

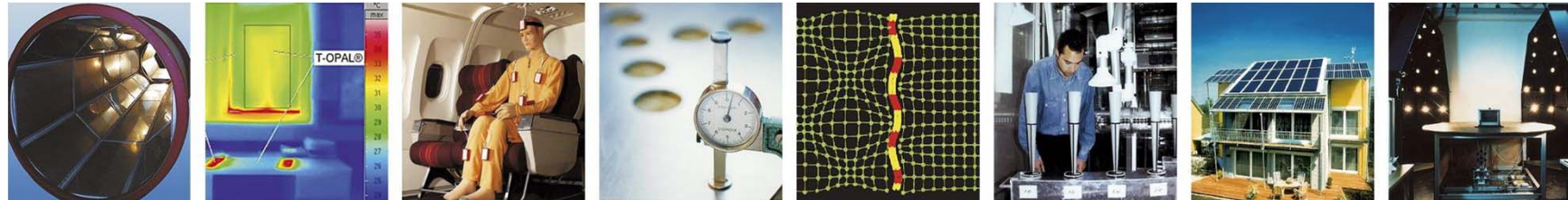
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# Modelling Biodiversity in Fuzzy Terms

Swiss LCA Discussion Forum

Zürich, March 15<sup>th</sup>, 2016

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# Agenda

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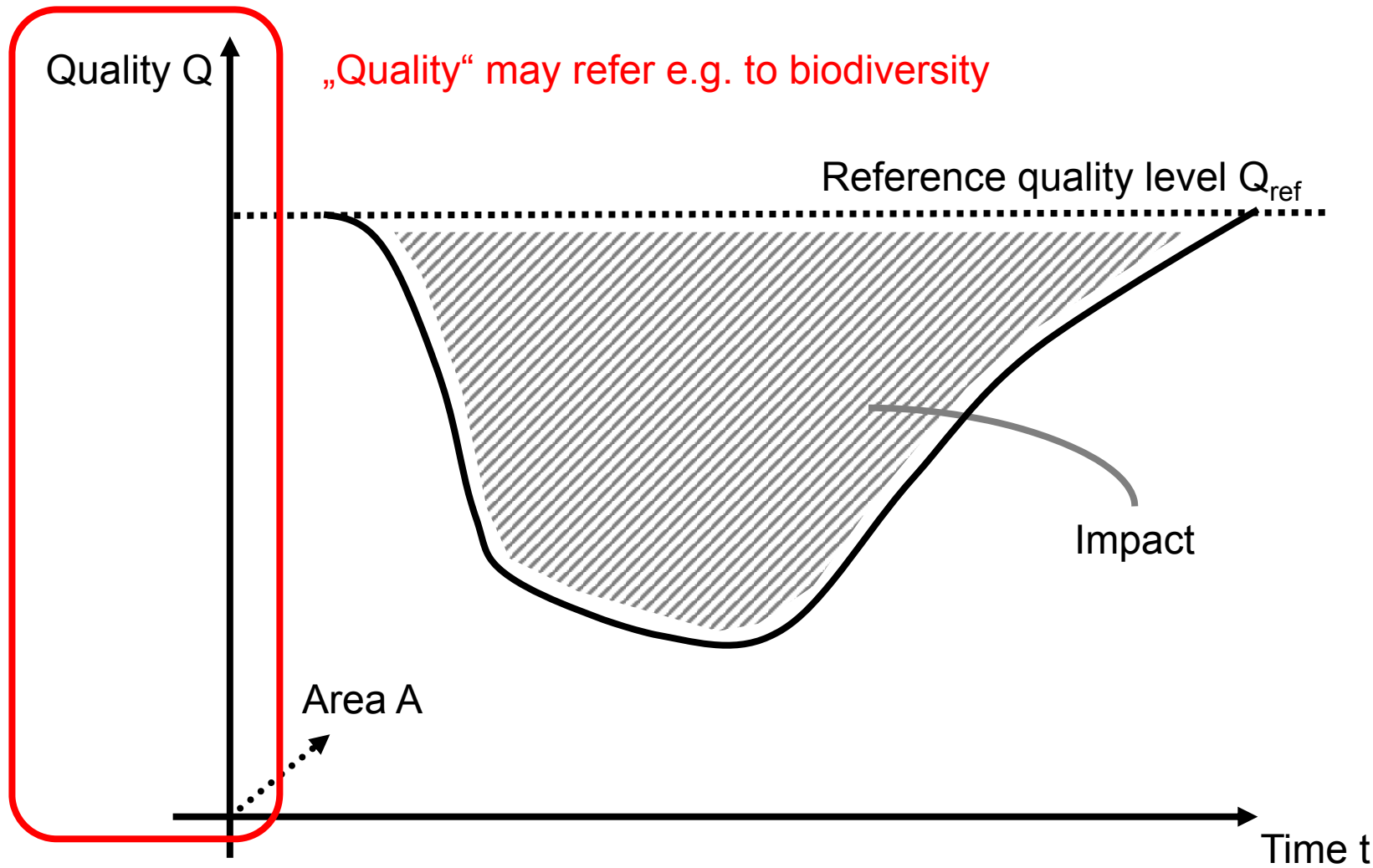
- Context: Land use in LCA
- Challenge: biodiversity as a fuzzy subject
- Biodiversity Impact Assessment
  - Assessment principle
  - Parameters and biodiversity contributions
  - Aggregation
- Conclusion/outlook/critique



BIODIVERSITY  
IMPACT  
ASSESSMENT



# UNEP-SETAC LCI Framework for land use in LCA



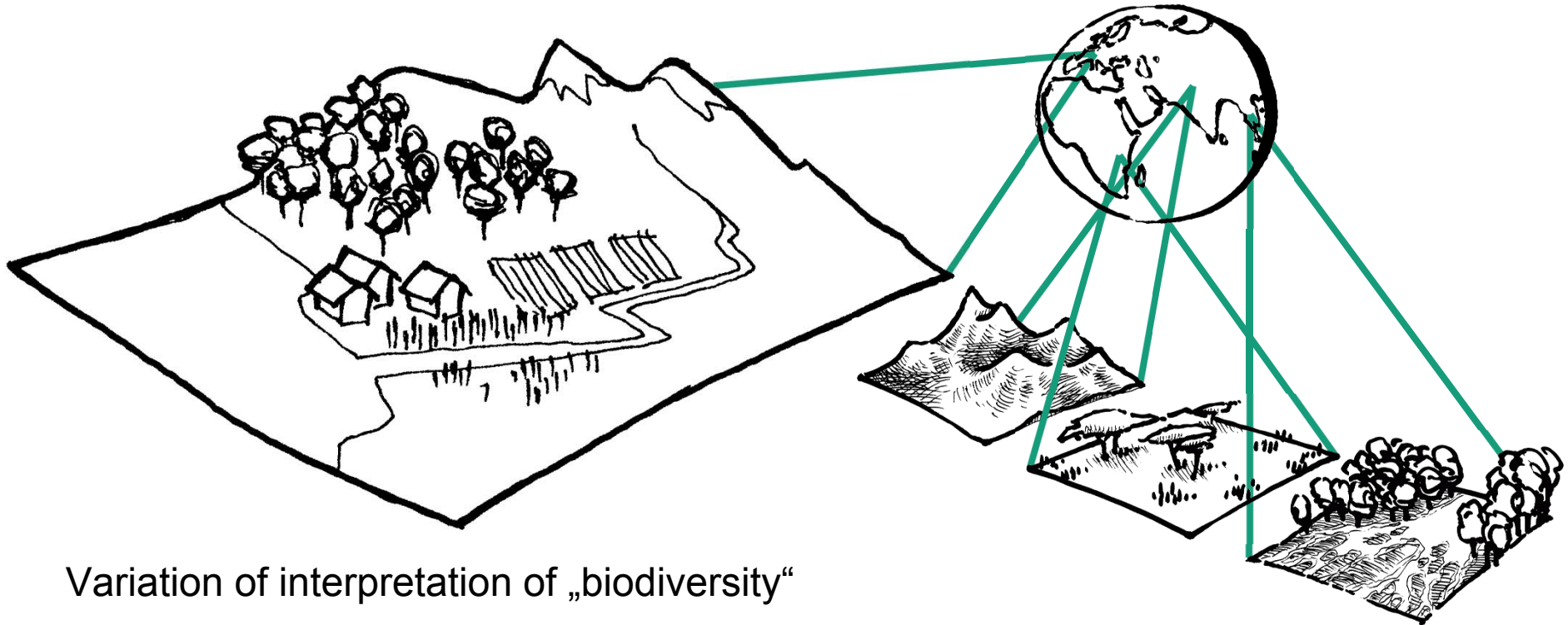
# What do we acutally want to protect?

Differing interpretations of „biodiversity“

- Scientific
  - Description of defined samples  
e.g. areas, organisms
  - Based on physical reality
  - No inherent normative meaning
- Political
  - Buzzword, fuzzy/diffuse meaning
  - Refers somehow to conservation policies
  - Strong normative contents



# Regional differentiation



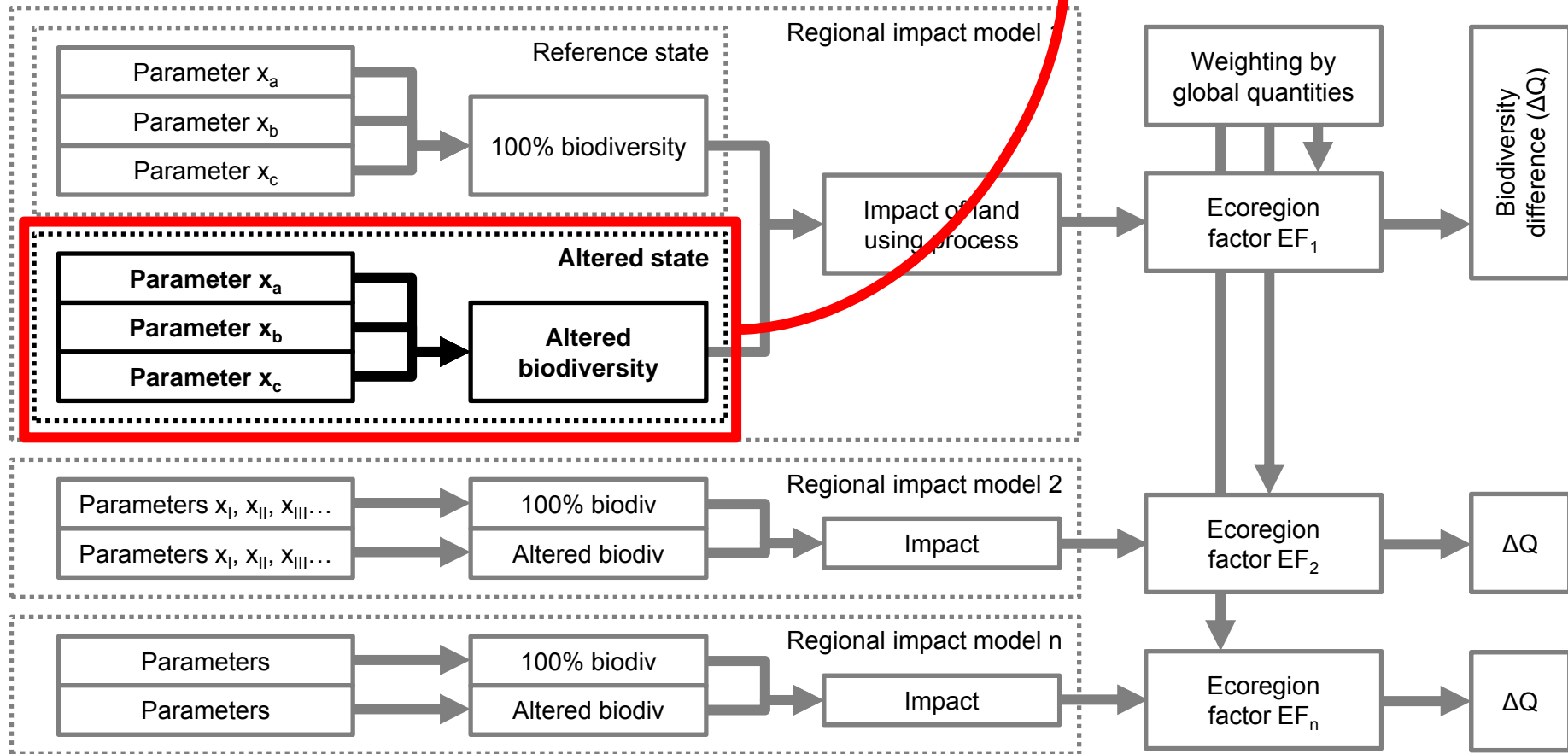
Variation of interpretation of „biodiversity“

- Biogeographic context
- Cultural context



# Assessment structure

today's presentation



# Assessment principle



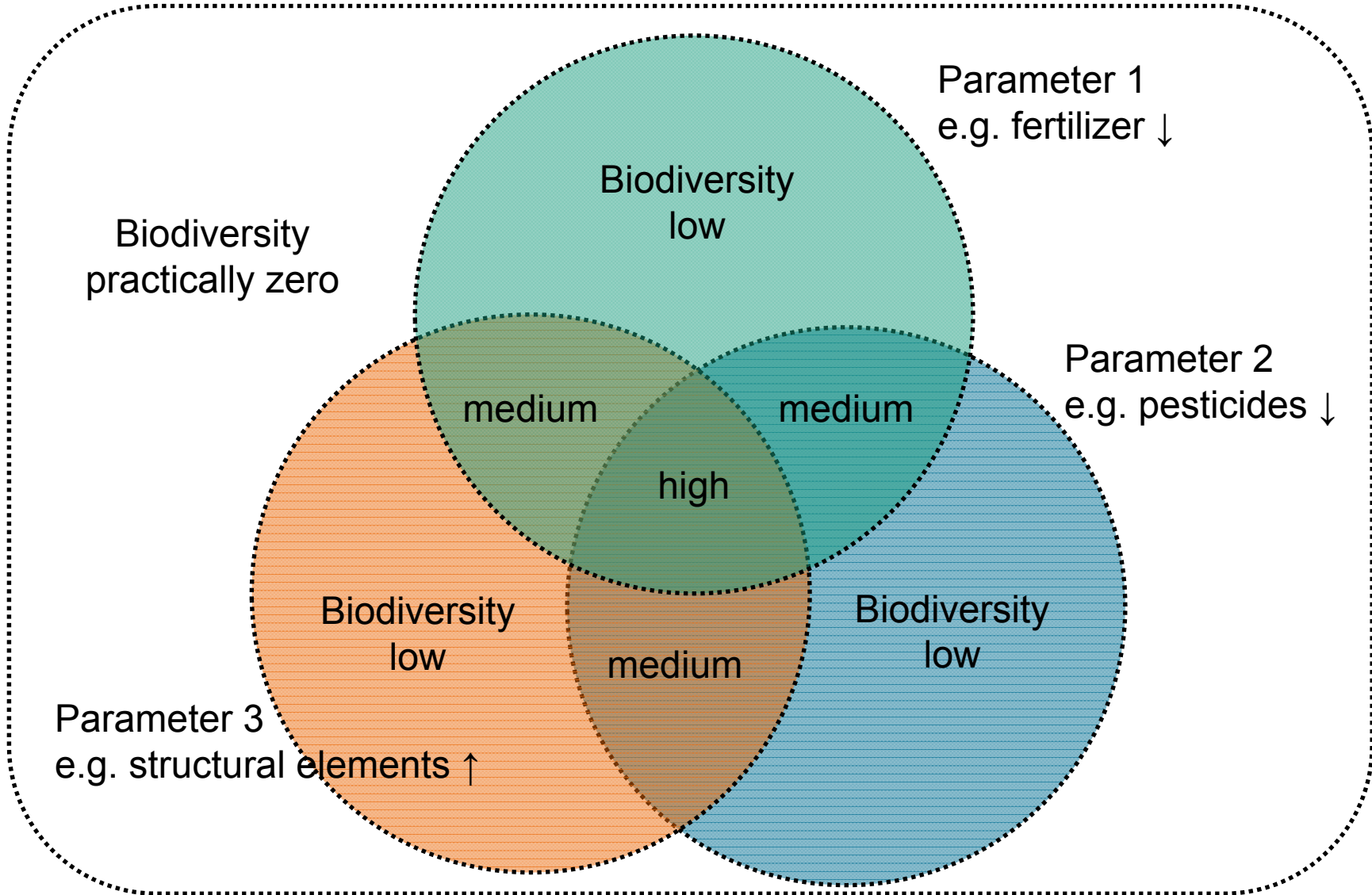
image: Gilles San Martin  
<https://www.flickr.com/photos/sanmartin/2321100890/>



Ganzheitliche Bilanzierung

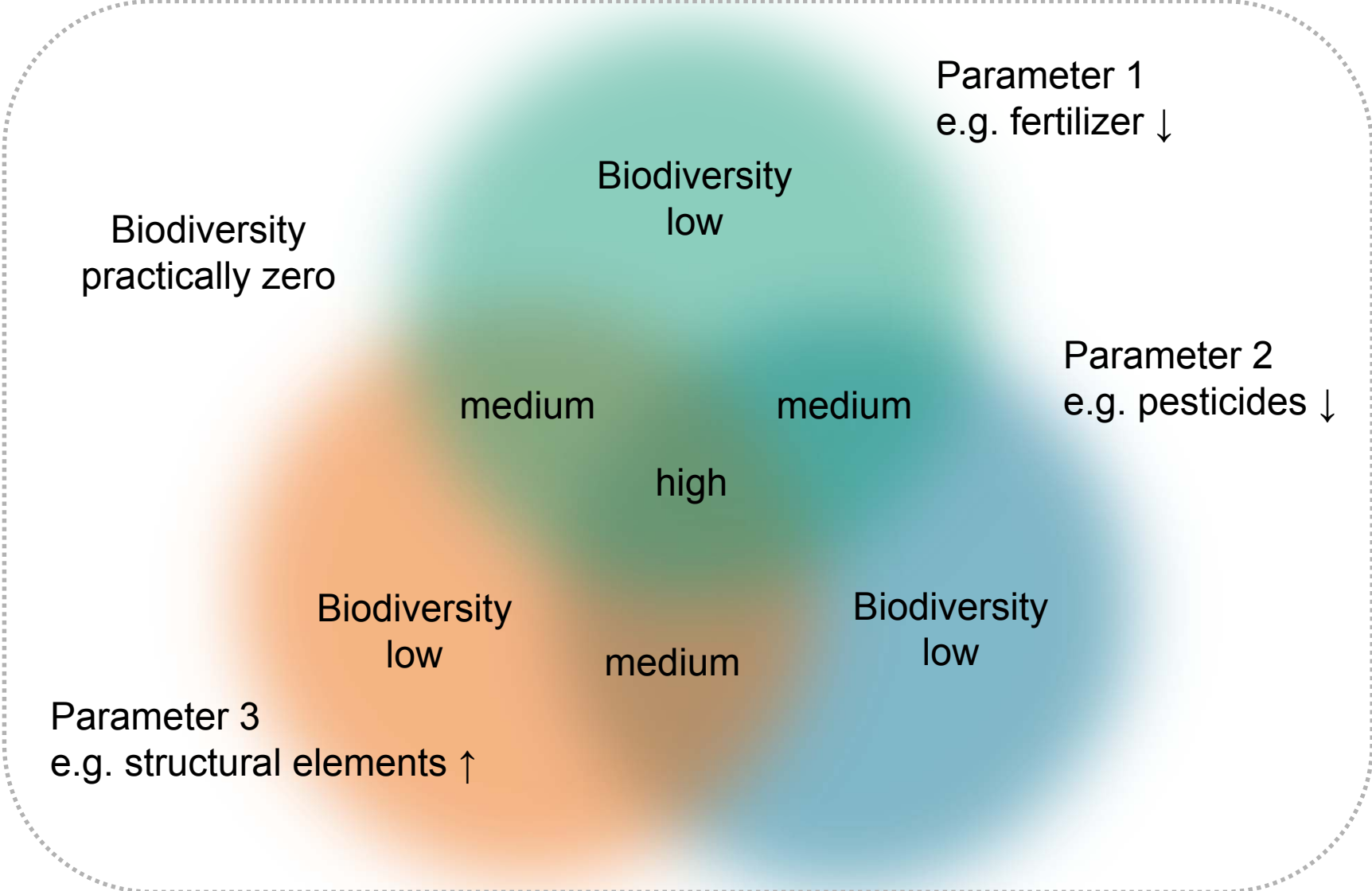
 **Fraunhofer**  
IBP

# Parameter relations





# Parameter relations



# Expert involvement

Augment literature research with expert knowledge to formulate parameter relations and eventually a formal biodiversity expression

## ■ Preparation

- Literature research: typical biodiversity of ecoregion, break down global drivers of biodiversity loss to regional level
- Identify set of parameters as a starting point
- If possible, produce biodiversity contribution functions
- Choose interview partners

## ■ Interviews

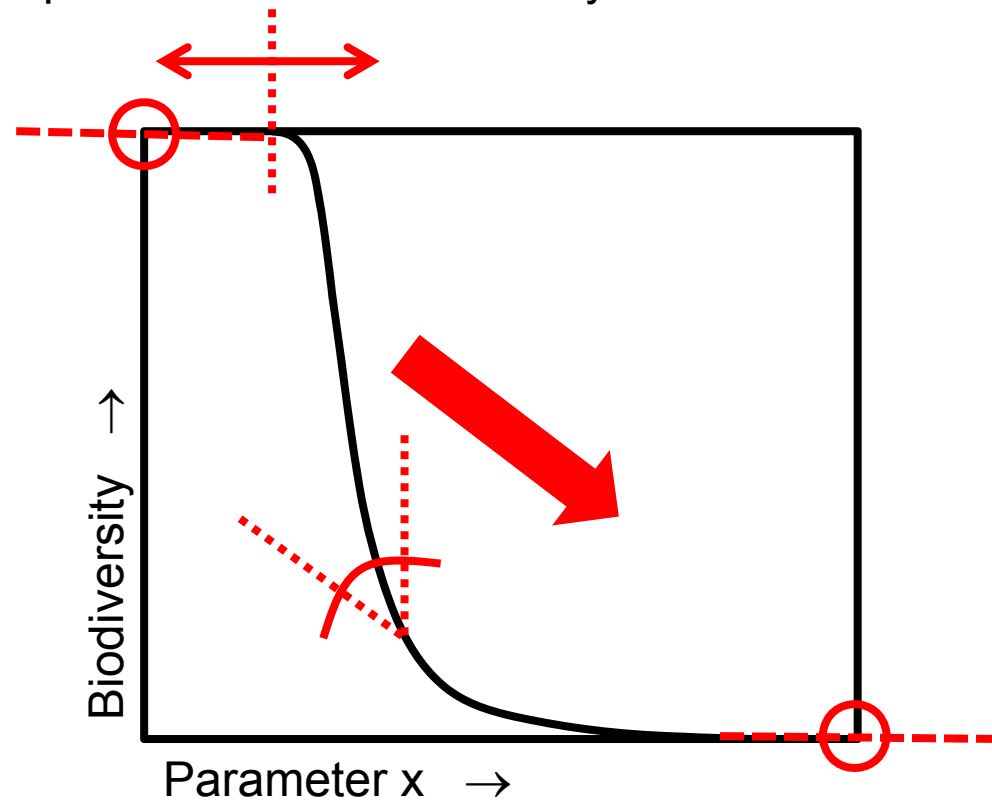
- Discuss parameters qualitatively, discuss relevance of parameters
- Develop biodiversity contribution of individual parameters graphically
- Formal expression of function, get confirmation



# Biodiversity contribution per parameter

Goal: quantitative relationship of parameter and biodiversity

- Simple, empty graph space
- General direction
- Fixed points
- Tangents
- Interpolation
- Adjustments



# Aggregation of biodiversity contributions

Aggregation of biodiversity contribution per parameter

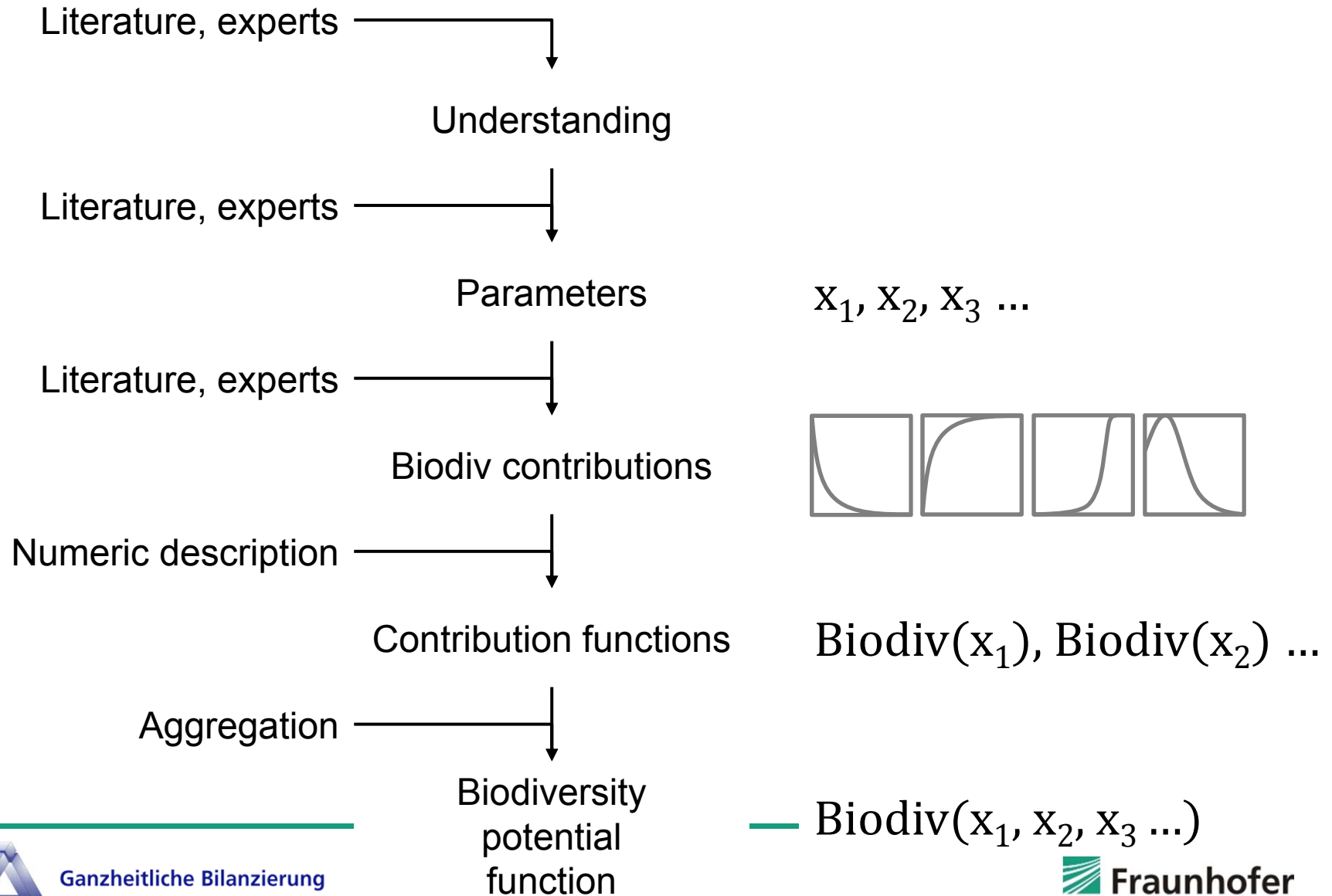
- Contribution from each parameter in the (0, 1) range
- For independent parameters
  - Addition, equal weighting
  - If specific parameters more important, uneven weighting
- For entangled parameters
  - Limiting factors → MIN
  - Compensating effect → MAX
  - More complex relations → other mathematical expressions available

Repeat hierarchically for groups of parameters if necessary

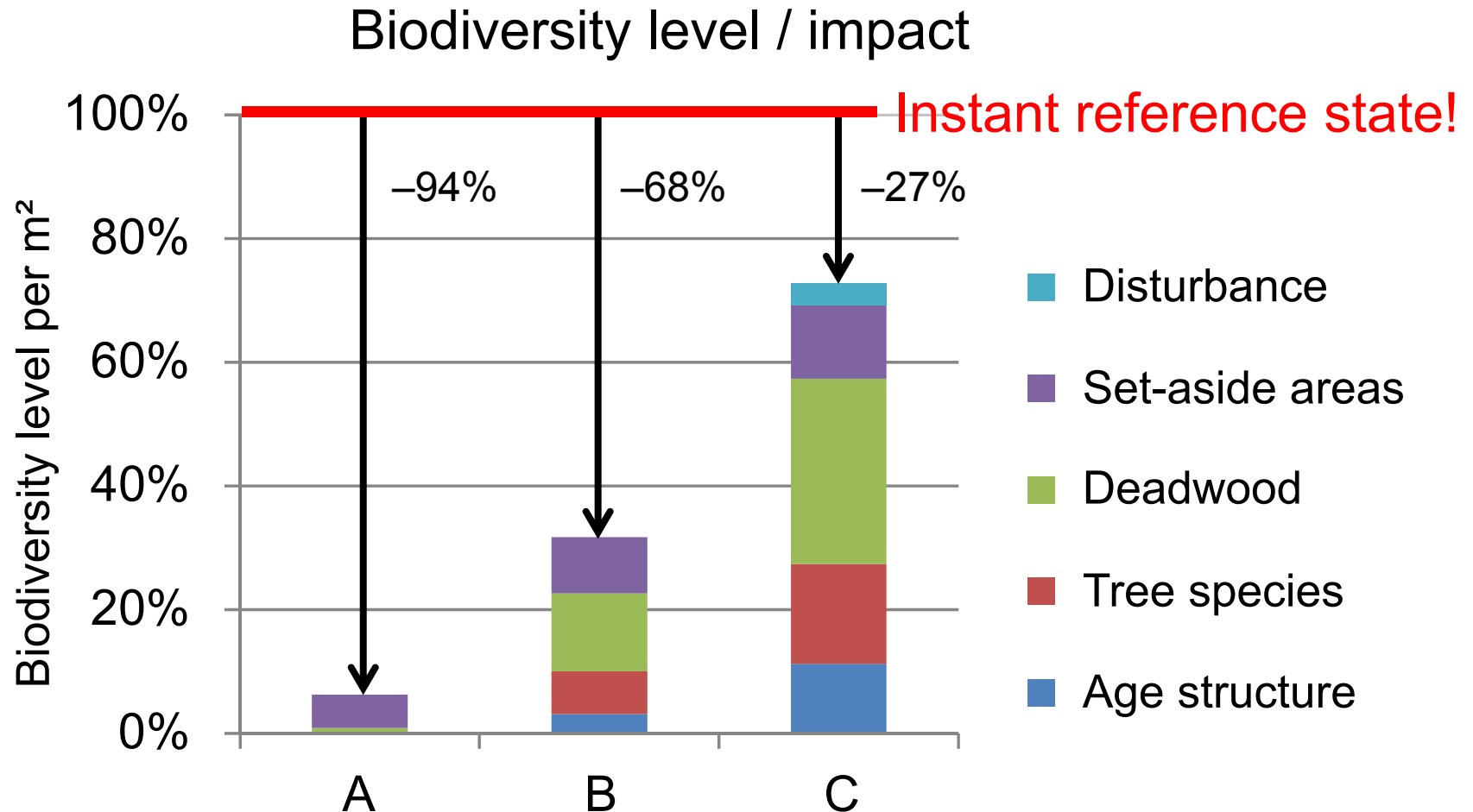
Result: biodiversity potential function of a given ecoregion



# Developing a biodiversity potential function



# Example results: forestry in Scandinavia



# Conclusions, outlook, critique

## Biodiversity Impact Assessment

- Framework allows integration of various parameters, various relations between parameters, various aggregation methods
- Dissects abstract concept „biodiversity“ into parameters and contributions
- Relies on expert judgement, formulates algorithm for replication
- Compatible with overall UNEP-SETAC land use framework, possible integration with other approaches (e.g. foreground/background)
- Reference state obtained automatically with development of regionally specific biodiversity description

Critique, please!



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Ganzheitliche Bilanzierung

