

# LocaGIStics

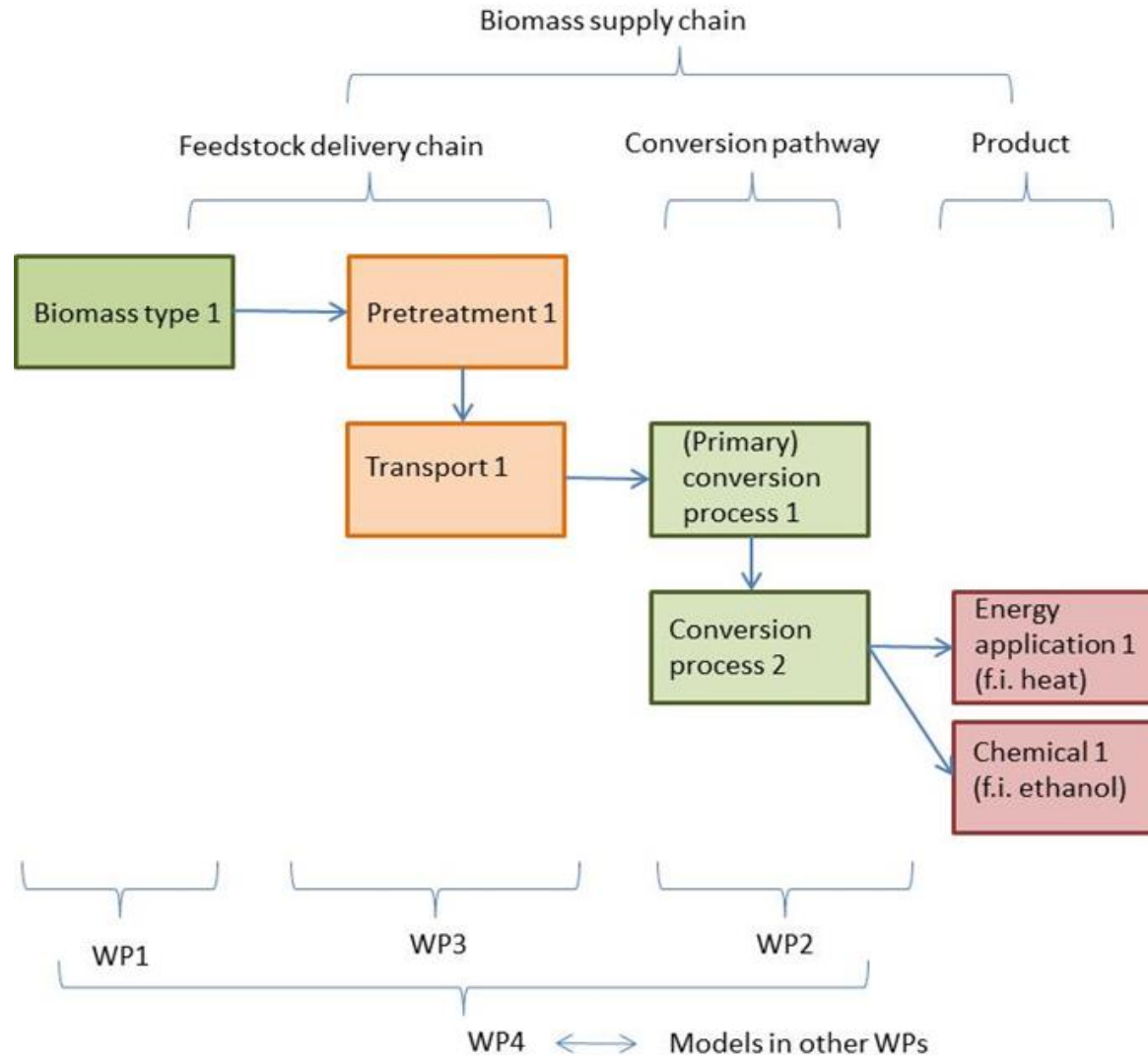
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Berien Elbersen**

**Webinar, 11 December 2015**



# Biomass supply chain



# Objectives & tasks

## WP3: Logistics



- to identify and characterise the main **logistical components** (such as storage, pre-treatment and transportation technologies) (Task 3.1)
- to identify and assess existing and develop new **logistical concepts** (e.g. biomass yards) to optimize sustainable non-food biomass feedstock delivery chains (Task 3.2)
- to **translate** theoretical logistical **concepts to specific cases**, and design the most promising logistic supply-chains for cases at local, regional and pan-European level (Task 3.3)

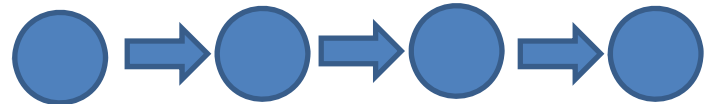
# From component to case study



- **logistical component:**



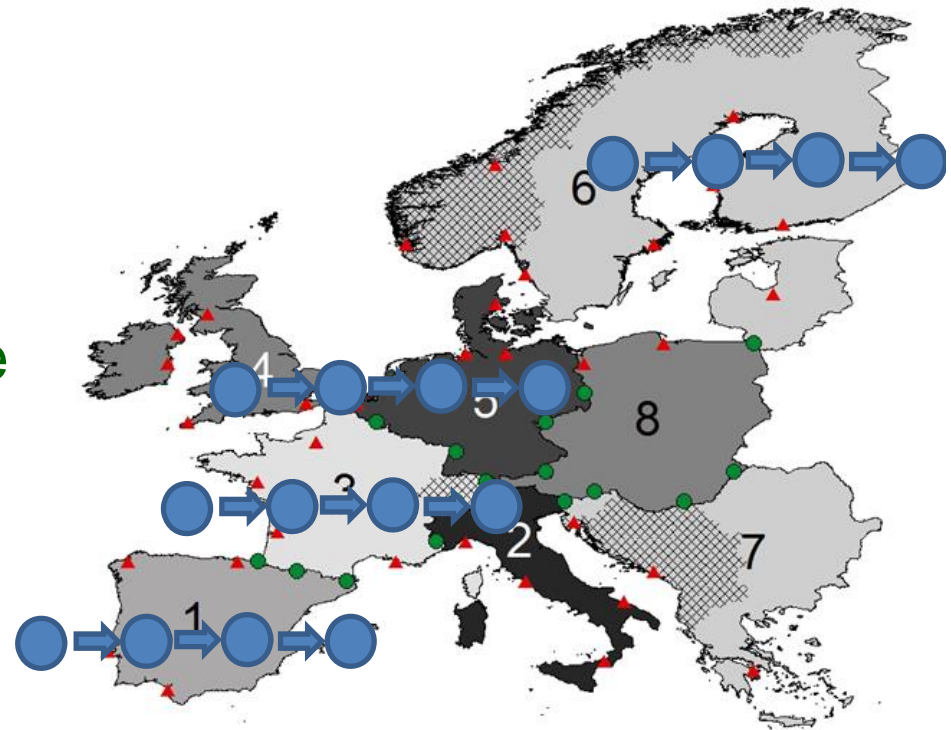
- **logistical concept/chain:**



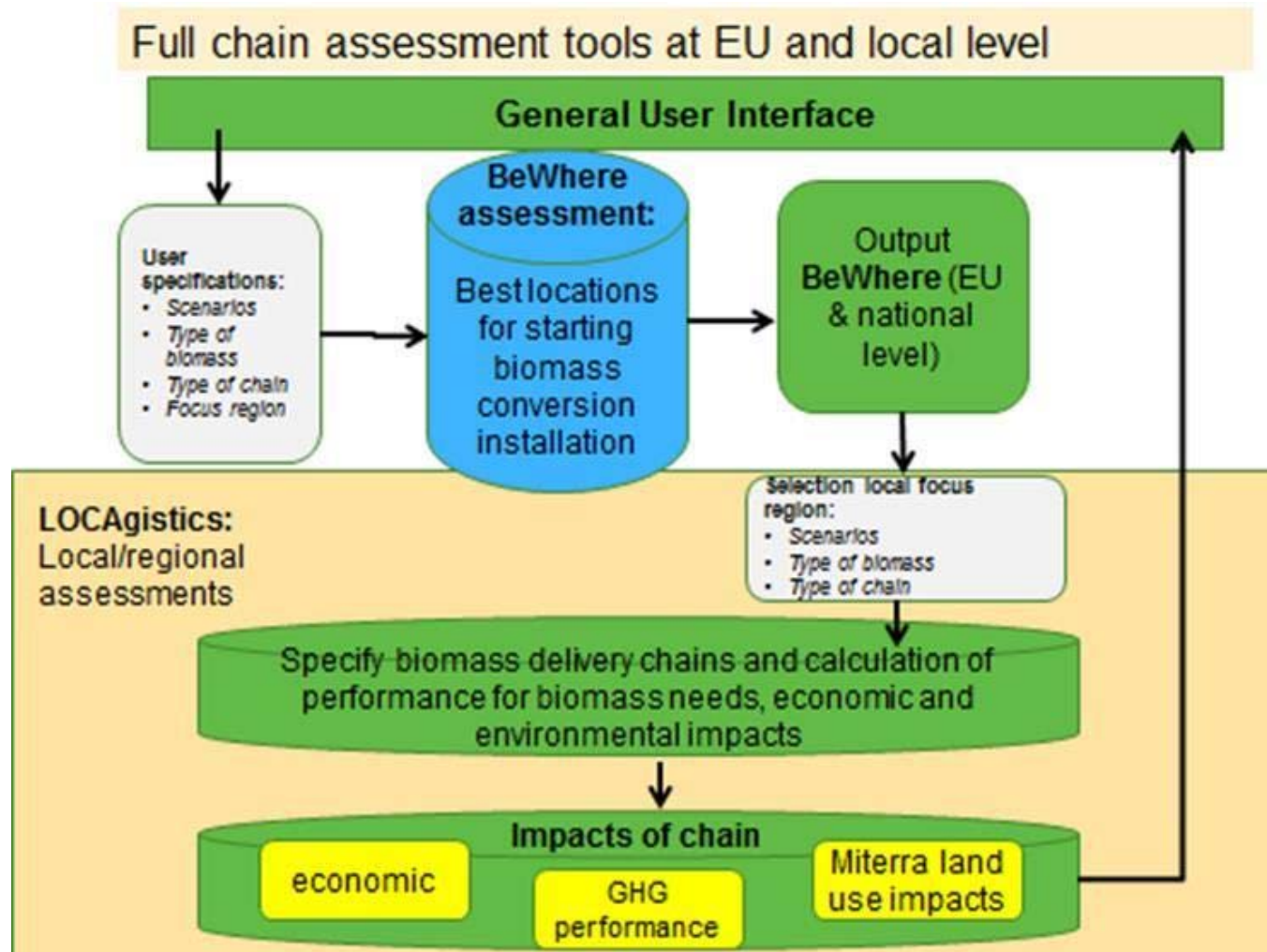
- **logistical concepts will be translated to**

1. EU level (BeWhere)
2. regional advanced case studies (LocaGIStics):

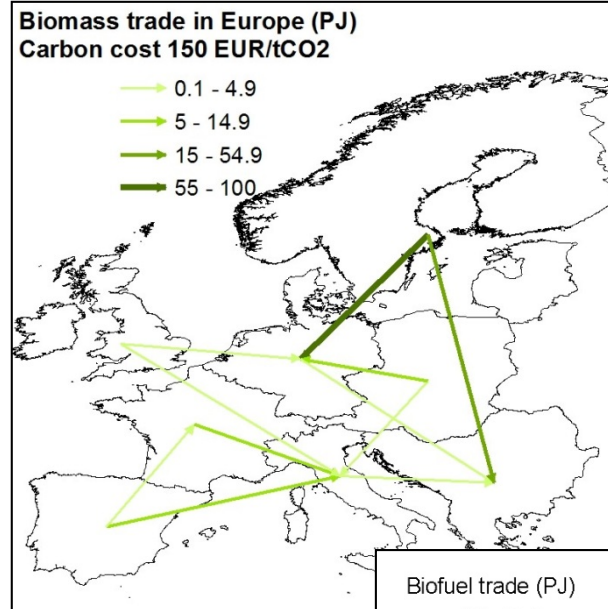
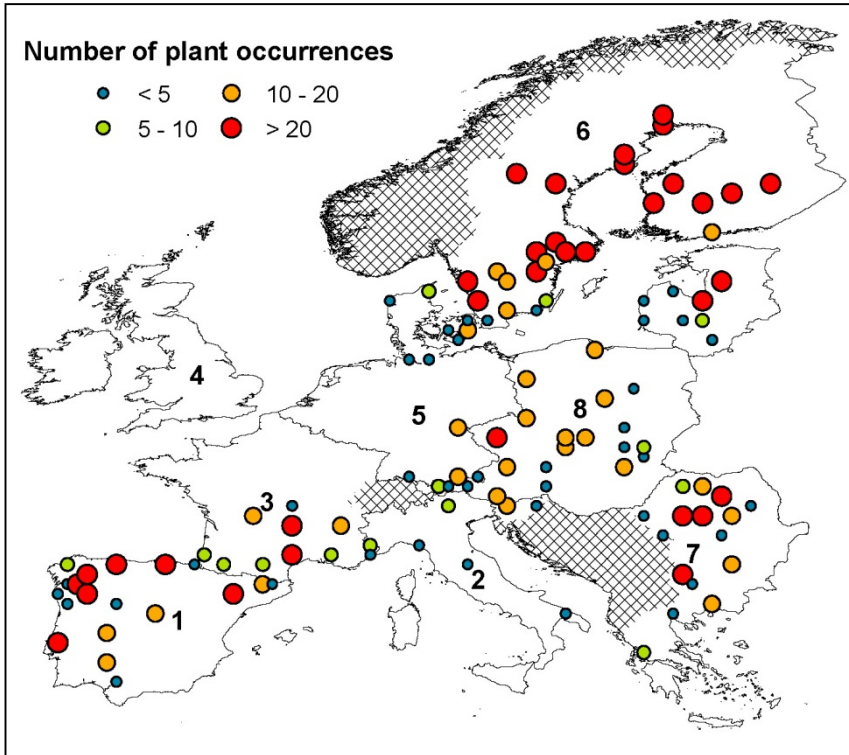
- Finland (Infres)
- France (LogistEC)
- Spain (Europruning)



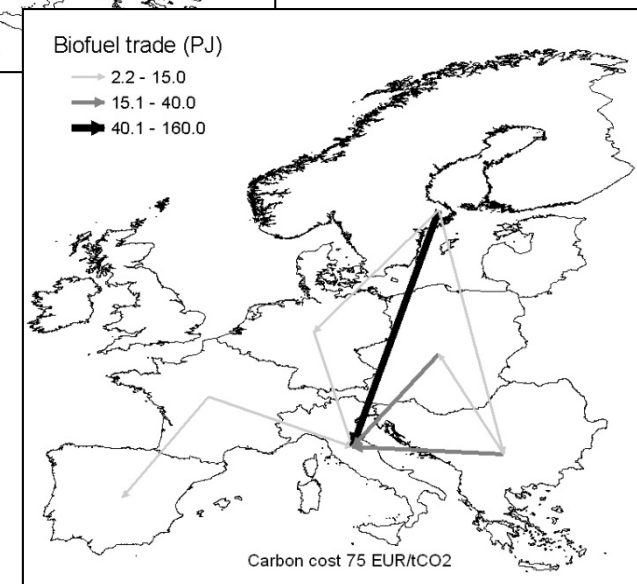
# Two tools for assessments: BeWhere & Locagistics



# Output BeWhere



Source: Leduc et al.,  
2013  
International Institute  
for Applied Systems  
Analysis (IIASA)



# Regional level: LocaGIStics



- **LocaGIStics is a visual, interactive tool for specification and assessment of biomass value chains**
- **it aims at regional level**
- **link with BeWhere model on an EU-/country level (output transferred to LocaGIStics)**
- **first developed in Dutch national 'ME4' project and now further developed for S2Biom**

# User interface LocaGIStics



Countries		Areas of interest	
France		Burgundy	

Cases			
Burgundy straw and miscanthus			

Variants				
Name	Financ...	Energ...	Net G...	
Demo 1	0	0	0	

Biomass types			
Name	Availa...	Field -...	ICP -...
Straw	33	14	9
Miscanthus	0	15	10

Biomass conversion plants						
Na...	Si...	A...	Fi...	En...	Net G...	
Po...	30...	0	0	0	0	

Intermediate collection points			
Name	Amou...	Distan...	
Power plant 1	0	0	



# Specify a case study (1)



- country, area of interest, case, variant, biomass types

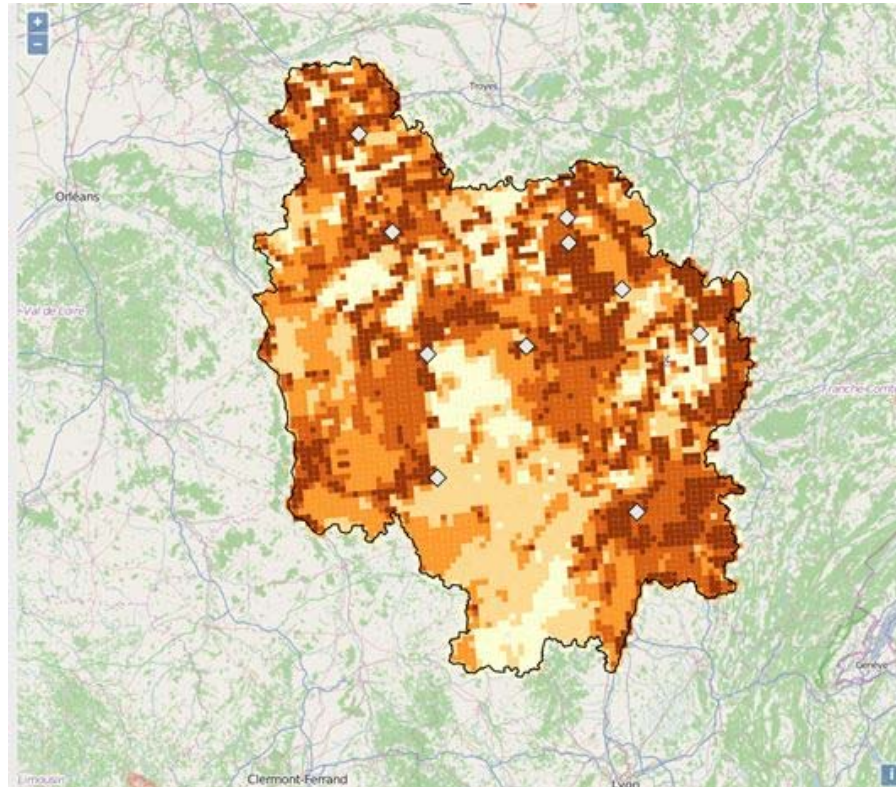
Countries	Areas of interest
France	Burgundy

Variants						
Name	Financial profit	Energy profit	Net GHG avoided			
Demo 1	2,192,796	411,899	39,301			

Biomass types				
Name	Availability (%)	Field - ICP moisture content (%)	ICP - PP moisture content (%)	
Miscanthus	0	15	10	
Straw	33	14	9	

## Specify a case study (2)

- regional biomass availability



- 10 powerplant locations suggested for the whole Burgundy region based on calculations BeWhere (white points)
- LOCAgistics will further analyse one of them in more detail

# Specify a case study (3)

- power plant
- intermediate collection point

Biomass conversion plants								
Name	Size (ton DM)	Amount (ton DM)	Financial pr...	Energy pr...	Net GHG a...			
Power plant 1	30,000	30,004	2,192,796	411,899	39,301	✗	✎	📄

Intermediate collection points					
Name	Amount (ton DM)	Distance (ton km.)			
IC_Point 1	11,551	112,018	✗	✎	📄
IC_Point 2	18,645	185,738	✗	✎	📄

## Specify a case study (4)



- position the power plant on the map
- position one or two intermediate collection points on the map
- start calculation: a GIS based 'peeling heuristic' determines biomass used (ton dm) and transport distances (ton.km) based on biomass availability maps

# Four variants as an example



- powerplant & no biomass yard; only straw
- powerplant & no biomass yard; straw & Miscanthus
- powerplant & one biomass yard; straw & Miscanthus
- powerplant & two biomass yards; straw & Miscanthus

# VARIANT 1

## powerplant & no biomass yard; only straw

Countries		Areas of interest	
France		Burgundy	

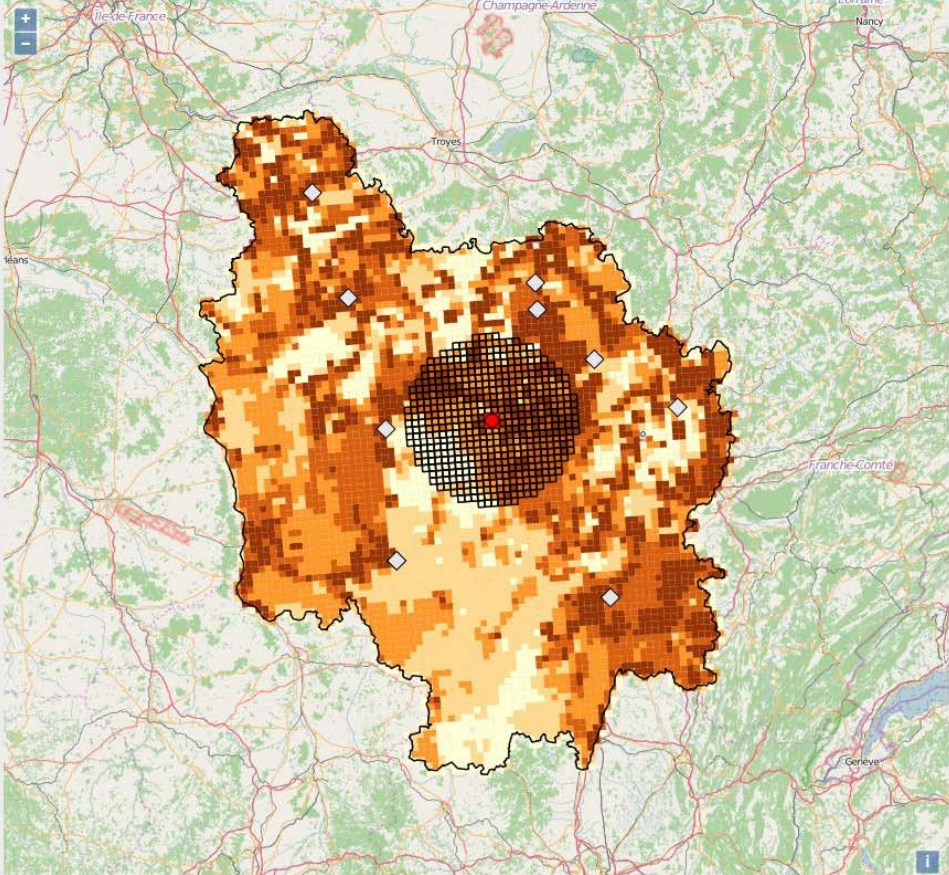
Cases			
Burgundy straw and miscanthus			

Variants				
Name	Financ...	Energ...	Net G...	
Demo 1	2,227,...	412,097	39,318	

Biomass types			
Name	Availa...	Field -...	ICP -...
Miscanthus	0	15	10
Straw	33	14	9

Biomass conversion plants						
Na...	Si...	A...	Fi...	En...	Net G...	
Po...	30...	30...	2,...	41...	39,318	

Intermediate collection points			
Name	Amou...	Distan...	
Power plant 1	30,015	712,078	

- map is shown for available straw (yellow)
- only 33% straw was available no Miscanthus
- the size of the collection circle can be influenced:
  - by assuming a higher or lower biomass availability % for a certain biomass type
  - but also by adding more biomass types (e.g. also include Miscanthus in variant 2)

# Variant 2

## powerplant & no biomass yard; straw & Miscanthus

Countries		Areas of interest	
France		Burgundy	

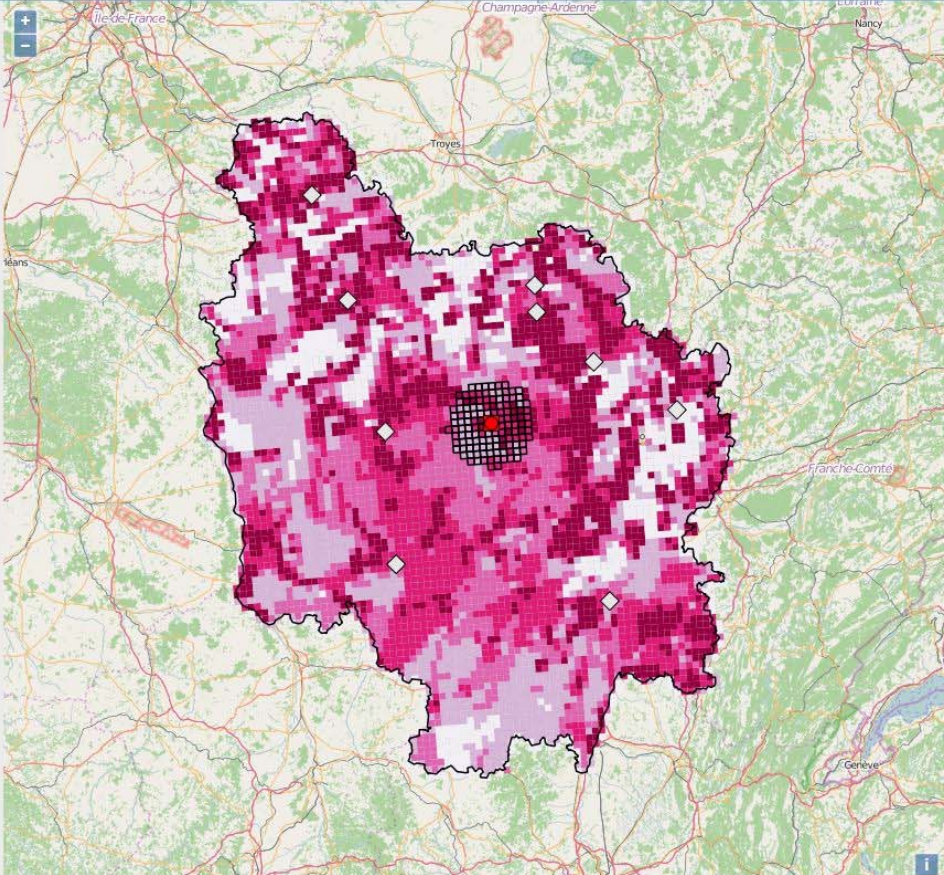
Cases			
Burgundy straw and miscanthus			

Variants						
Name	Financ...	Energ...	Net G...			
Demo 1	2,227,...	412,097	39,318			
Demo 2	3,545,...	433,998	41,539			

Biomass types			
Name	Availa...	Field ...	ICP -...
Straw	33	14	9
Miscanthus	100	15	10

Biomass conversion plants						
Na...	Si...	A...	Fi...	En...	Net G...	
Po...	30...	30...	3,...	43...	41,539	

Intermediate collection points			
Name	Amou...	Distan...	
Power plant 1	30,176	299,633	



- **different map is shown now: for Miscanthus (purple )**
- **smaller supply circle, because Miscanthus now is also available at closer distance**
- **notice that calculation results are different (e.g. profit)**

# Variant 3

## powerplant & one biomass yard; straw & Miscanthus

Countries		Areas of interest	
France		Burgundy	

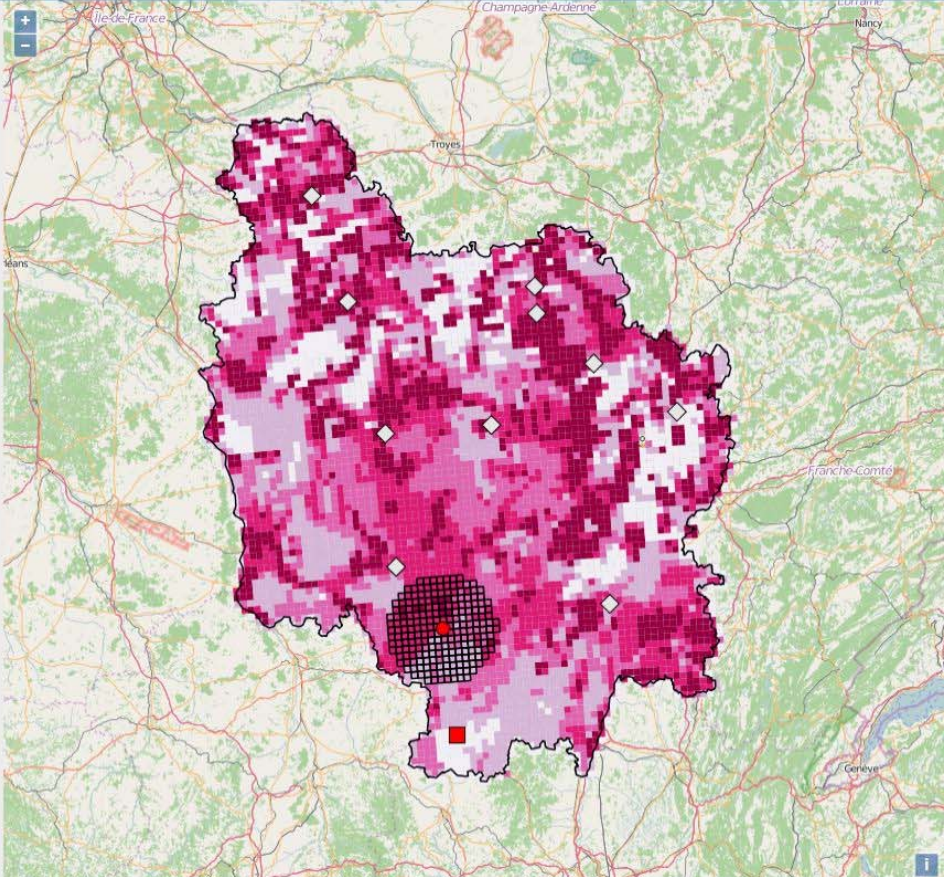
Cases			
Burgundy straw and miscanthus			

Variants					
Name	Financ...	Energ...	Net G...		
Demo 3	3,713,...	437,421	41,896		
Demo 1	2,227,...	412,097	39,318		
Demo 2	3,545,...	433,998	41,539		
Demo 4	3,521,...	435,130	41,656		

Biomass types			
Name	Availa...	Field ...	ICP -...
Straw	33	14	9
Miscanthus	100	15	10

Biomass conversion plants						
Na...	Si...	A...	Fi...	En...	Net G...	
Po...	30...	30...	3,...	43...	41,896	

Intermediate collection points				
Name	Amou...	Distan...		
IC_Point 1	30,133	481,248		

- **separate location for power plant (red box) and intermediate collection point (red circle)**
- **intermediate collection point located near to area with a high biomass availability (e.g. rural area)**
- **power plant located near to area with a high energy demand (e.g. city)**

# Variant 4

## powerplant & two biomass yards; straw & Miscanthus

Countries		Areas of interest	
France		Burgundy	

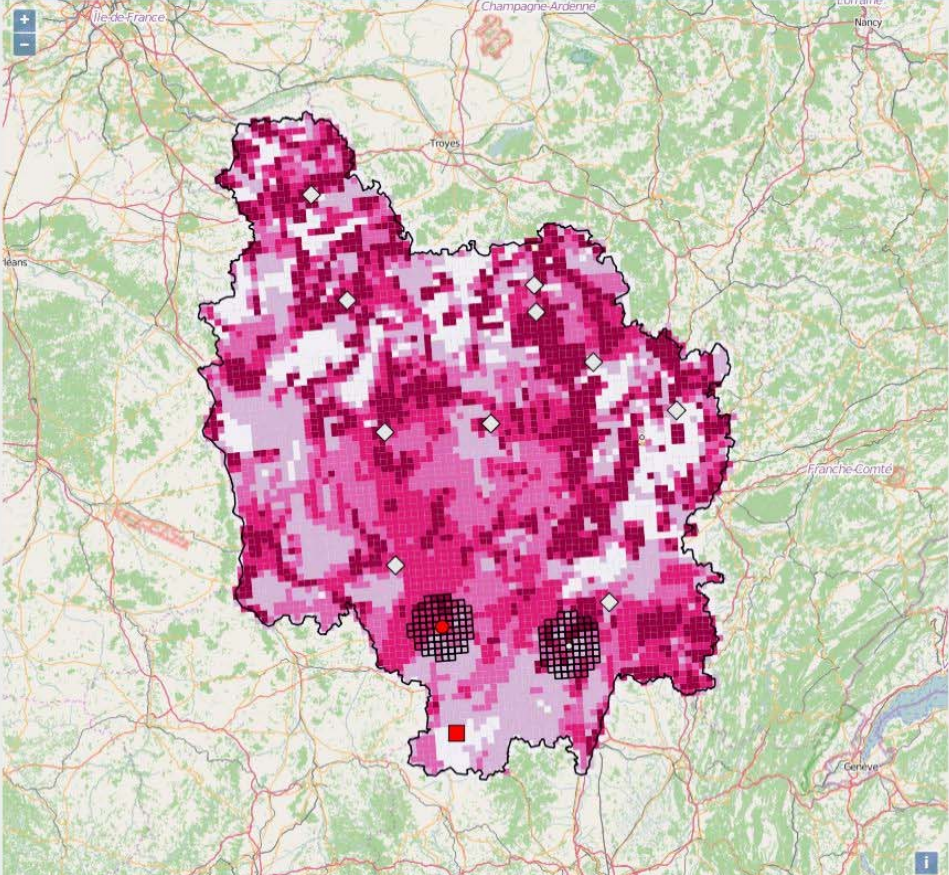
Cases			
Burgundy straw and miscanthus			

Variants						
Name	Financ...	Energ...	Net G...			
Demo 1	2,227,...	412,097	39,318			
Demo 2	3,545,...	433,998	41,539			
Demo 3	3,713,...	437,421	41,896			
Demo 4	3,521,...	435,130	41,656			

Biomass types			
Name	Availa...	Field -...	ICP -...
Straw	33	14	9
Miscanthus	100	15	10

Biomass conversion plants						
Na...	Si...	A...	Fi...	En...	Net G...	
Po...	30...	30...	3,...	43...	41,656	

Intermediate collection points			
Name	Amou...	Distan...	
IC_Point 1	11,551	112,018	
IC_Point 2	18,645	185,738	

- **two intermediate collection points with a much smaller biomass collection circle**
- **for this size of the power plant two intermediate collection points seems too much**
- **however, this can now be compared on costs, energy production and avoided GHG emissions**

# Regional level: LocaGIStics



- excel sheet calculates economics, energy production and avoided GHG emissions

Variants							
Name	Financial profit	Energy profit	Net GHG avoided				
Demo 3	3,713,960	437,421	41,896				
Demo 1	2,227,160	412,097	39,318				
Demo 2	3,545,369	433,998	41,539				
Demo 4	3,521,293	435,130	41,656				

# LocaGIStics output



## Output simple chain calculation

Case description	Burgundy		
Calculation number	1		
Biomass chain name	bioenergy		
<b>Total throughput:</b>			
<b>[ton dm]:</b>			
from sources	30,081		
<b>Revenues and costs:</b>			
<b>[euro]</b>			
electricity revenues	7,294,567		
heat revenues	1,035,200	total revenues	8,329,766
purchase costs	398,632		
storage costs	269,428		
transport costs	135,764		
loading/unloading costs	110,895		
pretreatment costs	2,165,373		
drying costs	0		
conversion costs	1,527,432	total costs	4,607,524
		profit	3,722,243

# Thank you for your attention!

