

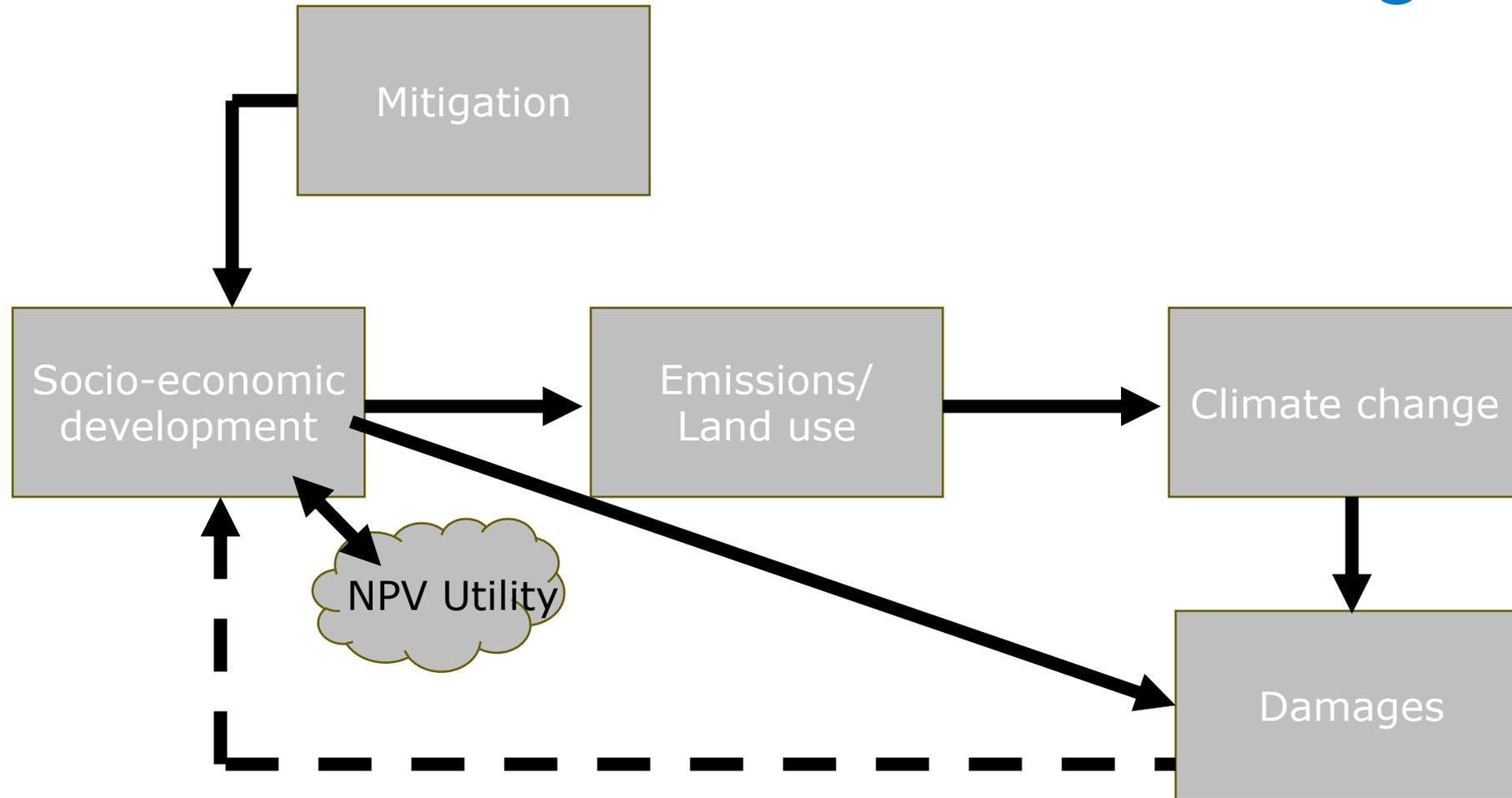


# Integrated assessment of climate change

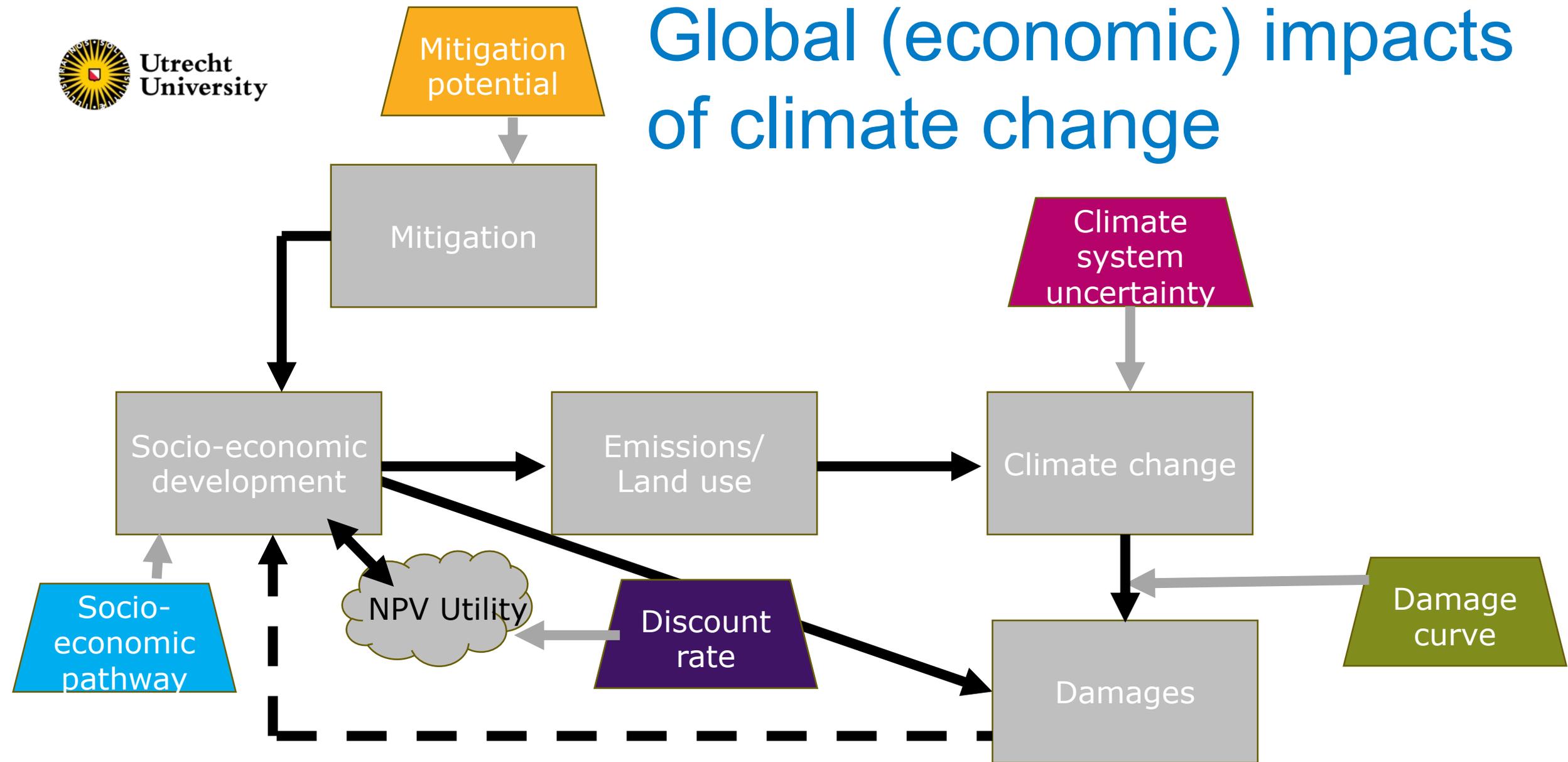
IMAGE-team

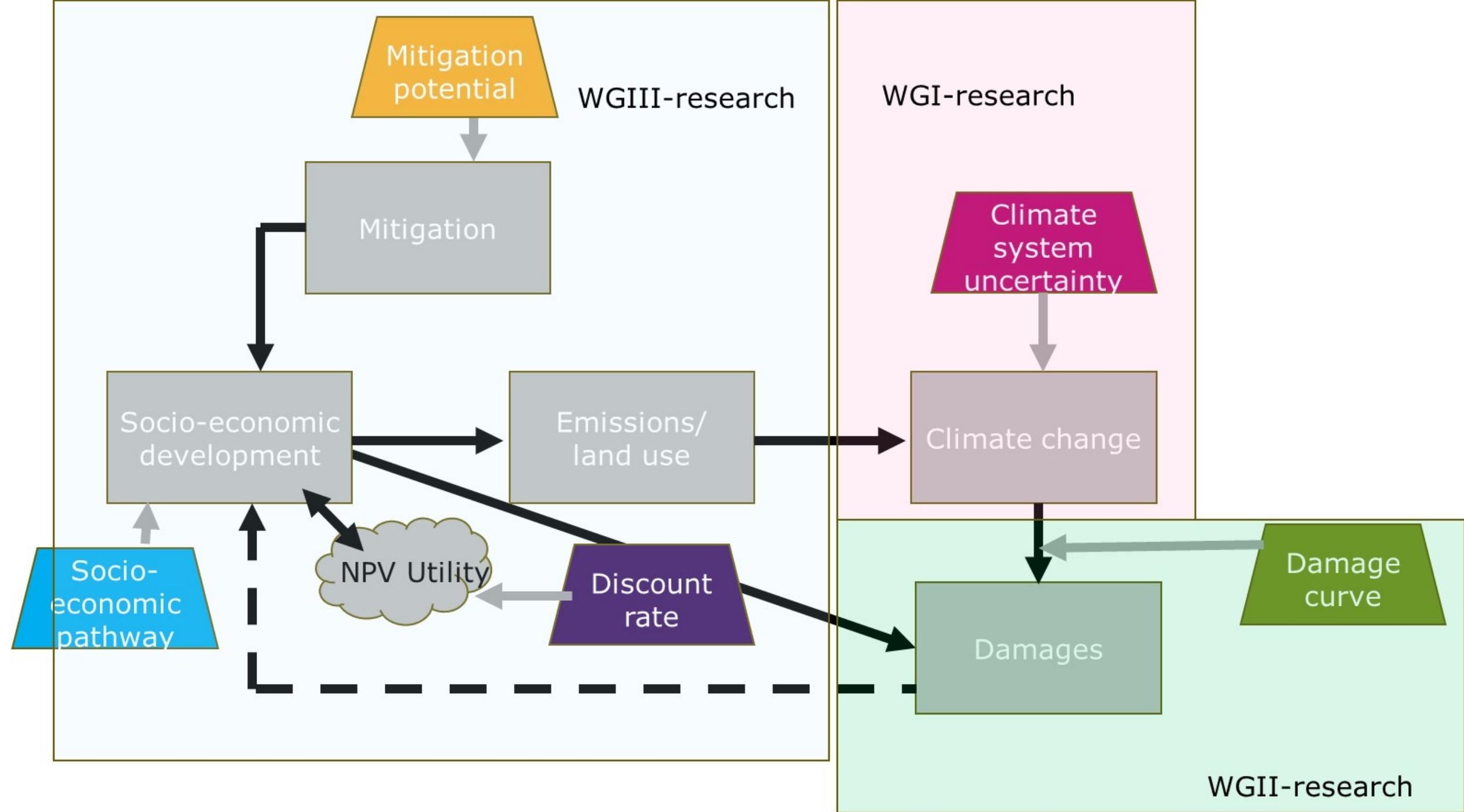
NSOB  
28-06-2018

# Global (economic) impacts of climate change



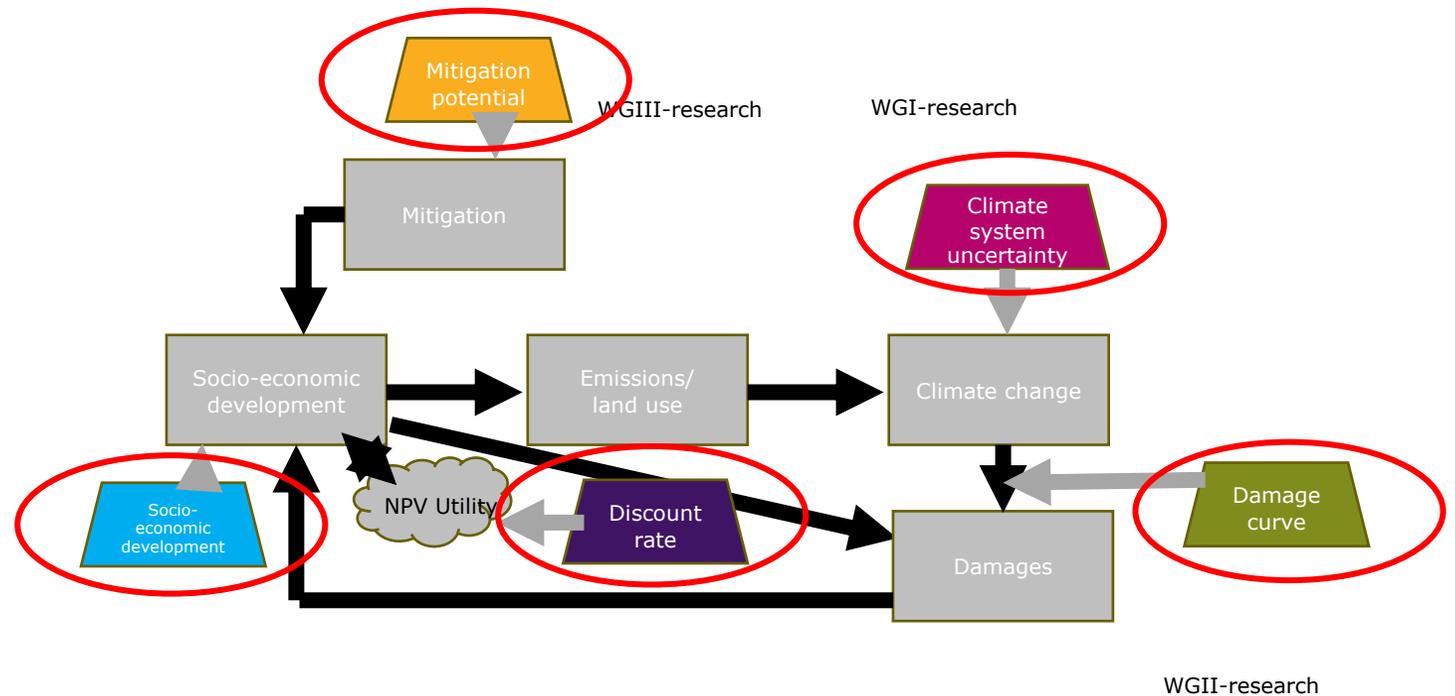
# Global (economic) impacts of climate change







# Critical role for uncertainty



# Critical role for uncertainty

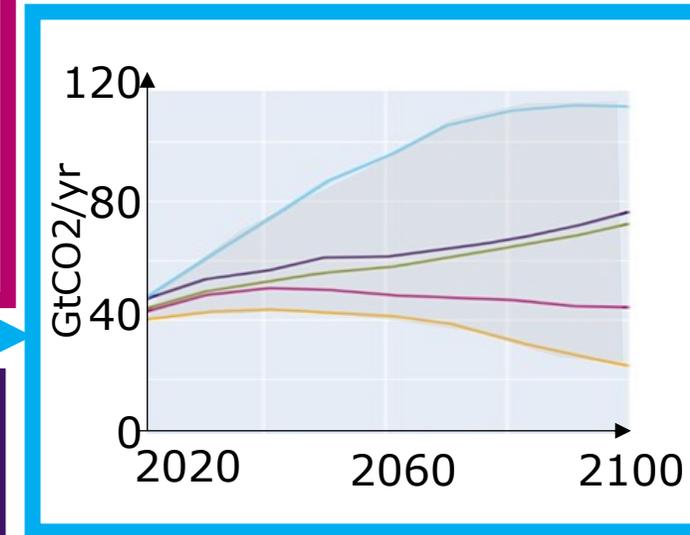
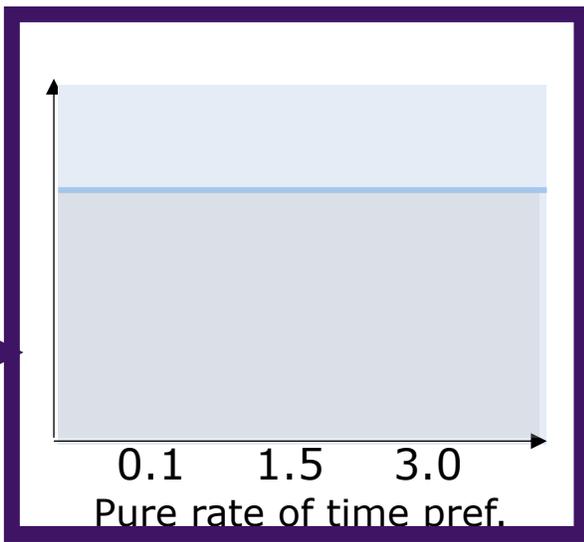
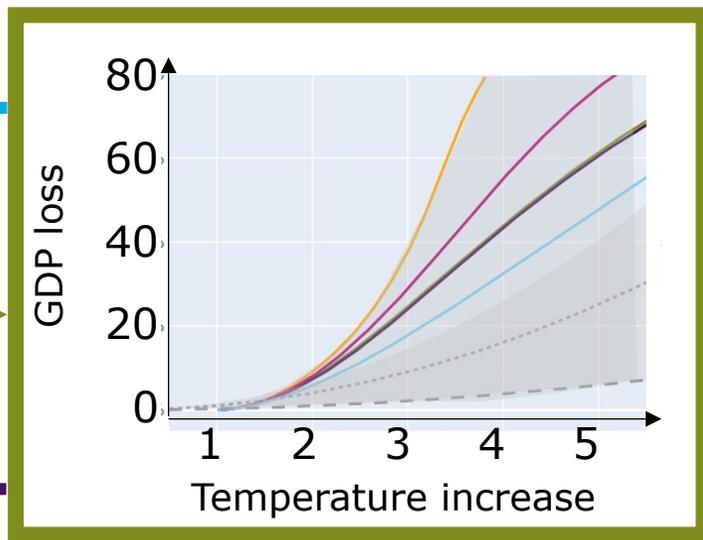
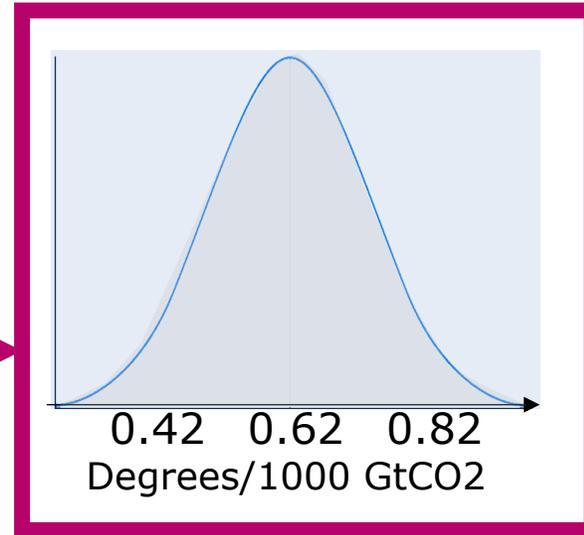
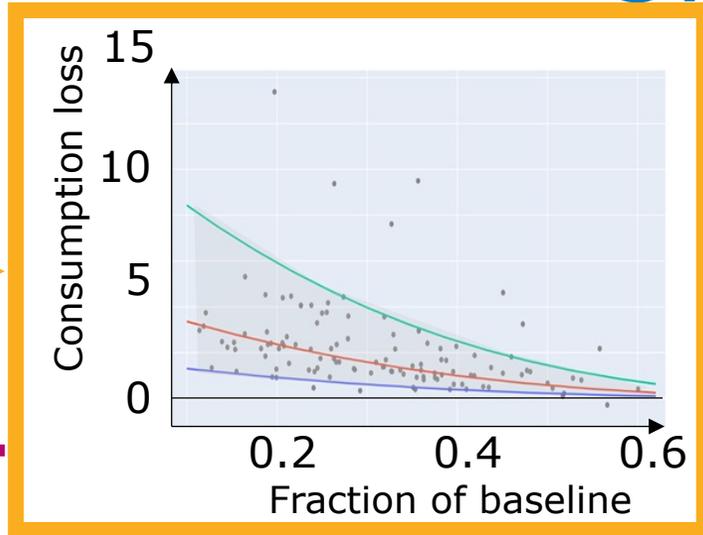
Mitigation potential

Climate system uncertainty

Socio-economic development

Damage curve

Discount rate





Probabilistic  
Scenario development

A set of  
storyline based  
scenarios



“Decision-makers need to address risks. Risks are determined by impacts AND probability. For instance, information that an asteroid can destroy the earth can only be properly assessed, if one knows that chances are 1 in a billion”.

“The probabilistic approach only attempts to assign subjective probabilities in a situation of ignorance forms a dismissal of uncertainty in favor of spuriously constructed expert opinion”.



# Two main scenario methods (handling uncertainty in different ways)

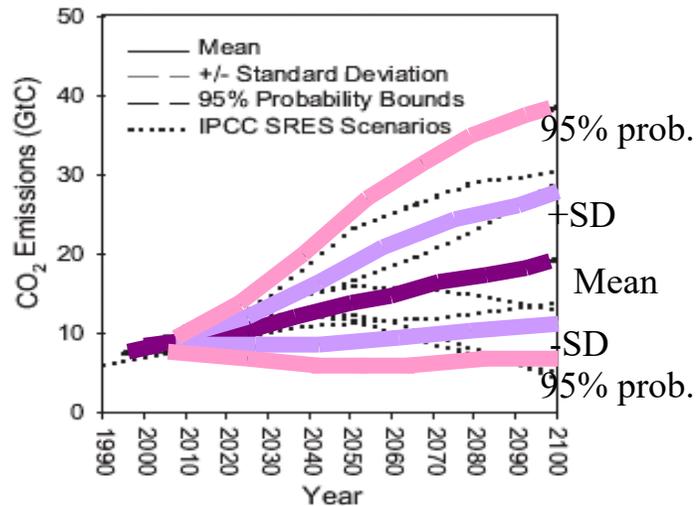


Probabilistic  
Scenario development

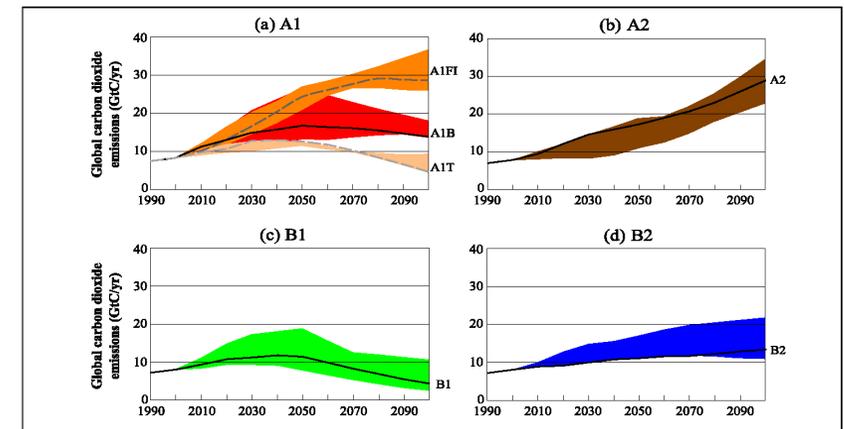
A set of  
storyline based  
scenarios

*Estimate best-guess and uncertainties of all relevant parameter in model; gives best-guess outcome + uncertainty range*

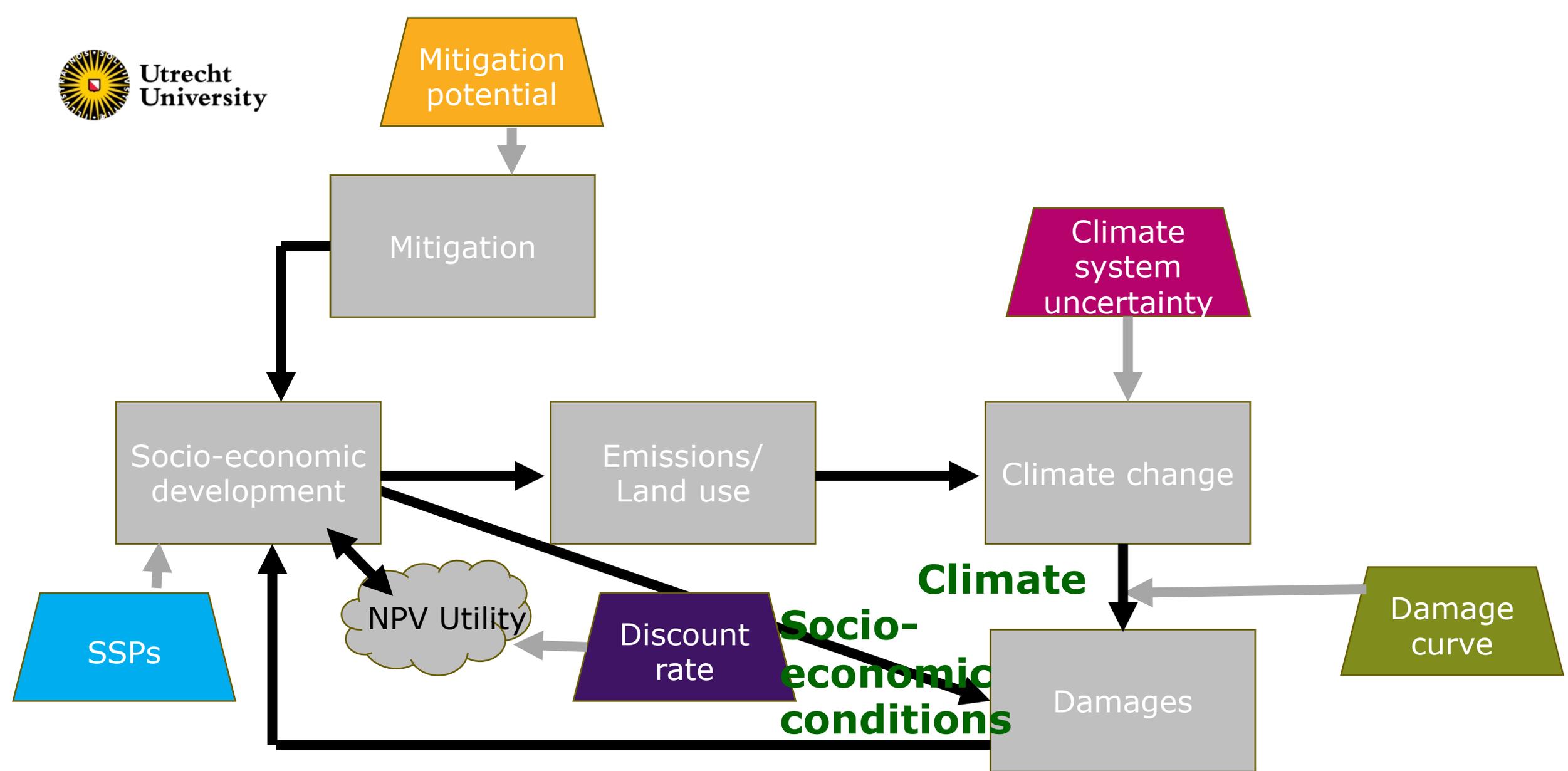
*Develop storylines around major uncertainties – and use storyline to estimate consistent values for other parameters. Explore the future.*



Webster et al. (2001)



Nakicenovic et al (2000)

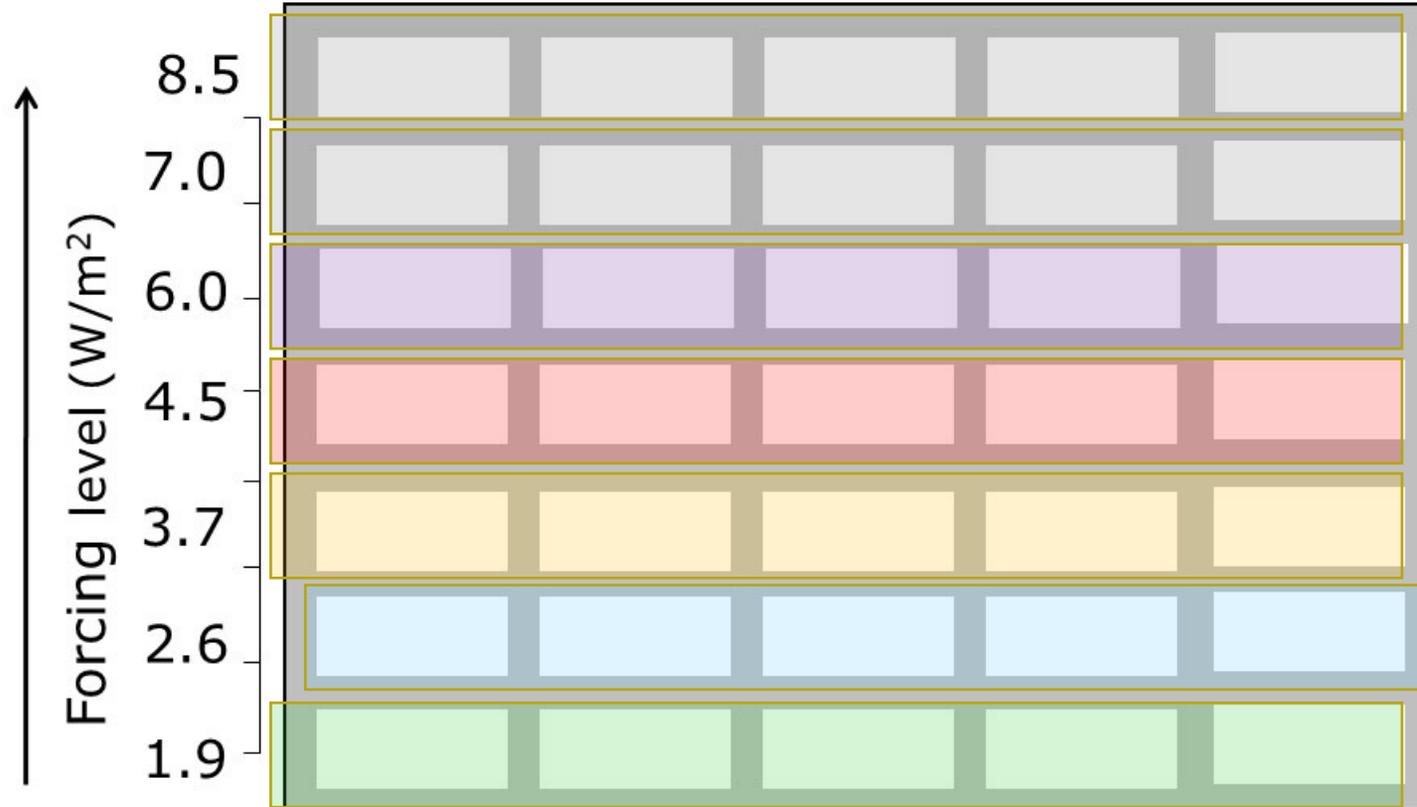


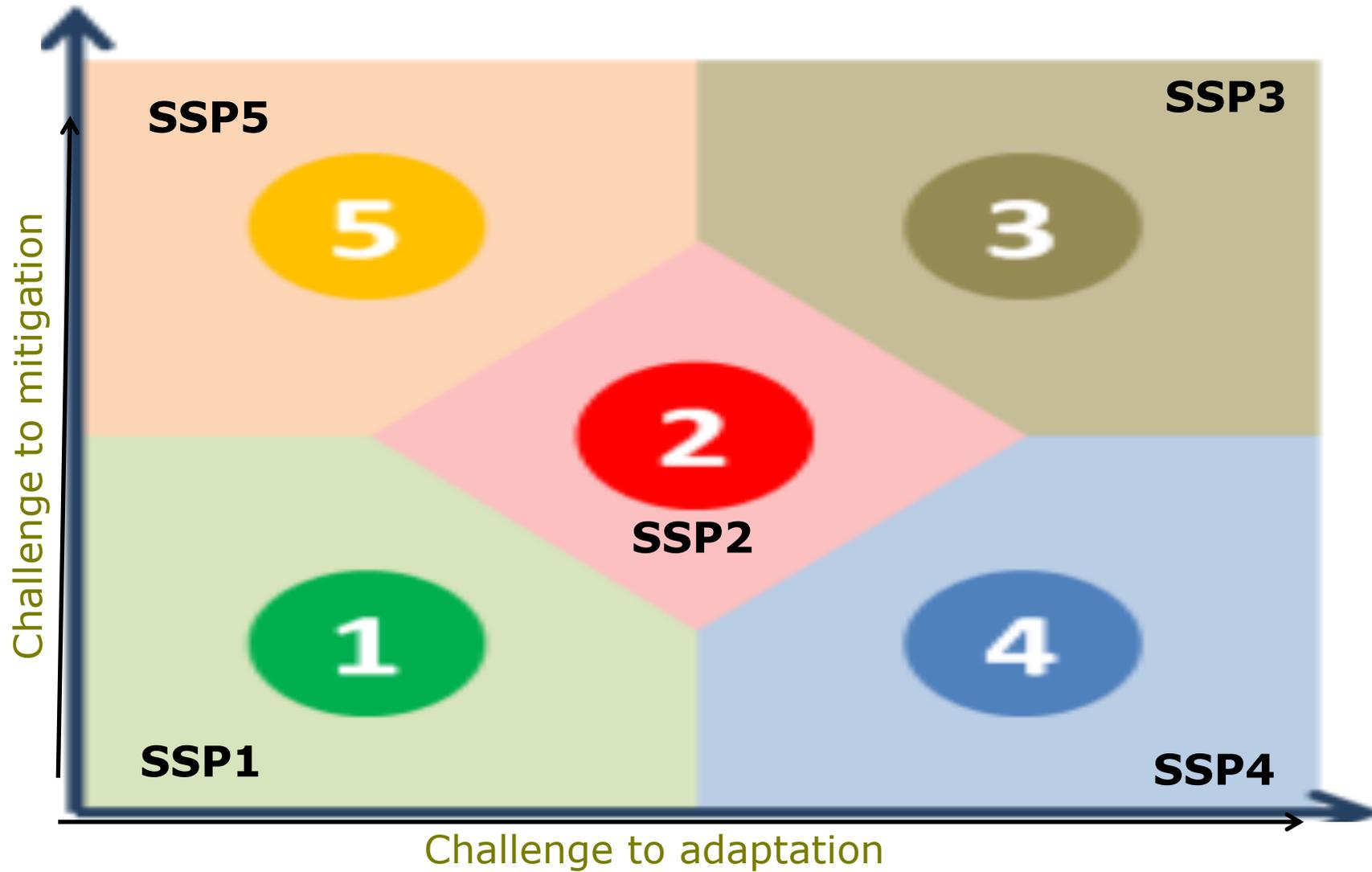


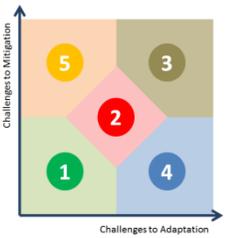
## Socio-economic conditions

**SSP1**   **SSP2**   **SSP3**   **SSP4**   **SSP5**

**Climate**







# Shared Socio-economic Pathways: 5 possible stories about the future

## SSP5: Fossil fuel-ed development

- Rapid growth, free trade
- High technology development,
- Environment and social goals not a priority: adaptive, technology-fix
- Focus on economic growth



Markets first



Clash of civilisations

## SSP3: Regional rivalry

- Competition among regions
- Low technology development
- Environment and social goals not a priority
- Focus on domestic resources
- High population growth
- Slow economic growth dev. countries

## SSP1: Green growth

- Global cooperation
- Rapid technology dev.
- Strong env. policy
- Low population growth
- Low inequity
- Focus on renewables and efficiency
- Dietary shifts
- Forest protection



UN world

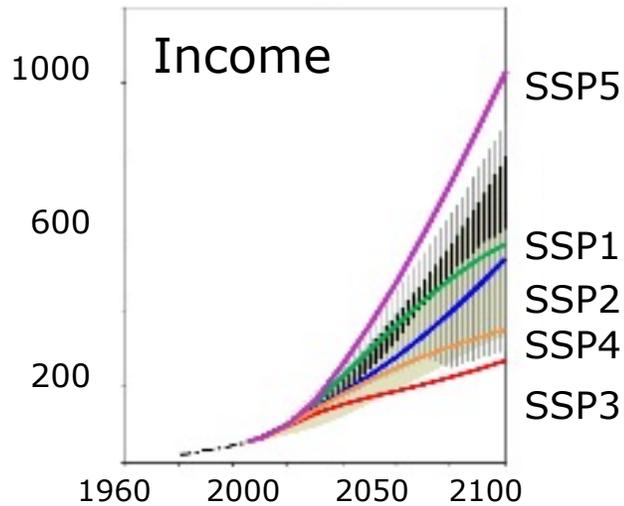
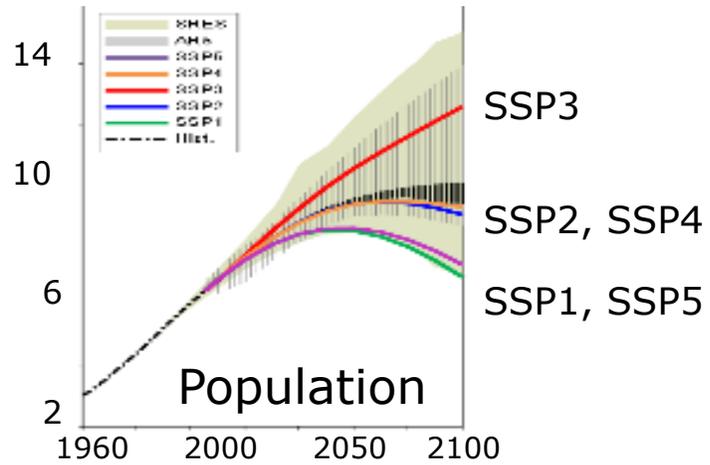
## SSP2: Middle of the Road



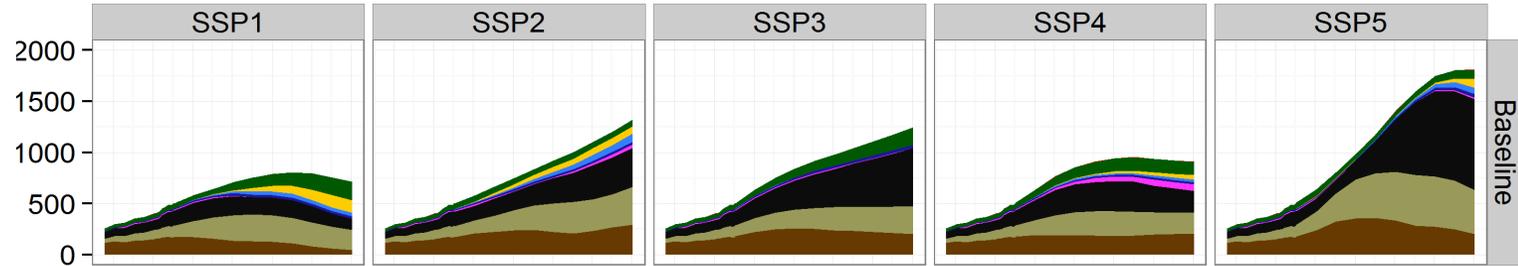
Have's and have not's

## SSP4: Inequality

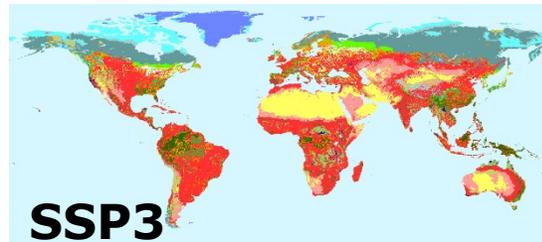
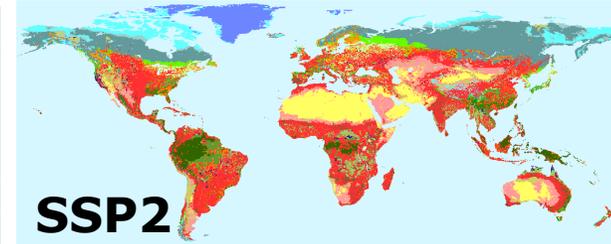
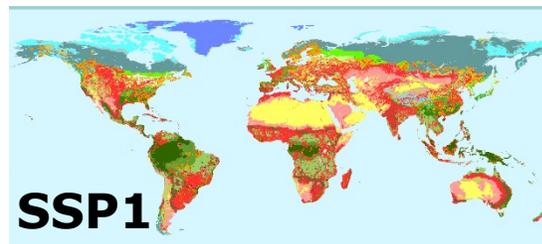
- Inequality across and within regions
- Low technology development
- Environment priority for those that can afford
- Limited trade



### Primary energy

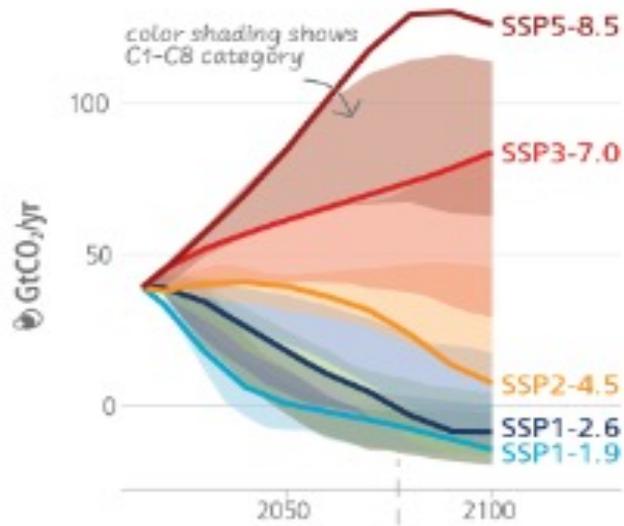


### Land use



- Community scenarios: model comparison makes scenarios stronger
- >2050 due to climate change, but projection skill goes down

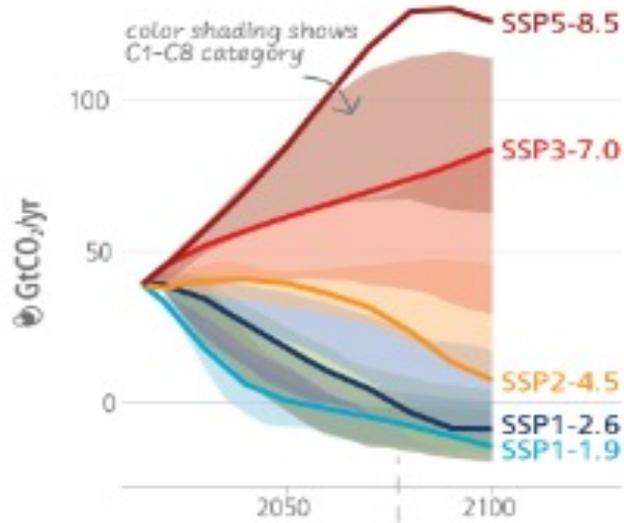
## CO<sub>2</sub> emissions for SSP-based scenarios and C1-C8 categories



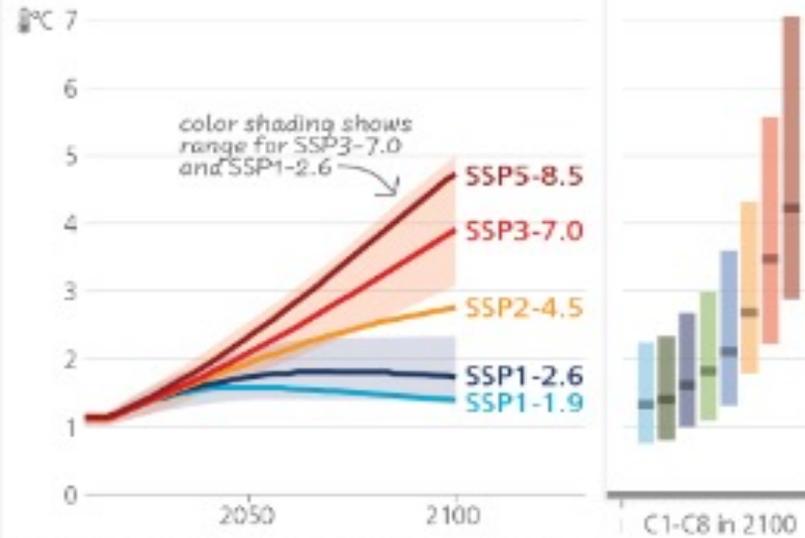
- Current policies lead to stabilization of emissions
- Paris goals net zero emissions in the period 2050-2070

These scenarios critical for main conclusions IPCC

CO<sub>2</sub> emissions for SSP-based scenarios and C1-C8 categories



Temperature for SSP-based scenarios over the 21<sup>st</sup> century and C1-C8 at 2100



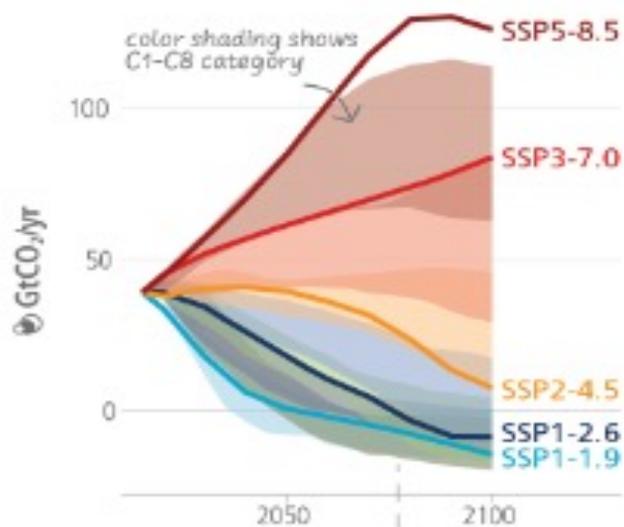
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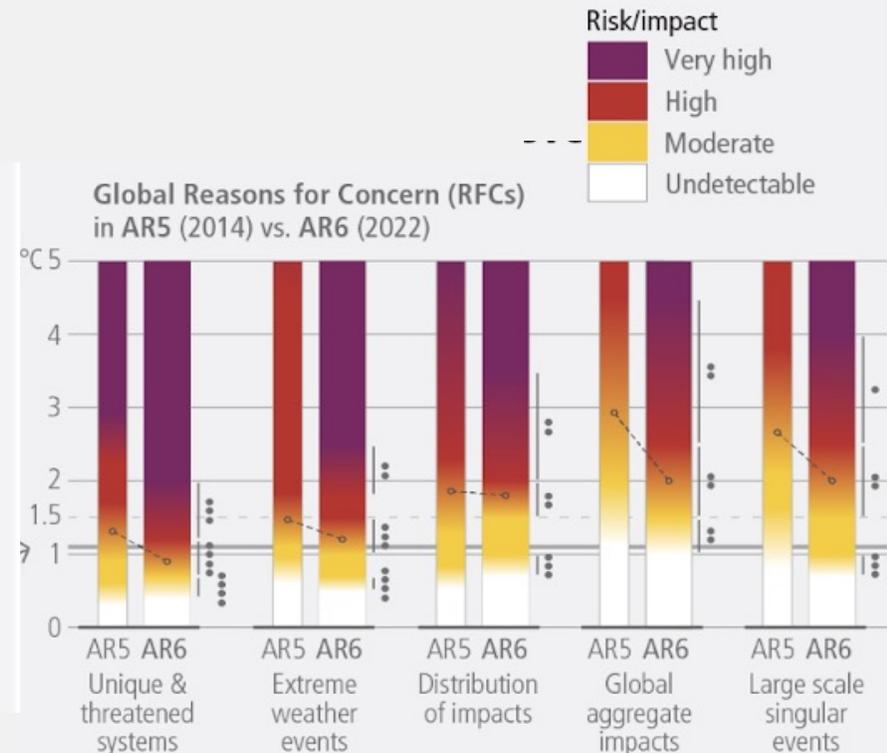
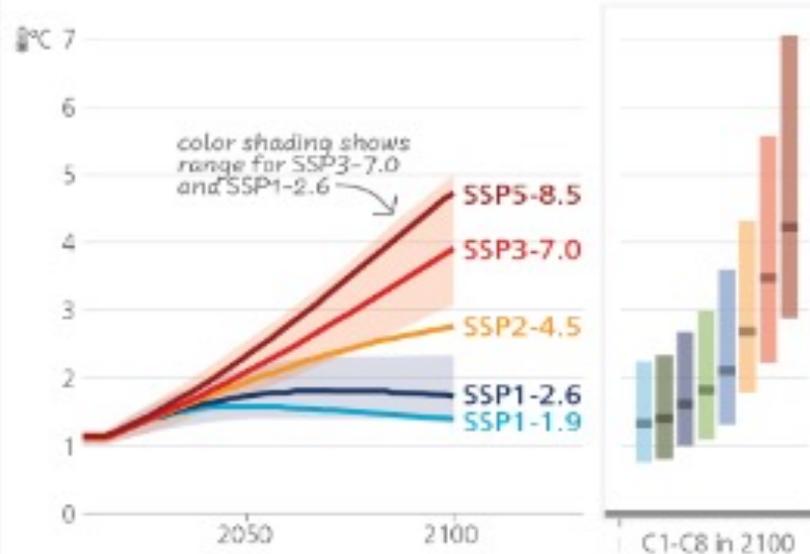
- Temperature range 1-7°C
- Current policies 2.5-3.5°C

These scenarios critical for main conclusions IPCC

CO<sub>2</sub> emissions for SSP-based scenarios and C1-C8 categories



Temperature for SSP-based scenarios over the 21<sup>st</sup> century and C1-C8 at 2100



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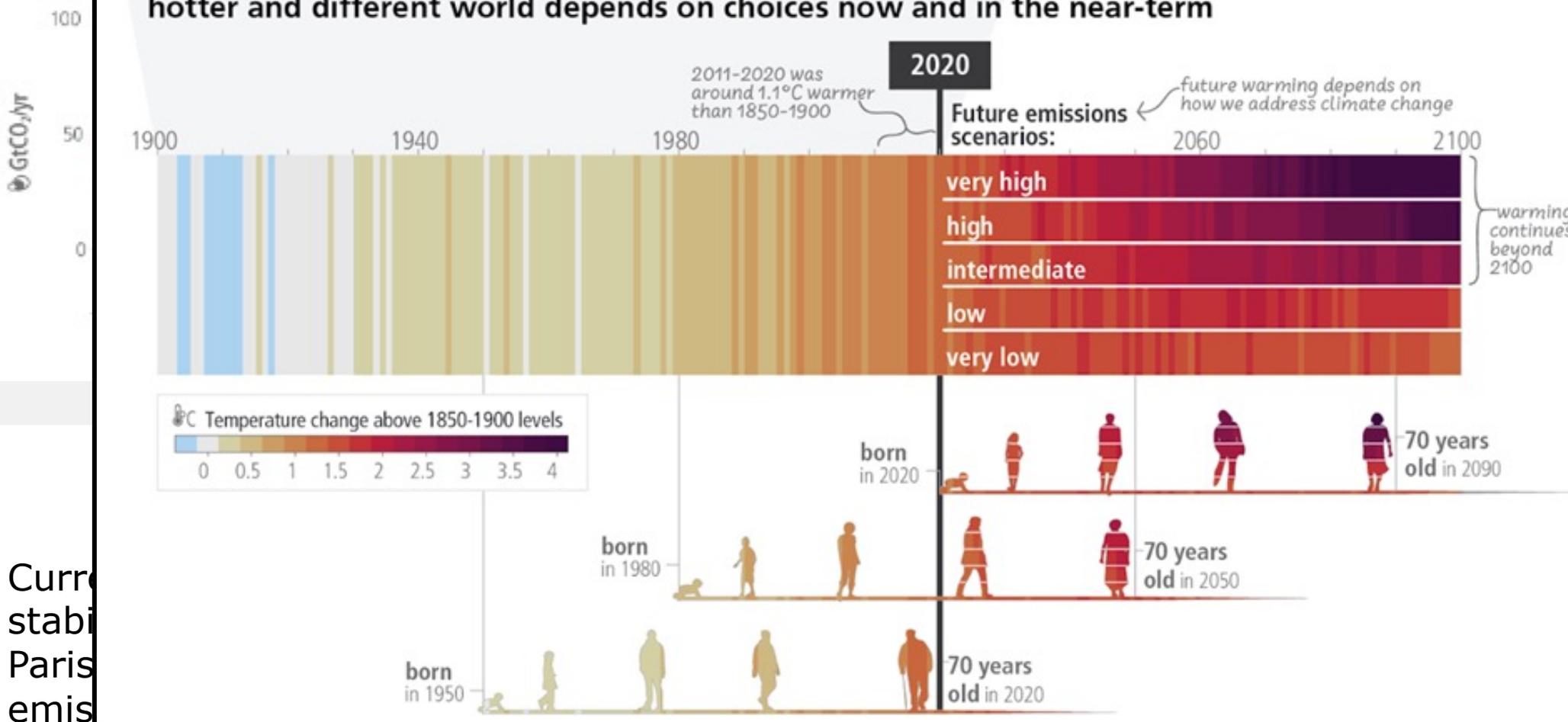
- Temperature range 1-7°C
- Current policies 2.5-3.5°C



- Worsening Impacts: Climate-related risks are higher than assessed in AR5,
- Every increment of global warming will intensify multiple and concurrent hazards

These scenarios critical for main conclusions IPCC

c) The extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term



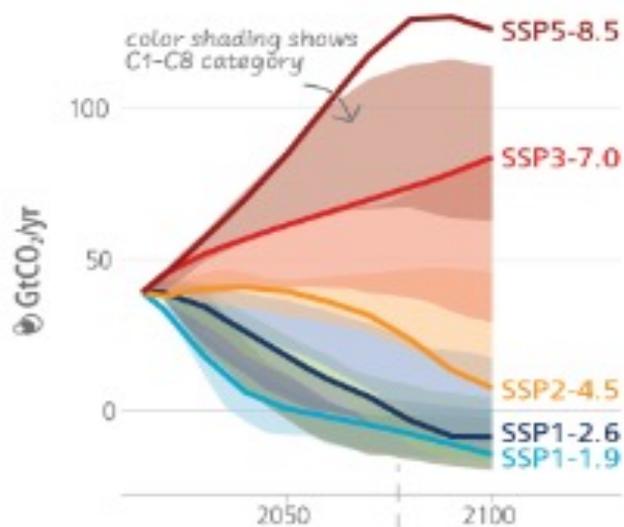
- Current stable
- Paris emissions 2050-2070

warming will intensify multiple and concurrent hazards

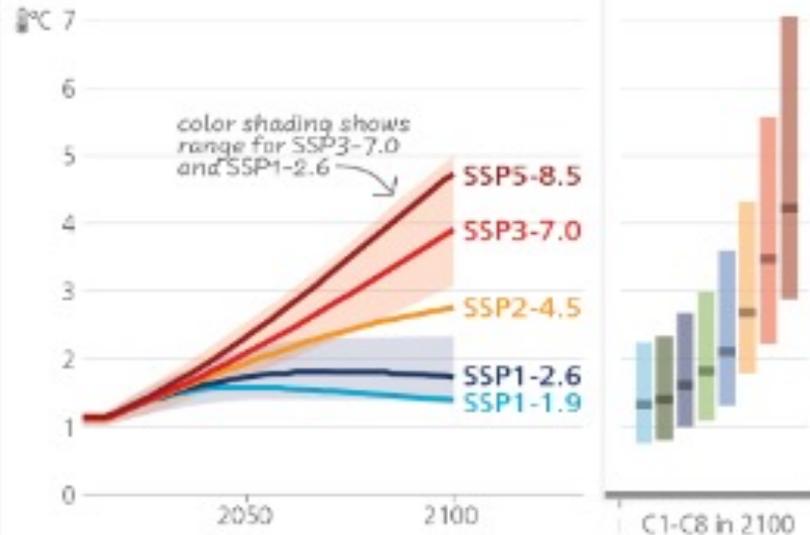
Climate-  
warmer than  
global

These scenarios critical for main conclusions IPCC

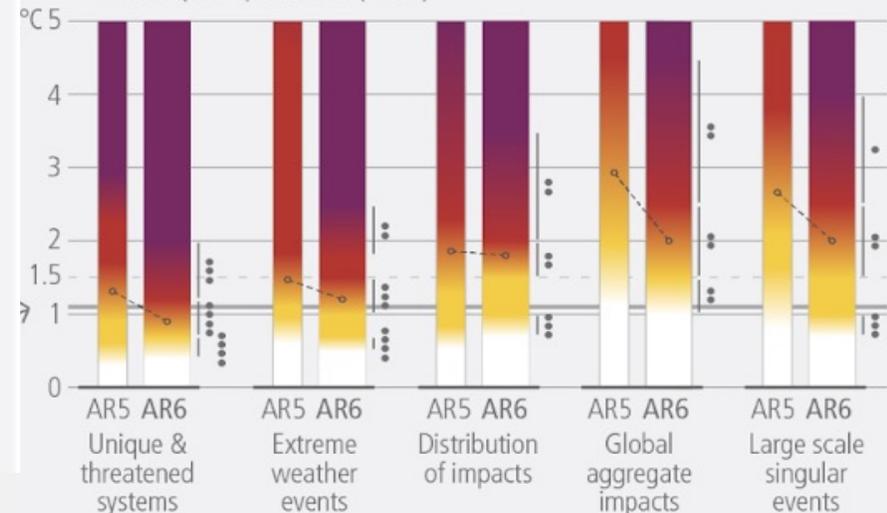
CO<sub>2</sub> emissions for SSP-based scenarios and C1-C8 categories



Temperature for SSP-based scenarios over the 21<sup>st</sup> century and C1-C8 at 2100



Global Reasons for Concern (RFCs) in AR5 (2014) vs. AR6 (2022)



## Climate change widespread, rapid, and intensifying – IPCC

The evidence is clear: the time for action is now. We can halve emissions by 2030.

IAMs could possibly contribute to further analysis, but:

- Process IAMs do not typically include impacts
- CBA IAMs typically have old damage curves
- Regular updates anyway needed



# Updates

SSPs

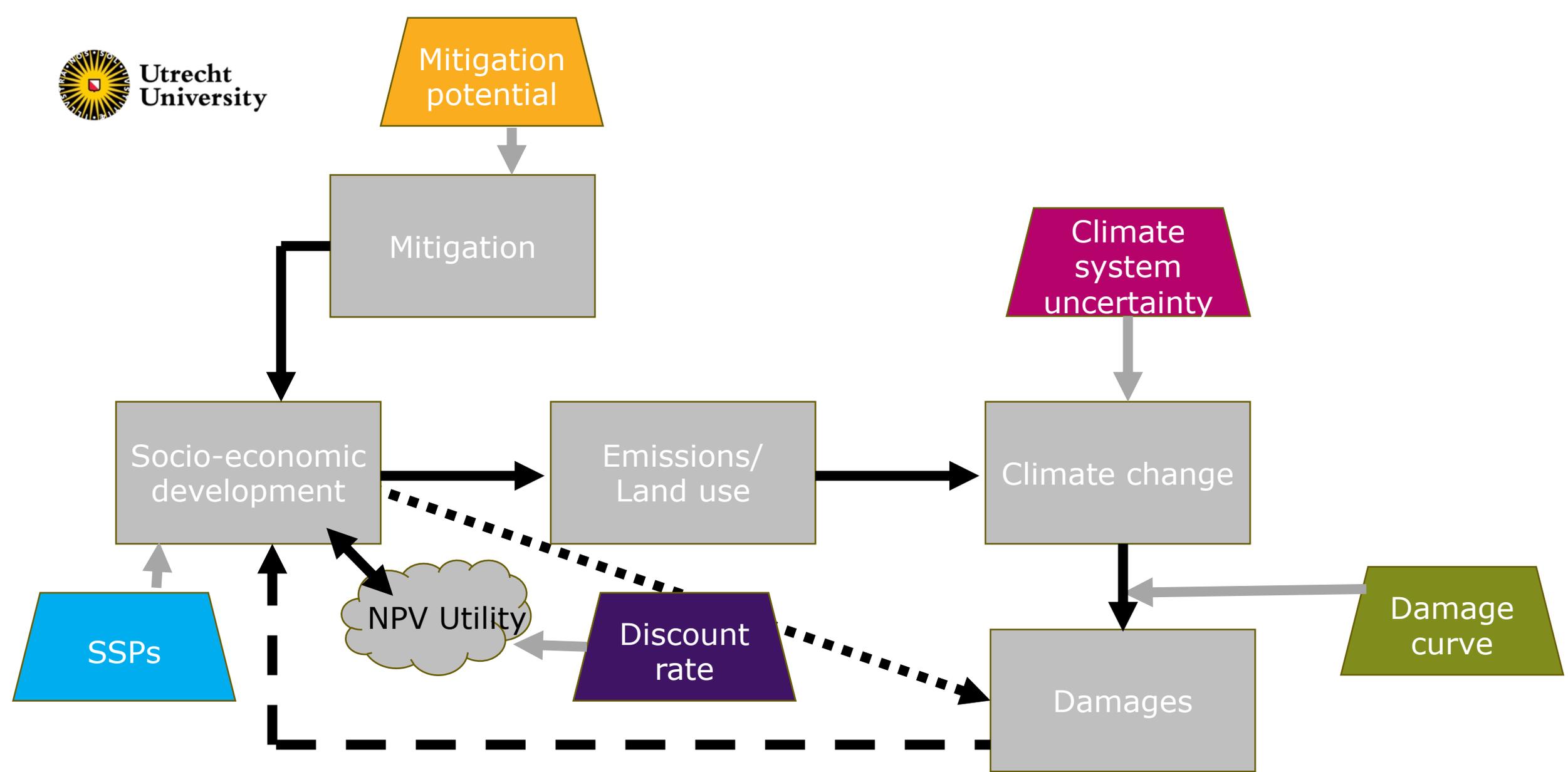
- New population and GDP scenarios
- Population revised upward given fertility trends in last 10 years

Range

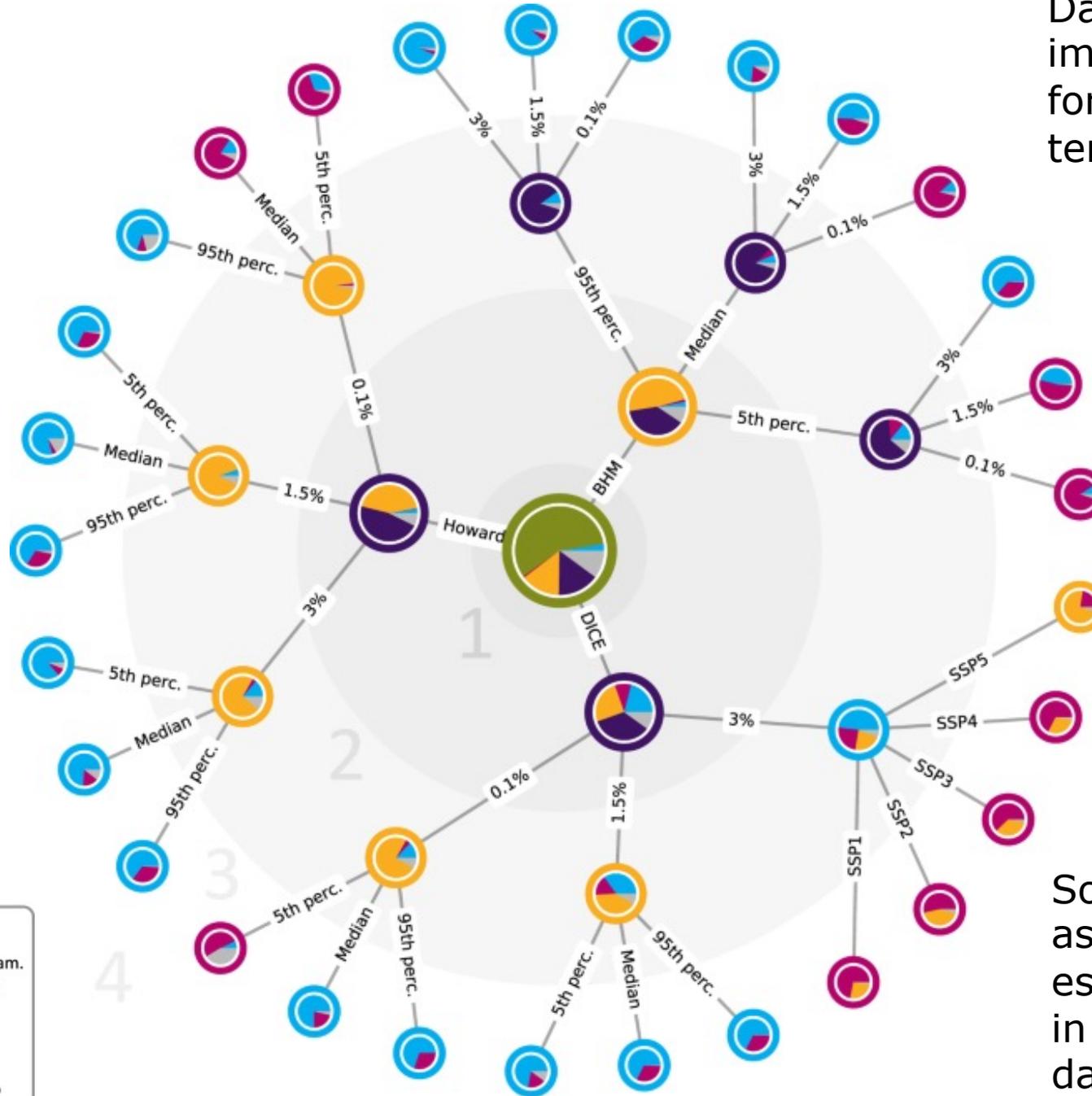
- New selection of scenarios
  - High end / low end

Damage curve

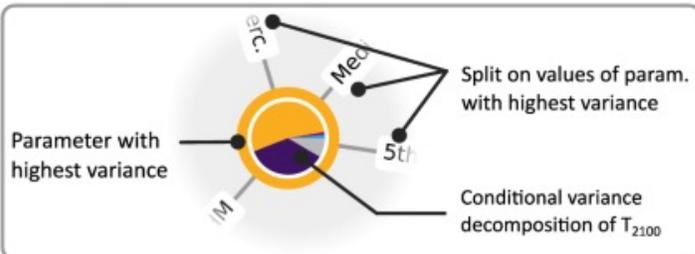
- Alignment of damage curves with bio-physical information



Damage curves most important uncertainty for optimal temperature



Socio-economic assumptions especially important in case of low damages



## Some observations

- SSPs provide useful set of economic/population projections
- Discussion on probability vs. scenario-based projections
- Some important improvements:
  - Updates ongoing on SSPs
  - More attention to feedback needed
  - More attention to adaptation needed