

## Abstract

The European Union is committed to reach a 10% target for renewable energy in transport by the year 2020. Second generation biofuel is then of interest. But to be economically competitive with fossil fuel, second generation biofuel has to be produced in large production plants. Due to feedstock competition and long transport distances, the location of those plants is crucial.

To determine the location of bio-energy production plants, a techno-economic model, BeWhere, is applied. The model identifies the characteristics of the production plants with regard to various policies applied in Europe.

The results show that biofuel production plants would be set up at high biofuel support irrespective of the carbon cost. More CO<sub>2</sub> emissions would be substituted at a high carbon tax and low biofuel support, as combined heat and power is favored. This shows a potential conflict of interest between the EU targets of both increased use of biofuel and decreased CO<sub>2</sub> emissions.

## Objectives

Develop the BeWhere model for competition of wood in Europe to identify:

- Policy options to produce biofuel or combined heat and power (CHP)
- CO<sub>2</sub> emission savings from biofuel or CHP production
- Trades of biomass and biofuel within Europe

## BeWhere Europe

The BeWhere Europe model is a techno-economic, spatially explicit model, where Europe is divided into eight regions. Each region is divided into grid cells with a half-degree spatial resolution. The objective of the model is to minimize the cost of the entire supply chain to identify the geographical locations of bio-energy production plants.

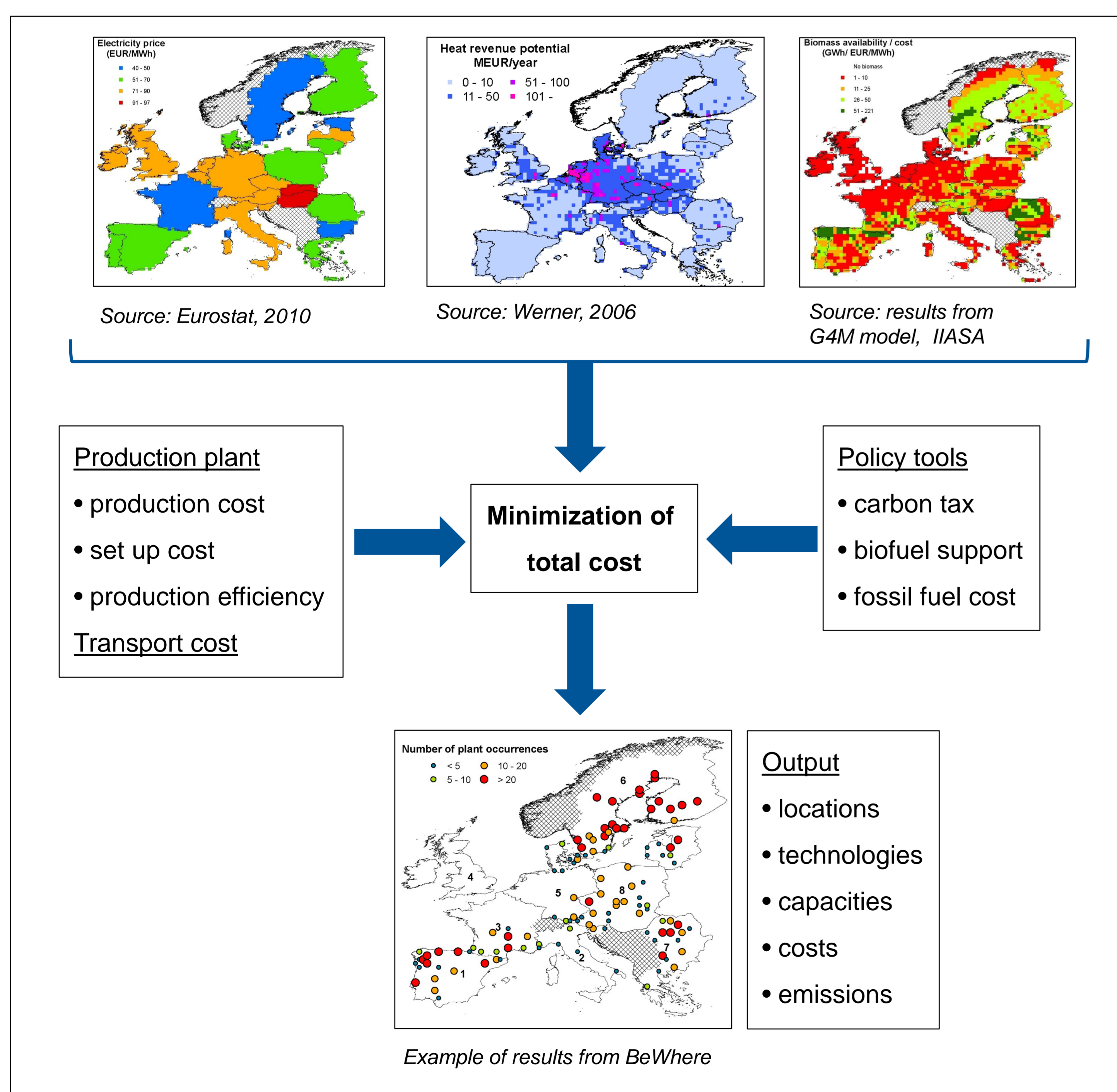
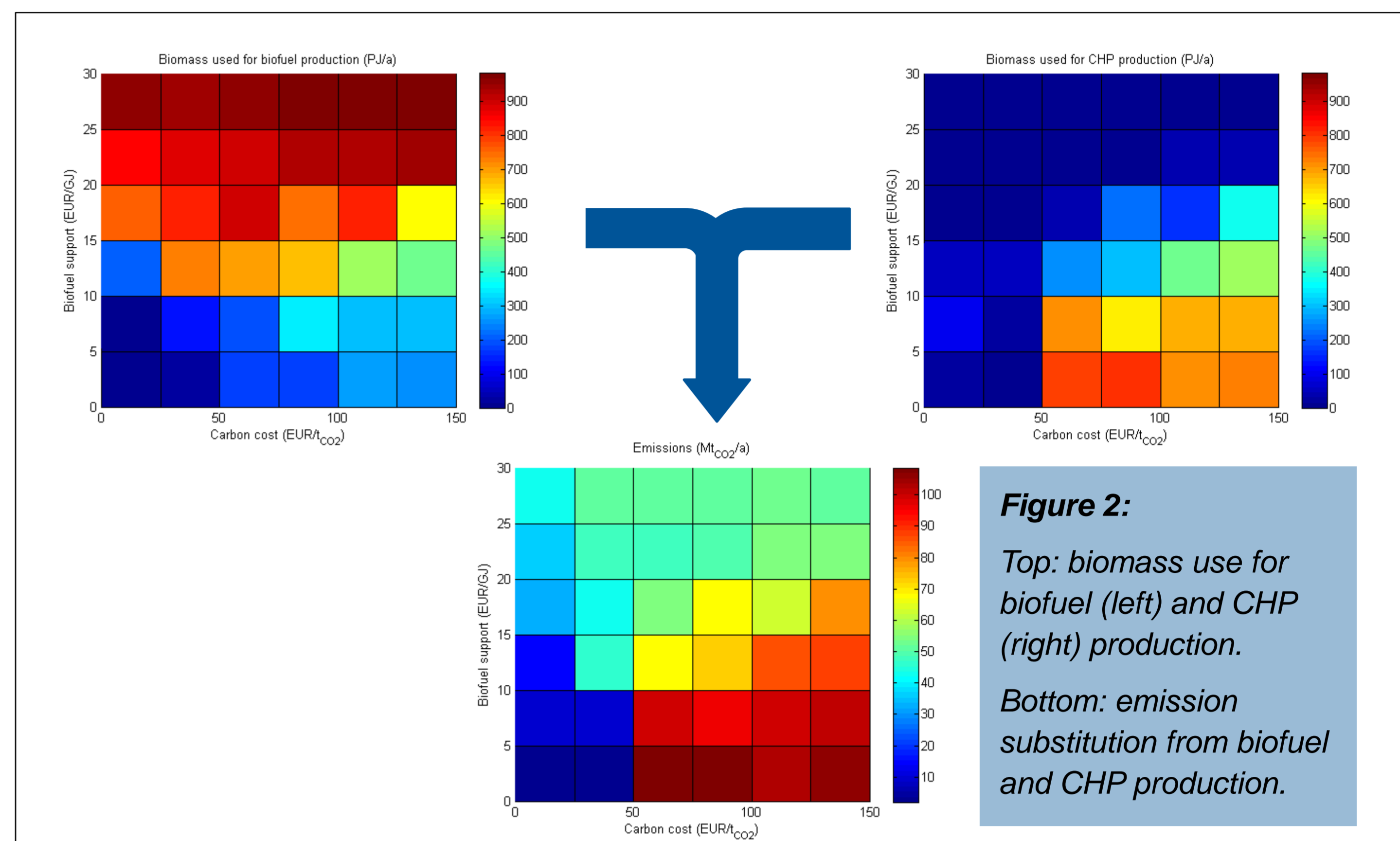


Figure 1: Overview of the BeWhere Europe model.

## Example of results



Biofuel production plants and CHP plants are competing for the available feedstock. Two policy tools, a carbon tax and biofuel support, are applied simultaneously. The more the biofuel support increases, the more biofuel is produced, irrespective of the carbon cost. On the other hand, CHP is favored by a high carbon cost and low biofuel support.

Combining the production of biofuel and CHP in terms of emission substitution shows that applying a high carbon cost and a low biofuel support has more influence on the emission mitigation. This shows a potential conflict of interest between different parts of the overall EU targets of both increased use of biofuel and decreased CO<sub>2</sub> emissions.

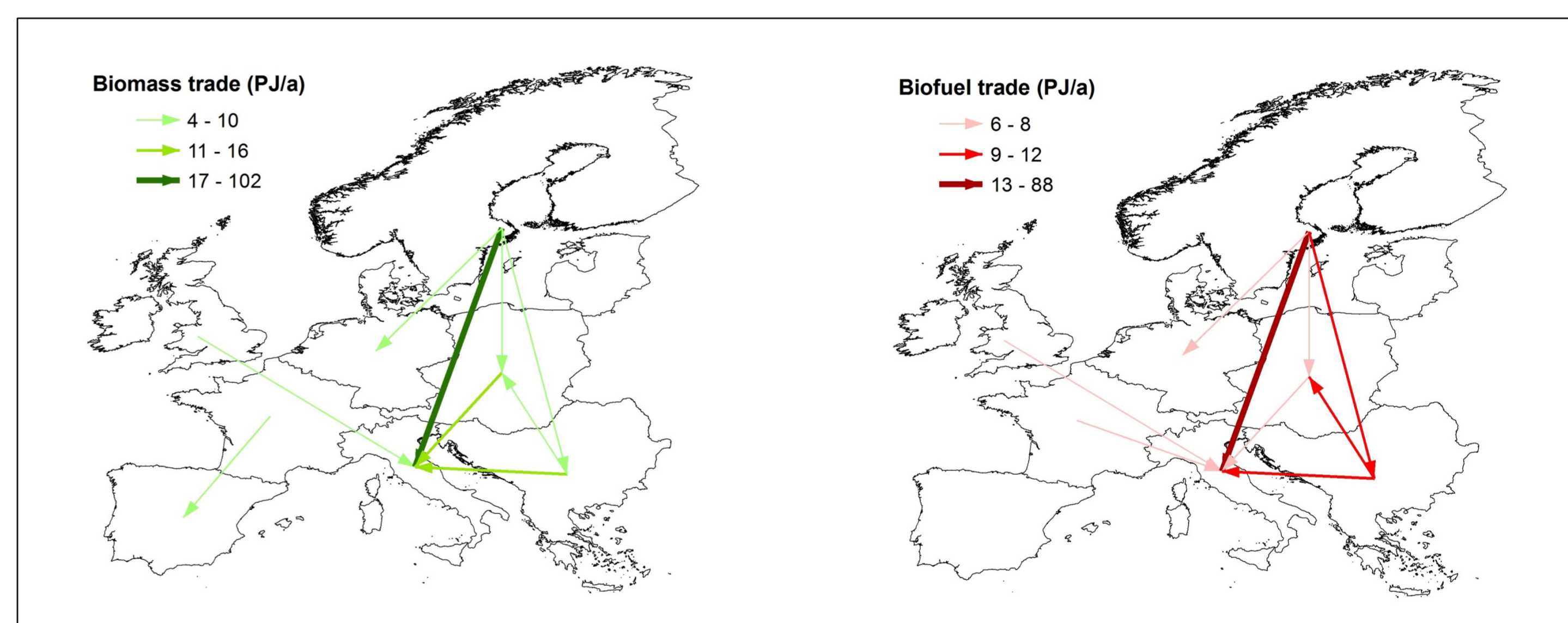


Figure 3: Trades of biomass (left) and biofuel (right) within Europe.

Northern Europe has been identified as a major wood and biofuel provider to countries with less abundant biomass resources and/or higher energy demand such as Germany, Denmark and Benelux. Italy needs to import both biomass and biofuel due to relative high prices of transport fossil fuel and heat.

## Conclusions

- 3-5% of EU transport fuel consumption can be substituted with second generation biofuels
- Biofuel support is essential for biofuel production
- Larger CO<sub>2</sub> emission savings can be achieved when using the available feedstock for heat and power production, than for biofuel production
- Northern Europe would be a major source for biomass feedstock and biofuel

## More information

[www.iiasa.ac.at/bewhere](http://www.iiasa.ac.at/bewhere)

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