

# PARIS REINFORCE



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Delivering on the Paris Agreement in a fragmenting world

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

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### **Sustainable transitions in major economies**

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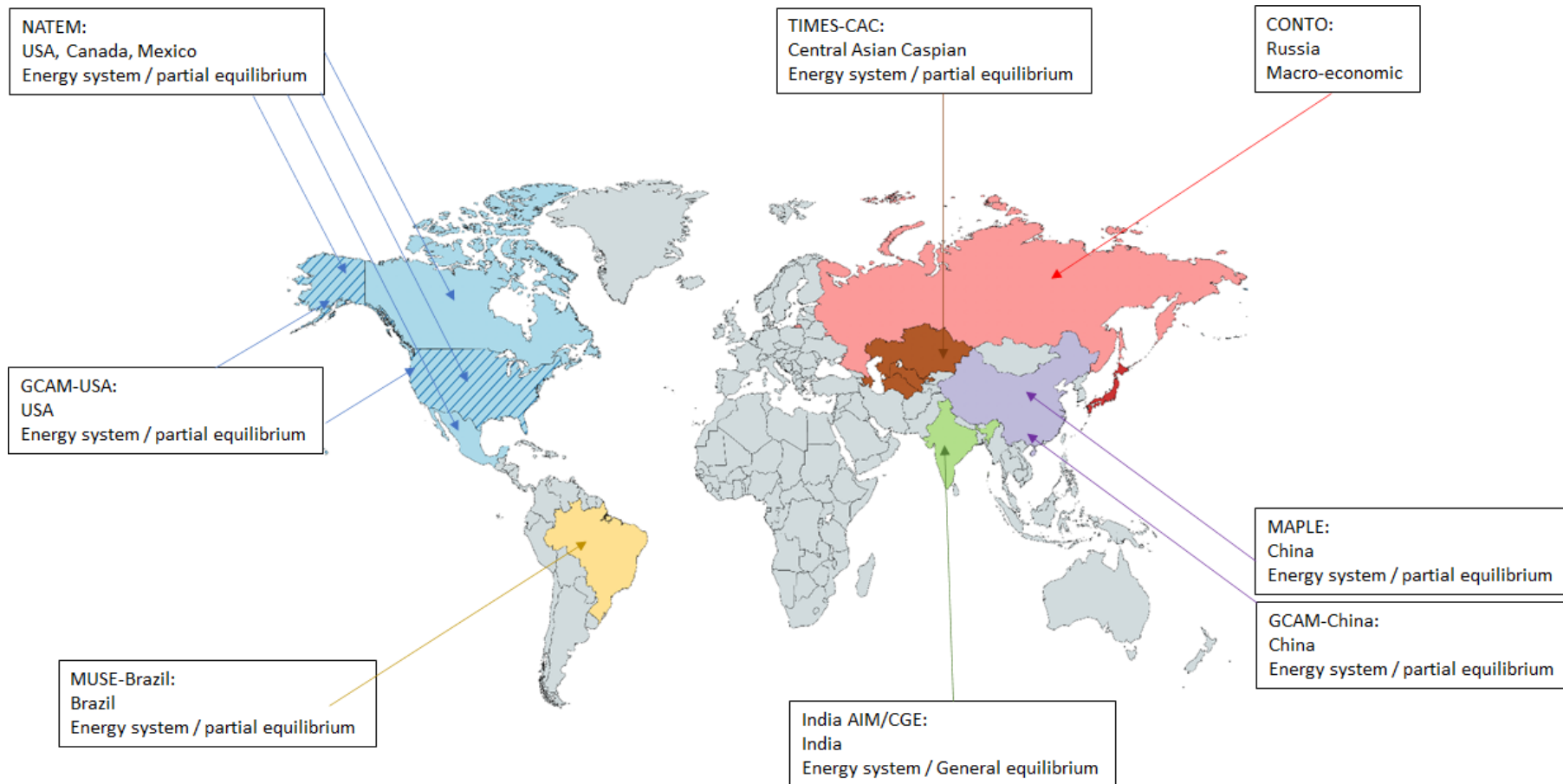
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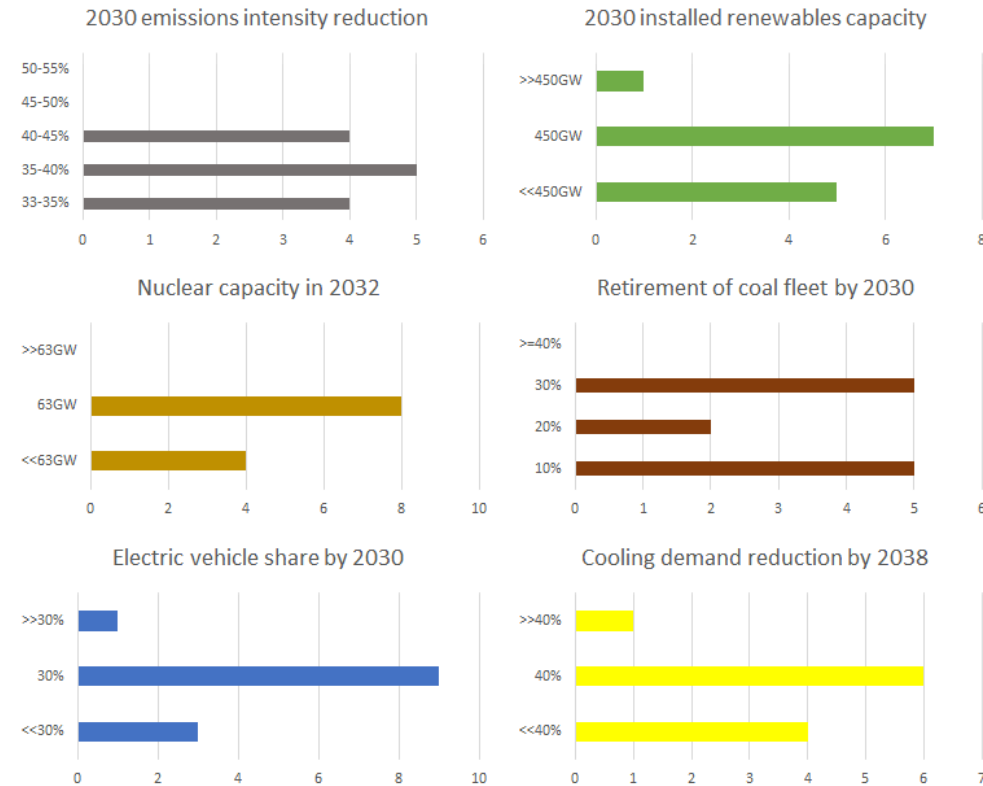
# Major economies studied in detail



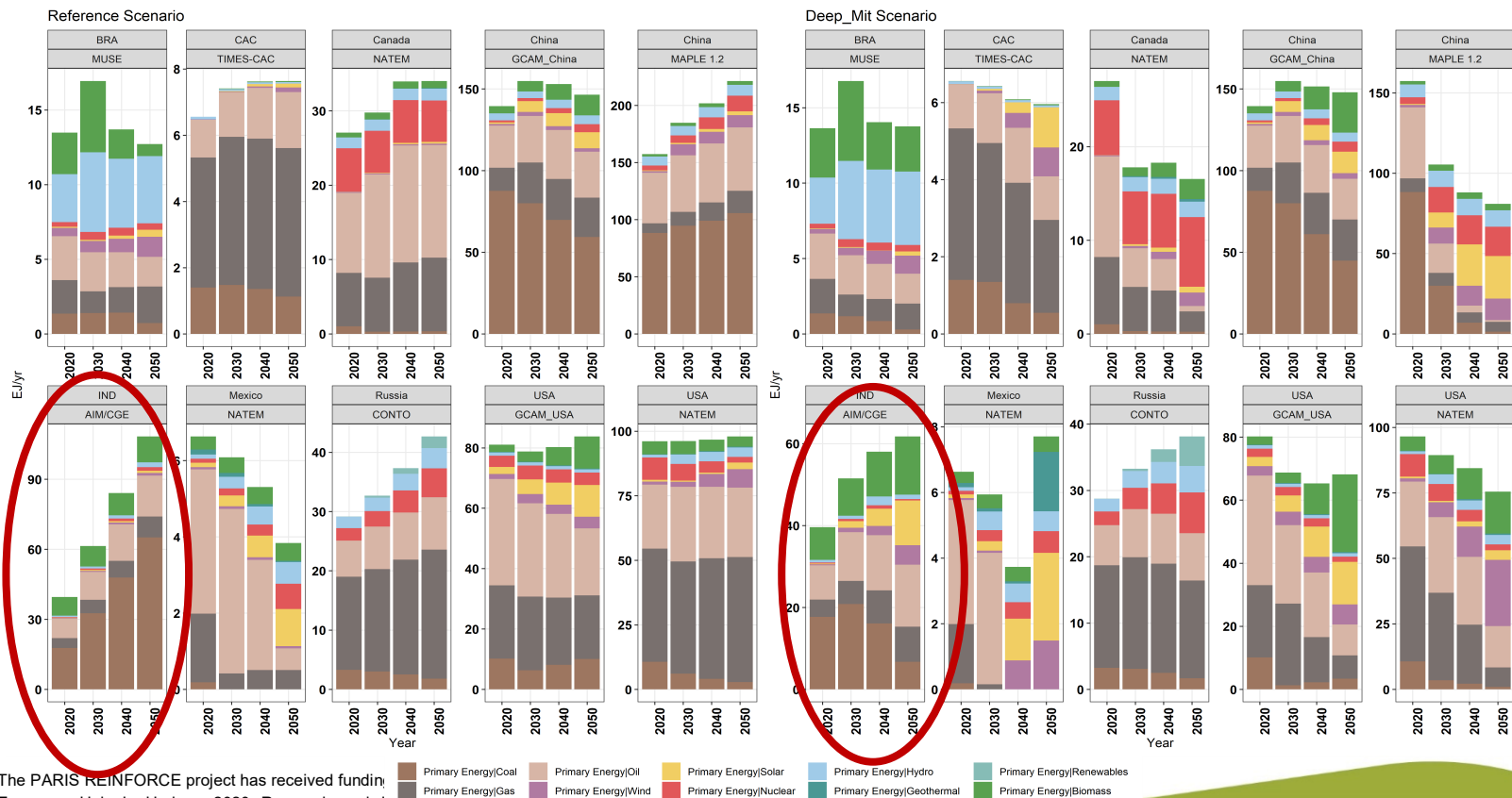
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Workshop details	Details discussed
India (Nov 2020)	Role of <b>power sector</b> , <b>transport sector</b> and <b>urbanisation</b> in achieving mitigation pathways.
Central Asian Caspian (Dec 2020, March 2021, May 2021)	Discussion on policy measures and regional climate ambitions, regional integration and cooperation, implications of <b>water consumption</b> in power sector, commodity <b>tariff phase-outs</b> , H2 market development.
Russia (Mar 2021)	Overall discussion of Russia's potential pathways, and deep-dives into the role of <b>forests</b> , <b>industrial manufacturing</b> and <b>electricity</b> in Russia's low-carbon pathways.
US (May 2021)	Targeted discussion on the importance of considering <b>equity</b> and <b>jobs</b> 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 <b>power</b> , <b>industry</b> , role of <b>coal</b> , 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 <b>biofuels</b> in transport, role of <b>renewables</b> and <b>storage</b> , importance of incumbents in oil and gas, limits of CCS
Canada (May 2022)	Role of <b>modal shifts in transport</b> , 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



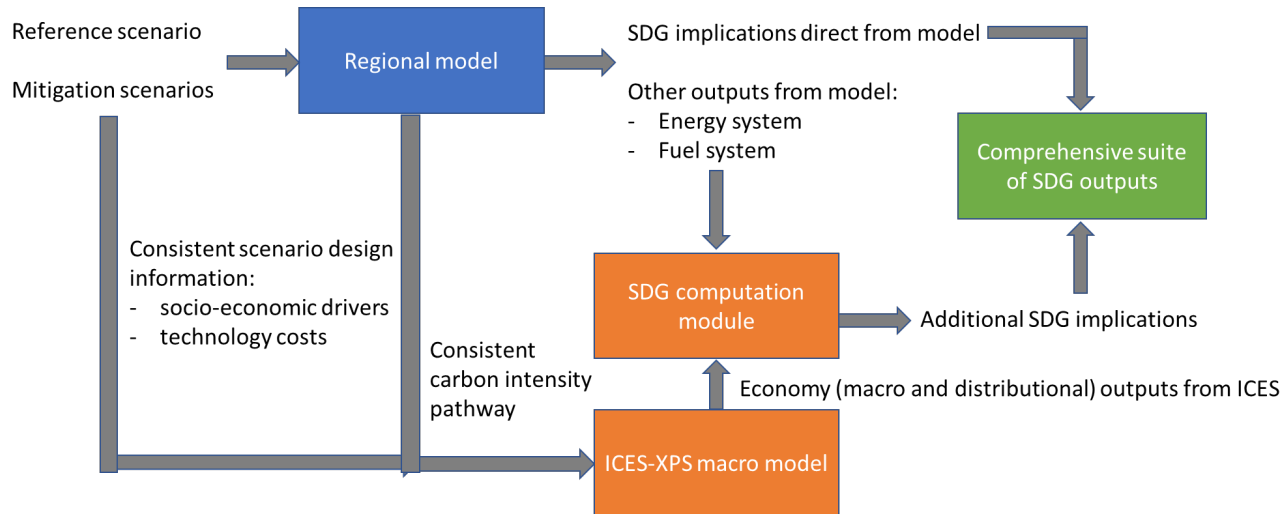
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- Potential for deep emissions cut across regions:
  - net-zero by 2050 in some
  - net-zero by 2070 in all
  
- In most regions this is achieved by:
  - a rapid penetration of renewables (and in some cases nuclear) into the electricity system
  - 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

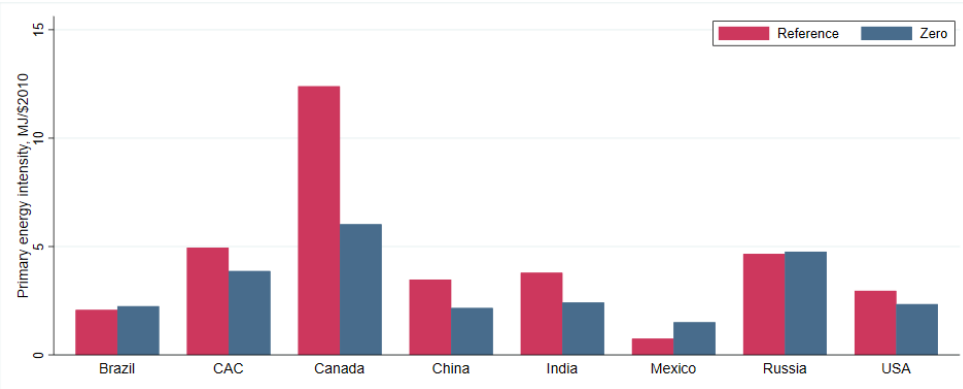
Model	Country / Region	Country Partner	SDGs														
			SDG1	SDG2	SDG3	SDG4	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG17
CONTO	Russia	IEF-RAS						X	X				X	X			
GCAM-China	China	BC3		X	X		X	X				X	X			X	
GCAM-USA	USA	BC3		X	X		X	X				X	X	X		X	
AIM/CGE; TIMES-INDIA	India	Grantham						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

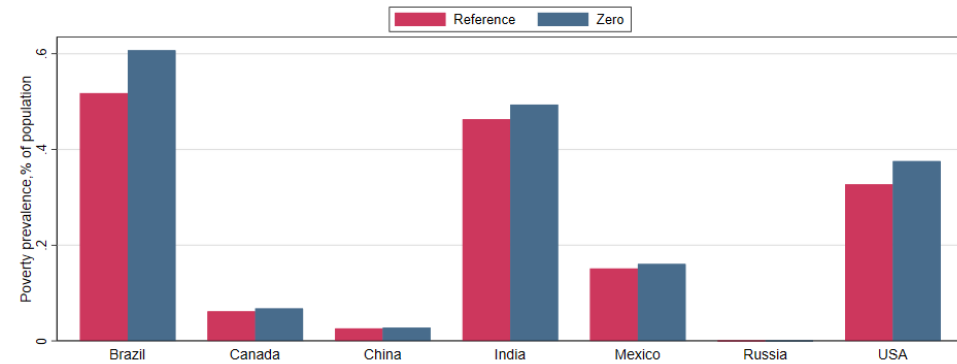


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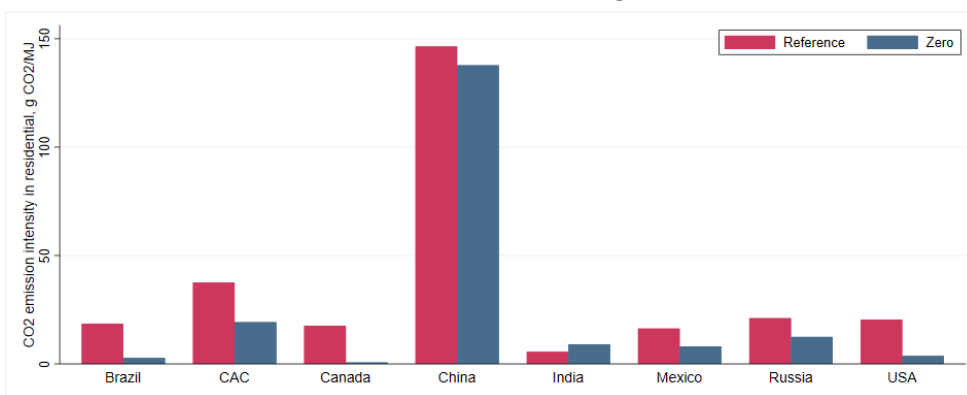
## SDG7: Primary energy intensity in 2050



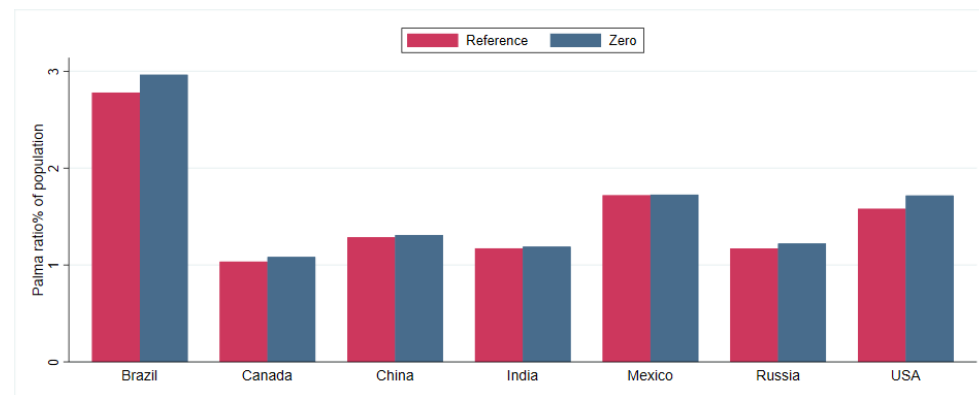
## SDG1: Poverty prevalence in 2050



## SDG11: CO2 emission intensity in resid. in 2050



## SDG10: Palma ratio in 2050



- 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)

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**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
- CO<sub>2</sub> Removal and Other Technologies

## Other Disruptive Innovations (ODIs)

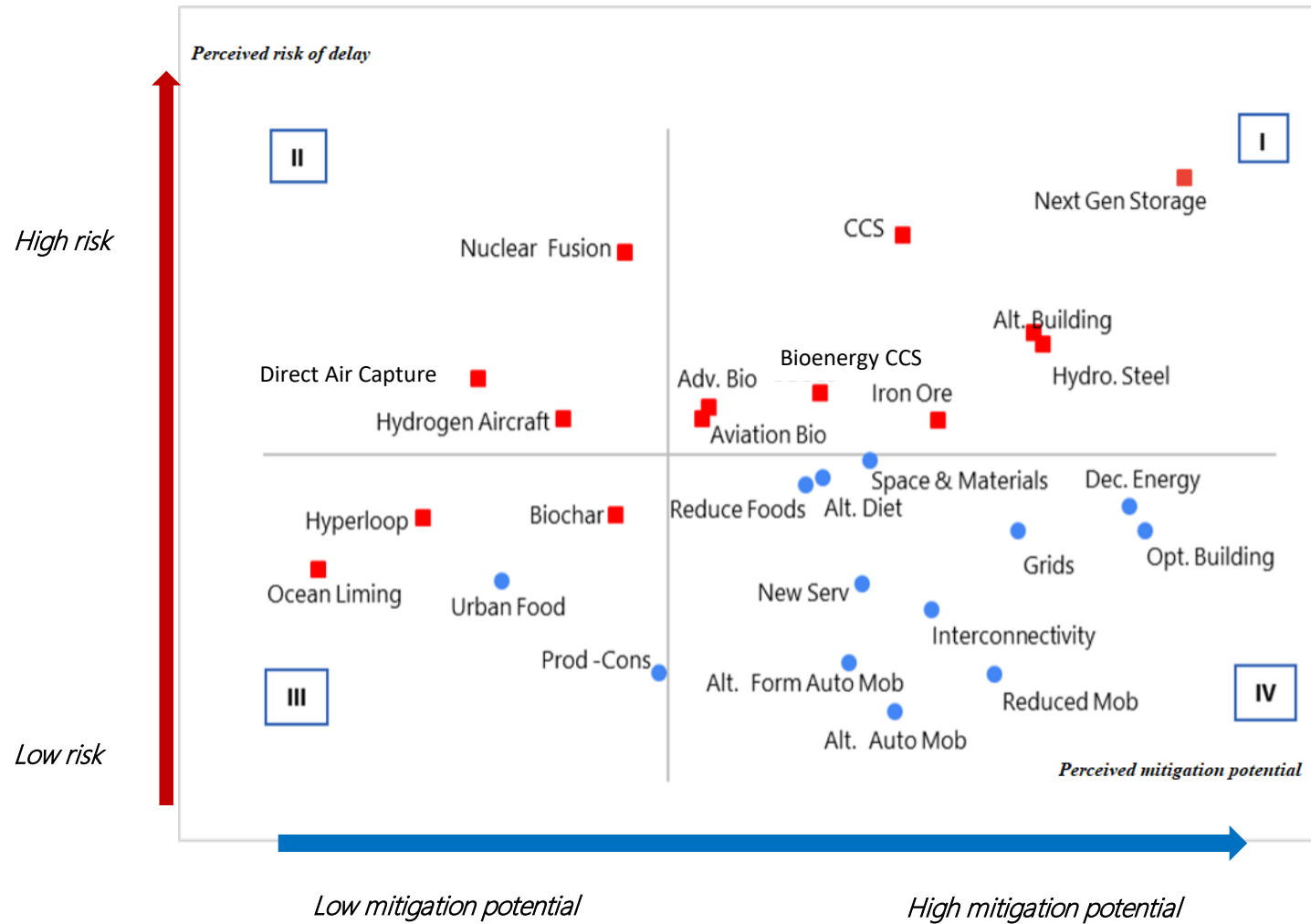
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**Wilson (2019):** Disruptive Low Carbon Innovation (DLCI)

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



# Game changers: delay vs. potential



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- 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

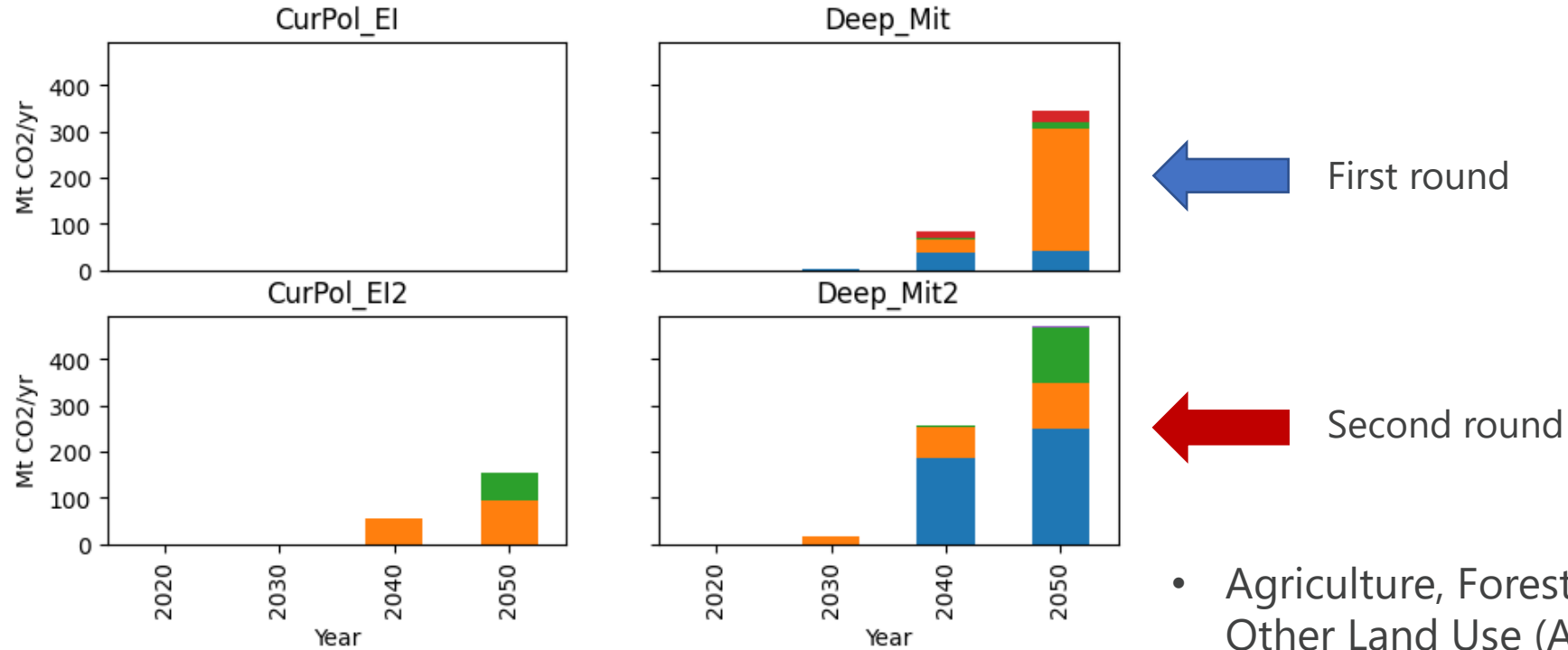


Workshop details	Details discussed	Scenario design plans
<b>Canada (May 9<sup>th</sup> 2022)</b>	First iteration of low-carbon pathways, decarbonisation <b>bottlenecks</b> , and transformative policy mixes (with a focus on decarbonising the <b>transport</b> sector)	Incorporation of modal shifts in the transportation sector, demand reductions, and limiting CCS usage.
<b>Brazil (May 2<sup>nd</sup> 2022)</b>	First iteration of low-carbon pathways, decarbonisation <b>bottlenecks</b> ; transformative policy mixes; <b>CCS</b> and <b>land-use</b> constraints	Updated renewable and hydrogen generation costs to better represent electrification and low-carbon vector uptake; <b>inclusion of land-use emission modelling</b>
<b>Central Asian Caspian (CAC) (December 2020 – May 2021)</b>	<b>Water-energy nexus</b> , 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



- 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

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

- 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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