Bridging the Gap Between Biodiversity Footprint Metrics and Biodiversity State Indicator Metrics

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11:00 – 12:300

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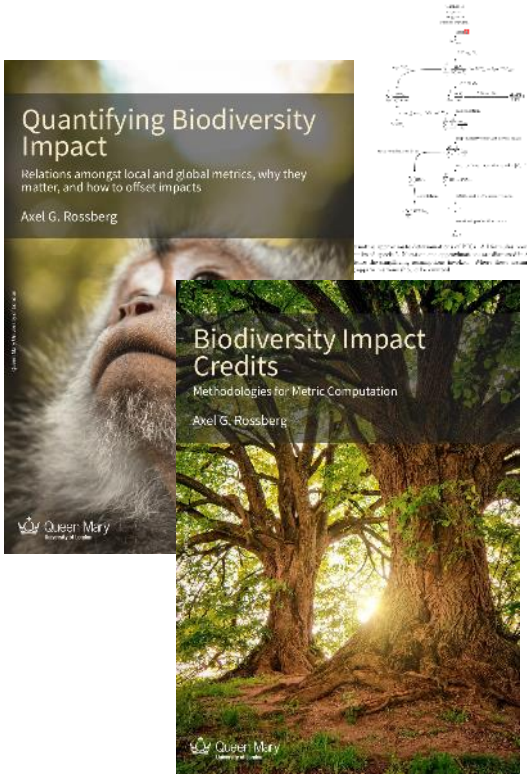
Queen Mary University of London

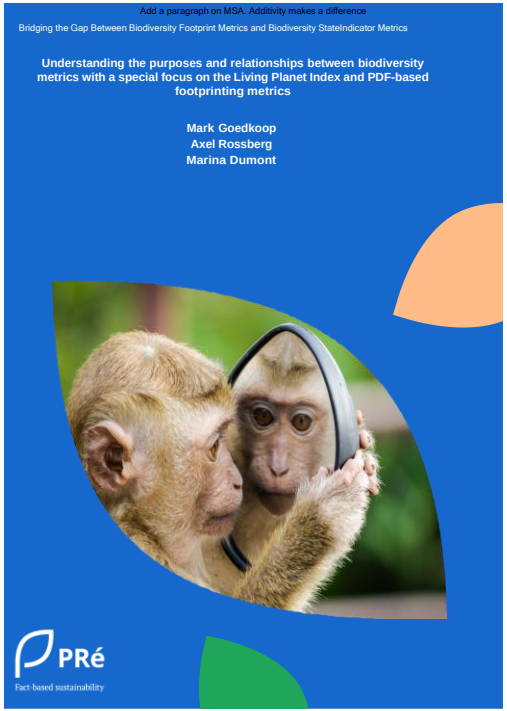
Today’s agenda

1. Biodiversity is declining
2. State Indicator Metrics
3. Footprint Metrics
4. Can we link State and Footprint Metrics
5. The implications for Target Setting
6. Compensating Residual impacts?

The scientific basis

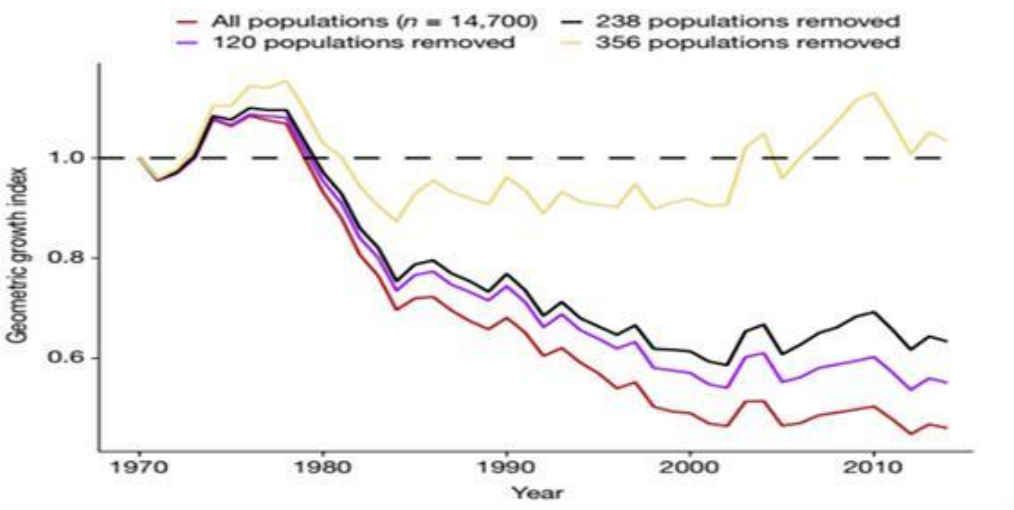


- Axel Rossberg made a math based link between various biodiversity metrics
  Main conclusion: a PDF based footprint is a very good proxy for the global extinction risk
- Axel approached us: Help me… nobody is going to read my paper
- The whitepaper is available via www.biodiversity-metrics.org *(metrics and methods -> understanding biodiversity metrics)*



All background information is available on www.biodiversity-metrics.org

The Living Planet Index as State Indicator



- WWF publishes the Living Planet Index, which is based on changes in population of 17000 species since 1970
  - Index is the Geometric Mean of the changes $\sqrt[n]{x_1 * x_2 * \ldots * x_n}$
  - Extremely sensitive for a few species with a fast decline….
  - If 365 species from the 17,000 species are removed there is no decline!
  - Yet, it is a useful metric to flag extinction risks

Leung, B., Hargreaves, A.L., Greenberg, D.A., McGill, B., Dornelas, M., Freeman, R., 2020. Clustered versus catastrophic global vertebrate declines. Nature 588, 267–271. https://doi.org/10.1038/s41586-020-2920-6

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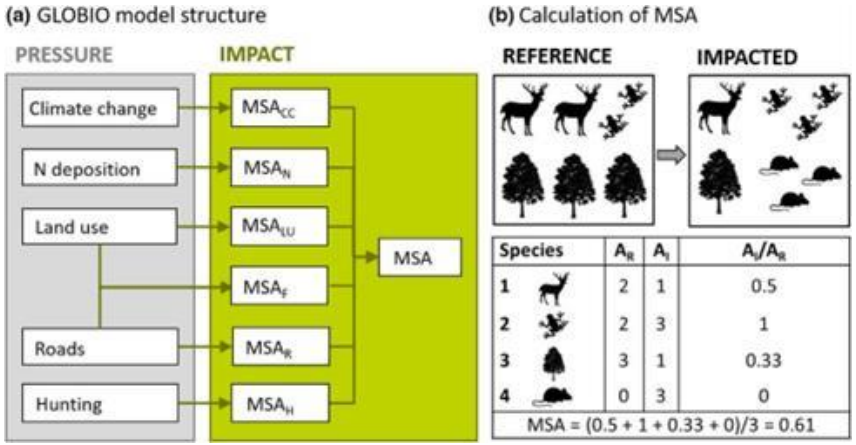
Mean Species Abundance as State Indicator

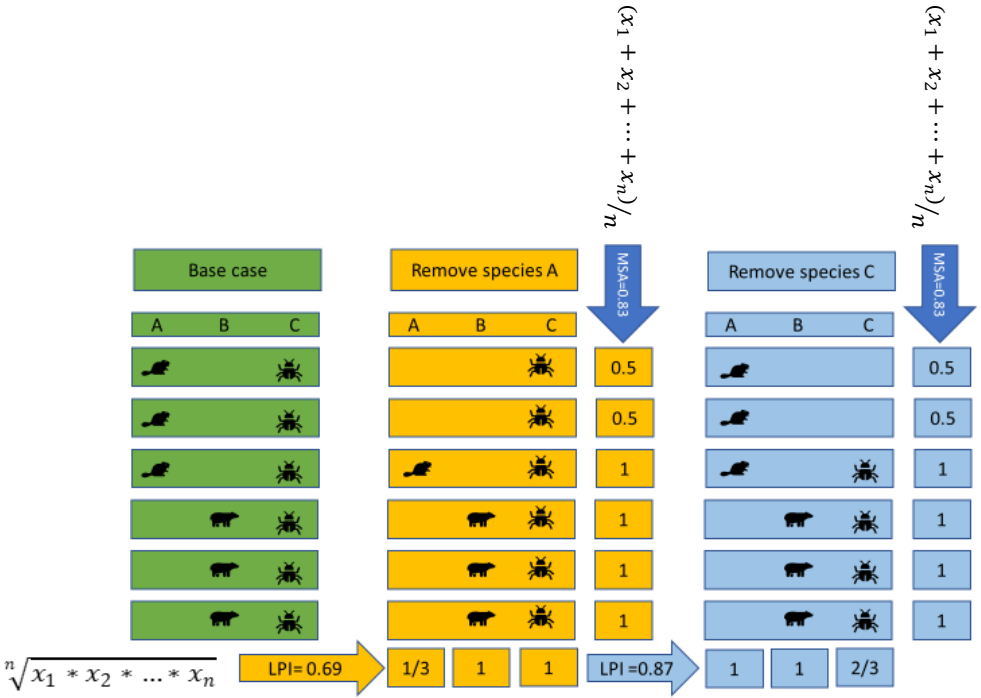
- Mean Species Abundance uses the Arithmetic Mean: $(x_1 + x_2 + \cdots + x_n)/n$
- Used in tracking the state, but also for forecasting, based on change in environmental pressures
- Note the truncation rule; increases in abundance (frogs), or new species (mice) are ignored



(source www.globio.org)

LPI and MSA measure different things

- LPI and MSA measure different things:
  - Suppose we have 6 regions with just 2 species; Note Specie C is abundant; A and B are not.
  - On two plots Specie A disappears ➔LPI=0.69, MSA=0.83
  - On two plots specie C disappears: ➔LPI=0.87, MSA=0.83
- MSA is not sensitive to abundance; it measures trends in abundance
- LPI is sensitive to abundance and indicates extinction risks



Footprint Metrics

- **Potentially Disappeared Fraction**
  The percentage of species lost due human/economic activities in an area during a certain time [PDF.m2.yr]

- **Means Species Abundance**
  The arithmetic average of specie populations change due to human/economic activities in an area, during a certain time [MSA.m2.yr]

PDF = 1 PDF = 0

MSA = 0 MSA = 1

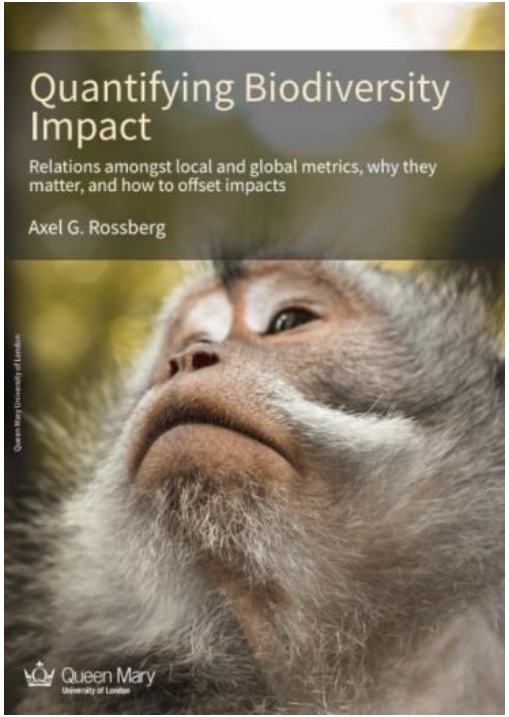
All background information is available on www.biodiversity-metrics.org

Linking LPI to PDF based Footprint results

- The detailed analysis from Axel Rossberg shows the mathematical relationship:

$$\Delta LPI \approx - PDF \cdot LPI$$

  - ΔLPI denotes the change in LPI
  - PDF denotes the potentially Disappeared Fraction of Species calculated in a Footprint
  - LPI denotes the pre-existing LPI
- Suppose we have 10 species in 6 plots. Populations are either 200 or 2000 individuals per species per plot.
- An intervention causes the disappearance of one different species (PDF=10%)



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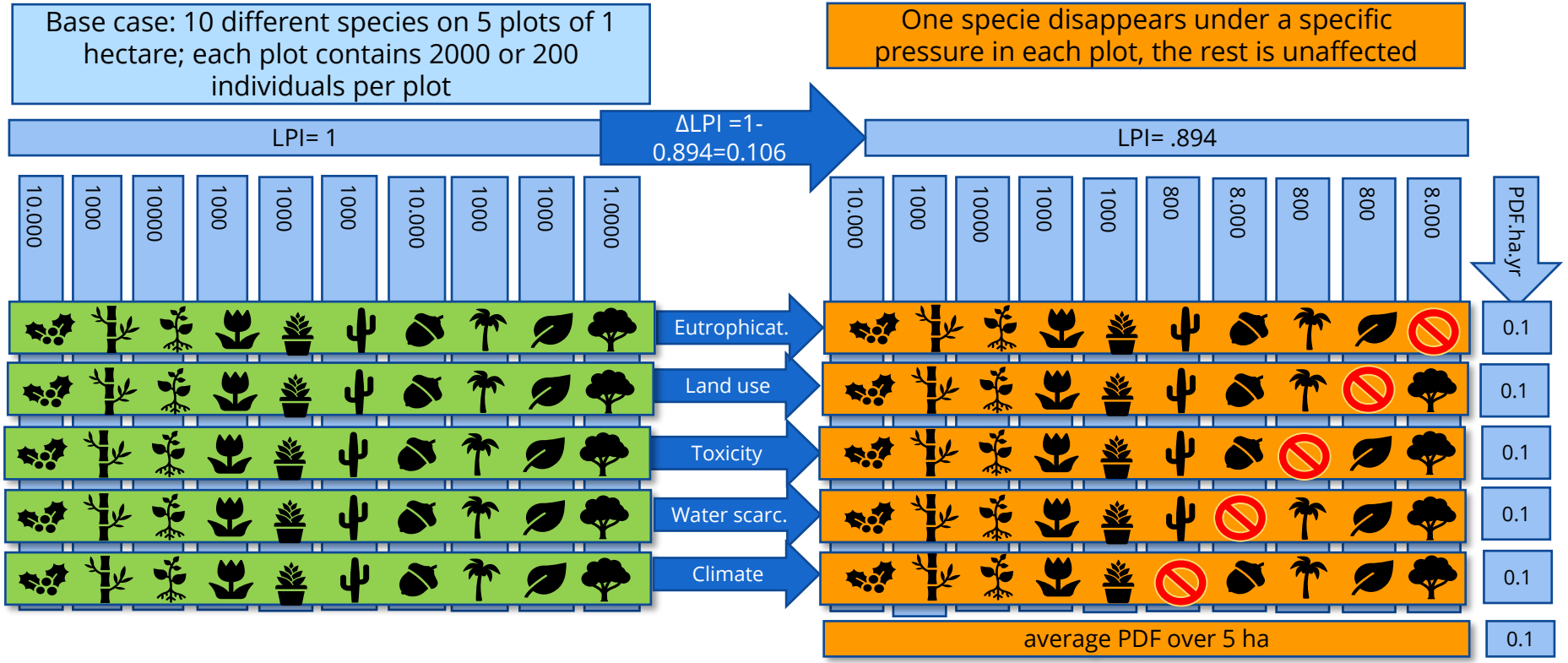
Linking PDF to LPI



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Implications

So far Biodiversity Footprint Metrics seemed to have no link with State Indicator Metrics, which are used in international policy development.

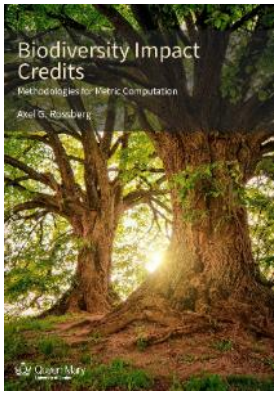
This is different from GHG metrics, where the Paris targets and the Footprint metrics use CO_2 equivalents ➔ companies can be allocated an emission space (Science Based Targets)

Now we can develop science-based targets for biodiversity reporting

All background information is available on www.biodiversity-metrics.org

Provocative? Compensating for Residual Impacts

- Case: ASN Bank portfolio impact is around 60.000 PDF.ha.yr. This can be converted into around 9 species.yr; if this pressure continues indefinitely; the world will lose 9 species (out of many millions).
  - Option 1 rescuing trees from extinction: www.treeconservationfund.org offer projects to invest in the extinction of a tree specie (and its associated micro-organisms)
  - Option 2: restore degraded land to avoid further losses:
    - The area size depends on the restored species richness, expressed as Range Size Rarity.
    - In Brazil ASN would need to restore 5000 km2; in the Netherlands it would be larger than the entire country (not a good idea)



Key messages

It is important to understand what metrics intent to measure

State Indicator Metrics and Footprint metrics can be directly linked

This opens new ways for target setting in the Biodiversity Space

As nobody can reduce its impact to zero; these metrics can inform decisionmaking around compensating residual impacts.

All background information is available on www.biodiversity-metrics.org

Thank you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Background documents are available via: www.biodiversity-metrics.org

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