Spatial optimization for land use sustainability—
a case for renewable energy

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Project Aim

To identify the potential and cost of production of renewable energy (RE) in the Alps in regards with the protection of the ecosystems services (ESS)
Background

- **Alpine Convention’s Energy Protocol:** Alpine region to make a long-term contribution to meeting Europe’s energy needs (EC 2005, p. 37)
- **Concern:** ESS often compete with RE for productive sites ⇒ important tradeoffs to be analyzed to maintain ES functions and services under increasing RE demand and other pressures.
- **Contributions:**
  - Detailed spatial analysis of renewable energy solutions and tradeoffs in multifunctional landscapes
  - Determining the cost-optimal location of RE plants under **sustainability criteria** at different scales
  - Support decision-makers in forming strategies offering robustness across uncertainties
The BeWhere Umbrella

- Forest resources
- Crop residuals
- Biofuel
- Heat
- Biochar
- Fertilizers
- Biogas
- Power
- Power to liquid/gas
- Co-firing
- BECCS
- Geothermal
- Ecosystem services
- MSW
- Algae
- Solar
- Wind
- Hydro

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recharge green
IUCN Categories

International Union for Conservation of Nature

Legend

UNESCO WH + BR

UNESCO World Heritage

Natura 2000

Sources: combined from EEA - European Environment Agency, WDPA - World Database on Protected Areas, and ALPARC.
Harmonized Protected Areas

Scenario 1 – Production restrictions

- High protection
- Medium protection
- Low protection
Marginal protection cost

Graph showing the relationship between the share of biomass in protected areas and the marginal protection cost.

- **Marginal protection cost (EUR/kWh)**
- **Share of biomass in protected areas**

Legend:
- 10 PJ - high
- 10 PJ - Medium
- 10 PJ - Low
- 10 PJ - None
- 12 PJ - high
- 12 PJ - Medium
- 12 PJ - Low
- 12 PJ - None
- 14 PJ - high
- 14 PJ - Medium
- 14 PJ - Low
- 14 PJ - None
Conclusion

- Renewables support to meet has the potential to worsen the trade-offs with respect to biodiversity conservation goals.
- Supporting renewables without taking into account their impact on other policy goals raises the cost of achieving other policy target.
- Other trade-off (e.g. presence of top down policy instruments) can be considered by this approach due to its flexibility.
The tool

http://www.jecami.eu/
Thank you!

More information on IIASA

www.iiasa.ac.at

More on BeWhere

www.iiasa.ac.at/bewhere

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