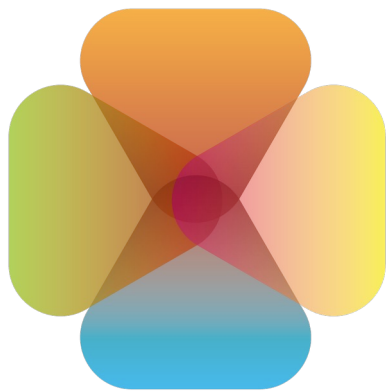




ACCREU
Assessing
Climate Change
Risk in **EU**rope

Budgets in high water? Fiscal implications of flood adaptation in the United Kingdom

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Introduction

- Climate change has been recognised as a major risk to the fiscal sustainability of the UK (OBR 2024)
- Public Planned Adaptation can yield benefits that outweigh costs (Agarwala 2021, Jones 2023, Barrage 2023)
- However, there is a research gap concerning fiscal implications, especially in terms of indirect effects that arise from adaptation and its financing (see f.e. Bachner and Bednar-Friedl 2019, Catalano 2020, Parrado 2020, Gao 2024)

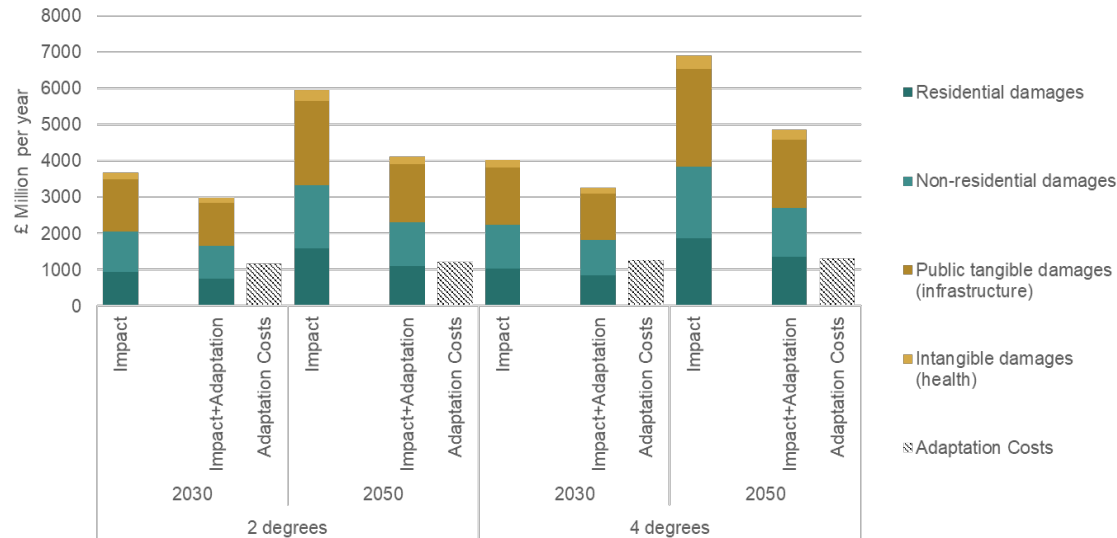
Objective of this macro-economic study

What are fiscal and macroeconomic implications from floods and flood adaptation in the UK?

How does the adaptation financing decision affect fiscal budgets?

UK Floods in COIN-INT

- Flood impacts in UK are based on national flood risk models including current and future spending, as well as impact and adaptation profiles for 2030 and 2050 (2/4°C)



Public finances and climate change adaptation

- Climate impacts have budget implications: tax base disruptions and additional costs assumed by the government (e.g. disaster relief payments)
- Adaptation reduces these impacts, but also have feedback effects and adaptation financing may again stress public budgets

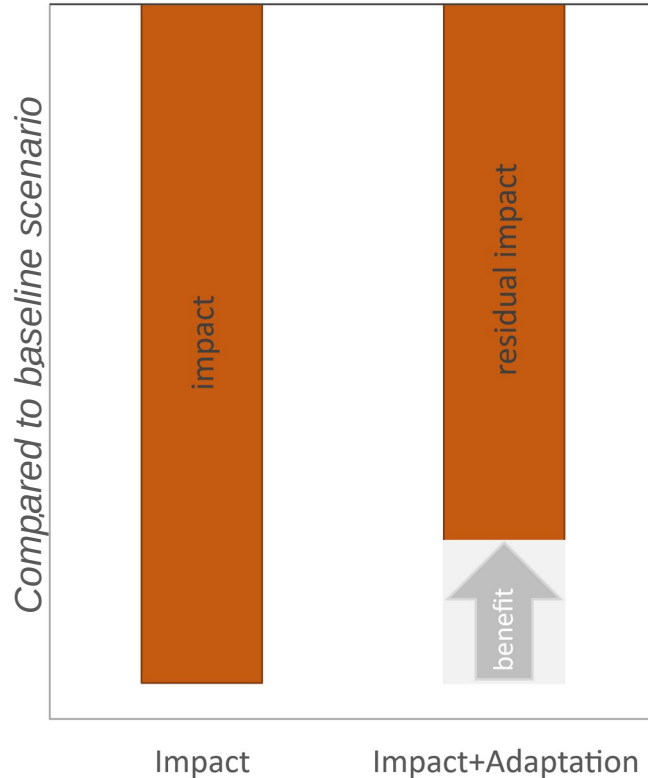
Three financing schemes:

- **Budget neutral** financing with no additional debt
- **Debt financing** under different interest rate environments
 - **Domestic green bonds** (already in place through National Savings Institute)
 - (International) **Market green bonds** (already in place with Green Gilts)

The model

- For this analysis, we build on the static version of the COIN-INT model (Knittel et al 2020, Bachner et al 2022, Preinfalk et al 2024)
- It is a global multi-sectoral, multi-regional CGE model with international trade
- Flood impacts are implemented in terms of destructed capital stocks, decreased productivity in affected sectors, and increased public demand for health services
- Adaptation reduces these expected annual damages, but it has to be financed by the government

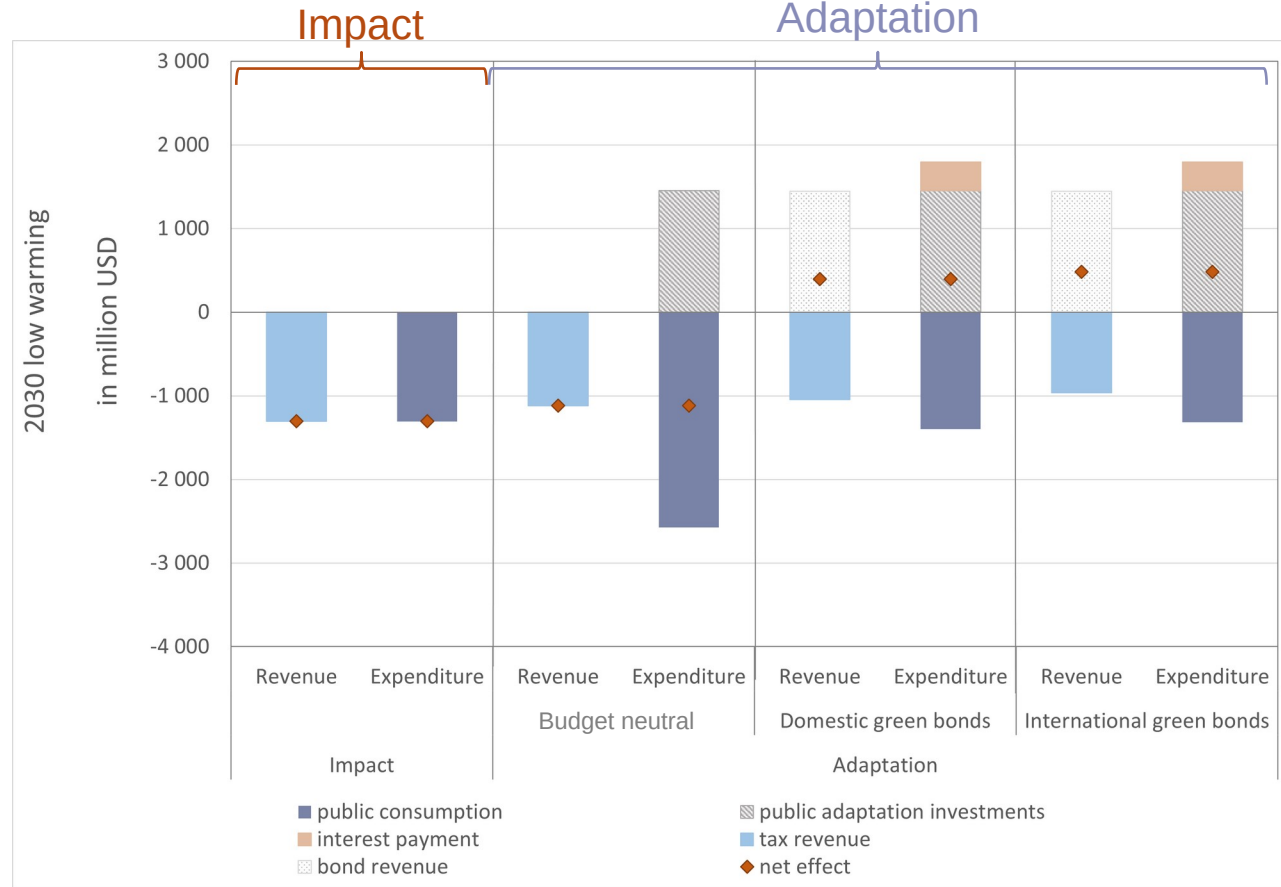
The scenario framework



- Two time periods: 2030 and 2050
- Scenarios:
 - Baseline: scenario without climate impacts
 - Impact scenarios: 2°C and 4°C warming by the end of the century
 - Impact scenarios with adaptation: include impacts + costs and benefits from adaptation, for three financing mechanisms

Budgetary implications of public adaptation in 2030

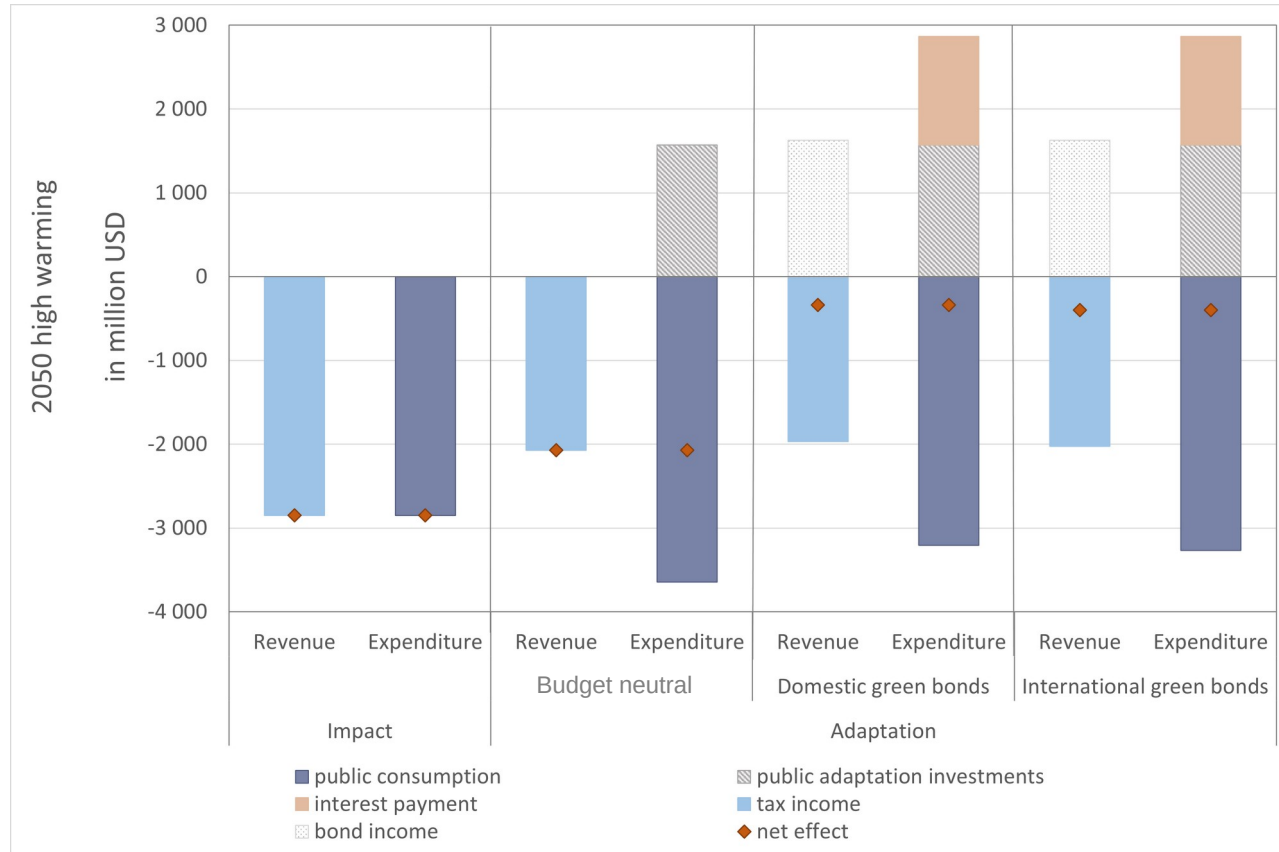
For 2°C global warming



- Flood impacts have an adverse effect on governmental revenues
- In all adaptation financing scenarios, governmental net revenues and expenditures increase
- Budget neutral financing: other public expenditures have to be cut to finance adaptation
- Bond financing: the additional adaptation finance increases both public revenue and total expenditures

Budgetary implications of public adaptation in 2050

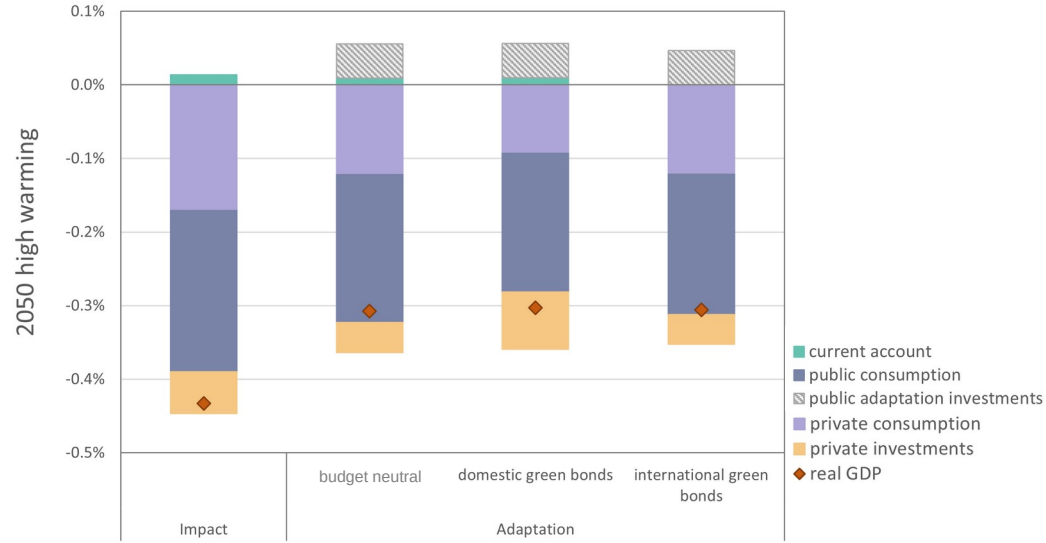
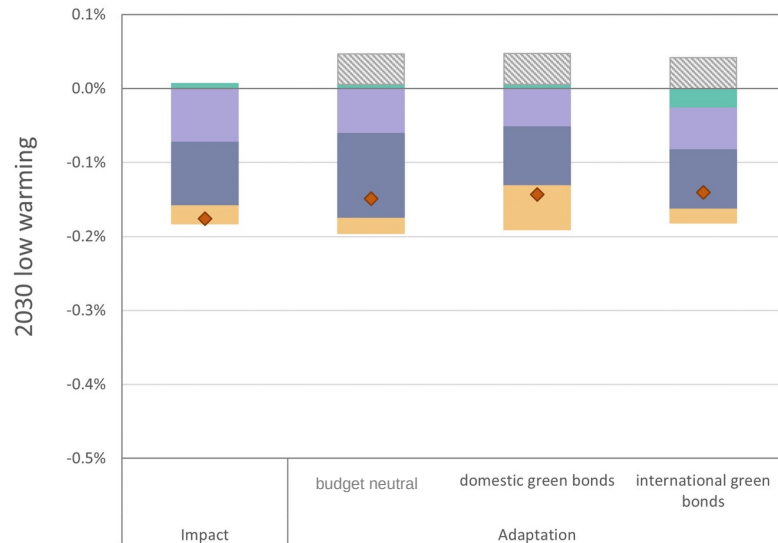
For 4°C global warming



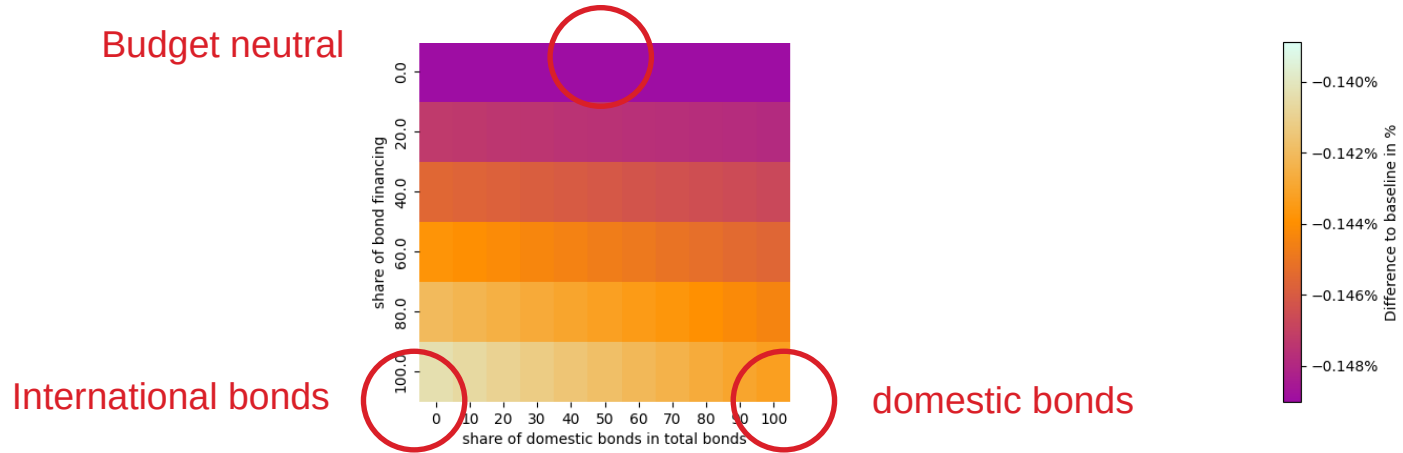
- In all adaptation scenarios, governmental net revenues and expenditures increase
- Bond financing: Interest payments for accumulated debt increase the pressure on the budget

Real GDP effects

- In all adaptation scenarios, negative GDP effects from floods are moderately reduced
- Structural differences:
 - Budget neutral financing: Reduced public consumption with welfare consequences especially in the short run
 - Domestic bond financing: Private consumption higher due to interest payments by government, but reduced private investments
 - International bond financing: Maintained private investments and consumption

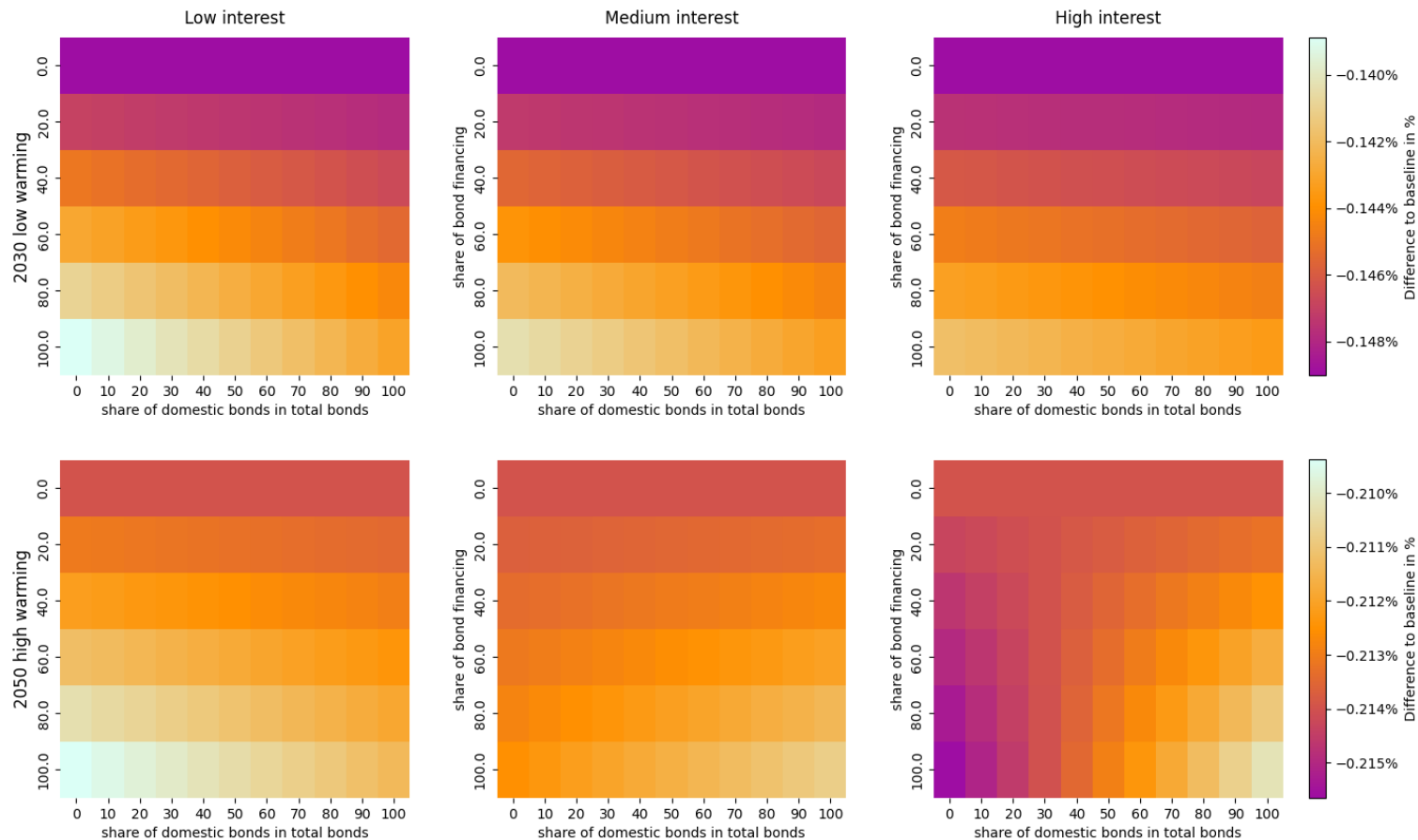


GDP effects under different interest rate environments



Medium interest, 2030, 2°C

GDP effects under different interest rate environments



Insights

- Adaptation can have positive effects on public finances, GDP and welfare, but the time period and financing scheme matter
 - In 2030, debt financing averts expenditure cuts that arise in the budget neutral case
 - In 2050, all adaptation financing options have positive effects on public finances and welfare, but bond interest payments put pressure on the budget
- Lending conditions (like interest rates) have macro-economic implications
- Policy priorities matter for the the optimal choice of financing

Financing of public climate change adaptation has high policy **relevance**, while the **assessment of fiscal trade-offs and uncertainties** needs more attention.



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Method: COIN-INT model description

- Multi-regional and multi-sectoral **Computable General Equilibrium model**
 - All economic markets (goods and factor markets) and income/expenditure in equilibrium
 - Input-output tables and trade statistics for 163 countries/regions and 57 sectors; database: GTAPv9 (2011)
- **26 regions**, higher resolution in European region
 - **20 economic sectors** represented by nested CES production functions and **3 input factors** (labour, capital, land)
 - One representative **private household**
 - One **public sector** in European region
- International trade via Armington assumption
 - Each sector can import and export (at the same time)
 - Goods produced domestically and abroad are not perfectly substitutable (can only be traded-off to a certain degree)

Method: exogenous assumptions

- Numéraire: welfare good of North America
- Model closures
 - Savings-investment closure: saving rates are fixed and determine investment
 - Balance of payments closure: current account is fixed, structure of foreign trade can change
 - Government budget closure: government income (from taxes) determines expenditures (including consumption and transfers to private households)
- Budget implications of impacts and adaptation depend on closure decision
 - No additional debt and fixed transfers: lower consumptions opportunities (default model assumption)
 - *Financing via debt: interest payments (can be modelled), impacts on creditworthiness (can not be modelled)*

UK Floods in COIN-INT

- Translate this data into the COIN-INT model via different channels:

Impacts	
<i>Type of flood impact</i>	<i>Technical implementation</i>
Residential and non-residential damages	Destruction of capital stocks (reduced capital stock accumulation with lower capital availability for production (i.e., a lower capital endowment in the economy))
Tangible damages (infrastructure etc)	Reduced capital productivity in the public services sector
Intangible damages (health)	Increased public demand for health services (consumption-neutral shift of public consumption towards health services)
Adaptation costs	
Annualised capital costs	Increased public adaptation investment with different assumptions regarding refinancing (scenario analysis)

Welfare effects under different lending conditions

