WHAT DO WE NEED TO UNDERSTAND, AND HOW?

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Policy Panel 1: Macroeconomic modelling of climate change: current situation and challenges

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How to achieve a rapid and smooth transition?

	Rapid transition	Smooth transition
Obstacles	What are the obstacles to expanding physical and financial low-carbon investment? • Differentials in technological progress • Radical uncertainty • Inertias (technical, cognitive, financial, political) • Investment drivers? 'Animal spirits'	What are the drivers and transmission channels of potential disruptions along the low-carbon transition? • Misalignment of expectations • Stranding of assets (natural, physical, financial) • Cascades in production and financial networks • Macro spillovers (A 'Climate Minsky moment') • Climate macroeconomic and financial impacts
Solutions	How can societies accellerate the reallocation of investments towards low-carbon activities? • Carbon pricing; but is it enough? • Additional policies aimed at physical/financial investments • Can they be implemented, and by whom? • Role of central banks and financial regulators	How can societies mitigate and adapt to macrofinancial transition-related risks? • Risk disclosure; but can they assess exposure? • Green macroprudential policies • Role of central banks and regulators • Adapt to transition effects • Adapt to climate impacts (e.g. monetary policy)

Ideal methodological features (I)

- Representation of multiple technologies
  - At the minimum: High-carbon vs low-carbon
- Representation of physical assets
  - Including capacity utilisation rates (physical stranding)
  - Vintages of stocks; technological development; inertia
- Representation of financial markets
  - Assets: credit, bonds, equities
  - Institutions: firms, banks, asset managers, central banks
  - Realistic representation of credit creation and allocation
- Representation of climate damages
  - Climate impacts
  - Macroeconomic and financial impacts (cross-boundary cascades)

Ideal methodological dimensions (II)

- Representation of networks of exchanges and assets
  - Production and financial networks
- Representation of uncertainty
  - Climate and macro stochastic factors
- Representation of investment behaviour
  - Realistic representation of expectations (planning horizons)
  - Representation of 'sentiments' (realisation, reversal, herding)
- Representation of endogenous structural change
  - Shifts in technological paradygms
  - Sunrise and sunset industries
- Representation of policies
  - Social/fiscal/monetary/financial/...

Multiple methodological approaches

- No existing methodology includes all dimensions
  - Integrated Assessment Models (IAMs)
  - Computable General Equilibrium (CGE) models
  - Dynamic Stochastic General Equilibrium (DSGE) models
  - Capital Asset Pricing Model (CAPM)
  - Diffusion models
  - Stock-Flow Consistent (SFC) models
  - Agent-Based Models (ABM)
  - Network analysis
  - ...
- No single methodology will ever include all dimensions
  - Pluralism of approaches needed

Cross-fertilization and hybrid models

- All of them have strengths…
  - IAMs know how to model energy and climate
  - CAPM/DSGE good at dealing with stochastic factors
  - SFC models good at modelling interacting balance sheets
  - ABMs introduce heterogeneity
- … and weaknesses
  - Optimal intertemporal behaviour vs macro-econometric relations
  - Either too much or too little heterogeneity
  - Analitical tractability vs computational intensity
- → Cross-fertilisation and hybrid models
  - Stochastic factors typical of CAPM into IAMs
  - Forward-looking behaviour into non-optimised models
  - Heterogeneity into diffusion models without agents