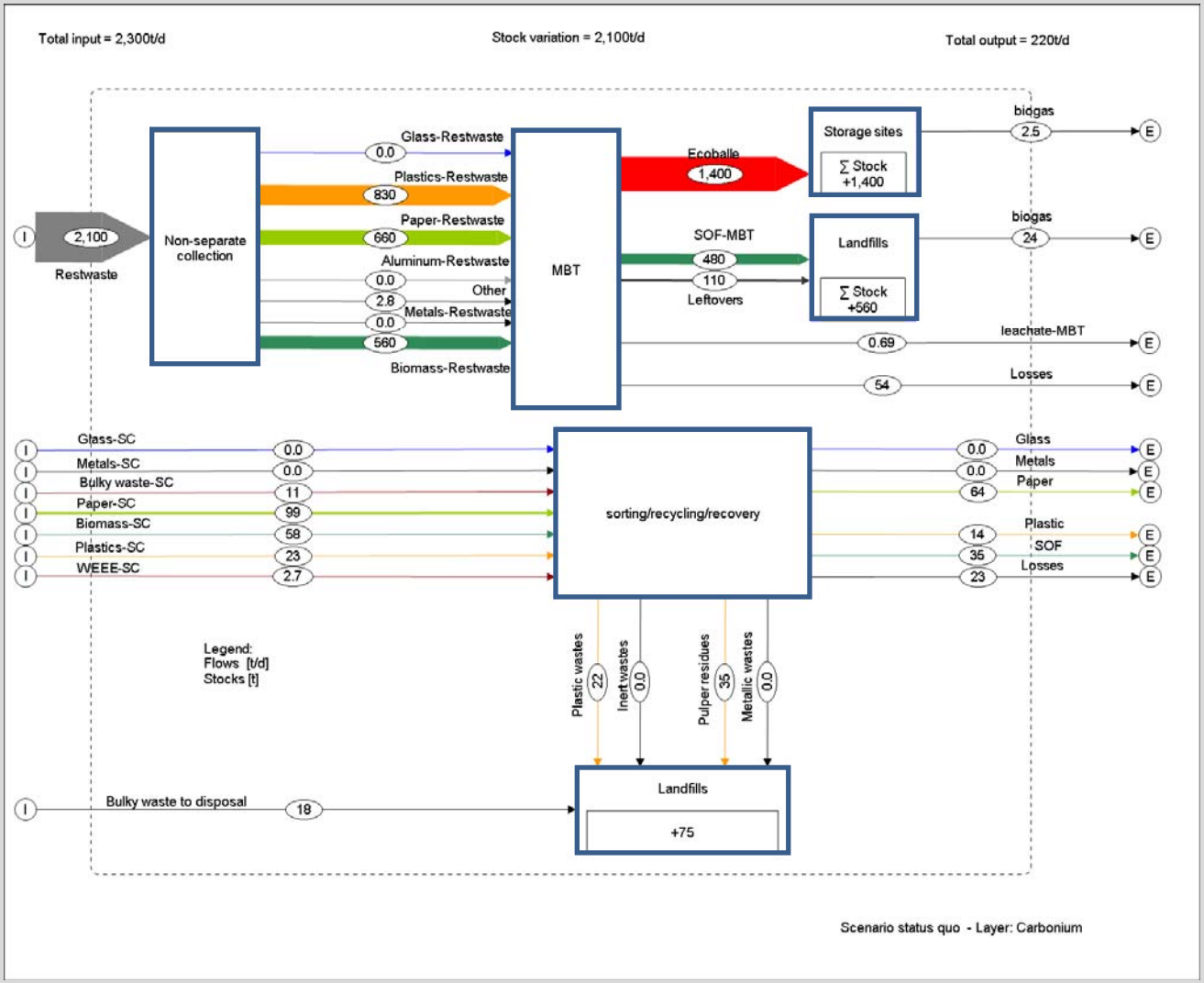
43
off-gas

3
export products

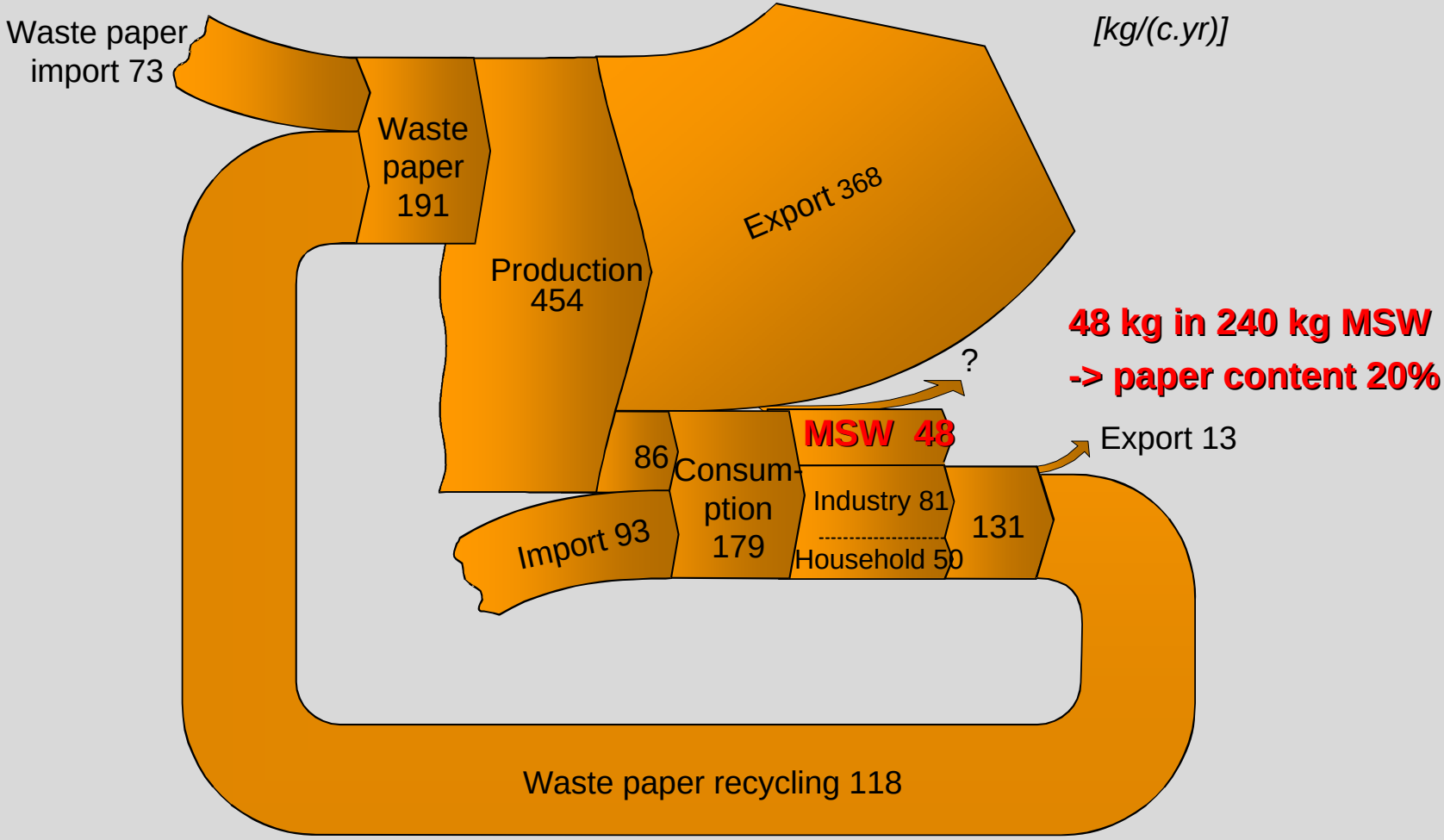
3
wastes

increase in stock
+ 4 to10 t/year

Modelling of waste management by MFA

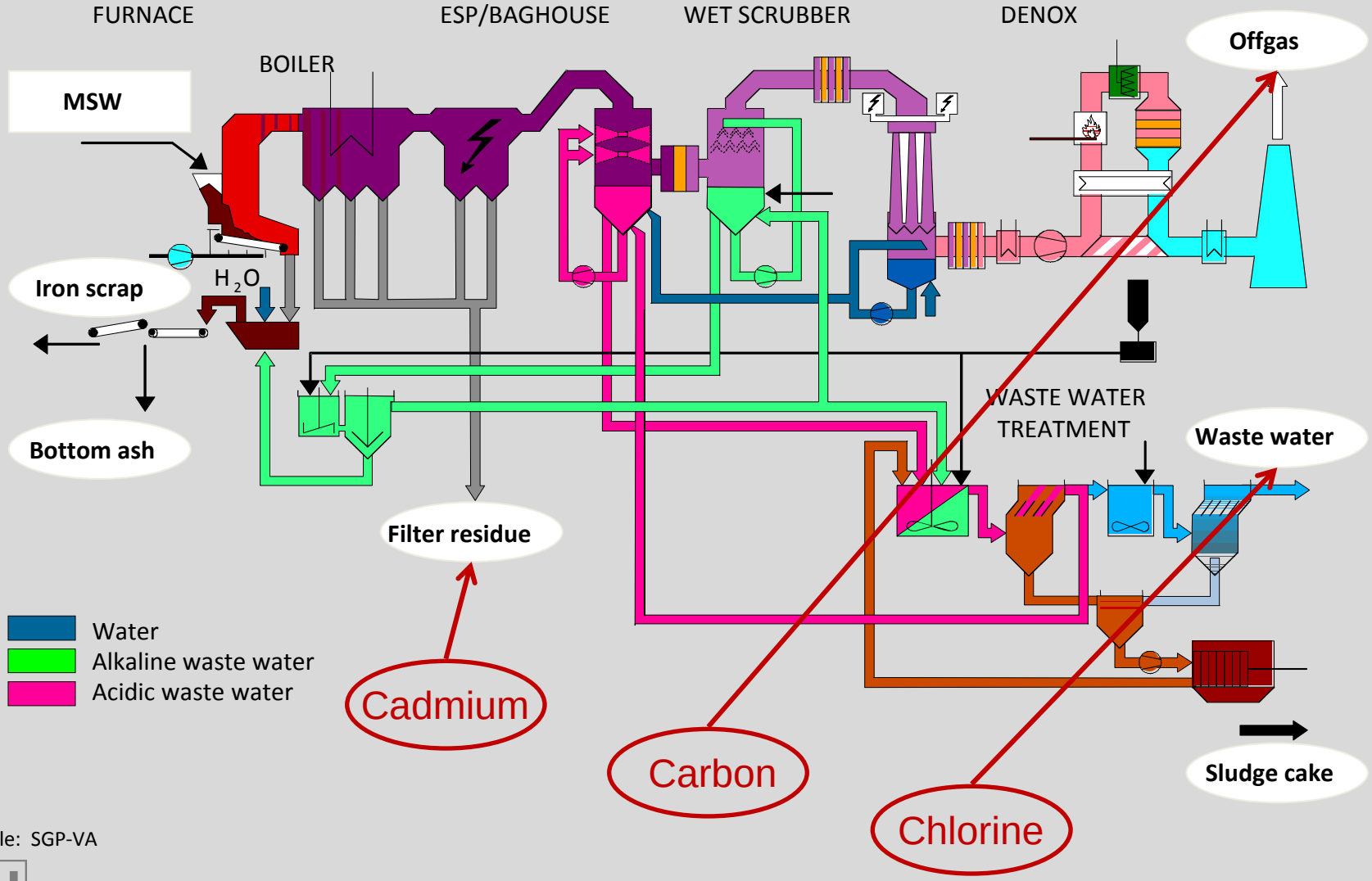


MFA of paper to assess waste composition



Data: Austrian Paper Industry, 1996

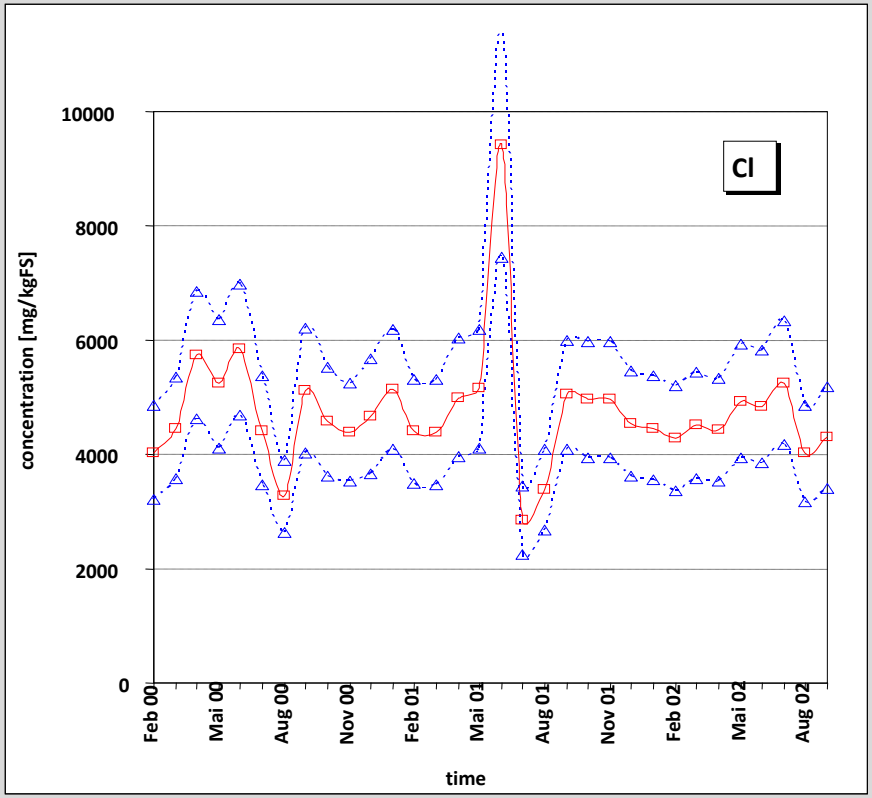
MFA of waste incineration to analyse waste composition

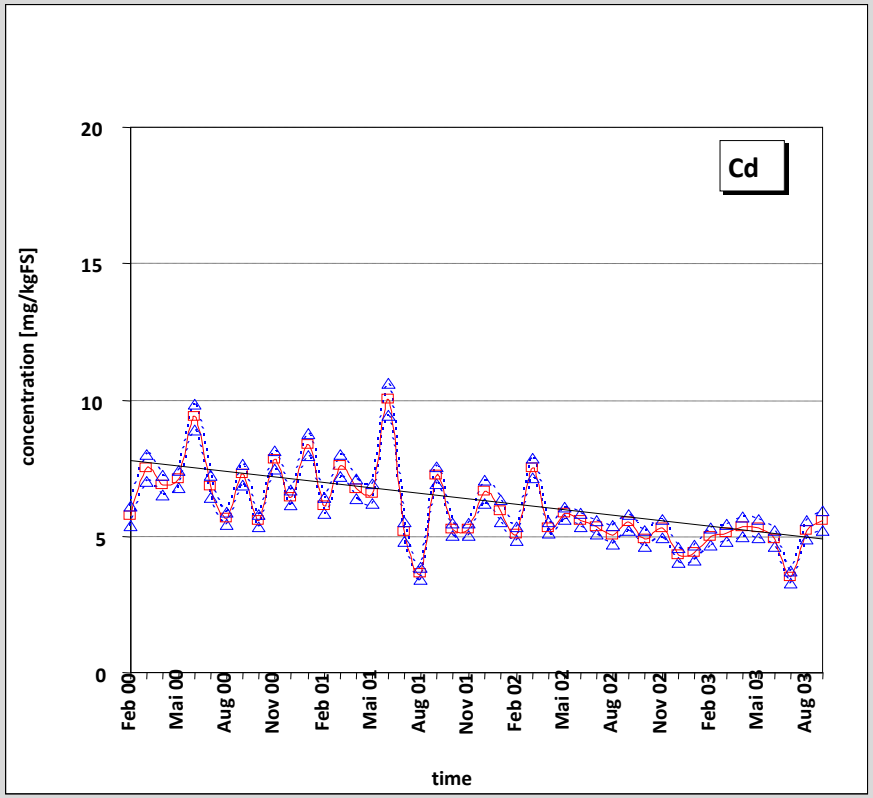


Quelle: SGP-VA

MFA of waste incineration to analyse waste composition

Monthly mean values of Cl and Cd in MSW determined over 2 ½ years in MSW incinerators





Source: Morf et al. 2003/2004

Systematic application of MFA for waste management

Goals:

- improving waste management practice
- better knowledge base for waste management:

1. Austrian Standard ONORM S 2096 “MFA- Application in waste management”
2. Software STAN (freeware) for easy MFA
3. Routine waste analysis by MFA on selected incinerators
4. MFA as a mandatory requirement for certification of MSW companies

---

5. Link all relevant information
   -> new knowledge base e.g. for waste management plan

Conclusions

Vision and objective: long-term resource availability
long-term environmental protection

MFA is instrumental for this vision because it

1. is a rigid, transparent, and objectiv method to model and visualize material flows including uncertainty
2. facilitates understanding and public acceptance of decisions
3. is a key decision support tool for resource management, environmental management, and waste management
4. is indispensable to establish knowledge bases for resources and waste management
5. needs to be standardized in order to fully exploit its potential

Thank you

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