

Integrated Modelling of Resource Efficiency and Climate Policy

Challenges

- The interactions between both material resources and the climate system with the economy are very complex.
- Different modelling approaches are required to estimate the economic outcomes of ambitious resource efficiency and climate policies.

Responses

- Recent modelling techniques, allied to modern computing power, have allowed increasingly sophisticated modelling approaches that seek to capture the interaction between material resources, policies to reduce greenhouse gas emissions and the economy.
- A number of physical and economic models were linked together in order to assess the outcomes of a number of scenarios, each of which represented a specific combination of potential future resource use trends and future greenhouse gas emissions pathways.



Examples

Scenarios of climate and resource efficiency policy combined

What?

New modelling carried out for the International Resource Panel by Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) and Austria's International Institute for Applied Systems Analysis (IIASA), adopts an integrated multi-model framework to explore potential future pathways for global resource use, greenhouse emissions, and economic activity to 2050, through ambitious action to improve resource efficiency and address climate change. Four core scenarios were developed, each representing a specific combination of potential future resource use trends and future greenhouse gas emissions pathways:

- **Existing Trends** is calibrated to historical trends in per capita resource use, across major world regions, accounting for changes in income and GDP per capita.
- **Resource Efficiency** assumes a package of innovations, information, incentives and regulations to promote ambitious but achievable increases in resource efficiency, and reductions in total resource extractions, with the same climate policy settings as Existing Trends.
- **Ambitious Climate** assumes resource use follows historical trends, but that the world shifts decisively to a 2°C climate pathway, involving more ambitious emissions reductions.
- **Efficiency Plus** combines the settings for the Resource Efficiency and Ambitious Climate scenarios to explore potential policy interactions.

Scenarios for assessing resource and climate futures

		RESOURCE USE	
		Historical resource trends (H)	Resource Efficiency (E3)
GREENHOUSE EMISSIONS AND CLIMATE	3°C+ pathway (RCP6.0)	Existing Trends (H3)	Resource Efficiency (E3)
	2°C pathway (RCP6.0)	Ambitious Climate (H2)	Efficiency Plus (E2)

Source: Modelling by CSIRO and IIASA for forthcoming UNEP (2017). Resource efficiency: Potential and economic implications. A report of the International Resource Panel. Ekins, P., Hughes, N., et al.

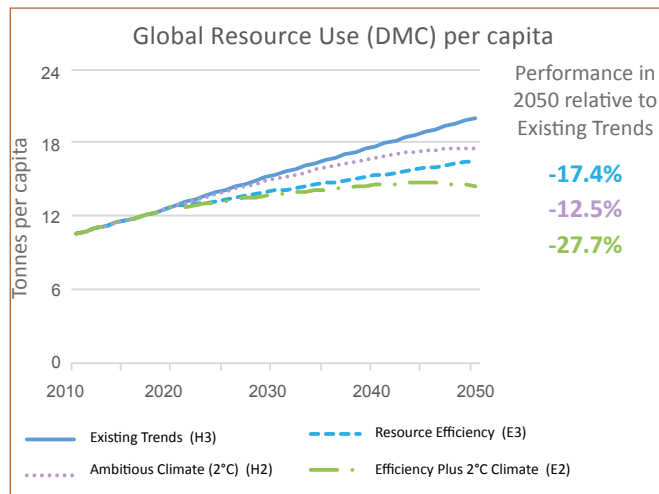
Success factors

- When policies to increase resource efficiency are implemented in combination with ambitious global action on climate change, the stronger economic growth associated with resource efficiency policies more than offsets the near-term economic costs of ambitious climate action.

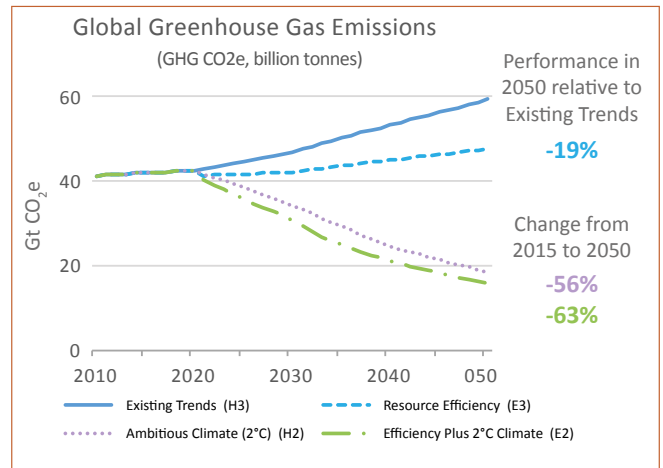
Results

Specific findings include the following:

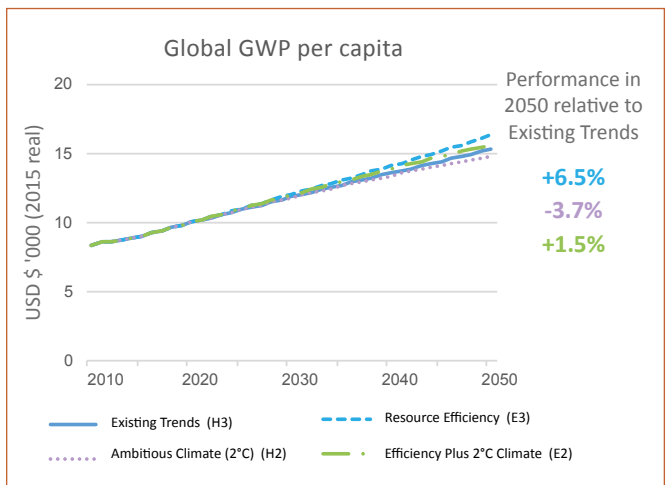
- The Existing Trends scenario projects that natural resource extraction will increase from around 85 to around 185 billion tonnes over the 35 years to 2050, reflecting a 28% increase in population and a 71% increase in per capita resource use.
- In Efficiency Plus resource efficiency policies and initiatives, in combination with ambitious global action on climate change, could reduce per capita natural resource use globally by 28% in 2050.



- Resource Efficiency policies alone could reduce greenhouse gas emissions by up to 20% in 2050 (for a given set of greenhouse policies). In combination with ambitious climate change abatement policies, global emissions could fall to 63% below 2015 levels by 2050.



- In Efficiency Plus the economic benefits from increased resource efficiency more than offset the economic costs of ambitious climate action, so that global Gross World Product (GWP) is higher and economic growth is stronger than in the Existing Trends scenario.
- In monetary terms, the annual economic benefits of Efficiency Plus are more than US\$2 trillion globally in 2050 relative to Existing Trends, while the climate policies help to put the world on track to limit average global warming to 2°C or lower.



For more information please contact
resourcepanel@unep.org
www.unep.org/resourcepanel

The International Resource Panel was established in 2007 to provide independent, scientific assessment on the sustainable use of natural resources and the impacts of resource use over the full life cycle.