International Institute for Applied Systems Analysis
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International Energy Agency

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BECCS status & gaps: Results from the IEA-IIASA Workshop on BECCS

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Bio-energy, CCS and BECCS: Options for Indonesia

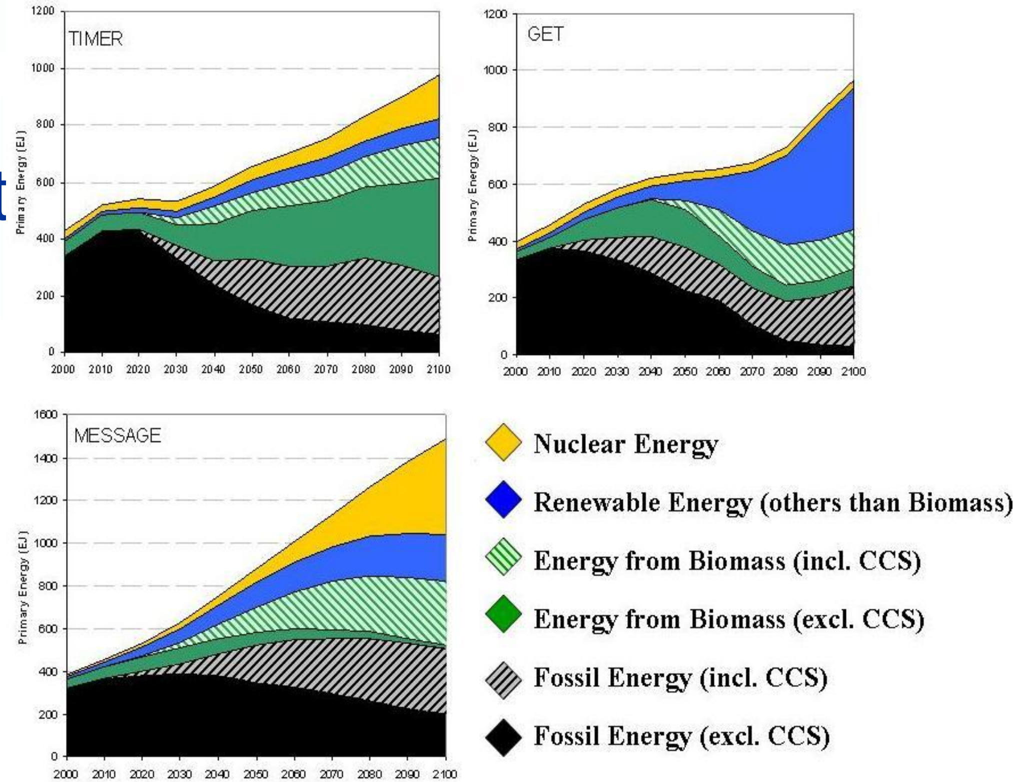
September 21-24, Jakarta

2011 workshop objectives

1. Review status quo of BECCS knowledge and identify gaps
2. Discuss policy context, possible incentive schemes and situation in case countries
3. Prioritize future research agendas

Status quo BECCS research

- BECCS as a component of a wider mitigation strategy and different technical aspects, but huge uncertainties remain.
- Some work on policy context, energy scenarios (e.g. IEA).
- No comprehensive assessment of potentials



Obstacles to BECCS diffusion

1. Biomass availability (local, regional, global)
2. Uncertainty about future biomass potentials

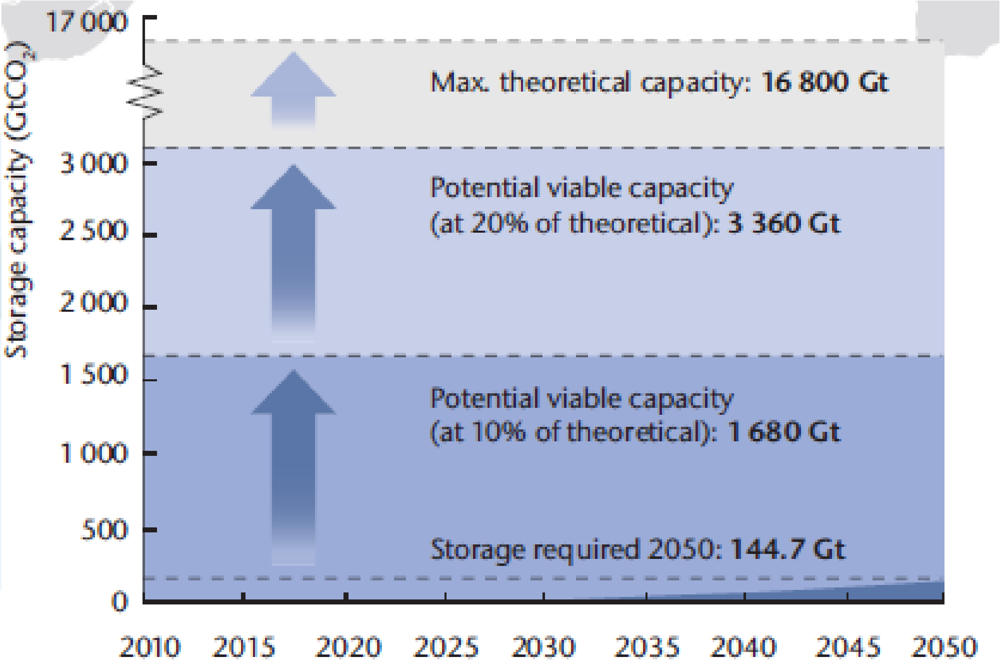
   – How much biomass can be sustainably used for bioenergy production?

   – Competition for land? Other policies?

   – How will biomass potentials look like under climate change (temperature, precipitation, etc)?

Obstacles to BECCS diffusion

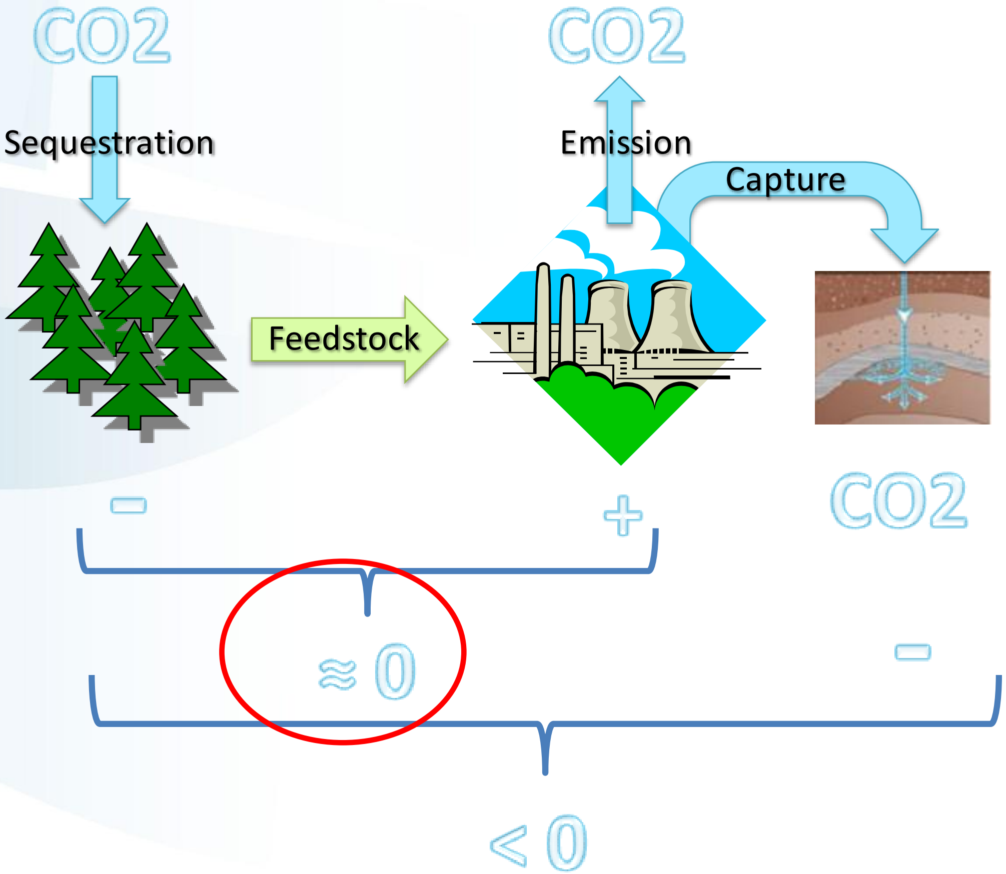
3. CCS costs
4. Uncertain availability of secure storage capacity



World Storage Potential: IEA CCS Roadmap

Obstacles to BECCS diffusion

5. Accountancy issues & GHG calculations



Obstacles to BECCS diffusion

6. Lack of awareness
7. Public acceptance

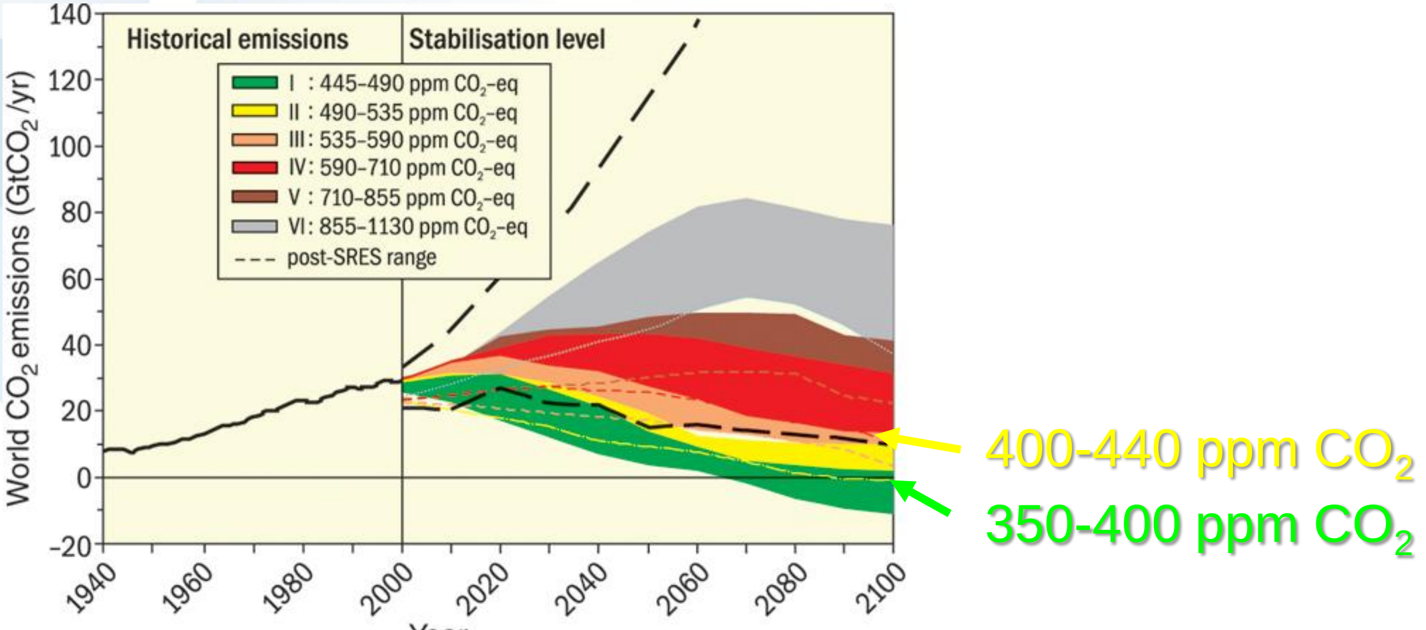
   – Not in my backyard effect (NL, Switzerland)
   – BECCS vs. fossil CCS
   – Impact of uncertainty

Expert recommendations for policy

Create price advantage for non-food competing biomass	Explore international funding mechanisms
- Decrease fossil fuel subsidies while supporting subsidies for sustainable bioenergy production on marginal land - Reducing barriers to a global biomass market	- CDM, NAMAs, REDD?
Support for demonstration projects	Accountancy issues: standardize international greenhouse gas accounting mechanisms
- Subsidies and other incentive mechanisms - Stimulate capacity building, Governmental facilitating demos (bureaucratical hurdles, tax incentives, etc.) - Risk guarantees	-
Full-scale commercial projects	Bridging the science-policy gap
- Promote carbon market - Portfolio standards and clarifying (% BECCS) - Enhance international cooperation	- Stakeholder engagement
Sustainability reporting should be mandatory	Storage capacity: IEA harmonization of assessment requirements and methodologies

Open BECCS issues: outcomes of the expert debate

- Overshooting
- Climate science assumptions
- Timing issues



Open BECCS issues cont'd

- Lifecycle emission
- Incentive mechanisms
- Funding and costs
- Impact on health, the environment & public acceptance
- The role of BECCS in different technology contexts: a portfolio view
- Economic considerations (EOR? Abatement alternatives?)

Modeling approach to BECCS

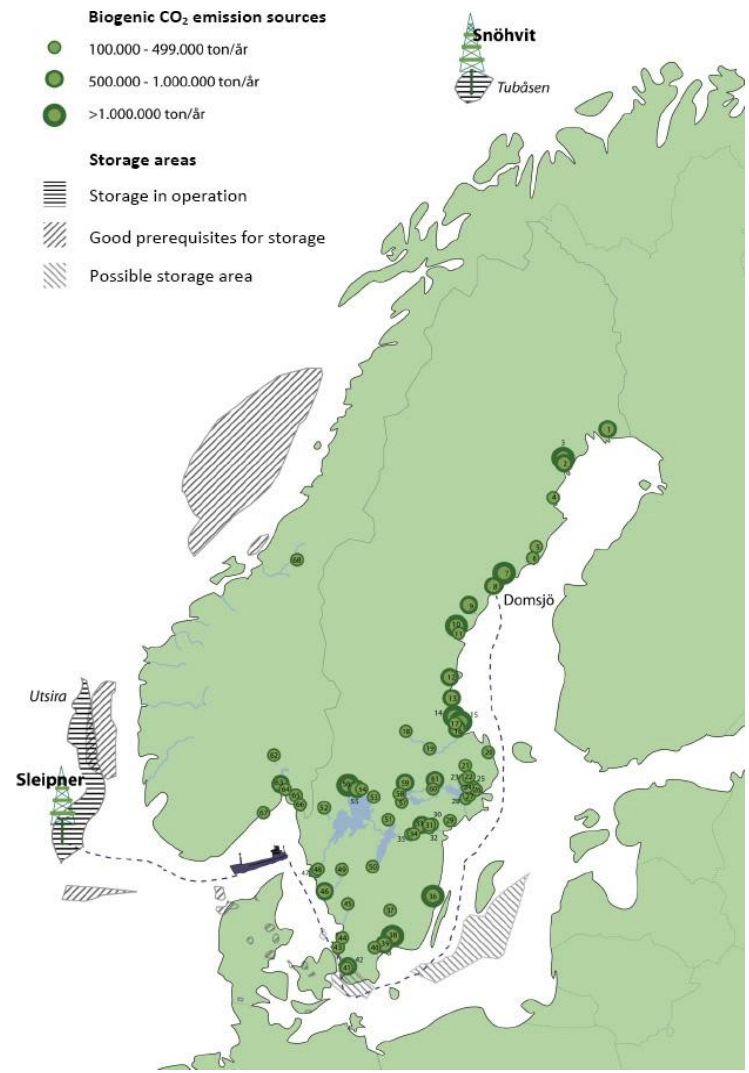
- Caveat: BECCS might be an attractive option to reach low ppm levels, BUT uncertainties and system effects are largely disregarded so far.
- Important factors: economies of scale, technological learning, discount rates
- Integrated analysis to capture system and knock-on effects for bioenergy potentials.
- Systems view also at higher level: interplay with other technologies needs to be addressed

Identified research priorities

- Bioenergy from biomass production + CO_2 capture
- Environmental aspects (sustainability, land use change)
- Logistics of production (geography, transport, storage, etc)

Regional focus: follow-up workshops

- Sweden (neighbors with storage potential, sustainable forest management)
- USA (EOR, geol. storage potential)
- Brazil (biomass, biofuels)
- Canada (EOR, EMP)
- China (biofuel demand, CCS)
- **Indonesia** (biomass, policy, bioenergy, offshore storage)



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Identified research priorities

1. Bioenergy from biomass production + CO2 capture	
Research needs	**Key questions**
A. biomass with CO2 capture affects the efficiency of power plants? Is there an additional energy penalty? Incremental penetration of biomass displacing coal	Traditional coal technology vs. gasification (pre combustion)
B. Given the different conversion technologies how can we proceed to implement BECCS (gasification, co-firing, fermentation)?	What are the technological and economic aspects of each technology?
C. Demonstration pilot projects	Small scale biomass based projects vs. collection of various large scale projects
D. Effect of flue gas composition in the CC unit	

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Research priorities cont'd

2. Environmental aspects (sustainability land use change)	
Research needs	**Key questions**
E. The Whole Picture – A 360 Degree View including Life cycle assessments (LCA). Necessity of including BECCS in LCAs and LCCs From a BECCS specific Framework	Which biomass feedstock in combination with CCS is qualified when we apply certain sustainability criteria?
F. Consideration of environmental externalities and aspects	What are the impacts on water consumption? – Residues, ashes, closing cycles? – Other air pollutants
G. Depending on the technology route some impacts are amplified, we need diverse pilot projects to understand the outcomes.	What is the difference in terms of public perception between BECCS and CCS? - Include multiple perspectives of stakeholders; different sorts of organizations

Research priorities cont'd

3. Logistics of production (geography, transport, storage, etc)	
Research needs	**Key questions**
H. Transport of the gas and (pipeline?) corrosion	What is the flue gas composition in terms of CO_2, condensable gases, moisture?
I. Availability, timing	When is the reservoir available – it is better to keep a constant flow over the year when the CO_2 is available – e.g. seasonal production in fermentation
J. Identify mismatches between expected CCS potential and storage availability	What are the implications of different BECCS location options (closer to cities, ag. regions, forests)?
K. Data availability: storage location, maps, global coverage, how deep, number and location of wells (access points)	
L. Centralized vs. decentralized BECCS (production to storage)	

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