Harmonizing compatibility assumptions between protection designations and renewable energy potential

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Background

- Climate change mitigation requires transboundary strategies for the expansion of renewable energies (RE) that are compatible with nature conservation objectives.
- However, there are multiple associated uncertainties:
  - lack of consistency between protected areas (PAs) designations
  - different local potential impacts of RE projects and different compliance levels of stakeholders
- **We propose a methodology to harmonization of protection constraints assumptions for strategic planning of RE production.**

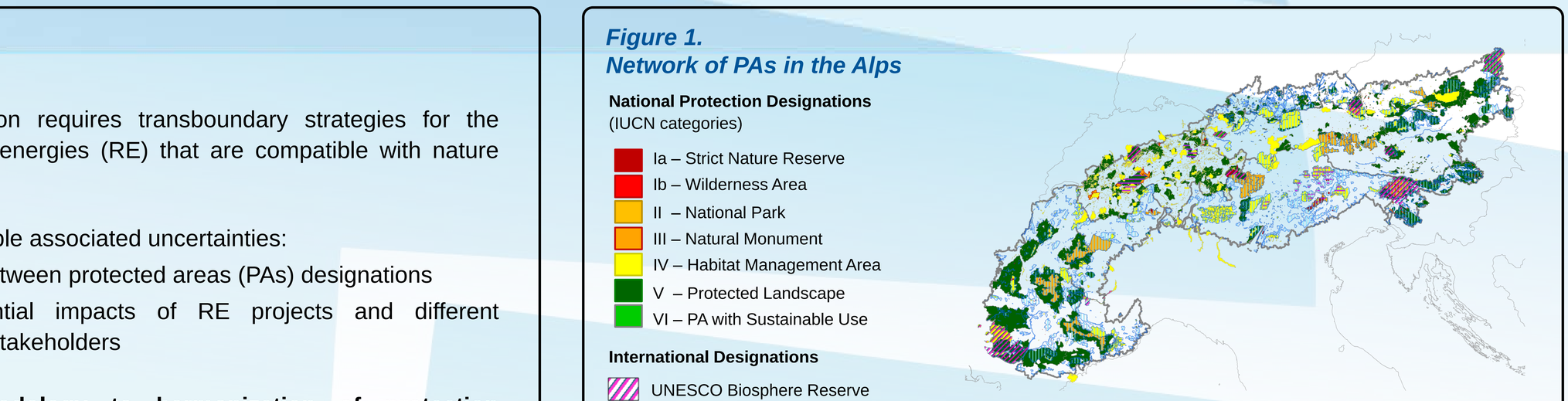
Methodology

- used the International Union for Conservation of Nature's (IUCN) System of Protected Areas (Dudley 2008).
- 3 scenarios with different compatibility levels for RE potentials assigned to the different PA classes and scenarios (Table 1).
- tested in the Alpine region for four different RE technologies: bioenergy, wind power, solar PV plants, and hydropower.
- spatial analysis using Geographic Information Systems (GIS).
- sustainable and economic potential for each RE technology determined by BeWhere (a techno-economic engineering model for RE systems).

Results

- considerable trade-offs between nature protection and the potential for RE production.
- available area and potential for RE production notably reduced by:
  - lower compatibility levels,
  - additional buffer restrictions to strictest PAs,
  - exclusion of Natura 2000 sites.

Figure 1.
Network of PAs in the Alps



Sources: adapted from EEA 2014, UNEP-WCMC 2014b, and SIG ALPARC 2013.

	% of potential RE production considered compatible		
	Reduced protection (Scenario 1)	**Medium protection** (Scenario 2)	**Increased protection** (Scenario 3)
IUCN Cat. I	0	0	0 + 5 km buffer: 20
IUCN Cat. II	Core area: 0 - 2,5 km zoning: 20	0	0 + 5 km buffer: 20
IUCN Cat. III	0	0	0 + 2.5 km buffer: 20
IUCN Cat. IV	Core area: 0 - 2,5 km zoning: 20	0	0
IUCN Cat. V	90	50	20
IUCN Cat. VI	50	30	10
Natura 2000	-	50	0
UNESCO World Heritage *	-	Core area *: 0 - development area: 50	Core area *: 0 - development area: 20
UNESCO Biosphere Reserve *	-	Core area *: 0 - development area: 50	Core area *: 0 - development area: 20

** Core area in UNESCO sites given by the overlaying stricter PAs.*

Table 1.
Proportion of potential RE production considered compatible with the management objectives and zoning of each protected area and scenario.

Scenario 1 – Reduced protection level | **Scenario 2 – Medium protection level** | **Scenario 3 – Increased protection level**

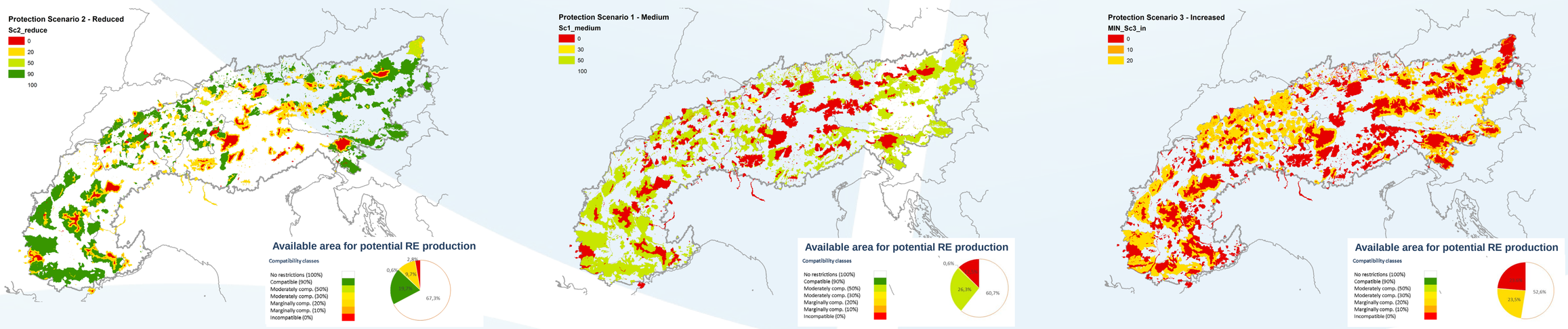
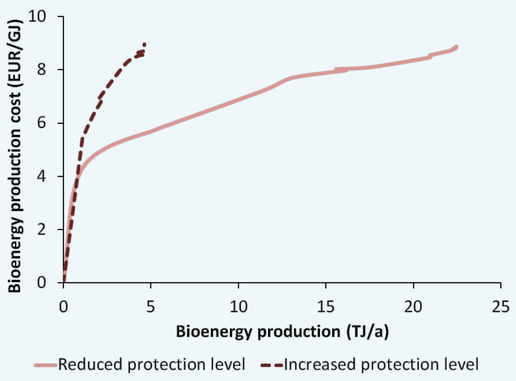


Figure 2. Protection constraints spatial analysis for the potential RE production considering reduced (left), medium (middle) and increased protection levels (right).

BeWhere results



Example of results from the BeWhere model on the production cost and bioenergy potential for two environmental protection levels.

Conclusions

- Realistic approach to evaluate protection constraints on RE potential calculations.
- Different protection scenarios address the multiple uncertainties regarding compatibility assumptions.
- Methodology independent from national and regional PA designations.
- Coherent basis for improving strategic RE planning across national boundaries.

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