THE FUTURE OF BECCS : THE ROLE OF BIOMASS AND CARBON STORAGE POTENTIALS

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Need to rethink energy systems

Paris Agreement: a strong signal for a low carbon transition
2°C objective: zero net emissions by ≈2070

Solutions for a low carbon and sustainable future

Give up fossil fuels
Develop other sources of energy
Use Carbon Capture and Storage (CCS)
Benefit from negative emissions for ambitious targets

Biomass – Carbon capture and storage

IPCC / AR5: 101 of the 116 430-480 ppm scenarios rely on BECCS

About 67% of these have a BECCS share in primary energy exceeding 20% in 2100.

(Fuss et al., 2014, *Nature Climate Change*)

Carbon storage potential

Onshore storage availability
Storage potential assessment
- By site - By region

Carbon storage sites	High	Mean	Low
EOR (Onshore / Offshore)	110 / 30	112 / 37	9 / 3
Depl. Oil Fields (On. / Off.)	113 / 26	113 / 26	113 / 26
Depl. Gas Fields (On. / Off.)	344 / 318	609 / 302	223 / 169
Coaldbed Meth. Rec. <1000m	89	133	0
Coaldbed Meth. Rec. >1000m	89	133	0
Deep saline aquifer (On. / Off.)	4907 / 4117	123 / 117	15 / 15
TOTAL (world)	**10 142**	**1 706**	**572**

(Selosse, Ricci and Maïzi, 2018)

High potential: **10 412 Gt**
(various databases)

Mean potential: **1 706 Gt**
(Hendricks, 2004, *Best case*)

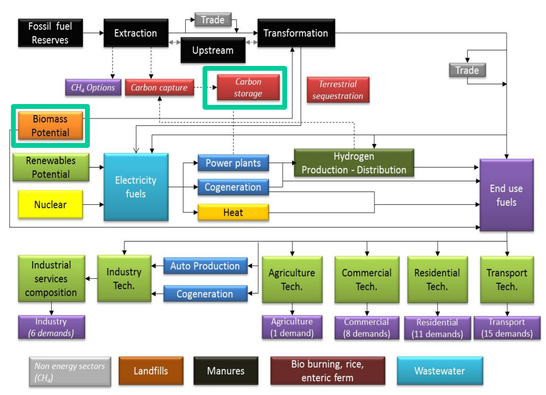
Low potential: **572 Gt**
(Hendricks, 2004, *Low case*)

Sustainable and low carbon future

Prospective analysis with TIAM-FR

2050: 70% of GHG mitigation
2100: a limited 2°C increase of temperature

TIMES Integrated Assessment Model



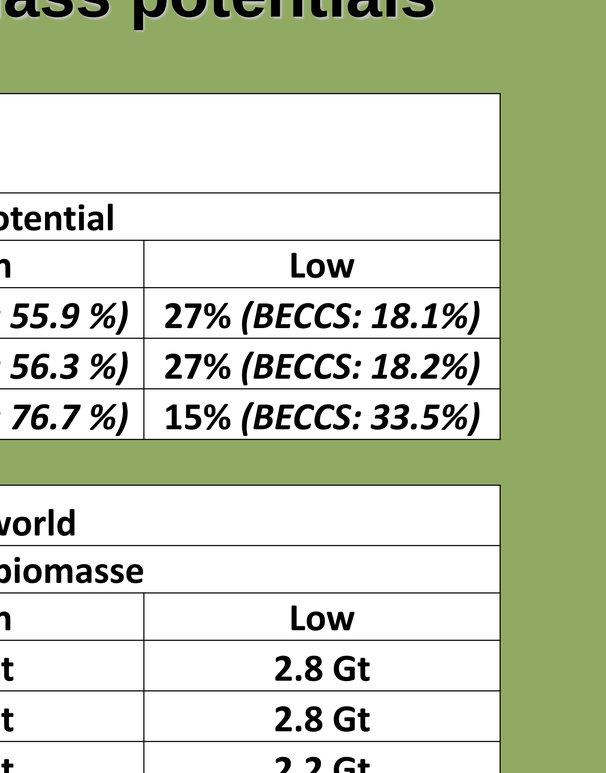
Bottom-up
2010-2100
15 regions
6 sectors
42 demands

Linear optimization : minimization of the energy system discounted cost

Biomass resources potentials

Sustainable resources management
Land-use competition (food /energy)
Biomass resources location
Technological development (pretreatment)
(Kang, 2017 ; Kang, Selosse and Maïzi, 2018, 2017, 2015)

Biomass potential assessment



Potential 2050

High
328 EJ

Mean
215 EJ

Low
70 EJ

Results: Role of carbon storage and biomass potentials

Share of CCS in electricity production in 2050				
70% GHG mitigation by 2050		Biomass potential		
		High	Mean	Low
Carbon storage potential	High	45% *(BECCS: 70%)*	39% *(BECCS: 55.9 %)*	27% *(BECCS: 18.1%)*
	Mean	45% *(BECCS: 69.8%)*	39% *(BECCS: 56.3 %)*	27% *(BECCS: 18.2%)*
	Low	33% *(BECCS: 93.9%)*	28% *(BECCS: 76.7 %)*	15% *(BECCS: 33.5%)*

Gigatonnes of sequestrated carbon by year by 2050 in the world				
70% GHG mitigation by 2050		Potentiel de biomasse		
		High	Mean	Low
Carbon storage potential	High	12 Gt	8.8 Gt	2.8 Gt
	Mean	12 Gt	8.9 Gt	2.8 Gt
	Low	11 Gt	7.7 Gt	2.2 Gt

- CCS technologies widely deployed in a context of strong GHG emissions reduction constraints, mainly in the electrical sector but also in the transport sector
- The lower the carbon storage potential, the higher the BECSC share in the development of CCS technologies
  → Negative emissions
- CCS and BECCS technologies development strongly constrained by biomass potential
- Many challenges remain: incentive and regulatory policies to support the economic models of the (BE)CCS, societal acceptability, official positioning of states, preservation and forest restoration, etc.