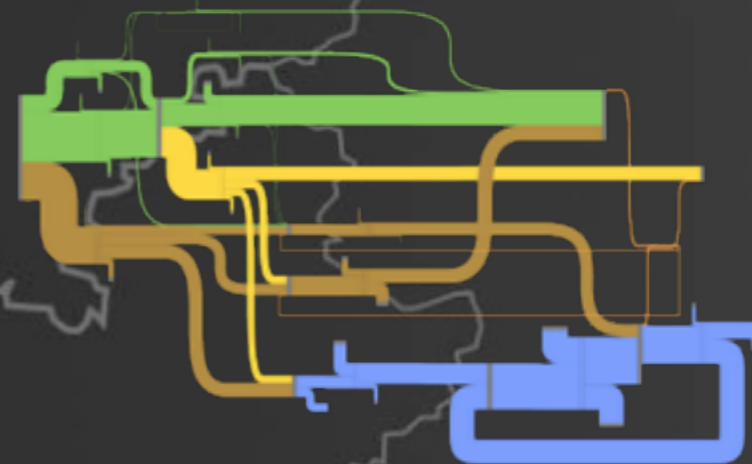


Wednesday 19th June 2019 - ESEE 2019 conference, Turku

Jean-Yves COURTONNE¹, J. ALAPETITE¹, M. BEVIONE^{1,2}, V. WAWRZYNIAK³, S. CAURLA⁴

1. STEEP team, Inria (Grenoble, France)
2. PACTE lab, University of Grenoble Alpes (France)
3. Auvergne-Rhône-Alpes Energie Environnement (Lyon, France)
4. BETA lab, INRA (Nancy, France)

The AF Filières project: Application of PSUT frameworks for regional analyses of agriculture and forestry supply chains and footprints in France



APR
GRAINE
2016



Biomass is at the core of environmental and social stakes

What strategical stakes?



Biomass is at the core of environmental and social stakes



What strategical stakes?

- Energy transition,
- Increasing use of bio-based products,
- Sustainable food supply,
- Local socio-economic development.



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Competition for land use and for raw resources:

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Trade-offs at all scales

We lack a consistent picture of the physical flows at stake

*Statistics produced
in silos*

We lack a consistent picture of the physical flows at stake

*Statistics produced
in silos*

Production

Transformation

Transport

*Resource
stock*

*Consumption
etc...*



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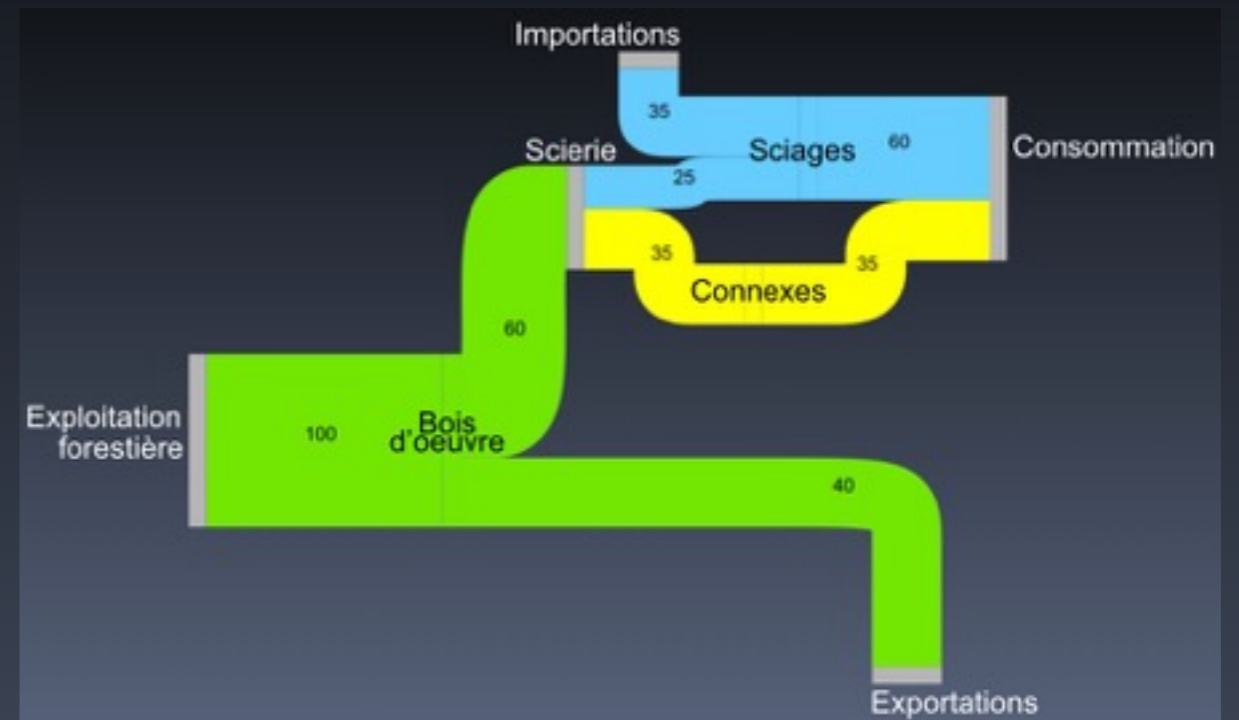
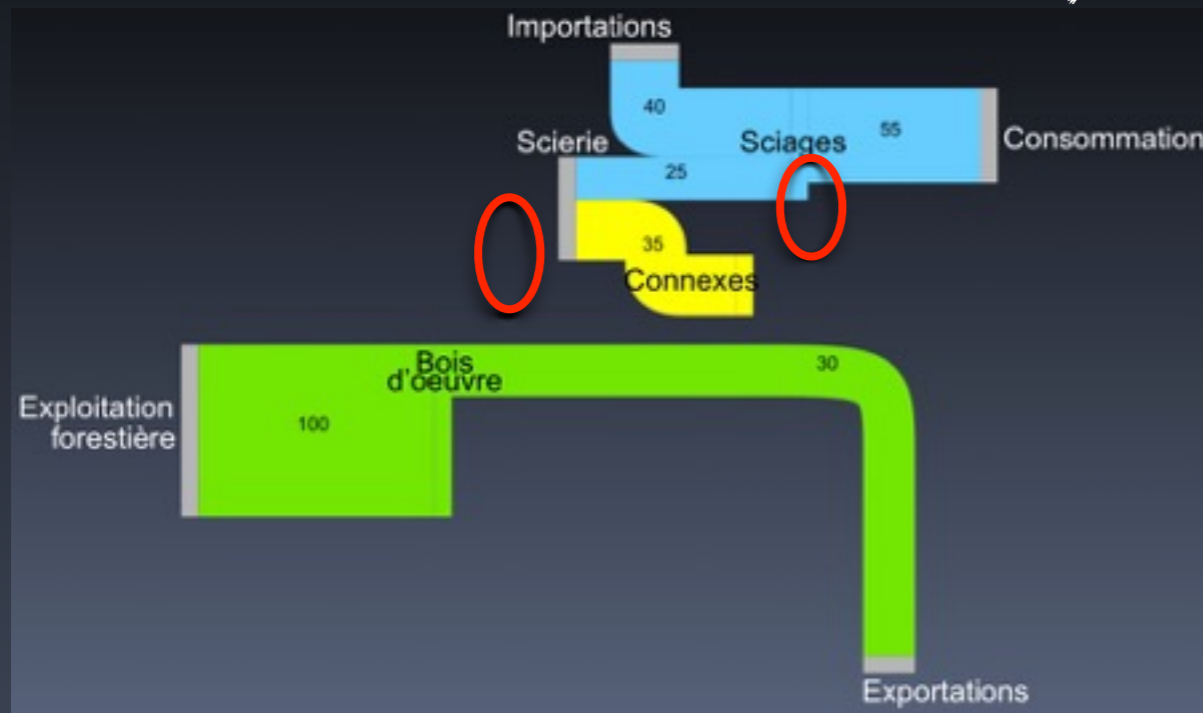
Incomplete, most often inconsistent data...

...Less and less data available as one zooms in geographically

Data reconciliation

data we have

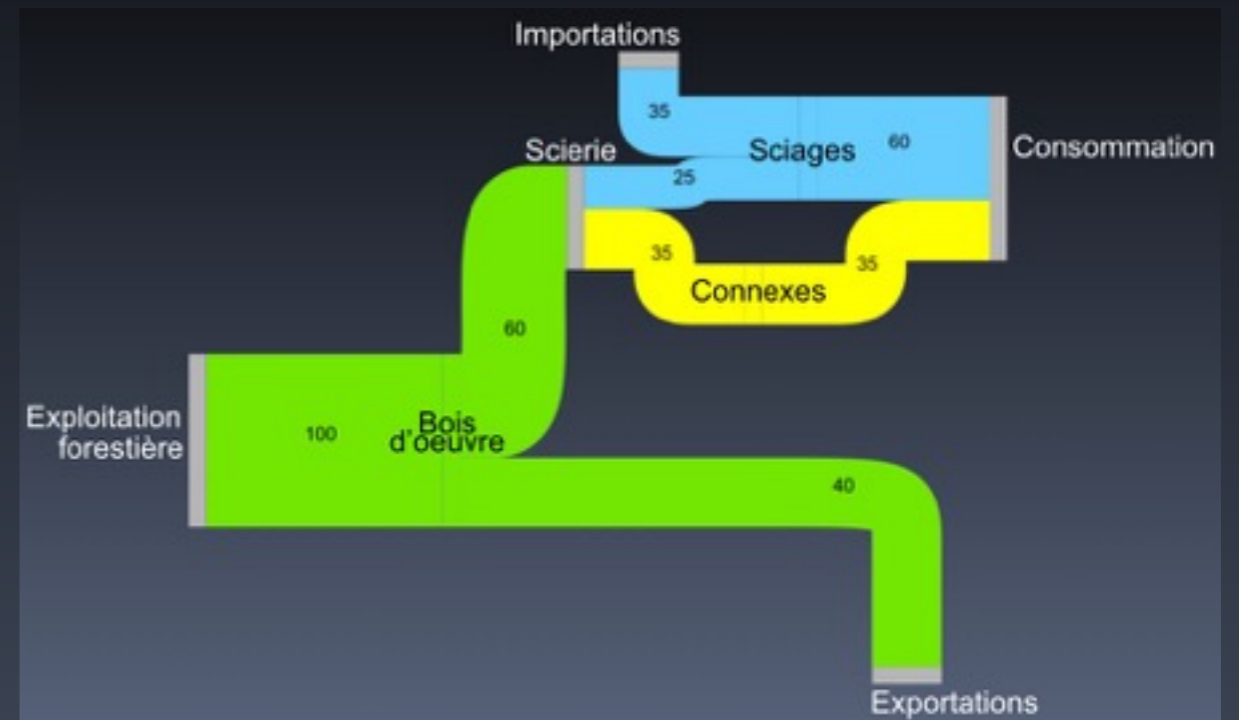
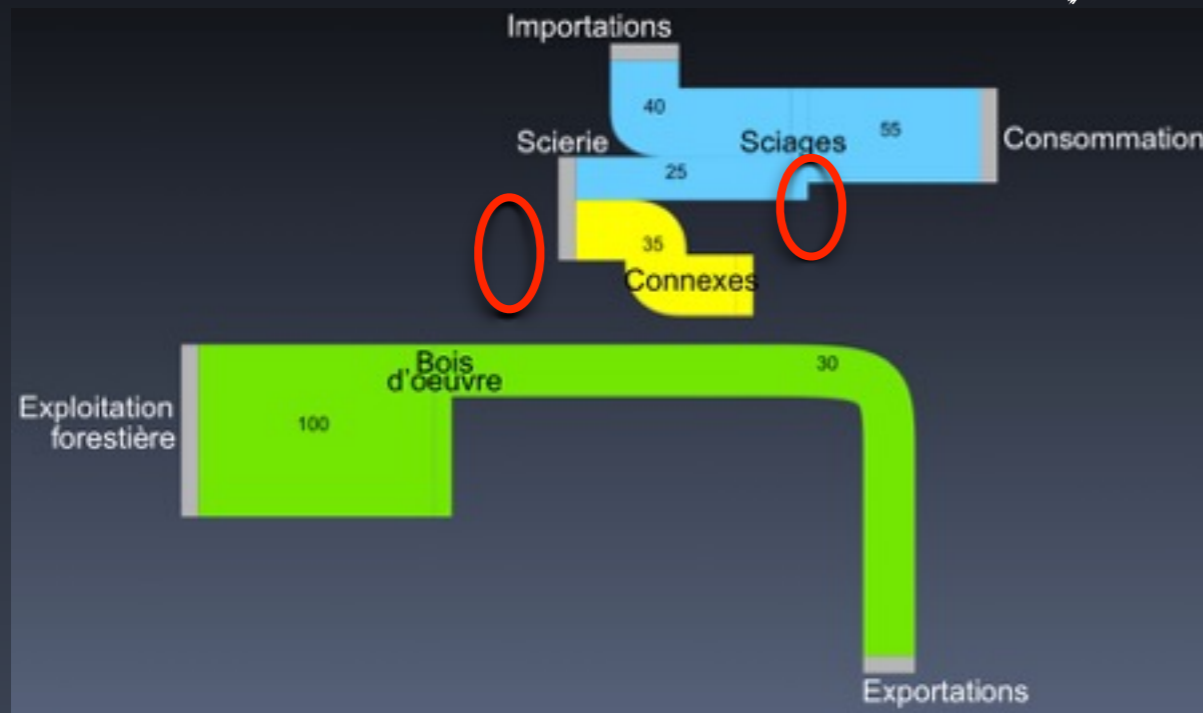
results we want



Data reconciliation

data we have

results we want



“STAN-like” constraint optimization

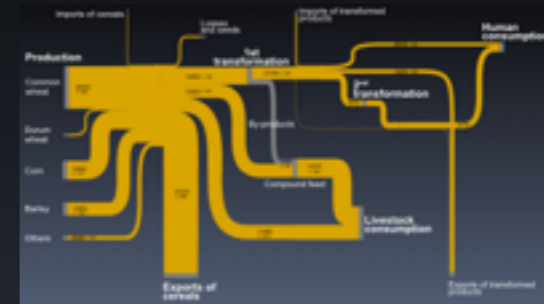


Downscaling

France



1 x



Downscaling =

Geographical aggregation constraints

+ Existing regional data

+ Proxis for some of the missing data



Downscaling

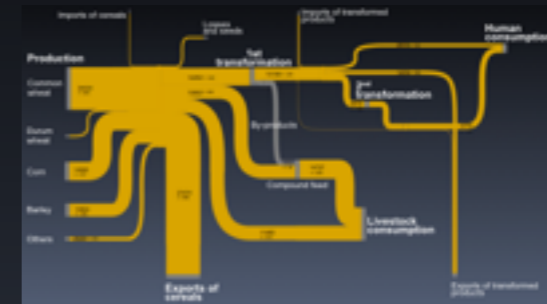
France



Régions



1 x



13 x



Downscaling

France



Régions

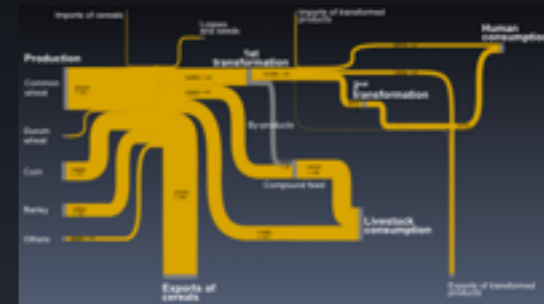


Infra-regional territories

(employment catchment areas, natural parks...)



1 x



13 x



Downscaling

France



Régions

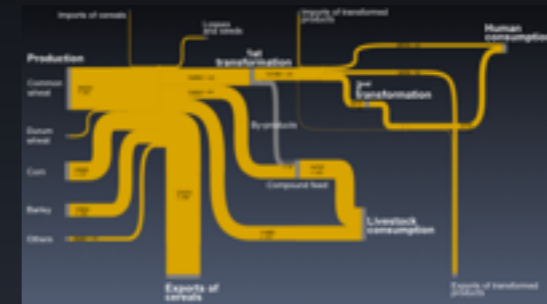


Infra-regional territories

(employment catchment areas, natural parks...)



1 x



13 x



*Courtonne, J-Y., Alapetite, J., Longaretti, P-Y., Dupré, D., Prados, E. 2015.
Downscaling material flow analysis: the case of the cereal supply chain in France.
Ecological Economics*

Main assets

Main assets

- Time-efficient (multi-regional)
- Comparable regional results + consistent with national results
- Any new local information benefits all regions
- Systematic uncertainty assessment

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Animation & continuous knowledge improvement tool

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AF Filières project (www.flux-biomasse.fr)



Steps

1. Definition of the SC structure using SUT framework

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LEVEL	PRODUCT NAME
1	Standing wood
1	Lumber
1	Sawnwood
1	Sawmill residues

Steps

1. Definition of the SC structure using SUT framework

LEVEL	PRODUCT NAME
1	Standing wood
1	Lumber
2	Soft Lumber
2	Hard Lumber
1	Sawnwood
1	Sawmill residues

Steps

1. Definition of the SC structure using SUT framework

LEVEL	PRODUCT NAME	MASS CONSERVATION?
1	Standing wood	
1	Lumber	x
2	Soft Lumber	x
2	Hard Lumber	x
1	Sawnwood	x
1	Sawmill residues	x

Steps

1. Definition of the SC structure using SUT framework

LEVEL	SECTOR NAME	MASS CONSERVATION?
1	Wood harvesting	x
1	Sawmills	x
1	Consumption	
1	Trade	
2	International trade	
2	Domestic trade	
3	...with region A	
3	...with region B	

Steps

1. Definition of the SC structure using SUT framework

SUPPLY TABLE	Wood harvesting	Sawmills	Consumption	Trade	International trade	Domestic trade
Standing wood						
Lumber						
Soft Lumber						
Hard Lumber						
Sawnwood						
Sawmill residues						
USE TABLE	Wood harvesting	Sawmills	Consumption	Trade	International trade	Domestic trade
Standing wood						
Lumber						
Soft Lumber						
Hard Lumber						
Sawnwood						
Sawmill residues						

Steps

1. Definition of the SC structure using SUT framework
2. Filling of input data

Steps

1. Definition of the SC structure using SUT framework

2. Filling of input data

Region	Origin	Destination	Value (original unit)	Unit (original)	Conversion factor	Value (MFA unit)	Unit (MFA)	Uncertainty	Data source
Region A	Standing wood	Wood harvesting	100	m3	1	100	m3f	20%	EAB survey
Region A	Sawnwood	International trade	30	tonne	1.9	57	m3f	25%	Customs
...
Region B	Sawmill residues	Region A	20	tonne	1.7	34	m3f	40%	Domestic freight survey
...

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Region B	Sawmill residues	Region A	20	tonne	1.7	34	m3f	40%	Domestic freight survey
...

Region	Origin	Destination	Min (MFA unit)	Max (MFA unit)	Unit (MFA)	Data source
Region A	Sawmills	Sawnwood	50		m3f	Partial survey
...
Region B	Sawnwood	Consumption	20	50	m3f	Expert guess
...

Steps

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Region	Origin	Destination	Min (MFA unit)	Max (MFA unit)	Unit (MFA)	Data source
Region A	Sawmills	Sawnwood	50		m3f	Partial survey
...
Region B	Sawnwood	Consumption	20	50	m3f	Expert guess
...

# Constraint	Region	Origin	Destination	= 0	<= 0	>= 0
1	All	Lumber	Sawmills		0.45	0.55
1	All	Sawmills	Sawnwood		-1	-1
2	...	...	...	...	...	...
2	...	...	...	...	...	...
2	...	...	...	...	...	...
...

Steps

1. Definition of the SC structure using SUT framework
2. Filling of input data
3. Data reconciliation and uncertainty assessment

SUPPLY TABLE	Wood harvesting	Sawmills	Consumption	Trade	International trade	Domestic trade
Standing wood						
Lumber	100			20	15	5
Soft Lumber	80			0	0	0
Hard Lumber	20			20	15	5
Sawnwood		60		0	0	0
Sawmill residues		60		20	0	20

USE TABLE	Wood harvesting	Sawmills	Consumption	Trade	International trade	Domestic trade
Standing wood	100					
Lumber		120		0	0	0
Soft Lumber		80		0	0	0
Hard Lumber		40		0	0	0
Sawnwood			20	40	20	20
Sawmill residues			70	10	10	0

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SUPPLY TABLE	Wood harvesting	Sawmills	Consumption	Trade	International trade	Domestic trade
Standing wood						
Lumber	[80, 120]			[15, 25]	[13, 27]	[2, 8]
Soft Lumber	[60, 100]			[0, 0]	[0, 0]	[0, 0]
Hard Lumber	[15, 25]			[15, 25]	[13, 27]	[2, 8]
Sawnwood		[50, 70]		[0, 0]	[0, 0]	[0, 0]
Sawmill residues		[50, 70]		[10, 30]	0	[10, 30]

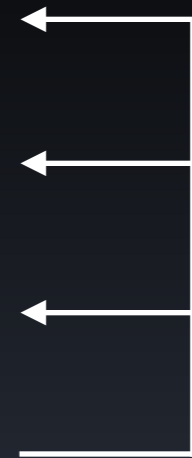
USE TABLE	Wood harvesting	Sawmills	Consumption	Trade	International trade	Domestic trade
Standing wood	[80, 120]					
Lumber		[100, 140]		[0, 0]	[0, 0]	[0, 0]
Soft Lumber		[60, 100]		[0, 0]	[0, 0]	[0, 0]
Hard Lumber		[30, 50]		[0, 0]	[0, 0]	[0, 0]
Sawnwood			[10, 30]	[30, 50]	[10, 30]	[10, 30]
Sawmill residues			[60, 80]	[0, 15]	[0, 15]	[0, 0]

Steps

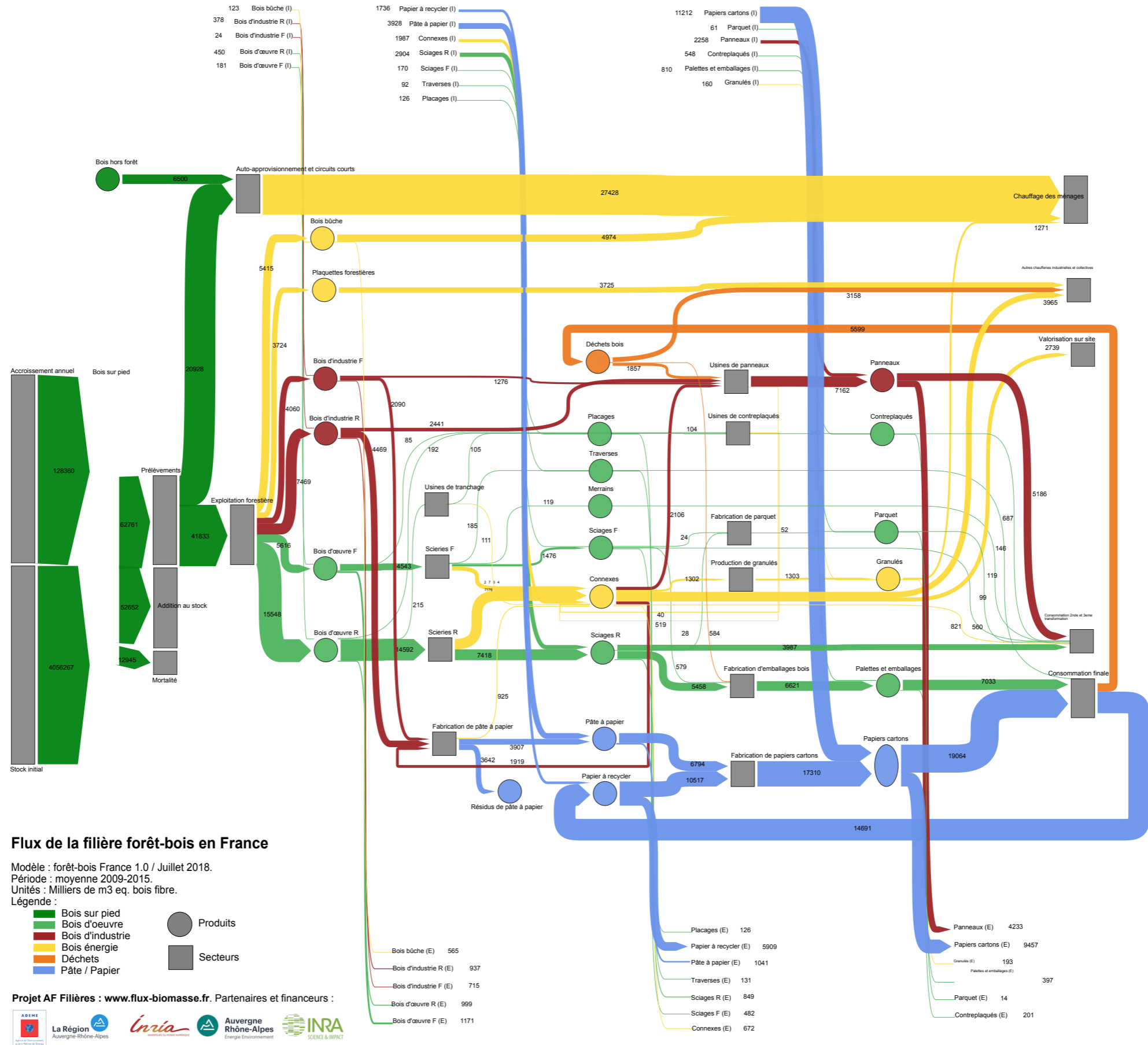
1. Definition of the SC structure using SUT framework
2. Filling of input data
3. Data reconciliation and uncertainty assessment
4. Visualization and discussion with stakeholders

Steps

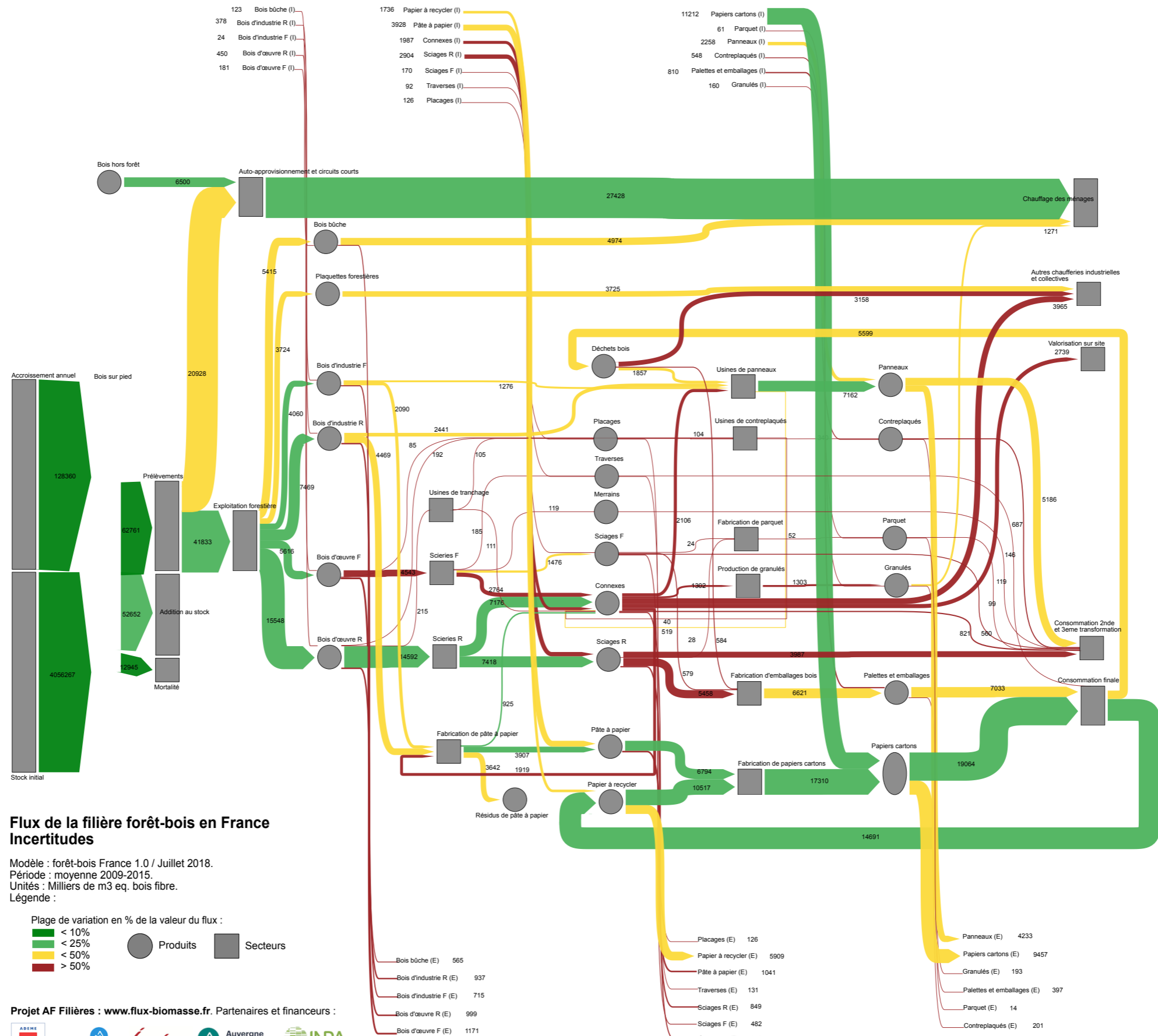
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Exemples (www.flux-biomasse.fr)



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ACCUEIL **PROJET** CONTRIBUTUER AGENDA ACCÈS PARTENAIRES

- France
- Ile-de-France
- Centre-Val de Loire
- Bourgogne-Franche-Comté
- Normandie
- Hauts-de-France
- Grand Est
- Pays de la Loire
- Bretagne**
- Nouvelle-Aquitaine
- Occitanie
- ✓ Auvergne-Rhône-Alpes
- Provence-Alpes-Côte d'Azur
- Corse

France et Régions - Sankey + données au format excel

Lisez-moi

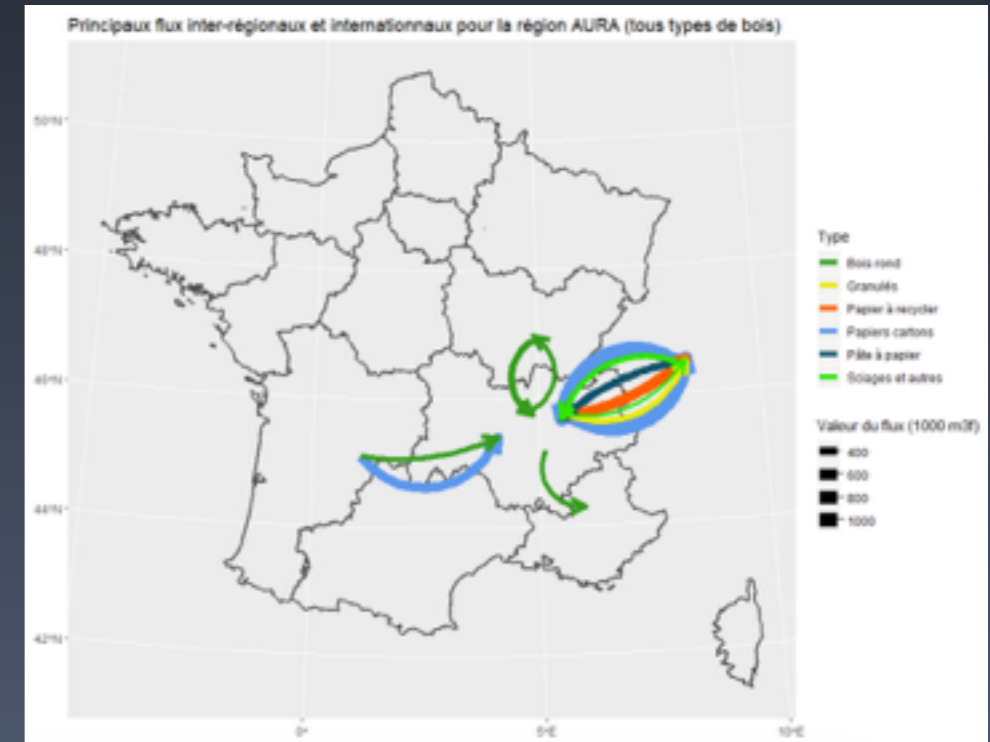
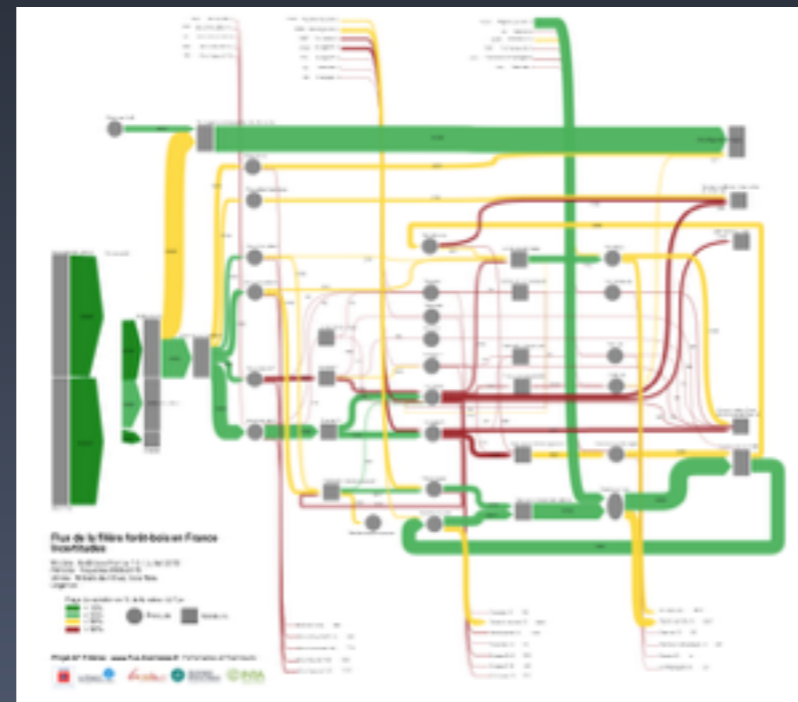
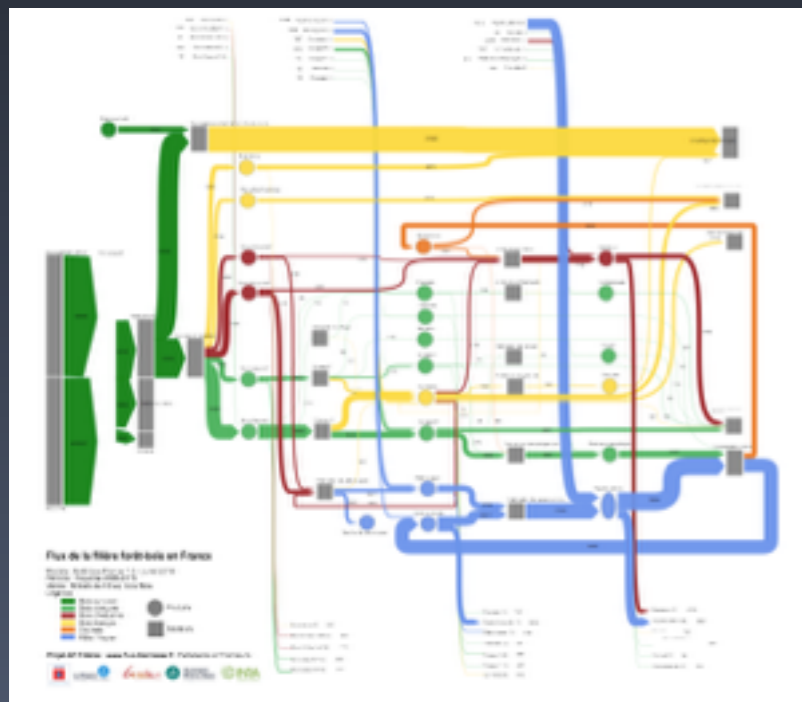
Données excel

Voir les cartes

Changer affichage couleurs

Changer affichage valeurs

Légende



Exemples (www.flux-biomasse.fr)

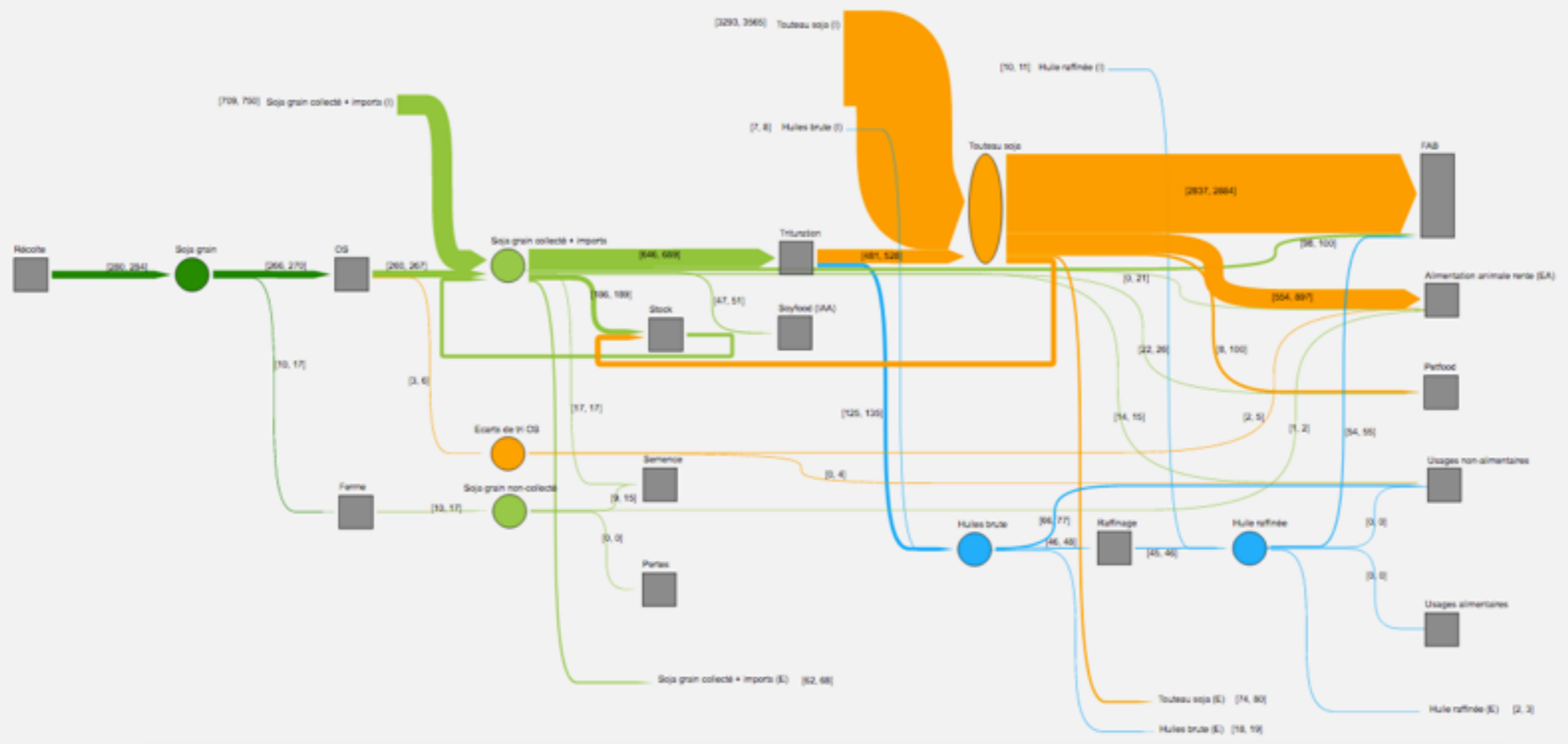
Flux de matières premières en alimentation animale, GIS Avenir Elevages.

NRA, du CNIEL, de FranceAgriMer, de TerresUnivia et de l'APCA, l'ANMF, AgroParisTech, Arvalis, Céréopa, Coop de France NA, l'IDELE, l'IFIP, Inria, l'ITAVI, MAAF, Réséda et le SNIA.

- Avoine
- Blé dur
- Blé tendre
- Fèves
- Lin
- Lupin
- Luzerne
- Maïs simplifié
- Maïs
- Pois
- ✓ Soja
- Sorgho
- Tournesol
- Triticale

Lisez-moi

Légende



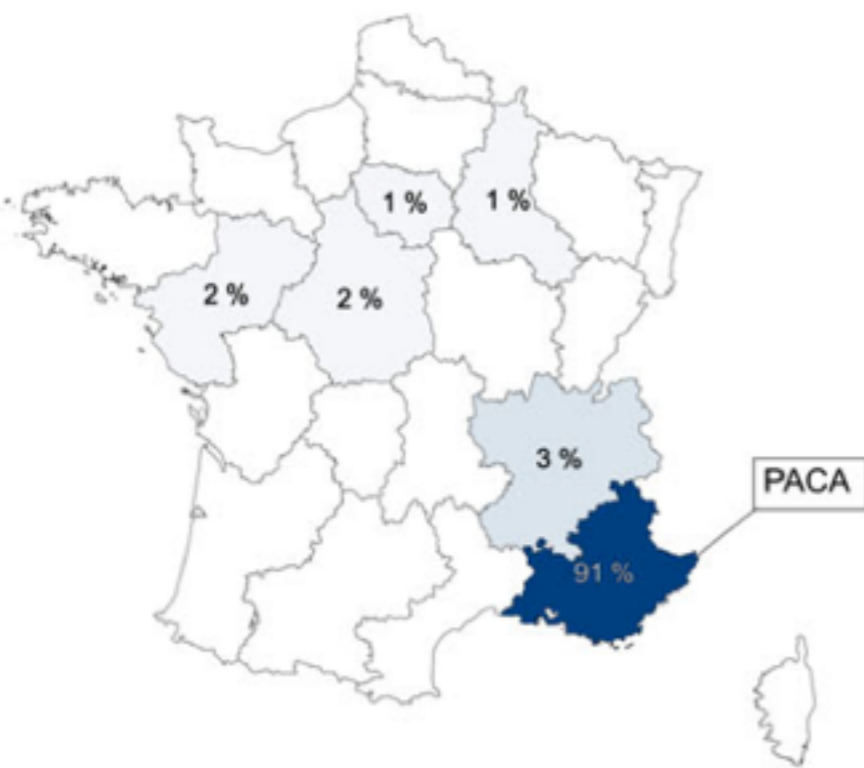
Tracing flows and footprints

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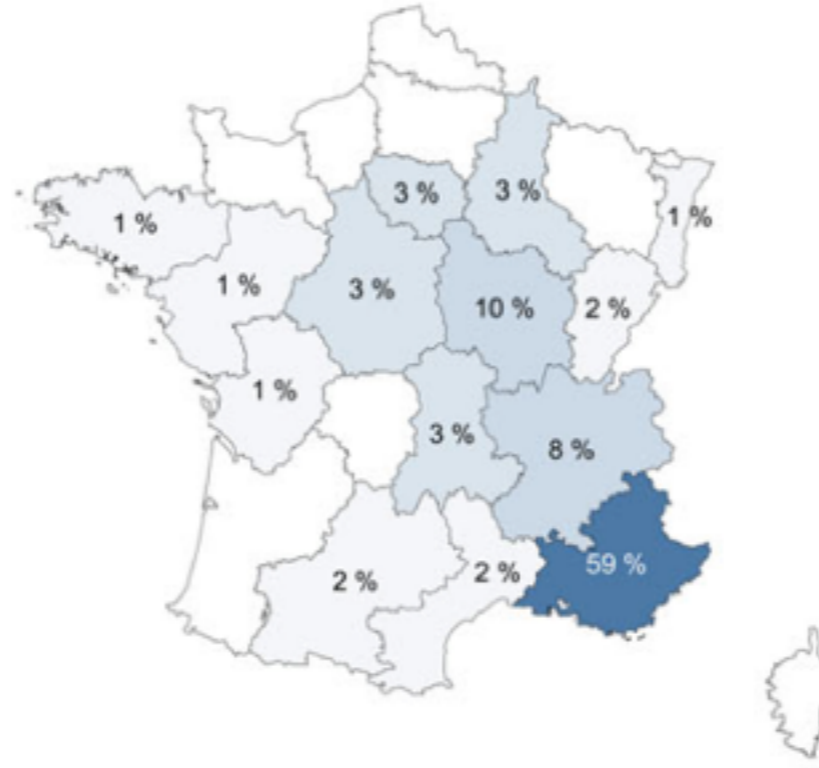
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Tracing flows and footprints

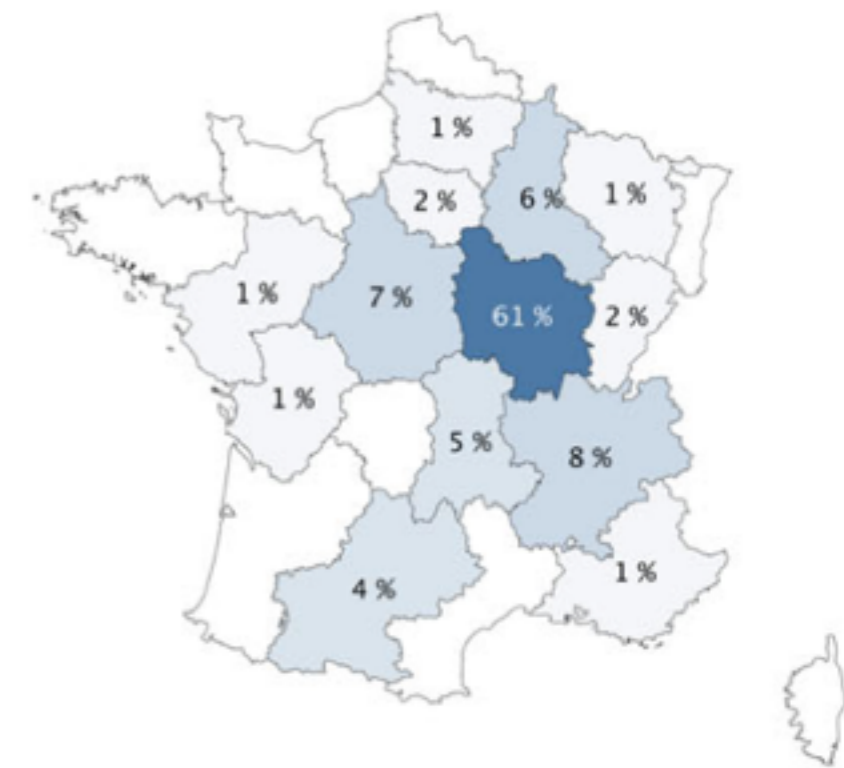
- MRIO (or AMC) model based on PSUT
- Study resource origin/destination



Origin of bread consumed in PACA



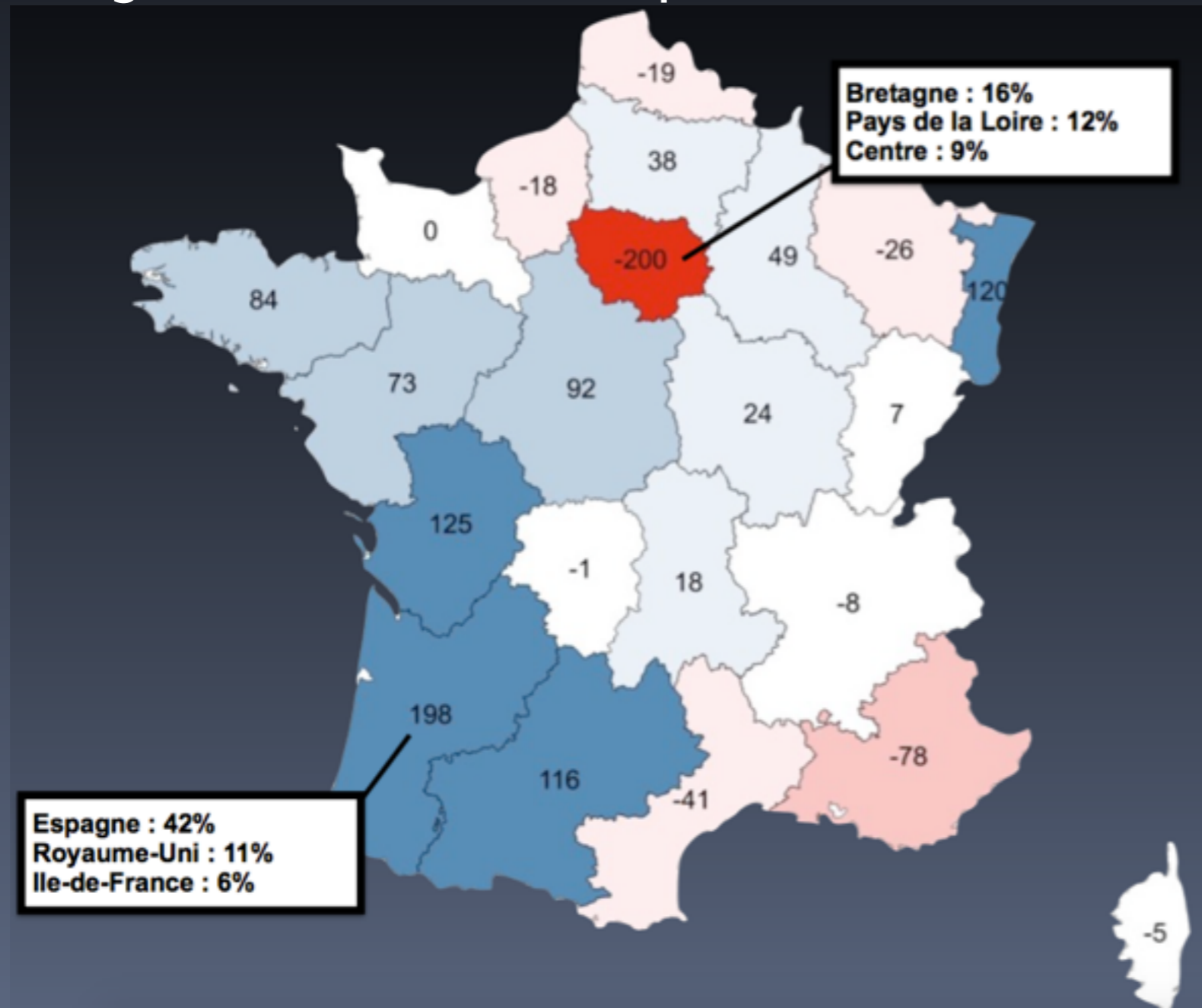
...of flour used to make the bread consumed in PACA



...of wheat used to make the flour used to make the bread consumed in PACA

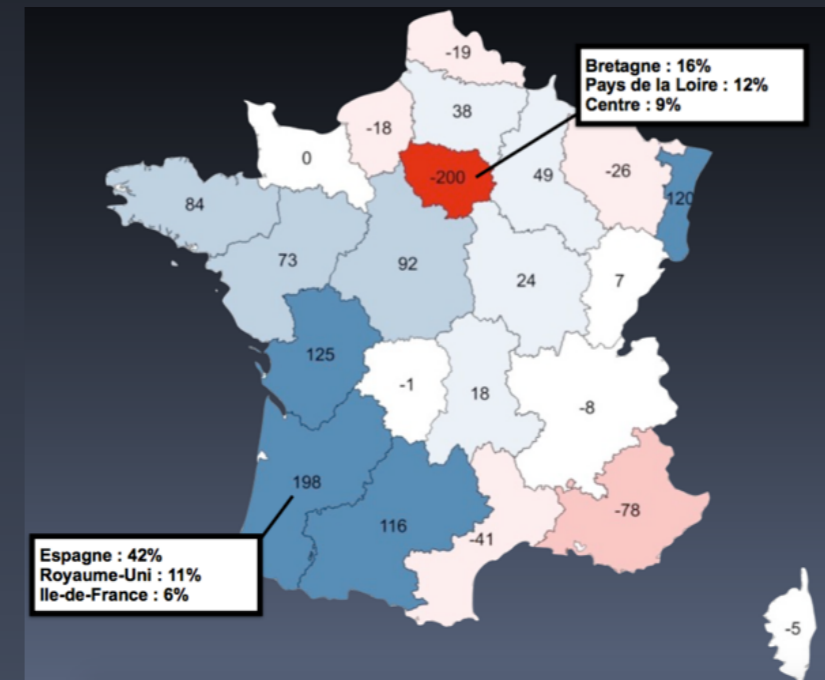
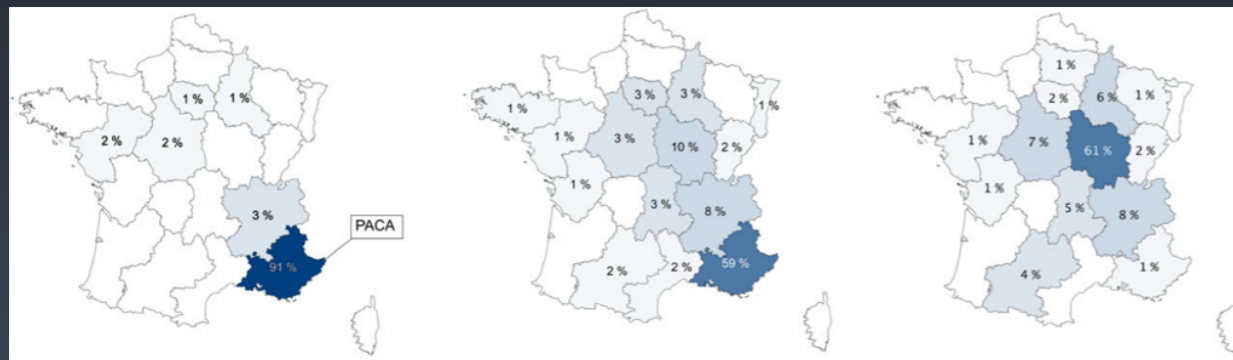
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*Courtonne, J-Y., Longaretti, P., Alapetite, J., Dupré, D. 2016.
Environmental Pressures Embodied in the French Cereals Supply Chain.
Journal of Industrial Ecology*

Future work

- Study agri-food chains at regional level

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- Study missing chains (whole picture of French biomass chains)

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Thanks for your attention!

www.flux-biomasse.fr

team.inria.fr/stEEP

jean-yves.courtonne@inria.fr