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# Energy Investment Needs for Fulfilling the Paris Agreement and Achieving Sustainable Development Goals

Keywan Riahi,

International Institute for Applied Systems Analysis (IIASA)

*The World Bank, 27 November 2017, Washington DC, USA*

# New Paper on Future Investment Needs

*McCollum et al, submitted to Nature Energy*
*Support by the World Bank and CD-LINKS.*



***Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals***

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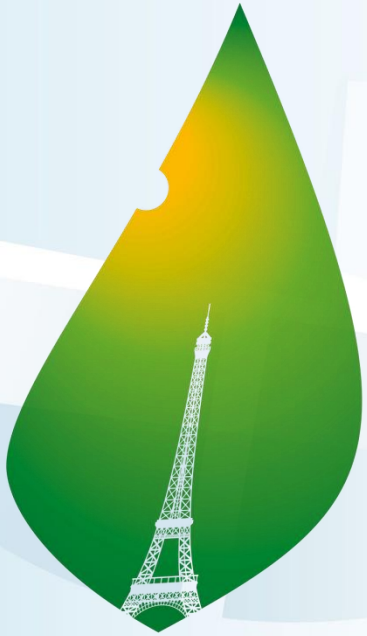
- ✓ Multimodel Assessment
- ✓ 6 teams
- ✓ 1.5 and 2C scenarios
- ✓ NDCs vs SDGs

# Paris Agreement + SDGs



COP21 · CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

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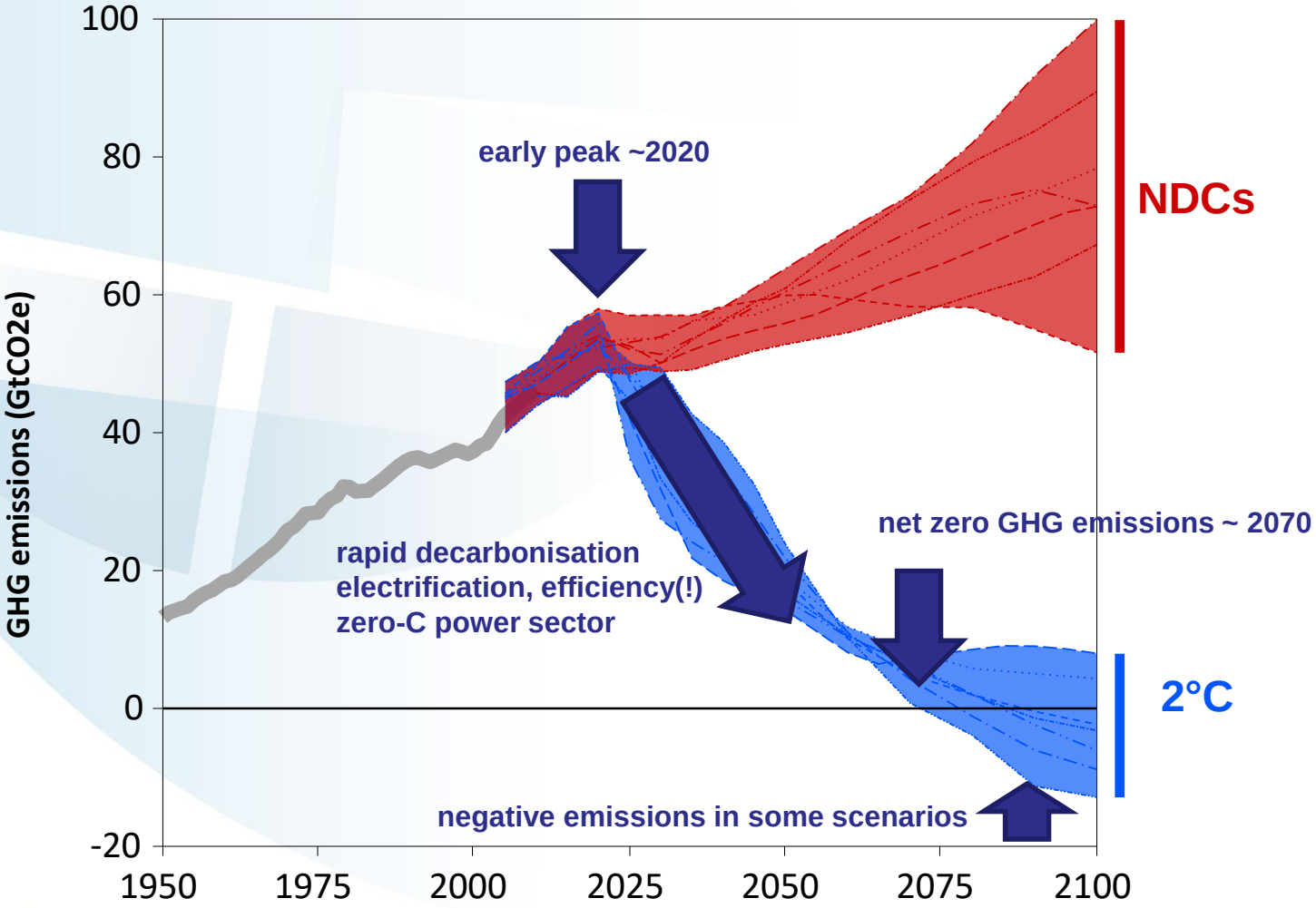
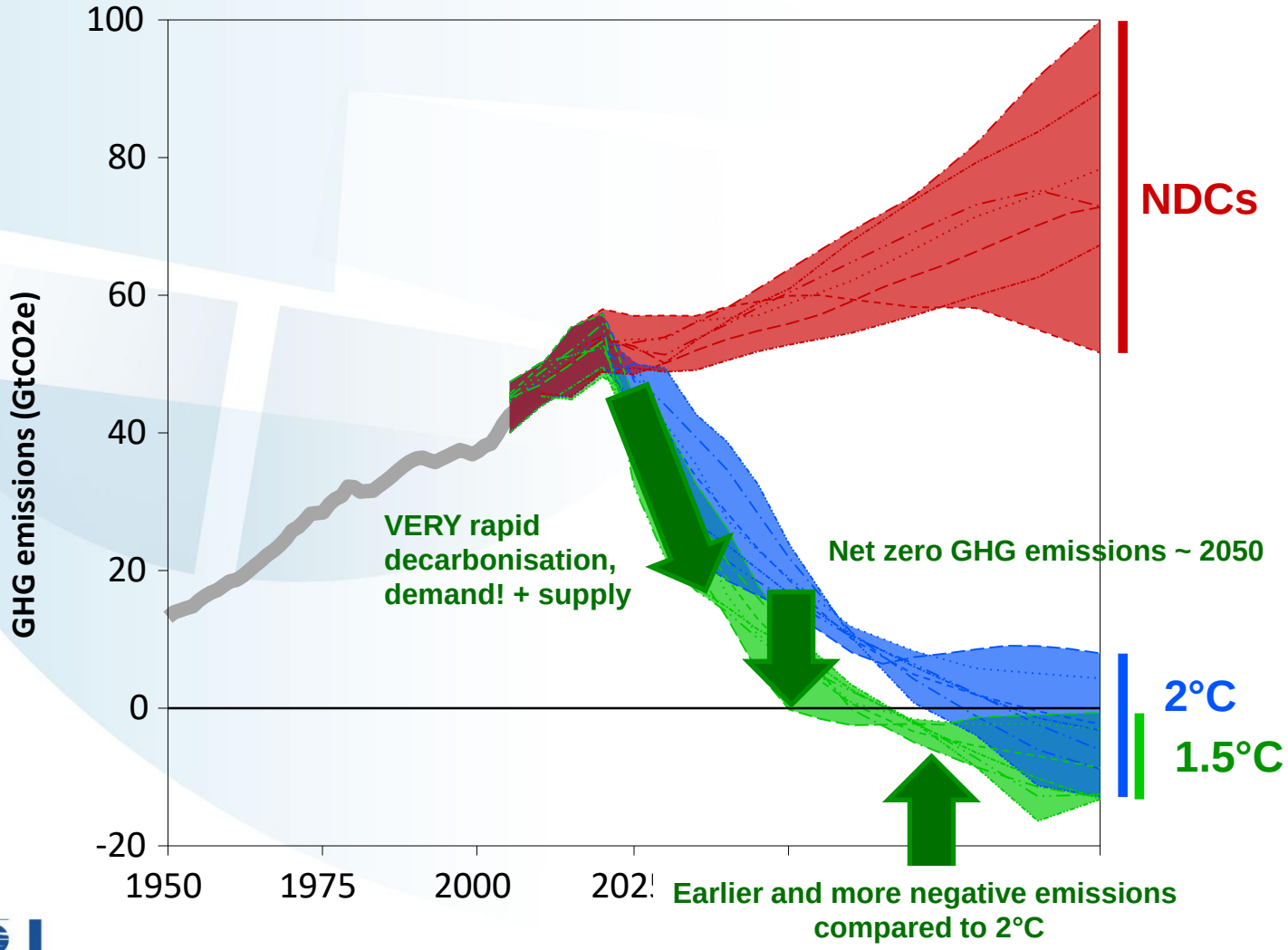
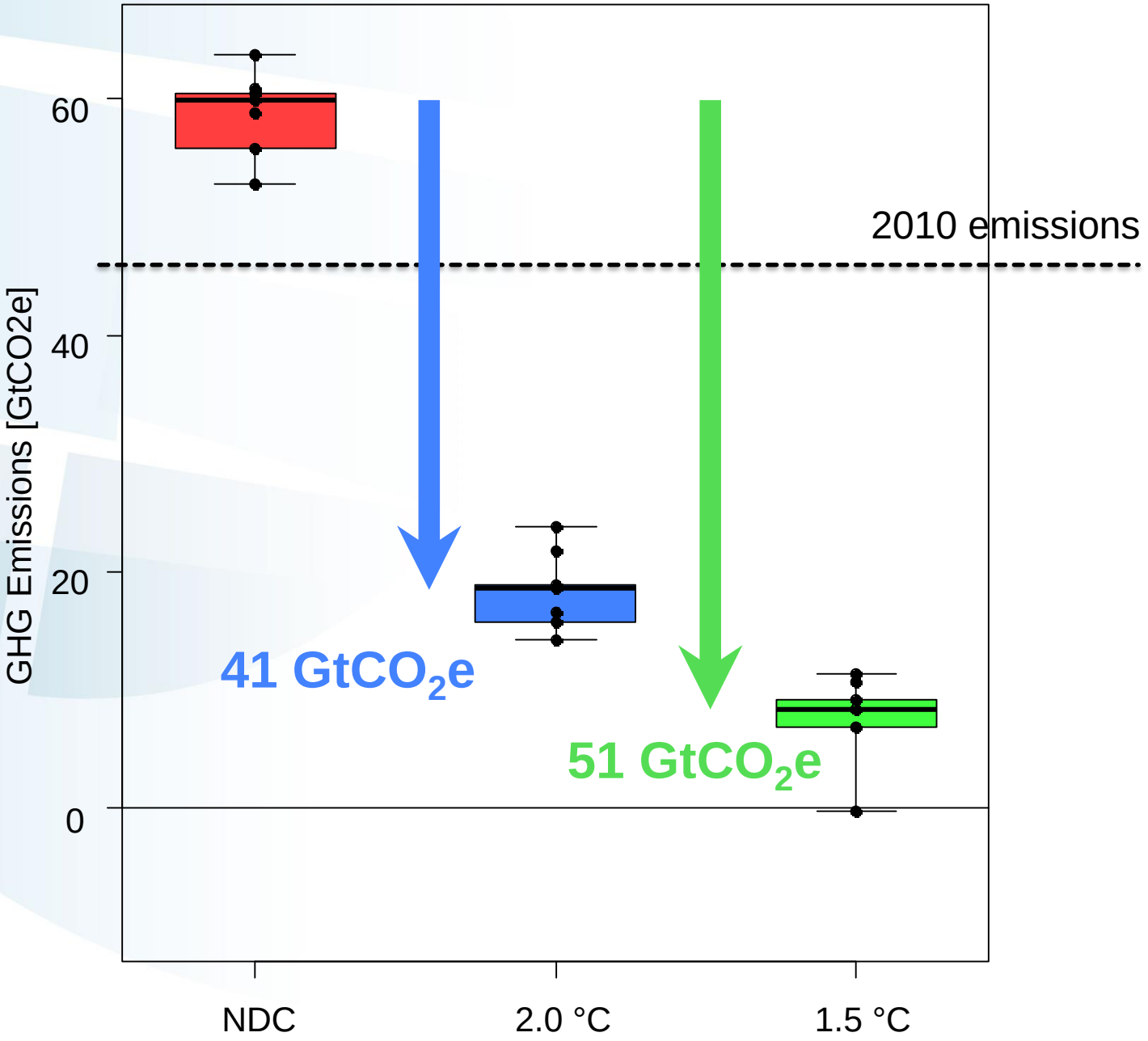
# Staying below 2C requires a deep and rapid transformation



# 1.5C requires further acceleration and an even deeper transformation

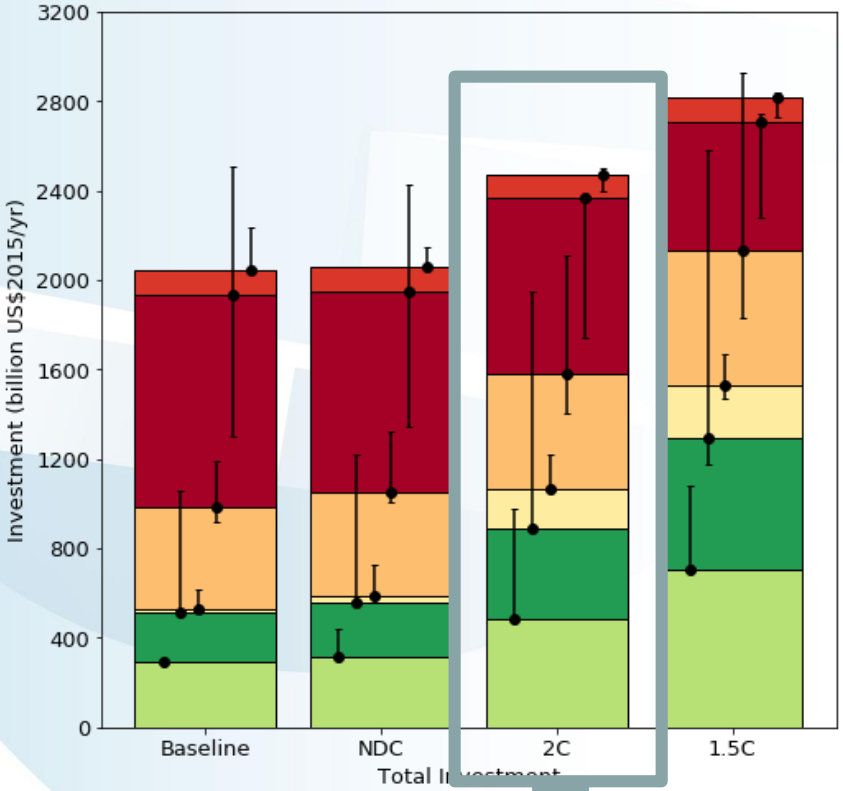


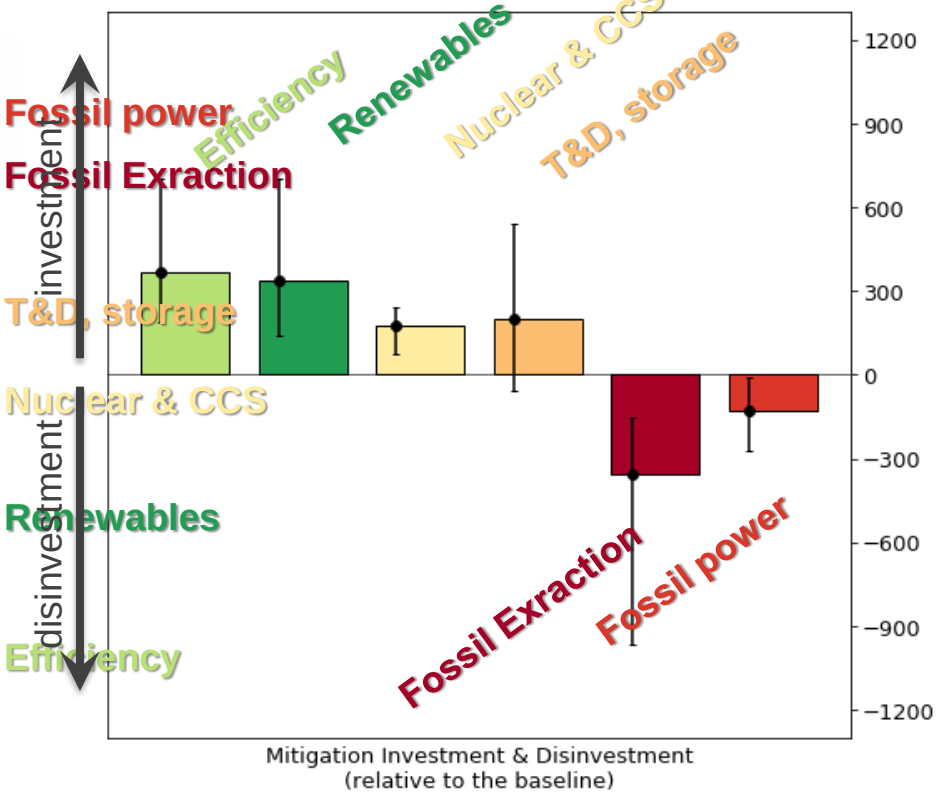
# The Emissions GAP by 2050



# Global Investment Portfolios for 1.5 and 2C

## Average annual investments 2010 to 2050



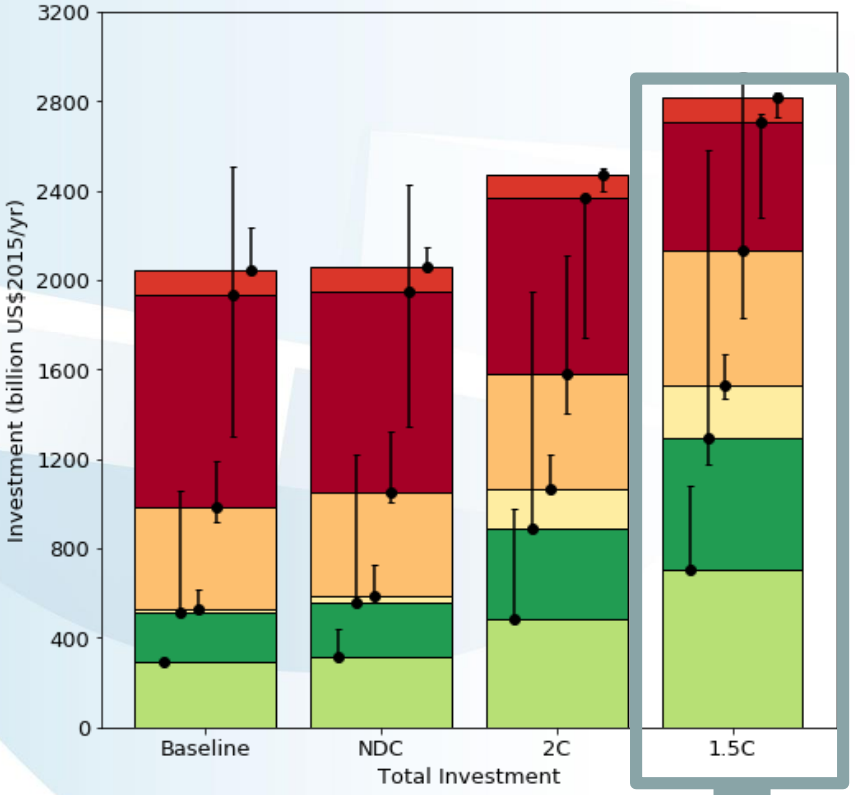



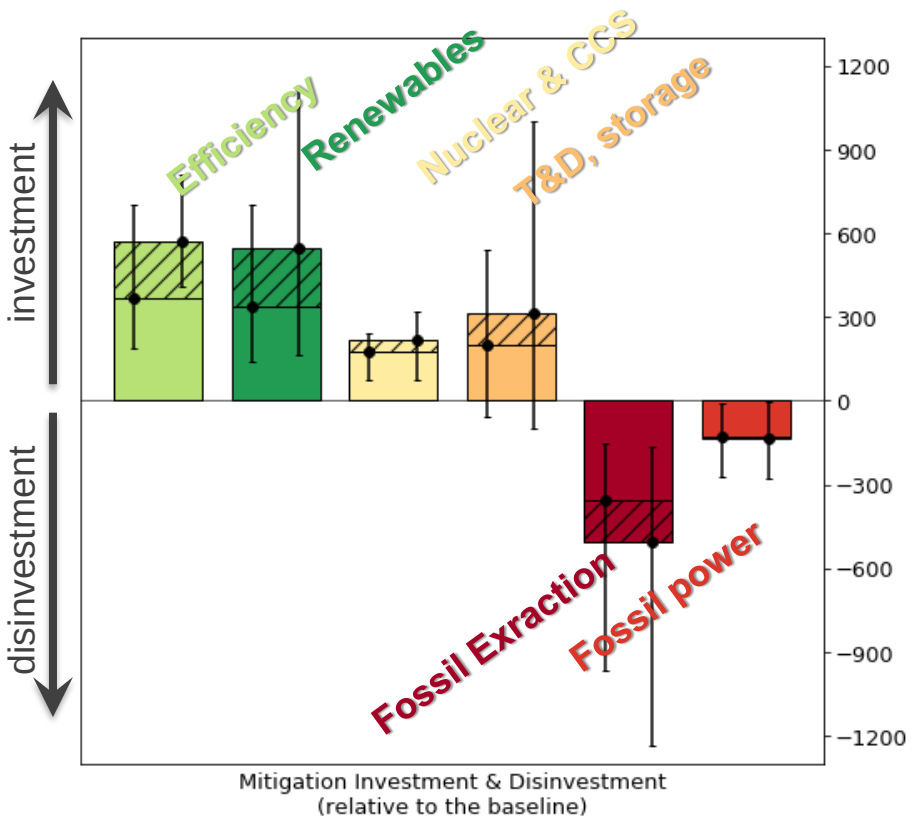

2°C compared to baseline

*McCollum et al, (under embargo – do not cite or quote)*

# Global Investment Portfolios for 1.5 and 2C

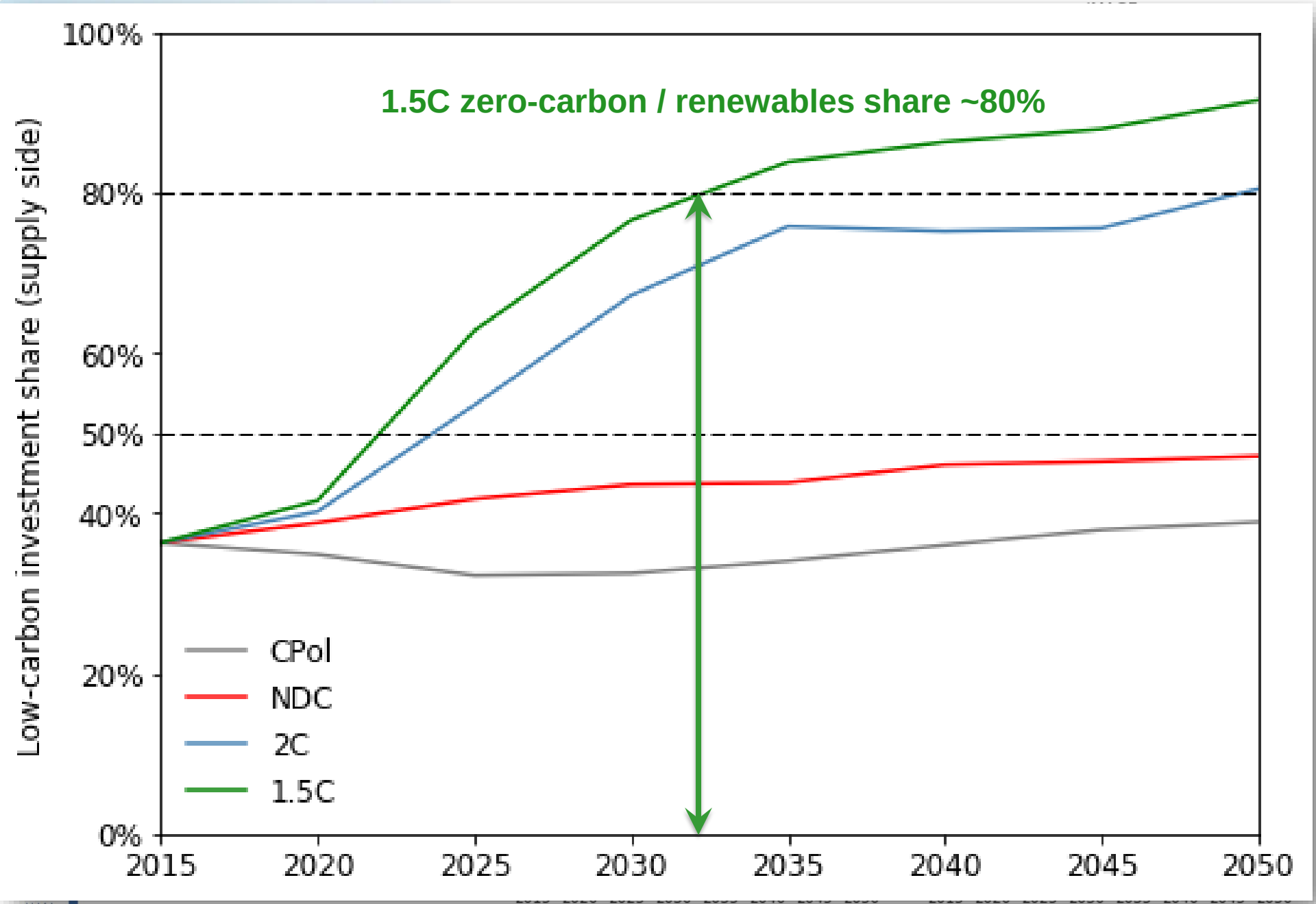
## Average annual investments 2010 to 2050



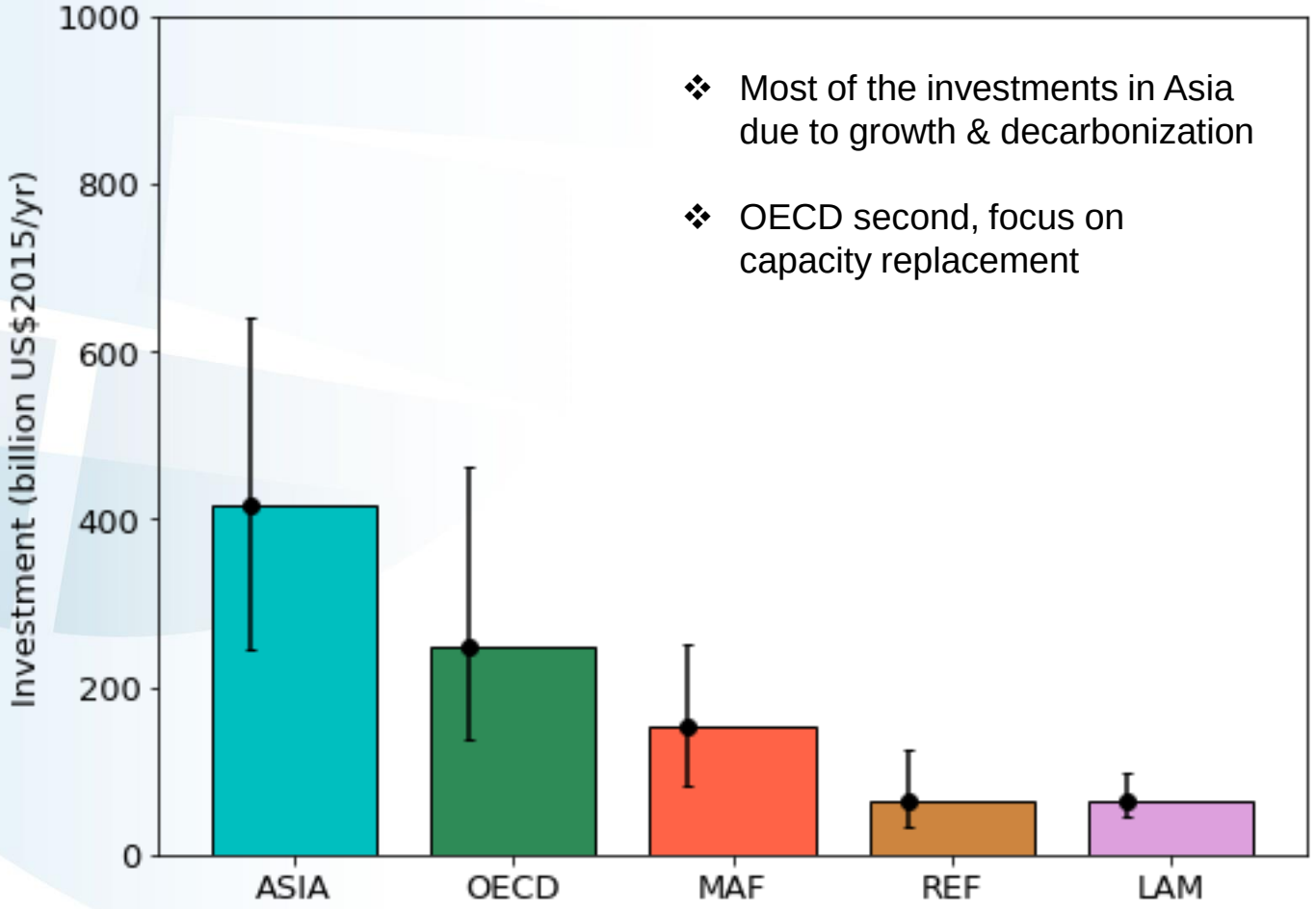

1.5°C compared to baseline

*McCollum et al, (under embargo – do not cite or quote)*


1.5C zero-carbon / renewables share ~80%
Low-carbon investment share (supply side)
100%
80%
60%
50%
40%
20%
0%
2015
2020
2025
2030
2035
2040
2045
2050
CPol
NDC
2C
1.5C

# Regional Investments (2C)

## 2015-2050, compared to baseline

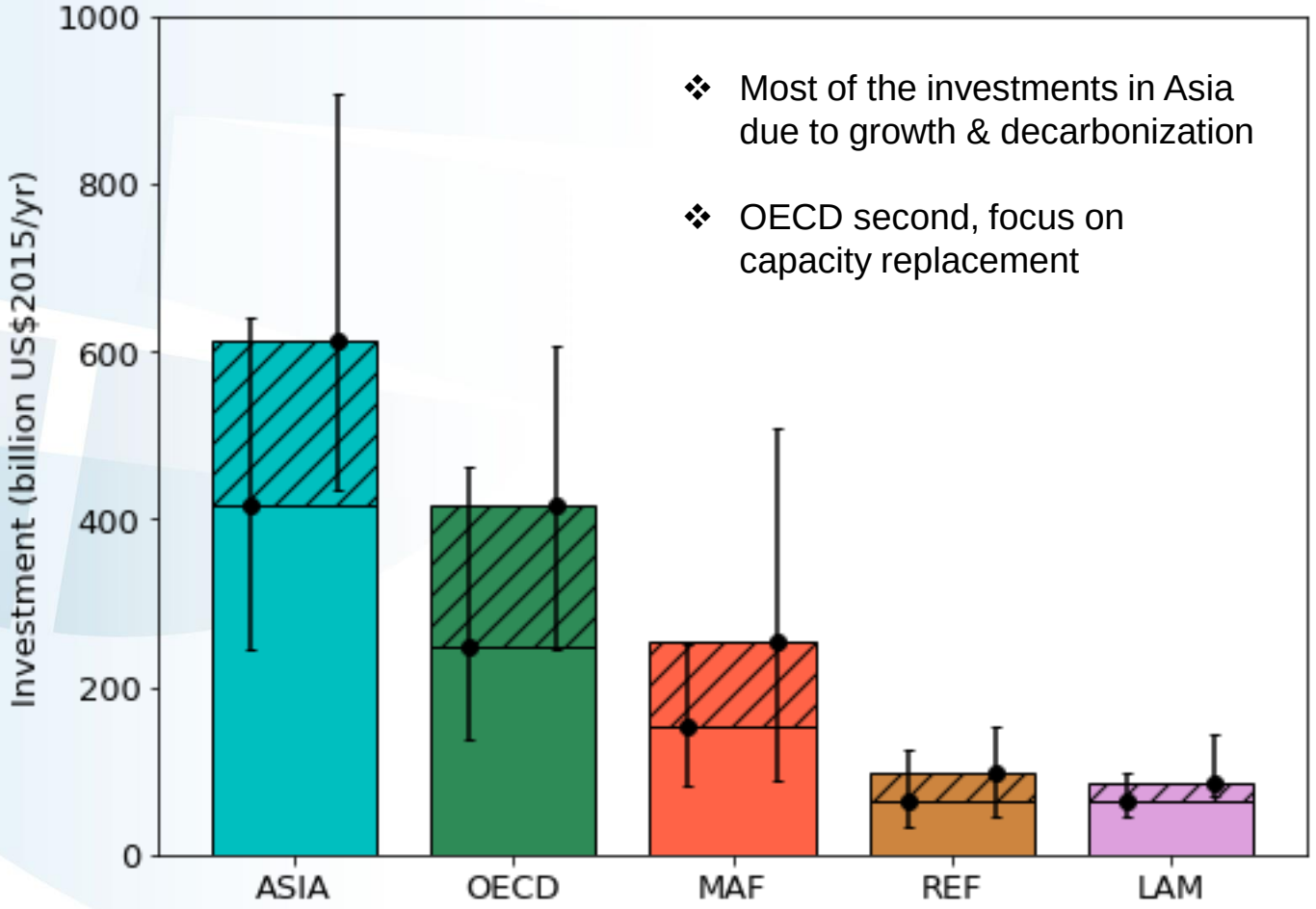



- Most of the investments in Asia due to growth & decarbonization
- OECD second, focus on capacity replacement

*McCollum et al, (under embargo – do not cite or quote)*

# Regional Investments (1.5 vs 2C)

## 2015-2050, compared to baseline

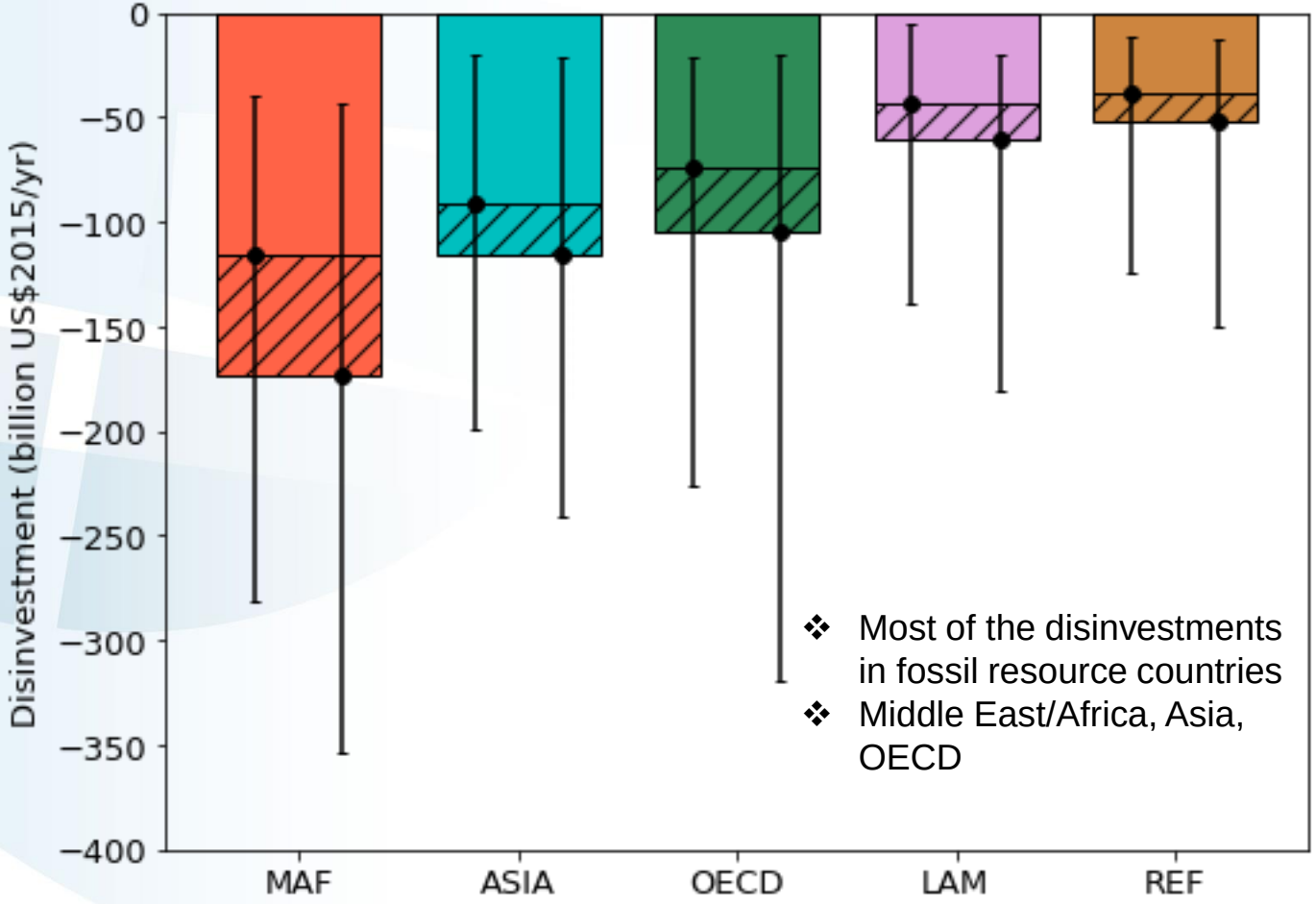



- Most of the investments in Asia due to growth & decarbonization
- OECD second, focus on capacity replacement

*McCollum et al, (under embargo – do not cite or quote)*

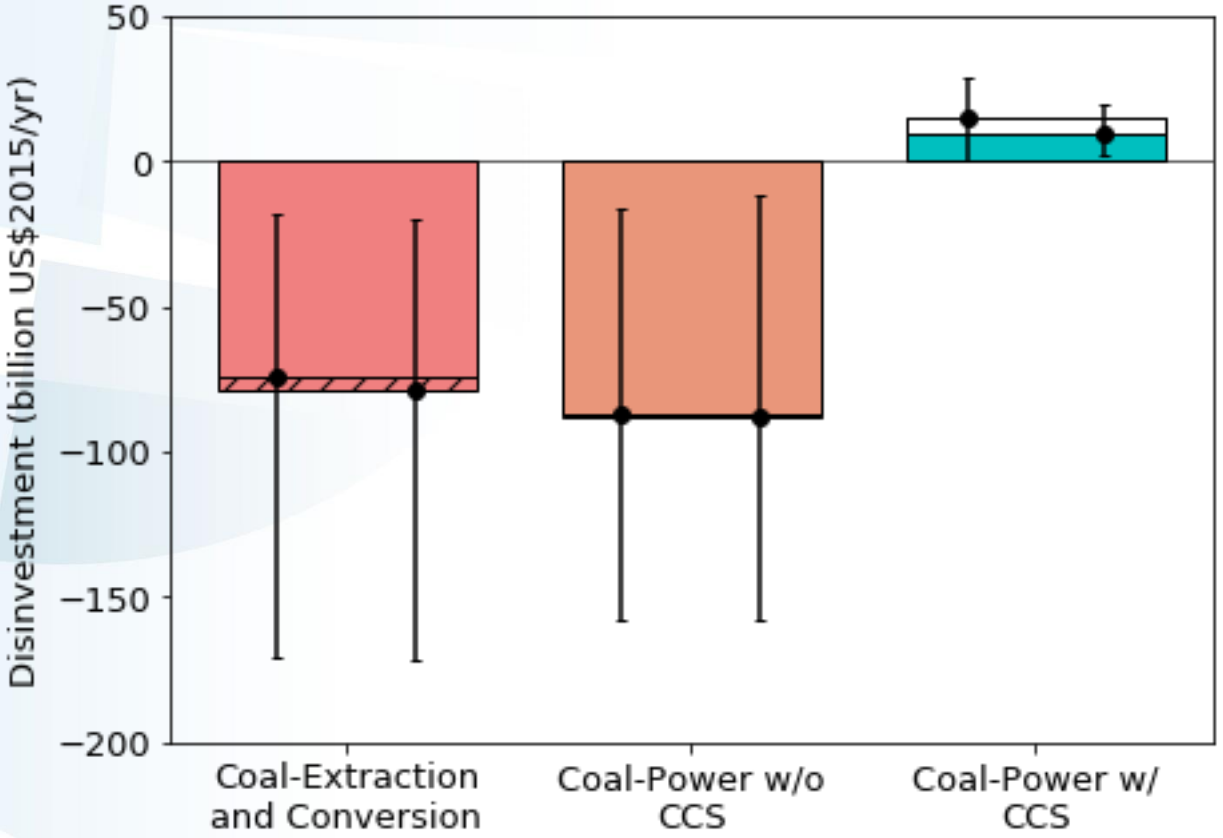
# Regional Disinvestments (1.5C vs 2C)

## 2015-2050, compared to baseline




*McCollum et al, (under embargo – do not cite or quote)*

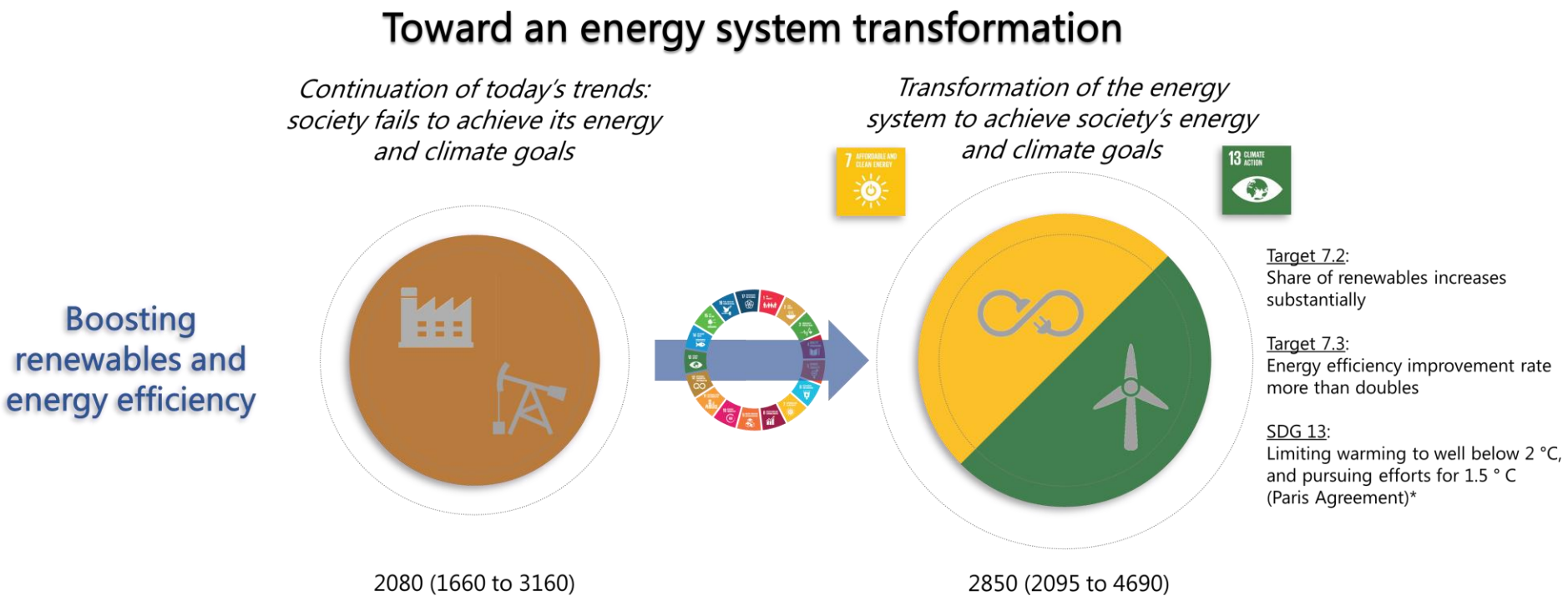
# Coal is phased out with only small investment into CCS




*McCollum et al, (under embargo – do not cite or quote)*


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

# Comparing Energy transformation investments to other investment needs



# Toward the achievement of other SDGs

*If the energy system remains largely the same*

*If the energy system is transformed*

Energy access

50 (50 to 85)


200 (125 to 320)

Target 7.1:
Ensure universal access to affordable, reliable and modern energy services

Policy costs to achieve 100% clean fuel adoption throughout the world via subsidies for cookstoves and fuels.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# Thank you

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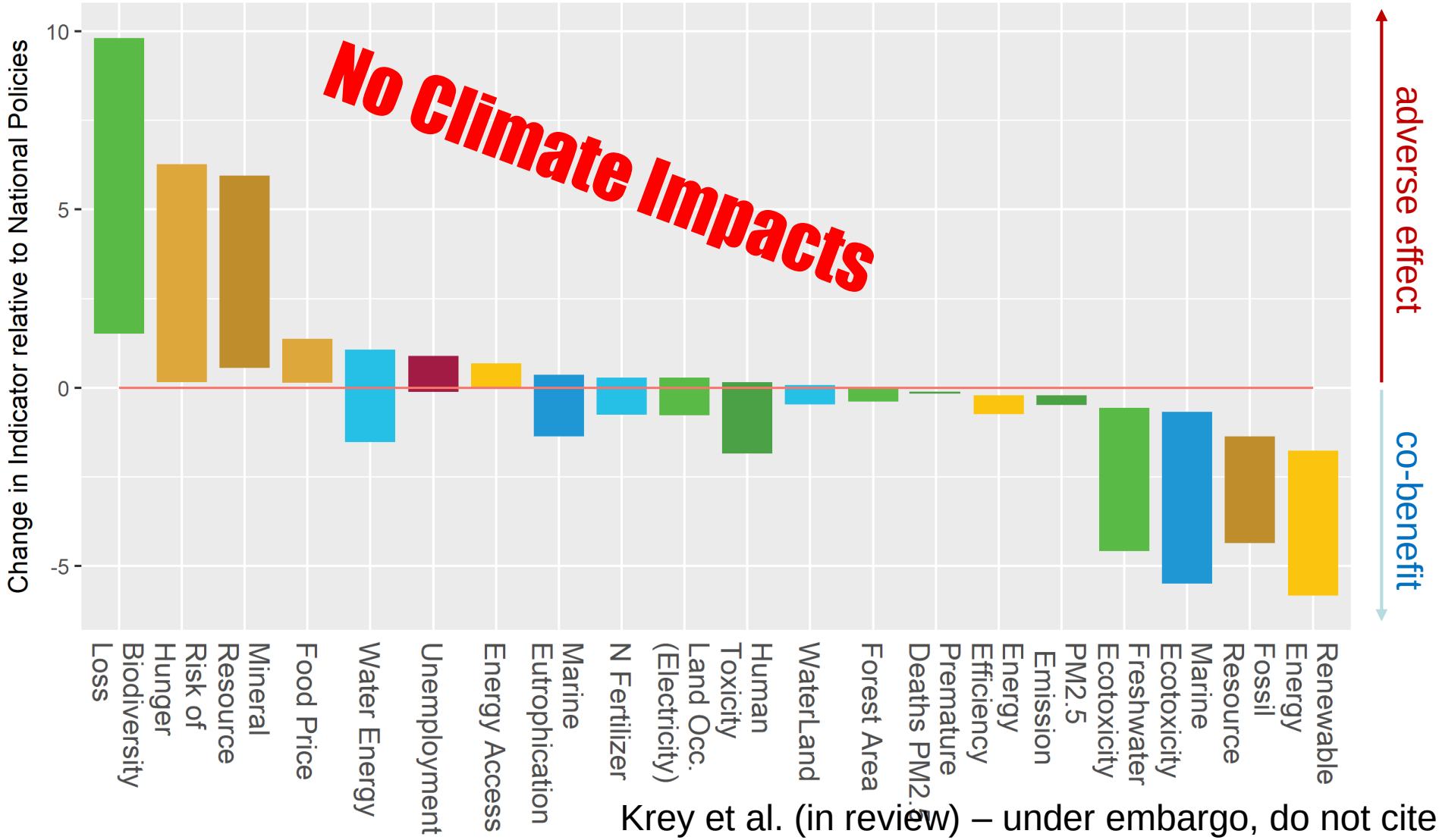
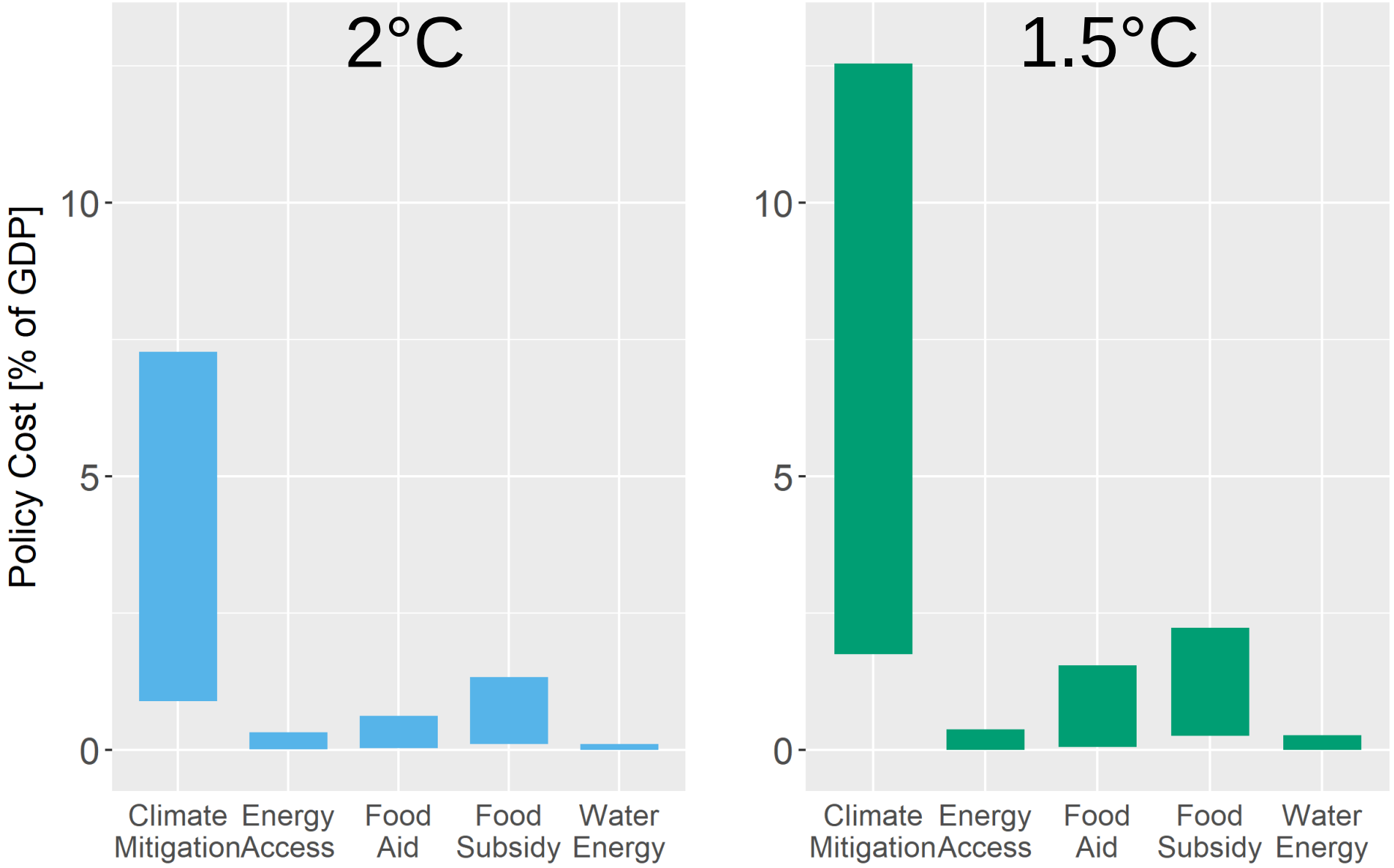
# Climate Policy Impact on SDG: 1.5°C

## 2050




Krey et al. (in review) – under embargo, do not cite

# Integrated Policy Costs – 2050

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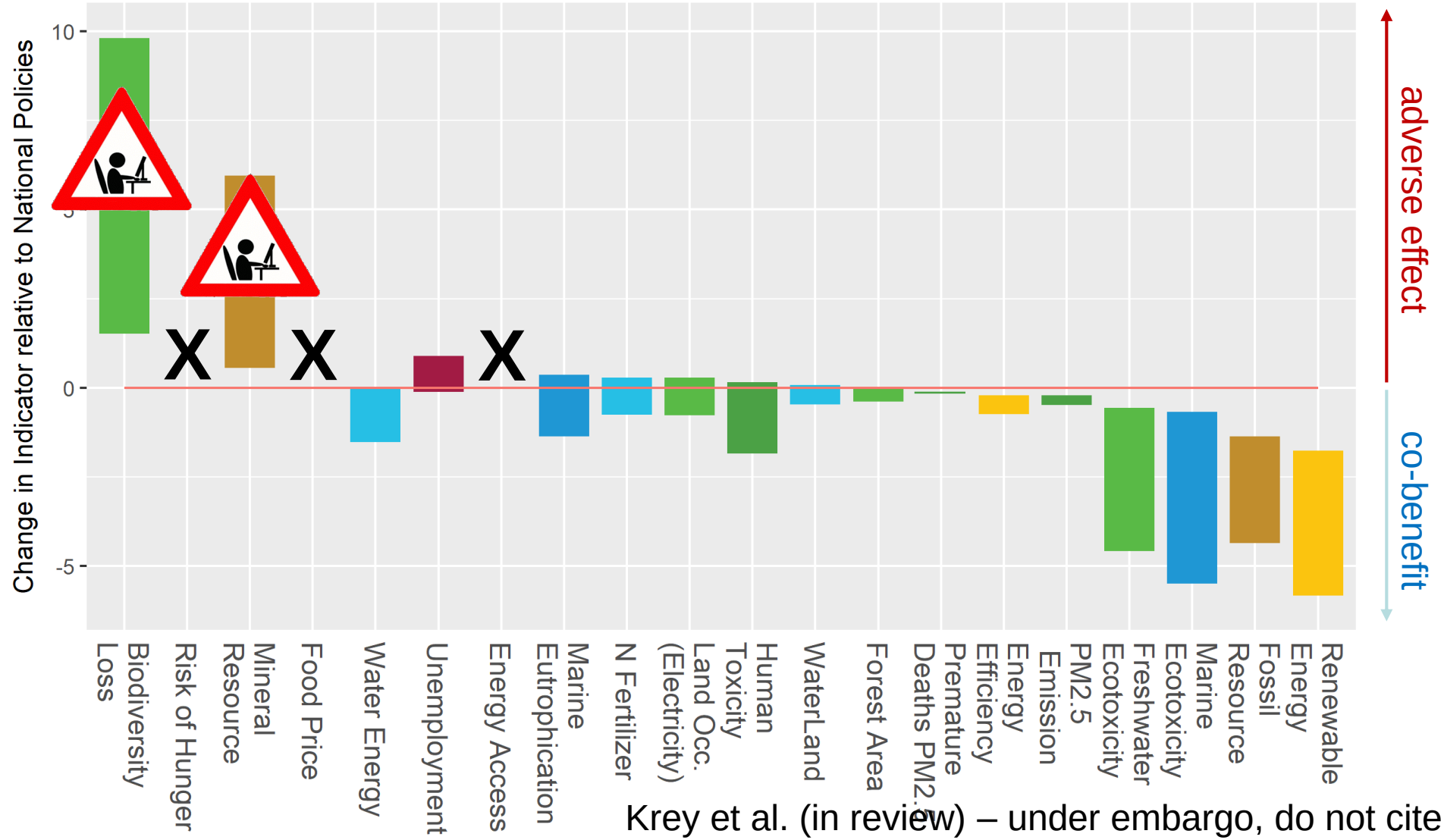
# Climate Policy Impact on SDG: 1.5°C

## 2050




Krey et al. (in review) – under embargo, do not cite

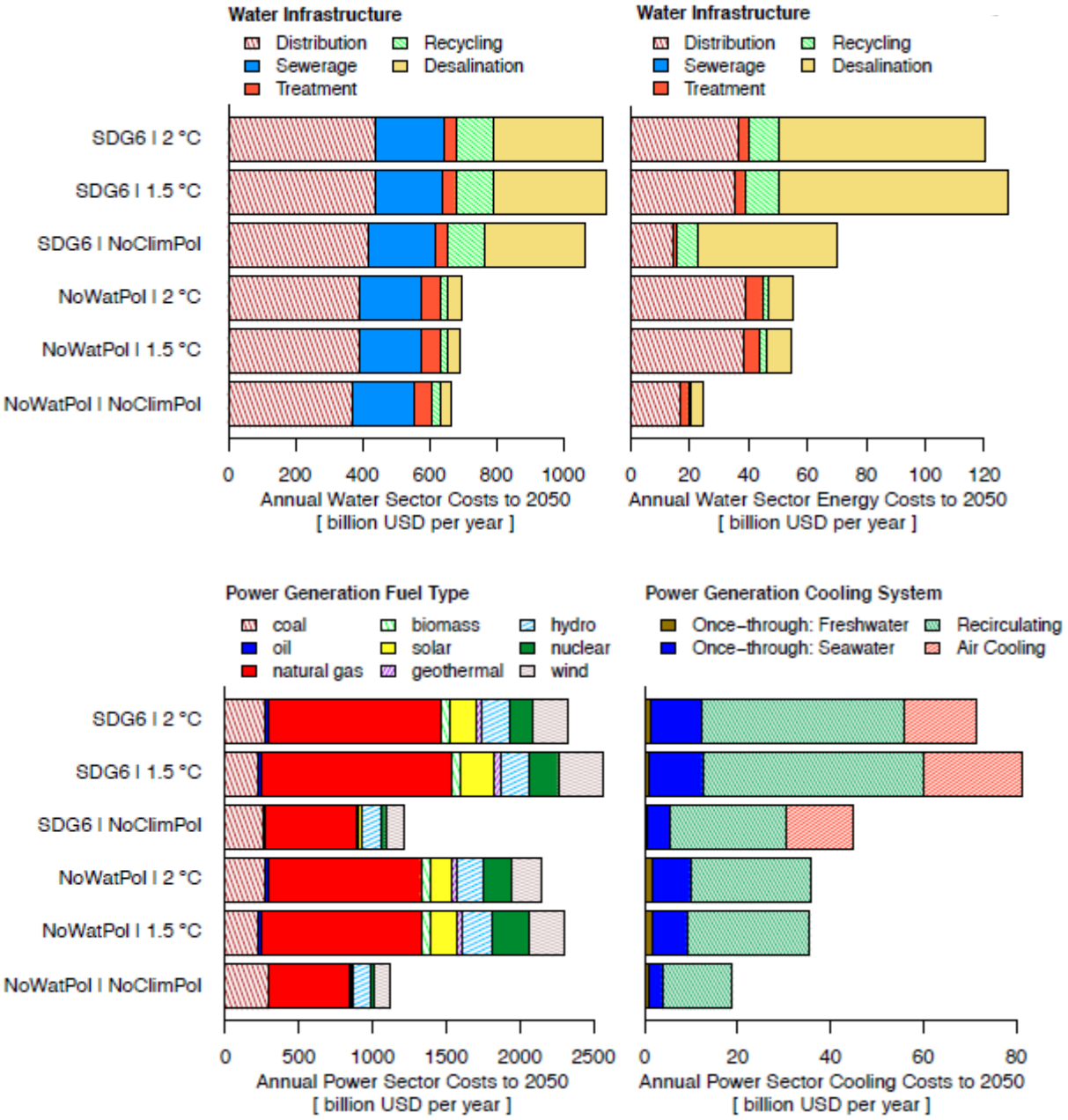
# Balancing Trade-offs Between Water and Energy Investments

Integrated assessment of **global energy** and **water infrastructure pathways**

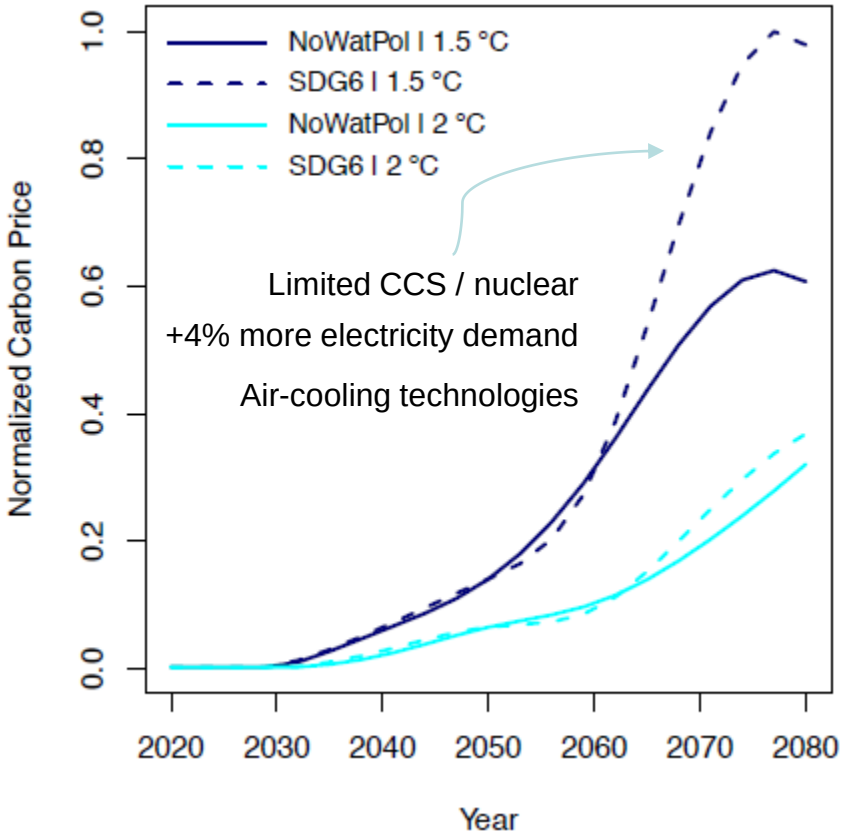
- Interactions between **clean water (SDG6)** and **climate change mitigation** through energy systems

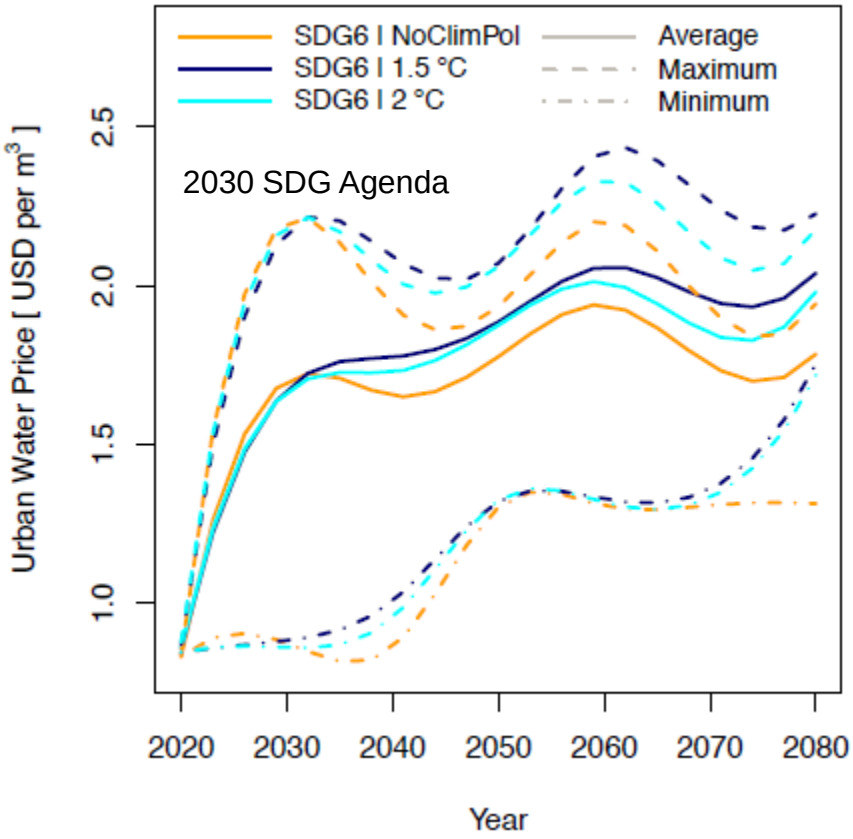
**Global power sector costs** are between **8 and 11 % higher when SDG6 added to 1.5 ˚C**

- SDG6 access and efficiency targets accelerate expansion of electricity-intensive water sources
- SDG6 water efficiency targets limit water-intensive low-carbon energy technologies



# Climate and Water Policy Interactions




**Water costs increasing under decarbonization**

- SDG6 scenarios are the most vulnerable due to the prevalence of electricity-intensive water infrastructure

# Integration of global and national perspective

**Framing within global targets**

**Boundary conditions,**
e.g. interntional feedbacks, techno-economics, resource prices

**Global transformation pathways**

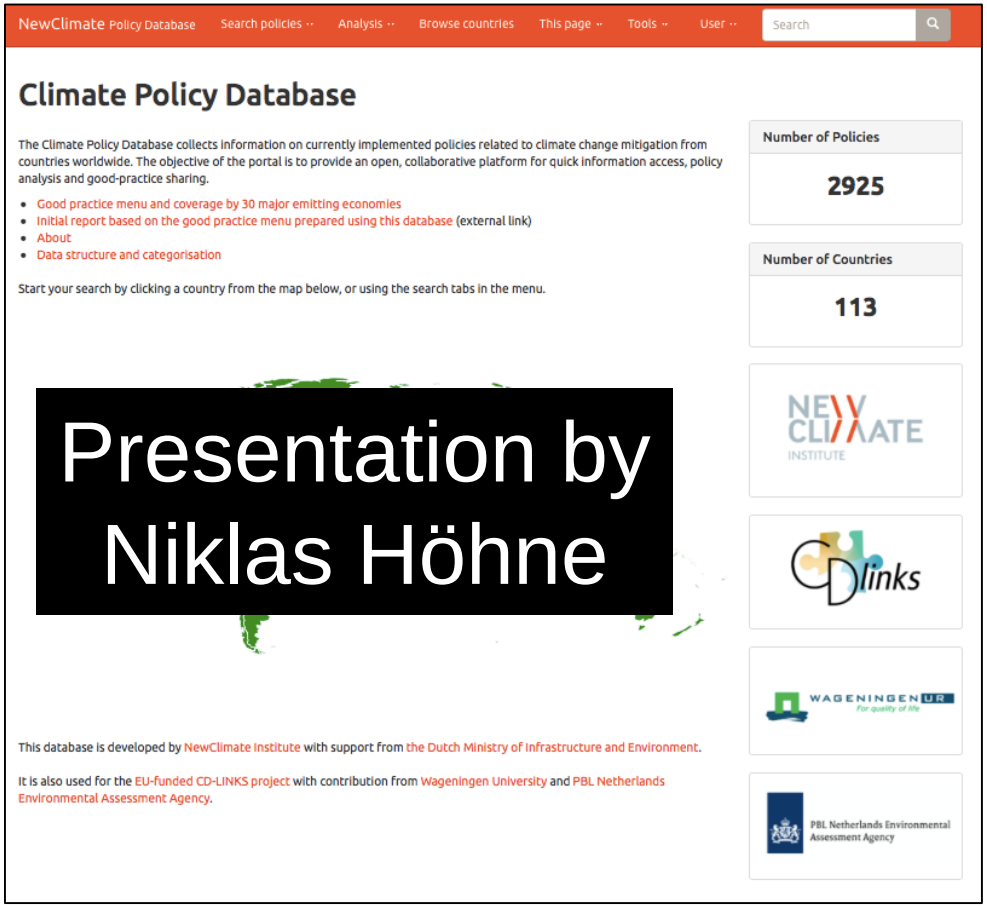
**National low-carbon development pathways**

**Improved representation of national circumstances and policy priorities**

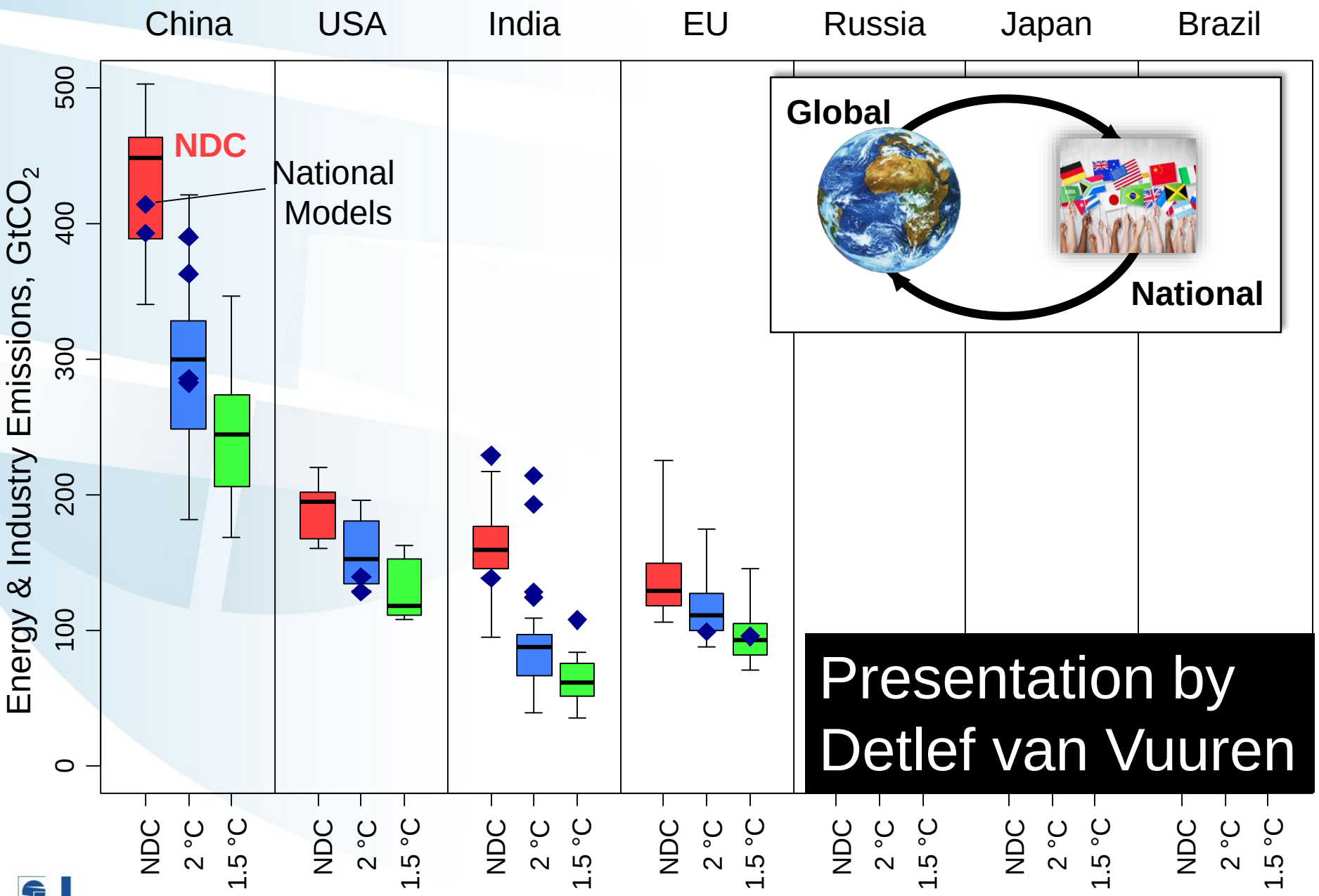
# CD-LINKS Partners

# Climate Policy Database

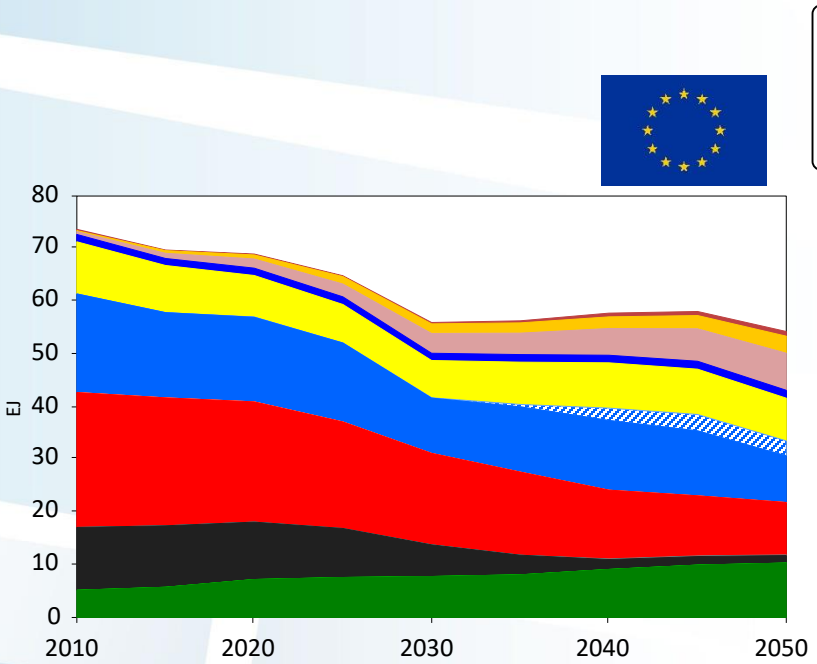
- **www.climatepolicydatabase.org**
- **Aim:** open, collaborative platform to gather all climate-related policies, with full geographical and sectoral coverage.
- **Platform:** Semantic Media Wiki, an open-source, database driven extension of MediaWiki
- Niklas Höhne:
  niklas.hoehne@wur.nl
  n.hoehne@newclimate.org

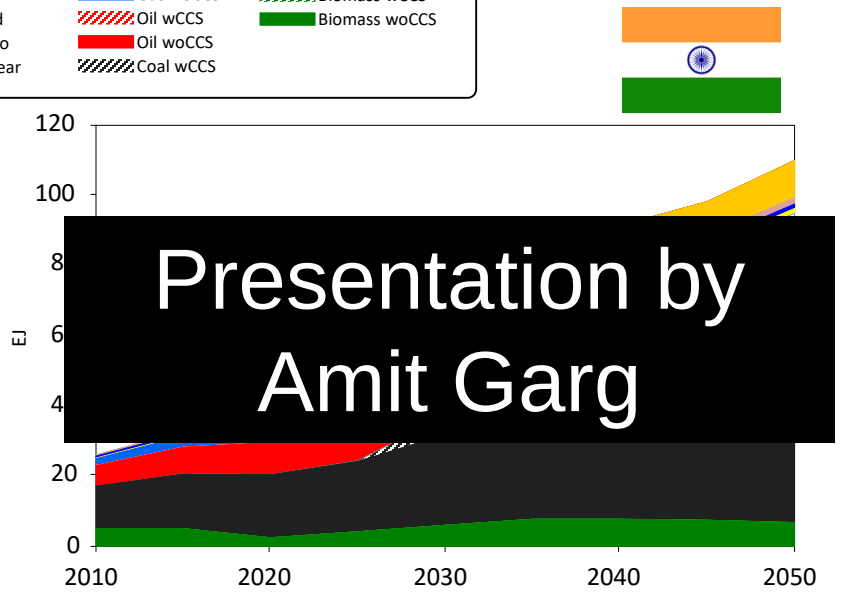


# Cumulative emissions 2010-2050, by region

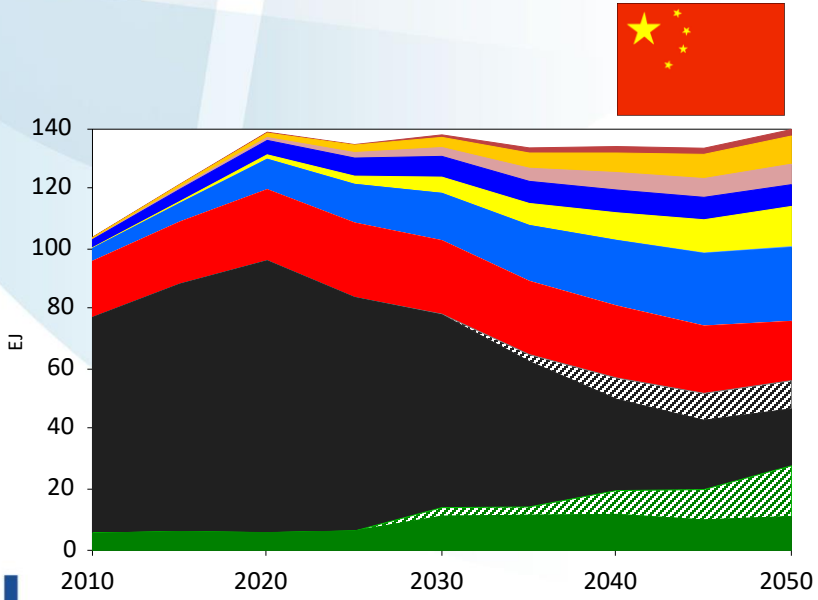


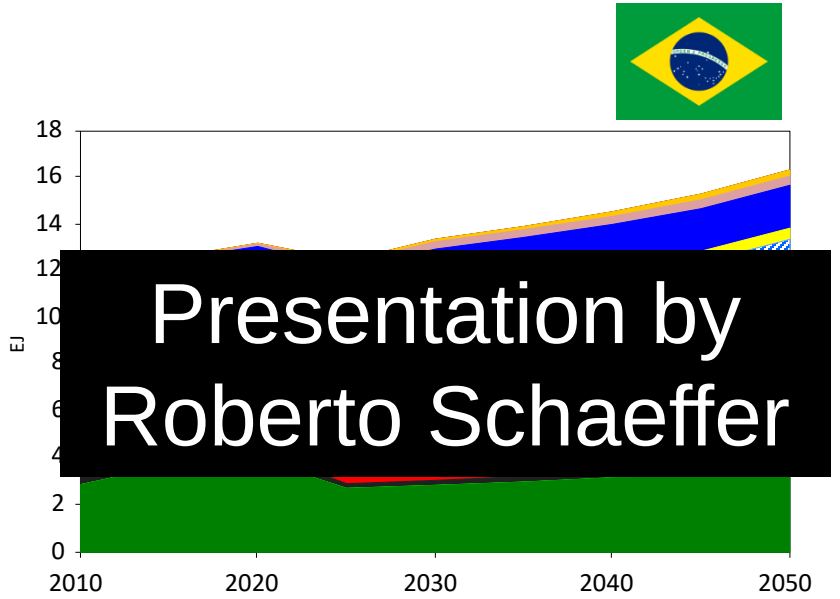
# Primary Energy – Results from National Teams




Presentation by Amit Garg




Presentation by Roberto Schaeffer

# Side event agenda

**Keywan Riahi, IIASA**

*Introduction and Overview of Decarbonization Pathways*

**Detlef van Vuuren, PBL**

*Burden Sharing and regional carbon budgets*

**Volker Krey, IIASA**

*Sustainable development implications*

**Niklas Höhne, WU**

*Policy Perpective on the NDCs*

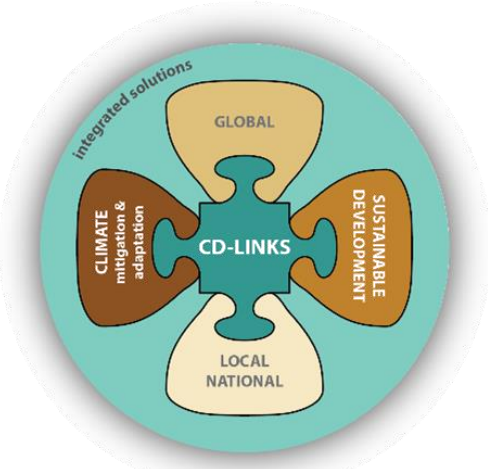
**Roberto Schaeffer, COPPE**

*Mid-century decarbonisation pathway for Brazil*

**Amit Garg, IIM**

*Mid-century decarbonisation pathway for India*

***Concluding Panel with Tom van Ierland, EC and Guido Schmidt-Traub, SDSN***

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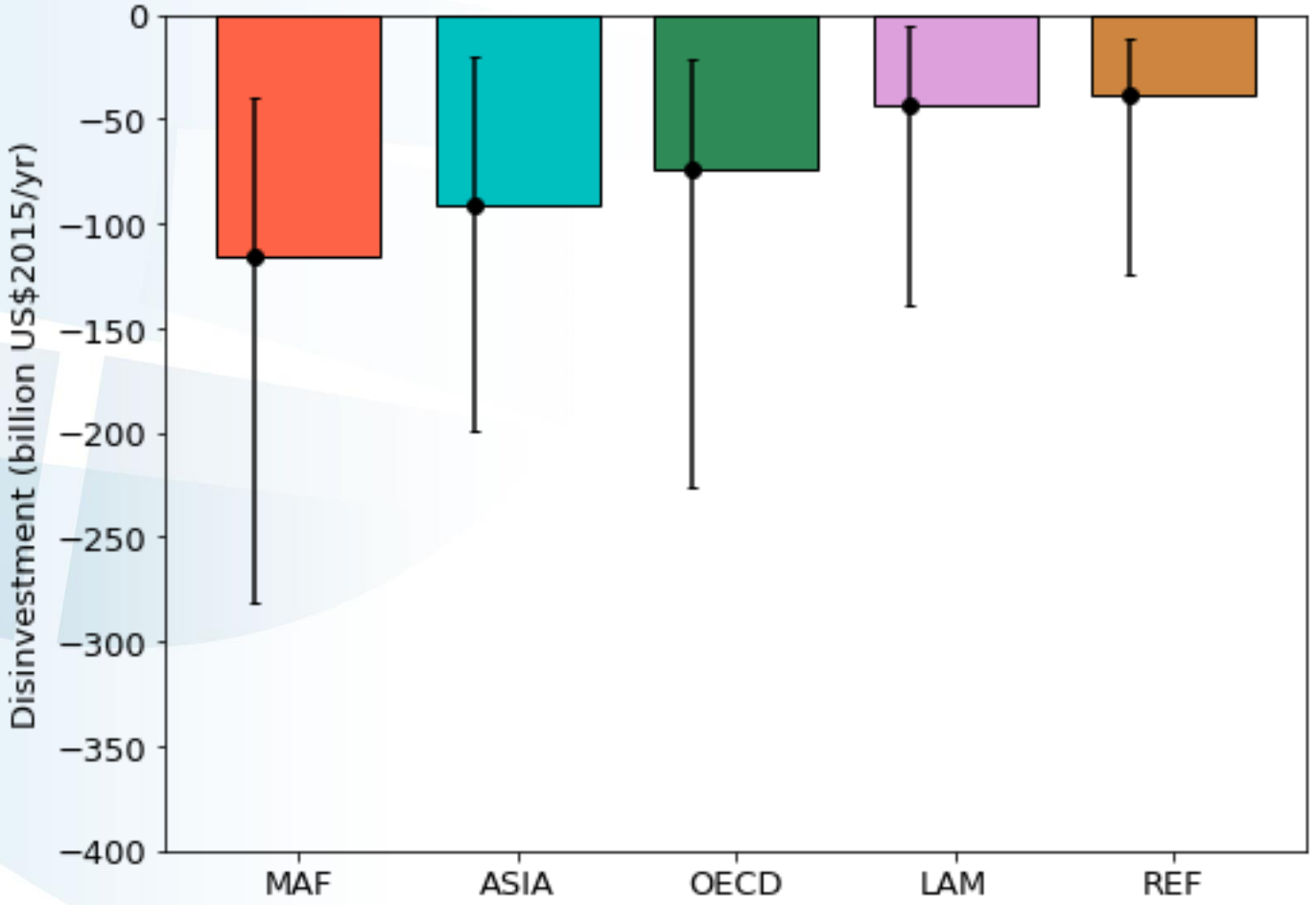
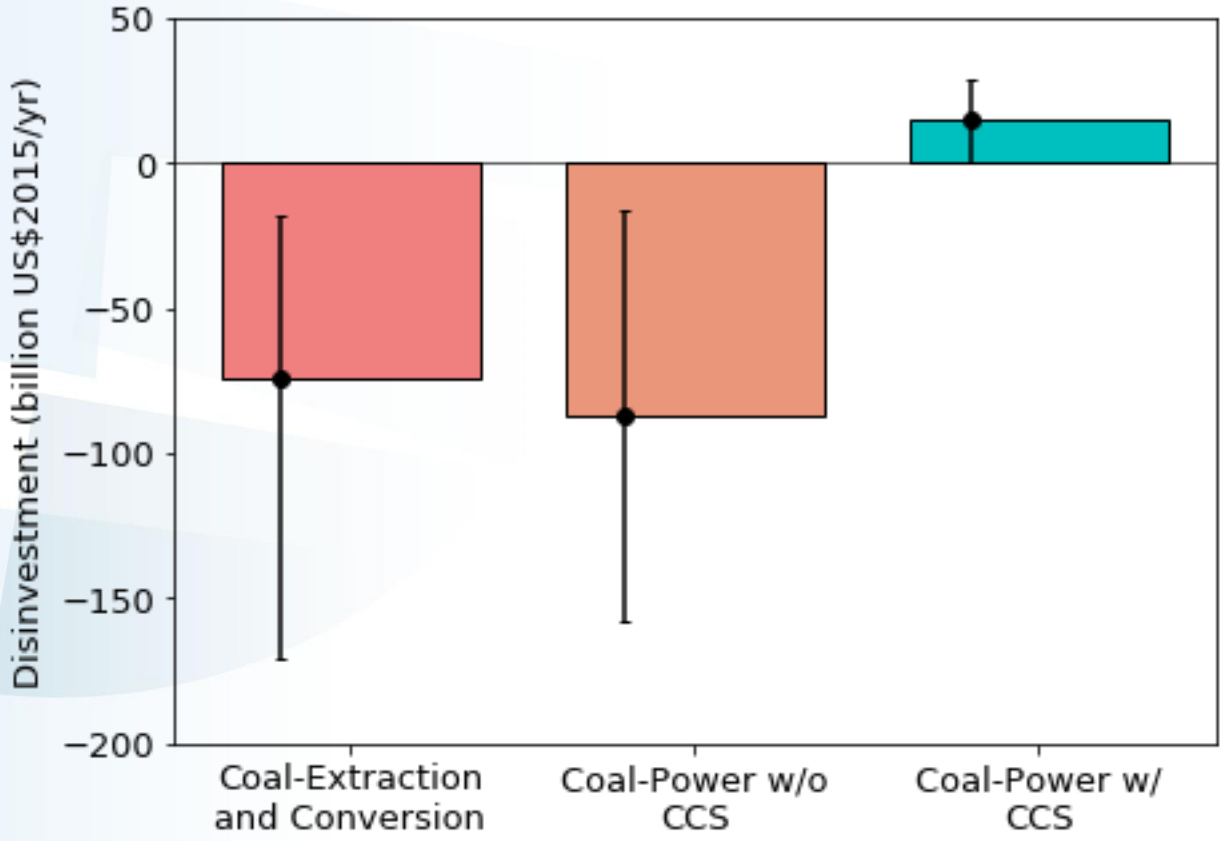
# Regional Disinvestments




*McCollum et al, (under embargo – do not cite or quote)*

# Coal phase-out

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# Global GHG 2030