

Meeting wood for energy targets: government or market driven?

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COST ORCHESTRA – WG1

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Background

- EU: Climate change → causes: GHG emissions
- CO₂ reduction = public good
 - free-rider, no motivation to investment
 - [Government] economic incentives to persuade towards the change i.a. Forest biomass energy
- Spain: economic crisis → environmental issues 2ary = decrease or reduction of EI; “*laissez-faire*” approach
 - BUT!!! Forest biomass utilisation keeps on growing

RQ & methodology

- **Phenomenon:** increasing use of wood for energy even if economic incentives decrease
- **RQ:** How are economic incentives perceived to drive the increase of woody biomass use?
- **Case study:** Spain
- **Data collection:**
 - 2ary data: Document analysis (legal docs, press releases, statistics)
 - 1ary data: Semi-structured, open-question interviews to 10 stakeholders, frame of COOL project
- **Data analysis:** axial coding according to 1) phenomenon; 2) conditions (context, causal); 3) actions & strategies; 4) consequences; conceptualised in a DPSIR framework (Drivers-Pressures-State-Impacts-Responses)

Stakeholders' interviews

- **Selection:** representatives of 5 groups

Stakeholder type	Interviewee	nr
Policy-makers	Ministry of Agriculture	1
Economic	Certification, Silvicultural firms, Lobby industry	4
Practitioners	Forest owners	1
Science	Research	2
Ecology	ENGO	2



- **Duration:** 68min average
- **Jan-Sept. 2013**
- **Conversation guideline:** including other aspects (COOL project)

EU Renewable Energy Directive in Spain (I)

- **Underlying rationale of the EU RE Directive**

DRIVERS

Cheap current prices
Investments already
done
Lack of Life Cycle
Assessment

PRESSURES

Use of fossil fuels

STATE

↑ GHG emissions
↑ External energetic
dependence

IMPACT

↑ Climate change
-External balance

- RE use 2008 in Spain: → Target: 20% by 2020
- National Action Plan 2011-2020: biomass fraction:
8.3_M t wood = 2,8 ktoe

EU Renewable Energy Directive in Spain (II)

- National Action Plan**

	2006		2020	
	Amount (t)	Primary energy production (Ktoe)	Amount (t)	Primary energy production (Ktoe)
Direct woody biomass from forests and woods	4,800,000	1,200	8,332,328	2,801
Indirect woody biomass from industry residues	5,218,750	1,600	5,674,765	1,702

Year	Policy	Level
1997	Electricity sector law: first differentiation between “ordinary” and “ special regime ” for electricity produced from renewable sources.	State
2003	Spanish Forest law : competences AACC, forest product, national strategy	State
2005	Renewable Energies’ Plan 2005-2010: objective of 12% from RE.	State
2007	Special regime of electricity production from renewable energies. Feed-in tariffs.	State
2007	Regulation on heat installations in buildings, supporting biomass boilers	State
2009	EC Directive 2009/28: target for Spain 20%	EU
2010	National Action Plan for Renewable Energies 2011-2020 : objective 22,5%	State
2011	Renewable Energies’ Plan 2011-2020	State
	Aids (generally related to CAP) for biomass extraction from forests	Regional
	Aids for biomass-fed boilers	Regional
2011-2013	Specific regulations for forest biomass for energy use (“ forest plantations ”)	Andalucía (2011), Aragón, Castilla-León (2012), Catalonia (2013)
2012	Suspension of feed-in tariffs for new electricity plants installations from RE	State
2012	Law 15/2012 new taxes on all electricity generation plants	State
2013	RDL9/2013 reduces previously approved subsidies to renewable electricity producing plants → discouraging new investments	State

EU Renewable Energy Directive in Spain (II)

REAL DECRETO 661/2007, de 25 de mayo, por el que se regula la actividad de producción de energía eléctrica en régimen especial

- Categories for **direct biomass** are described as Grupo b.6.:
 - Subgrupo b.6.1. Centrales que utilicen como combustible principal biomasa procedente de **cultivos energéticos** (agrícolas o **forestales**).
 - Subgrupo b.6.2. Centrales ... biomasa de residuos de las actividades agrícolas o de jardinerías.
 - Subgrupo b.6.3. Centrales que utilicen como combustible principal biomasa procedente **de residuos de aprovechamientos forestales** y otras **operaciones silvícolas en las masas forestales** y espacios verdes.

b.6.1	P ≤ 2 MW	primeros 15 años	16,0113	11,6608
		a partir de entonces	11,8839	0,0000
	2 MW ≤ P	primeros 15 años	14,6590	10,0964
		a partir de entonces	12,3470	0,0000
b.6.2	P ≤ 2 MW	primeros 15 años	12,7998	8,4643
		a partir de entonces	8,6294	0,0000
	2 MW ≤ P	primeros 15 años	10,7540	6,1914
		a partir de entonces	8,0660	0,0000
b.6.3	P ≤ 2 MW	primeros 15 años	12,7998	8,4643
		a partir de entonces	8,6294	0,0000
	2 MW ≤ P	primeros 15 años	11,8294	7,2674
		a partir de entonces	8,0660	0,0000

EU Renewable Energy Directive in Spain (III)

Measures:

- **DEMAND** of woody biomass (for energy production):
 - NATIONAL level:
 - Feed-in tariff for RE (incl. biomass from forestry)
 - Equal electricity prices for all sources
 - REGIONAL level:
 - Subsidies for boilers' installation
- **OFFER** of woody biomass:
 - REGIONAL level:
 - subsidies for biomass machinery acquisition
 - Subsidies for forest biomass extraction



EU Renewable Energy Directive in Spain (IV)

- **Rationale behind measures:** reducing risks of medium-term investments through attractive economic incentives

RESPONSE

EU RE Directive / National Action Plans on RE

Feed-in tariff

Subsidies for boilers / machinery / extraction...



DRIVERS

Medium term returns → shorter
Smaller investments

PRESSURES

↑ Use of woody biomass for electricity

STATE

↓ CO₂ emissions
↑ use of own Natural resources
2ary: Rural jobs

IMPACT

↓ Climate change (↑ mitigation)
+ External balance
↑ Rural development

Findings from interviews (I)

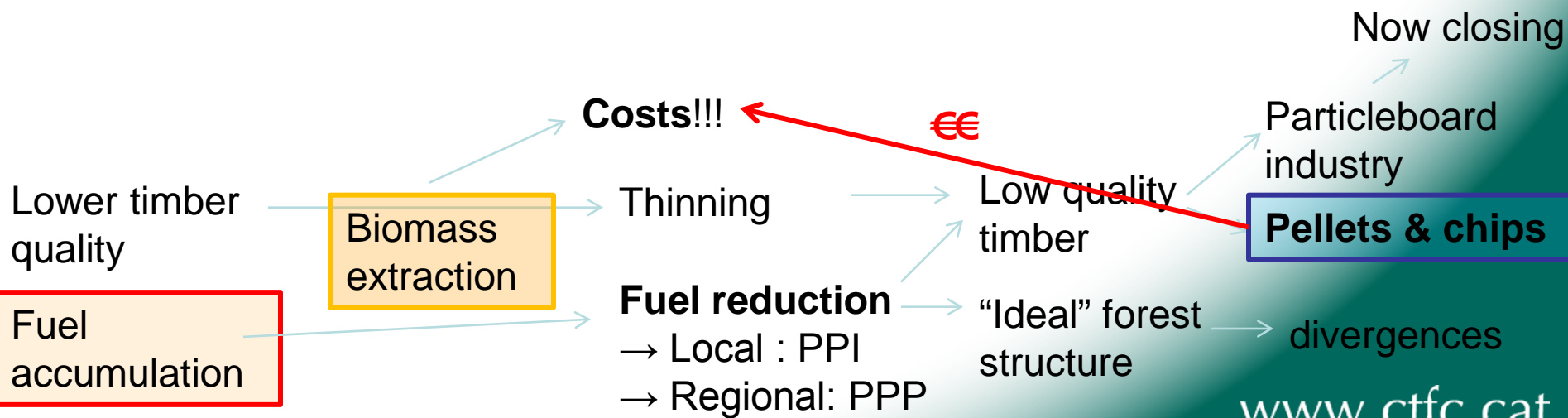
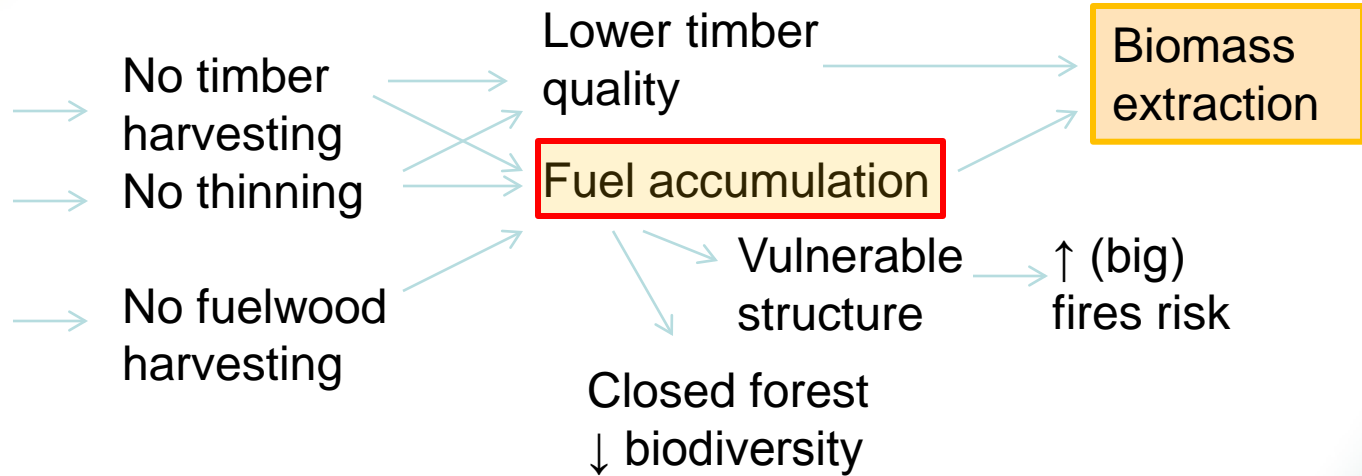
- **Different approach:**
 - synergies between fire risk reduction and biomass energy promotion
 - Easier, (relatively) cheaper and more efficient heating



Axial Coding (Offer-side)

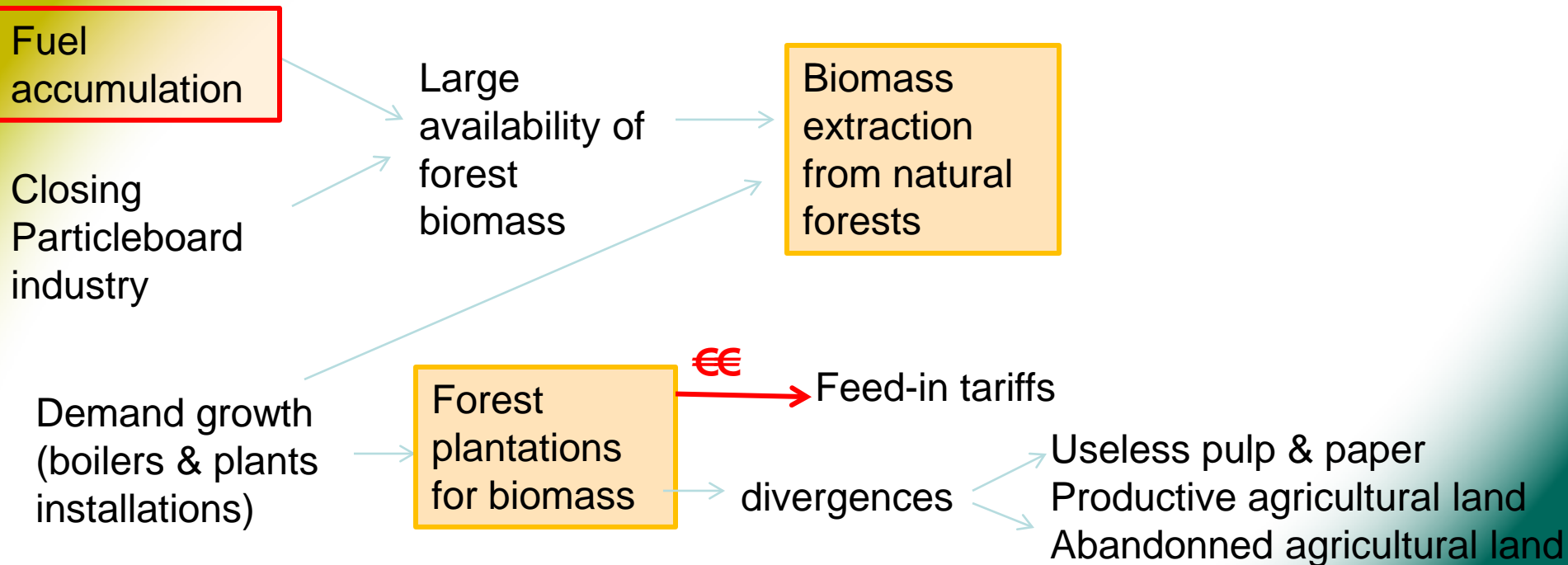
OFFER

Lack of forestry profitability
 Large reforestations (50-70s)
 Gas introduction (60s)

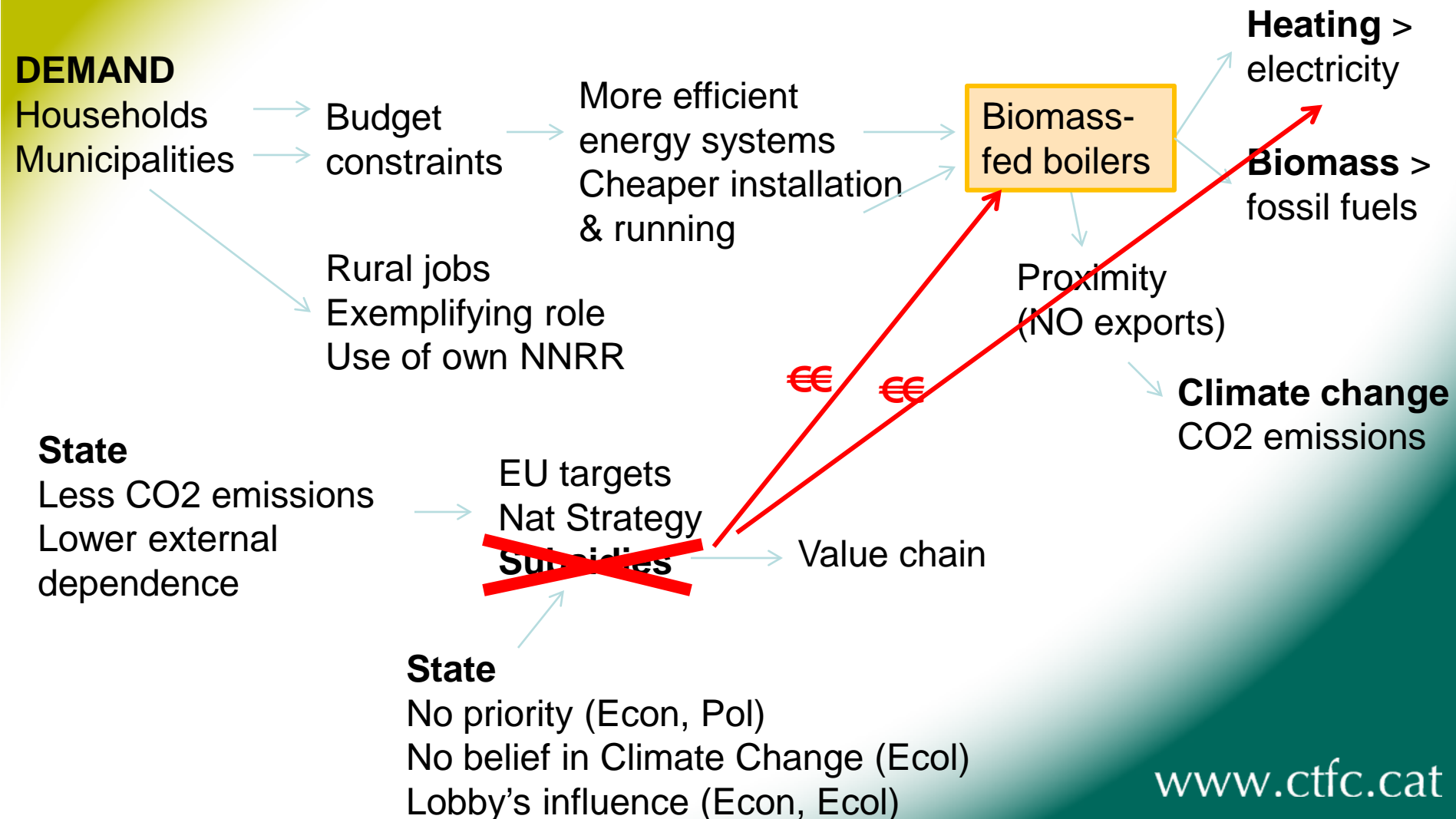


Axial Coding (Offer-side II)

OFFER



Axial Coding (Demand-side)



Findings from interviews (II)

RESPONSE

Government-driven

Feed-in tariffs suspended for new, reduced for existing
Subsidies stopped and/or reduced
Electricity tax

DRIVERS

Medium to longer term electricity returns

PRESSURES

↓ biomass for electricity plants



EXTERNAL DRIVERS

Market-driven

High oil prices
Biomass technology developments
Smaller boiler investments
Households' economic restrictions
Higher electricity prices
Particleboard industry in crisis

PRESSURES

↓ electricity use
↑ Use of woody biomass for domestic & municipal heating
↑ biomass processing firms

Availability of forestry residuals and low quality wood
Need of reducing biomass in forests

STATE

1ary: rural jobs
↑ use of own Natural resources
↓ CO₂ emissions

IMPACT

+ Domestic balance
↑ Rural development
+ External balance
↓ Climate change effects (↑ mitigation & adaptation)



Government-driven

Fire prevention requirements & costs

Consensus: large stock of forest biomass

- **There is a consensus among all interviewed agents on having a large stock of forest biomass ready to be used:**

The Ecology group uses this argument to be against plantations in agricultural lands

The policy maker uses it to justify that there is a possibility to increase the biomass consumption in Spain

- [GREENPEACE] *“we have more than enough biomass; forests are wishing to that you enter to cut!”*.

Causes for fuel accumulation

- Interviewees usually relate the origin of that stock to abandonment of forestry works; closing of particleboard industry, & reforestations of the 60-70s
- to the extensive reforestations, the introduction of household gas, and the high extraction costs. Such changes are mentioned in relationship with more severe wildfires. Especially the economic group uses threatening terms to refer to a potential catastrophe.
- [TRABISA] *“In the 60s there was the butane crisis in Spanish forests. People gave up coming to harvest fuelwood because everyone had butane stove. And then fuel started to be accumulated and **fires started to become much bigger** than to date. Then, this is a thing that we are accumulating and accumulating, and finally **is like a ticking time bomb**”.*
- [REMUFOR] *“If in 40 years you don’t cut a tree, we end up with a **terrible fuel load**. Well, this **is a powder keg** (...) In the end, data is **devastating**. And when you see that given that there is no forest management in the last 40 years, the number of burnt hectares rockets so much... something has to be done. It [management] should be recovered”.*

Biomass extraction = fuel model change

- Forestry interventions for biomass production are perceived as changing the **fuel model** towards another with **less propagation** characteristics and **lower fire impacts**.
- [ASEMFO] *“Executing thinnings and pre-commercial thinning very much **improves the fuel model**”.*
- [TRABISA] *“The day that a spark falls there, there won't be human manner to put out that. With the rational and sustainable extraction we're doing of biomass, then that is **much cleaner**, more controlled and when there is a problem, its **impact is minimised**”.*



Consensus: biomass as an opportunity

- **There is a consensus among all interviewed agents on biomass market as an opportunity for finance forestry works:** Ecology group justifies the need of such works for fire prevention purposes.
- [GREENPEACE] *“For us the biomass in the **feed-in tariff** of the special regime for renewable energies to biomass **is the way to finance forestry works**. We enter into **preventive treatments**: wildfires, cleaning of electricity lines, purely forestry management, this is, the residuals and the wood where there is no exit to the industry”. “biomass will serve as a tool for financing forest management, both the work of fire prevention, and the improvement of forest areas, and it **could give a value**, or generate some revenues in zones **where** right now the presence of forest is practically **abandoned**... there is no [management]”*
- [WWF] *“Biomass extraction means an **opportunity** (...) to, maybe, being able to apply **preventive management of forest fires** (...) These silvicultural treatments are in general, very often committed in some fire preventive plans and that later **aren’t applied due to lack of budget availability**. Then biomass, if it results profitable, can be a **chance to activate that**”.*

Different approaches to model of a fire-protected forest

Different understandings of desirable forest structure: the term “clean forest” is object of discussion. Whereas the ecology group unify voices against using the term, practitioners and firms use it often and positively.

- [WWF] *"We cannot have forest completely clean and garden-like".*
- [GREENPEACE] *"The extraction of biomass has to take very much into account that there is an important soil cover in terms of vegetal cover, and then also the reposition, this is, to keep the nutrients' balance. We are very worried, and we express it in its moment, the concept of "clean forest". It seems to us that an expression that wants to be pedagogic has been spread but encloses a wrong idea, doesn't it? This is, the forest should have elements that are not only trees; it should have shrubs, it should have herbaceous, it should have strata and, in addition, they form part of the functioning, don't they? (...) Then, spreading the idea that forests should be clean is an error".*
- Still, they assume that some wildfire preventive management should be done, but aim at finding a compromise with the criteria of creating vegetation discontinuities and different fuel load areas. *"It's true that the biomass must be managed in such a way that in case of fire, well, we avoid continuities, that we have zones with different biomass loads, that there are zones that can be free of herbaceous, shrub stratus through the techniques that are... [more appropriate]."*

Biomass for electricity

- Electricity **less efficient** than heating.
- [REMUFOR] *“I too much doubt on electricity energy, because in a box where you put 100 and you get 25, which is the performance of biomass, something is wrong”*.



- Cogeneration also good, but limited.

Subsidies' dependence

- Electricity largely **dependant on feed-in tariffs**
- [REMUFOR] *“because there is conjuncture of subsidies and subsidized prices that allows for that [= electricity use of biomass] to work. But if we want to be really sustainable, we will have to bet on the thermal use of biomass”*.
- [AVEBIOM] *“this is a matter of the subsidized prices... Then, electric energy is nowadays not feasible without an aid, a support. However, thermal generation is completely feasible because it perfectly competes with gasoil, natural gas, propane, which are more expensive”*.

Uncertainty about Ren. Energy targets

- **expressions of uncertainty about meeting the renewable energy targets:**
- Ecology group do not perceive as realistic reaching the RED targets
 - [GREENPEACE] *“It’s a scenario that has been wiped out. This is, one thing is what the EU proposed and another thing is what the Spanish government has decided in the last year”*; *“we don’t know whether we’re going to meet the kW,”*
 - [WWF] *“Until the suspension of the feed-in tariffs it looked like it could be reached; however, now the entire part of the electricity sector remains paralised”*.
 - **Targets’ setting context** [WWF] *“The problem is that these objectives were established before the measures of feed-in tariff suspension for renewable [energies] and another series of legislations that have changed. (...) Right now they are not realistic because they don’t adjust to the context in which they were elaborated”*.
 - Targets’ adjustment. [WWF] *“That they [the targets] are adjusted to the current socio-economic context (...) Man, since objectives are established, if they can be adjusted to reality, much better”*.
- Economic group
 - [Trabisa] *“So far, Spain, when there was no renewables’ moratorium, in line with this European policy (...), there was here a legislation that promote the issue of biomass plants... [After the moratorium] the projects have been left totally paralyzed or abandoned. At that time we already were following the European policy. Now we’re following our own policy against the crisis. Then, as long as this doesn’t change, Spain won’t accomplish with the European targets”*.

Government trust

- The biomass' firms' association informs about the **low trust in the Government** given the lack of continuity, putting the emphasis in the discontinuity of economic support.
- [AVEBIOM] *“Who trust the Government predictions? This is worthless scraps of paper. They are continuously changing their minds (...) One thing is that you have a plan, but a plan without money doesn't go anywhere. Maybe this year they don't have money... The proof is that the aids for production of electricity with biomass have disappeared. They said that there was a renewable bubble. Lie. There wasn't renewable's bubble: there was a photovoltaic and wind bubble, but not of biomass”*

Biomass for heating

- The economic crisis that Spanish homes are facing makes them more prone to engage in heating methods that reduces their costs.
- [REMUFOR] *“it’s clear that chips’ or pellets’ boiler has a higher price than gasoil boilers. But when you take the perspective for 3 or 4 years, you have paid off it and you’re saving. (...) Therefore, in the end, people (...) as they’re so tightened with money, they will generate... Even now there are offers of not changing the boiler, but only the burner. Hence, it’s even cheaper and the first year, if you only change the burner, so you are already saving money”.*

Biomass vs oil/gas

- If targets met is because of **oil price** promotes households changing boilers
- [Trabisa] *“first, oil price is nowadays conditioning the increase of pellets demand for heating. And this is pulling more than any Government aid”*.
- [REMUFOR] *“really, chips’ price is every year higher (...) because gasoil [price] is non-stop increasing and here chips are very demanded”*.
- [ASEMFO] *“The price of fossil fuels is the main factor that facilitates the use of forest biomass”*.

Consensus against transport & exports

- CO2 emissions appear mostly when dealing with transport-related issues (plants locations, exports)
- There is consensus on **transport causing more CO2 emissions** and therefore preferring local processing and trade
- Ecological group: Carbon balance should include the transport of the material. When incorporating it, the theoretical neutral balance of Carbon starts to be questioned, especially for large distances (e.g. imports).
[GREENPEACE] *"[Carbon balance of biomass] is considered neutral; what happens is that it's a theoretical concept. But when (...) United Kingdom imports chips from Canada, then well, it starts to... [=fail]. Harvesting wood in the Valencian Community to ship it to Italy is in fact subsidised and there is a benefit, but we haven't done the life cycle [assessment]. Then it should be seen whether these emissions... (...) Most likely we are emitting more Carbon with the transport, aren't we?"*
- [Local burnt of wood] Based on the transport implications for the carbon cycle, they rather support the utilization of local wood in the nearby area.[GREENPEACE] *"That's why it makes sense making pellets and burnt them in the proximity; it makes sense biomass within a more local system"*.

Theories to contrast?

- Theory of polycentric governance? ↔ opportunistic situation

Contrasting findings

- Profitability of heating biomass vs gasoil
- Profitability of heating vs electricity (**to do**)
- Evolution biomass availability, fuel prices, biomass installations

Comparative: biomass vs gasoil boiler

Comparació entre una caldera de biomassa i una de gasoil

POTÈNCIA CALDERA (KW)	100	200	300	400	500
Hores/any de funcionament	1.600	1.900	2.000	2.000	2.000
Consum tèrmic (KWh/any)	160.000	380.000	600.000	800.000	1.000.000
Consum estella (t/any)	39	93	147	197	246
Cost biomassa anual (€/any)	2.949	7.004	11.059	14.746	18.432
Cost instal·lació caldera biomassa (€)	39.000	54.000	86.000	95.500	100.000
Cost operacions i manteniment (€/any) caldera biomassa	400	600	700	825	1.000
Cost caldera biomassa amb ajut a la inversió (30%) ICAEN	27.300	37.800	60.200	66.850	70.000
Consum gasoil (l/any)	15.968	37.924	59.880	79.840	99.800
Consum gasoil anual (€/any)	10.379	24.651	38.922	51.896	64.870
Cost instal·lació caldera gasoil (€)	13.000	18.000	28.667	31.833	33.333
Cost operacions i manteniment (€/any) caldera de gasoil	350	500	600	725	900

SECTOR TÈRMIC

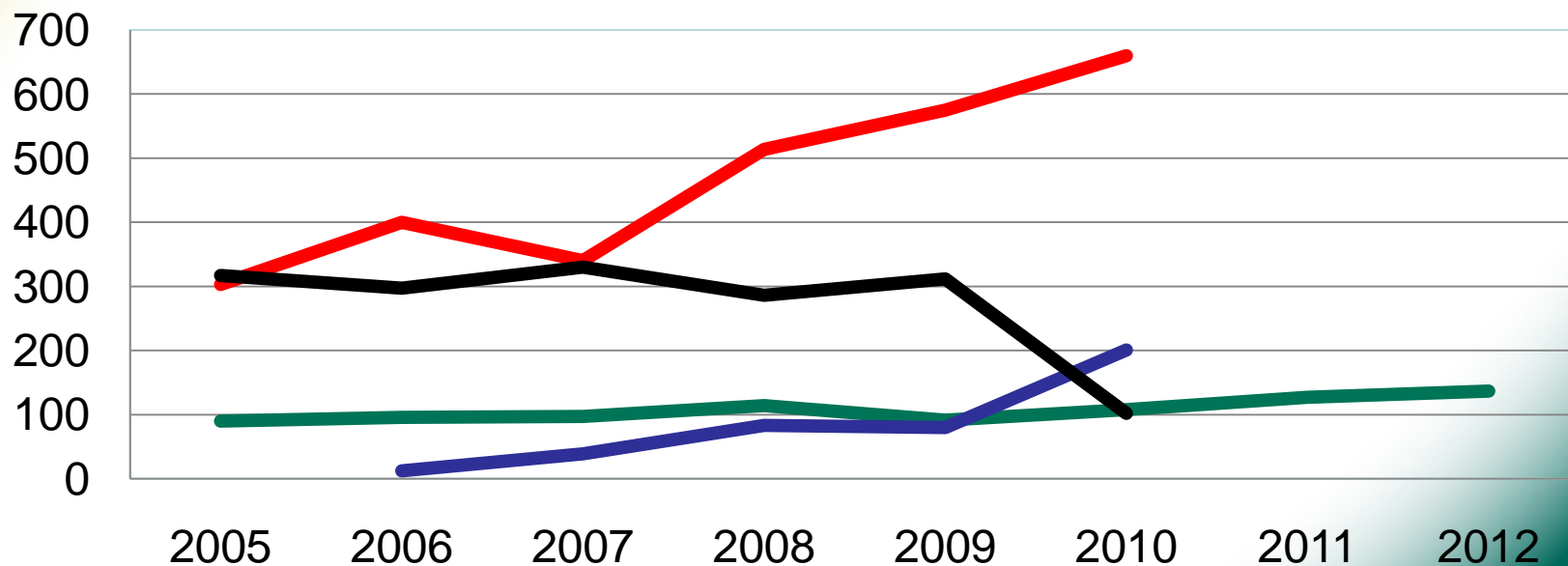
Temps d'amortització d'una caldera de biomassa respecte una de gasoil

Potència de la caldera	biomassa sense ajut	biomassa amb ajut
100 kW	a partir del 4rt any	a partir del 2n any
200 kW	a partir del 3r any	a partir del 2n any
300 kW	a partir del 3r any	a partir del 2n any
400 kW	a partir del 2n any	a partir del 1r any
500 kW	a partir del 2n any	a partir del 1r any

(*) S'ha considerat el següent:
 Poder calorífic inferior: Estella:
 4.069 kWh/t; gasoil: 10,02 kWh/l
 Preu mig combustible: Estella:
 75€/t; gasoil: 0,65 €/l
 Cal considerar que el cost
 d'instal·lació de les calderes és de
 referència i caldria fer un estudi
 més detallat segons fos el cas.

Data on variables' dynamics

- Dynamics: particleboard industry – gasoil prices – biomass developments



— oil price (cents of €)

— nr boilers installed (hundreds)

— pellet consumption (kt)

— particleboard production (10000 m3)

Source: INE (2013);
AVEBIOM (2011),
MAGRAMA (2011)

Conclusions (I)

- New paradigm: public money in biomass energy promotion justified by fire-related savings **OFFER!**
- Growing paradigm: non-public dependence
- Dismatch policy formulation & implementation
- Conjunctural situation:
 - DEMAND-side: individual interests channelled through energy markets is pushing the growth of forest biomass utilisation → no specific CC awareness, no tailor-made (fire prevention, plantations)
 - SUPPLY-side: forest fires' driven, which also tackles CC from another perspective, but not focused on GHG reduction

Conclusions (II)

- Vulnerability: oil price-dependence
- Complexity: multiple synergies supportive (Strength?) → vertical & horizontal coordination needed!
 - Energy / Climate change / Interior / Forestry / Industry / Rural development
- Effectiveness: How to disentangle RED effects and other factors?

- Thank you!
- Questions, suggestions...



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