

# Optimal use of woody biomass for bio-energy in Europe

Sylvain Leduc, Piera Patrizio, Sennai Mesfun  
*International Institute for Applied Systems Analysis (IIASA),  
Laxenburg, Austria*

Elisabeth Wetterlund

*Luleå University of Technology, Luleå, Sweden*

Bert Annevelink, Igor Staritsky, Berien Elbersen  
*Wageningen University & Research, The Netherlands*

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# Outline

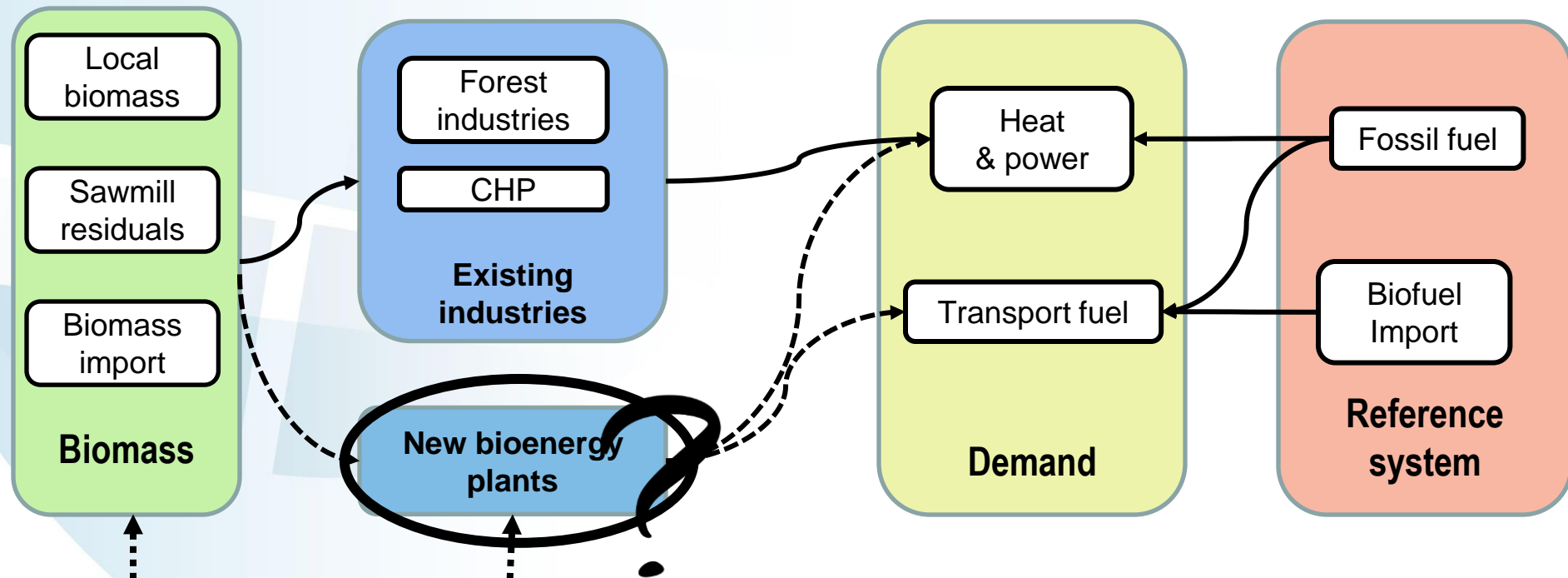
- Model description (1 slide)
- 2 case studies
  - Sweden (2 slides)
  - Europe (3 slides)
- Online tool (2 slides)
- Conclusions & future work (1 slide)

# BeWhere



→ Existing flows

- - - → Optional flows



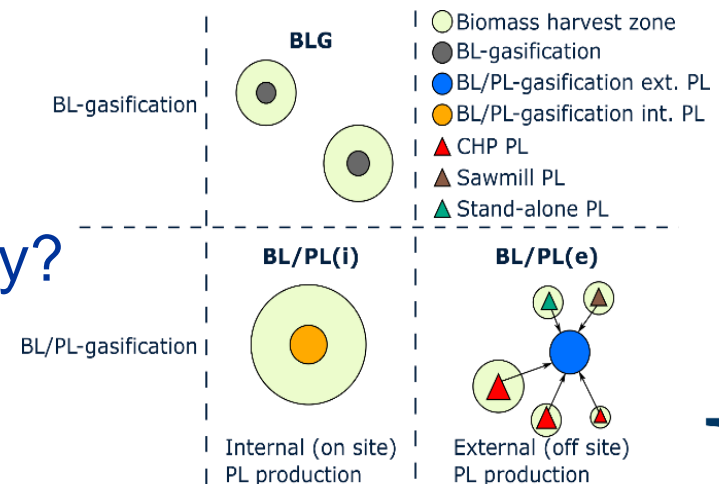
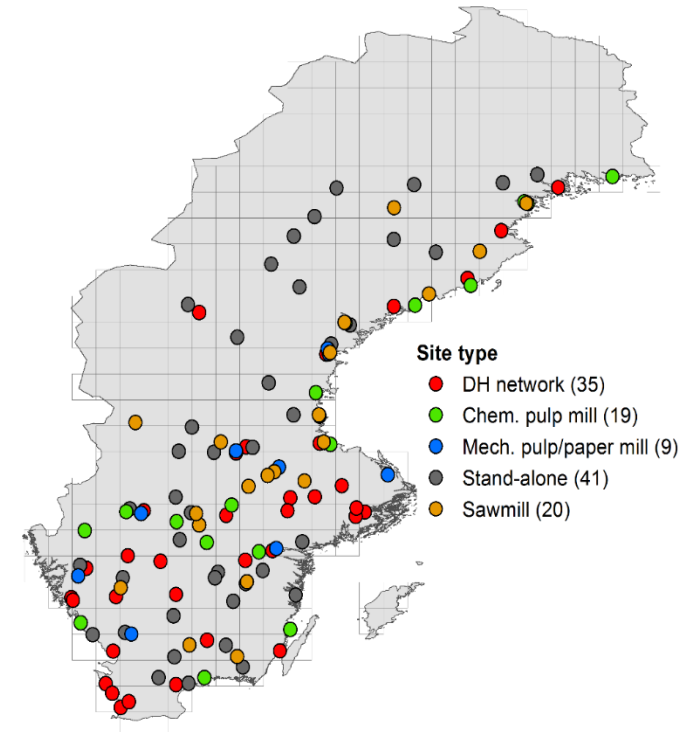
Environmental constraint

Minimization of **COST** for the region welfare

$$\mathbf{COST} = (\text{Total Cost}) + (\text{Total Emission}) * (\text{Carbon Cost})$$

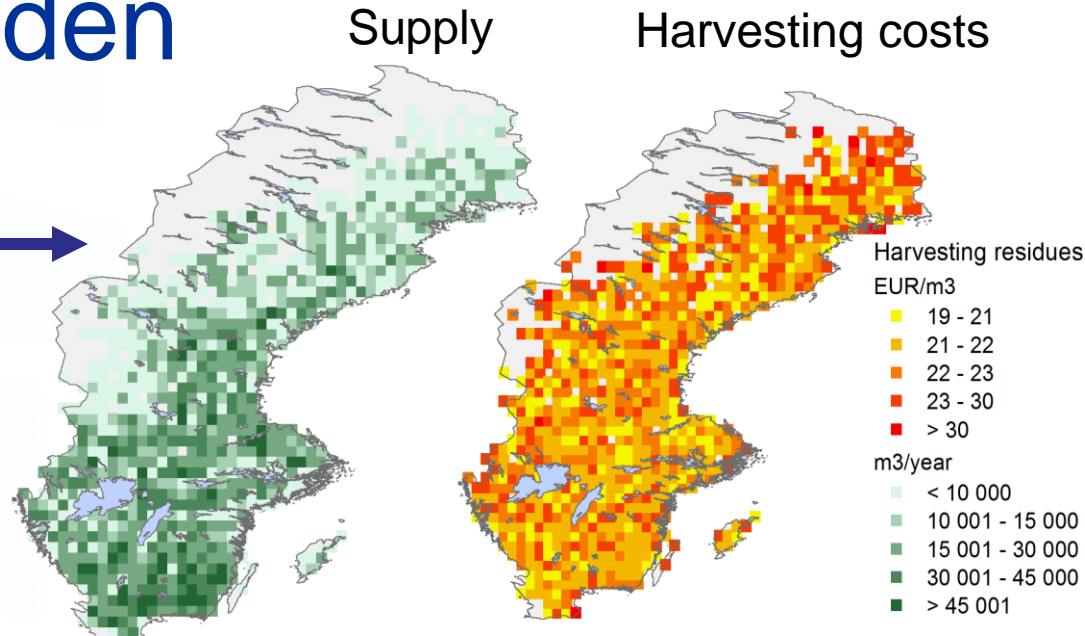
# BeWhere Sweden

- Focus on
  - forest based biofuels and chemicals
  - use of existing industrial infrastructure
- Identifying
  - *how* can future bio-based value chains be implemented cost efficiently?
  - what role can (forest) industry play?

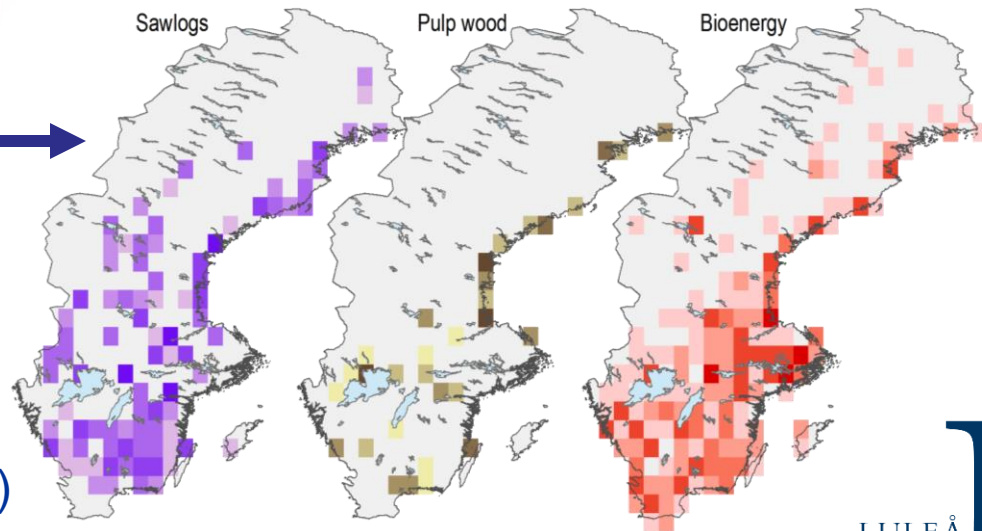


# BeWhere Sweden

- Forest biomass resources
  - SKA08 / SKA15
  - bottom-up cost approach

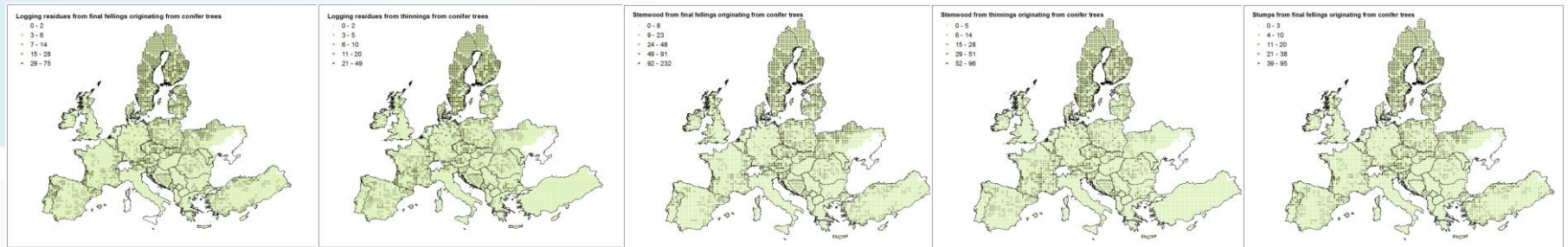


- Competing use
  - existing (forest industry, district heating, CHP)
  - Emerging (e.g., iron and steel, biofuels)

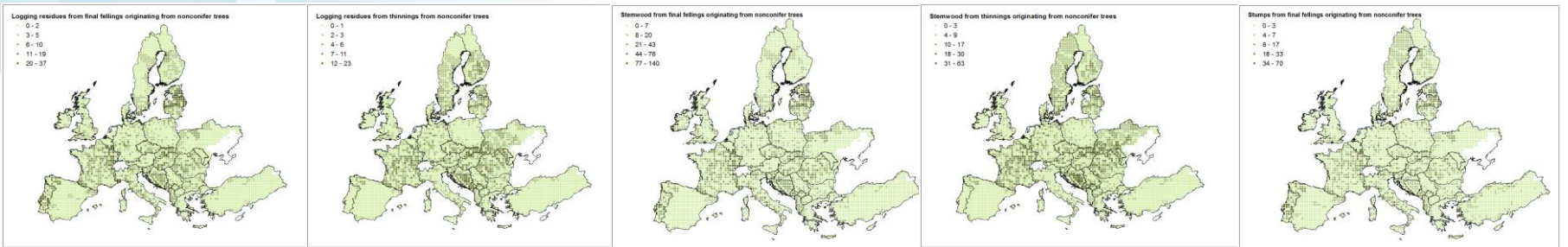


# Woody biomass feedstock

## Conifers



## Non-conifers



Stumps final  
fellings

Stemwood  
final fellings

Stemwood  
thinning

Logging residues  
final fellings

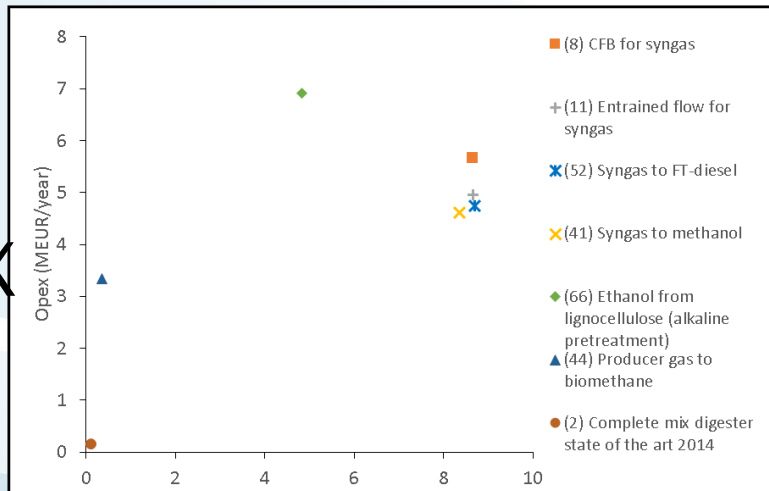
Logging residues  
thinnings

# Technology Input (WP2)

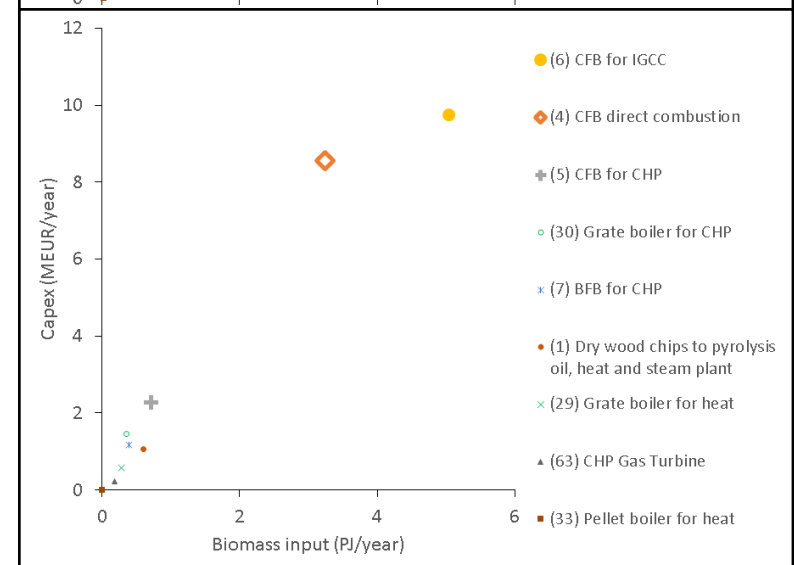
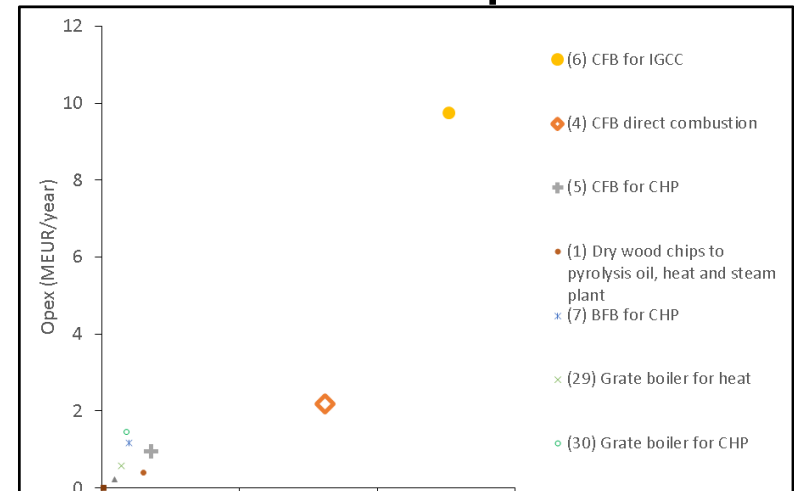
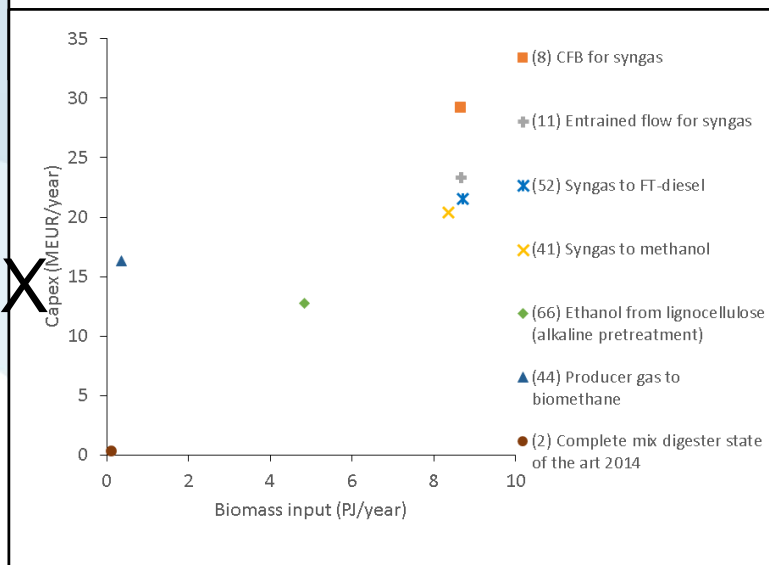
## Biofuel

## Heat and power

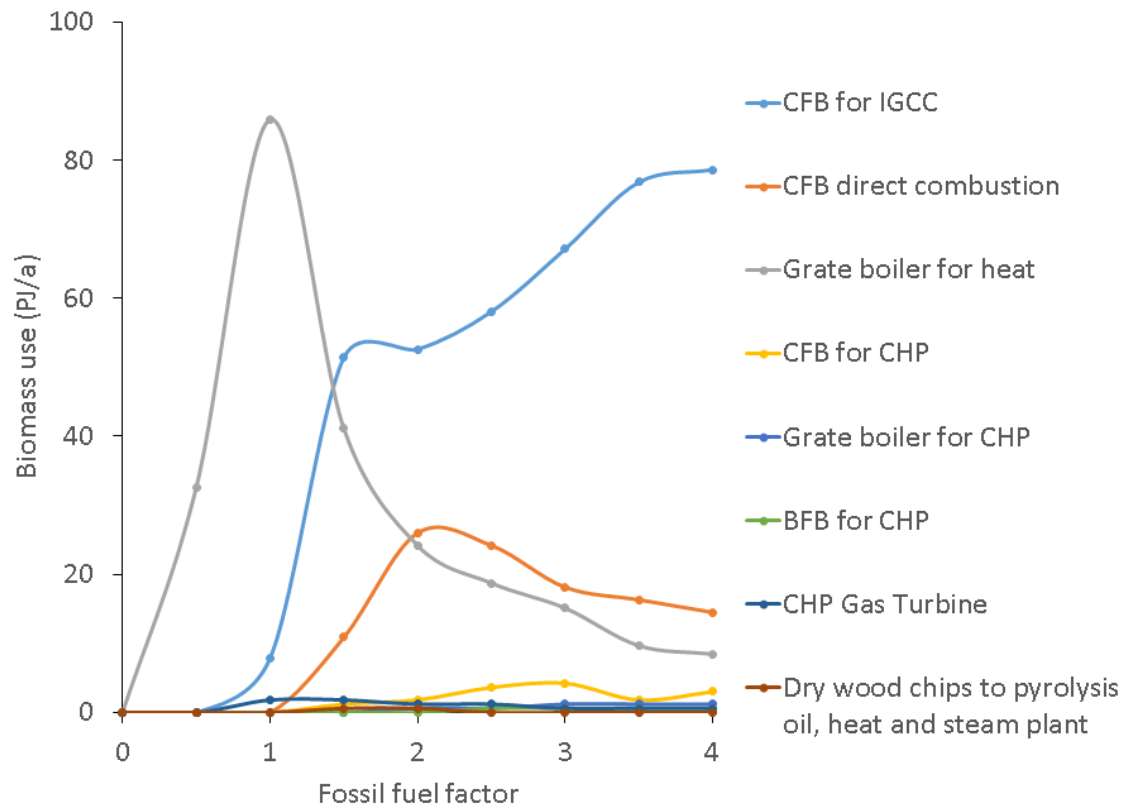
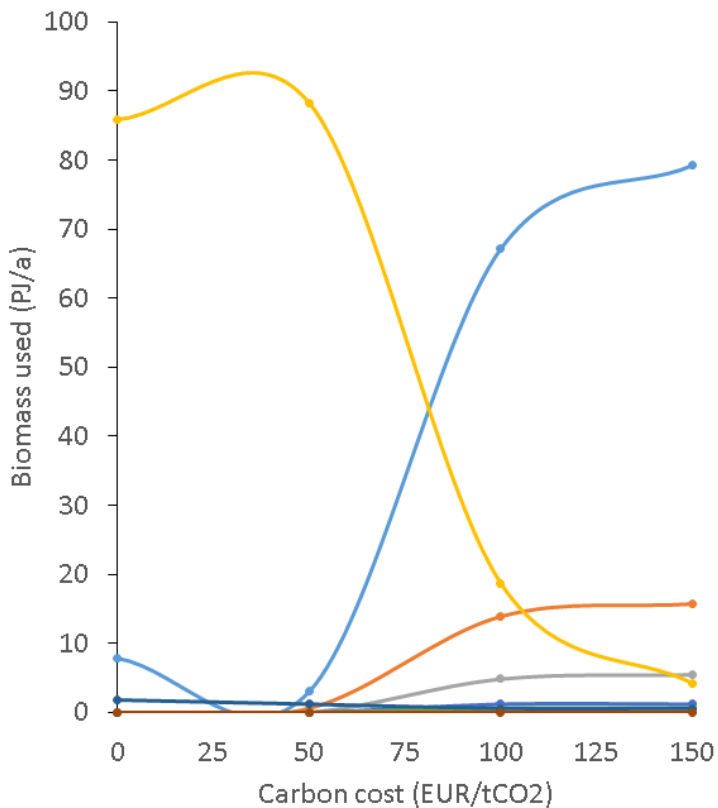
OPEX



CAPEX



# CHP: Carbon cost or subsidy?

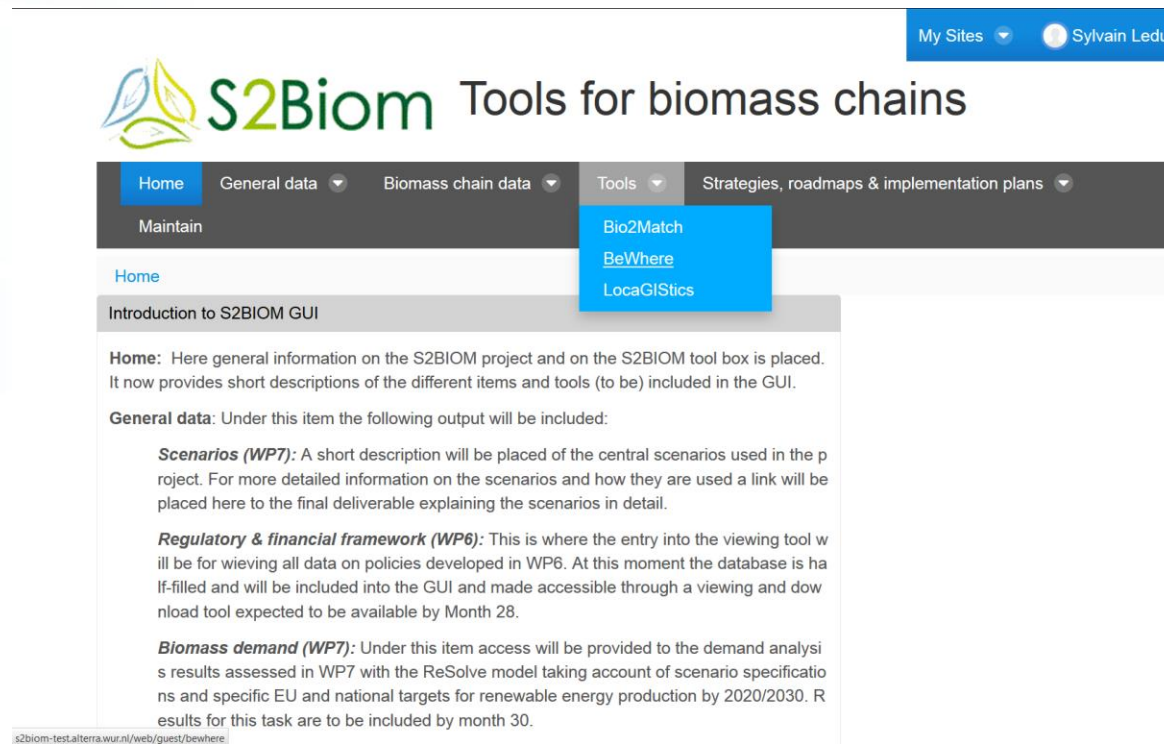




# Online tools

- <http://S2biom-test.Alterra.wur.nl>

- Login:
  - Username: demo
  - Password: helsinki



The screenshot displays the S2Biom website interface. At the top right, there are links for "My Sites" and "Sylvain Ledu". The main header features the S2Biom logo and the text "Tools for biomass chains". Below the header is a navigation bar with dropdown menus for "Home", "General data", "Biomass chain data", "Tools", and "Strategies, roadmaps & implementation plans". A "Maintain" button is also visible. A blue dropdown menu is open under "Tools", listing "Bio2Match", "BeWhere", and "LocaGISTICS". The main content area is titled "Introduction to S2BIOM GUI" and contains the following text:

**Home:** Here general information on the S2BIOM project and on the S2BIOM tool box is placed. It now provides short descriptions of the different items and tools (to be) included in the GUI.

**General data:** Under this item the following output will be included:

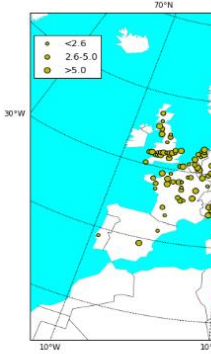
- Scenarios (WP7):** A short description will be placed of the central scenarios used in the project. For more detailed information on the scenarios and how they are used a link will be placed here to the final deliverable explaining the scenarios in detail.
- Regulatory & financial framework (WP6):** This is where the entry into the viewing tool will be for viewing all data on policies developed in WP6. At this moment the database is half-filled and will be included into the GUI and made accessible through a viewing and download tool expected to be available by Month 28.
- Biomass demand (WP7):** Under this item access will be provided to the demand analysis results assessed in WP7 with the ReResolve model taking account of scenario specifications and specific EU and national targets for renewable energy production by 2020/2030. Results for this task are to be included by month 30.

s2biom-test.alterra.wur.nl/web/guest/bewhere

Scenario #20

Feedstock: crops  
Final product: heat and power

Plant



Disclaimer: The results presented have been calculated using the BeWhere model. They do not reflect reality but present an overview of the impact of different parameters, and can only be compared with each other.  
[www.iiasa.ac.at/bewhere](http://www.iiasa.ac.at/bewhere)

## Biomass used

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Total use of crops (Pj/year)					
Country	Perennials grassy	Perennials woody	Straw residues	Prunings residues	Grassland
AL	0	0	0	0	0
AT	0	0	0	0	0
BE	0	0	0	0	0
BA	0	0	0	0	0
BG	2.32	0	0	0	0
HR	0.57	0	0	0	0
CY	0	0	0	0	0
CZ	0	0	0	0	0
DK	0	0	0	0	0
EE	0	0	0	0	0
FI	0	0	0	0	0
FR	3.97	0	0	0	0
DE	2.05	0	0	0	0
GR	0	0	0	0	0
HU	2.63	0	0	0	0
IE	0	0	0	0	0
IT	6.65	0	0	0	0
KS	0	0	0	0	0
LV	0	0	0	0	0
LT	0	0	0	0	0
LU	0	0	0	0	0
MT	0	0	0	0	0
MD	0.29	0	0	0	0
ME	0	0	0	0	0
NL	0	0	0	0	0
PL	6.29	0	0	0	0
PT	0.29	0	0	0	0
RS	0	0	0	0	0
RO	4.25	0	0	0	0
SK	0.72	0	0	0	0
SI	0	0	0	0	0
ES	0	0	0	0	0
SE	0.41	0	0	0	0
MK	0	0	0	0	0
TR	1.43	0	0	0	0
GB	0.18	0	0	0	0
UA	0	0	0	0	0

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

## Export

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Export of crops (Pj/year)					
Country	Perennials grassy	Perennials woody	Straw residues	Prunings residues	Grassland
AL	0	0	0	0	0
AT	0	0	0.2	0	0
BE	0	0	0	0	0
BA	0	0	0	0	0
BG	0	0	0	0	0
HR	0	0	0	0	0
CY	0	0	0	0	0
CZ	0	0	0	0	0
DK	0	0	0	0	0
EE	0	0	0	0	0
FI	0	0	0	0	0
FR	0	0	0	0	0
DE	0	0	0	0	0
GR	0	0	0	0	0
HU	0	0	0	0	0
IE	0	0	0	0	0
IT	0	0	0	0	0
KS	0	0	0	0	0
LV	0	0	0	0	0
LT	0	0	0	0	0
LU	0	0	0	0	0
MT	0	0	0	0	0
MD	0	0	0	0	0
ME	0	0	0	0	0
NL	0	0	0	0	0
PL	0	0	0	0	0
PT	0	0	0	0	0
RS	0	0	0	0	0
RO	0	0	0	0	0
SK	0	0	0	0	0
SI	0	0	0	0	0
ES	0	0	0	0	0
SE	0	0	0	0	0
MK	0	0	0	0	0
TR	0	0	0	0	0
GB	0	0	0	0	0
UA	0	0	0	0	0

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## Import

20-Dec-16  
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Country	Perennials grassy	Perennials woody	Straw residues	Prunings residues	Grassland
AL	0	0	0	0	0
AT	0	0	0	0	0
BE	0	0	0	0	0
BA	0	0	0	0	0
BG	0	0	0	0	0
HR	0	0	0	0	0
CY	0	0	0	0	0
CZ	0	0	0	0	0
DK	0	0	0	0	0
EE	0	0	0	0	0
FI	0	0	0	0	0
FR	0	0	0	0	0
DE	0	0	0	0	0
GR	0	0	0	0	0
HU	0	0	0	0	0
IE	0	0	0	0	0
IT	0	0	0	0	0
KS	0	0	0	0	0
LV	0	0	0	0	0
LT	0	0	0	0	0
LU	0	0	0	0	0
MT	0	0	0	0	0
MD	0	0	0	0	0
ME	0	0	0	0	0
NL	0	0	0	0	0
PL	0	0	0	0	0
PT	0	0	0	0	0
RS	0	0	0	0	0
RO	0	0	0	0	0
SK	0	0	0	0	0
SI	0	0	0	0	0
ES	0	0	0	0	0
SE	0	0	0	0	0
MK	0	0	0	0	0
TR	0	0	0	0	0
GB	0	0	0	0	0
UA	0	0	0	0	0

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## Production

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Country	Heat [PJ]	Power [PJ]	Emission avoided (MtonCO <sub>2</sub> )
AL	0	0	0
AT	0	0	0
BE	5.688	13.23	0.95
BA	0	0	0
BG	6.1512	12.1361	1.66
HR	1.1862	1.1642	0.19
CY	0	0	0
CZ	15.048	39.312	4.38
DK	0	0	0
EE	0	0	0
FI	0	0	0
FR	6.192	0.756	0.39
DE	3.159	0	0.58
GR	0	0	0
HU	6.0264	6.9401	0.91
IE	0	0	0
IT	9.072	6.804	1.48
KS	0	0	0
LV	0	0	0
LT	0	0	0
LU	0	0	0
MT	0	0	0
MD	0.243	0	0.03
ME	0	0	0
NL	21.456	54.054	4.4
PL	12.834	17.01	3.56
PT	2.511	6.048	0.43
RS	0	0	0
RO	10.611	13.608	1.61
SK	4.689	8.316	0.91
SI	0	0	0
ES	0.72	1.512	0.15
SE	1.566	2.268	0.14
MK	0	0	0
TR	4.455	6.804	1.07
GB	8.883	18.144	1.97
UA	0	0	0

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# Conclusion

- Highly sensitive to initial conditions  
(e.g., energy mix, policy)
- Process integration  
(e.g., Sweden case)

## Future work for EU model

- Develop a dynamic version
- Include more industries  
(e.g., steel, cement)

# Contact

## Sylvain Leduc

Research scholar, BeWhere coordinator  
Ecosystems Services and Management Program  
International Institute for Applied Systems Analysis  
Laxenburg, Austria

[leduc@iiasa.ac.at](mailto:leduc@iiasa.ac.at)

Phone: +43 2236 / 807 267

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

