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Delivering on the Paris Agreement in a fragmenting world

PARIS REINFORCE final event, Sorbonne, Paris, November 15, 2022

Sustainable transitions in major economies

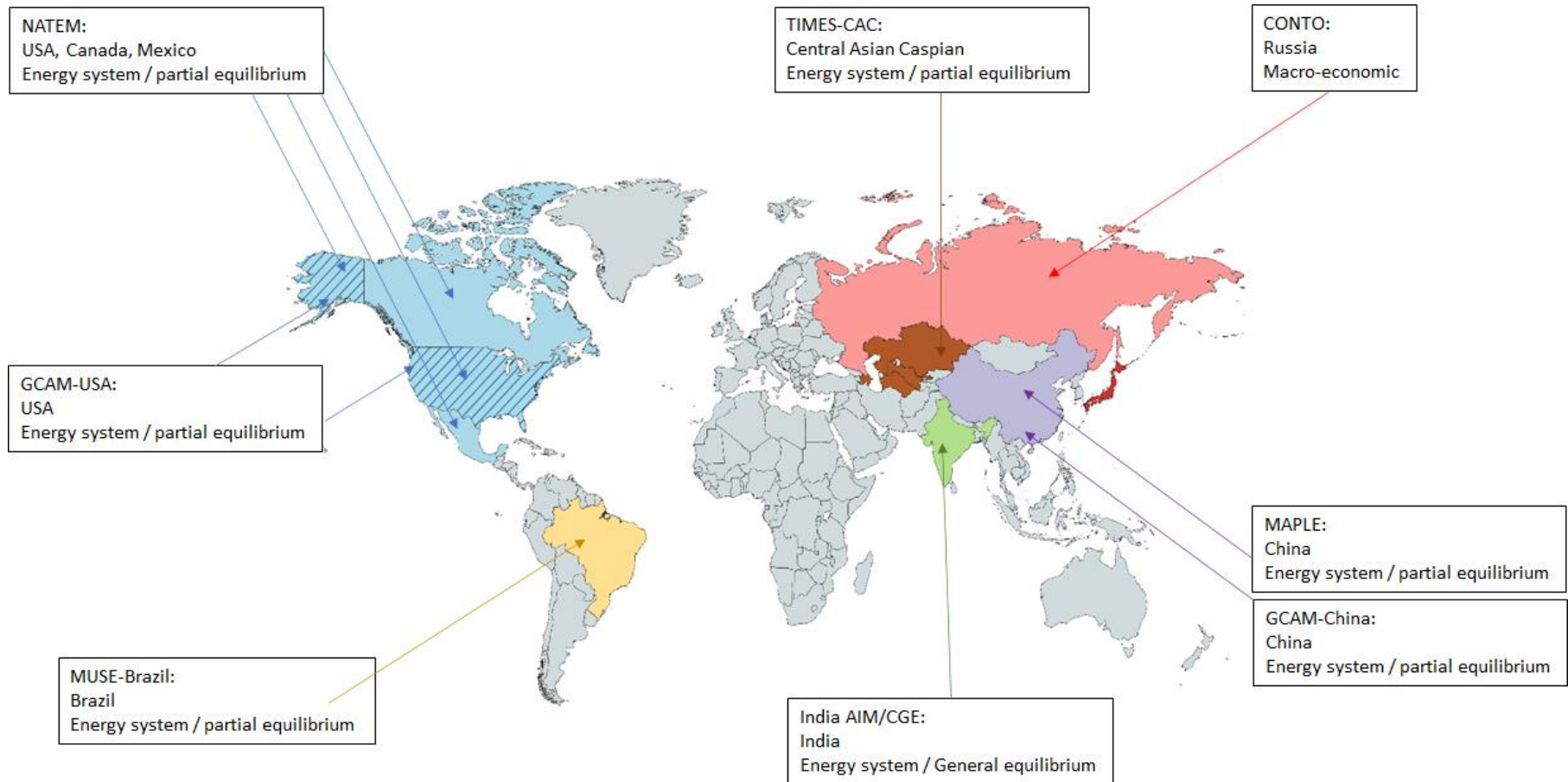
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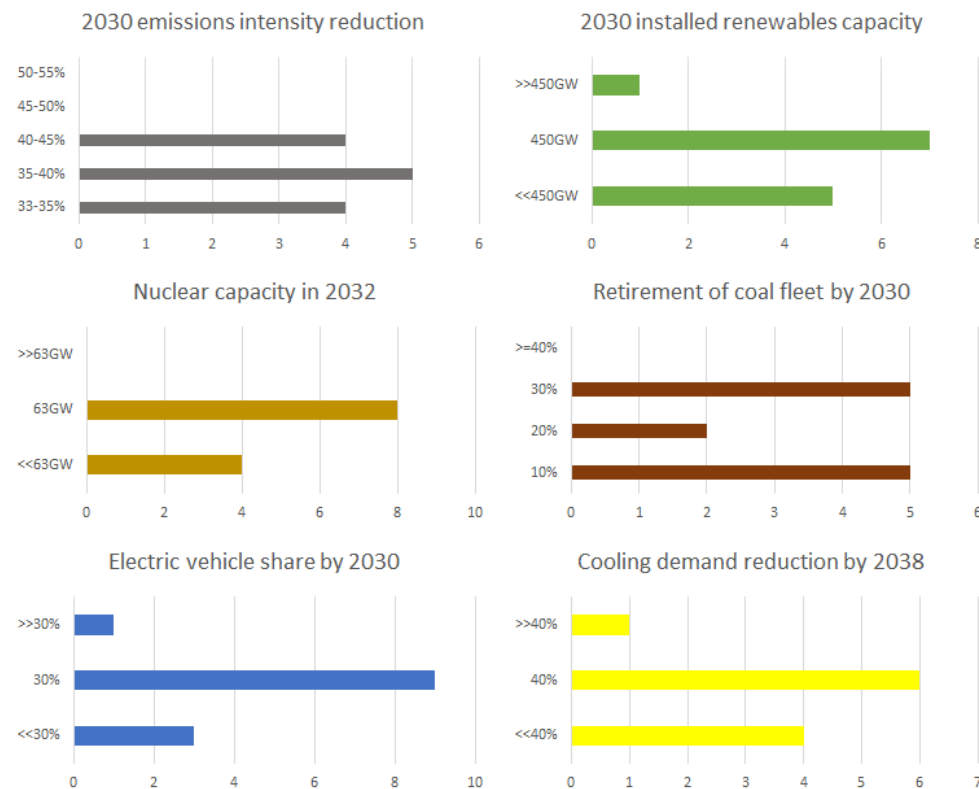
Major economies studied in detail



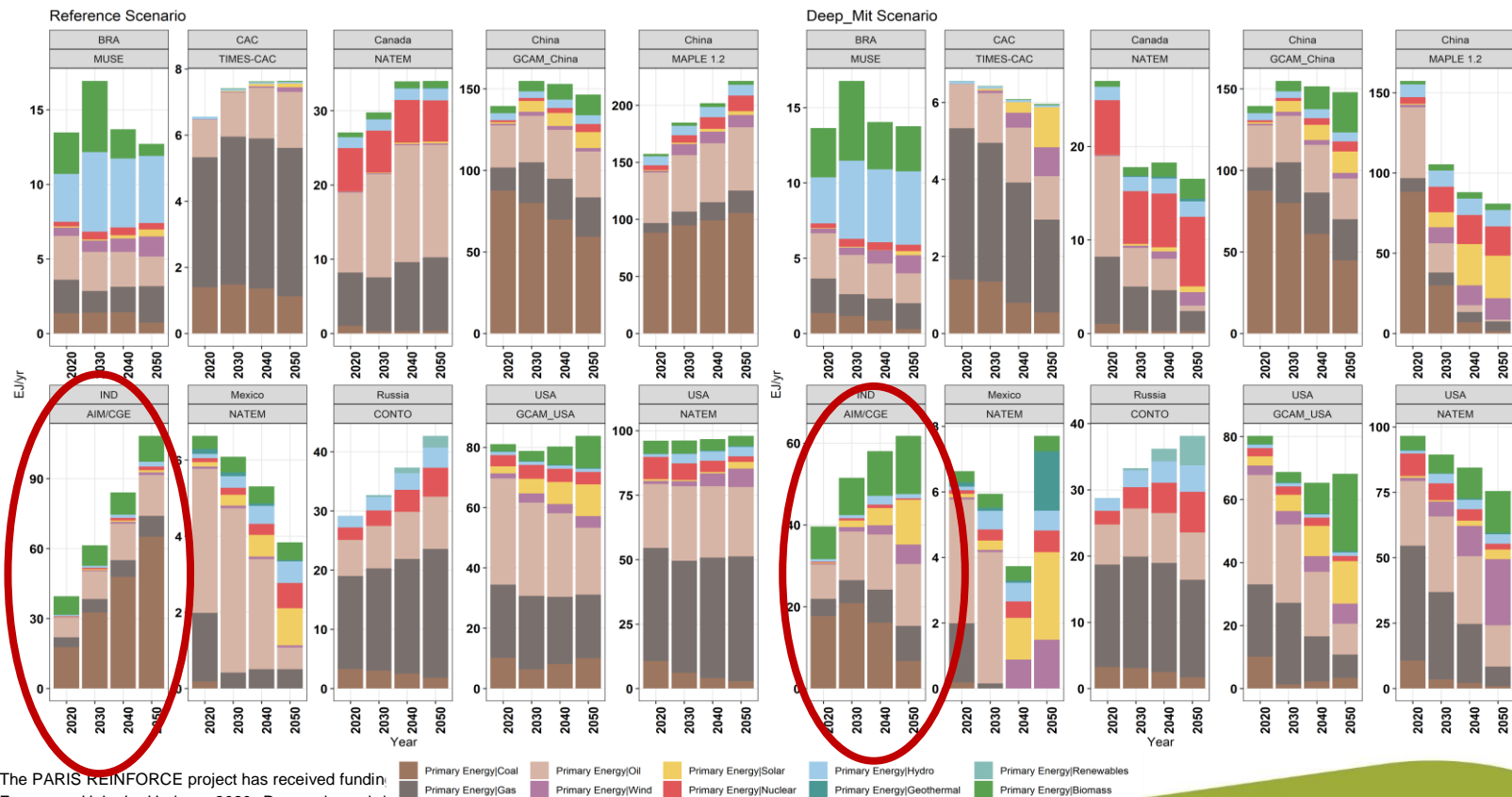
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Workshop details	Details discussed
India (Nov 2020)	Role of power sector , transport sector and urbanisation in achieving mitigation pathways.
Central Asian Caspian (Dec 2020, March 2021, May 2021)	Discussion on policy measures and regional climate ambitions, regional integration and cooperation, implications of water consumption in power sector, commodity tariff phase-outs , H2 market development.
Russia (Mar 2021)	Overall discussion of Russia's potential pathways, and deep-dives into the role of forests , industrial manufacturing and electricity in Russia's low-carbon pathways.
US (May 2021)	Targeted discussion on the importance of considering equity and jobs in the US long-term strategy towards net-zero in 2050.
China (June 2021)	Discussion on China's net-zero 2060 target, role of multiple sectors including power , industry , role of coal , provinces. Discussion of Belt and Road initiative and opportunity and challenge for it to become Low Carbon.
Brazil (May 2022)	Role of land use, role of electrification versus biofuels in transport, role of renewables and storage , importance of incumbents in oil and gas, limits of CCS
Canada (May 2022)	Role of modal shifts in transport , role of CCS.

India workshop polling results



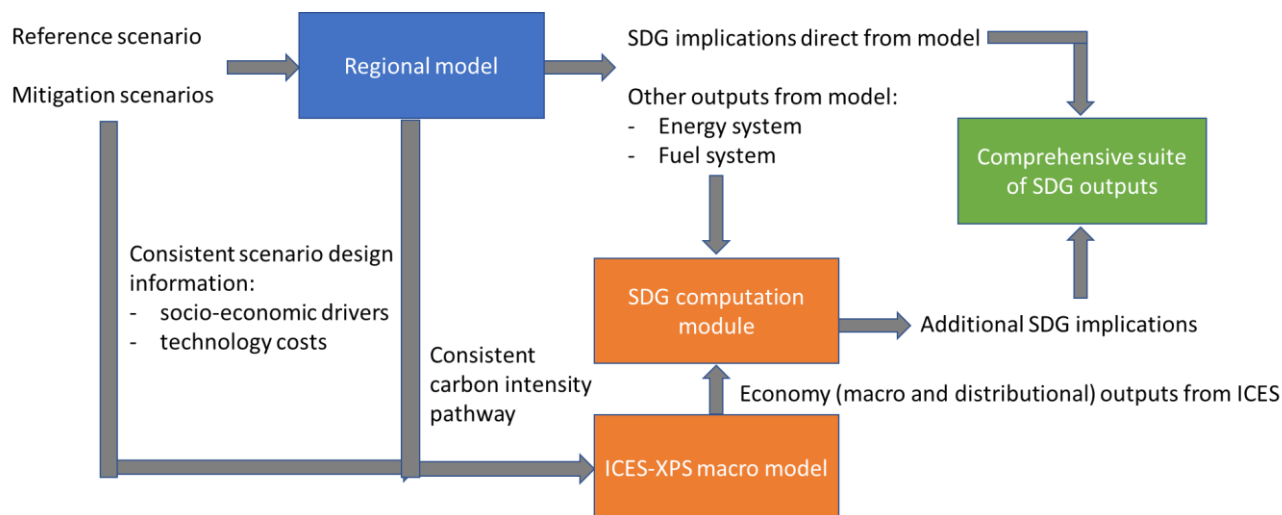
- Polled stakeholder results were translated into scenario targets:
 - India polls: majority view of 35-40% emission intensity reduction target in 2030
 - India modelled Net-Zero scenario: adjusted if more than 45% emission intensity reduction in 2030



- Potential for deep emissions cut across regions:
 - net-zero by 2050 in some
 - net-zero by 2070 in all
- In most regions this is achieved by:
 - a rapid penetration of renewables (and in some cases nuclear) into the electricity system
 - CCS plays a role (especially in China, Russia)
 - increasing electrification of end-use sectors (industry, transport, and buildings)
 - the use of other low-carbon energy vectors, e.g. biomass and hydrogen
 - efficiency gains across all sectors



SDG framework



Models and SDG coverage

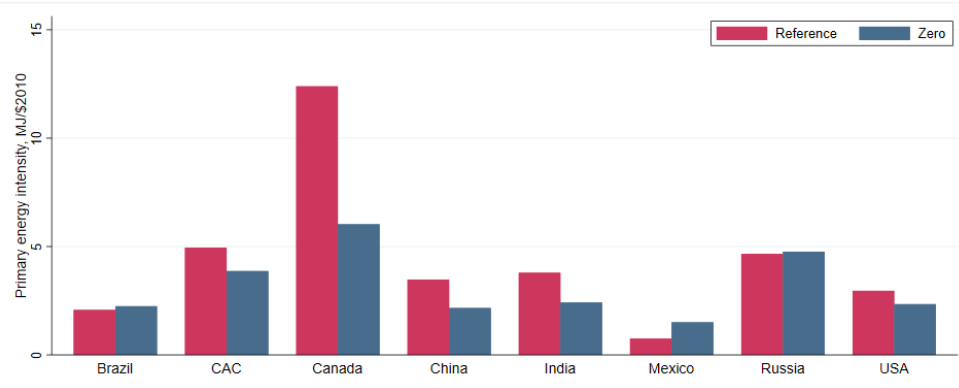
Model	Country / Region	Country Partner	SDGs														
			SDG1	SDG2	SDG3	SDG4	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG17
CONTO	Russia	IEF-RAS						X	X				X	X			
GCAM-China	China	BC3		X	X		X	X				X	X			X	
GCAM-USA	USA	BC3		X	X		X	X				X	X	X		X	
AIM/CGE; TIMES-INDIA	India	Grantham						X				X	X	X			
MAPLE	China	CUP						X				X	X				
NATEM	USA, Canada, Mexico	IEECP						X				X	X	X			
MUSE-Brazil	Brazil	Grantham						X				X	X	X			
TIMES-CAC	Central Asian Caspian	E4SMA						X				X	X	X			
ICES-XPS	Global	CMCC	X	X	X	X	X	X	X	X	X		X	X			X

- 32 indicators
- 14 SDGs
- 8 countries/regions

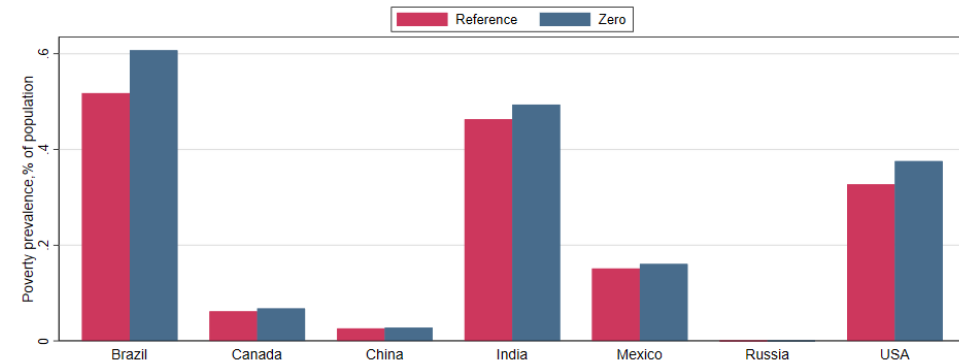


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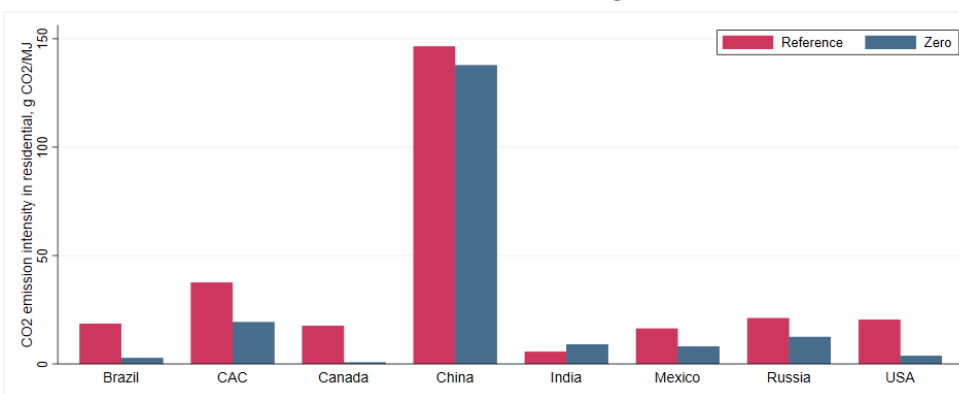
SDG7: Primary energy intensity in 2050



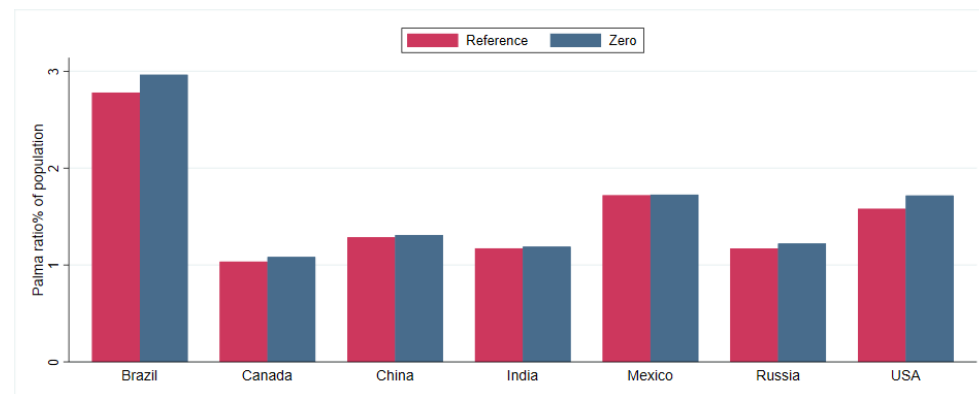
SDG1: Poverty prevalence



SDG11: CO2 emission intensity in resid. in 2050



SDG10: Palma ratio in 2050



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- In the Net-Zero emissions scenario:
 - environmentally-oriented SDGs converge towards a sustainable pathway in most regions
 - several trade-offs emerge with respect to economic and social indicators
- Economic indicators tend to worsen due to the cost of mitigation policy (excluding China)
- Social indicators may worsen due to the reduction in wealth, the contraction of sectoral production for loss of competitiveness or policy costs, and the shrinking of government expenditure
- The side effects must be tackled by a broader sustainable development policy framework tailored to the needs and context of each region



Evaluating **game changing innovations** from an **expert** perspective:

- 3,000 invitations (2k EU & 1k non-EU)
- 260 responses from 56 countries: 71% Male, 27% Female, 2% Others

Core Technological Innovations (CTIs)

Napp (2017): selected technological innovation required to achieve deep decarbonization based on Technology Readiness Level (TRL) and Implementation Scale

- Transportation
- Industrial Sectors
- Building and Construction
- CO₂ Removal and Other Technologies

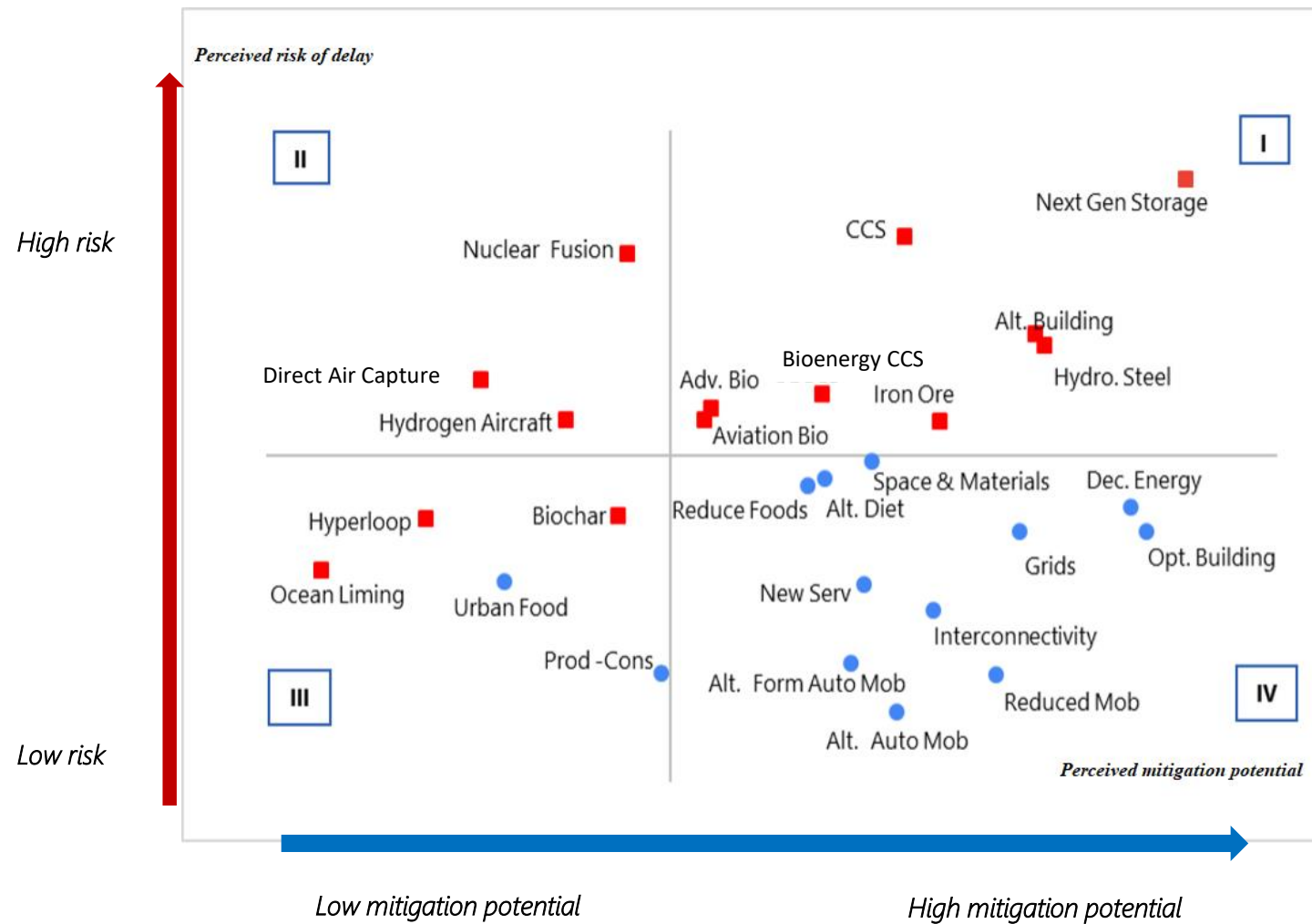
Other Disruptive Innovations (ODIs)

Wilson (2019): Disruptive Low Carbon Innovation (DLCI)

- Mobility
- Building and Interconnectivity
- Food: Consumption Pattern Sustainability Development
- Energy Supply and Distribution



Game changers: delay vs. potential



- Expert perceptions varied on technological innovations; more uniform for non-tech innovations
- Scenarios considering non-tech innovations (e.g., behavioral changes) critical and should be explored
- The role of hydrogen technologies in industrial sectors, next gen energy storage, decentralized supply should be modelled
- CCS and BECCS:
 - valid mitigation options
 - considerable risk of delay
- Almost unlikely to be available before mid-century:
 - Direct Air Capture
 - hyperloops
 - ocean liming
 - nuclear fusion
- These must be considered less relevant in mitigation aiming for net neutrality around 2050

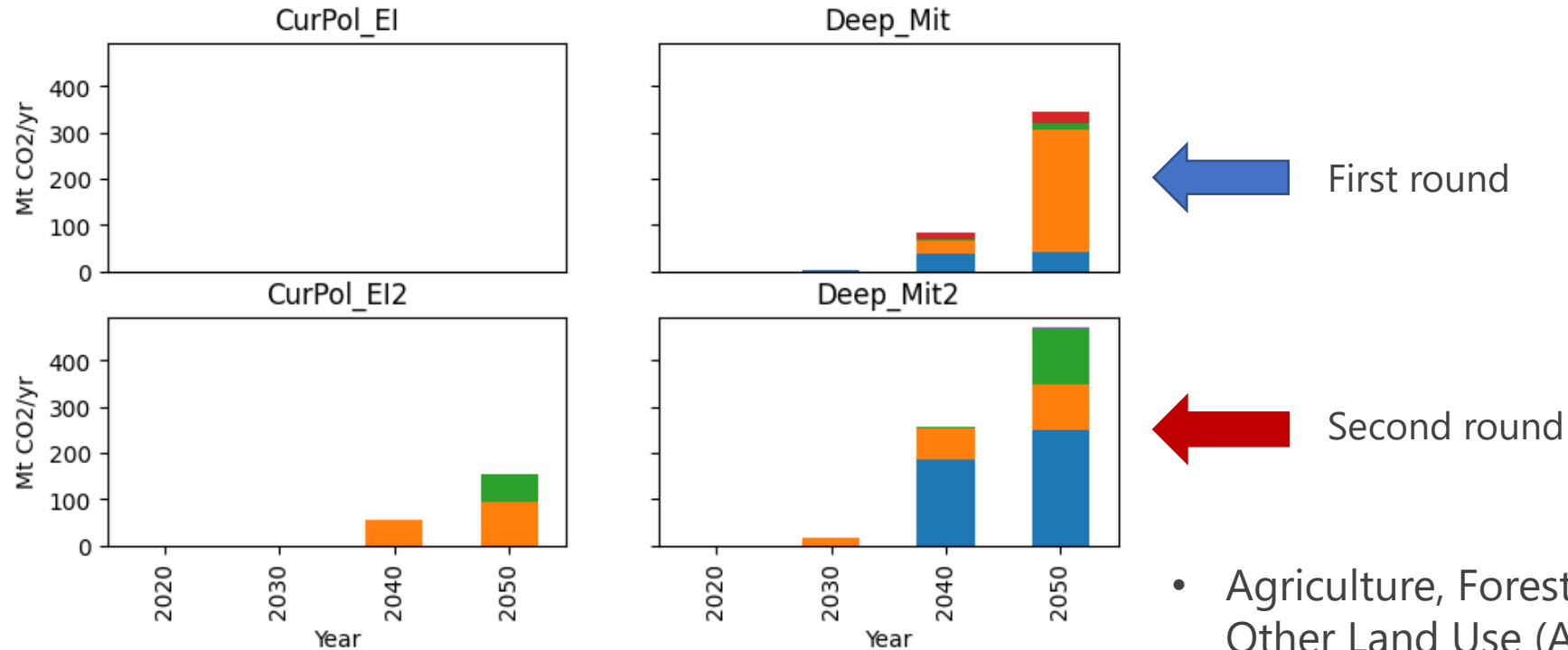


Workshop details	Details discussed	Scenario design plans
Canada (May 9th 2022)	First iteration of low-carbon pathways, decarbonisation bottlenecks , and transformative policy mixes (with a focus on decarbonising the transport sector)	Incorporation of modal shifts in the transportation sector, demand reductions, and limiting CCS usage.
Brazil (May 2nd 2022)	First iteration of low-carbon pathways, decarbonisation bottlenecks ; transformative policy mixes; CCS and land-use constraints	Updated renewable and hydrogen generation costs to better represent electrification and low-carbon vector uptake; inclusion of land-use emission modelling
Central Asian Caspian (CAC) (December 2020 – May 2021)	Water-energy nexus , and the correlation between power supply and water consumption; tariff phase-out	Incorporation of water-related constraints, e.g., seasonal availability of hydropower plants; cross-checking tariffs

- Key updates for other regions:
 - China, India, Mexico – updated policy and technology assumptions
 - USA – incorporation of jobs analysis



Carbon sequestration



- Agriculture, Forestry and Other Land Use (AFOLU) projections added
- Much less Bioenergy CCS
- Much more AFOLU

Carbon Sequestration|CCS|AFOLU
 Carbon Sequestration|CCS|Biomass|Energy
 Carbon Sequestration|CCS|Biomass|Industrial Processes
 Carbon Sequestration|CCS|Fossil|Energy
 Carbon Sequestration|CCS|Fossil|Industrial Processes
 Carbon Sequestration|Direct Air Capture

- Arrival of net-zero targets influenced first round of modelling
- In most cases stakeholders felt these targets are feasible
- Second round workshop-based insights were used to further “tweak” scenarios along specific technologies (CCS, modal shifts, AFOLU)
- Considering AFOLU projections highlighted the relevance of this option in Brazil net zero mitigation scenario and the overestimated contribution of bioenergy CCS in the first modelling round
- Overall stakeholder process had an educational role in explaining the operation of models





Thank you!

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