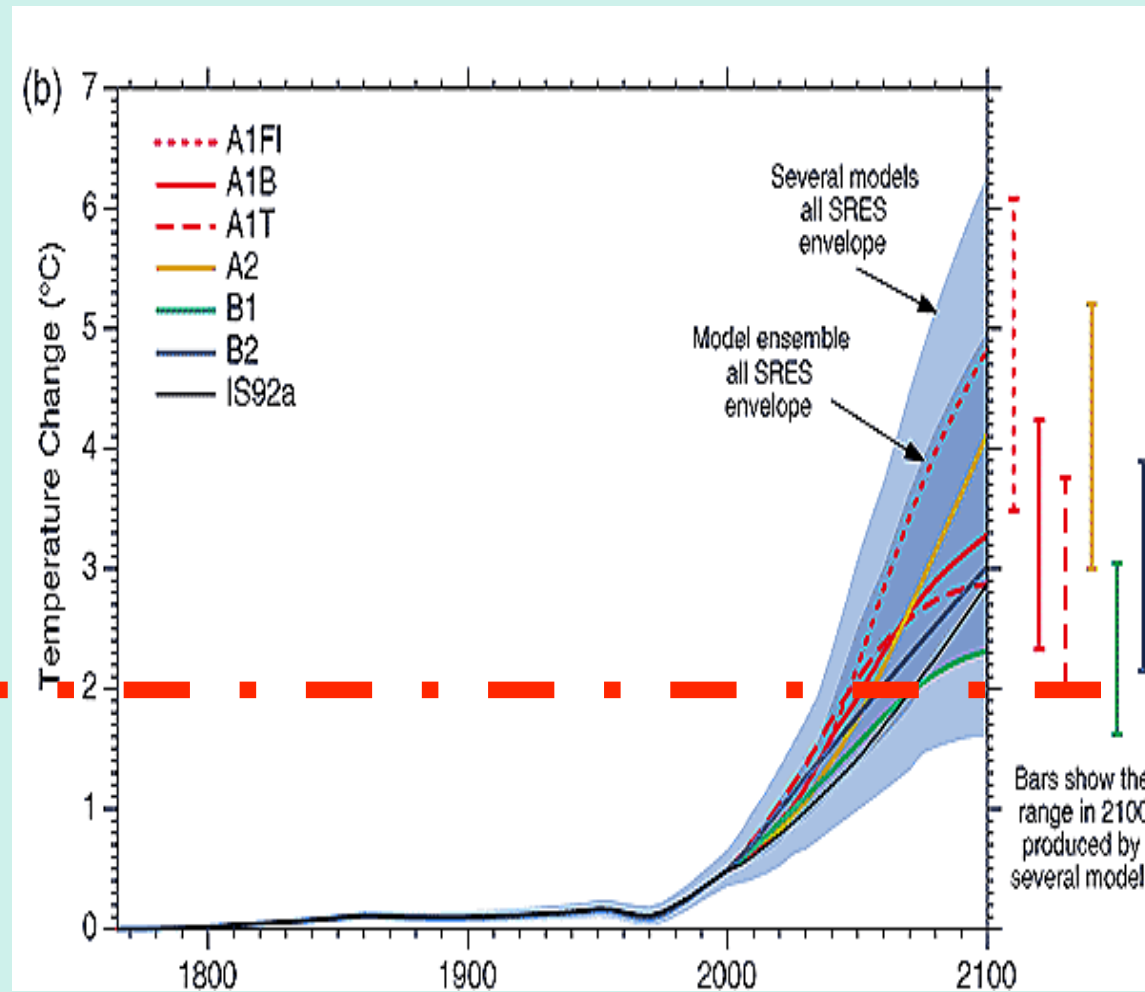


A Climate challenge with specific importance: the estimate of climate sensitivity

Hervé Le Treut

Policy-free scenarios (SRES)

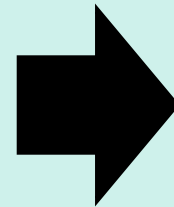
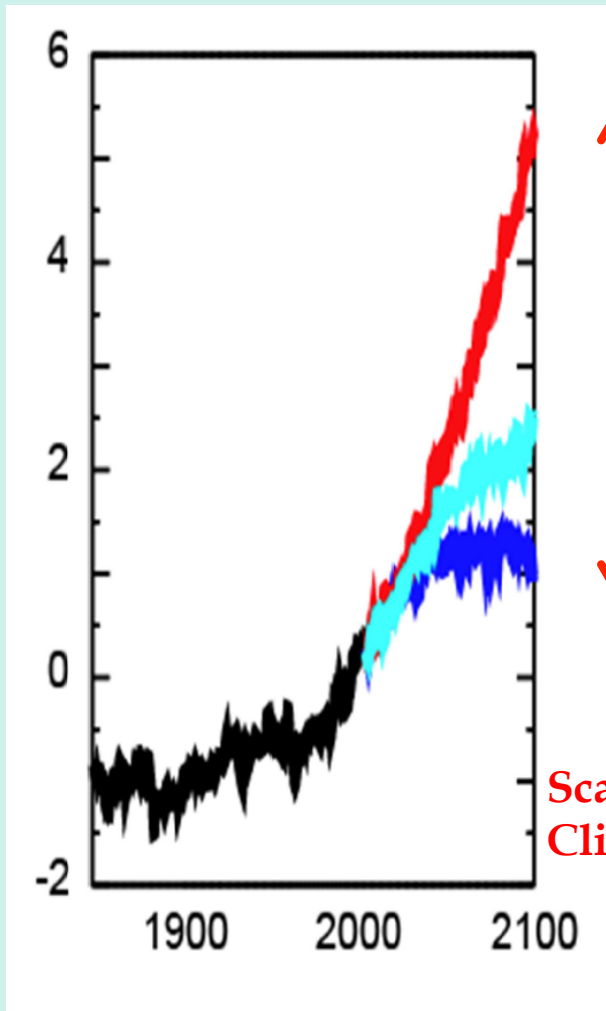


H. Le Treut, P. Criqui, O. Boucher, H. Benveniste (GICN)

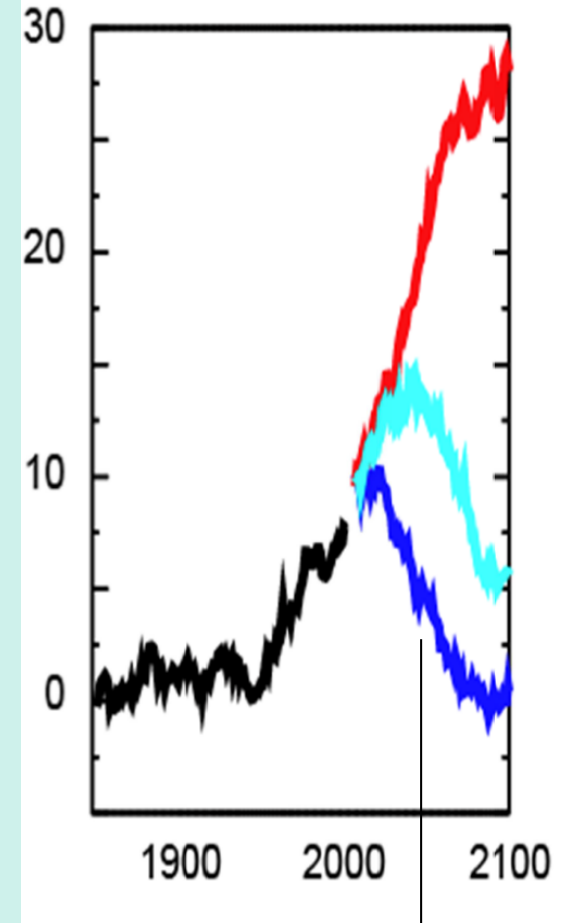
Future Climate Trajectories

Targeted Earth Surface Temperature Changes **IPSL / IPCC 2013**

(in °C)

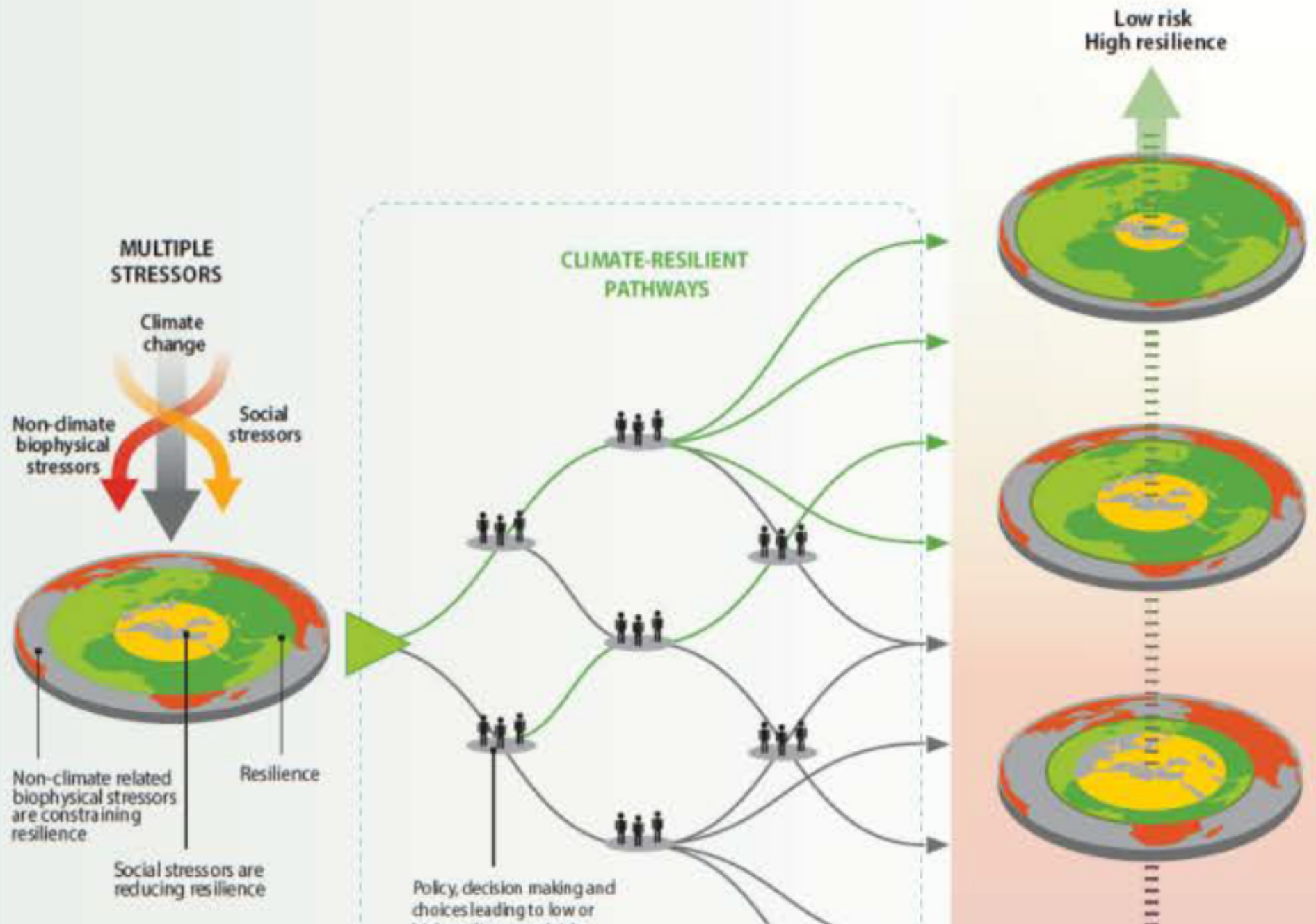


Required CO₂ emissions (in Gt per year)



40 à 70%

Multiple stressors and Climate-resilient development pathways

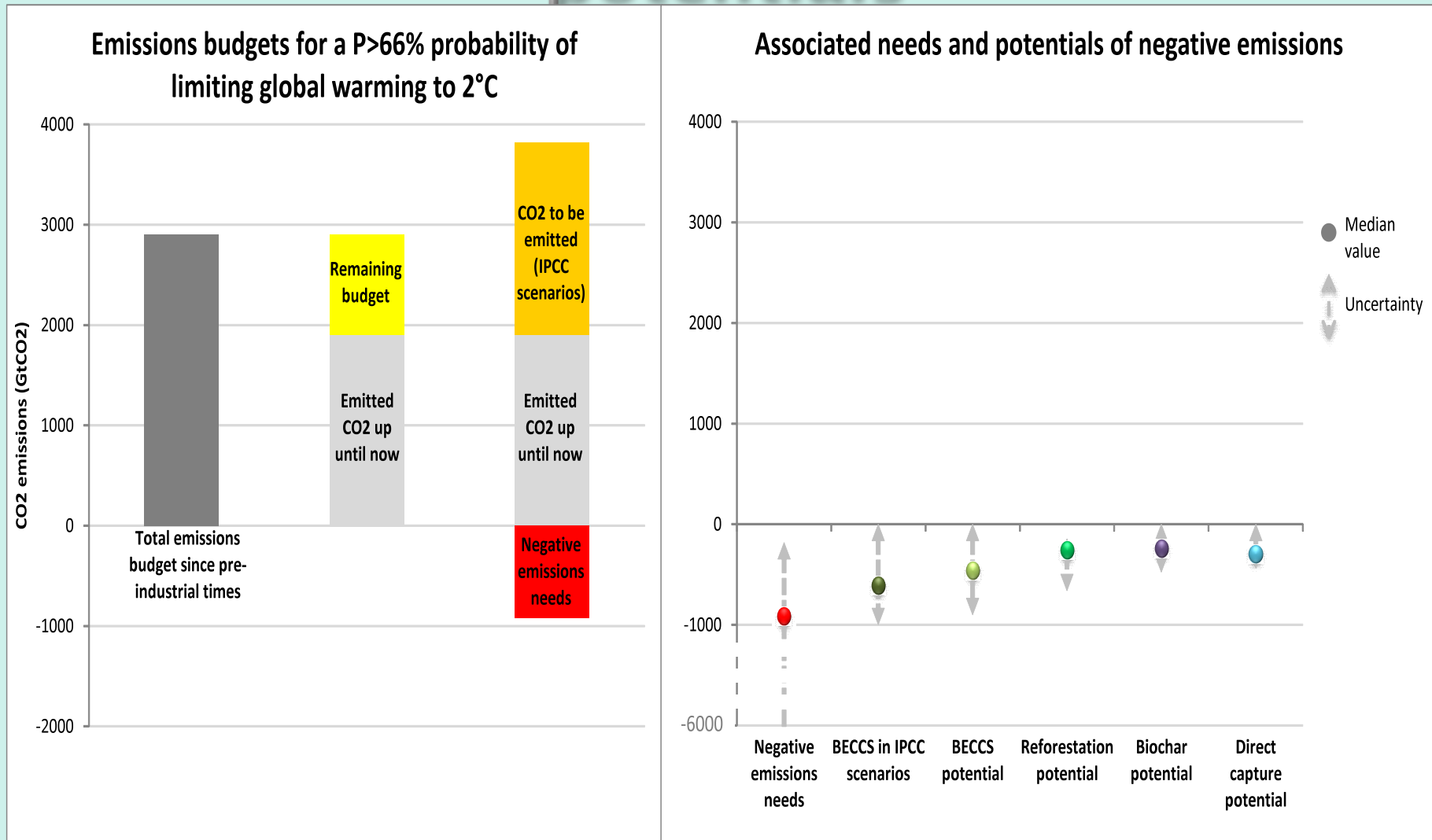


The Interdisciplinary Group on National Contributions (GICN)

- ▣ **Hervé Le Treut** (IPSL, UPMC) : coordinator
- ▣ **Olivier Boucher** (LMD, IPSL, CNRS) : co-coordinator
- ▣ **Hélène Benveniste** (IPSL) : scientific secretary
- ▣ **Philippe Ciais** (LSCE, IPSL, CEA)
- ▣ **François-Marie Bréon** (LSCE, IPSL, CEA)
- ▣ **Franck Lecocq** (CIRED, AgroParistech)
- ▣ **Céline Guivarch** (CIRED, ENPC)
- ▣ **Thomas Gasser** (LSCE, IPSL, CIRED)
- ▣ **Patrick Criqui** (EDDEN, CNRS-UGA)
- ▣ **Sandrine Mathy** (EDDEN, CNRS-UGA)
- ▣ **Emmanuel Prados** (INRIA-Grenoble)
- ▣ **David Salas** (Météo-France)
- ▣ **Roland Séférian** (Météo-France)
- ▣ **Valentin Bellassen** (INRA, Dijon)

H. Le Treut, P. Criqui, O. Boucher, H. Benveniste
(GICN)

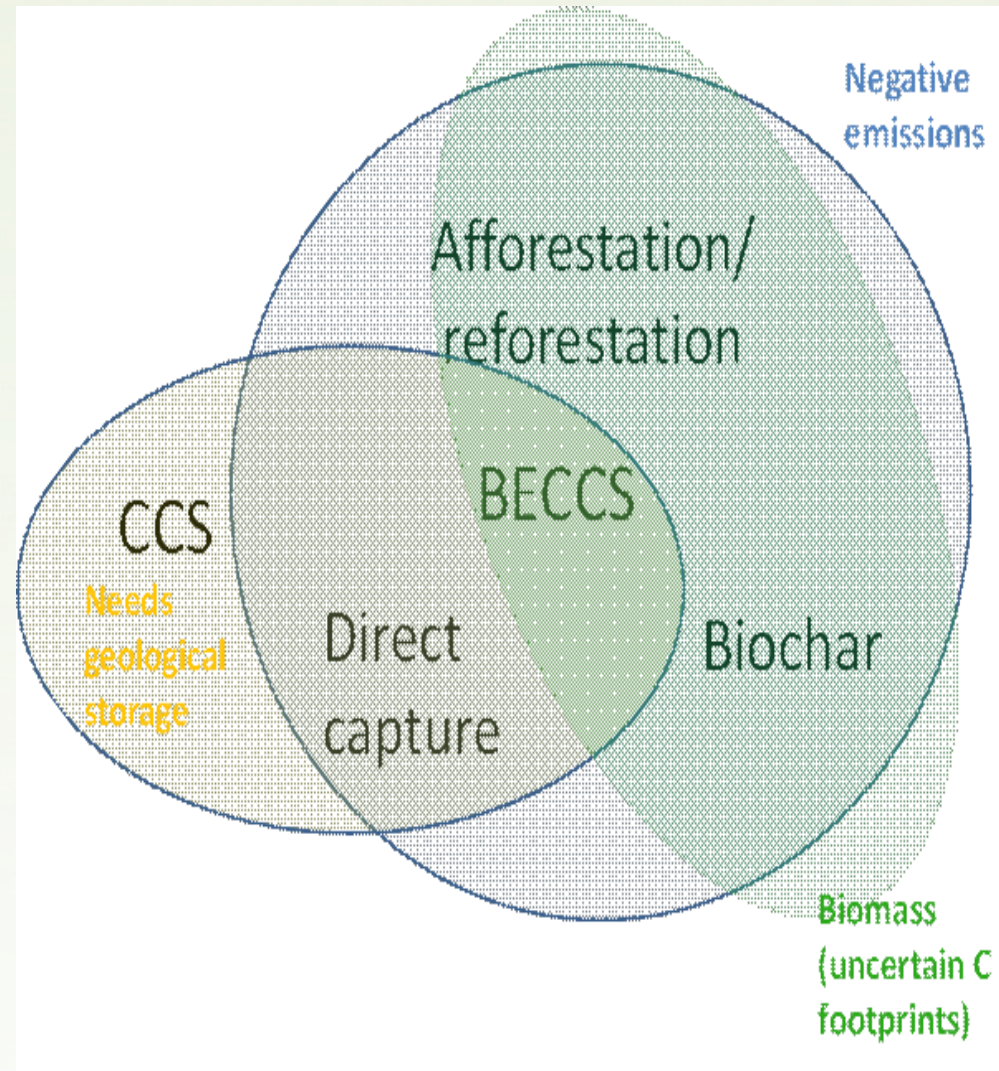
Negative emissions: uncertain potentials



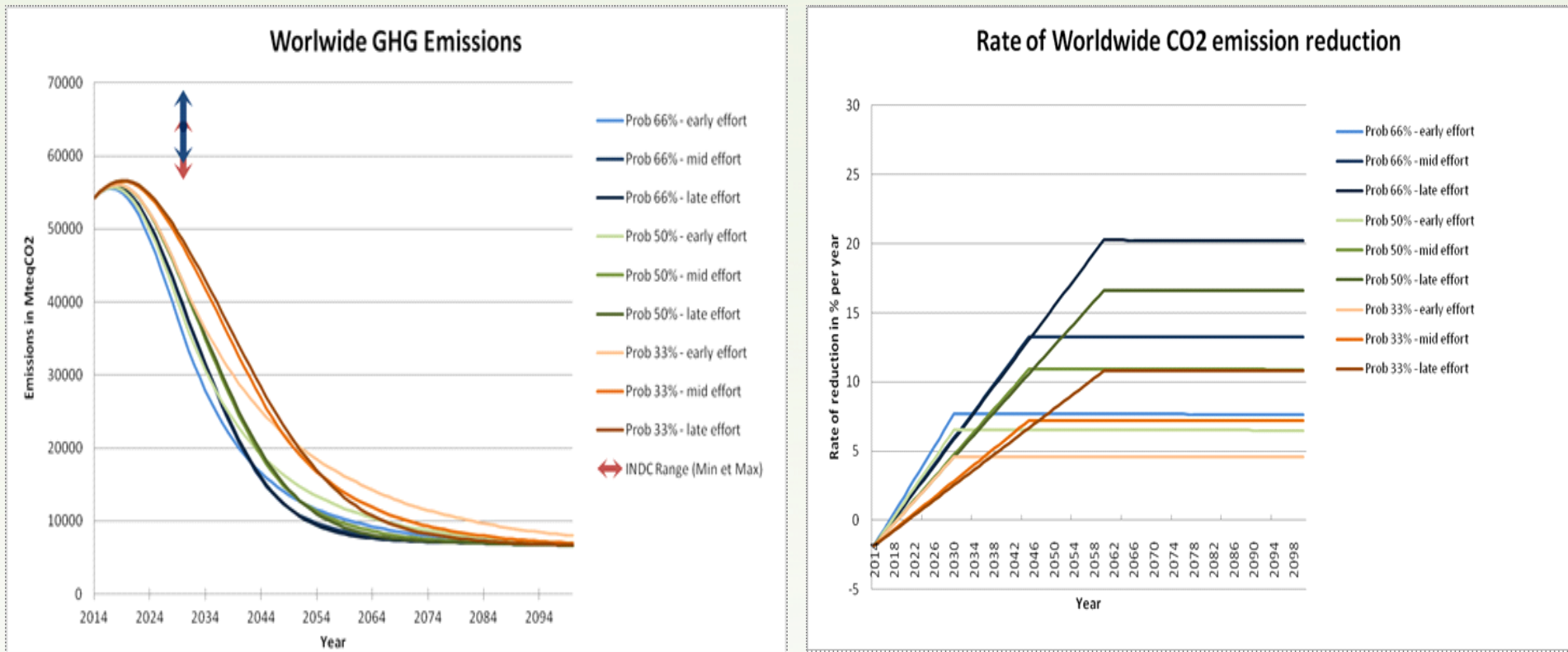
H. Le Treut, P. Criqui, O. Boucher, H. Benveniste (GICN)

Source: GICN, 2015

Negative emissions: different techniques

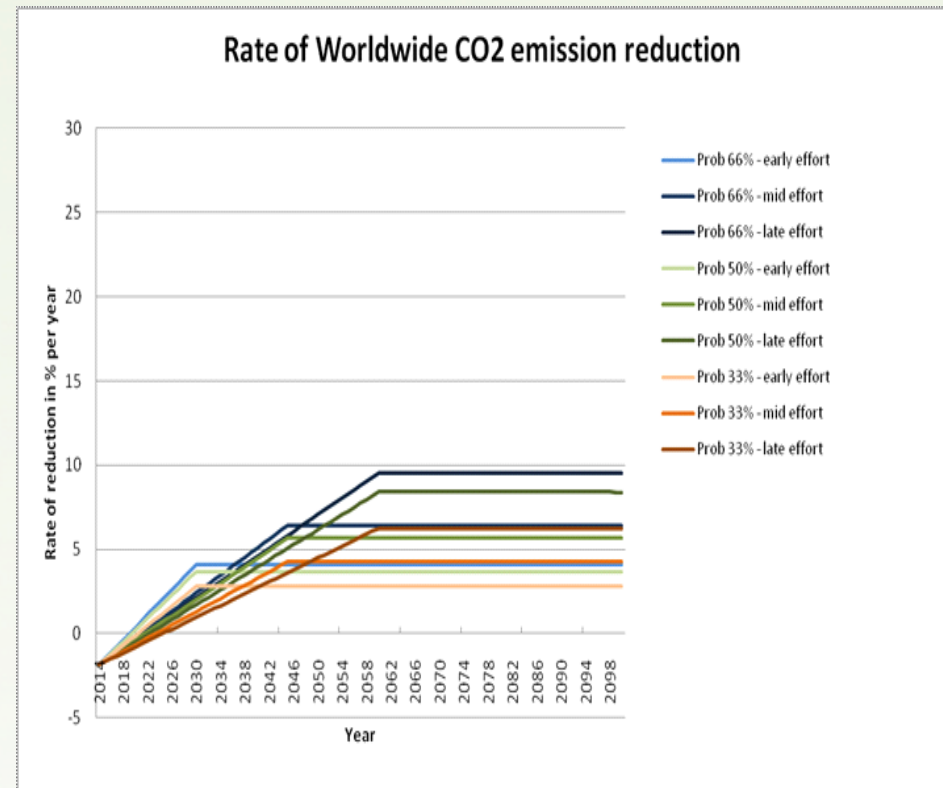
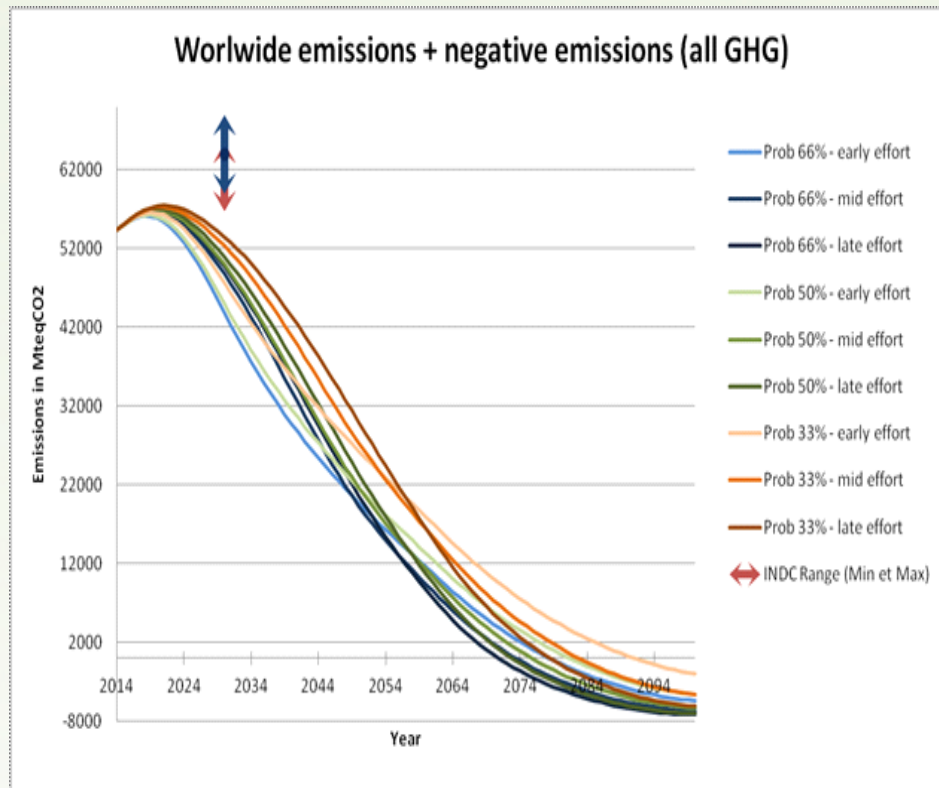


INDCs compared to REDEM 2°C pathways (1) without negative emissions



Trajectories **without negative CO₂ emissions** for different probabilities of reaching the 2°C target and different maximum effort dates, against aggregated INDCs.

INDCs compared to REDEM 2°C pathways (2) with negative emissions

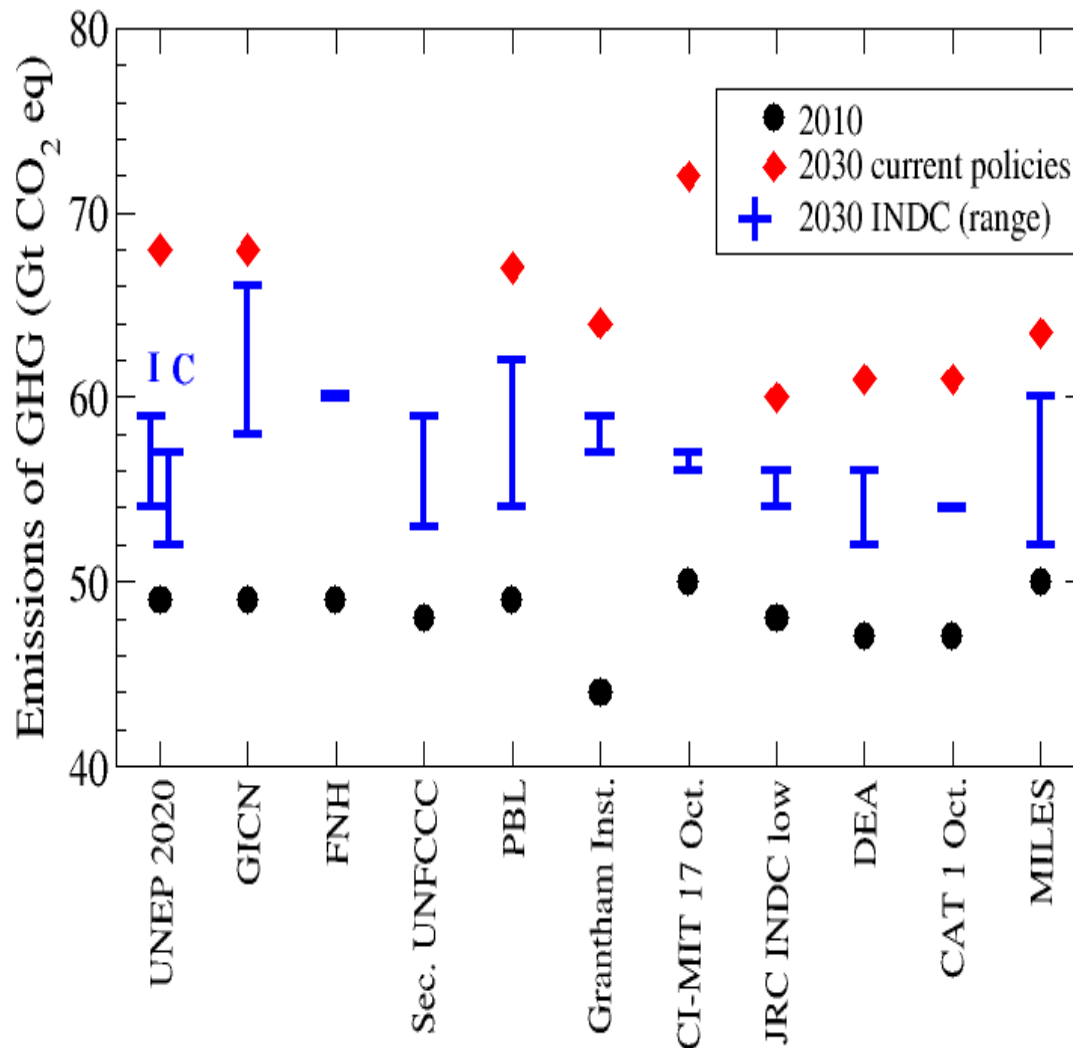


Trajectories **with negative CO₂ emissions (500 GtCO₂eq)** for different probabilities of reaching the 2°C target and different maximum effort dates, against aggregated INDCs.

Summing up INDC assessment studies

Differences in treatment of
 -baseline 2010 emissions
 -land use emissions
 -C intensity targets
 -aviation & shipping
 -small countries

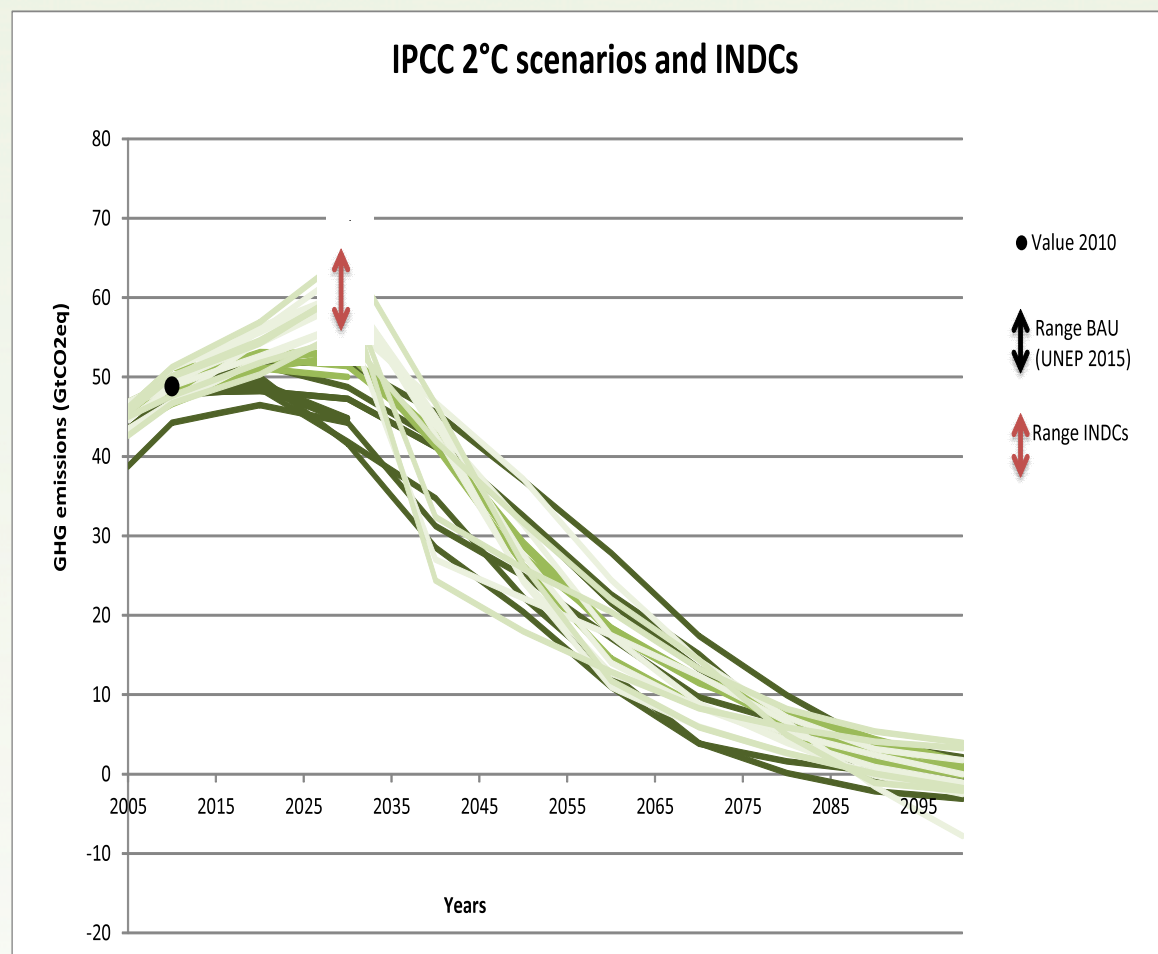
⇒MRV paramount
 ⇒Land use & sectors
 ⇒Contributions from
 RoW is uncertain



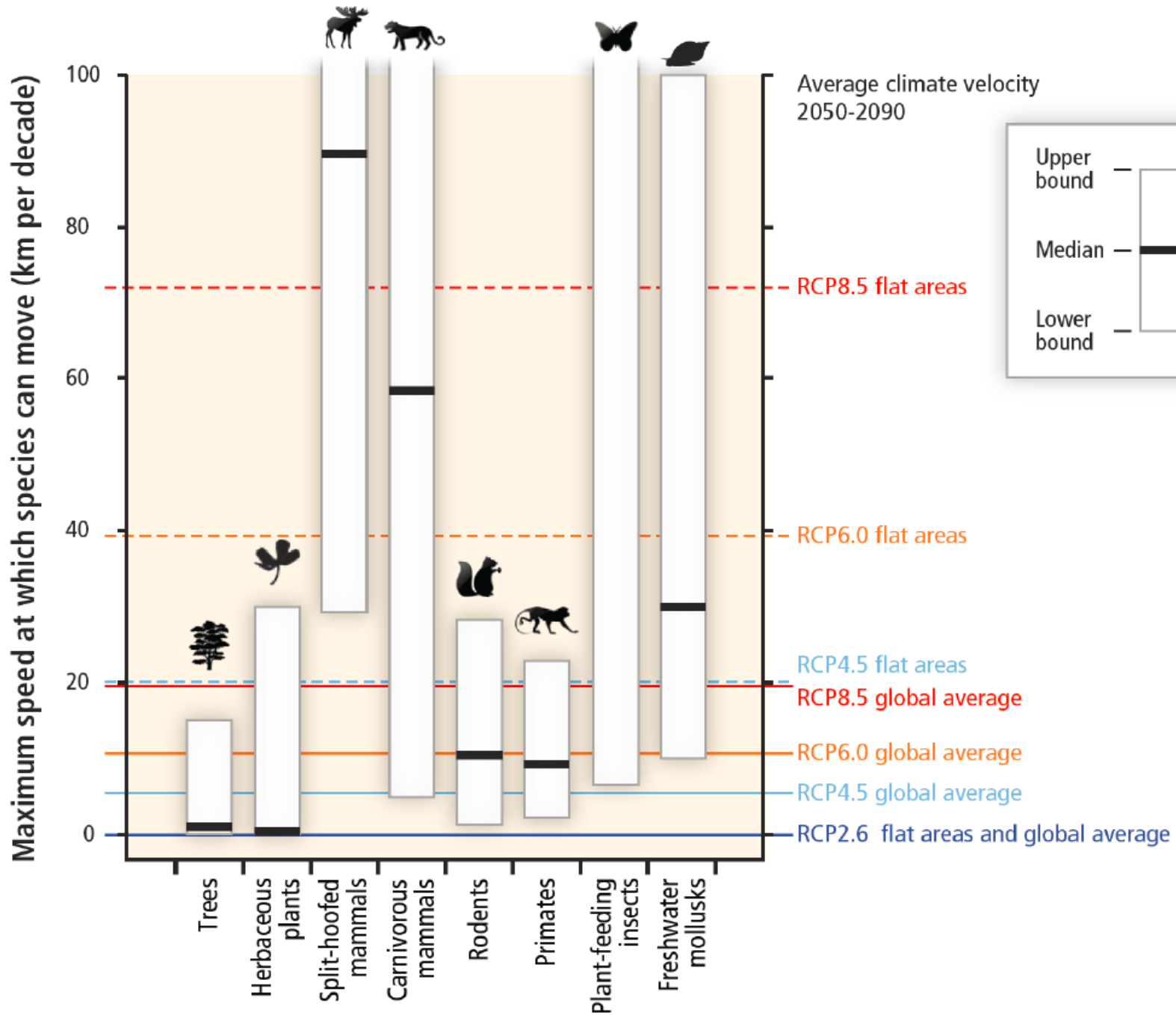
INDCs compared to IPCC 2°C pathways

The range of consolidated INDCs as computed by GICN is compatible only with those IPCC AR5 trajectories that correspond to:

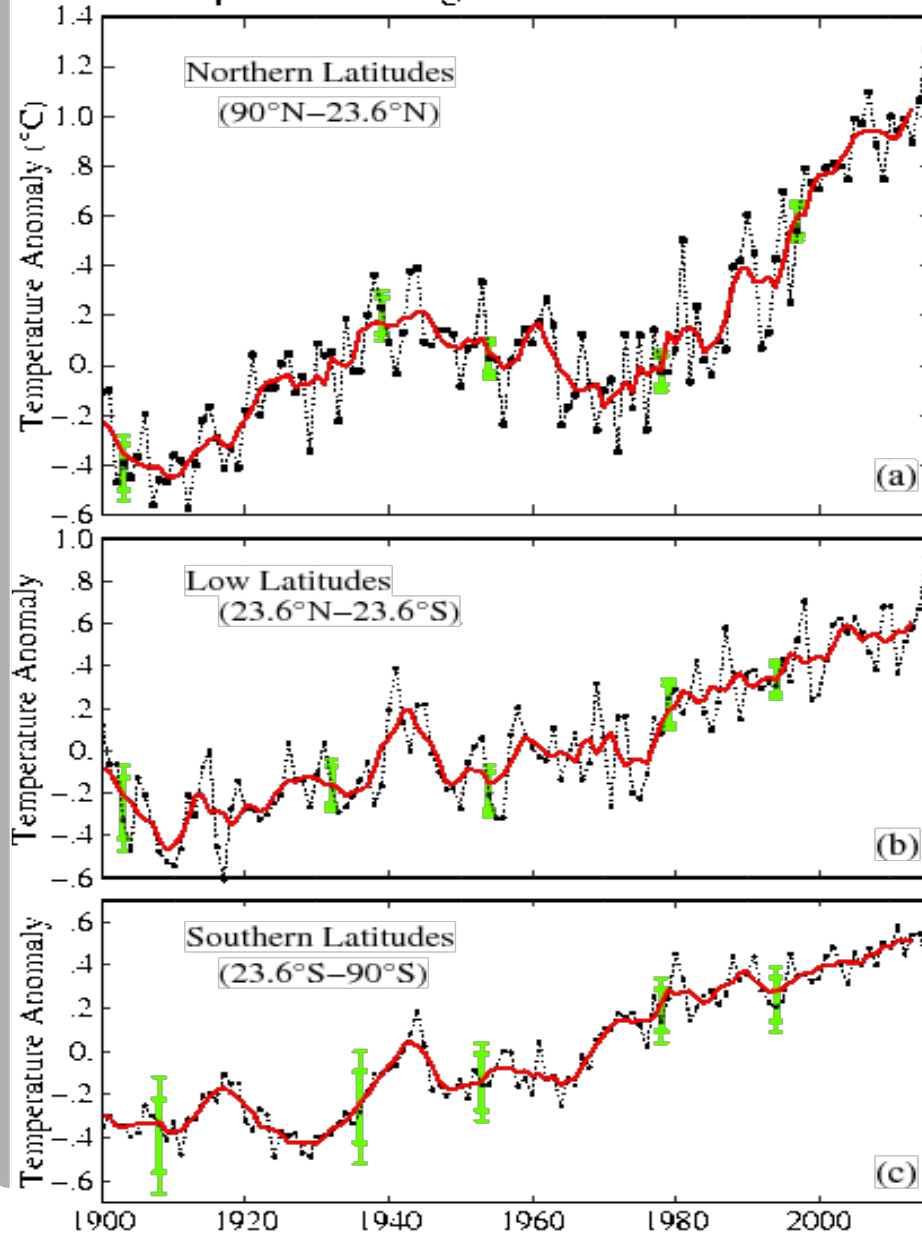
- a delayed action
- a sharp downturn in 2030
- negative emissions by the end of the century



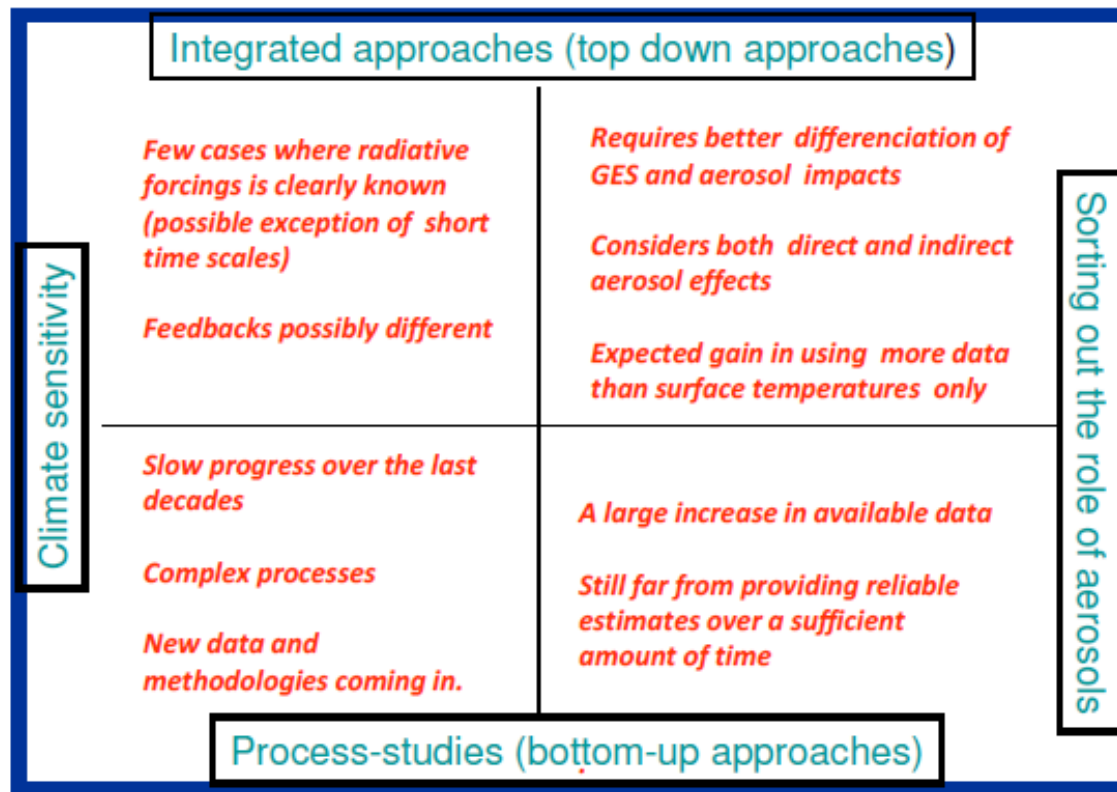
Source: IPCC WG3 AR5 SPM, 2014; GICN, 2015



Temperature Change for Three Latitude Bands



**Recent warming:
unable to constrain
climate sensitivity?
(NASA, GISS)**



The only way forward: multi-parameter process-oriented studies. Huge progress through CALIPSO. More is needed