



POTSDAM INSTITUTE FOR  
CLIMATE IMPACT RESEARCH

# A sustainable development pathway for climate action within the UN 2030 Agenda

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NAVIGATE webinar, Oct 05 2021

# Climate action and sustainable development



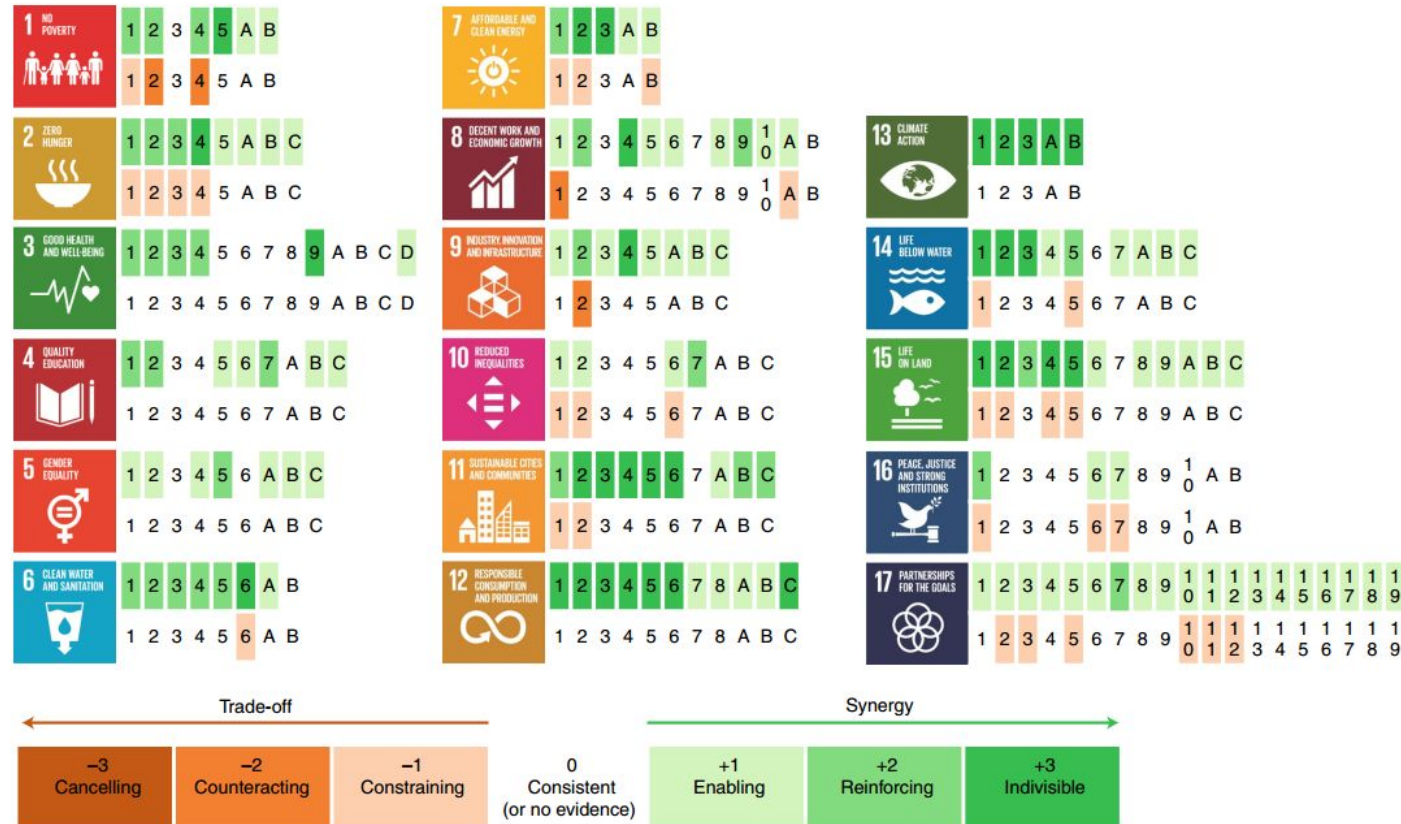
“...strengthen the global response to the threat of climate change, in the context of **sustainable development** and **efforts to eradicate poverty**”

# Climate action and sustainable development



**SDG 13: “Take urgent action to combat climate change and its impacts”**

# Climate action and SDGs are interconnected



## Projection for 2100 warming levels

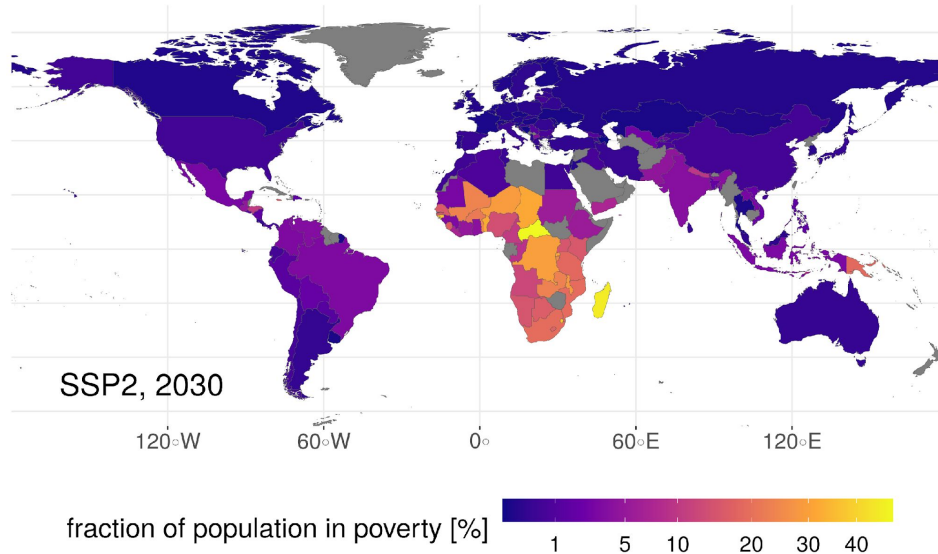


May 2021 Update



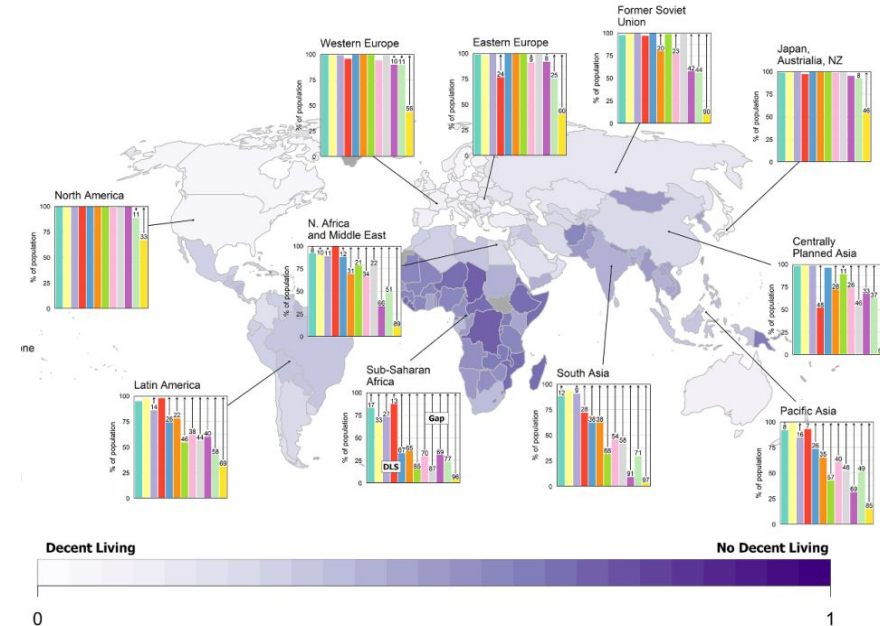
# The world is not on track towards the targets

Projection for 2030 poverty rates (pre-COVID)



-> 350 million people left in extreme poverty by 2030  
([Soergel et al. 2021, Nature Communications](#))

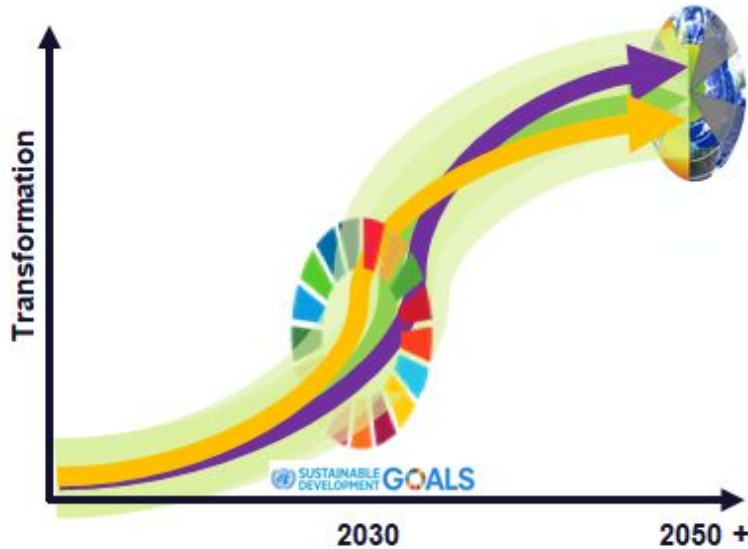
Gaps in decent living standards



Kikstra et al. (2021)



# A sustainable development pathway (SDP)

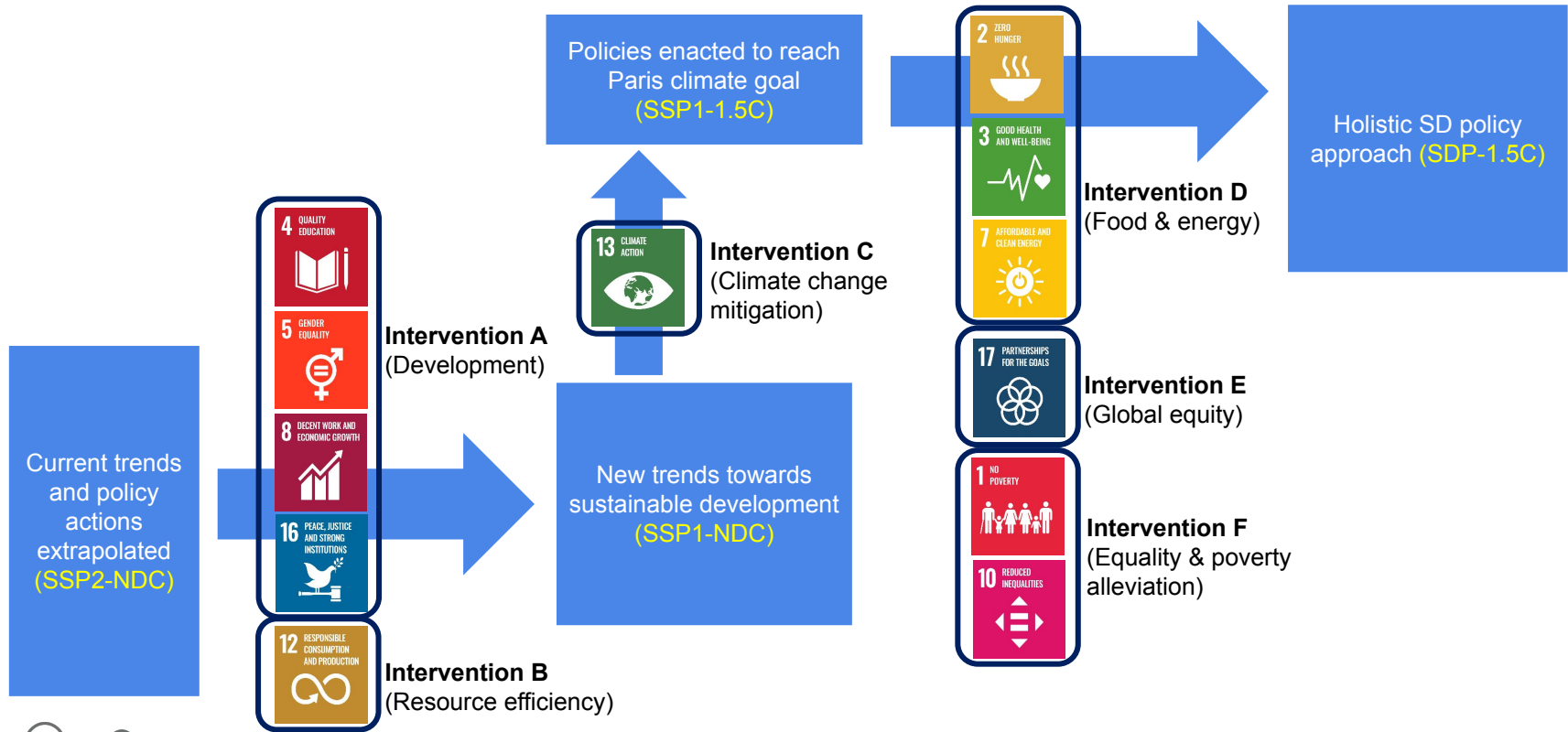


Source: TWI2050 Report 2018  
<http://pure.iiasa.ac.at/id/eprint/15347/>

SDP as “target-seeking” scenario:

- as much progress towards SDGs as possible by 2030
- continue sustainable development towards 2050 and beyond
- meet climate targets of the Paris Agreement
- respect Planetary Boundaries for other environmental indicators

# A sustainable development pathway (SDP)

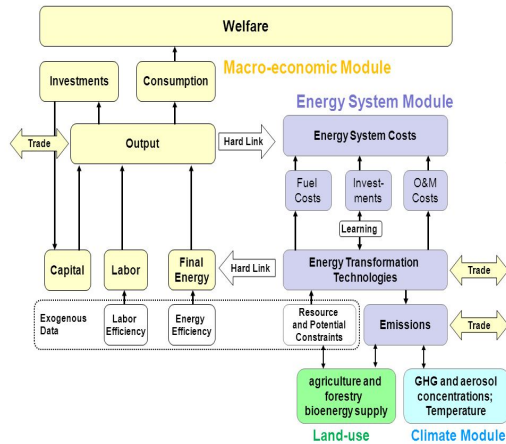




# REMIND-MAgPIE framework

# REMIN

(e.g. Luderer et al. 2015)



Land-use emi.,  
Bioen. price

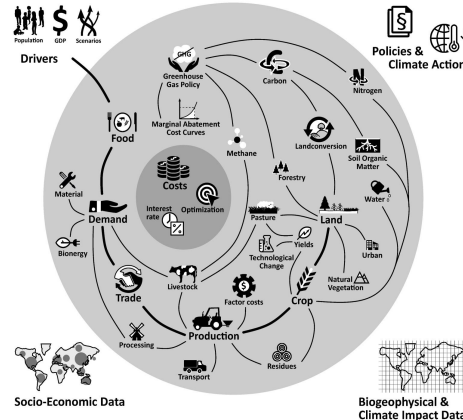


Carbon price,  
Bioen. demand

## Energy and land-use system are interlinked.

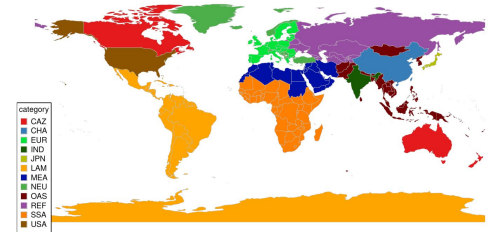
# MAgPIE

(Dietrich et al. 2018)



## Resolution:

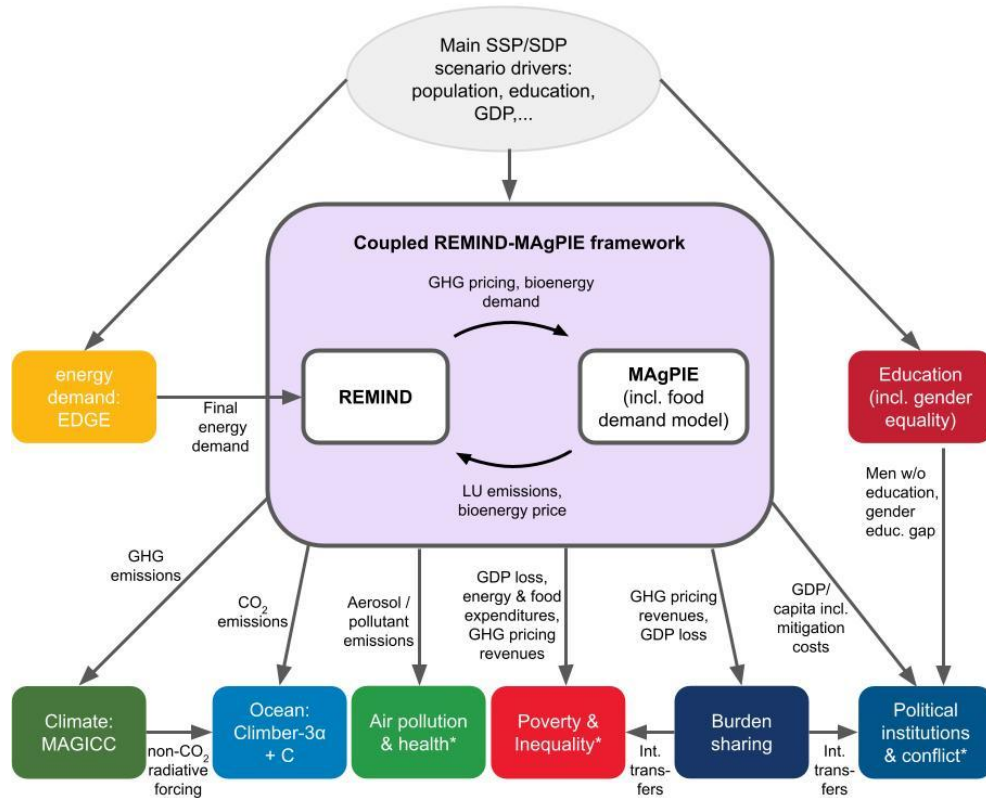
- Flexible, default: 12 regions
- Large countries as regions
- Small countries grouped



## Climate policy setting:

- Policy starts after 2020
- Staged accession:  
convergence to global  
carbon price in 2050

# Modelling toolbox + indicators

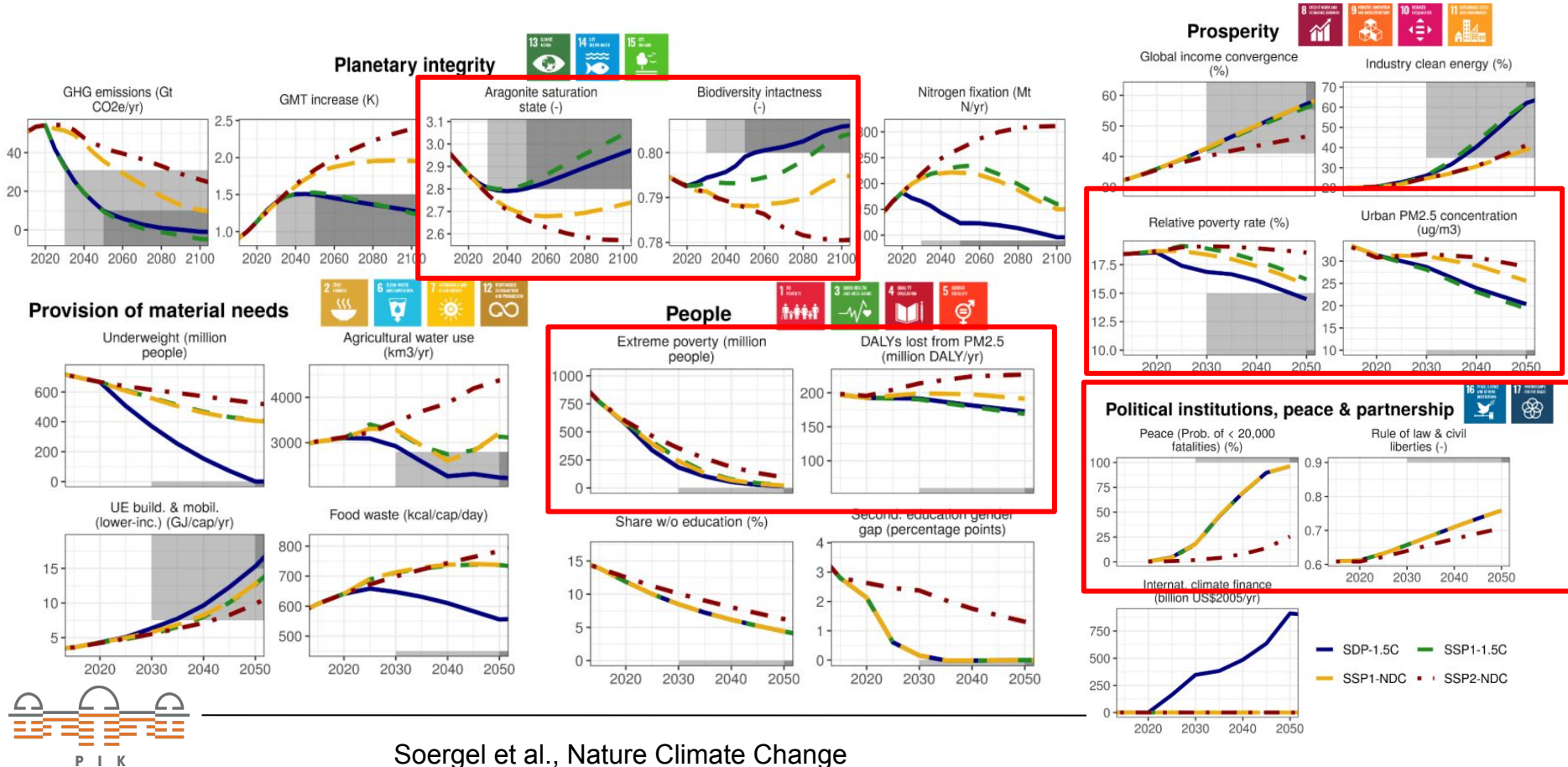


\* post-processing models use additional SSP(-based) inputs, e.g. Gini coefficients, population downscaling, education projections

- SSP scenarios as basis
- energy-economy-land-climate modelling framework REMIND-MAgPIE as workhorse
- additional downstream models for SDG indicators
  - Ocean (SDG 14)
  - Air pollution & health (SDG 3,11)
  - Inequality & Poverty (SDG 1,10)
  - Political institutions & violent conflict (SDG 16)

**Goal: quantify indicators or meaningful proxies for all 17 SDGs**

# Comprehensive coverage of the SDG space



# Interventions: Food and energy

## Intervention D (Food & energy)



- transition to zero hunger and healthy and sustainable diets (EAT-Lancet) by 2050 (**ScAs**)
- meet energy demand for decent living standards in developing regions (**ScAs / MoDy**)
- reduce energy consumption in high-income regions (**ScAs / MoDy**)
- additional energy and land system sustainability policies, e.g. coal phase out, BECCS limit, biodiversity hotspot protection (**ImPo: constraint**)

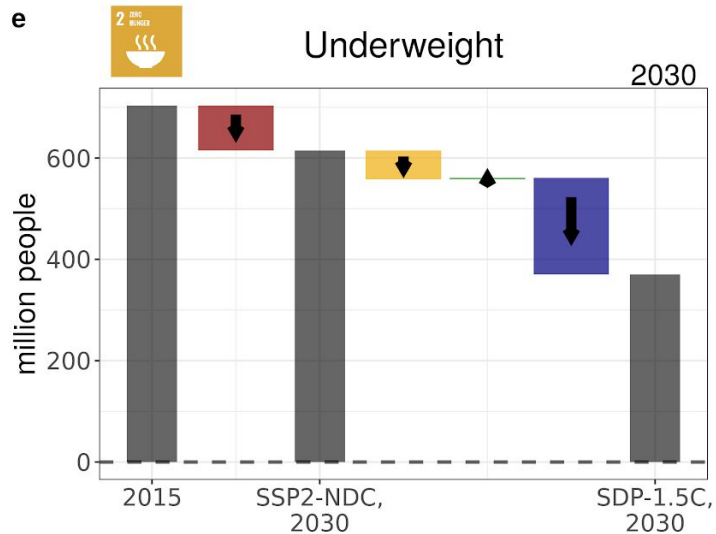
Legend\*: **S**cenario **A**ssumption; **I**mplemented **P**olicy; **M**odel **D**ynamics



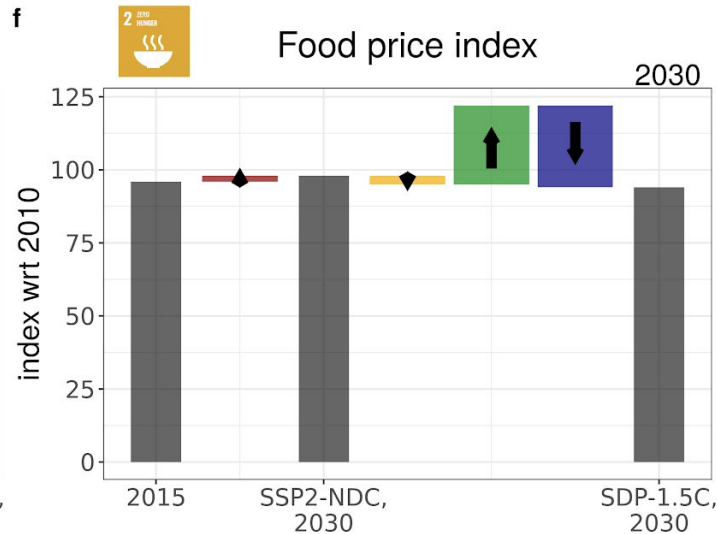
\* see Supplementary Tables of paper for detailed description

# Effects of the interventions: food

e



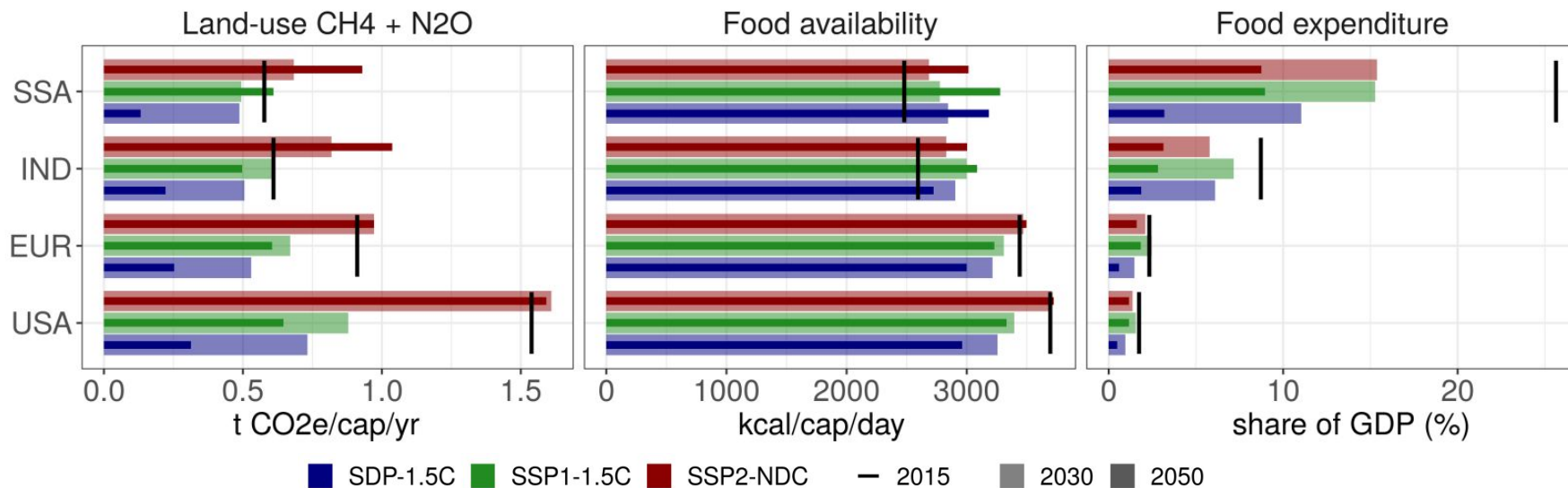
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- trend continued
- development
- climate policy
- SD interventions

- **Transition to healthy and sustainable nutrition (EAT-Lancet)**
- **Prevalence of underweight is substantially reduced (zero by 2050)**
- **Effect of climate policy on food prices is fully compensated.**

# Food and land-use system



## SDP: Transition to sustainable diets:

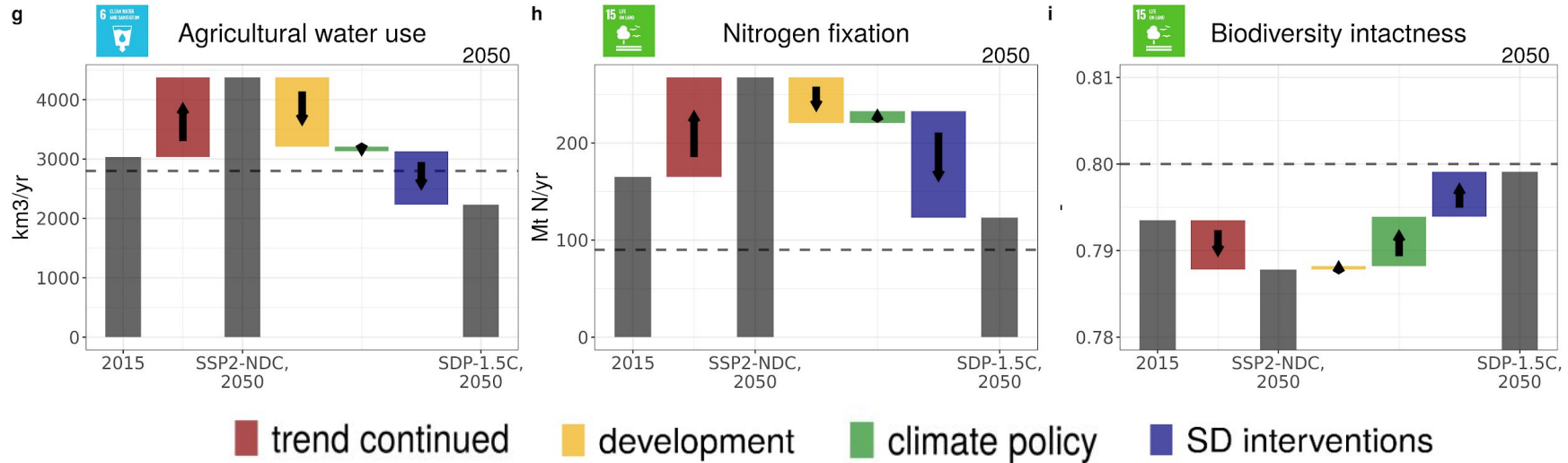
- rapid reduction of agricultural emissions
- slightly (100 Gt) higher 1.5°C-compatible CO<sub>2</sub> budget





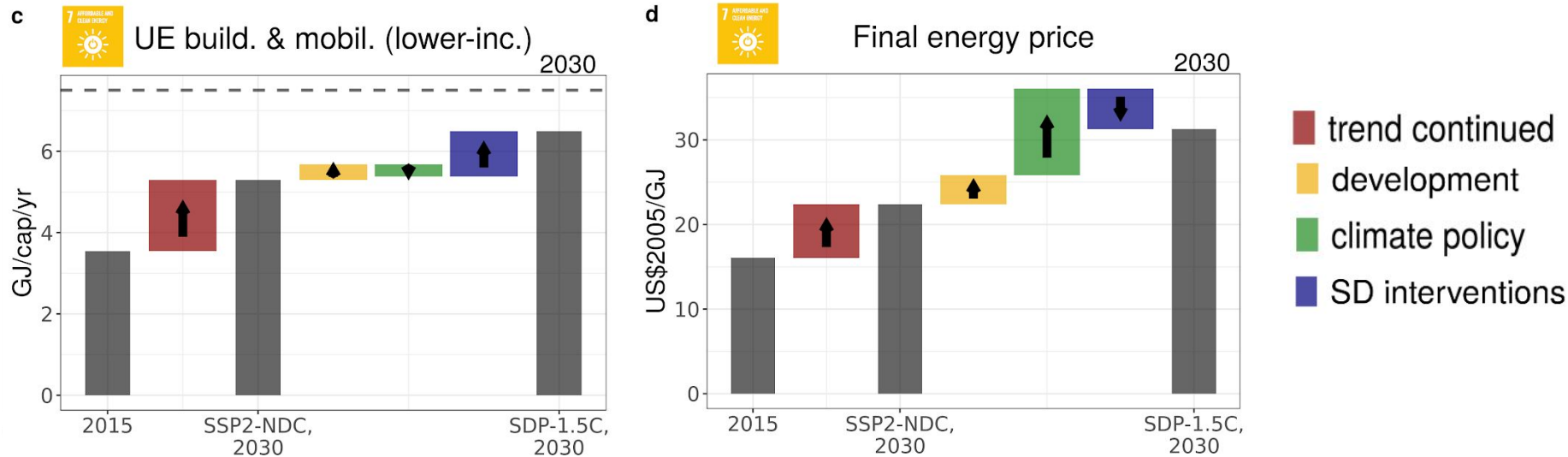
# Effects of the interventions: land & water

## Planetary boundaries in 2050



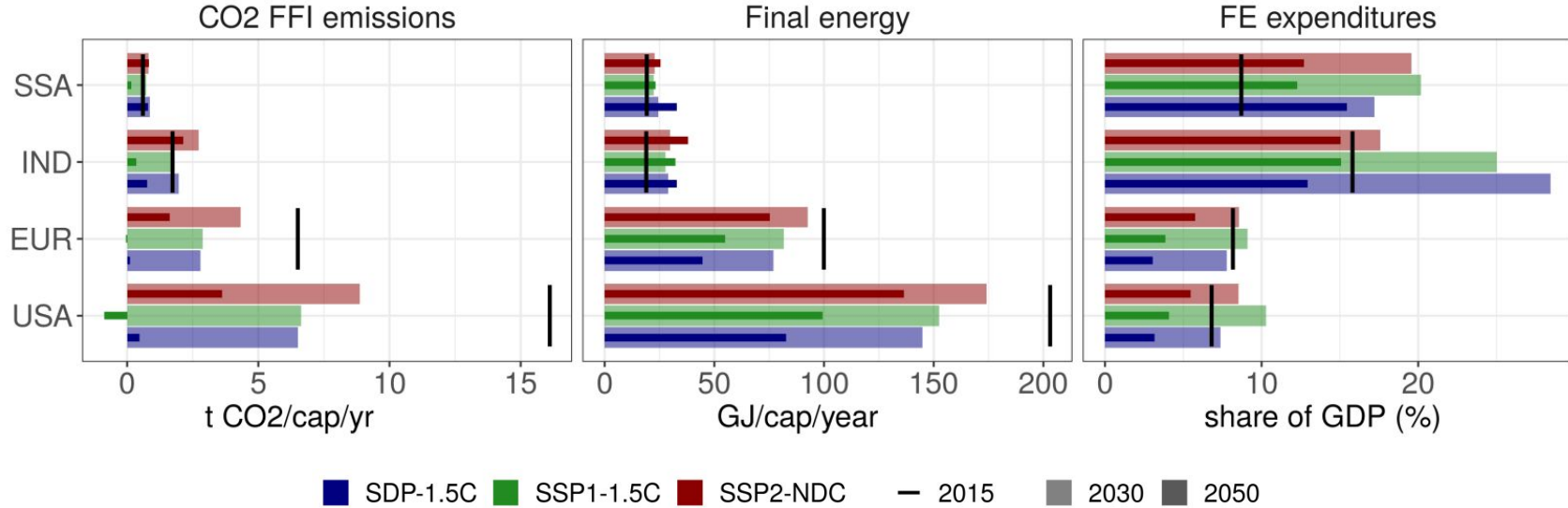
**Large co-benefits of healthy and sustainable nutrition for multiple planetary boundaries.**

# Effects of the interventions: energy



- improved availability of modern energy services in lower-income regions
- ambitious shift to sustainable lifestyles in high-income regions
- price increase caused by climate policy is dampened

# Energy system



## SDP energy demands:

- ambitious reductions in high-income regions
- higher, SDG-compatible energy demands in low-income regions
- Trade-off: higher energy expenditures in near term (compensated, see below)

# Interventions: Global equity & poverty alleviation

## Intervention E (Global equity)



- international redistribution of part of the carbon pricing revenues  
-> 'climate & development finance'  
(ImPo: post-proc)

## Intervention F (Equality & poverty alleviation)

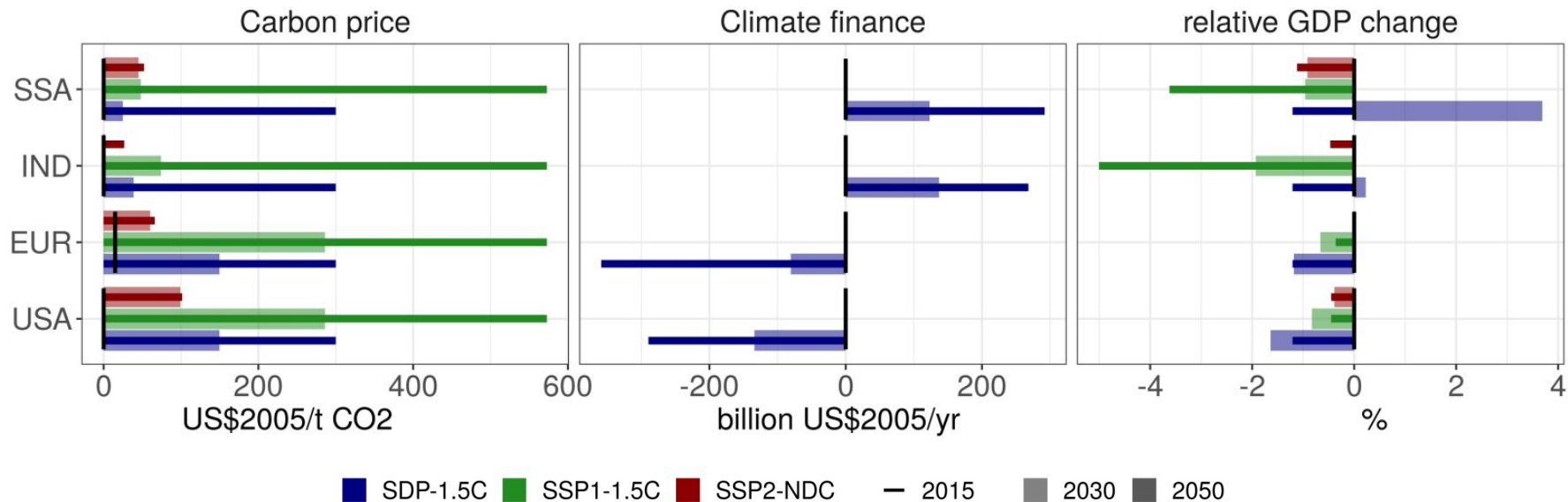


- national redistribution of carbon pricing revenues (+ int'l transfers)  
as equal-per-capita 'climate dividend'  
(ImPo: post-proc)

Legend\*: **S**cenario **A**ssumption; **I**mplemented **P**olicy; **M**odel **D**ynamics

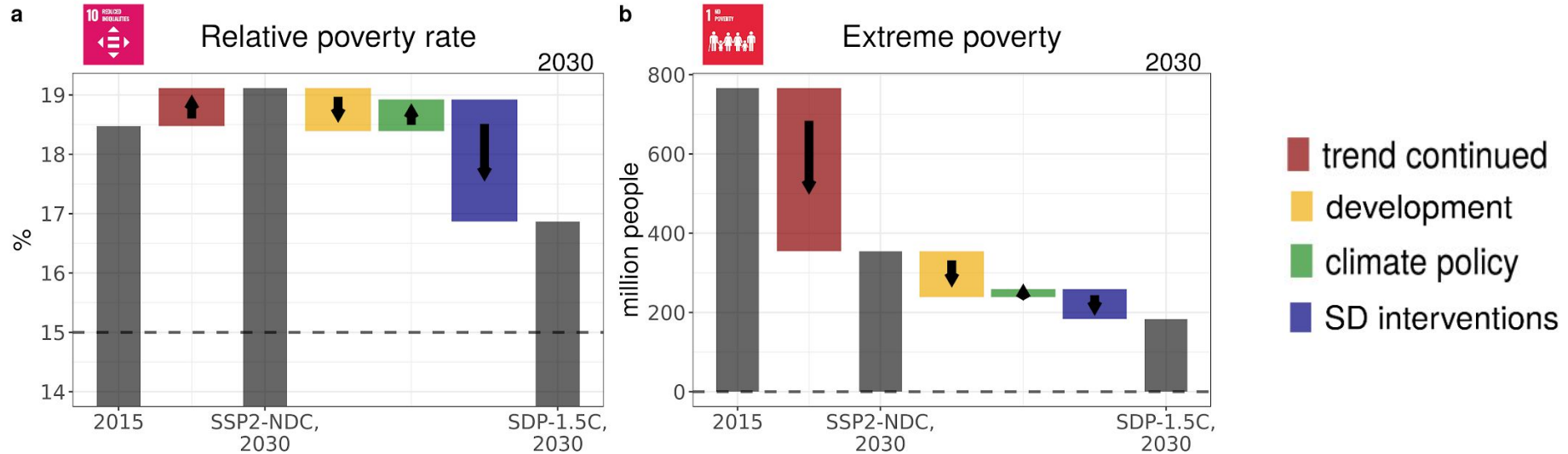
# Burden sharing & climate & development finance

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- SDP: Carbon prices roughly halved compared to SSP1-1.5C
- differentiated carbon prices & international climate finance: low policy costs for developing regions
- redistribution of carbon pricing revenues reduces inequality and poverty

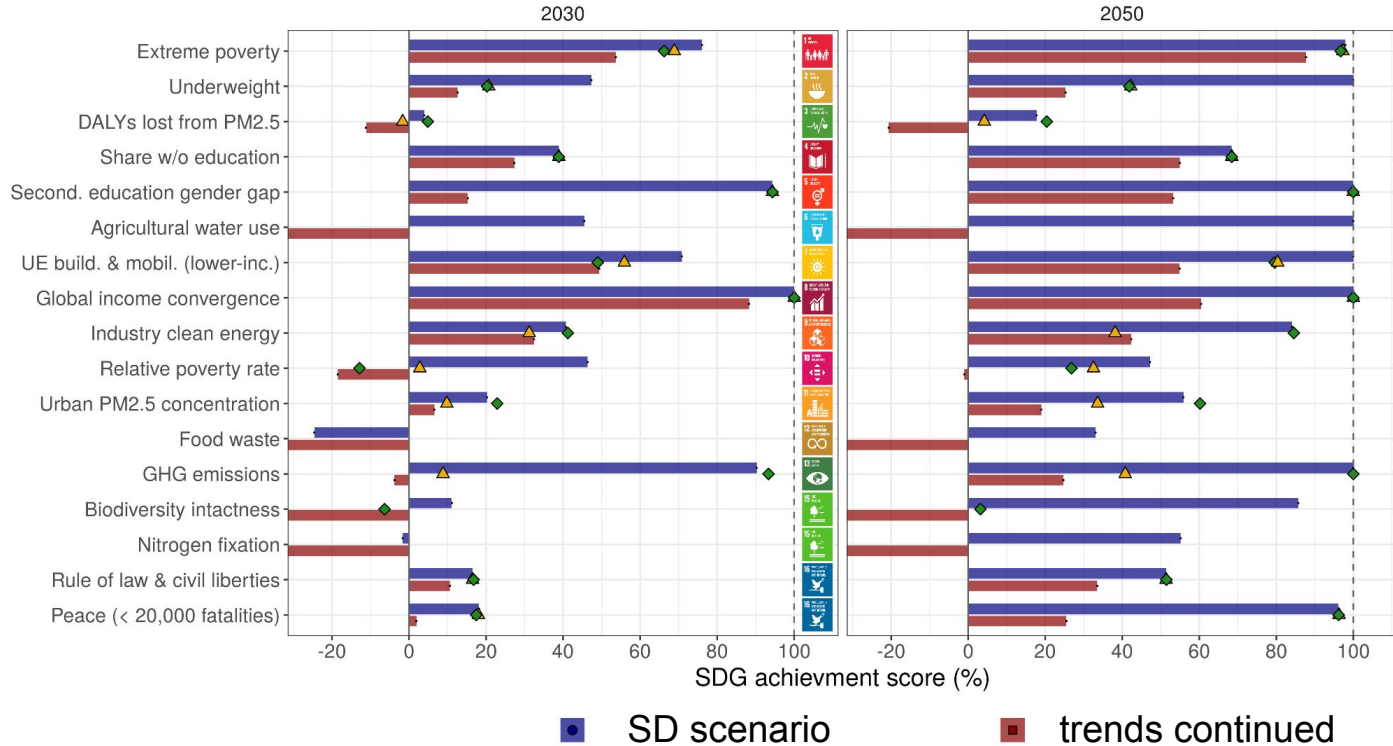
# Effects of the interventions: inequality & poverty



- **Redistribution policies funded from carbon pricing revenues reduce inequality and poverty.**
- **Climate policy trade-off is more than compensated.**

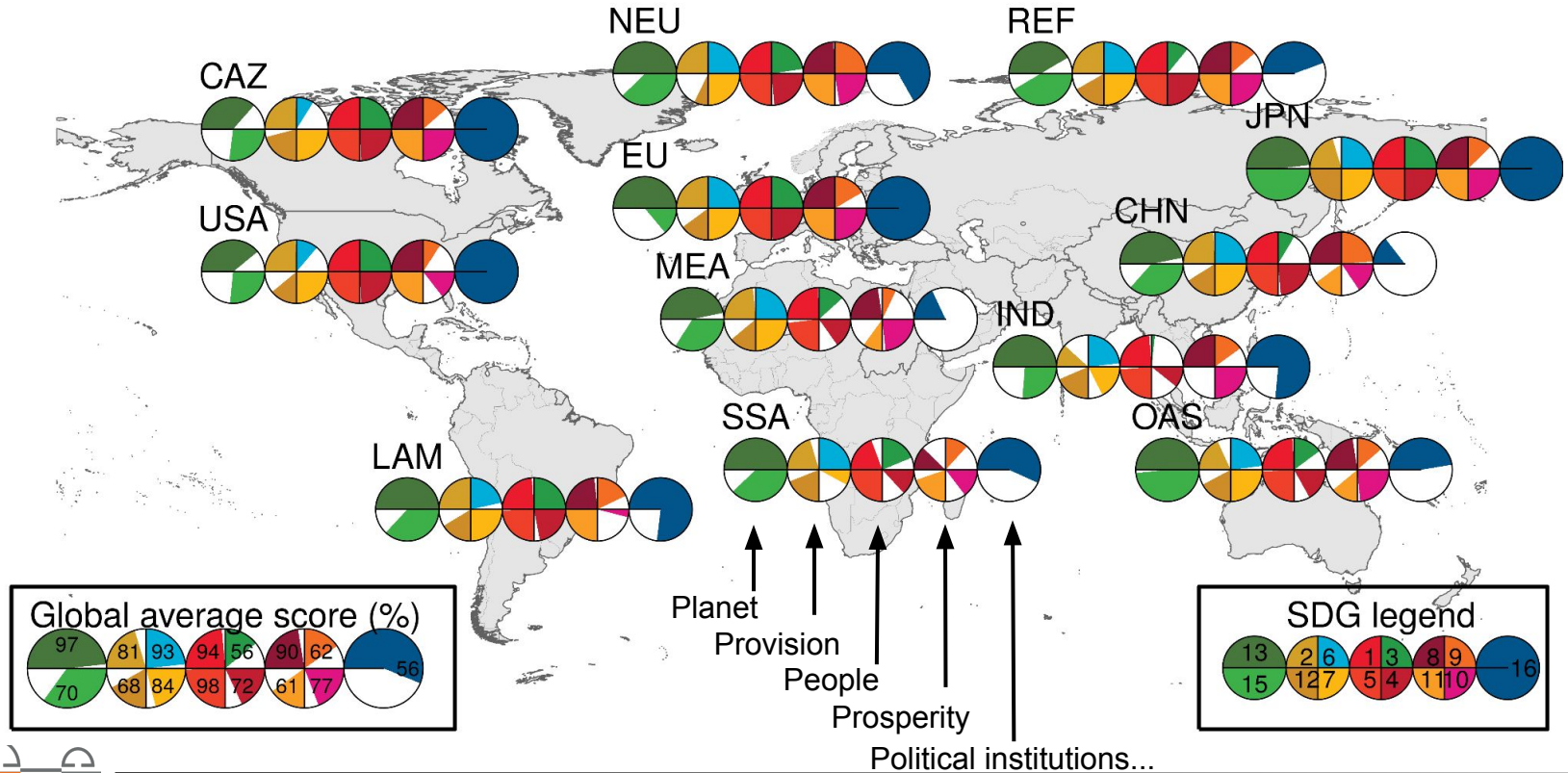


# Global SDG achievement and gaps

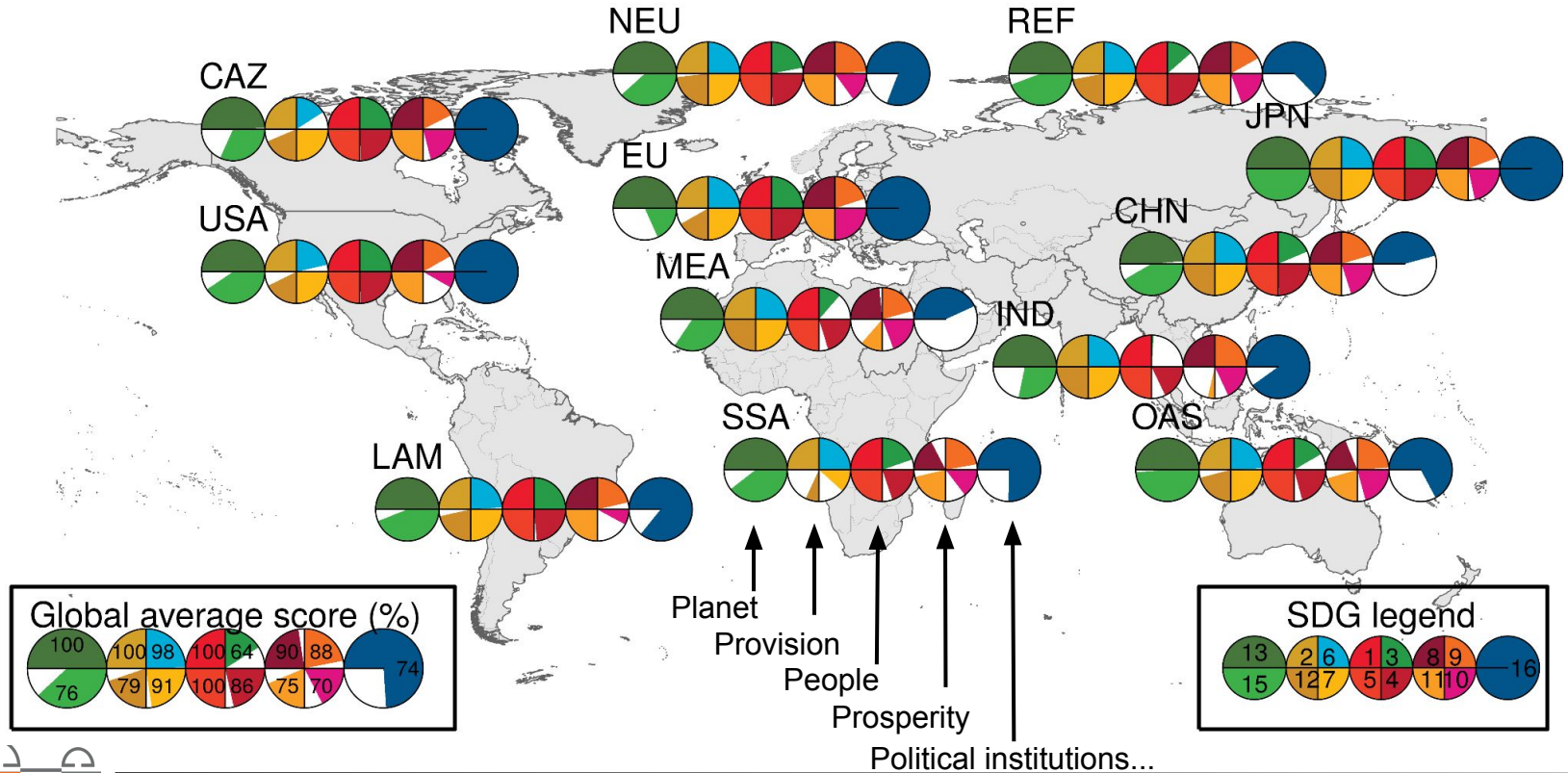


- SDP scenario improves substantially over reference scenario across nearly all SDGs.
- Nonetheless: many targets are difficult to meet by 2030.
- Further progress until 2050 can close most of the gaps.

# Regional SDG achievement and gaps (SDP 2030)



# Regional SDG achievement and gaps (SDP 2050)



# Conclusions

- **development, resource efficiency and moderate lifestyle change + climate policies are insufficient to meet SDGs**
  - additional **SD interventions** required:
    - **global cooperation**: “climate & development” scheme
    - **national redistributive policies** funded from carbon pricing revenues (“policy linking”)
    - **food & energy** -> co-benefits of healthy diets for climate, land, water, nitrogen cycle, biodiversity
- => Substantial improvements towards nearly all SDGs
- comprehensive coverage of SDG space
  - SDG achievement **gaps remain in 2030**, but can largely be **closed by 2050**

