



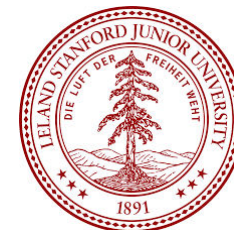
Stakeholder Perceptions of Carbon Dioxide Removal in Europe: Assessing Social License to Operate

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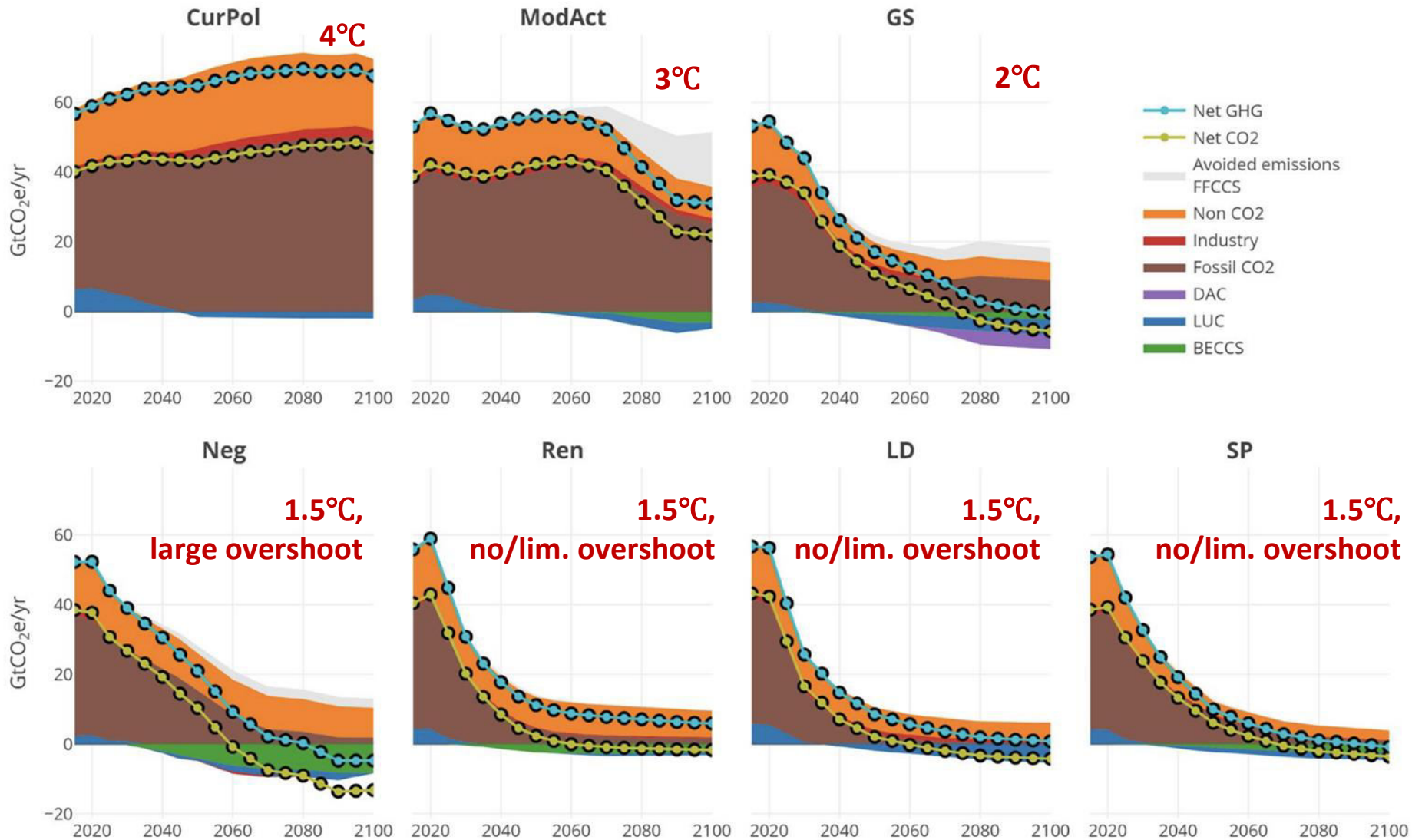


16th June 2022

*2nd International
Conference on
Negative CO₂
Emissions*

Gothenburg, Sweden

CDR is likely to be necessary across emissions scenarios



Source: IPCC AR6 WGIII, Ch. 3



Stakeholders will likely have active roles in shaping CDR policymaking & implementation

- ▶ EU's climate targets delineate CDR
 - ▶ 55% by 2030 & net-zero by 2050
- ▶ CDR is relatively unknown among the public, contested among stakeholders (Cox et al., 2020; Carton et al., 2020)
- ▶ Social license to operate: the “ongoing approval and broad acceptance of society to conduct its activities” (Prno & Slocombe, 2012)



**How do European stakeholders perceive CDR?
How does this vary across geography, time and sector?**



Text mining for sentiment analysis

- ▶ Unstructured text \cong 80% organizational data (Kobayashi et al., 2018)
- ▶ Natural language processing (NLP) used to mine **over 750 documents**
- ▶ All European countries assessed across years 2000 to 2021
- ▶ “Substantive consideration” constraint
- ▶ Applied sentiment analysis for sentences that contained key words, assigning an average on a -8 to 8 scale



CDR approaches considered



DAC

Direct Air Capture



BECCS

Bioenergy with Carbon Capture and Storage



Biochar



Enhanced

Weathering



Afforestation/ Reforestation



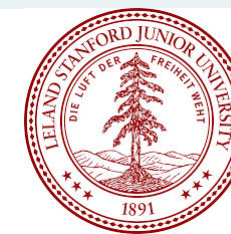
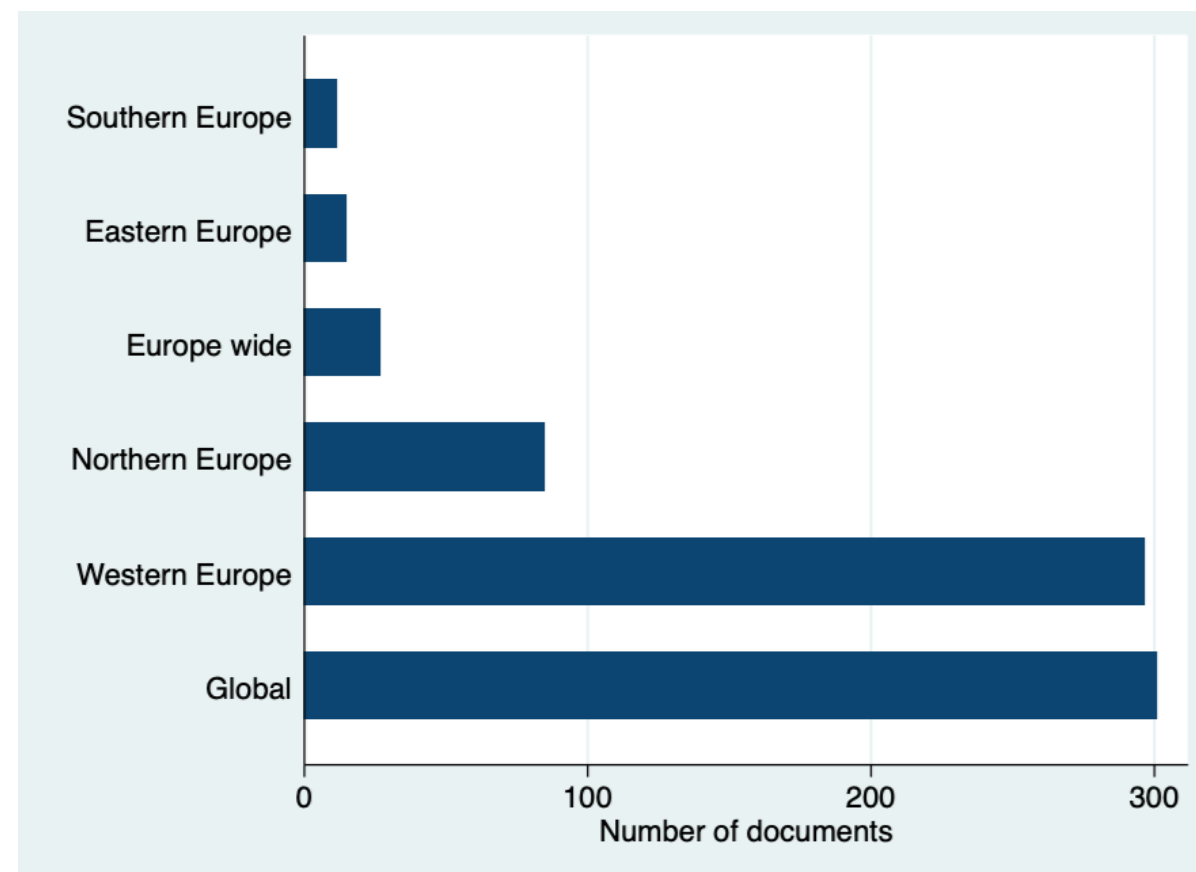
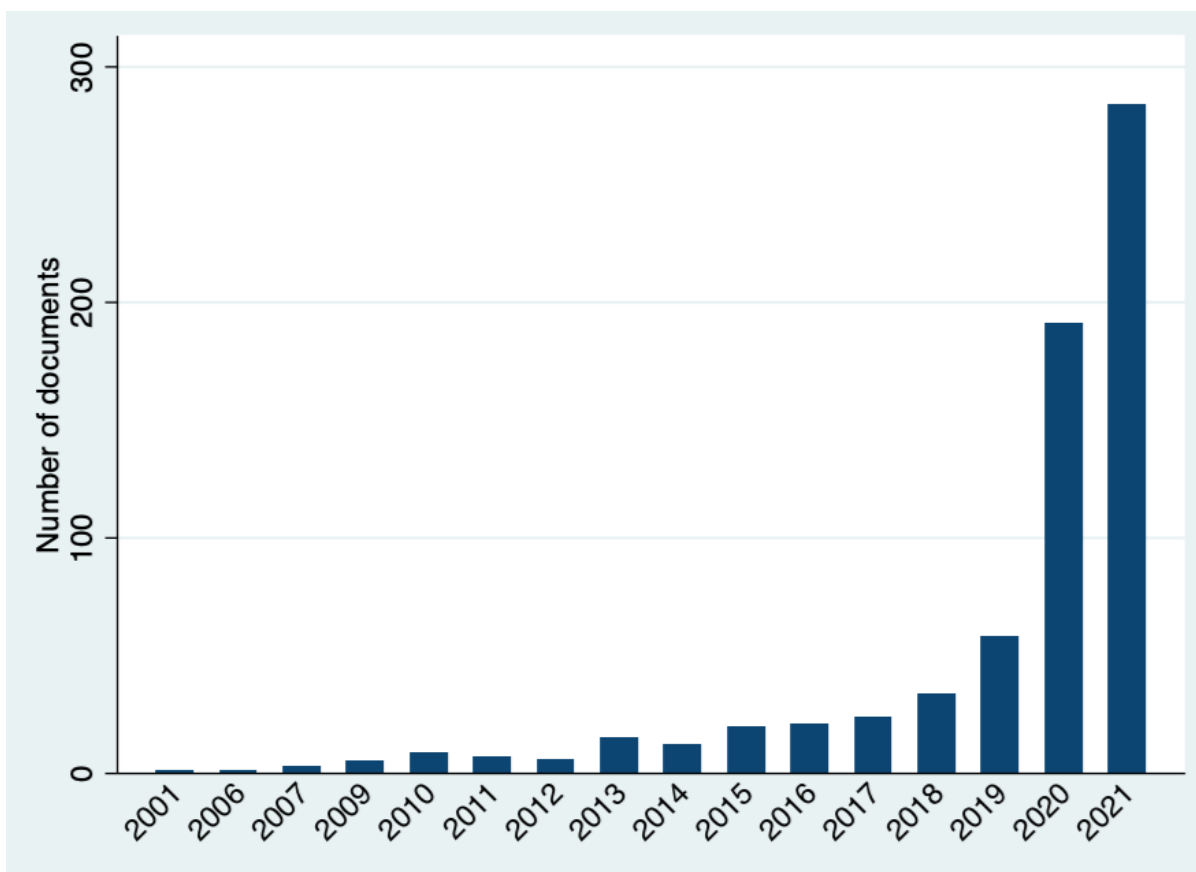
Soil Carbon Sequestration



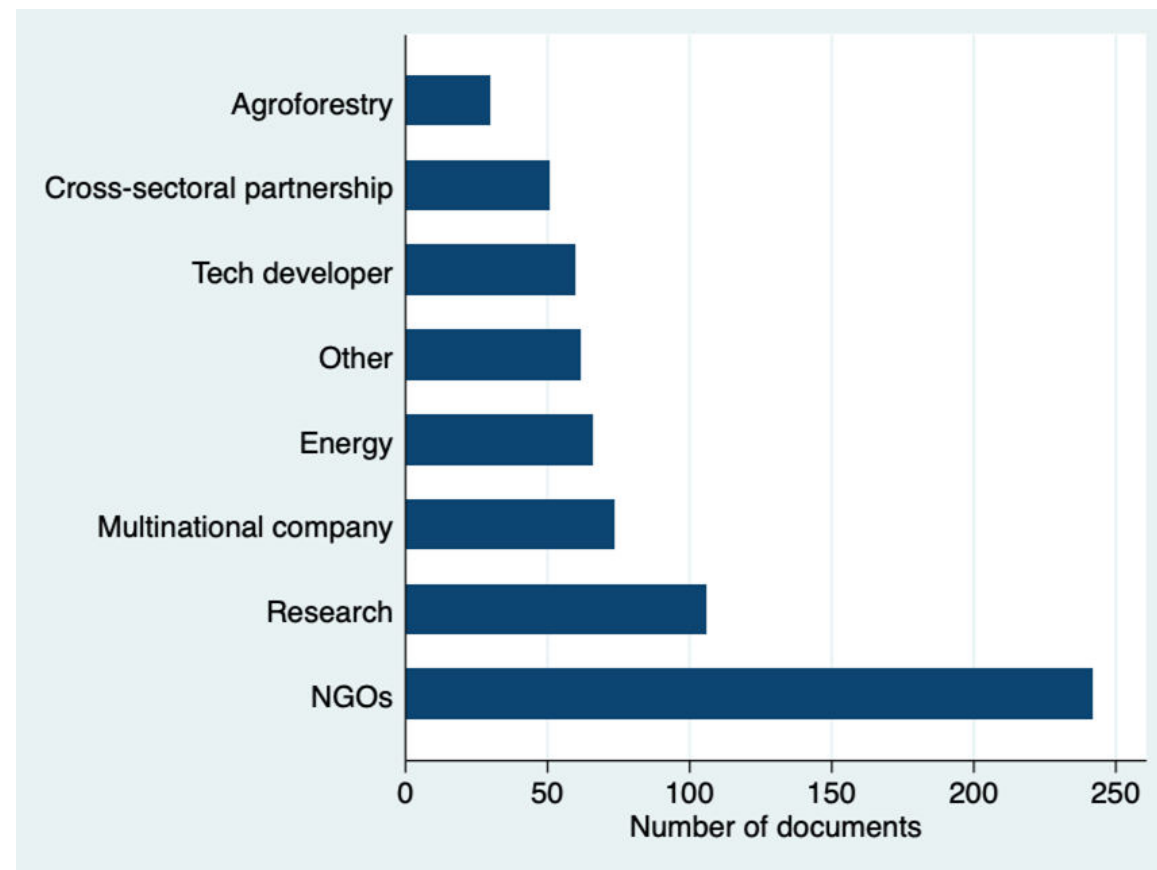
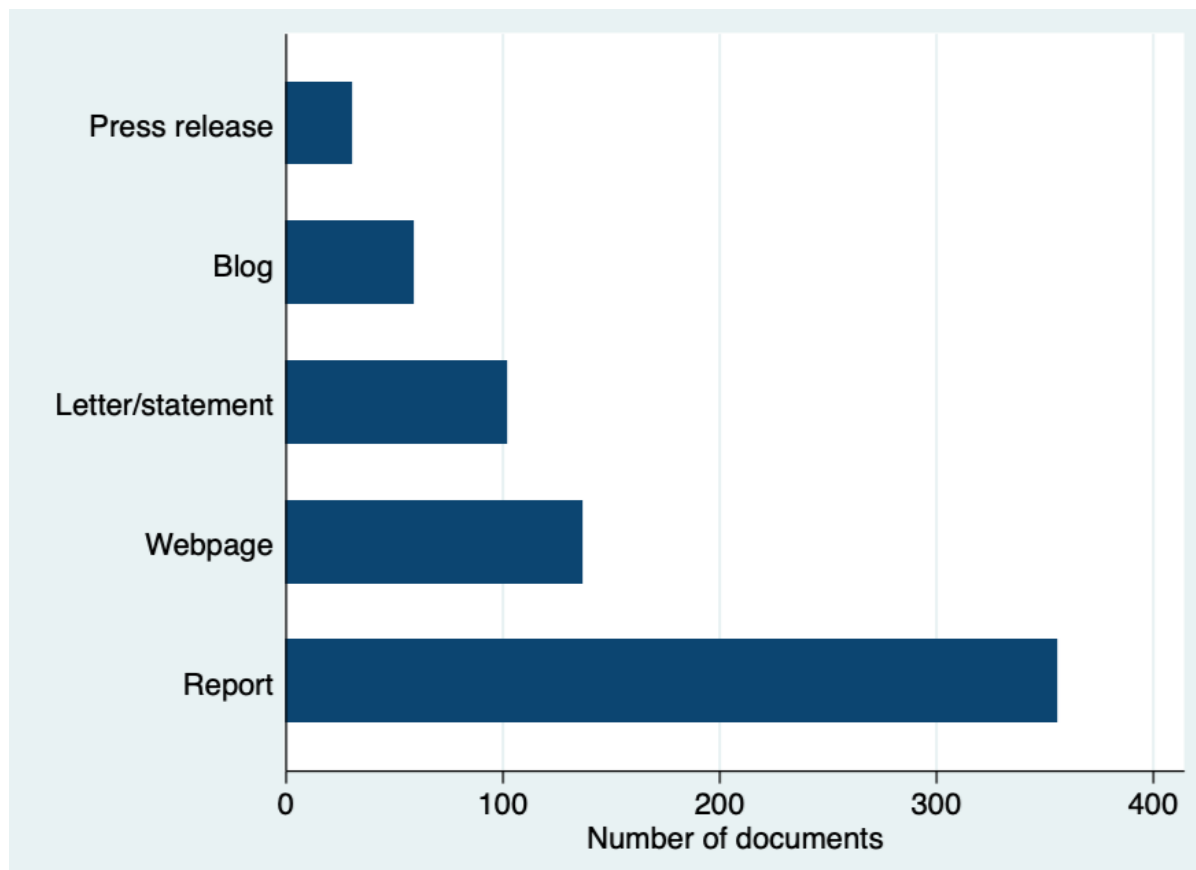
Ocean-Based Approaches



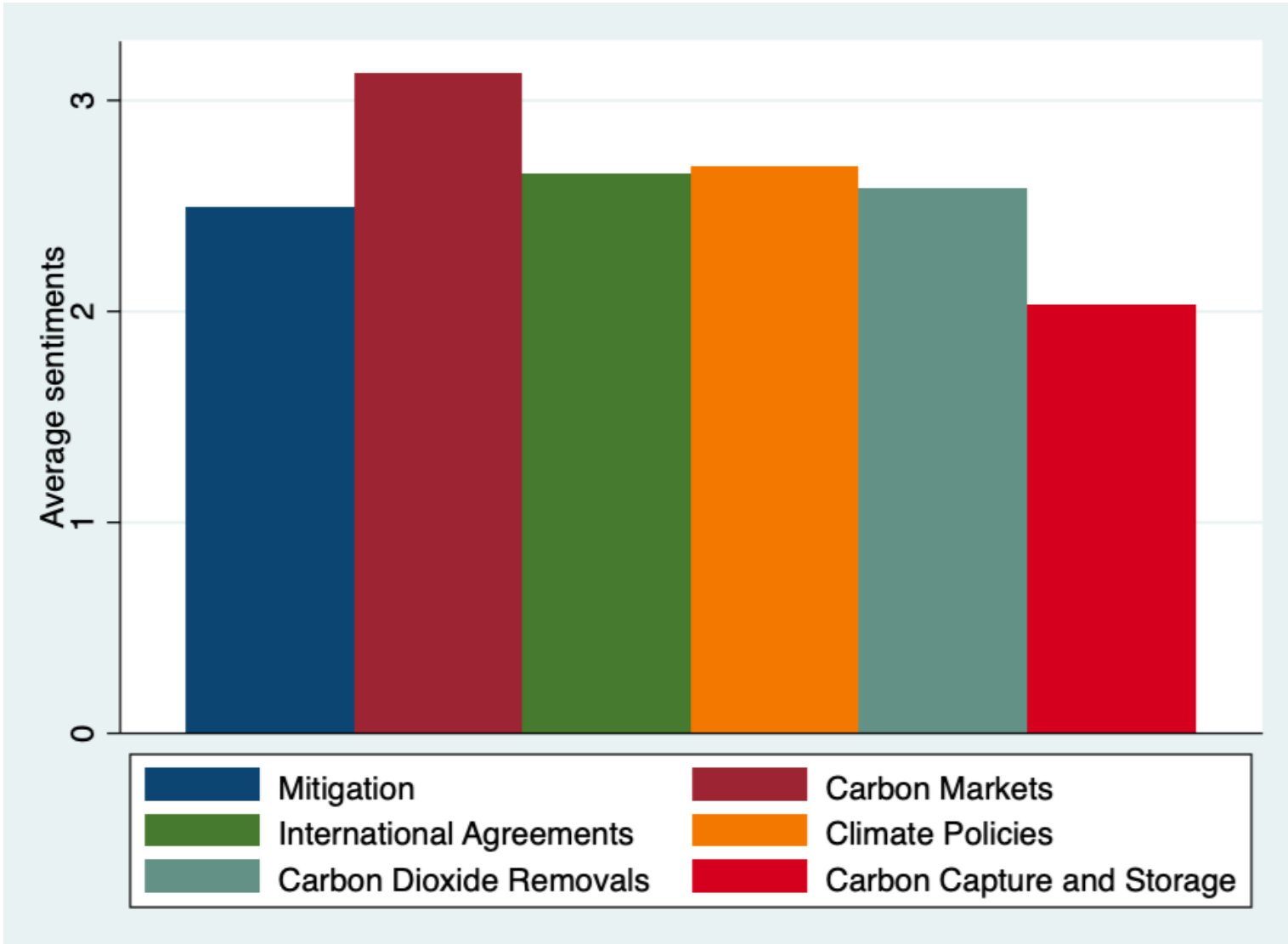
Discussion of CDR is highest in recent years and in Western Europe



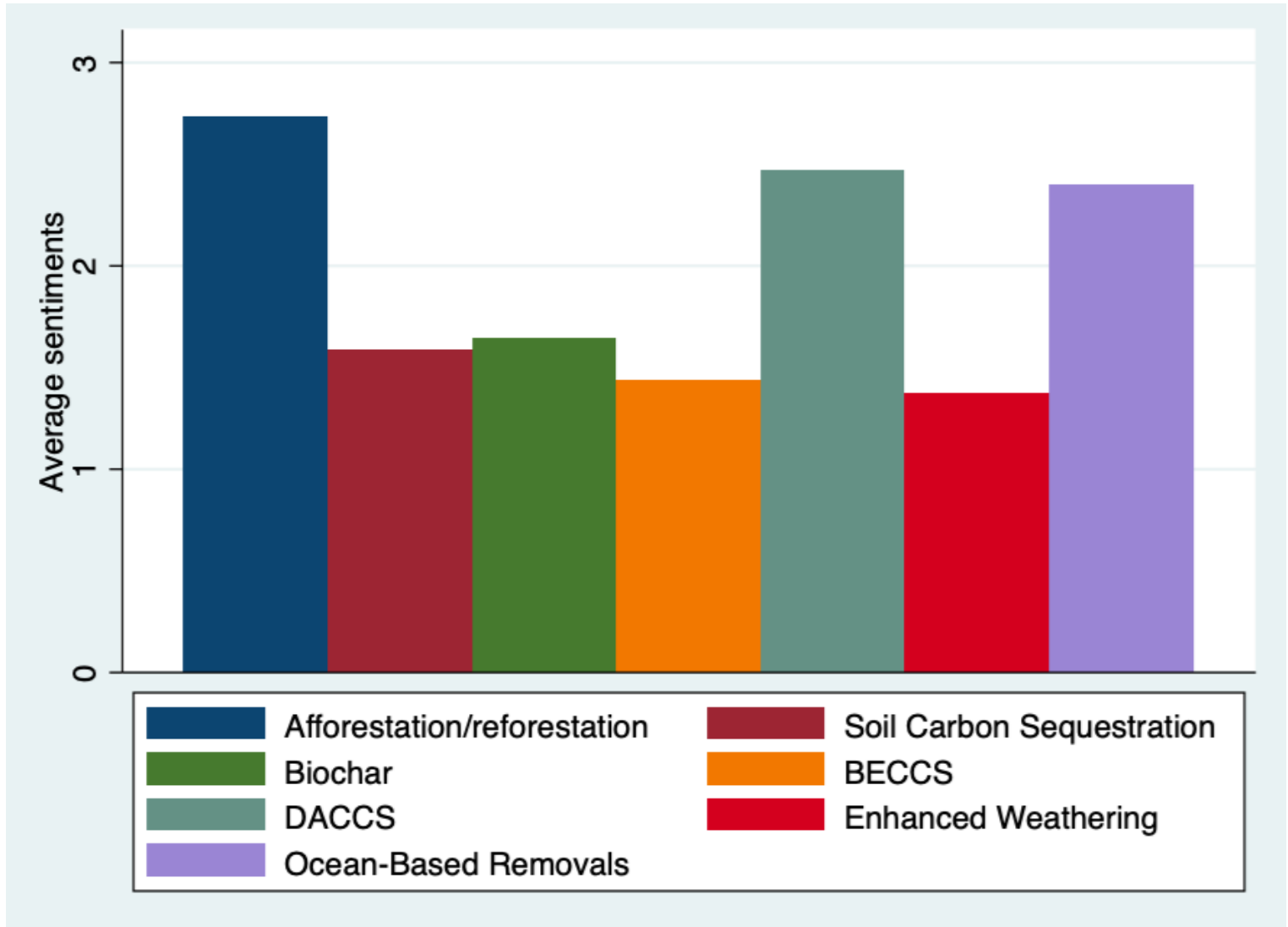
Discussion of CDR is highest in report format and split between NGOs and the private sector



CDR performed comparably to mitigation and climate international agreements



We also found overall positive sentiments across CDR approaches



Optimistic results are more complicated when disaggregated

Sentiment towards CDR	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Afforestation/ Reforestation	Soil Carbon Sequestration	Biochar	BECCS	DACCS	Enhanced Weathering	Ocean-Based Removals
Year	0.016	0.048	0.146	0.169	0.220	0.367**	0.226**
NGO	-1.404***	0.514	-0.277	-0.555	0.023	-0.824*	0.908
Cross-sector Partnership	0.237	0.354	0.120	0.400	2.957**	-1.001	0.791
Agroforestry	-0.432	1.954	0.399	1.810**	0.956	3.060**	-2.983**
Energy	0.017	0.403	-0.096	0.427	0.854	-0.620	-2.264*
Research	-0.289	0.448	0.626	0.983***	-0.844	-0.069	-0.946*
Tech Developer	-0.044	-0.604	-0.167	1.007**	0.844	-0.341	2.245*
Multinational Company	2.192***	0.831	1.103	0.608	0.234	-1.712**	2.594
Financial	-0.342	-0.484		1.385	-0.784		
Multistakeholder (dummy)	-0.974**	-1.069	-1.143	-0.645	-2.122**	0.325	0.187



- ▶ European NGOs were most strongly opposed to afforestation/reforestation
- ▶ Cross-sector partnerships were found to increase favorability of DAC
- ▶ Multinational companies were most strongly in favor of afforestation/reforestation

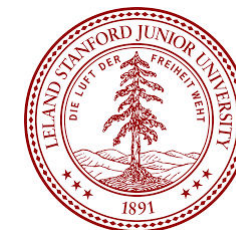


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Year	0.016	0.048	0.146	0.169	0.220	0.367**	0.226**
Eastern Europe	0.493	0.425		-0.040	0.593		
Northern Europe	-0.951*	-2.896***	-0.392	0.212	-2.292*	0.632	-2.708*
Southern Europe	-0.009	1.286	-1.958	-0.545	3.724	3.246***	4.226**
Western Europe	-0.474	-0.472	-0.755	0.286	-0.486	-0.781*	-0.052
Europe Wide	-1.464**	-2.966*	-0.427	0.581	1.042	-2.455***	-1.632



- ▶ Northern European & Europe-wide stakeholders were most likely to oppose CDR, especially on soil carbon sequestration
- ▶ Southern European stakeholders were most likely to support CDR, especially enhanced weathering & ocean-based approaches



Implications & next steps

- ▶ Policy implications:
 - ▶ One-size-fits-all may be less likely to succeed; regional (or national?) portfolios should be considered with location-specific attitudes in mind
 - ▶ Policymakers must disaggregate sentiments of CDR for clearer understanding
- ▶ Questions for further research:
 - ▶ When organizations discuss CDR positively or negatively, what descriptors, analogies, and/or framings are they using?
 - ▶ How do interactions across networked stakeholders affect sentiments?
 - ▶ What patterns exist outside the European context?



Thank you!



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	Afforestation/ Reforestation	Soil Carbon Sequestration	Biochar	BECCS	DACCS	Enhanced Weathering	Ocean-Based Removals
Year	0.016	0.048	0.146	0.169	0.220	0.367**	0.226**
Report	-0.217	-0.528	-1.970***	-0.426	-0.235	-1.403***	-0.027
Webpage	-0.272	-1.763*	-0.235	-0.858	1.457*	-1.735**	-1.537*
Press Release	-0.435	-0.596	1.091	-0.673	1.321	-2.762***	3.714**

	*p<0.1	**p<0.05	***p<0.01
Positive			
Negative		