

Energy and the Post-Carbon Transition

Prof **Cameron Hepburn**

Thanks to **Dr Matt Ives and team**

INET at the Oxford Martin School
Smith School of Enterprise and the Environment

23 March 2022



Agenda

1. Sensitive Intervention Points (SIPs)
 2. SIPs and COVID research
 3. SIPs in China, India, Brazil & EU
 4. SIPs applied to UK CCC
 5. SIPs in Oxford courses
 6. SIPs competition and SIPs wiki
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Sensitive Intervention Points

- Rapid and radical change in values, beliefs and economic systems are not only possible, they have happened repeatedly throughout human history.
- There is a need for an similar approach to climate action.
- Sensitive intervention points (SIPs) in socio-economic, technological, and political systems offer an opportunity to rapidly advance climate change mitigation.



Sensitive Intervention Points

- Sensitive intervention points (SIPs) occur where a small change can trigger a larger change that becomes irreversible.
- And where nonlinear feedback effects act as amplifiers.
- SIPs can be triggered by a “kick” or a “shift”.
- A kick can be effective when the system is chaotic, or when it is near a critical point (Fig 1A). e.g. subsidising low cost renewables.
- A shift can occur in the underlying system dynamics, where the rules of the system itself change and trajectories alter dramatically (Fig 1B), e.g. UK Climate Change Act 2008.

Figure 1A: “kick”

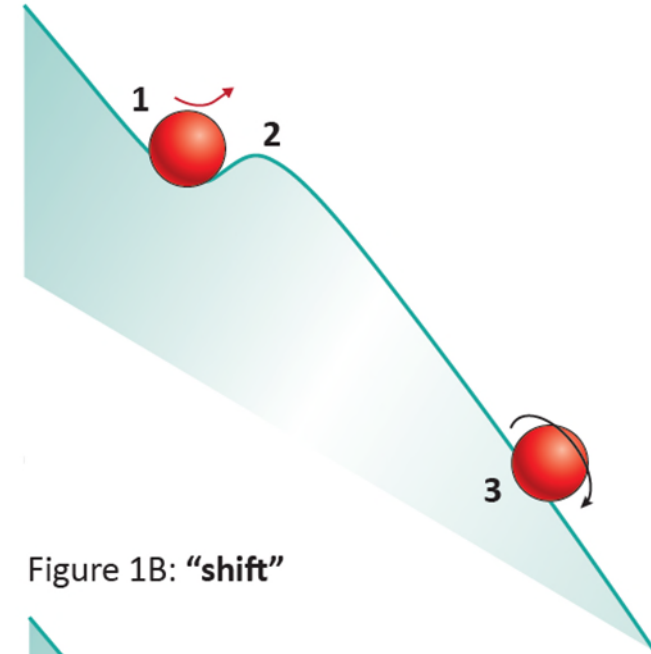
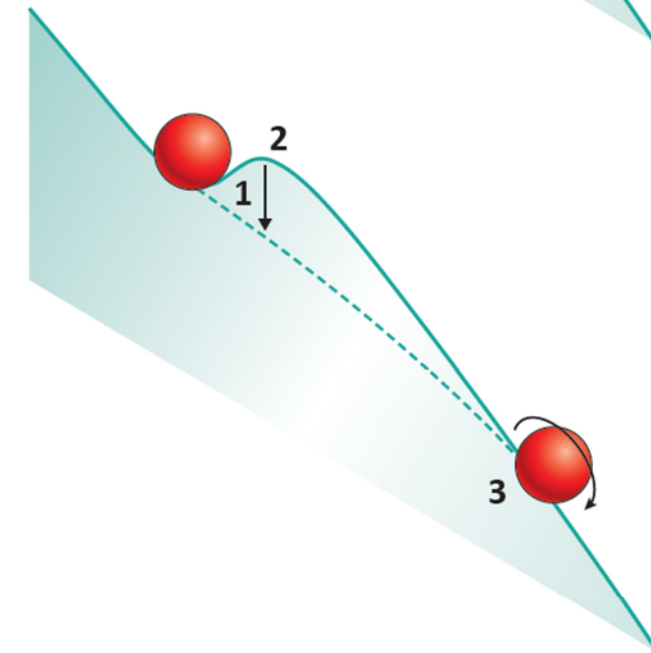


Figure 1B: “shift”





An analysis of ways to decarbonize conference travel after COVID-19

Klower, Hopkins, Allen and Higham, *Nature* 583, 356-359, 2020



A global analysis of the progress and failure of electric utilities to adapt their portfolios of power-generation assets to the energy transition

Alova, *Nature Energy*, 2020



Beyond national climate action: the impact of region, city, and business commitments on global greenhouse gas emissions

Kuramochi, Roelfsema, Hsu, Lui, Weinfurter, Chan, Hale, Clapper, Chang & Höhne, *Climate Policy*, 2020



Economic complexity and the green economy.

Mealy & Teytelboym, *Research Policy*, 2020



Less precision, more truth: uncertainty in climate economics and macroprudential policy.

Hepburn and Farmer, in *Handbook on the Economics of Climate Change*, pp420-438, 2020.



Transformational change: parallels for addressing climate and development goals

Mealy and Hepburn, in *Handbook on the Economics of Climate Change*, pp397-419, 2020.



The Effect of Firm-level ESG Practices on Macroeconomic Performance

Zhou, Caldecott, Harnett & Schumacher, *Climate Policy*, Working Paper 2020



Bringing rigour to energy innovation policy evaluation

Pless, Hepburn & Farrell, *Nature Energy*, 5, 2020



Revoking coal mining permits: an economic and legal analysis

Rafaty, Srivastav & Hoops, *Climate Policy*, 2020



The technological and economic prospects for CO2 utilization and removal

Hepburn, Adlen, Beddington, Carter, Fuss, MacDowell, Minx, Smith & Williams, *Nature*, 575, 2019



Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?

Hepburn, O'Callaghan, Stern, Stiglitz & Zenghelis, *Oxford Review of Economic Policy*, 2020



Demonstrating GWP*

Lynch, Cain, Pierrehumbert & Allen, *Environmental Research Letters*, 2020

Supply and demand shocks in the COVID-19 pandemic: an industry and occupation perspective ^{FREE}
R Maria del Rio-Chanona, Penny Mealy, Anton Pichler, François Lafond, J Doyne Farmer
Oxford Review of Economic Policy, Volume 36, Issue Supplement_1, 2020, Pages S94-S137,
<https://doi.org/10.1093/oxrep/graa033>
Published: 29 August 2020

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Abstract

We provide quantitative predictions of first-order supply and demand shocks for the US economy associated with the COVID-19 pandemic at the level of individual occupations and industries. To analyse the supply shock, we classify industries as essential or non-essential and construct a Remote Labour Index, which measures the ability of different

Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change? ^{FREE}

Cameron Hepburn, Brian O'Callaghan, Nicholas Stern, Joseph Stiglitz, Dimitri Zenghelis

Oxford Review of Economic Policy, Volume 36, Issue Supplement_1, 2020, Pages S359-S381,
<https://doi.org/10.1093/oxrep/graa015>

Published: 08 May 2020

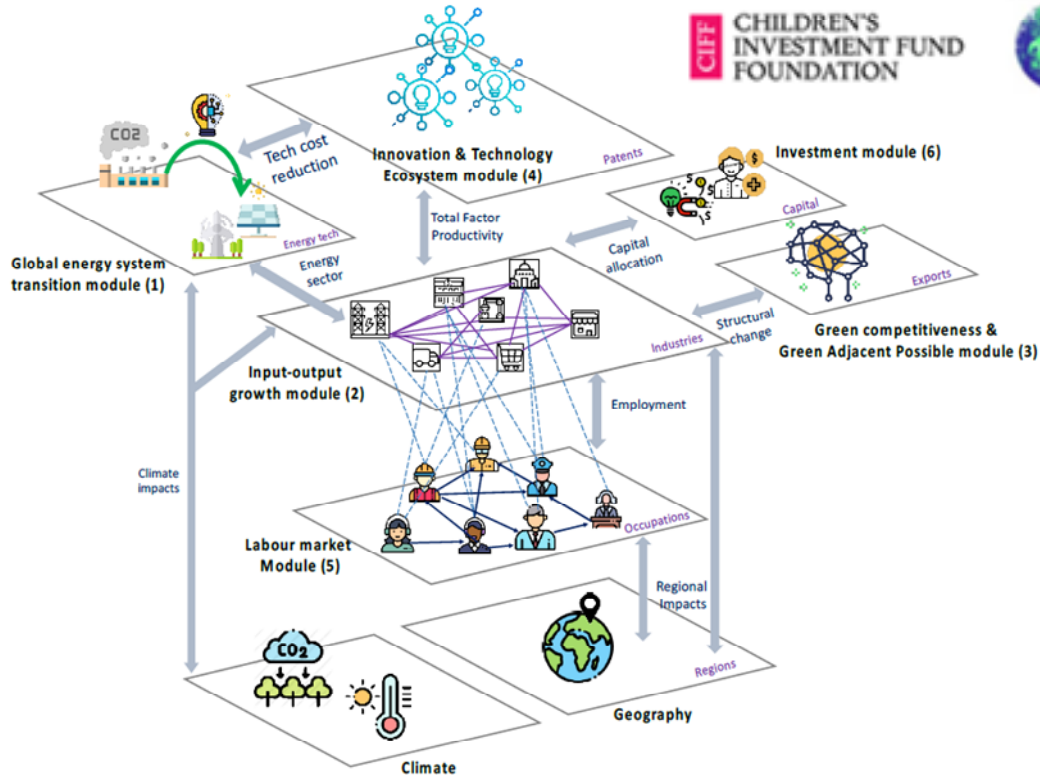
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Abstract

The COVID-19 crisis is likely to have dramatic consequences for progress on climate change. Imminent fiscal recovery packages could entrench or partly displace the current fossil-fuel-intensive economic system. Here, we survey 231 central bank officials,



ECONOMICS OF ENERGY INNOVATION AND SYSTEM TRANSITION



1.3 Impact and theory of change

High-quality research is necessary but not sufficient to drive the scale of change required to transition to a post-carbon society at the appropriate pace. Our theory of change, illustrated in Figure 1 includes but goes beyond publication in journals such as *Nature* or *Science*.

First, we will develop new models and identify new empirical insights that are rigorous and useful. Second, we will co-create and embed those models with key policymakers with the objective of having the models used in the policymaking process. In particular, we will work closely with leading officials and agencies in the United States and China. In the U.S. we will target the DOE/EIA, EPA and CBO and in China the State Council NRC and the NDRC.



Figure 1: Theory of Change

Sensitive intervention points to achieve net-zero emissions

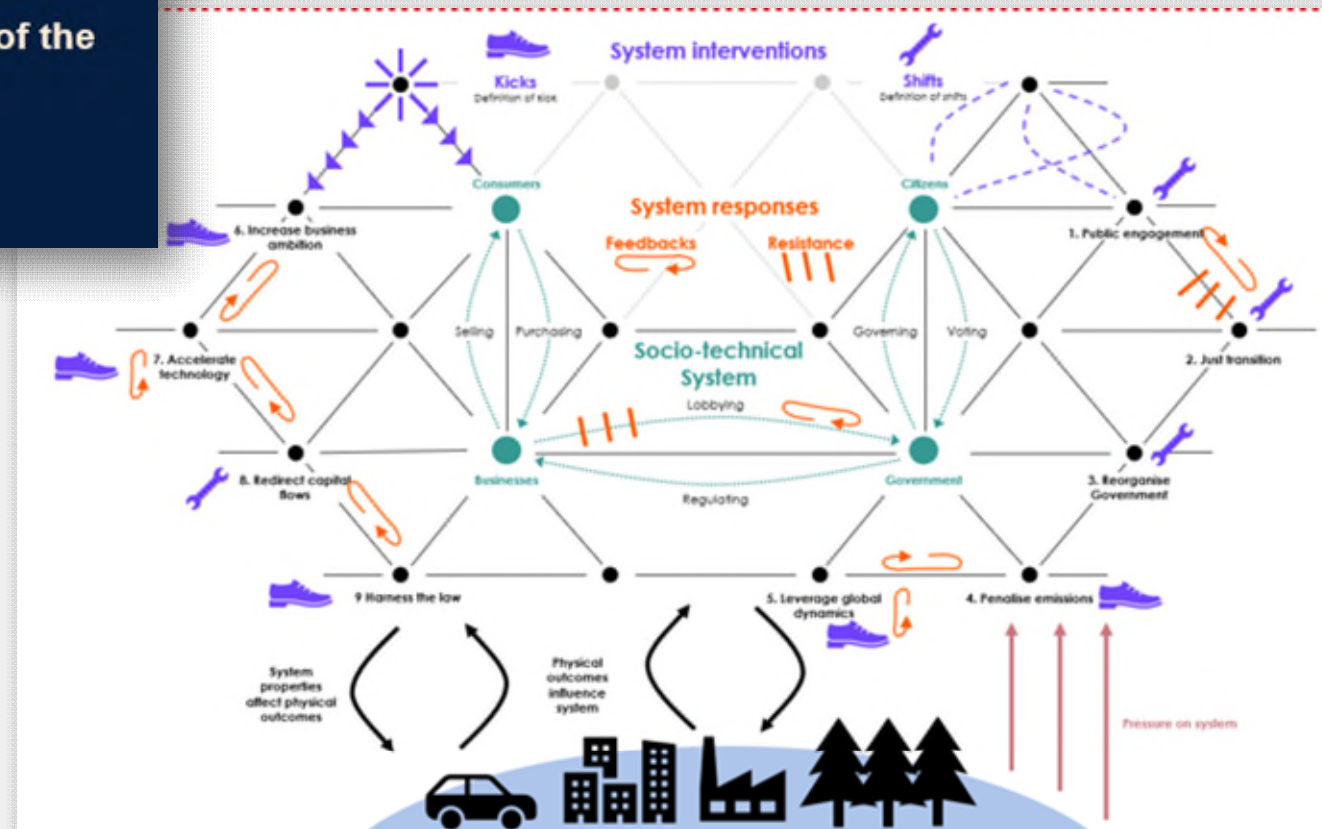
Report of the Policy Advisory Group* of the Committee on Climate Change

DRAFT: 3 November 2020

Cameron Hepburn, Tera Allas, Laura Cozzi, Michael Liebreich,
Jim Skea, Lorraine Whitmarsh, Giles Wilkes and Bryony Worthington

RECOMMENDATION 5: LEVERAGE GLOBAL DYNAMICS

- **Border Carbon Adjustments:** Working with the EU, the Secretary of State for International Trade (**Truss**) and BEIS (**Sharma**) should use trade law levers to prevent carbon leakage and to encourage carbon pricing in other countries
- **Preferential trading arrangements:** Consider forming bilateral and multilateral preferential trading arrangements for environmental goods and services
- **Stop UK Export Finance loans or guarantees to fossil projects:** UK Export Finance (**Taylor**) must ensure that UK state or private financial institutions are no longer financing new projects inconsistent with global net zero emissions by 2050.
- **Support climate-compatible growth in developing countries:** The FCDO (**Raab**) should work with the COP26 to deploy carrots and sticks to eliminate fossil subsidies, lift climate ambition and implementation in other nations
- **Bolder UK targets:** By taking bold action, the UK will have to develop effective policy frameworks which others can copy. More ambitious targets could comprise a 100% reduction by 2040 (90% domestic, 10% international offsets) and 120% by 2050 (100% domestic, 20% offsets) (**Johnson, Sharma, Raab**). Offsets could be used to scale up action in other countries.





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SIPs at the Climate Neutrality Forum

- Brought together 1000 academics in hubs at Oxford, Berlin, Milan and Brussels
- Six weekly webinars exploring different SIPs
- Selected interventions:
 - Border carbon adjustments
 - Debt-for-nature / climate restructuring
 - Scale up of clean R&D
 - Radical agricultural subsidy reform
 - A carbon takeback obligation
 - National FITs for carbon dioxide removal
 - CfDs for the final 20% of emissions



Sensitive Intervention Points for Achieving Climate Neutrality

Summary Report of the Climate Neutrality Forum

Hosted University of Oxford, Mercator Research Institute on Global Commons and Climate Change, and RFF-CMCC European Institute on Economics and the Environment

Supported by JPI Climate, and the Climate Works Foundation

September to November 2021 to be presented at COP 26

Find the report online at <http://www.ClimateNeutralityForum.org>

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**This report is a working document and includes notes and research presented by hundreds of academics and experts at the Carbon Neutrality Forum in search of Sensitive Intervention Points for Achieving Climate Neutrality and represents the wide set of policy perspectives and considerations. As such not all views are necessarily shared commonly by authors, contributors and sponsors but the report instead summarizes insights across many themes.*

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Sips Competition & SIPs wiki

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Sensitive intervention points competition: the finalists

21 May 2020

From over a hundred entries, we picked the seven that would have the biggest impact, that are presented below in particular order. For more competition entries and other suggested SIPs, please visit <http://postcarbontransition.wiki>

Central bank "brown" collateral haircuts

Suggested by Andrew McConnell

Sensitive Intervention Point: Climate change takes place in a socio-economic context fraught with barriers and limits that inhibit effective mitigation. Despite the increased frequency and intensity of extreme weather events associated with climate change and our ever improving understanding of the dramatic consequences of inaction, politicians are still

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Sensitive Intervention Points

In the transition to a post-carbon economy

[Home](#)[About](#)[What are SIPs?](#)[List of SIPs](#)[Get Involved](#)

Welcome to the Post-Carbon Transition

How can we transition to a world that is cleaner, safer, smarter, and more prosperous? Incremental change along existing paradigms will fall short ... but what if we could identify areas where small or moderate changes could trigger outsized impacts, accelerating the post-carbon transition? What part can we play in triggering these interventions?



About this Wiki

This page catalogues sensitive intervention points (SIPs) which might accelerate the transition to a post-carbon economy. It is intended as an open community resource where members can learn about and contribute to our understanding of sensitive intervention points, and can debate ideas for their implementation. This Wiki was created by the Oxford Martin Programme on the Post-Carbon Transition.