GEOBENE

Geographical-Economical Profits of Solar Energy with Remote Sensing Data

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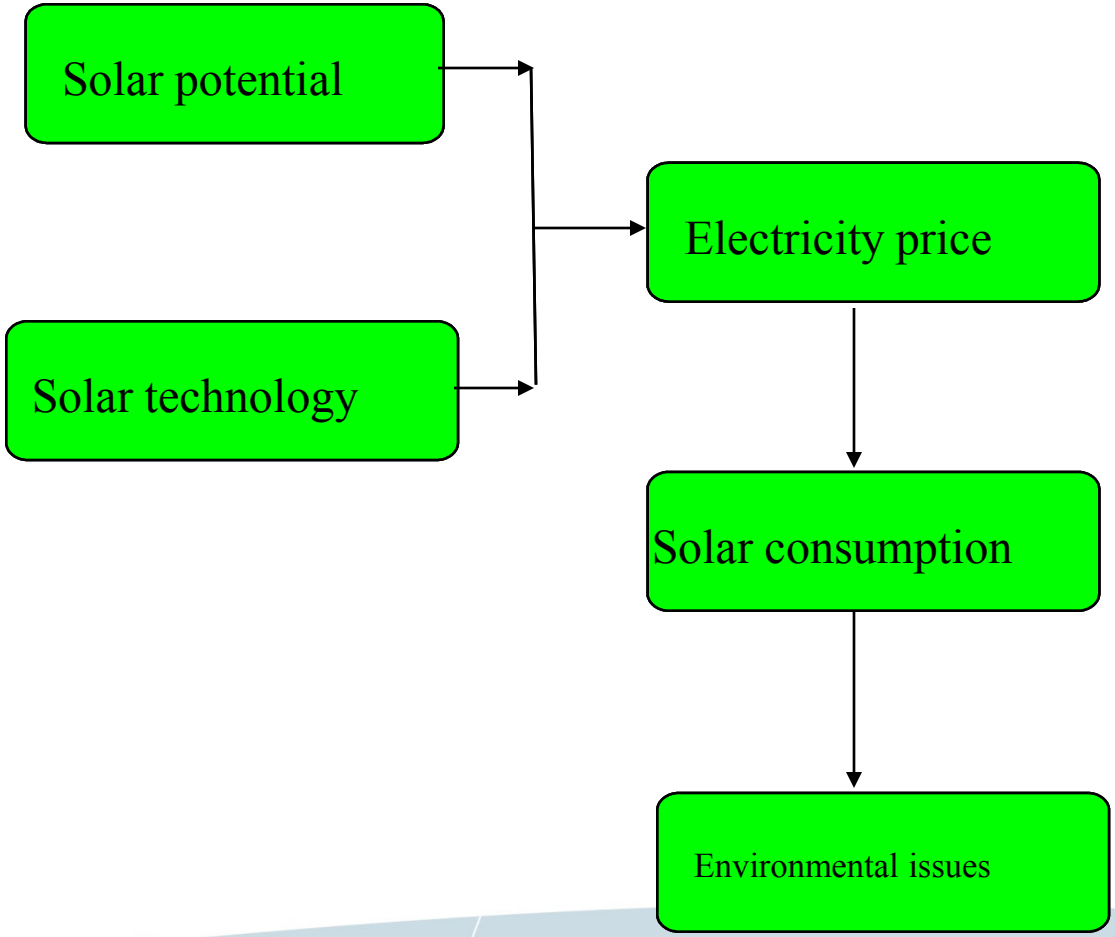
Outline

- Issues concerning the electricity price
- BEWHERE model
- Advantages of remote sensing data
- Couplings of energy models with remote sensing
- Solar potential with remote sensing data
- Results

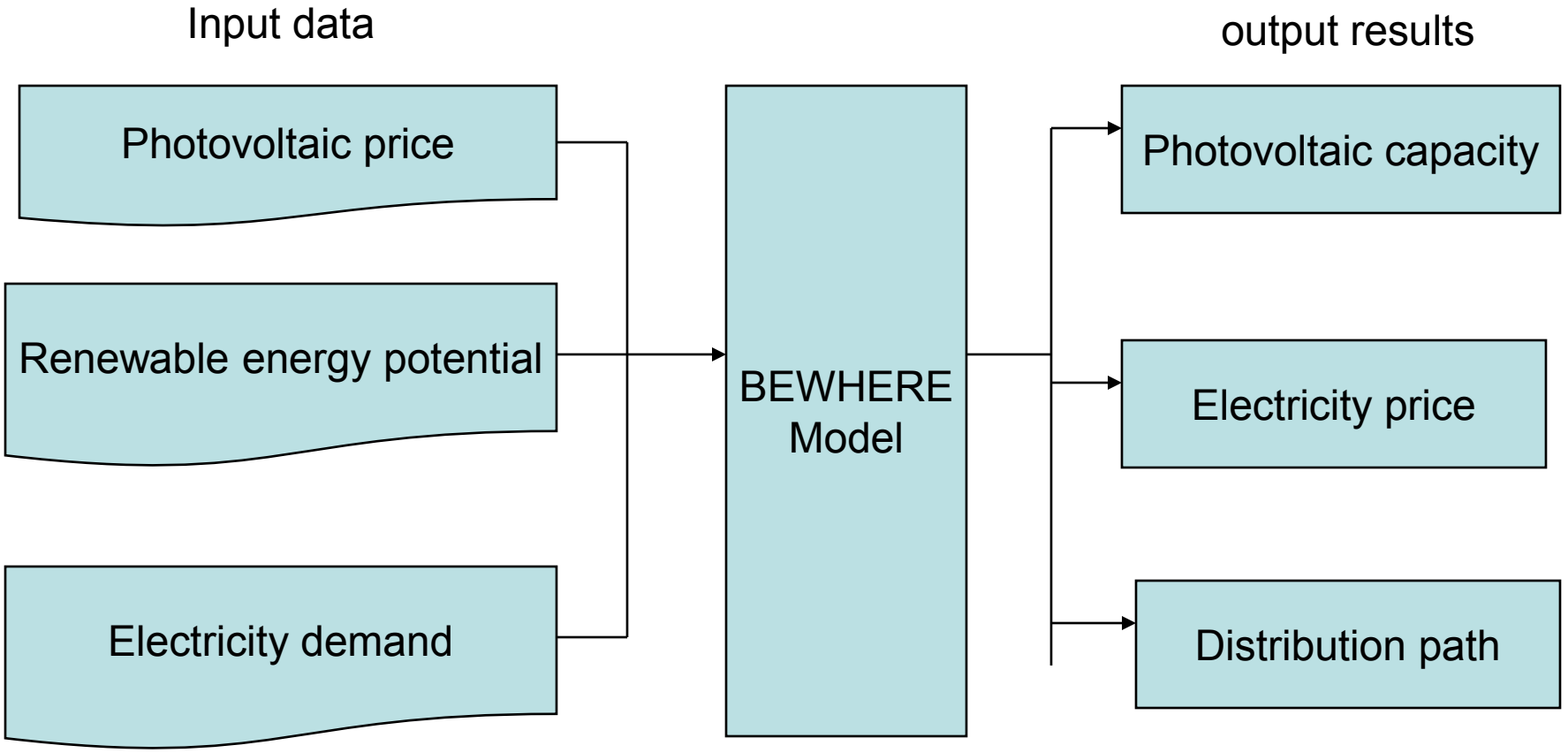
Issues concerning the electricity price



BEWHERE Model

- General equilibrium energy model (demand-supply theory)
- Complete competition
- Technology-based model

BEWHERE Model (con.)



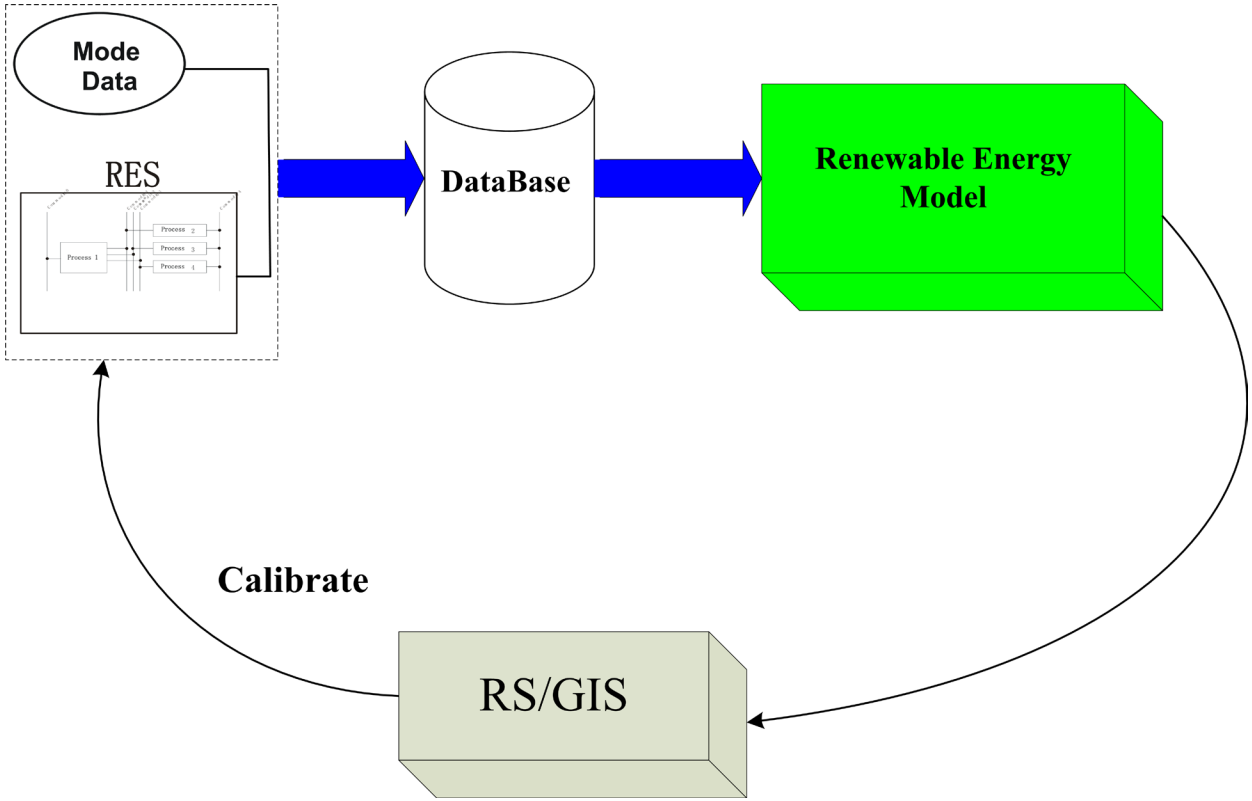
Flow of BEWHERE Model

Advantages of remote sensing data

- labor-reduced
- quick
- simultaneous

Couplings of renewable energy models with remote sensing

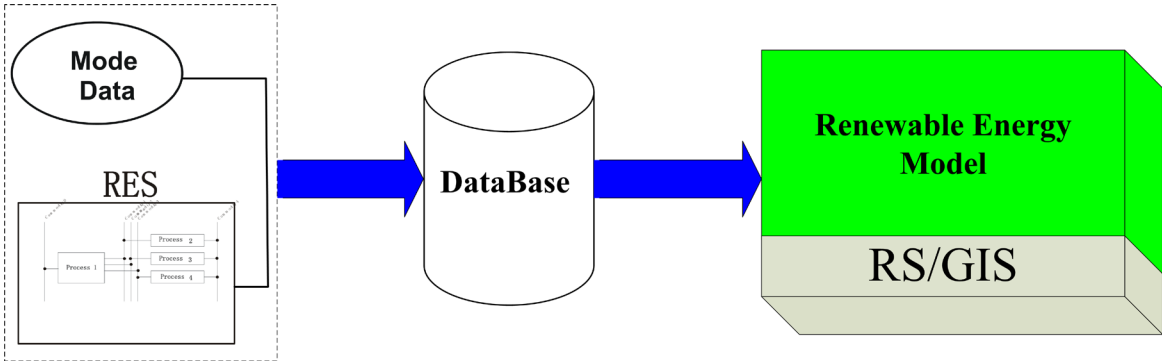
1. Loose coupling



Source: Wang *et al.* 2009

Couplings of renewable energy models with remote sensing (con.)

- 2.Tight coupling



Source: Wang *et al.* 2009

Couplings of renewable energy models with remote sensing (con.)

3. Mixed coupling (wang *et al.* 2009)

- takes good use of the merits of both preceding couplings.

- Before running the model, RS spatial operator, such as spatial overlay, are first used to reduce the impossible model result.

Couplings of renewable energy models with remote sensing (con.)

4. Comparison of three couplings

Loose coupling	Tight coupling	Mixed coupling
flexible	Highly efficient	intermediate
Easy to implement and improve	Ensure data consistency	Ensure data consistency

Solar potential with remote sensing data

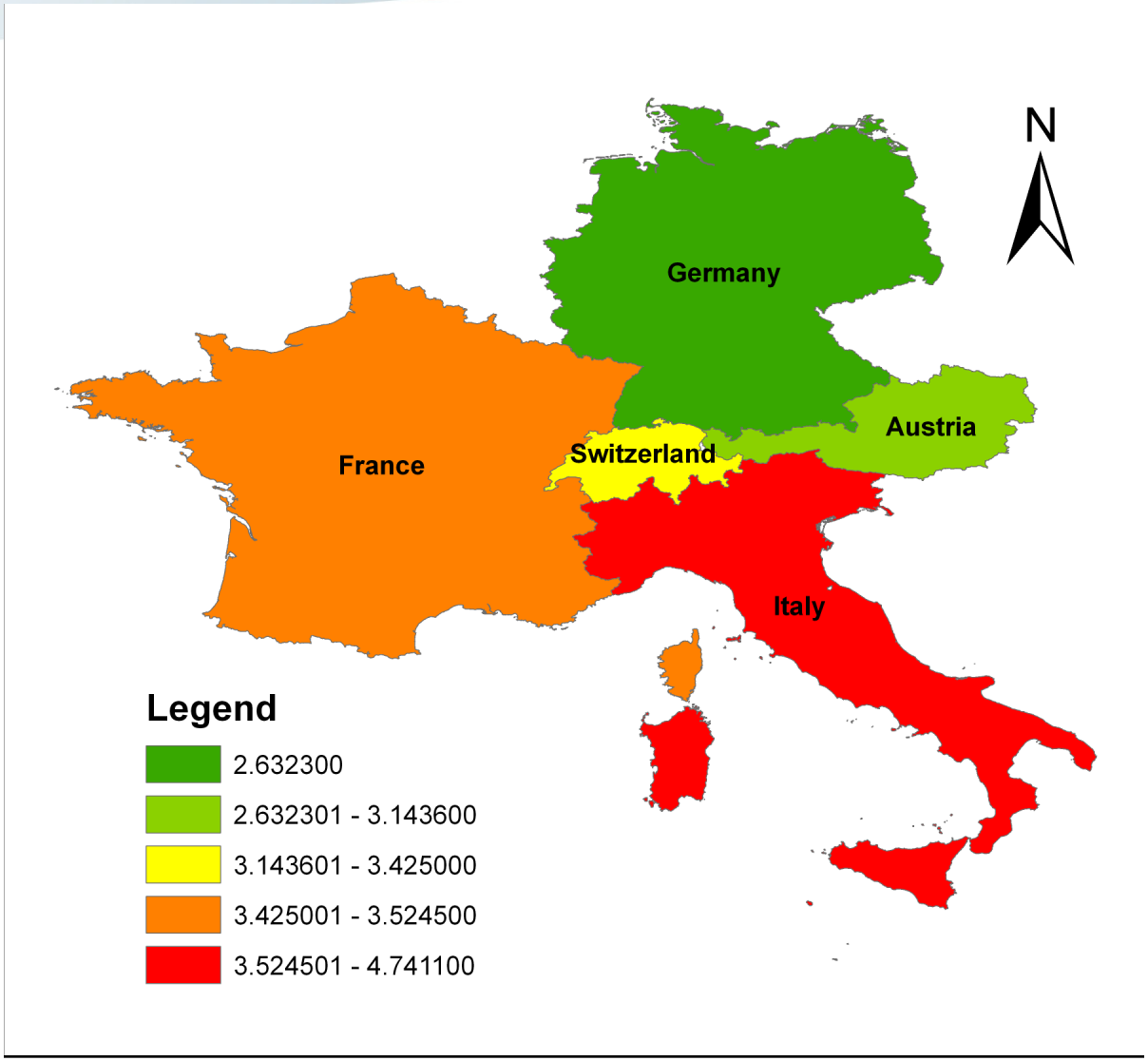
- Equation

$$G_i = 10^3 * I_i * h * A_i$$

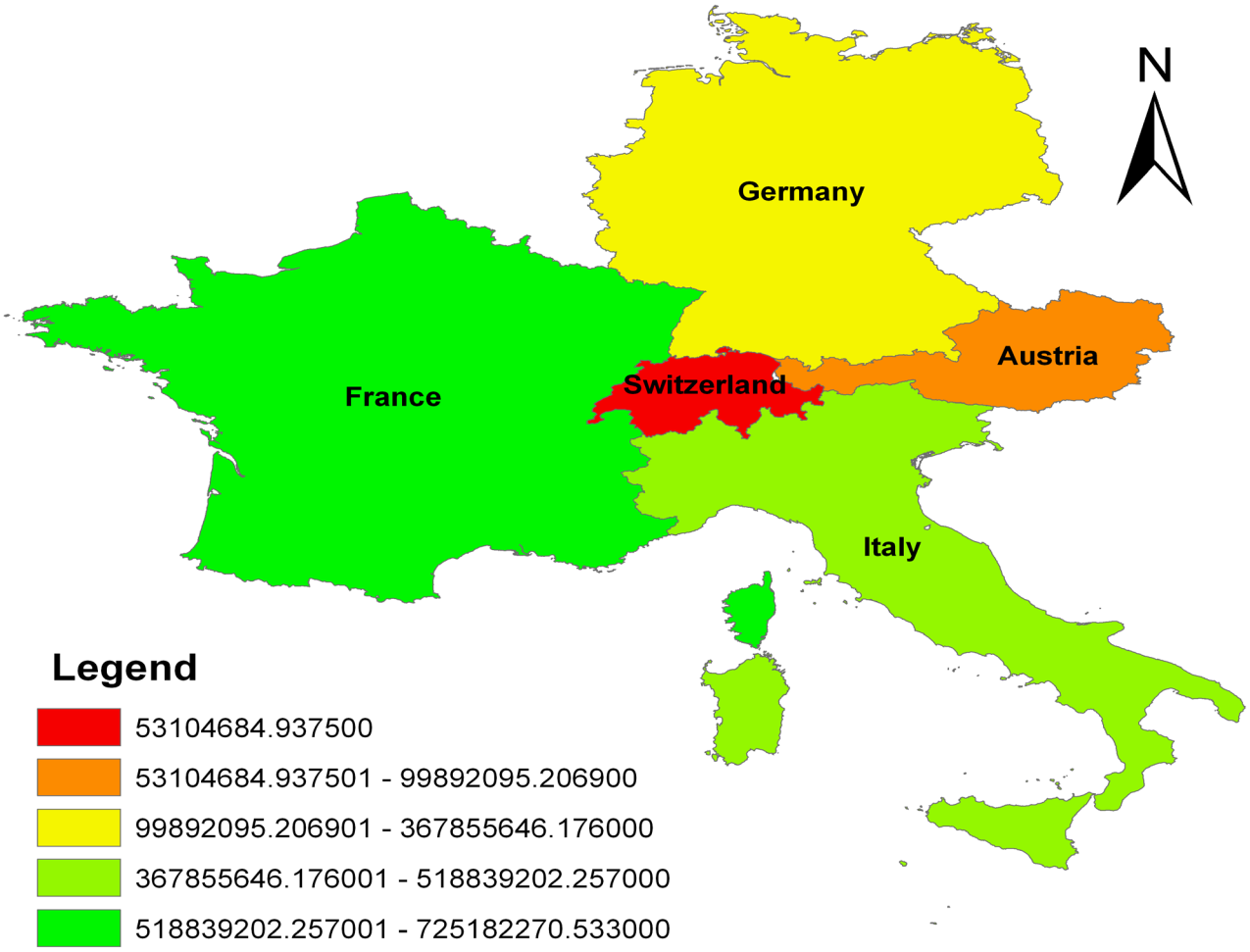
- Where G is the geographical solar potential, *I* is the time-averaged irradiance (W / m^2), h = 8,760 hours / year. A is the available area (km^2).

- Available area A

- Land use



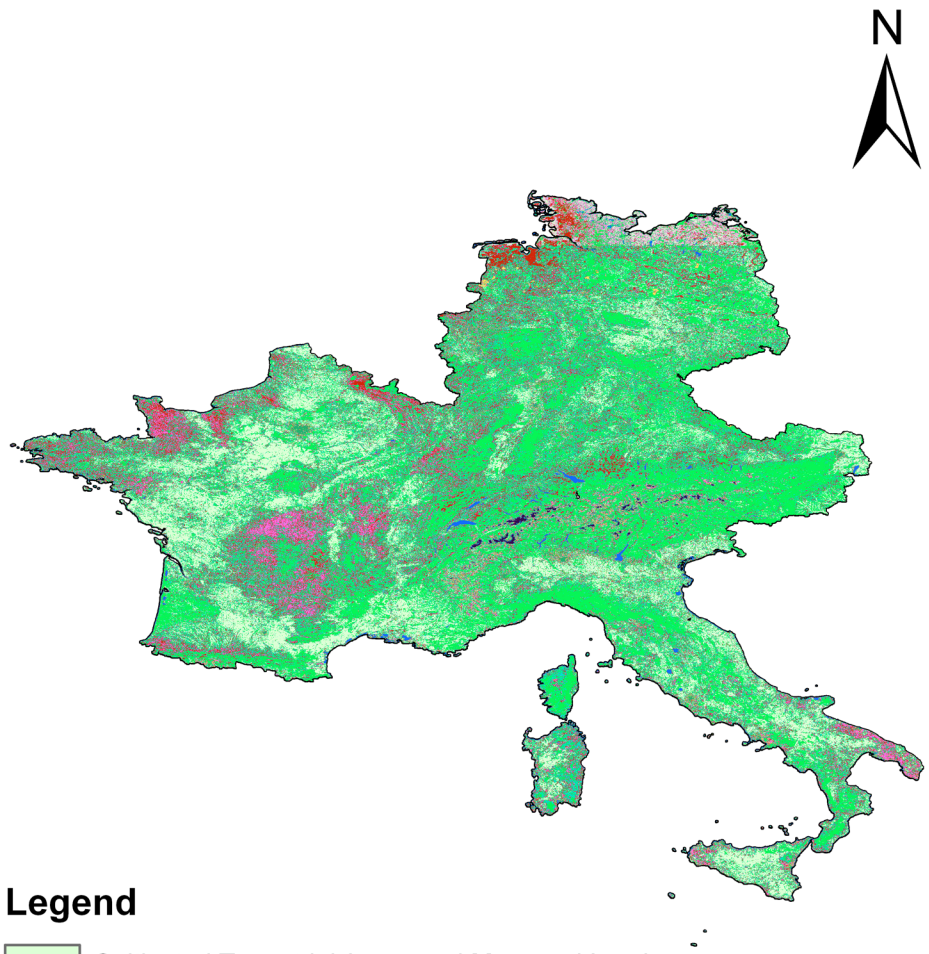
Solar irradiation distribution. Source: NASA 2009

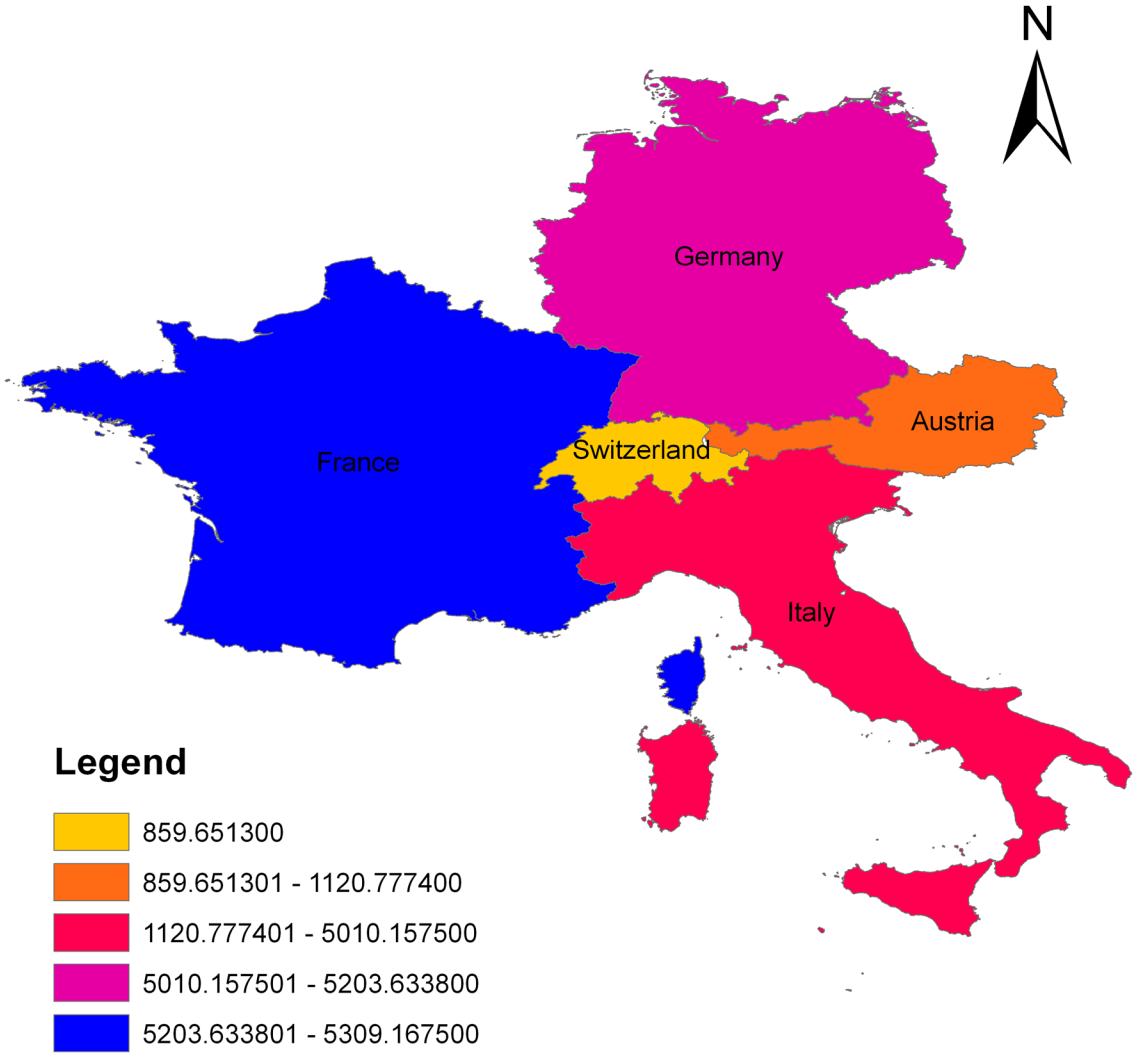


Theoretical solar potential (GWh/a)

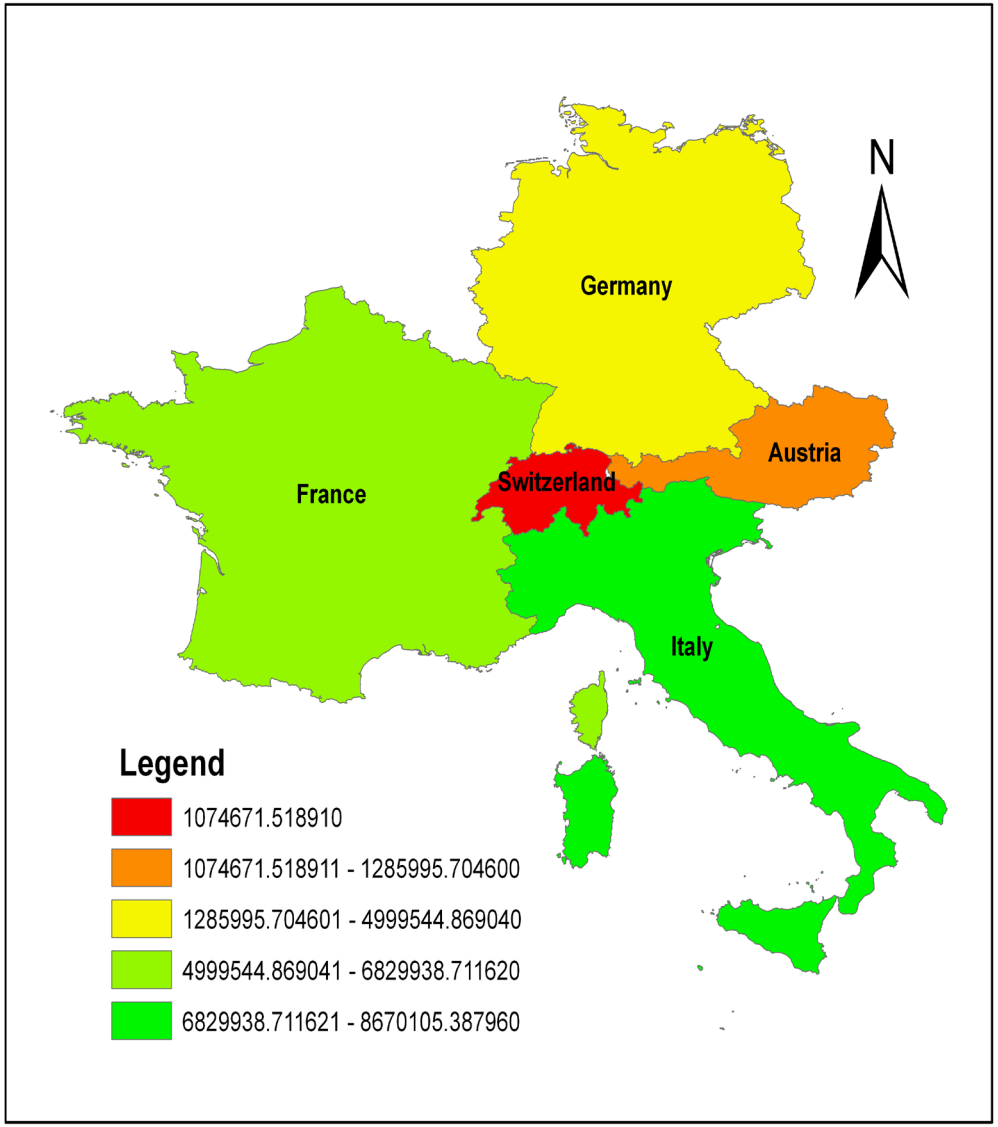
Landuse data

Source: ESA Globcover





Available Area (km^2)



Geographical solar potential (GWh/a)

scenarios

- Scenario 1:

theory solar potential is inputted and transportation can be conducted in each two countries.

- Scenario 2:

geographical solar potential is inputted and transportation can be conducted in each two countries.

- Scenario 3:

theory solar potential is inputted and transportation can be conducted in neighbor countries.

- Scenario 4:

geographical solar potential is inputted and transportation can be conducted in neighbor countries.

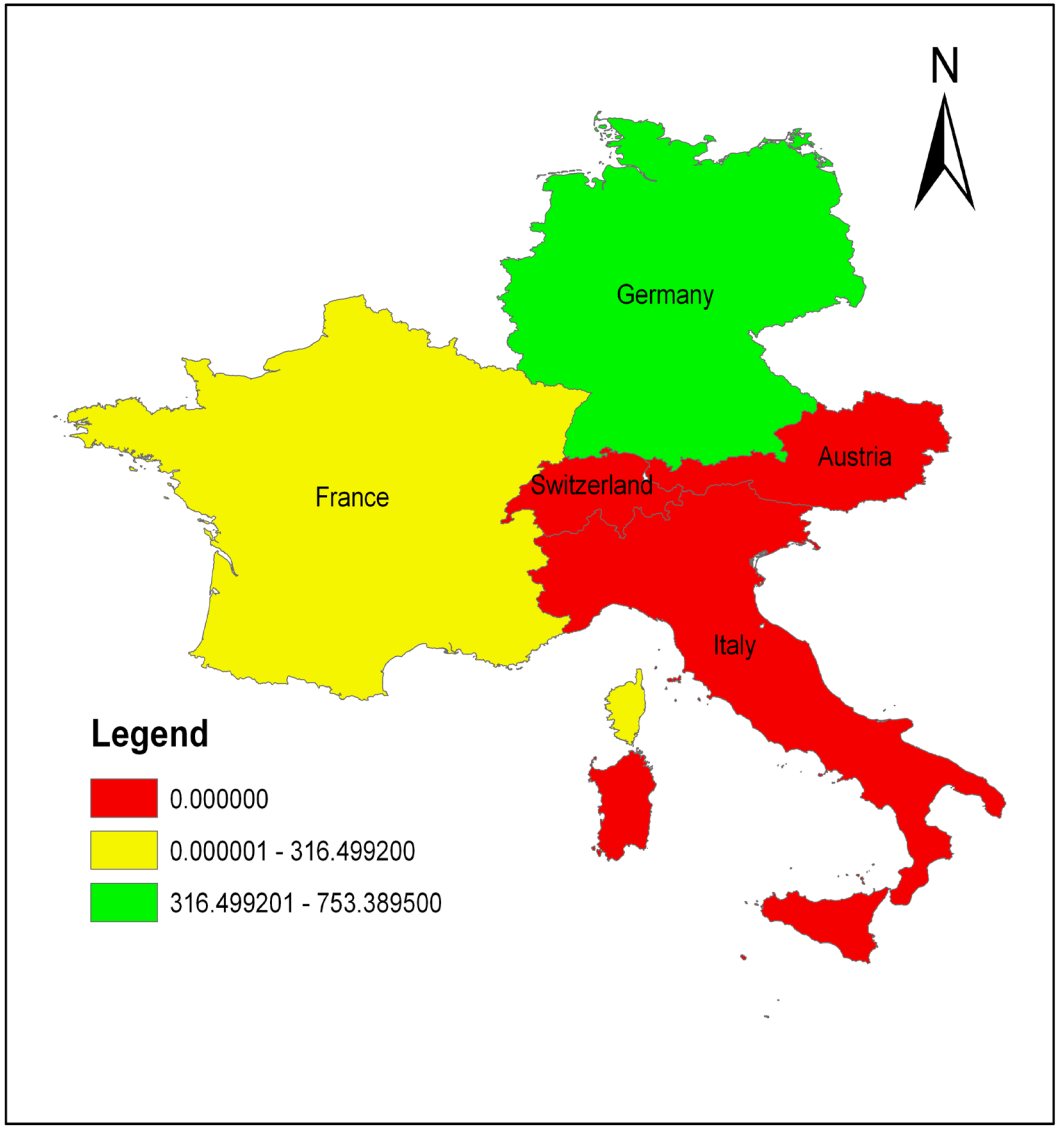
Scenarios (con.)

- Scenario 5:

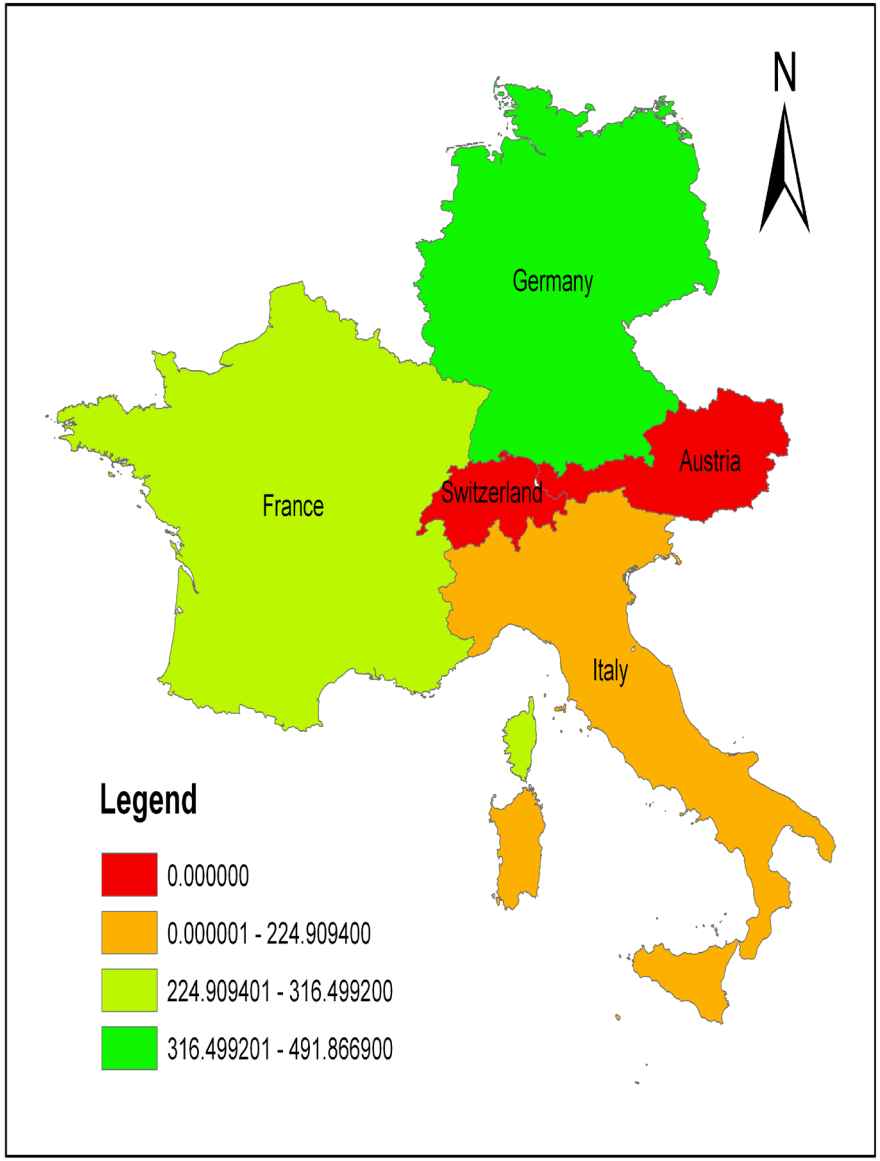
  geographical solar potential is inputted and transportation can be conducted in neighbor countries. There are past installed PV.

- Scenario 6

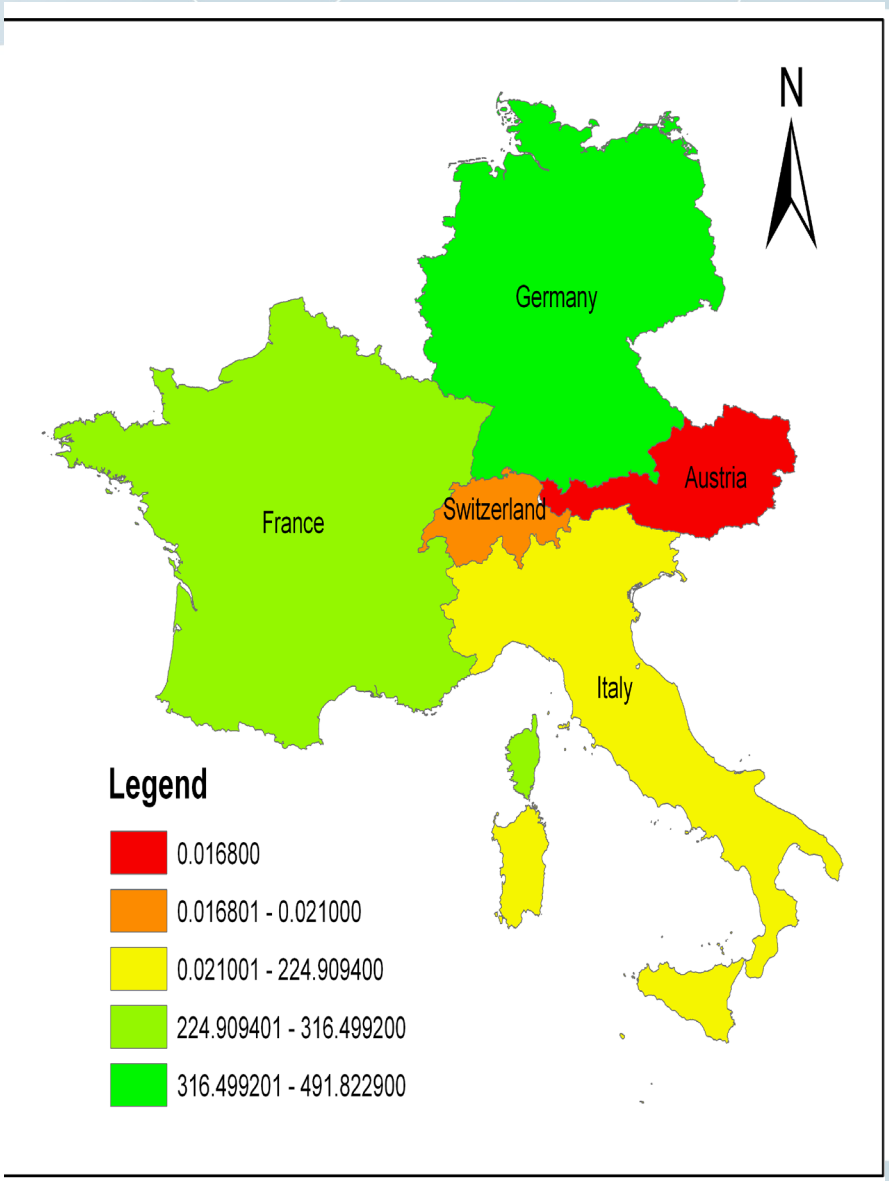
  random geographical solar potential is inputted and transportation can be conducted in neighbor countries.



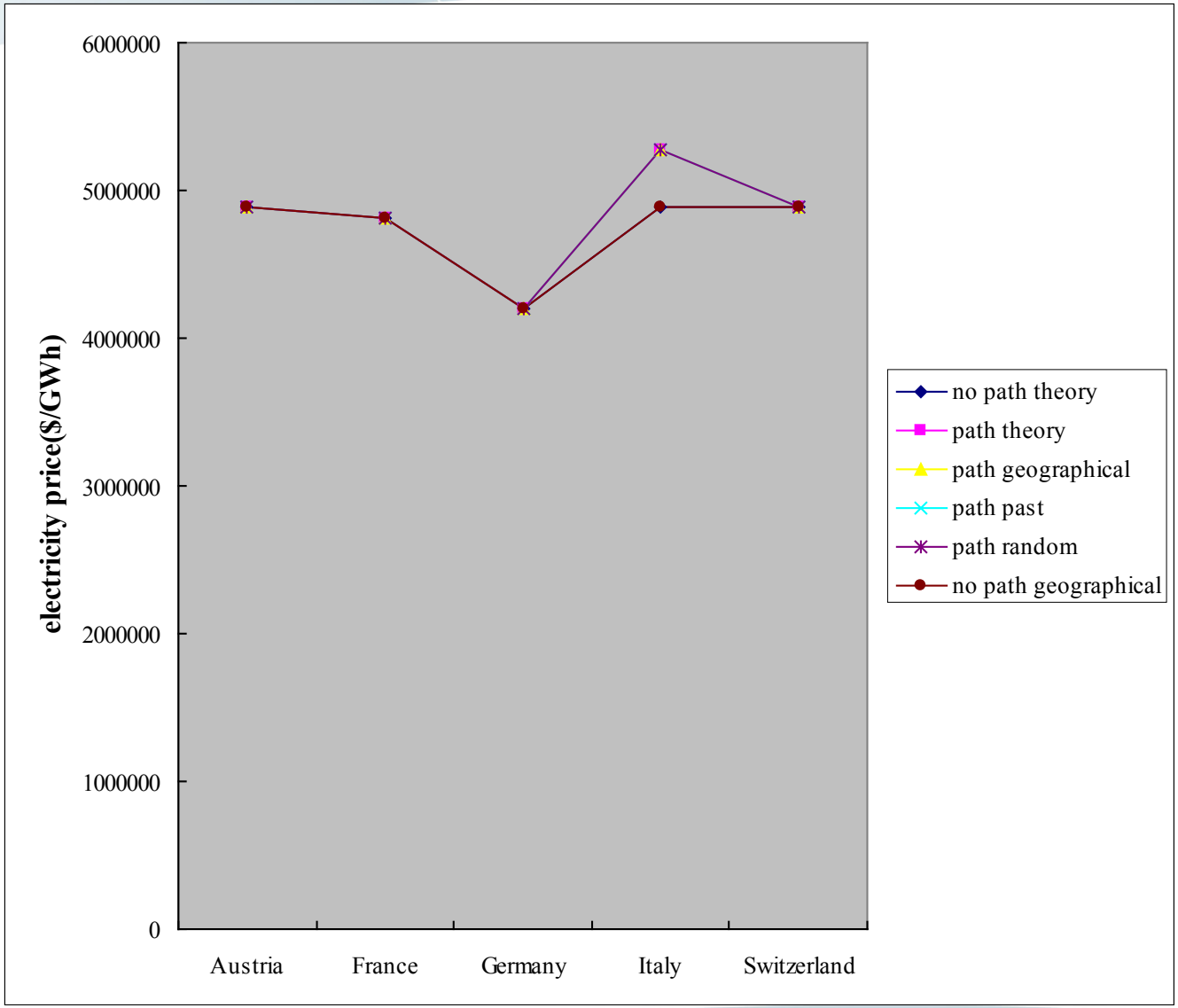
PV Capacity of Scenario 1 and 2 (unit: GW)



PV Capacity of Scenario 3, 4 and 6 (unit: GW)



PV Capacity of Scenario 5 result (Unit: GW)



Electricity price for 6 scenarios

Thank you for your attention!