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Governance provisions and challenges of large-scale deployment of BECCS

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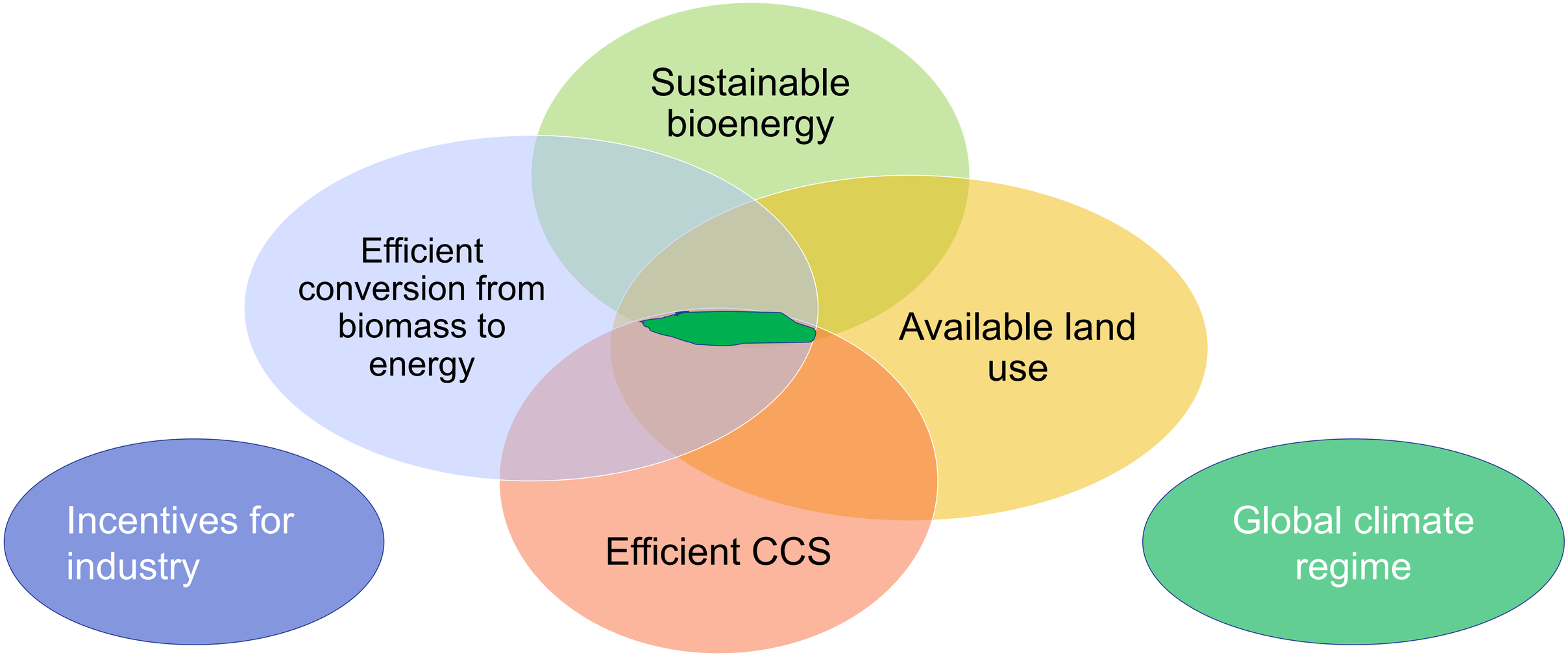
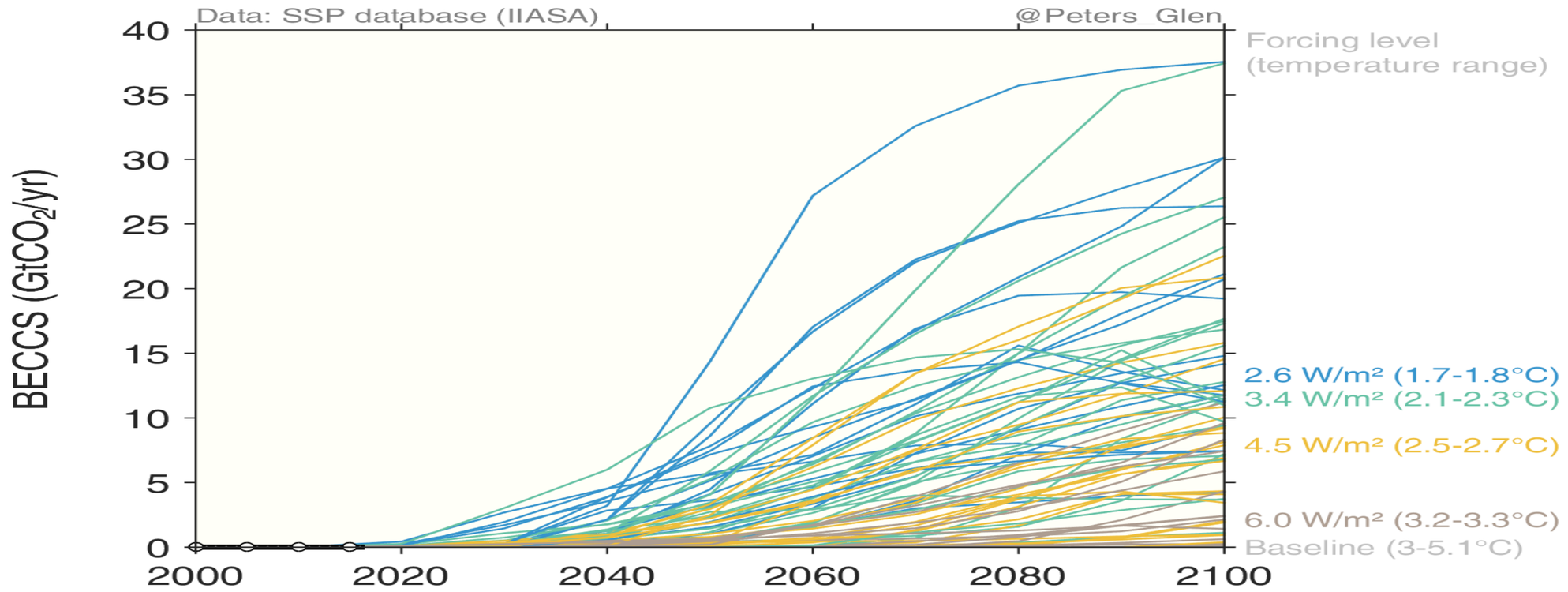
BECCS must deliver on many stages to be sustainable, negative, and viable



Need for negative emissions – BECCS +

(Shared Socioeconomic Pathways, IIASA, IPCC AR5)



Source: Glen Peters, CICERO.

A few BECCS operations exist:

- USA, Canada, Netherlands.
- Fermentation – ethanol.
- Three – Enhanced oil recovery.
- Two - CO_2 storage planned.

Illinois Basin Decatur, USA. Ethanol from fermentation of corn. Three years: 1 Mt CO_2 stored in sandstone.

Scalability of BECCS?

- Physical and land use terms, if major climate technology (Smith et al. 2015):
  7 - 25 % of global agricultural land
  3 % of global water use

- Carbon cycle ‘rebound’ effect (Jones et al. 2016):
  Less effect on atmospheric concentration than volume CO_2 removed

- Technical and economic terms: Technologies exist but expensive

- Governance and sustainability terms: many issues

- Feasible and realistic in political and societal terms?

Accounting bioenergy and CCS - 1

- Net CO_2 removal? Losses due to production, transport, conversion, bioenergy use. Rebound effect from global carbon cycle
- Sustainability: Land use, lifecycle, re-growth, carbon storage, replace fossil fuels?
- Land use competition: Local use, crops, eco-system, biodiversity
- Life cycle assessment? How much include?

Accounting bioenergy and CCS - 2

- CCS - Net captured and stored CO_2: Realistically 90 % of CO_2 captured; Monitoring of stored CO_2 - Contingency plans in case of leakage
- Trade: CO_2 transportation between countries
- Emissions commonly reported by sector (e.g. energy in transportation; independent of biomass/agriculture). Net CO_2 hard to calculate. Project-based accounting is better.

Rewarding BECCS

- Discounting due to carbon cycle interaction – Rebound effect
- Additional value to BECCS in case of emissions ‘overshoot’ situation?
- Present CO_2 value too low (allowance price in European emissions trading system 29 USD/ton CO_2). BECCS cost 70 – 250 USD/ton CO_2
- Significant risk for industry investments
- Substantial government support needed: Framework and money
- Support later reduced when international carbon price picks up; Learning and up-scaling will lead to cost reductions

Market mechanisms alignment

- Ability to handle negative emissions vary among CO_2 emission trading schemes and mechanisms
- Depends on handling of sinks (forests, land use) and CCS
- BECCS difficult to handle by regional cap&trade schemes, since biomass included in ‘baseline’, or biomass entities excluded (e.g. European emissions trading system)
- BECCS easier to include in project-based schemes.
  Clean Development Mechanism (CDM) accounting can be model, but BECCS should be more standardized and simpler
- BECCS included as ‘credits’; or ‘net-back’ - subtracted from positive emissions in a broad emissions portfolio

Paris Agreement

- "… conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases …". Paris Agreement Article 5.1
- Internationally Transferred Mitigation Outcomes; Article 6.2
- Emission Mitigation Mechanism; Article 6.4
- Negotiate 'Paris Agreement rulebook'. Modalities for negative emissions
- Reporting of actions under Nationally Determined Contributions
- Use experience from CDM
- Balance between 'perfect'/expensive and efficient/operational/realistic

BECCS way forward

- BECCS only has limited and regional scale-up potential
- Adopt standardized framework for sustainable biomass
- Adopt standardized framework for accounting and rewarding BECCS
  * Negative emissions valued at carbon price, or
  * Negative emissions discounted?
- Early government support to enable business engagement
- Maximize learning across BECCS applications and other NETs
- Align BECCS development with Paris Agreement and market mechanisms

References

- Torvanger, Asbjørn (2018), Governance of bioenergy with carbon capture and storage (BECCS): accounting, rewarding and the Paris agreement, ***Climate Policy***, doi:10.1080/14693062.2018.1509044.

- Smith, Pete, et al. (2016), Biophysical and economic limits to negative CO_2 emissions, ***Nature Climate Change***, Vol. 6, January. https://doi.org/10.1038/nclimate2870

- Jones, C.D. et al. (2016), Simulating the Earth system response to negative emissions, ***Environmental Research Letters,*** Vol. 11. doi:10.1088/1748-9326/11/9/095012.

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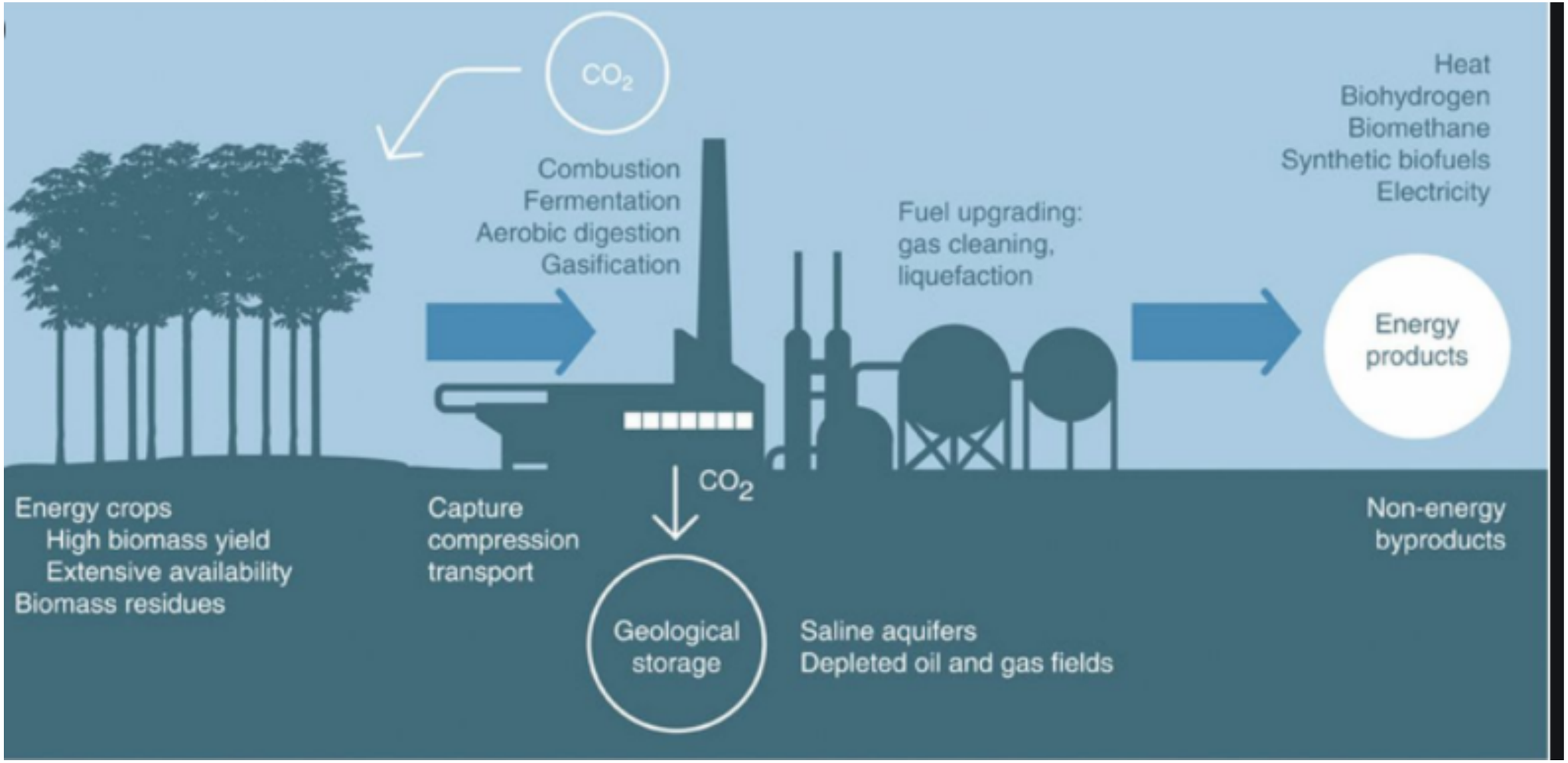
ADDITIONAL SLIDES

Setting the stage for BECCS -
Bio Energy with Carbon Capture and Storage

- The Paris Agreement's climate policy target is ambitious, and the world is far behind on greenhouse gas emission reductions
- Need for large-scale negative emissions due to insufficient and belated reductions of carbon dioxide and other greenhouse gases, and difficulties reducing e.g. agriculture and land use related emissions
- BECCS is often considered as the most promising negative emission technology along with forestation (other: direct air capture, biochar, enhanced weathering, ocean fertilization)
- But BECCS is very demanding in terms of land use, sustainability, efficient processing from biomass to energy, and carbon capture and storage

Bio Energy combined with Carbon Capture and Storage - BECCS



Source: Venton (2016), PNAS