



The IMECOGIP Toolbox



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Sense and Nonsense of Monetizing Ecosystem Services in Small Areas: An Example from Bochum, Germany

Harald Zepp



Luis Inostroza

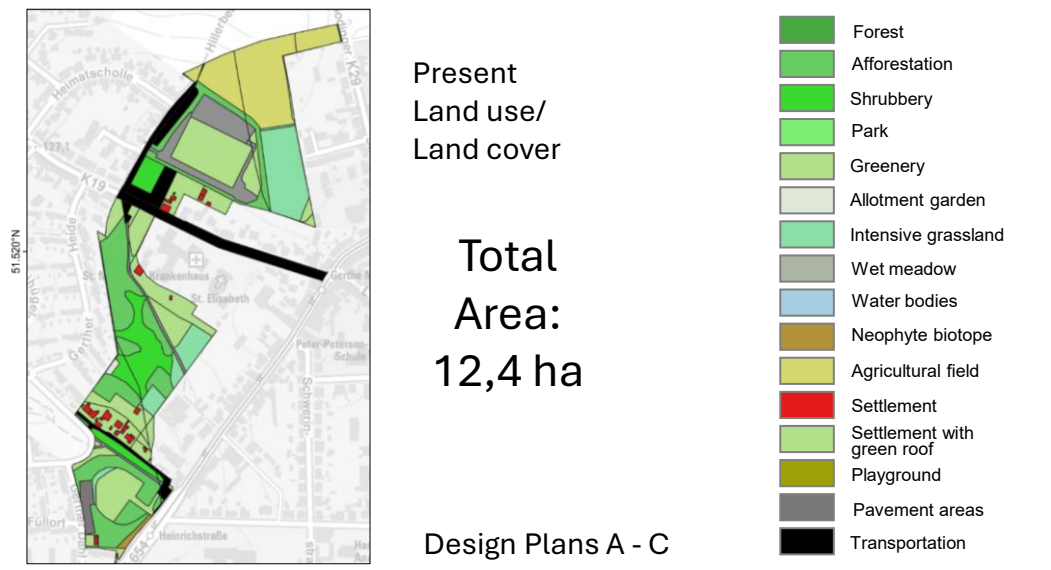


EnhancES
The IMECOGIP Toolbox

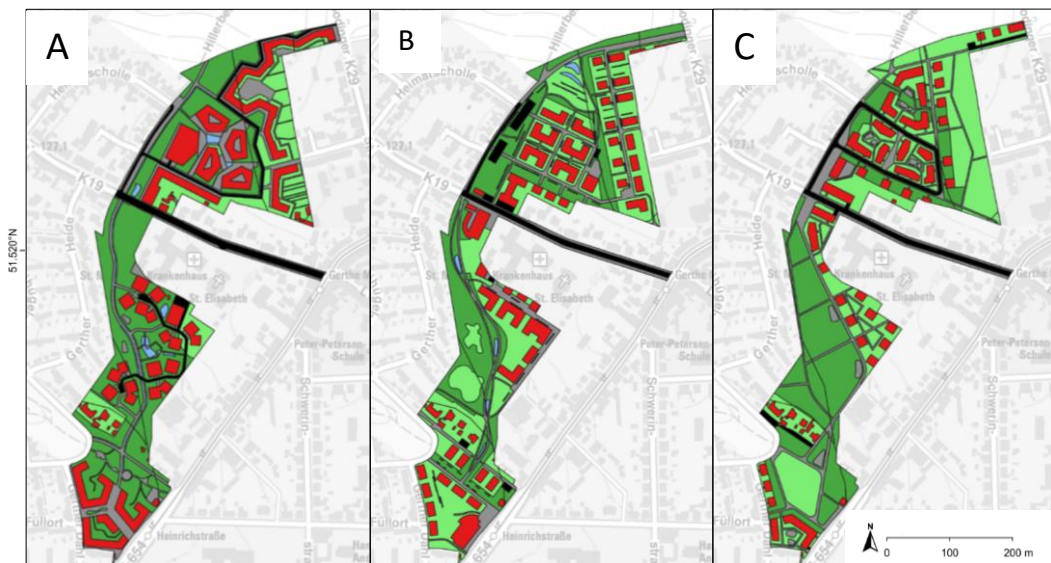


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Competing Urban Design Plans



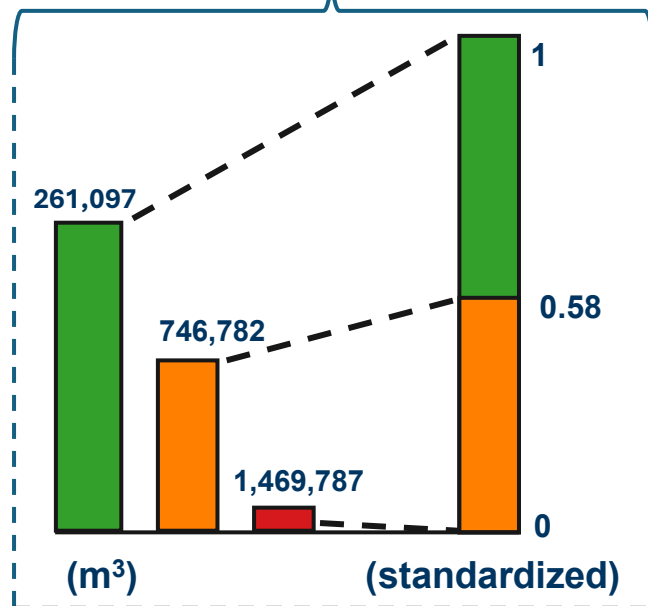
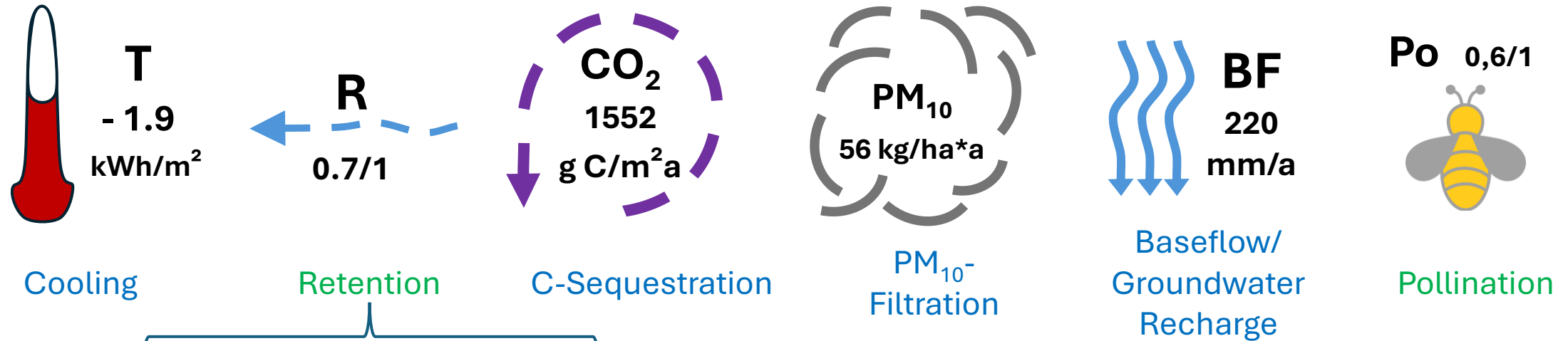
Which plan is the best in terms of ES ?



Data sources:
City of Bochum, BSÖR
(2016), Geologischer Dienst
NRW (2021); Topography:
Bezirksregierung Köln (2024)

The Basis of Evaluation: Ordinal- and Ratio-Scaled Ecosystem Services

Exemplary figures for six ecosystem services based on biotope types and soil/groundwater characteristics

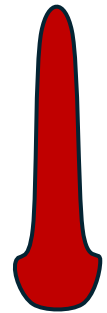


1 Evaluation (choice) based on **standardization of ES**
(cf. Zepp et al. 2025)

2 Evaluation (choice) based on assigning **monetary values to ES**



The Basis for Monetization: Ordinal- and Ratio-Scaled Ecosystem Services

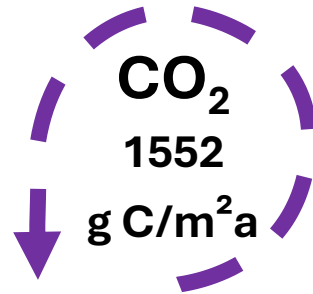


T
- 1.9
kWh/m²

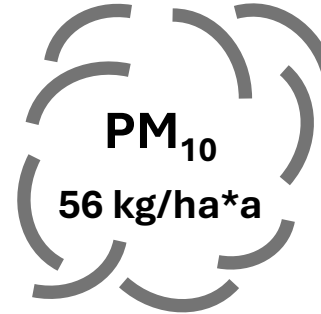
Cooling

R
0.7/1

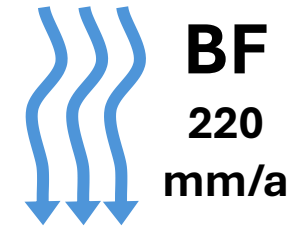
Retention



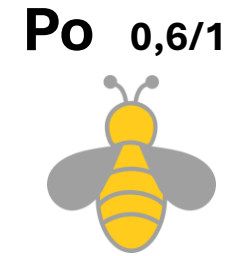
C-Sequestration



PM₁₀-
Filtration



Baseflow/
Groundwater
Recharge



Pollination

Energy (kWh)
consumption
by transpiration;
Municipal power
supplier

Local running costs of
electricity

Municipal
taxation of rain-
water and raw
water from sealed
surfaces

According to current
statute

Federal Climate
Change Act of
Germany (CO₂
Compensation)

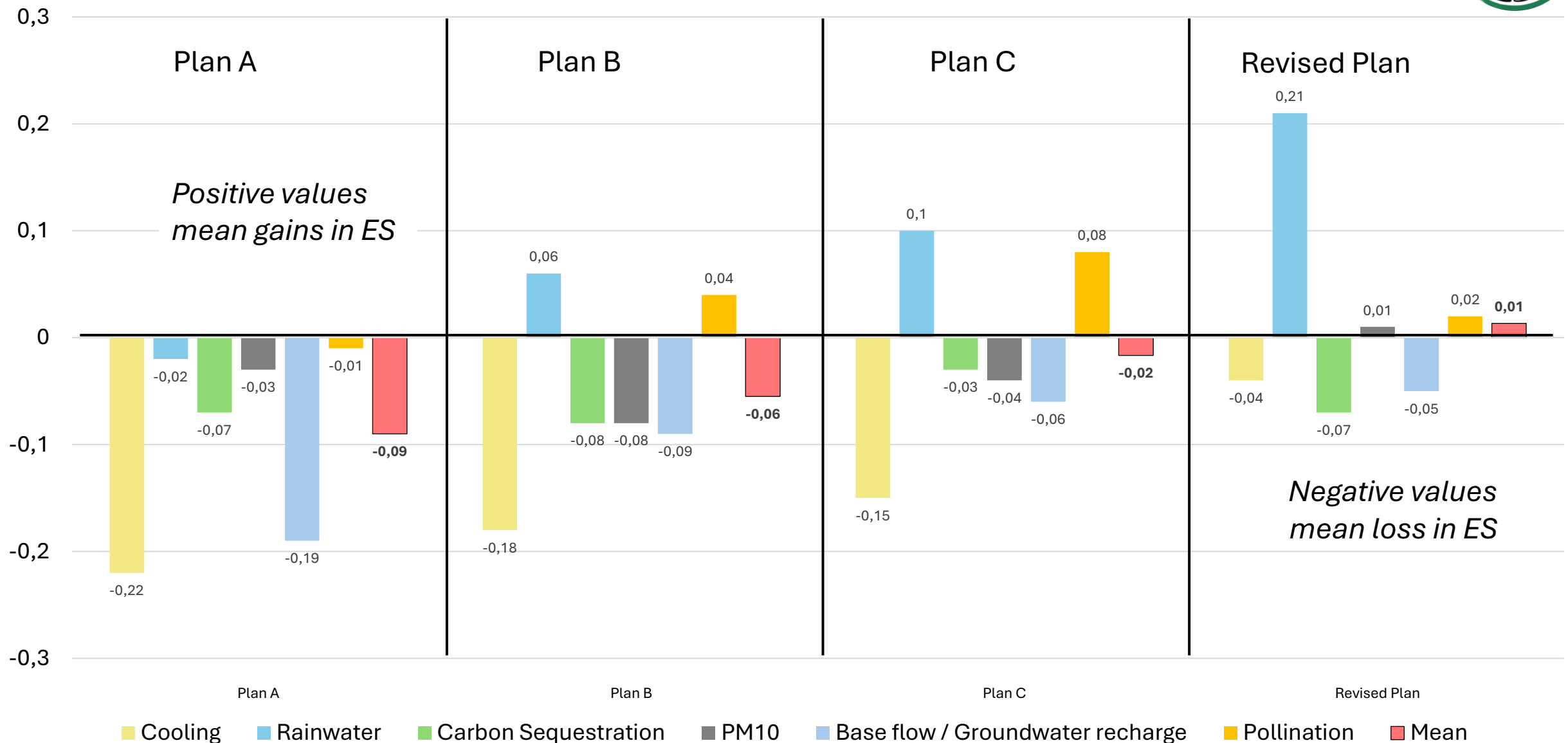
According to current
taxation

Delft-Study
(2020): Damage
(Health + social
costs) caused by
PM₁₀ pollution in
13 cities nearby
Costs for Δ 1 µg PM₁₀
after correction for
confounding variable
,income/capita‘

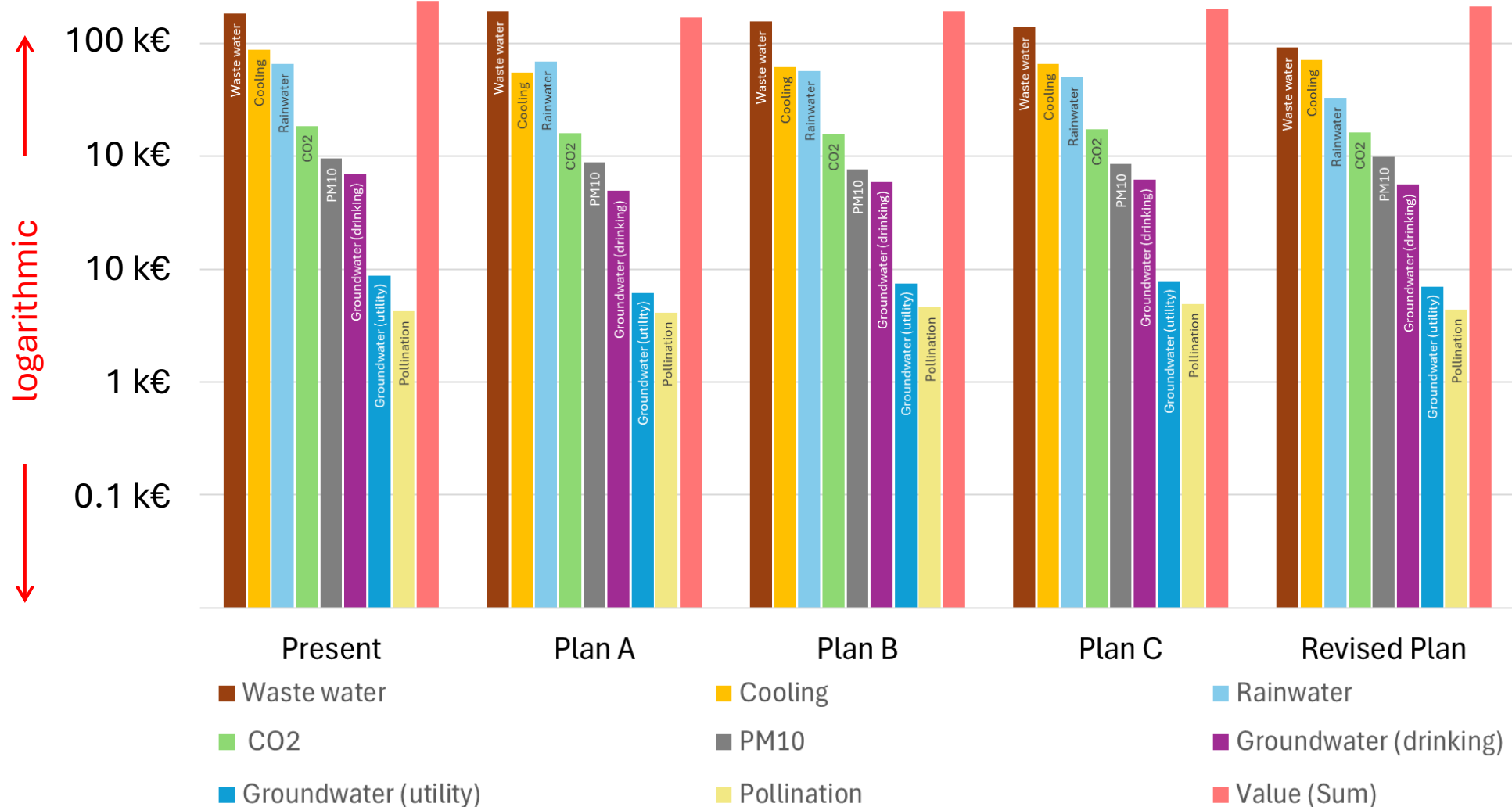
NRW Federal state
Costs of utility water
from surface water
bodies and costs for
groundwater for
drinking purpose
before processing

Contribution to
food production in
Germany (TEEB
2018)

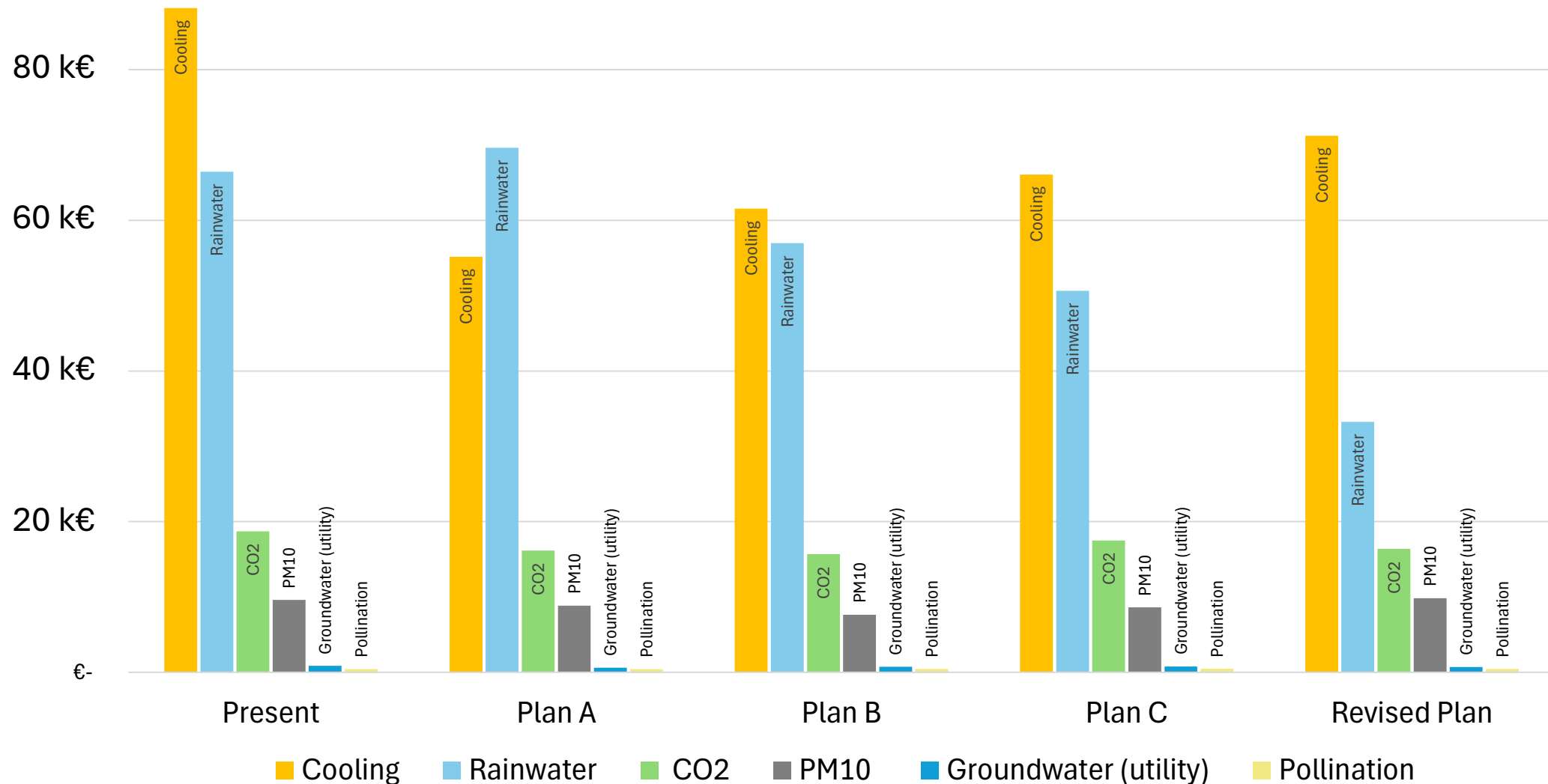
Difference of standardized ES of the 4 plans against the present standardized ES and Mean (equal weights)



Monetary values of eight ES in the order of magnitude and total value (Sum of values = $\sum [\text{Cooling}/\text{Rainwater}/\text{CO}_2/\text{PM}_{10}/\text{GW(utility)}/\text{Pollination}]$)

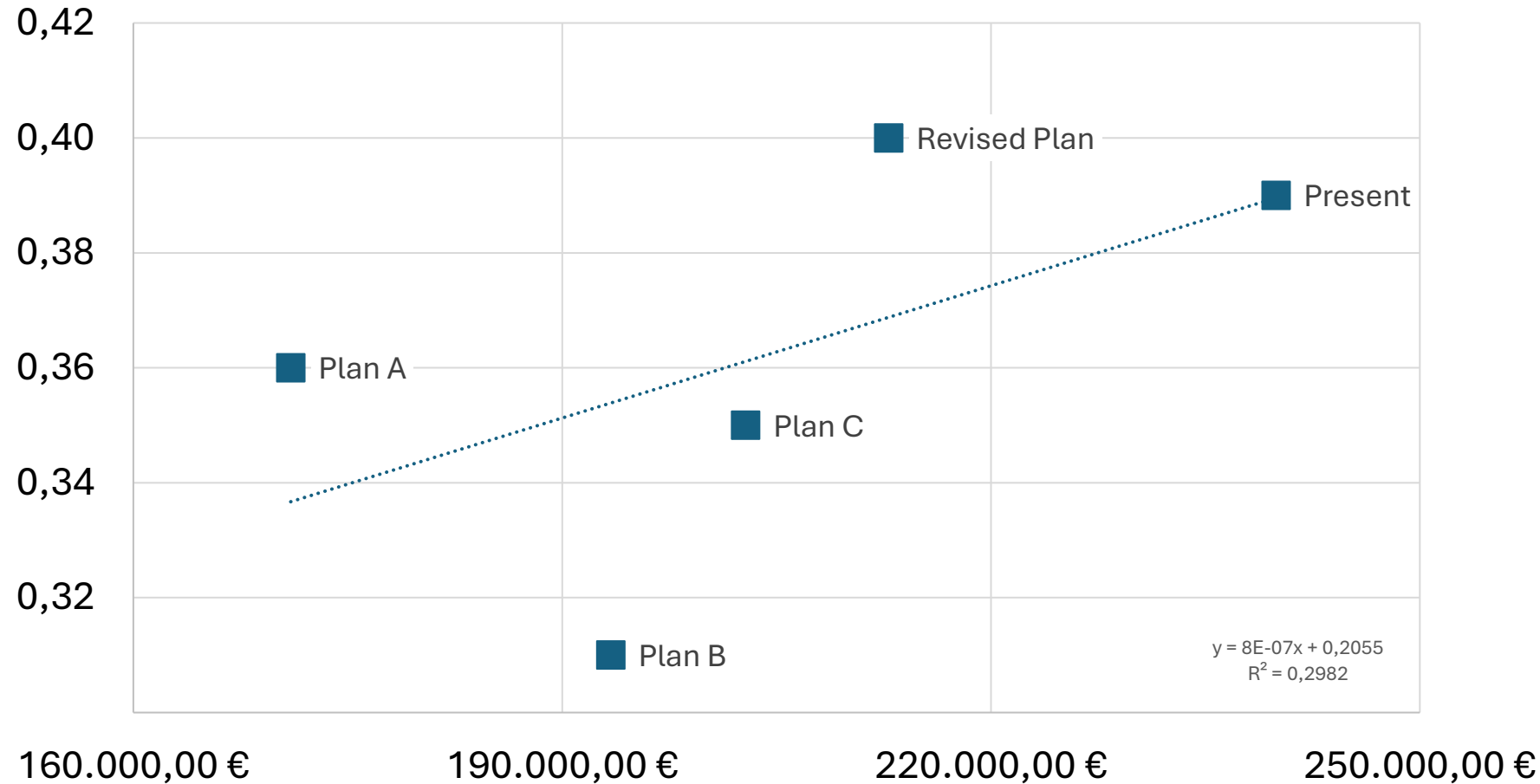


Monetary values of six selected ES in the order of magnitude



Comparison of the evaluation methods

Monetary valuation against standardized ES (equal weights)



Sum of Values:
Cooling /
Rainwater /
CO₂ / PM₁₀ /
GW (utility w.) /
Pollination)

Conclusions

- Market prices for ES and contingent valuation are subject to change, volatile, and arbitrary.
- Ecosystems and ecosystem functions do not follow market mechanisms, as do societal trends in ES preferences.
- If optimization of design plans follows monetary values, there are huge discrepancies between the modes of valuation.
- By valuing certain ES over others, one tends to give certain processes more support than others. In sustainably functioning ecosystems, functional processes are more or less balanced-out over timespans of years.

What was not (yet?) priced-in:

- Premature death due to heat waves and air pollution
- Recreational ES (CICESv5.1: 3.1.1.1, 3.1.1.2, 3.1.2.4)
- Other cultural ES (education, symbolic meaning, research etc.) covered by EnhanceES
- Approx. 80 additional ES of the CICES list.



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