The economic consequences of climate change

Rob Dellink
OECD Environment Directorate

Joint work with Elisa Lanzi and others
Potsdam, 20-21 June 2016
Introduction

- Context: part of the CIRCLE project on costs of inaction
  - Other workstreams focus on air pollution and land-water-energy nexus
- Aim: assess the economic consequences of climate change
- Methodology:
  - Take existing impact estimates from literature
  - Calculate costs of environmental damages to the macro-economy and study how the economies adjust to the presence of environmental damages
  - Put into larger context of other major impacts of climate change

CIRCLE: Costs of Inaction and Resource scarcity: Consequences for Long-term Economic growth
Methodology for climate damages

- Collaboration with experts from around the world and use of existing impact studies
  - Focus of this study is on economic consequences of market impacts
- Damages calculated in OECD’s multi-sector, multi-region CGE model (ENV-Linkages) to 2060
  - Production function approach: link impacts to specific drivers of growth
  - Autonomous adaptation takes place via sectoral adjustments and international trade
- Stylised calculations with aggregated model to 2100
  - Baseline and damages to 2060 harmonised with ENV-Linkages
Selected impacts of climate change

Included in the modelling

- Agriculture: yield changes for 8 crop sectors, and fisheries
- Coastal zones: capital and land losses due to sea level rise
- Health: diseases and labour productivity losses from heat stress
- Energy demand
- Tourism demand
- Capital damages from hurricanes

Stand-alone analysis

- Fatalities from heatwaves
- Urban damages from river floods
- Ecosystems: biodiversity (crude approximation)

Still not quantified

- Large-scale disruptive events, ...
Regional cost of selected climate impacts

Source: ENV-Linkages calculations

Uncertainty ranges in 2060 due to uncertainty in ECS

-7%  -6%  -5%  -4%  -3%  -2%  -1%  0%
Competitiveness depends on relative impacts.
Regional results and uncertainty from climate sensitivity – year 2060

Source: ENV-Linkages calculations
Long-term damages

Source: AD-DICE calculations
Damages affecting growth

Source: AD-DICE calculations
Global importance of different impacts

Global GDP loss:
- 2035: 0.3-1.0%
- 2060: 1.0-3.3%

Source: ENV-Linkages calculations
Other important consequences

Urban flood damages

Premature deaths from heat stress

Loss of biodiversity and ecosystems

Tipping points

OECD country | Current climate | 2050
---|---|---
Other | 1 | 2 | 8 | 23
Other | 0 | 0 | 1 | 4
Mexico | 1 | 4 | 12 | 36
USA | 11 | 2 | 63 | 27
Other | 1 | 4 | 13 | 39
EU large EU | 1 | 4 | 13 | 39
Other | 1 | 4 | 13 | 39
Spain | 3 | 8 | 10 | 30
France | 1 | 2 | 9 | 17
OECD total | 28 | 79 | 226 | 487

RCP6.0 | RCP8.5
---|---
Most OECD countries | 0.5 | 1.1
Chile | 0.3 | 0.6
Mexico | 0.4 | 0.9
Non-OECD EU | 0.3 | 0.7
Brazil | 0.1 | 0.2
Russia | 0.2 | 0.4
India | 0.1 | 0.1
Indonesia | 0.0 | 0.1
China | 0.2 | 0.5
South Africa | 0.4 | 0.8
Other regions | 0.0-0.1 | 0.0-0.3

...and many more that could not be quantified!

Source: Own calculations based on various sources
Damages with policy controls

Source: AD-DICE calculations
Components of climate change costs

Source: ENV-Linkages calculations
Main messages (I)

1. In almost all regions significant negative market and non-market impacts, plus downside risks
   – Global GDP cost 1.0-3.3% by 2060, 2-10% by 2100
   – Largest losses in Africa and Asia
   – Largest losses from health and agricultural impacts
   – Largest losses to capital and labour
   – Costs increase more than proportionately with temperature

2. Losses spread across economies
   – All sectors and regions are indirectly affected

3. Consequences are unavoidable and enduring
   – Emissions commit the world to long-lasting impacts
4. Ambitious adaptation and mitigation can reduce future impacts and limit risks

- Ambitious policies can reduce macroeconomic costs by 2100 from 2-10% to 1-3%
- Adaptation is important to ensure consequences of climate change remain limited
- Ambitious global mitigation can help avoid half of the economic consequences and limit downside risks
- Distribution of policy costs and benefits across regions and sectors will not be proportional (but both imply a shift towards more services)
Are we missing significant growth effects of climate change?

- Large-scale events: potentially huge
- Extreme weather & disasters: less clear
- Biodiversity and ecosystems: almost no clue
- Risks: yes, but…
- Poverty-traps and credit constraints: ?

Remember:

- Don’t confuse benefits with avoided damages
- More detailed and thorough analysis does not have to imply larger losses
THANK YOU!

For more information:
www.oecd.org/environment/CIRCLE.htm
www.oecd.org/environment/modelling
rob.dellink@oecd.org
No-damage baseline GDP projection

Source: ENV-Linkages calculations
Global damages under optimal mitigation – alternative discounting rules

Source: AD-DICE calculations