

LCA Leads to Reassessment of Contaminated Sediment Disposal

Event

SETAC Conference 2016, Nantes

Authors

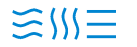
Emil Franov (presenting author) and Thomas Kägi
Carbotech AG, Basel
e.franov@carbotech.ch

Overview



1. The problem
2. Why an LCA was ordered
3. Used methodology
4. The effect of our LCA
5. Conclusions

The Klingnau Reservoir in Switzerland



Klingnau Reservoir

Brief Overview



- Built in 1935 for hydro power generation
- 3 km long and 500 m wide
- Still produces hydro power
- Gradually converted into Natural Conservation Area
 - Important wintering ground for migratory birds
 - Important breeding place for local bird species
 - High overall biodiversity in flora and fauna
- But... there are two main problems.

1. Problem: Silting of the Klingnau Reservoir



Solution of Problem 1: Planned Reactivation of a Side Channel



- 25 m wide, 2 m deep
- 35'000 m³ of sediment to be disposed off
- Environmental Impact Assessment (environmental legal compliance check) was carried out.

EIA: Check for Contaminants



2. Problem: Contaminants in the Sediment



- Polychlorinated biphenyls (PCB's)
 - Heavy metals (cadmium, mercury, lead, etc.)
 - And others
-
- Compared with maximum contaminant levels
 - Lead to conclusion that 90 % resuspension and 10 % landfilling was environmentally preferable as sediment disposal.

Call for Tender by Authorities



- Dredging and disposal of sediment was tendered.
- Main variant (“Resuspension”): 90 % of sediment for resuspension, 10 % of sediment with highest contamination to landfill
- Bidders were also asked to propose own variant, if environmentally beneficial
- A bidder asked us to calculate an LCA of his variant with all contaminated sediments to landfill (“Landfill” variant) and compare it with the main variant

System Boundaries and Functional Unit



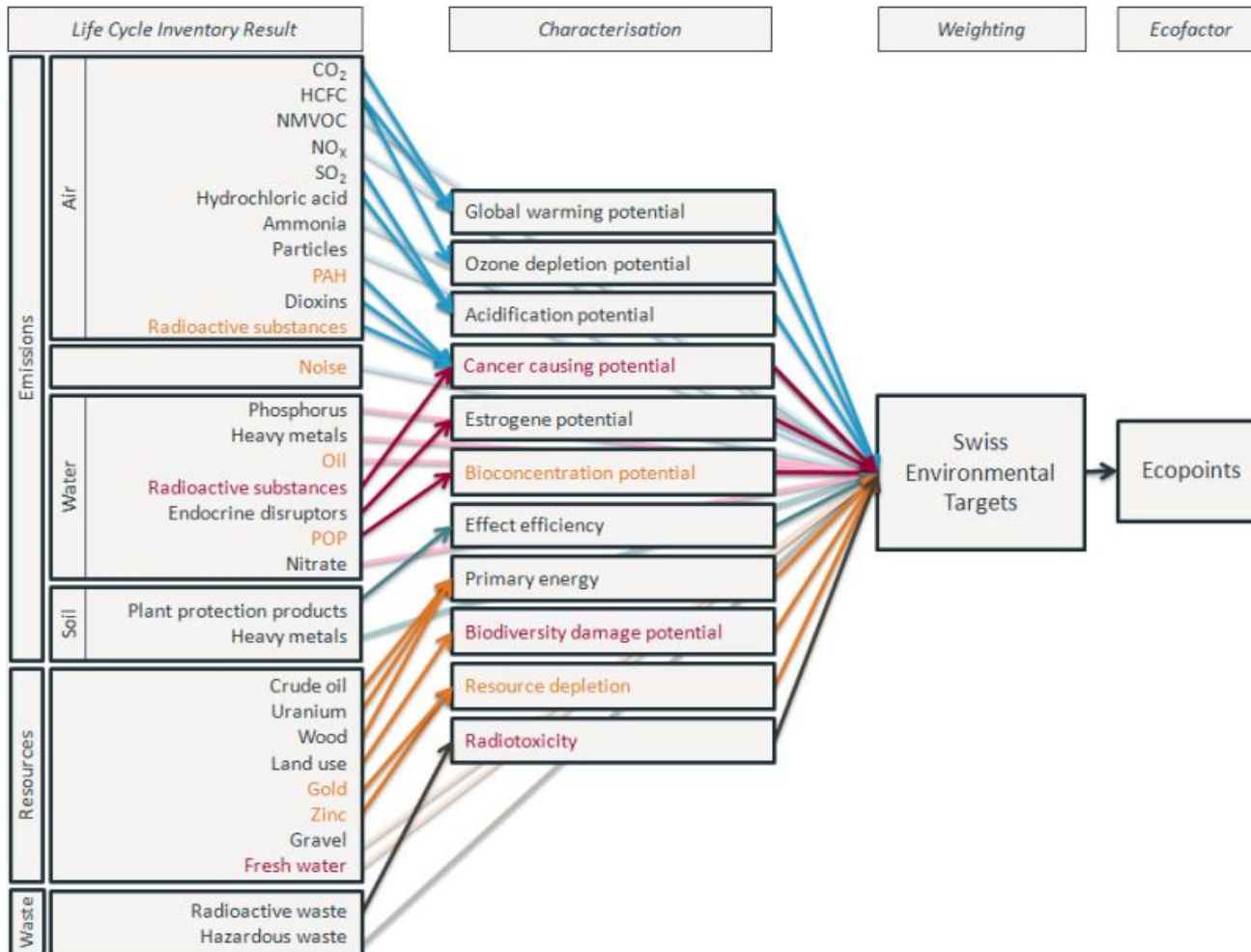
- Main focus on differences between both variants
 - Direct emissions into water
 - Transport of sediment
 - Impacts connected to land filling
- Dredging itself was not modelled
- Functional Unit: Disposal of 1 ton of sediment



Available Data

- Concentration measurements of most important contaminants:
 - Seven congeners of PCB (PCB7)
 - Seven heavy metals
 - Polycyclic Aromatic Hydrocarbons (PAH)
- For 21 channel sectors
- Transport distances for land filling
- Background data: ecoinvent

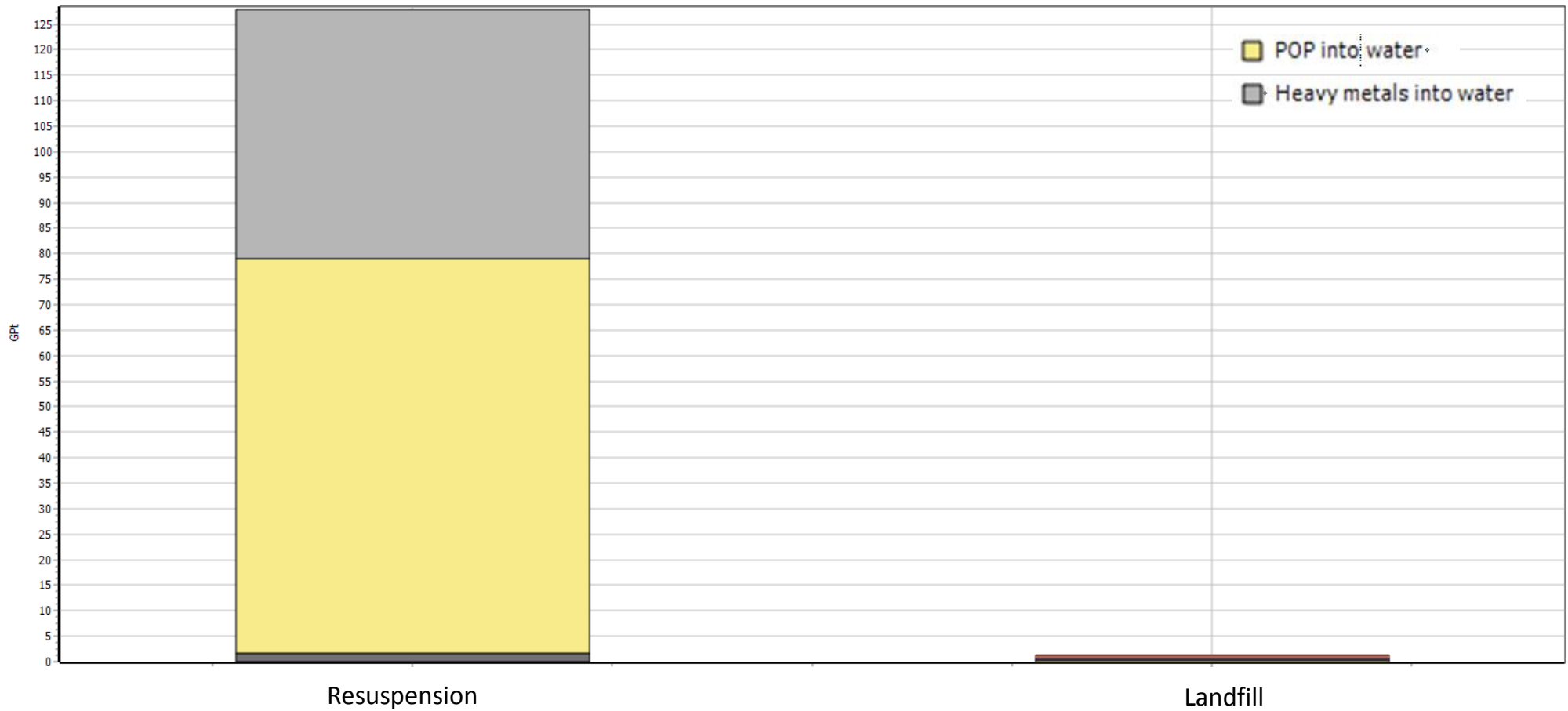
LCA Weighting Method Used



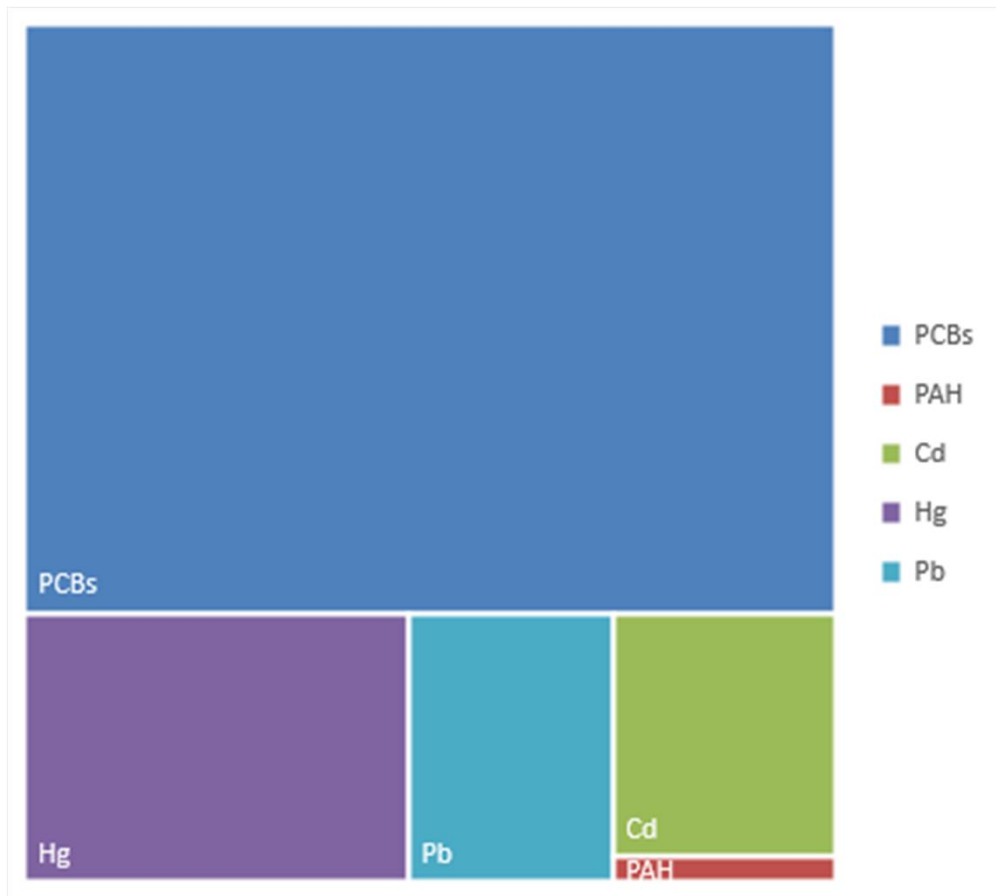
- Swiss ecological scarcity method
- distance to target
- based on Swiss environmental legislation
- single score (ecopoints)

LCA Sediment Resuspension vs. Landfill

Single Score Results (Ecopoints)



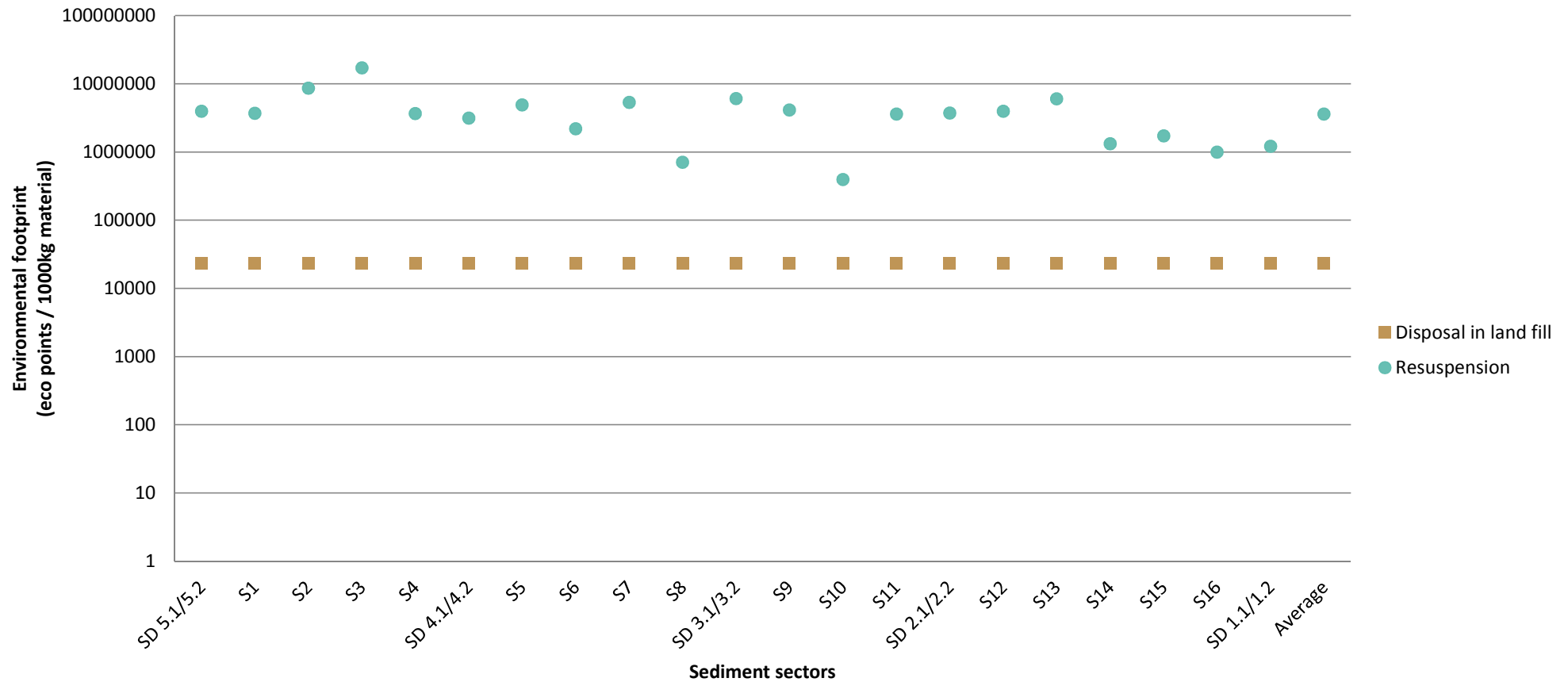
Sediment Resuspension: Contribution of Pollutants to Environmental Footprint



- 69 % PCB7
- 15 % mercury
- About 8 % each for lead and cadmium

LCA Sediment Resuspension vs. Landfill

Detailed Results for Each Sector



Mass flow check for PCB



- Total annual mass flow of PCB7 in Swiss rivers: 5 to 10 kg
- Amount of PCB7 to be resuspended in the river Rhein as in the original variant: around 4 kg

The annual mass flow of PCB in rivers was about to be raised by 40 % to 80 %!



Effect of the Results

(after presentation to authorities)

- Tender was stopped
- Stakeholders still trying to figure out best proportion of landfill to resuspension:

KLINGNAUER STAUSEE

Der Kanton steht vor einem Umwelt-Dilemma am Klingnaue
von Hans Lüthi — az Aargauer Zeitu

KLINGNAU

Klingnauer Stausee: Deutsche Kritik an Aushub-Plänen mit Gift-Schlamm
Gift ganz raus: Klingnauer Stausee soll zum Vorbild werden

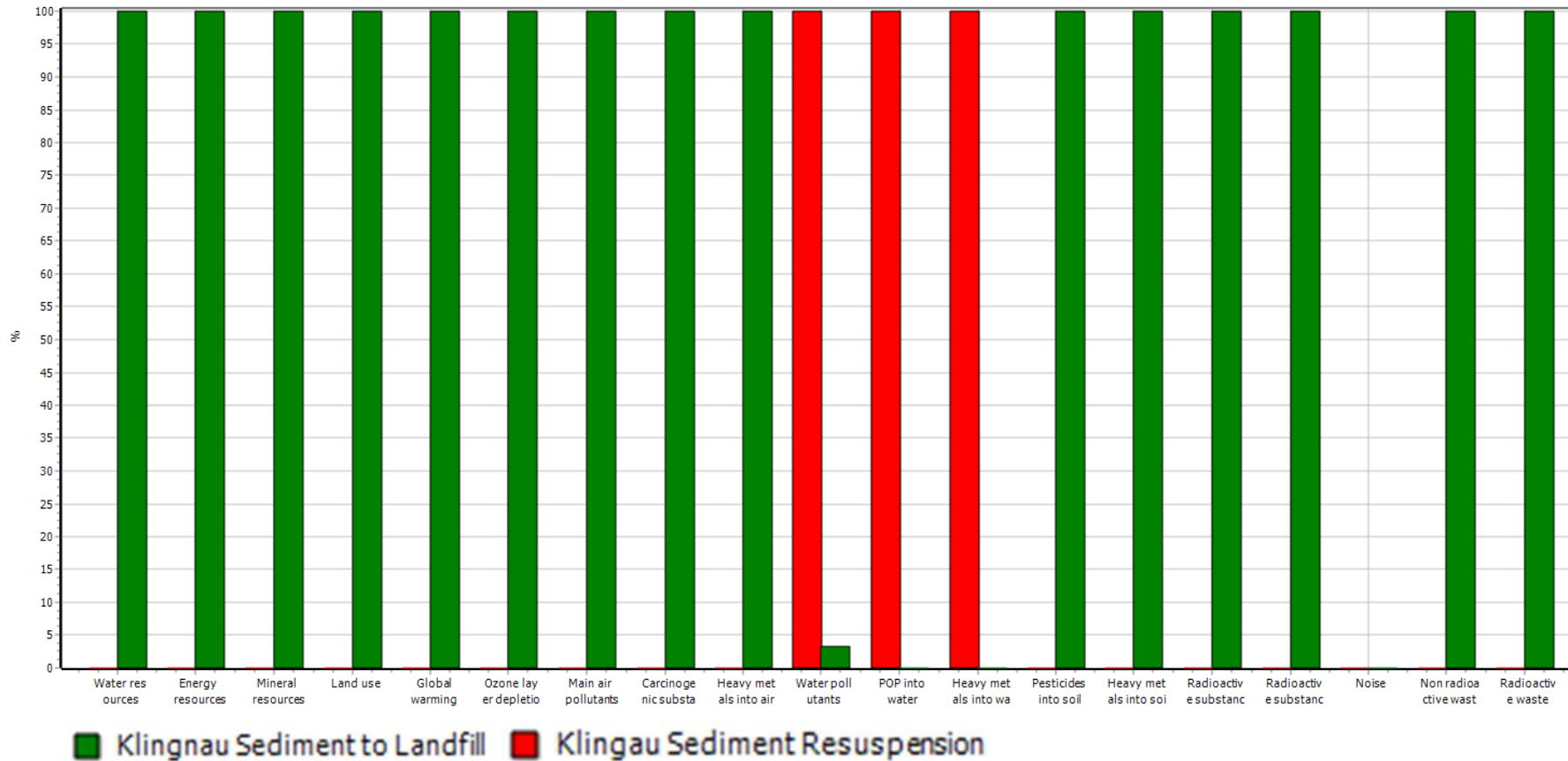
Dienstag, 19. April 2016, 15:12 Uhr

Alex Moser



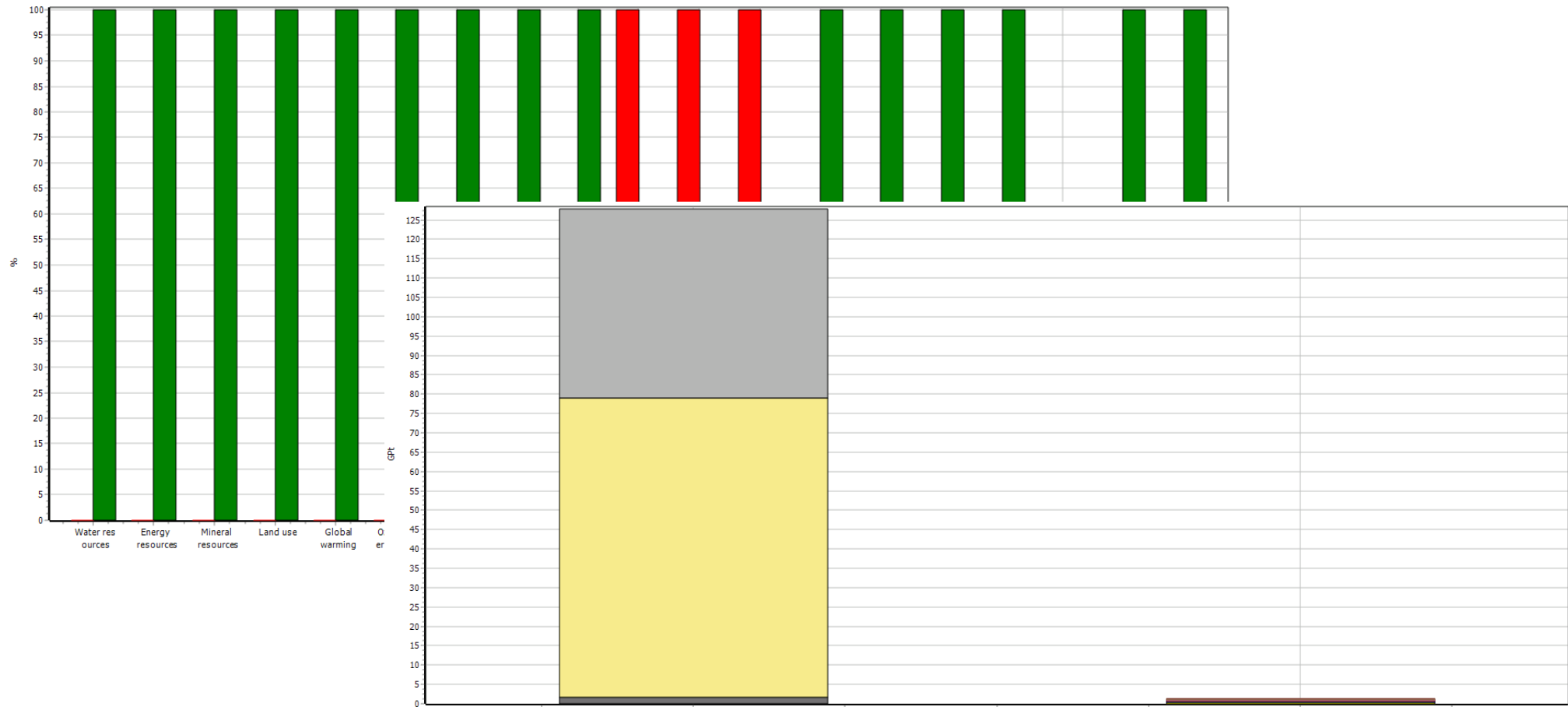
LCA Sediment Resuspension vs. Landfill

Impact Category Results (unweighted)



LCA Result Communication

Impact Category vs. Single Score



Conclusions



- Don't resuspend contaminated sediments, at least not before an LCA gives you green light.
- Single score results are very useful for comprehensive communication of LCA results to non-experts.

Environmental Consulting

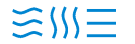
- Life Cycle Assessments
- Environmental Product Declaration (EPD)
- Carbon Footprinting
- Cumulative Energy Demand
- Material Flow Analysis
- Fuzzy Logic Analysis

Energy Consulting

- Constructor Consulting
- Sectoral Planning Energy
- Energy concepts
- 2000 Watt-Calculations
- Structural-physical clarifications

Pollutants in Buildings

- Diagnostics of Buildings
- Constructor Consulting
- Sectoral Planning
- Asbestos measurements
- Air Pollutants Consulting



Thank you
for your attention!

Emil Franov
Member of the Executive Board
e.franov@carbotech.ch
p +41 61 206 95 32

Carbotech AG
P.O. Box
CH-4002 Basel
www.carbotech.ch

