Advances in evaluating protected area effectiveness in avoiding forest loss

CSC Geocomputing seminar
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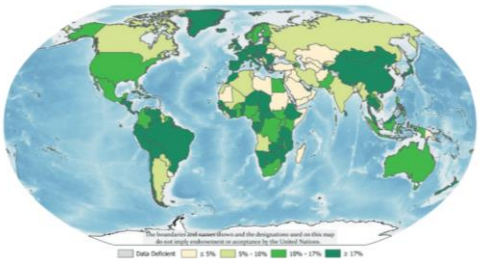
Establishing protected areas to save biodiversity



National coverage of PAs UNEP-WCMC and IUCN 2016

Globally: 14.7 % of terrestrial area protected – CBD Aichi target 17 %

How effective are these areas in protecting biodiversity?

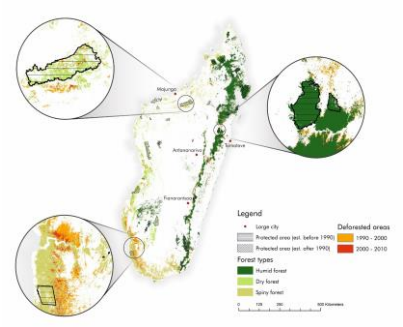
EVALUATING IMPACT: WHAT TO COMPARE?

Inside-outside

Counterfactual approach

What would have happened had a treatment (protection) not been applied?

Madagascar as case study



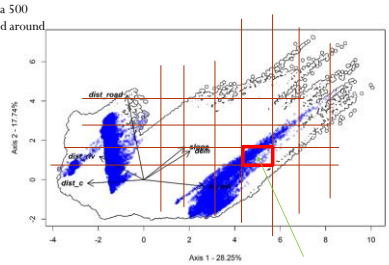
Data and Methods:

- Comparing two time periods:
  - 1990-2000 and 2000-2010
- 3 forest types: humid, dry, spiny
- 39 + 7 PAs (national parks and special reserves)
- Land cover changes based on Landsat data with 30 m spatial resolution, produced by local authorities (ONE et al.2013)

Accounting for covariates: distance to cities, roads, rivers, elevation, slope, and annual rainfall

New method for matching forest areas

20 splits in first round, then decreasing in order to always get a 500 pixel- cloud around



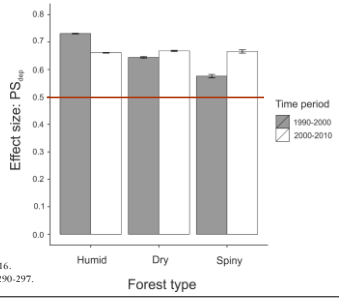
Covariates:

Elevation,
Slope
Annual rainfall
Distance to big cities, roads, rivers, forest edge

500 closest pixels

Eklund et al. 2016.
Biol Cons 203: 290-297.

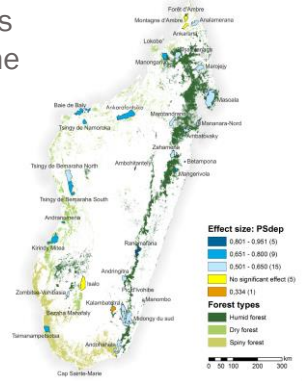
PAs in general effective, but impact varies over time and across forest types



Eklund et al. 2016. Biol Cons 203: 290-297.

Values above 0.5 show success
Whiskers: 95 % confidence intervals

PA effectiveness varies across the network



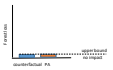
Eklund et al. In prep.

BUT

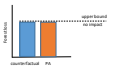
The variation in effectiveness in avoiding forest loss is not explained by management effectiveness measures

Exploring the mechanisms behind impact: when does management matter and how?

No impact:



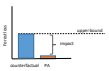
due to design



due to weak management

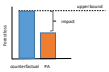
Correspondingly, same impact can be achieved:

under low pressures



Hardly any deforestation inside

under high pressures



High deforestation inside

Meanwhile methodological comparisons continue…

- Effect of sample size on these types of assessments?
- Aspects of spatial autocorrelation remain unexplored
- Hoping to publish R package of the new method soon

Terraube & Eklund et al. In prep.

Conclusions

- Satellite based data on land use change poses challenges to existing matching approaches for evaluating impact
- Computational time has been main constraint
- Running analyses in parallel on Taito has been crucial

- Room for both conceptual and methodological advances in this recently emerging field
- Good news: protected areas matter and establishing them seems to be an efficient way to avoid deforestation
- Such information is key for providing policy recommendations and the results are especially timely for the upcoming renegotiations of new post-2020 targets of the Convention on Biological Diversity.

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