



CIRCLE

Costs of Inaction and Resource scarcity:
Consequences for Long-term Economic growth

The economic consequences of climate change

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Joint work with Elisa Lanzi and others

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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





- 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



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)

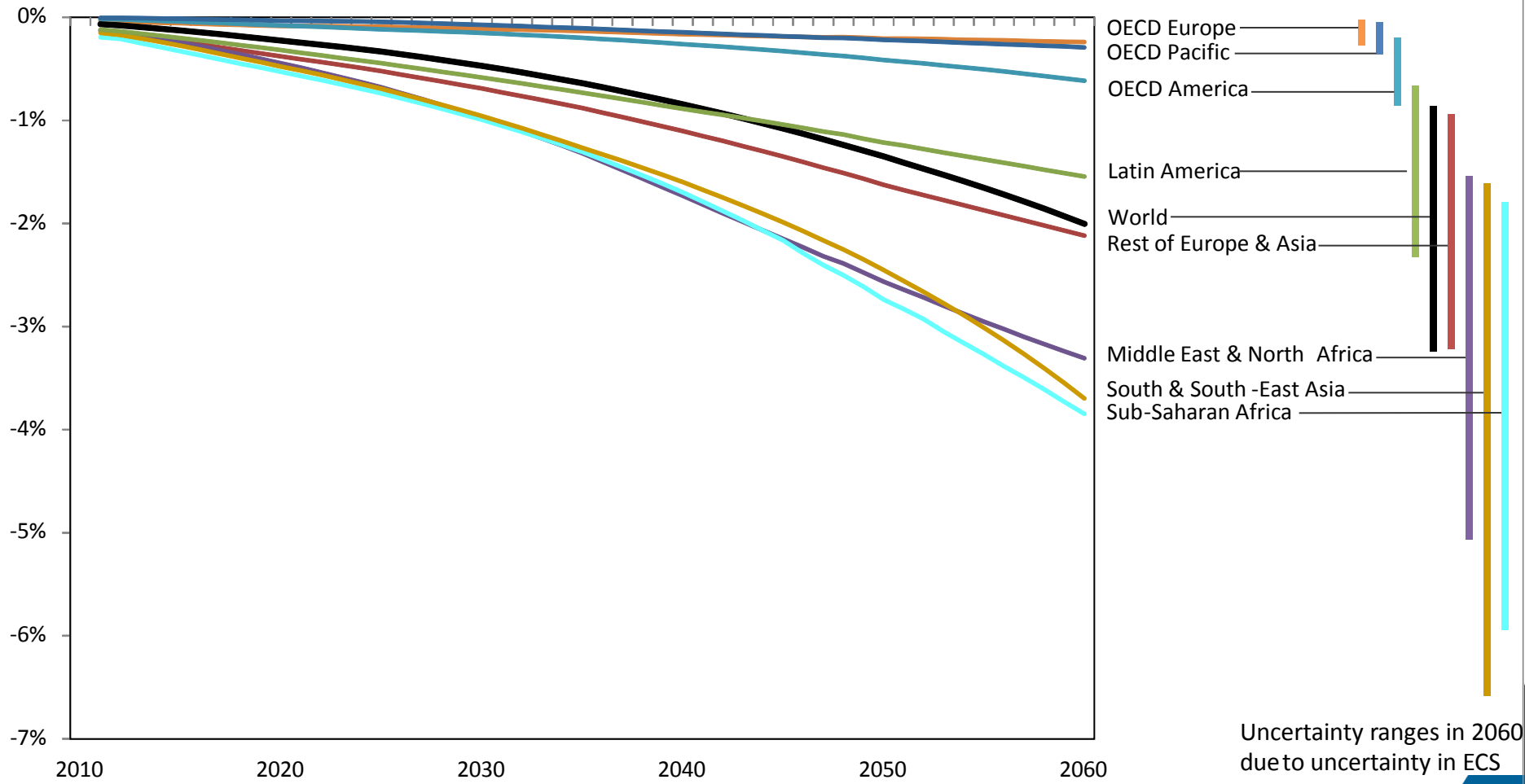
Still not quantified

- Large-scale disruptive events, ...

Regional cost of selected climate impacts

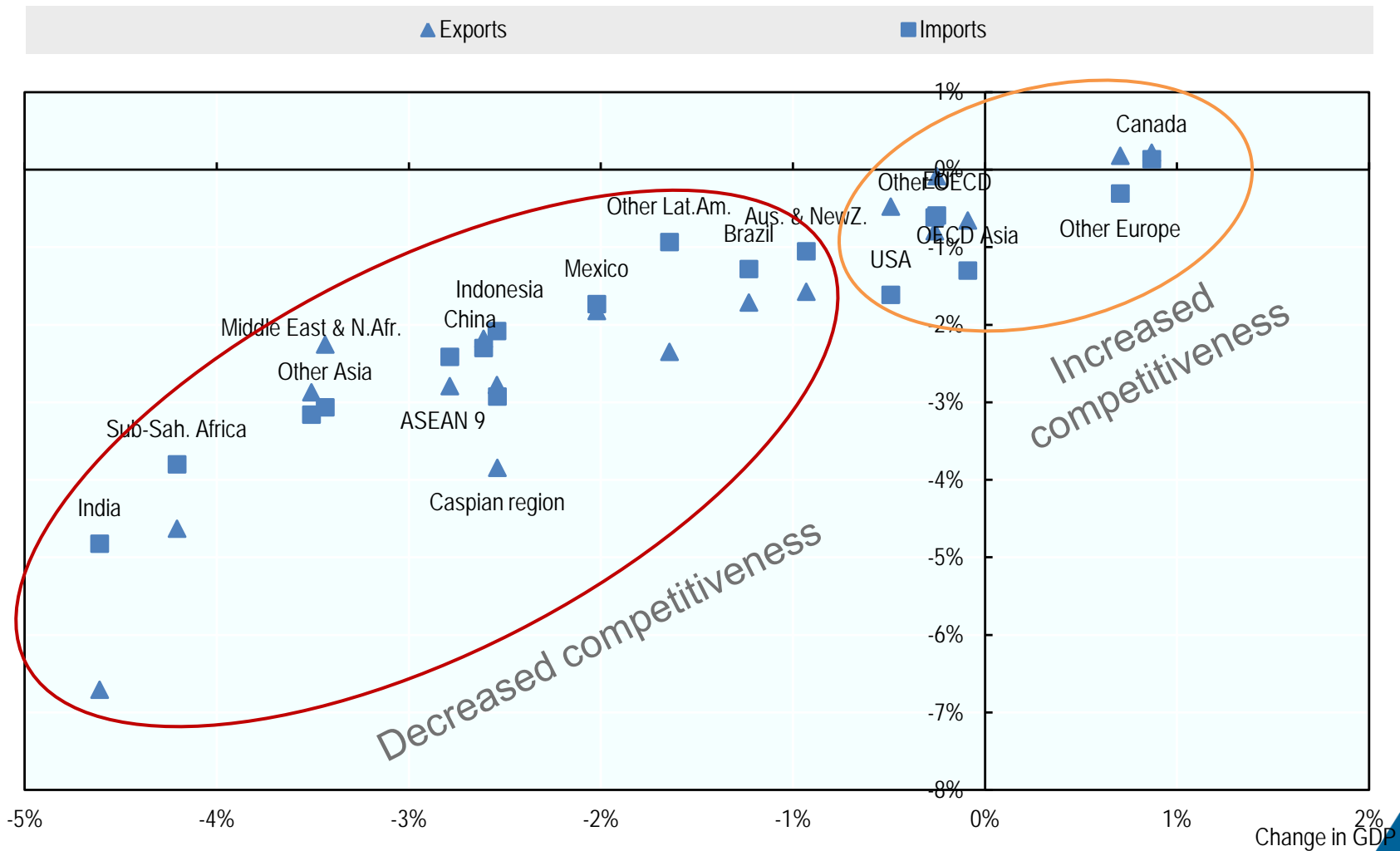


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Source: ENV-Linkages calculations

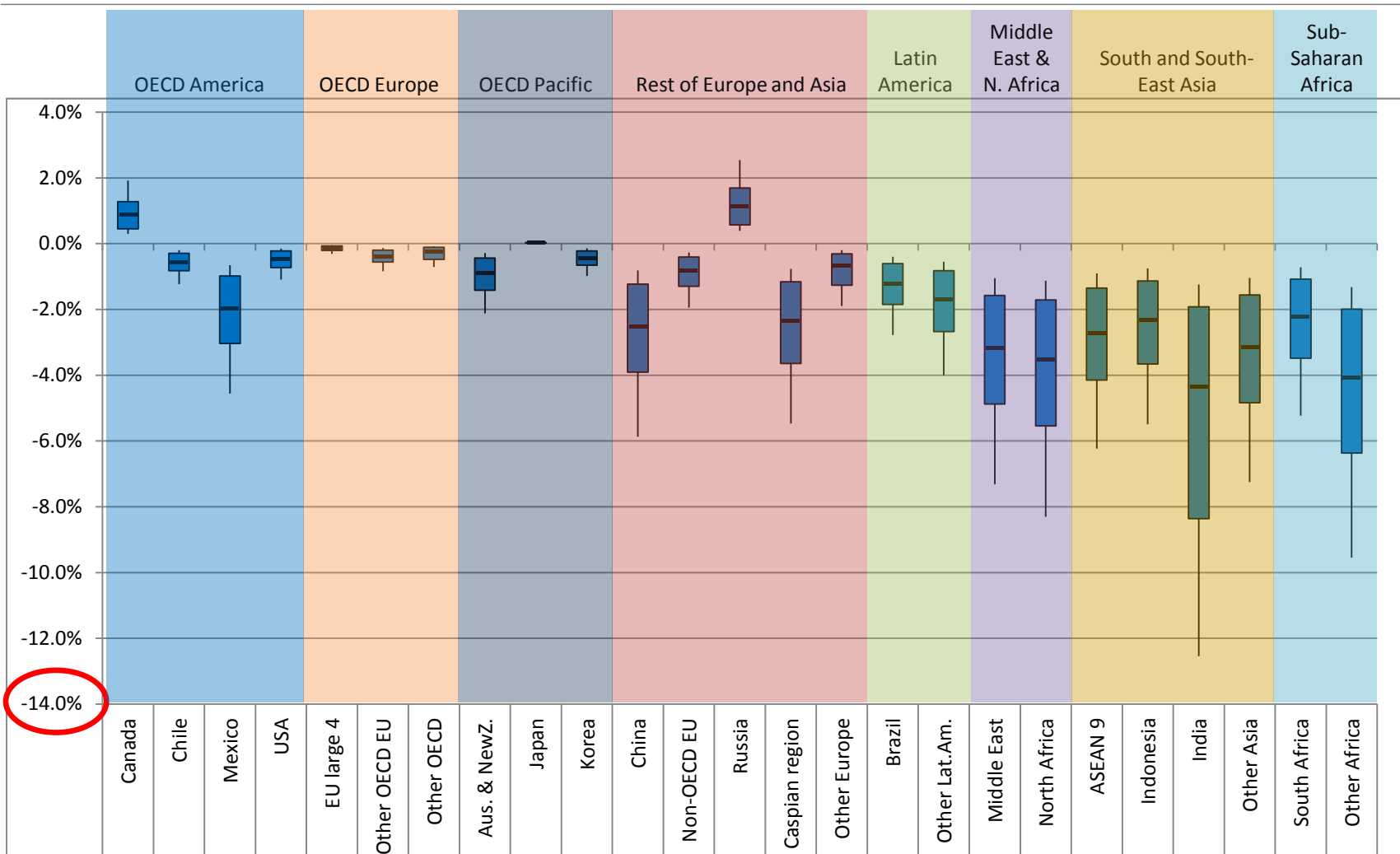
Competitiveness depends on *relative* impacts



Regional results and uncertainty from CIRCLE climate sensitivity – year 2060

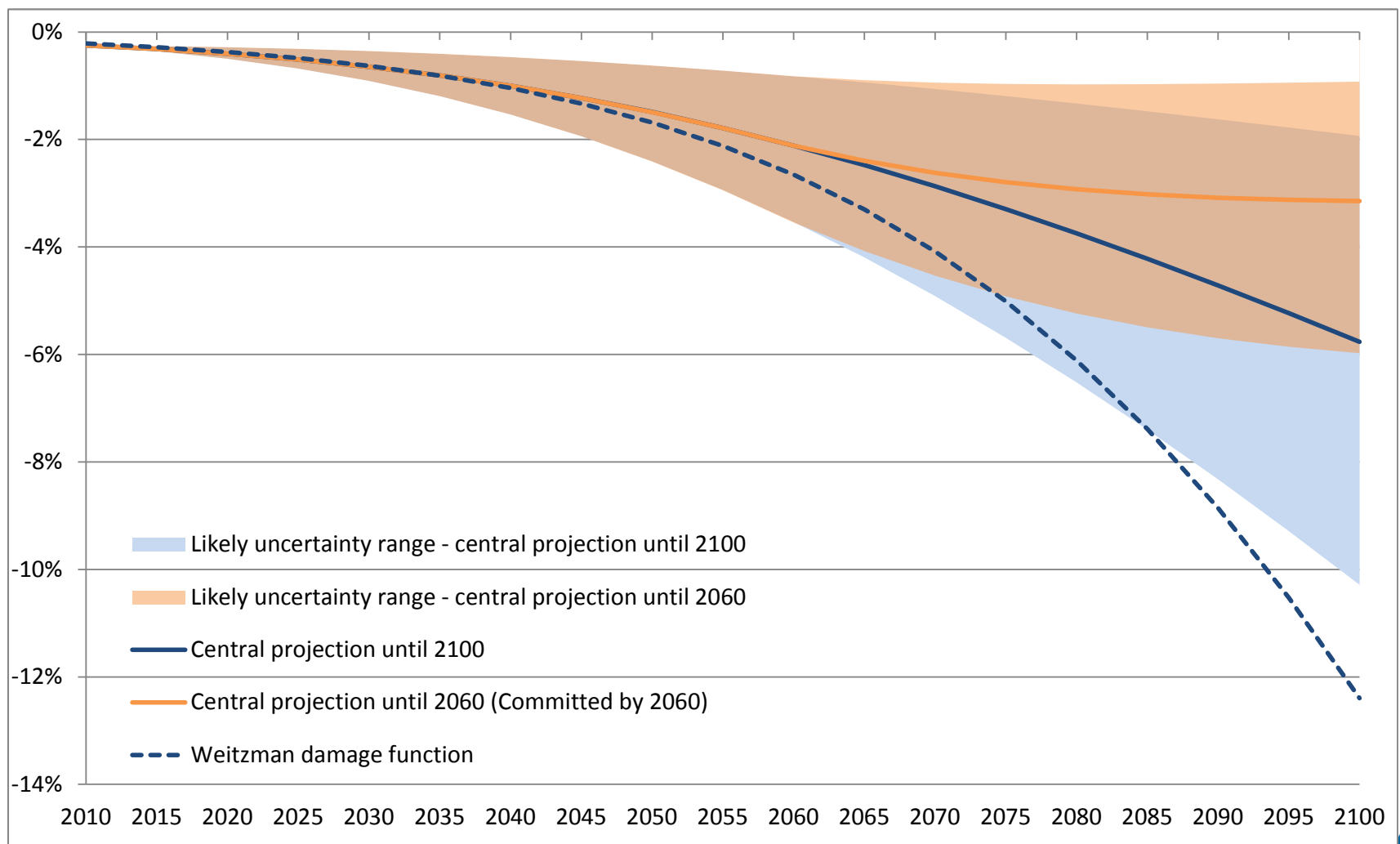


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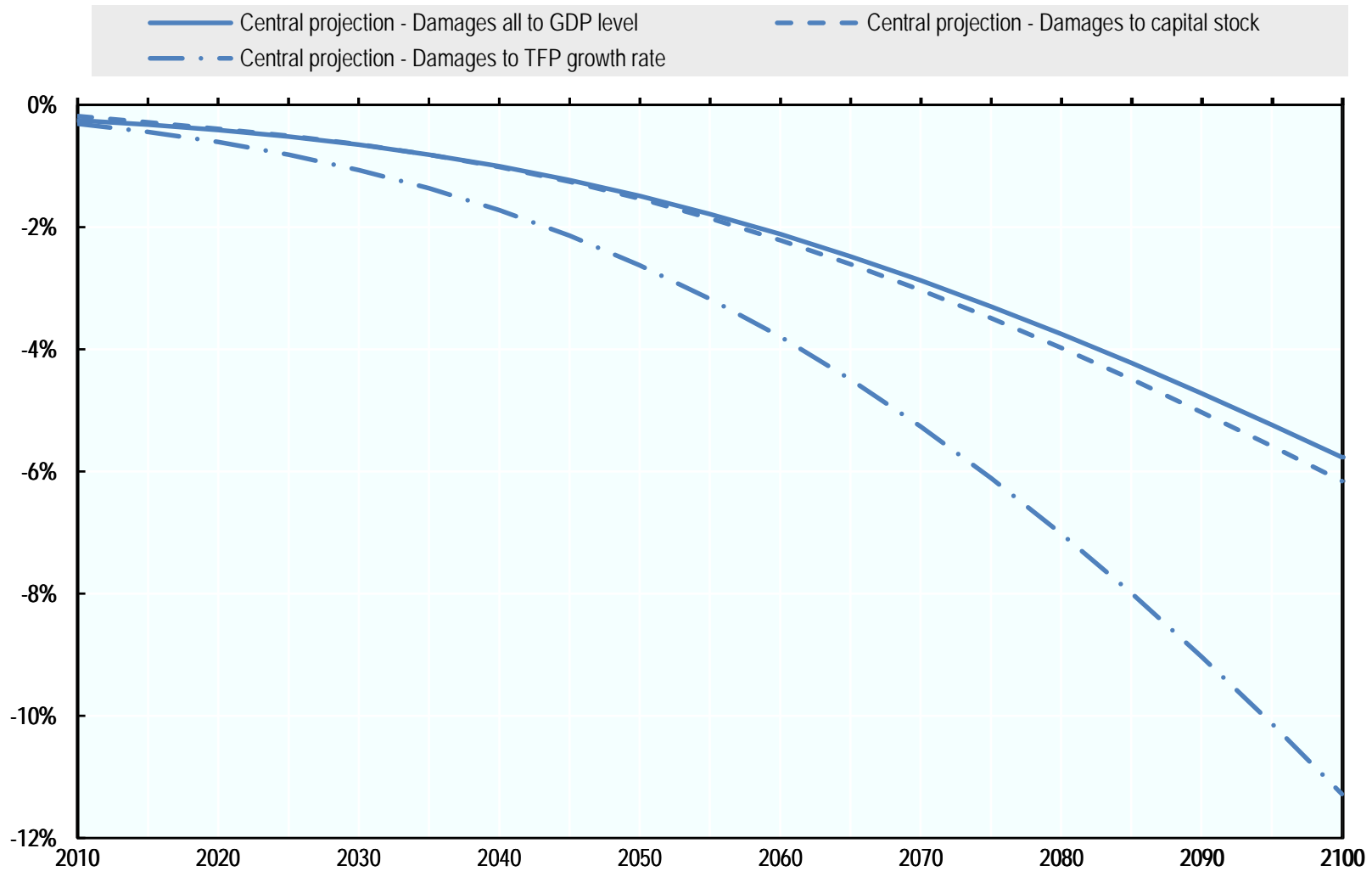
Source: ENV-Linkages calculations

Long-term damages



Source: AD-DICE calculations

Damages affecting growth



Source: AD-DICE calculations

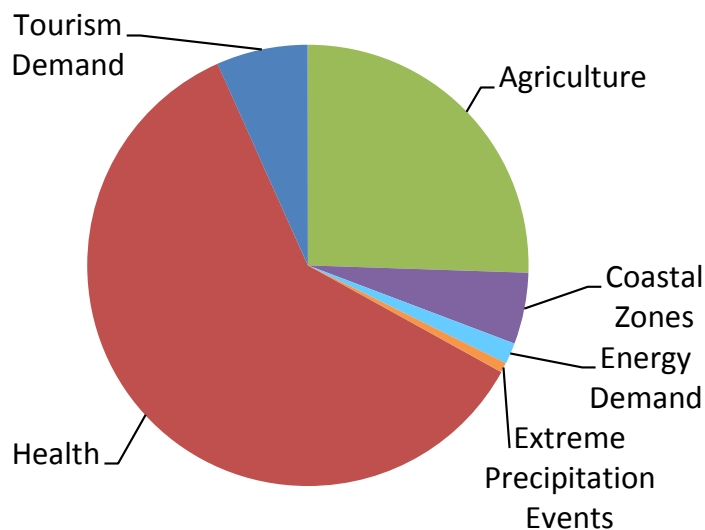
Global importance of different impacts



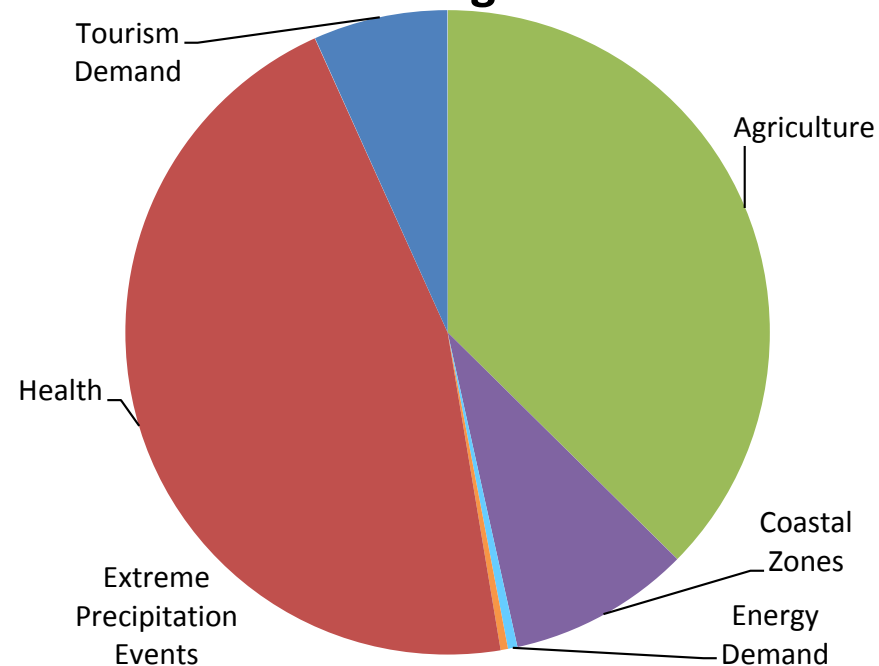
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Global damages 2035



Global damages 2060



Global GDP loss:

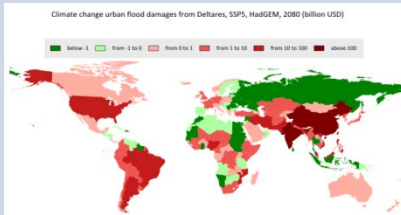
0.3-1.0%

1.0-3.3%

Source: ENV-Linkages calculations

Other important consequences

Urban flood damages



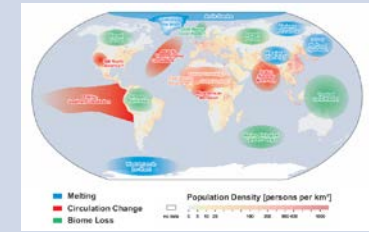
Premature deaths from heat stress

OECD country	Current climate		2050	
	Mortality (thousands)	Costs (billion USD)	Mortality (thousands)	Costs (billion USD)
Canada	1	3	8	23
Chile	0	0	1	4
Mexico	1	4	12	36
USA	11	2	63	27
EU large 4	11	34	66	197
Other OECD EU	8	17	44	104
Other OECD	1	4	13	39
Aus. & New Z.	1	2	3	9
Japan	3	8	10	30
Korea	1	2	6	17
OECD total	38	75	226	487

Loss of biodiversity and ecosystems

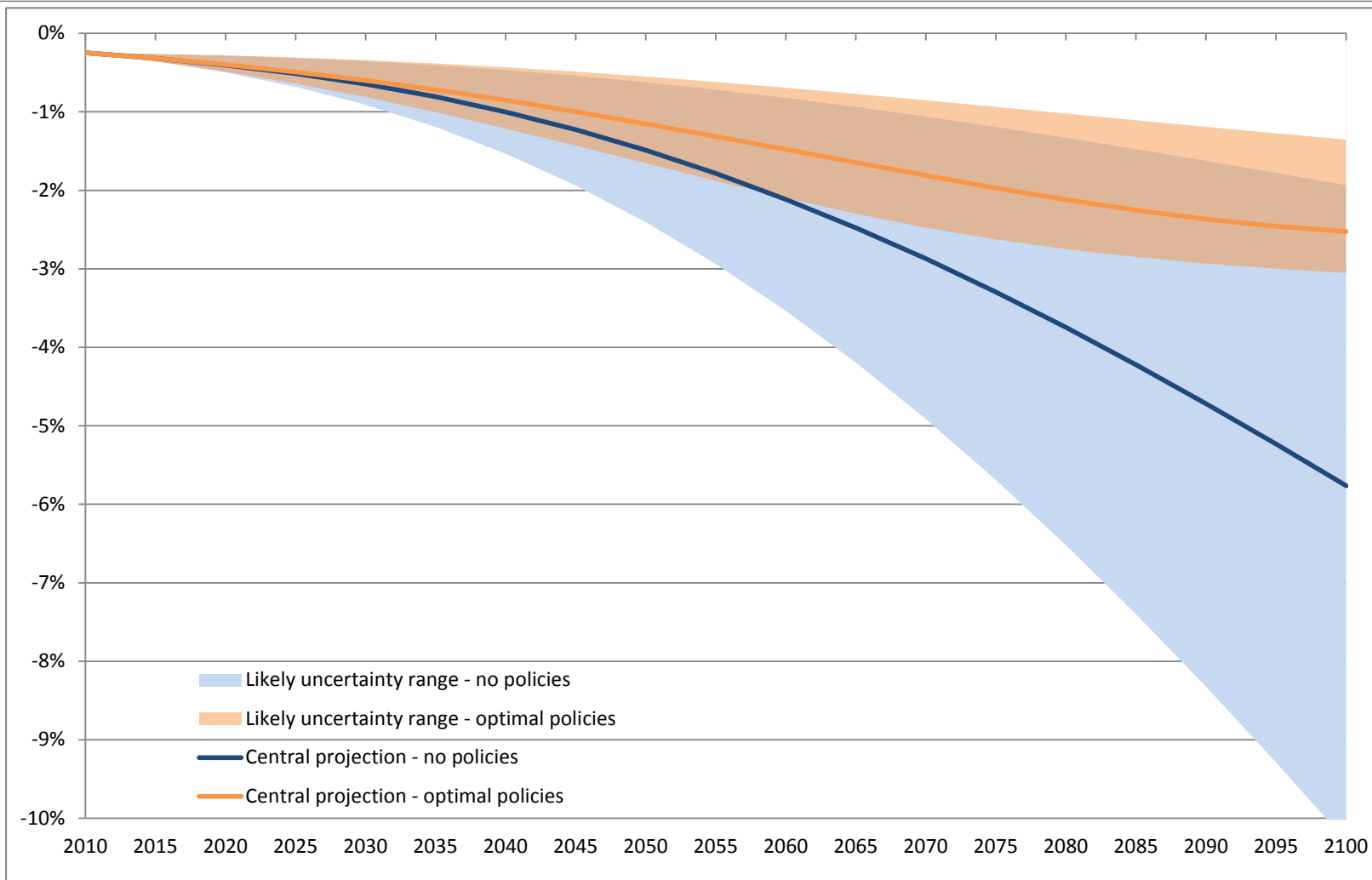
	RCP6.0	RCP8.5
Most OECD countries	0.5	1.1
Chile	0.3	0.6
Mexico	0.4	0.9
Non-OECD EU	0.3	0.7
Brazil	0.1	0.2
Russia	0.2	0.4
India	0.0	0.1
Indonesia	0.0	0.1
China	0.2	0.5
South Africa	0.4	0.8
Other regions	0.0-0.1	0.0-0.3

Tipping points



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

Damages with policy controls

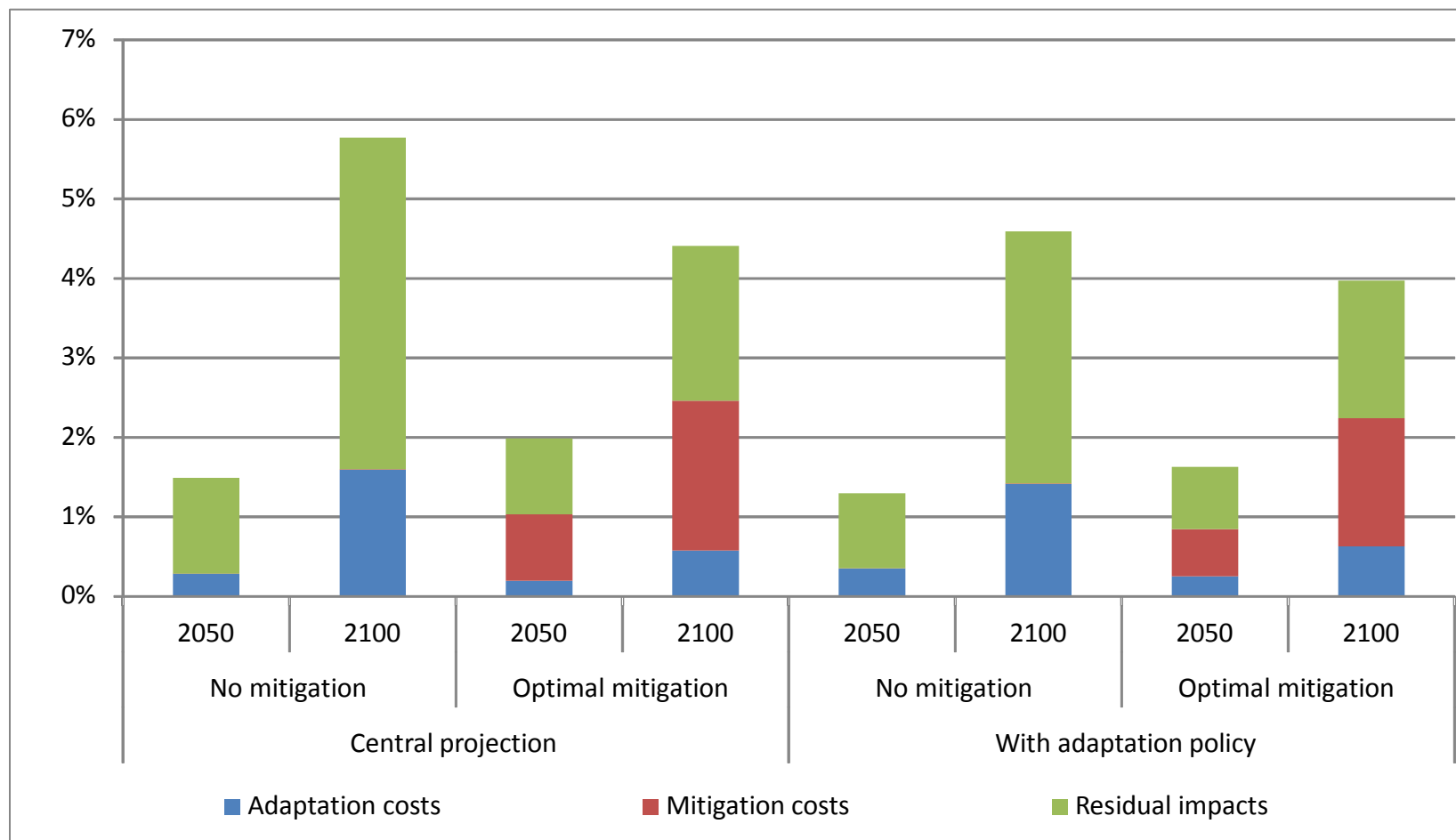


Source: AD-DICE calculations

Components of climate change costs



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Source: ENV-Linkages calculations

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 something?

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

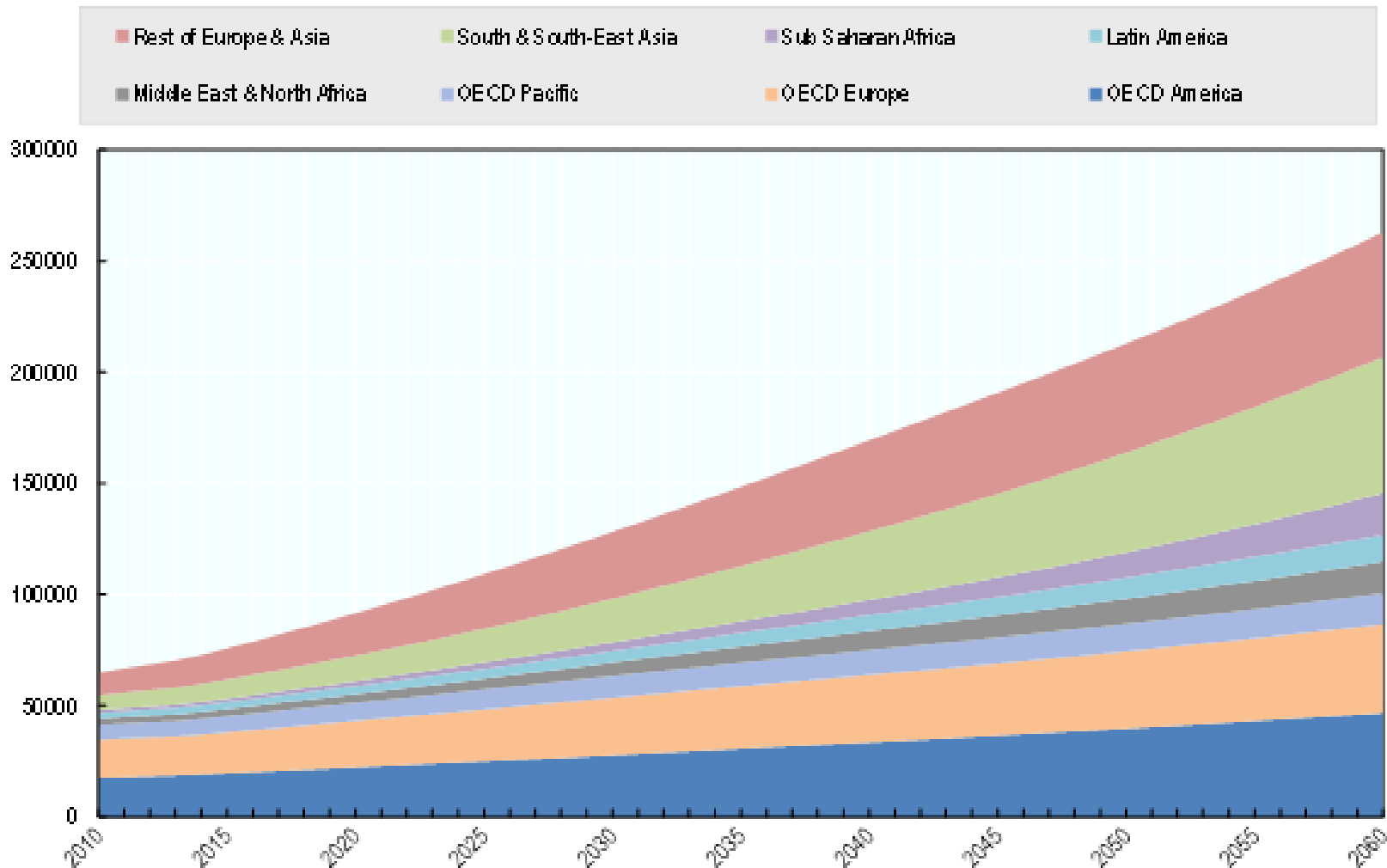
www.oecd.org/environment/modelling

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No-damage baseline GDP projection

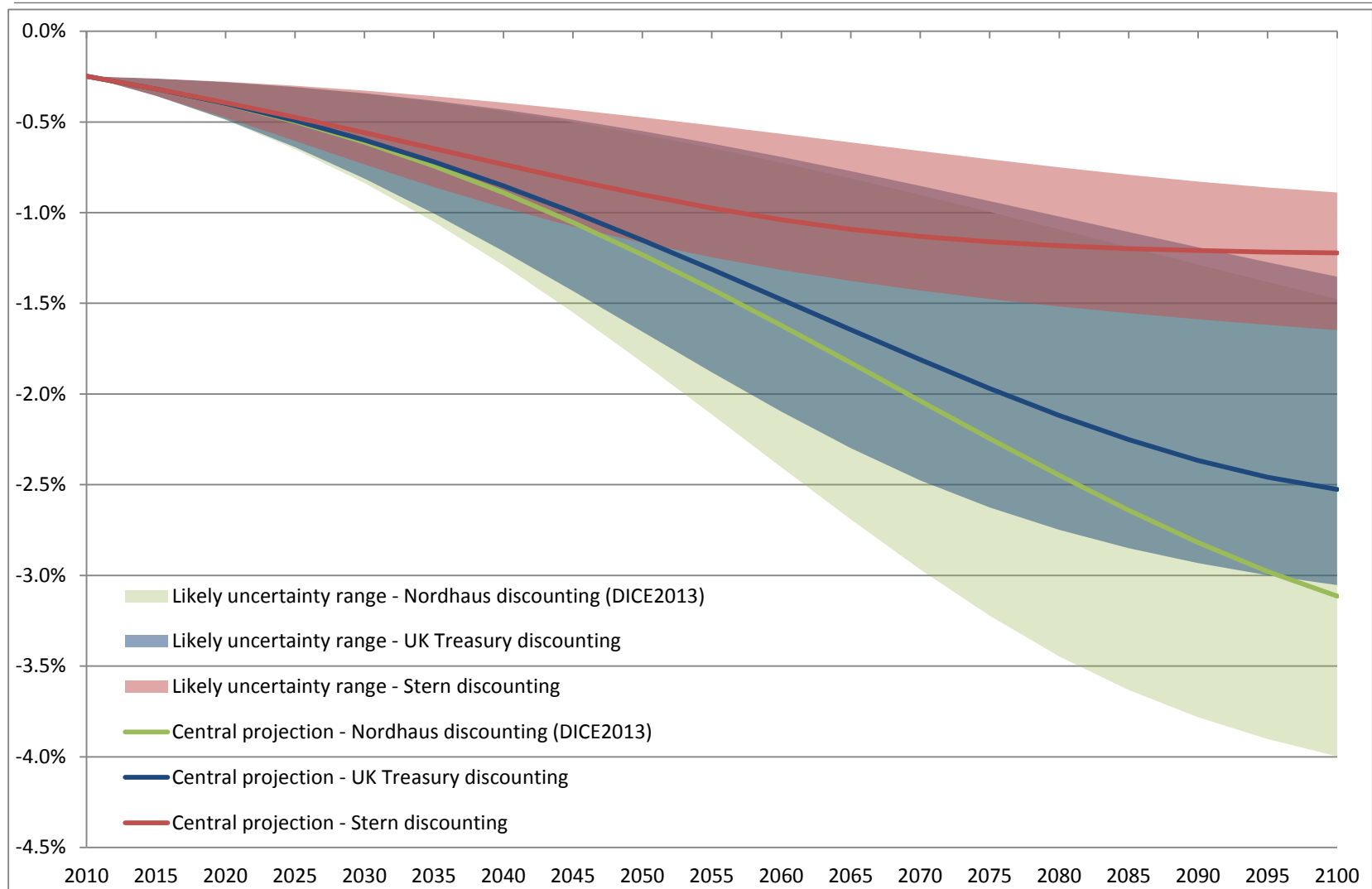


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Source: ENV-Linkages calculations

Global damages under optimal mitigation – alternative discounting rules



Source: AD-DICE calculations