

Climate Change 2022

Climate Change Mitigation: Innovation, Technology Development and Transfer

Gabriel Blanco

Coordinating Lead Author

Chapter 16

Working Group III

IPCC



Main objectives of WGIII Chapter 16: Innovation, Technology Development and Transfer

1. Assess how national systems of innovation contribute to the development, adoption, diffusion and deployment of mitigation (and adaptation) technologies
2. Assess how public policies contribute to strengthen national innovation systems and what are the key characteristics of these policies in order to be effective
3. Assess the role of international cooperation on technology
4. Discuss the development, adoption, diffusion and deployment of mitigation (and adaptation) technologies in the broader context of sustainable development

Note: Chapter 16 is not about individual mitigation technologies which are assessed in different chapters across the WGIII report, mainly in the sectoral chapters

How national systems of innovation contribute to the development, adoption, diffusion and deployment of mitigation (and adaptation) technologies

- A systemic view of innovation to direct and organize the processes has grown over the last decade.
- This systemic view of innovation takes into account the role of actors, institutions, and their interactions and can inform how innovation systems that vary across technologies, sectors and countries, can be strengthened
- A systemic perspective on technological change can provide insights to policymakers supporting their selection of effective innovation policy instruments
- Where a systemic view of innovation has been taken, it has enabled the development and implementation of indicators to provide insights in innovation processes

How public policies contribute to strengthen national innovation systems and what are the key characteristics of these policies in order to be effective

- A combination of scaled-up innovation investments with demand-pull interventions can achieve faster technology unit cost reductions and more rapid scale-up than either approach in isolation
- Public R&D funding and support as well as innovation procurement have shown to be valuable for fostering innovation
- Innovation outcomes of policy instruments not necessarily aimed at innovation, such as feed-in tariffs, auctions, emissions trading schemes, taxes and renewable portfolio standards, vary from negligible to positive for climate change mitigation.
- Some specific designs of environmental taxation can also result in negative distributional outcomes.
- Innovation policy instruments have to be tailored to local development priorities, to the specific context of different countries, and to the technology being supported.
- The development of planning and innovation capabilities remains necessary, especially in least-developed countries and SIDSs.

The role of international cooperation on technology

- The sharing of knowledge and experiences between developed and developing countries can contribute to addressing global climate and sustainable development goals
- The effectiveness of such international cooperation arrangements, however, depends on the way they are developed and implemented
- Some initiatives have mobilised investments in developing countries; however, gaps in innovation cooperation remain, including in the Paris Agreement instruments.
- These gaps could be filled by enhancing financial support for international technology cooperation, by strengthening cooperative approaches, and by helping build suitable capacity in developing countries across all technological innovation system functions

Development, adoption, diffusion and deployment of mitigation (and adaptation) technologies in the broader context of sustainable development

- Countries are exposed to sustainable development challenges in parallel with the challenges that relate to climate change.
- Addressing both sets of challenges simultaneously presents multiple and recurrent obstacles that systemic approaches to technological change could help resolve, provided they are well managed
- Technological innovation can bring about new and improved ways of delivering services that are essential to human well-being. At the same time as delivering benefits, innovation can result in trade-offs that undermine both progress on mitigation and progress towards other sustainable development goals.
- Trade-offs include negative externalities – for instance greater environmental pollution and social inequalities – rebound effects leading to lower net emission reductions or even increases in emissions, and increased dependency on foreign knowledge and providers (high confidence).
- Effective governance and policy has the potential to avoid and minimize such misalignments

Development, adoption, diffusion and deployment of mitigation (and adaptation) technologies in the broader context of sustainable development (cont.)

- Cultural factors strongly influence the pace and direction of technological change.
- Sustainable solutions require adoption and mainstreaming of locally novel technologies that can meet local needs, and simultaneously address the SDGs

Case Study: Digitalization

- Where sustainable development, climate change mitigation and technological change interact is digitalization.
- Digital technologies can promote large increases in energy efficiency through coordination and an economic shift to services, but they can also greatly increase energy demand because of the energy used in digital devices.
- Digital devices, including servers, increase pressure on the environment due to the demand for rare metals and end-of-life disposal
- System-level rebound effects also occur since digitalization promotes and facilitates the consumption of goods and services diminishing the potential mitigation benefits.

Gabriel Blanco

Coordinating Lead Author
Chapter 16
Working Group III
IPCC