

Optimizing renewable energy systems in the Alpine space – balancing production and protection

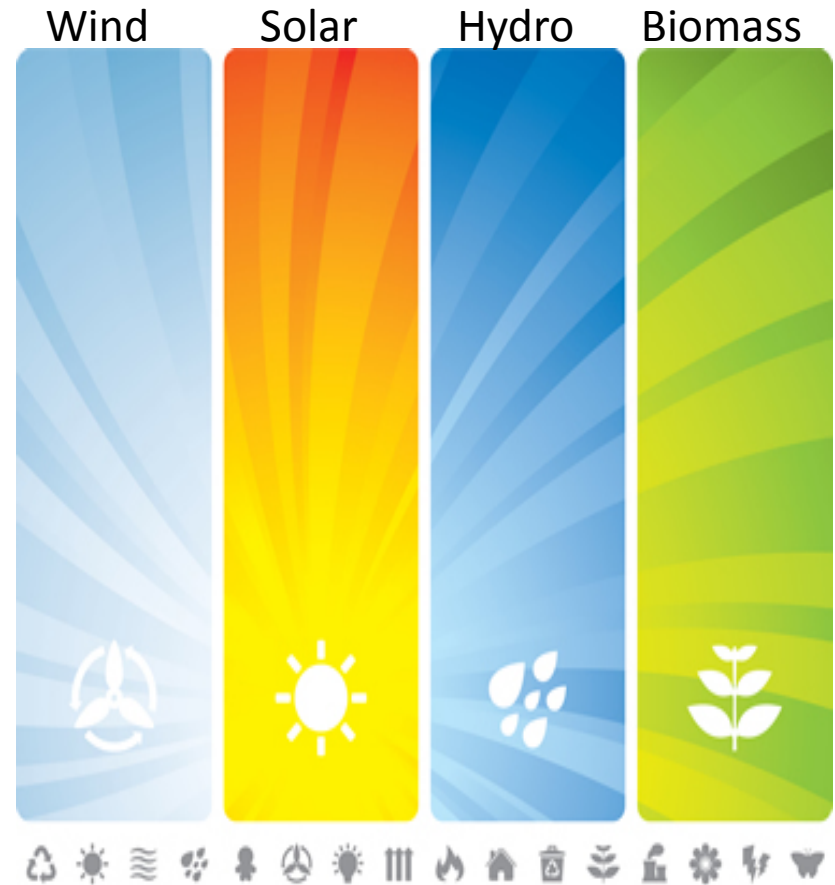
**International final conference
of the recharge.green project
20-21 May 2015, Sonthofen, Germany**

Florian Kraxner, Sylvain Leduc, Hernán
Serrano León, Giulia Garegnani,
Chris Walzer, and many more...

Optimal decision?

An optimal decision is a decision such that no other available decision options will lead to a better outcome.

It is an important concept in decision theory.



OPTIMIZATION

recharge  green

Conventional
Energy

Tourism

Biodiversity

Structure

Transport

Costs

Renewable
Energy

Farmer

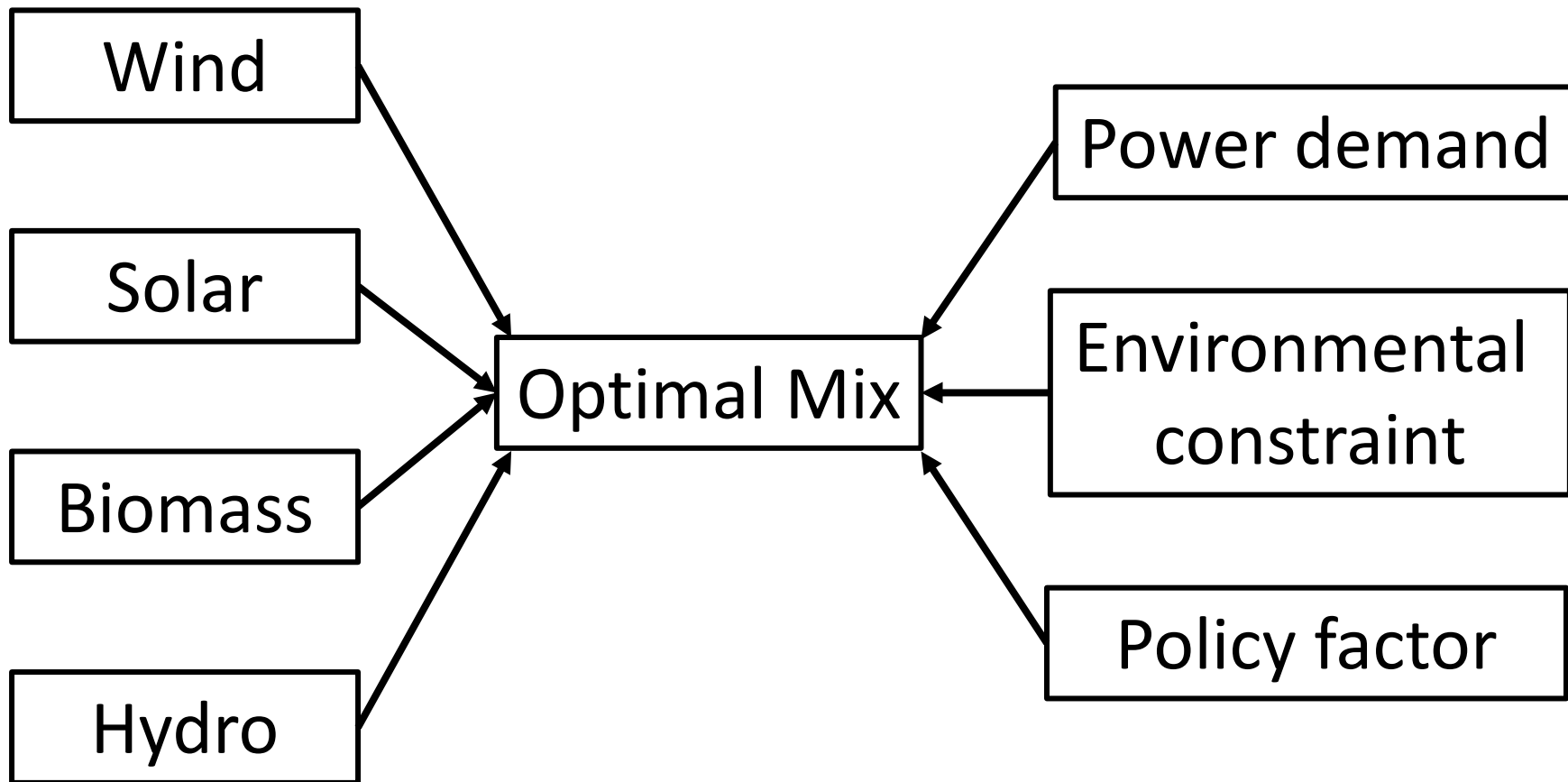
Forestry

Environment

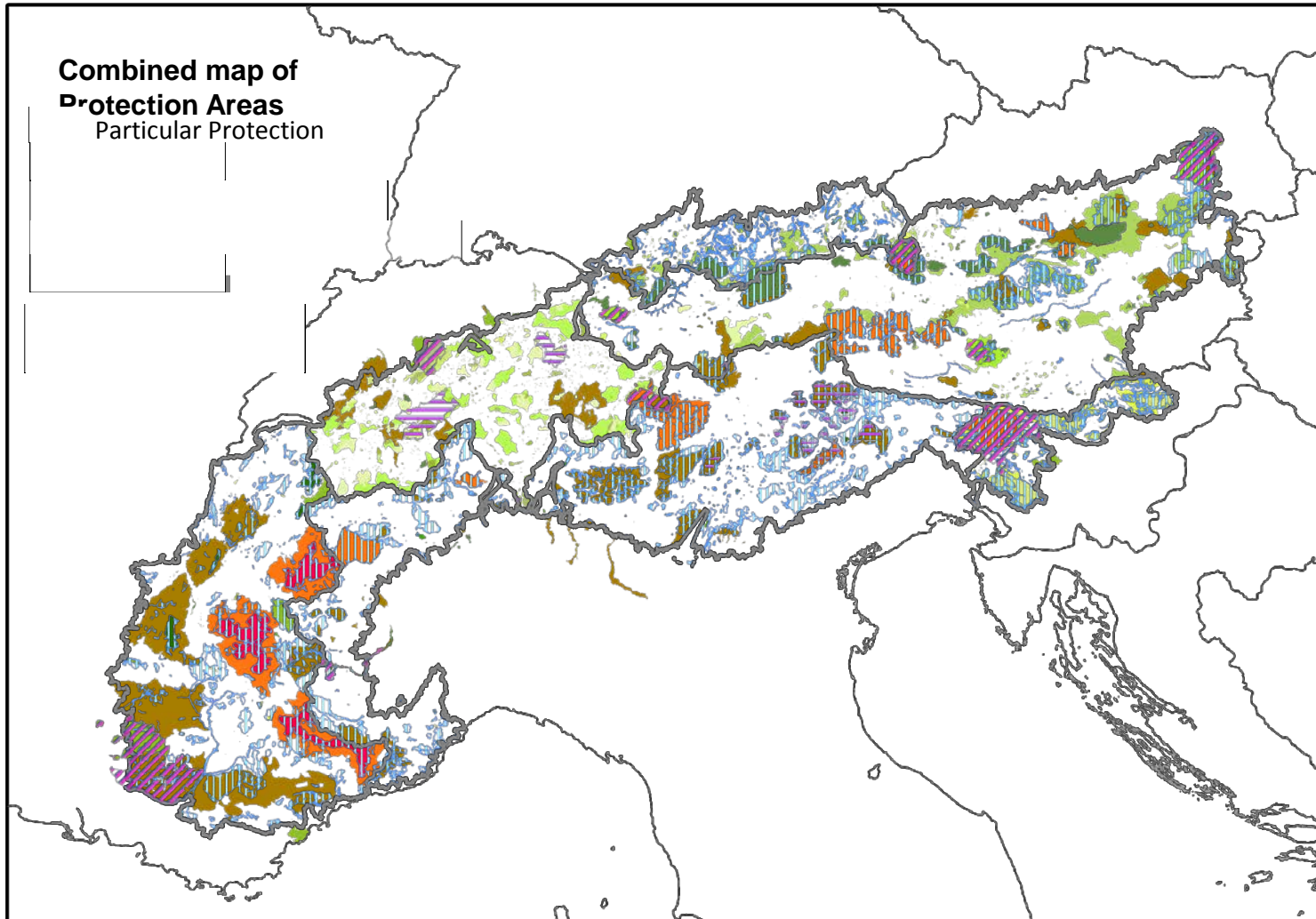


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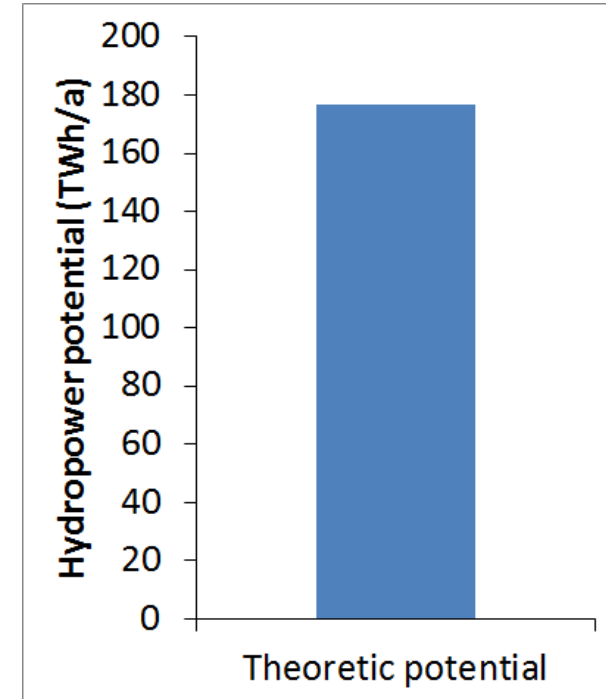
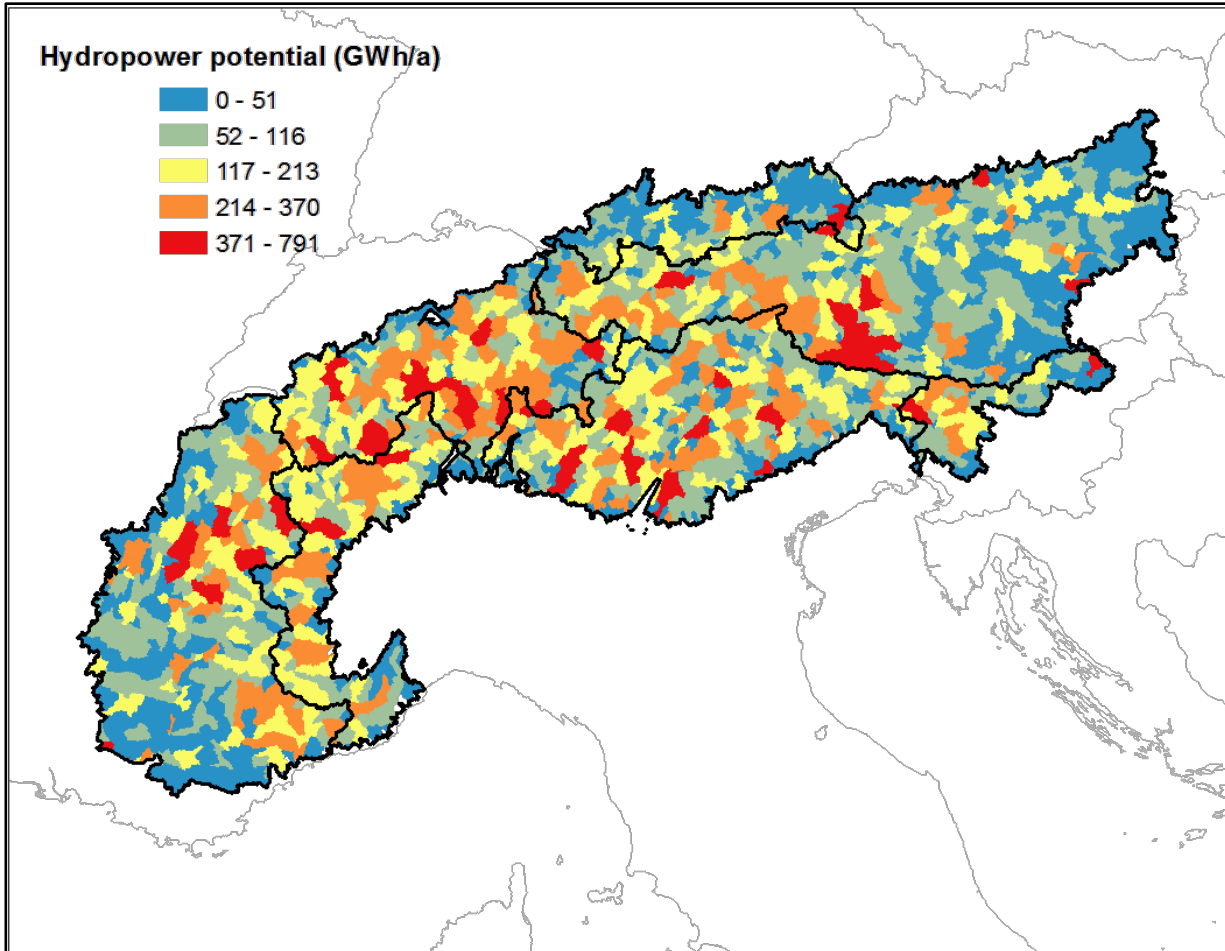
The optimal renewable energy mix recharge:green



Protected areas

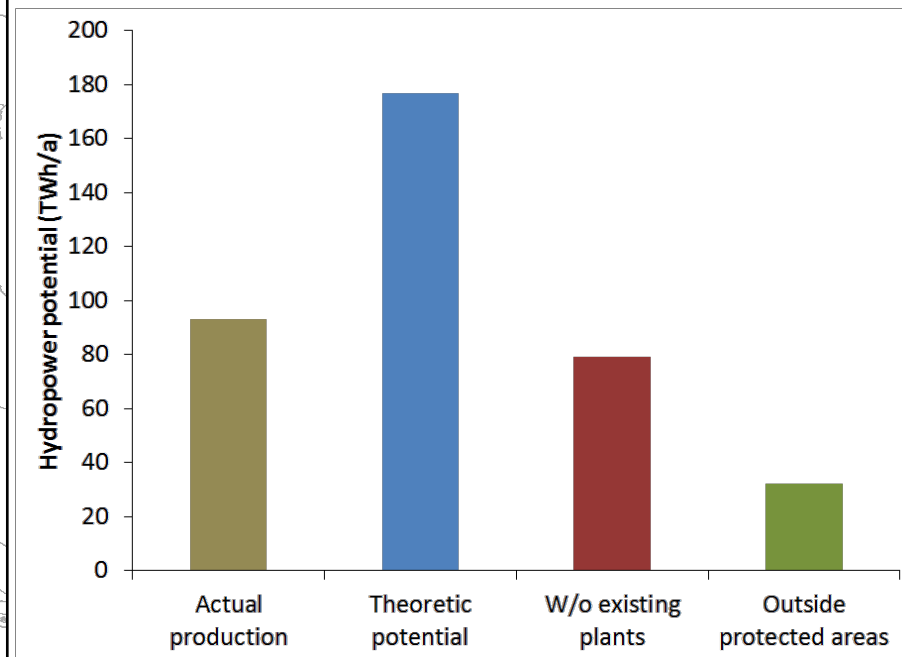
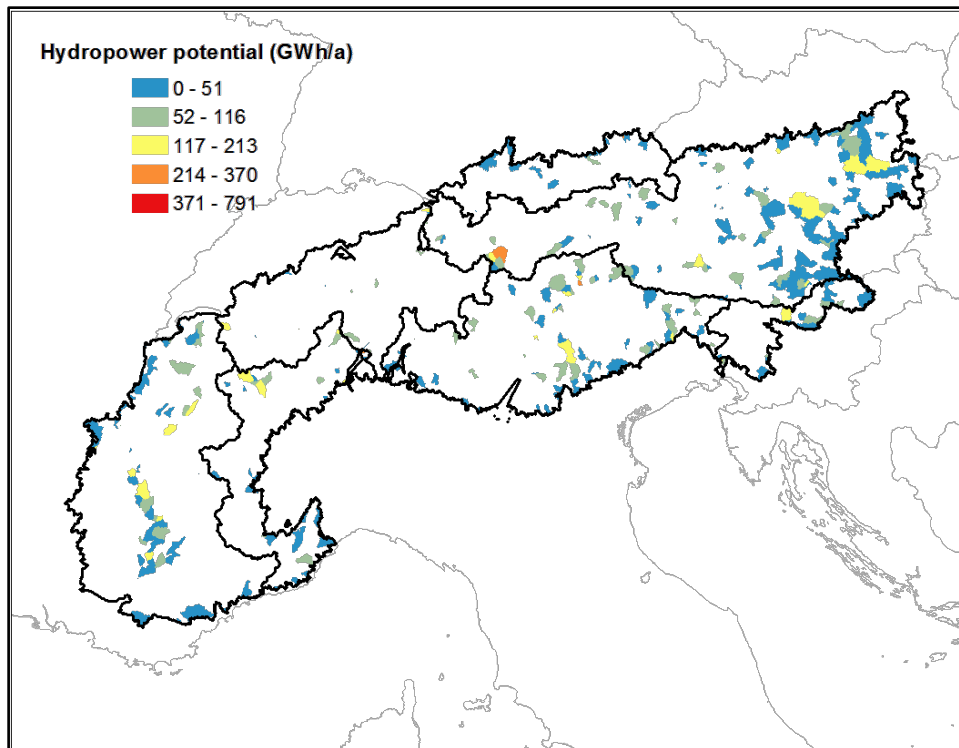


Theoretical potential by catchment



Source: Garegnani et al., 2015

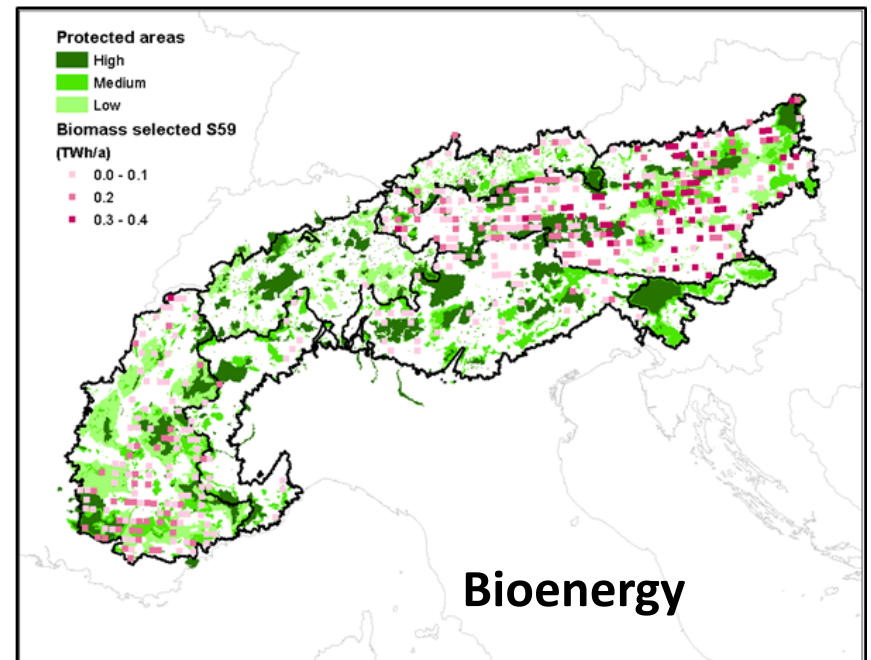
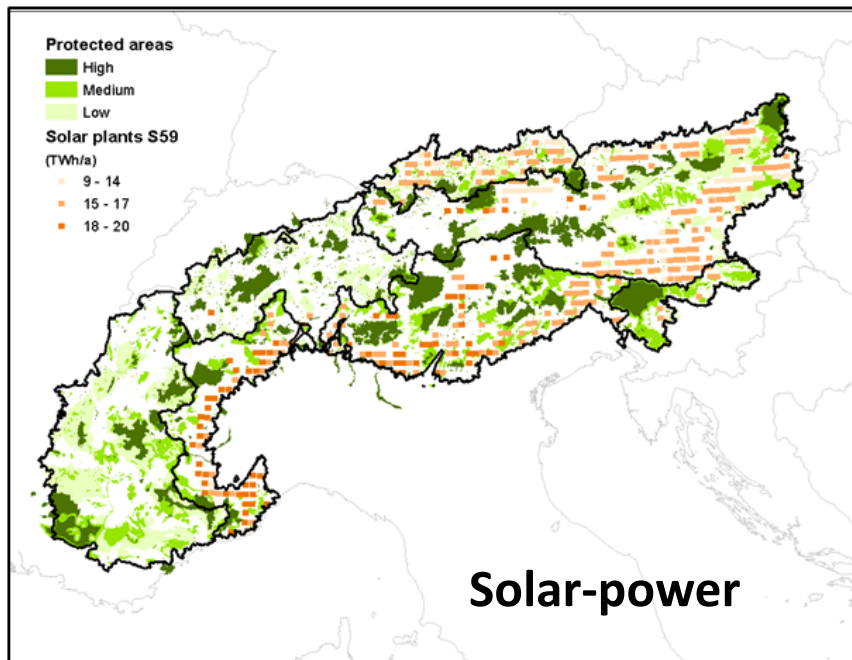
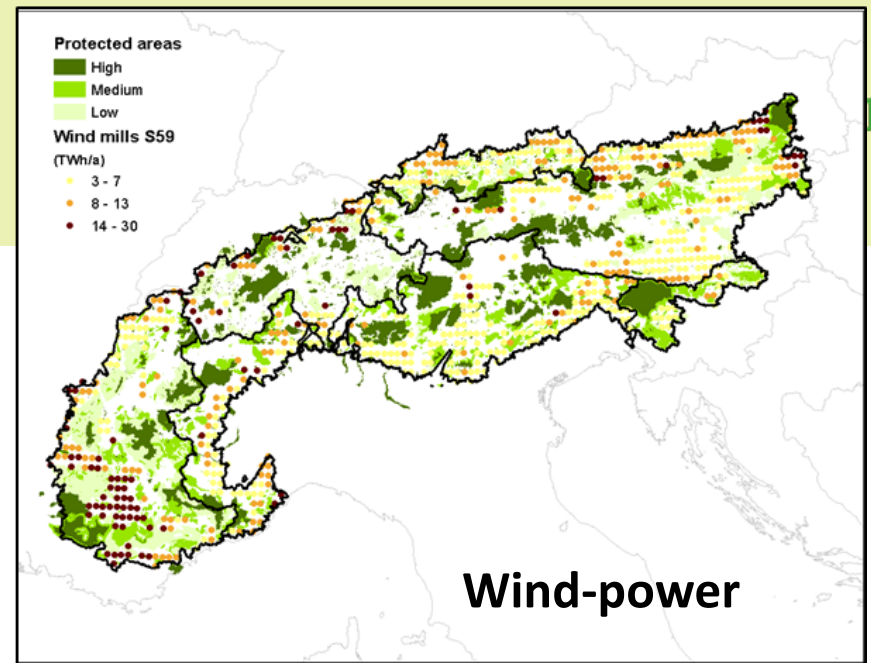
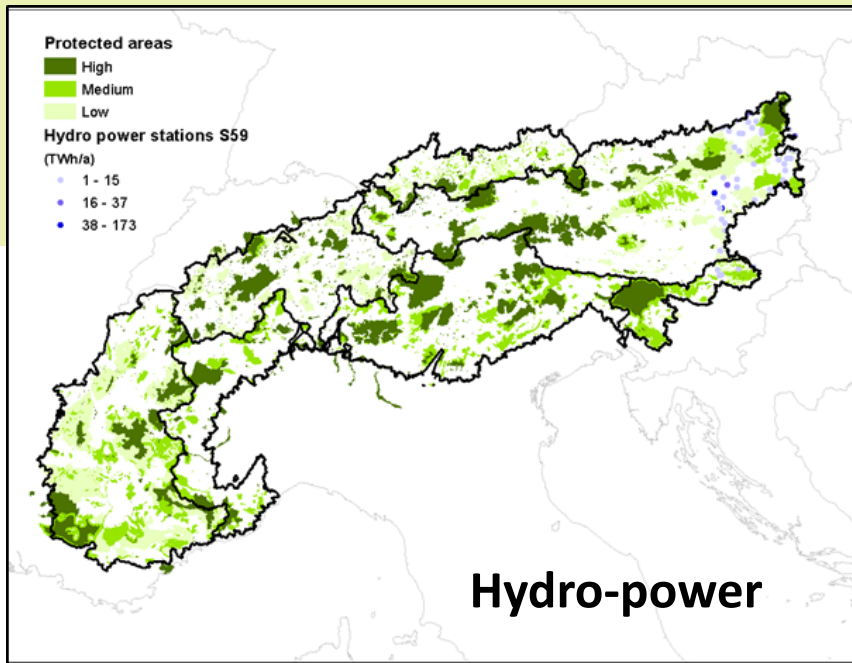
Environmental potential



Source: IIASA, 2015

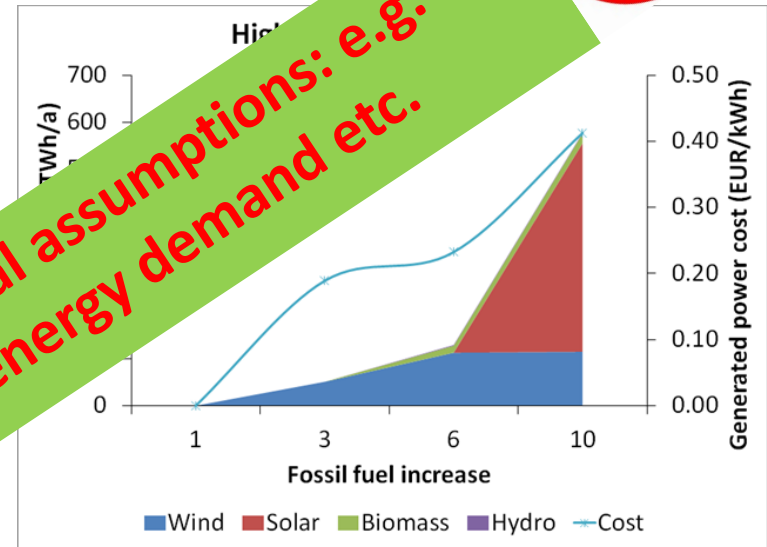
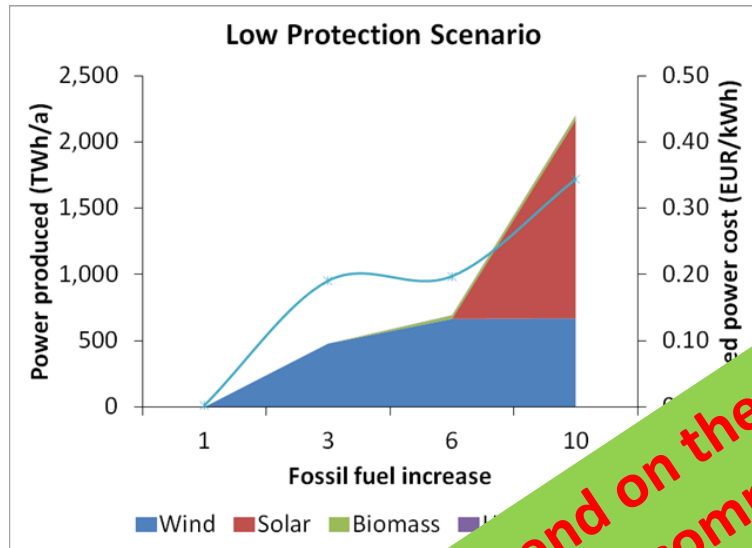
High theoretical potential - ~ 180 TWh → Technical potential ~ 30-80 TWh

Business as usual scenario under environmental constraints (Environmental Potential):
→ increase capacity by about **10% !!** (on average over the Alpine Space)



Cost-optimal energy mix

recharge green



All results depend on the individual assumptions: e.g. protection, elevation, competition, energy demand etc.

- Mainly dominated by **wind** and **wind** technology.
- In addition by **accessibility**, and **other local factors** such as specific policies.
- Power production **increases about 4x** when applying a **high protection level**.
- About **4 x more RE** can be produced **under low protection** level at the same costs.



JECAMI – Low protection

Bioenergy Windpower Hydropower Solar PV All technologies

Step 2. Choose the fossil fuel cost (increase):



Step 3. Choose the carbon cost (€/tCO2):



Step 4. Choose the environmental protection level:



Calculate results

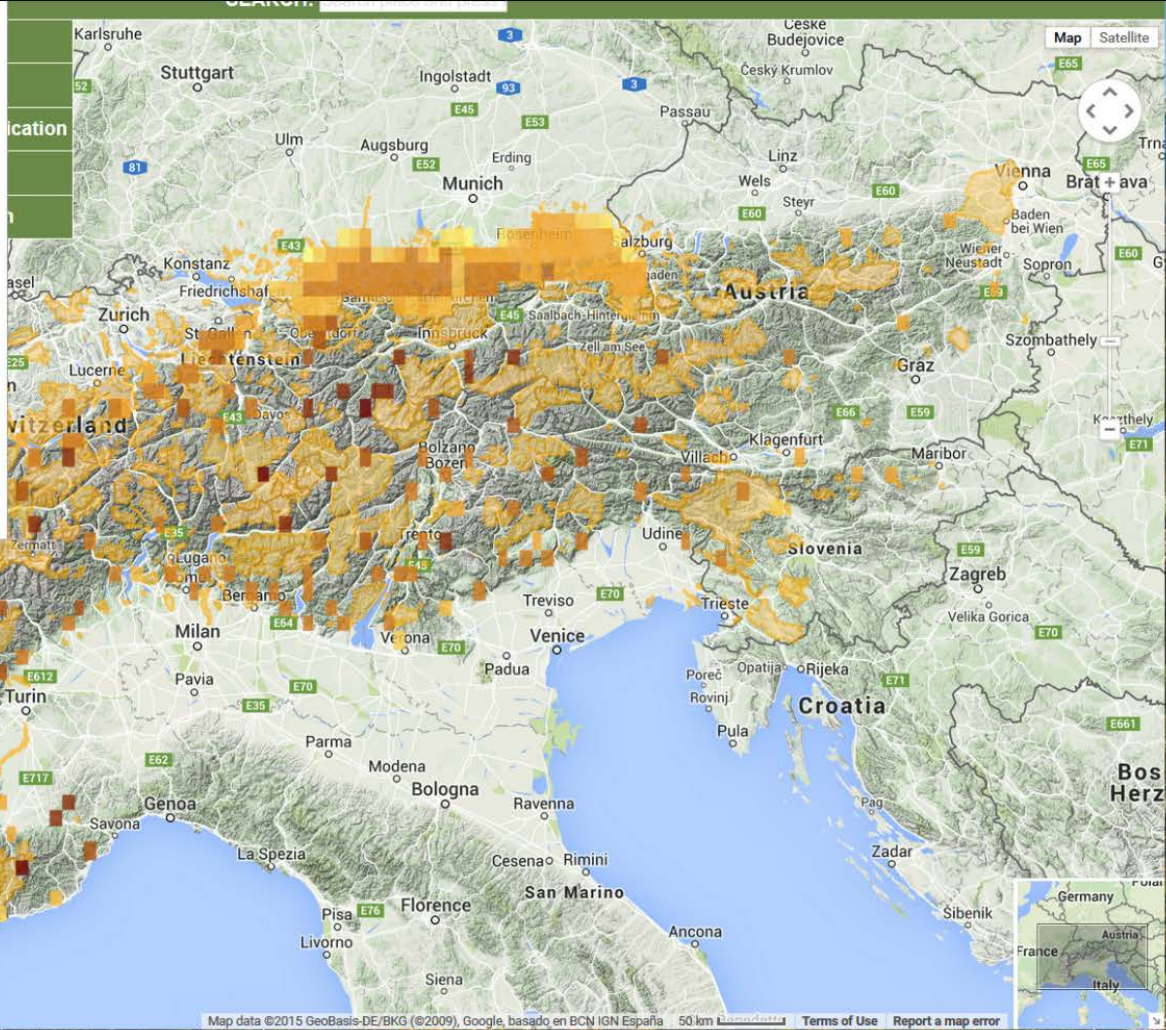
Results:

Power Potential: 78.88 TWh/a

Power Cost: 8.34 EUR/kWh

Avoided Emissions: 15.84 MtCO2/a

Scenario: S17



Thank You!

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www.recharge-green.eu

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