



Global aspects based on the AR5 of the IPCC



Climate change, biodiversity and food security

Josef Settele
Helmholtz Centre for Environmental Research - UFZ
Dept Community Ecology, Halle, Germany
email: Josef.Settele@ufz.de

CLIMATE CHANGE 2014:

IMPACTS, ADAPTATION, AND VULNERABILITY

IPCC AR5 WGII





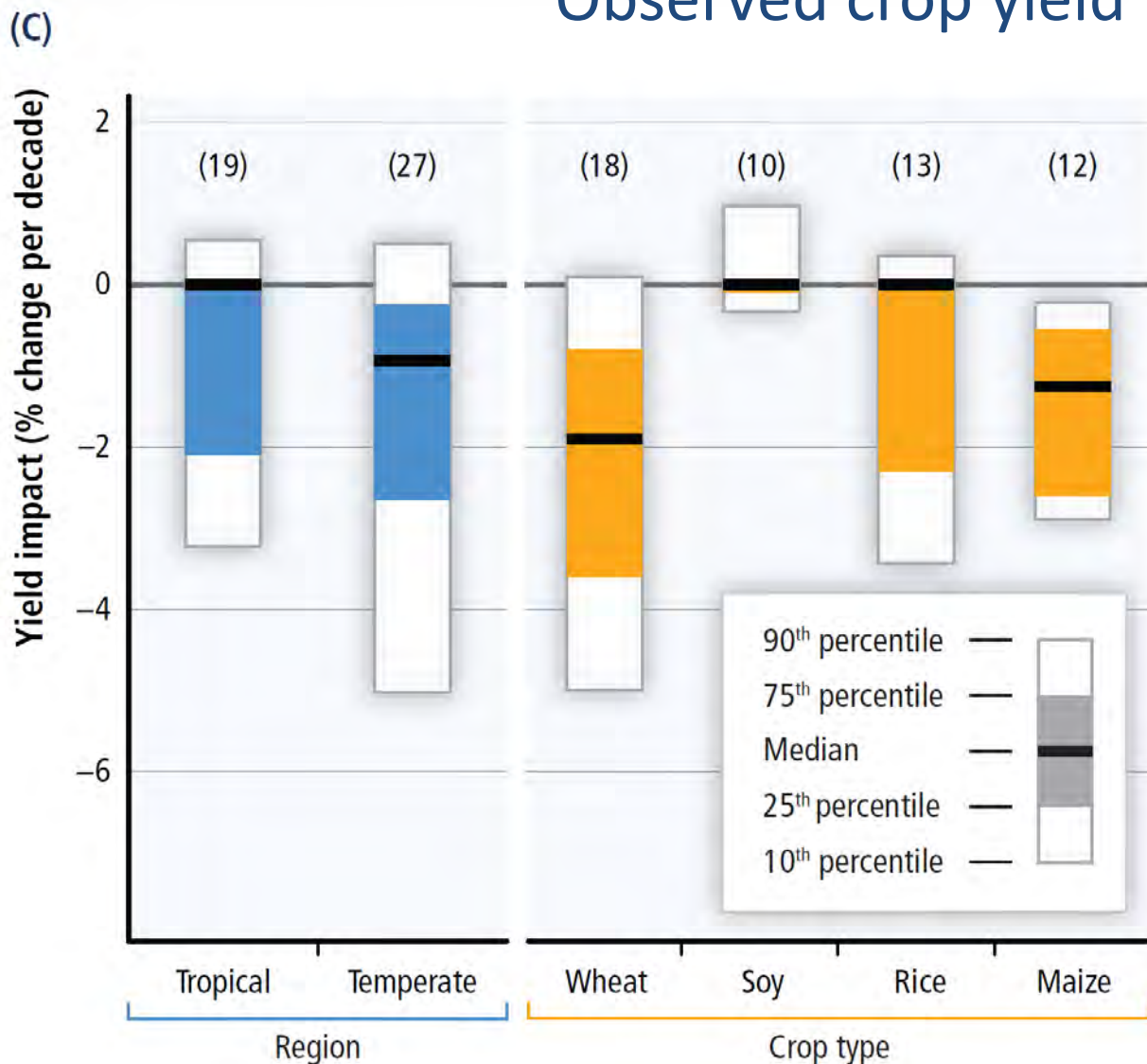
RISKS OF
CLIMATE CHANGE
INCREASE
WITH CONTINUED
HIGH EMISSIONS

Climate and Food Production

v. Risk of *food insecurity* and the *breakdown of food systems linked to warming, drought, flooding, and precipitation variability and extremes*, particularly for poorer populations in urban and rural settings.

Climate and Food Production

Observed crop yield

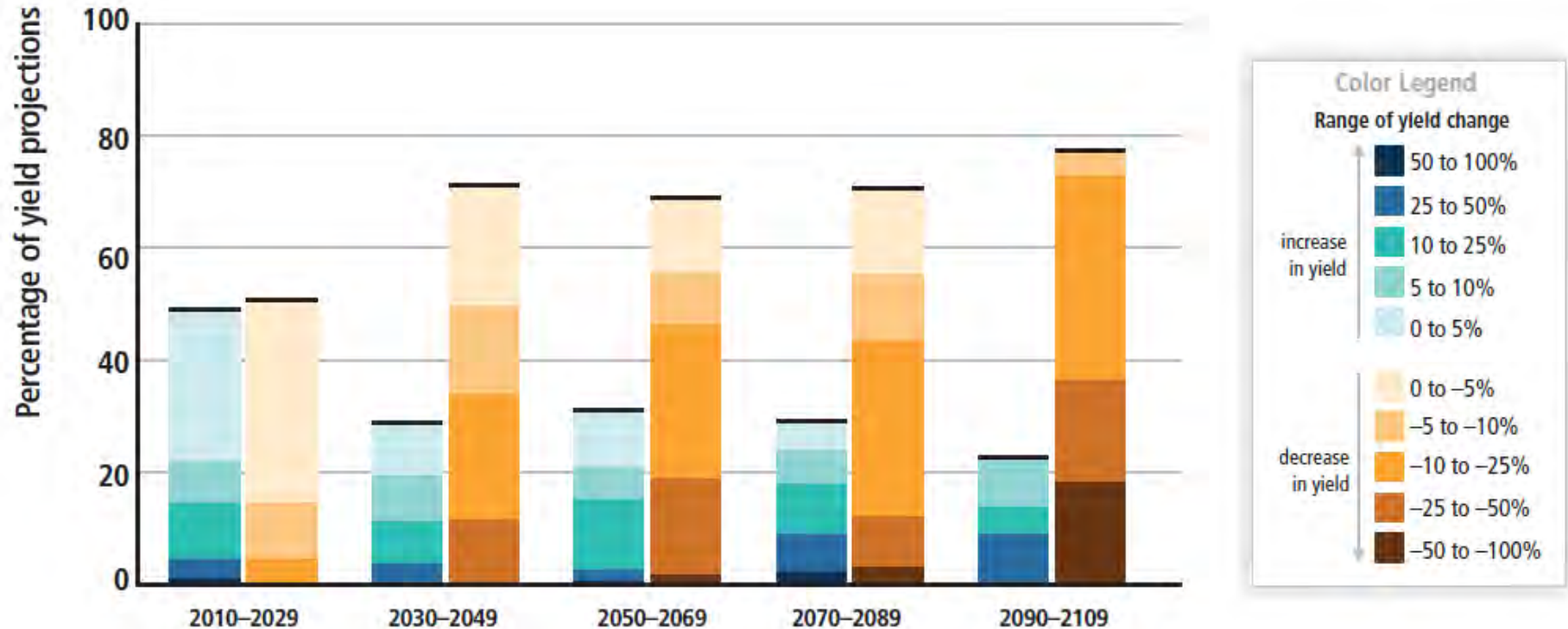


Summary of estimated impacts of **observed climate changes** on yields over **1960–2013** for four major crops in temperate and tropical regions.

The number of data points analyzed is given within parentheses for each category

Climate and Food Production

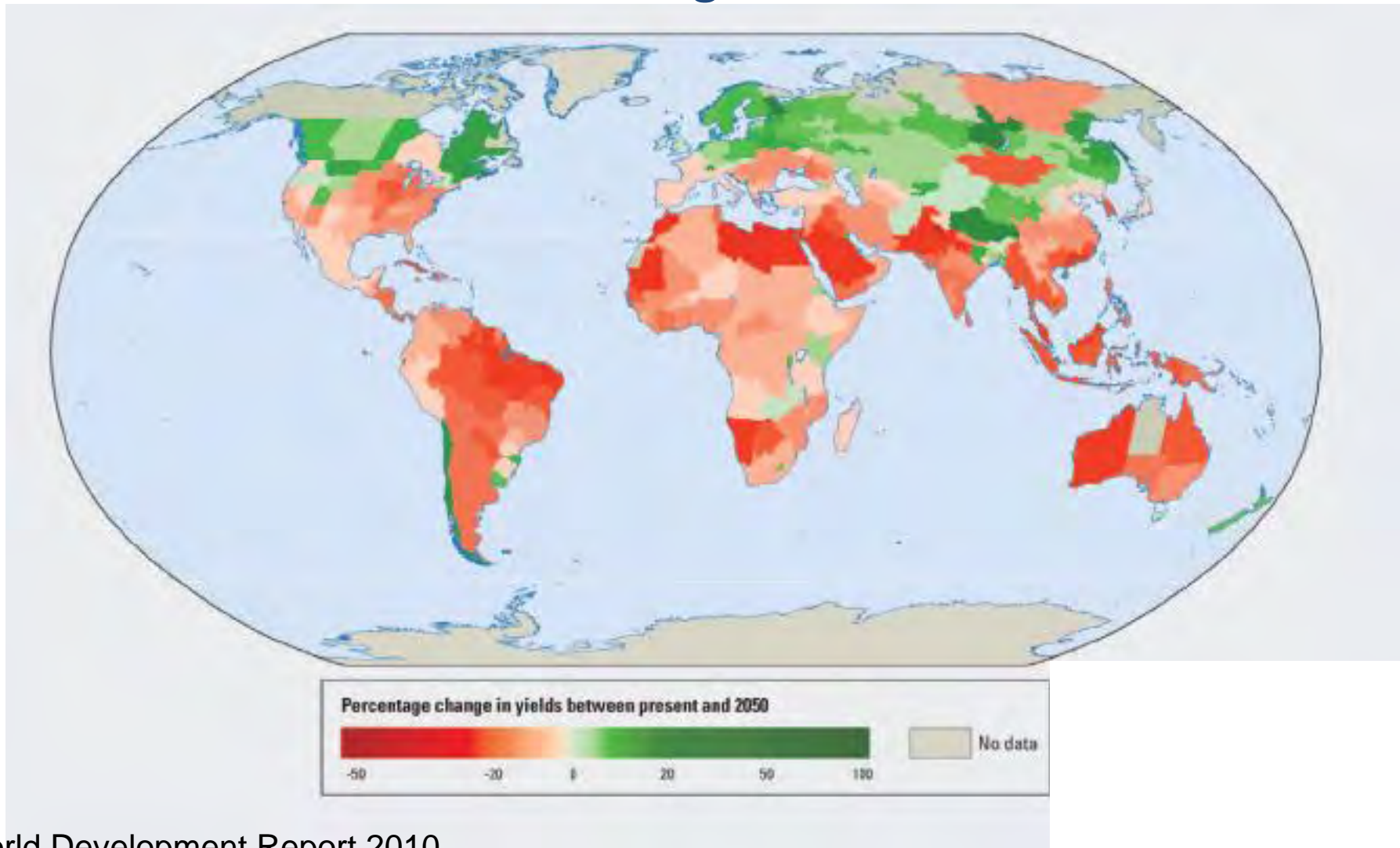
Modelled crop yield



➡ Decreases dominate over increases in future crop yield

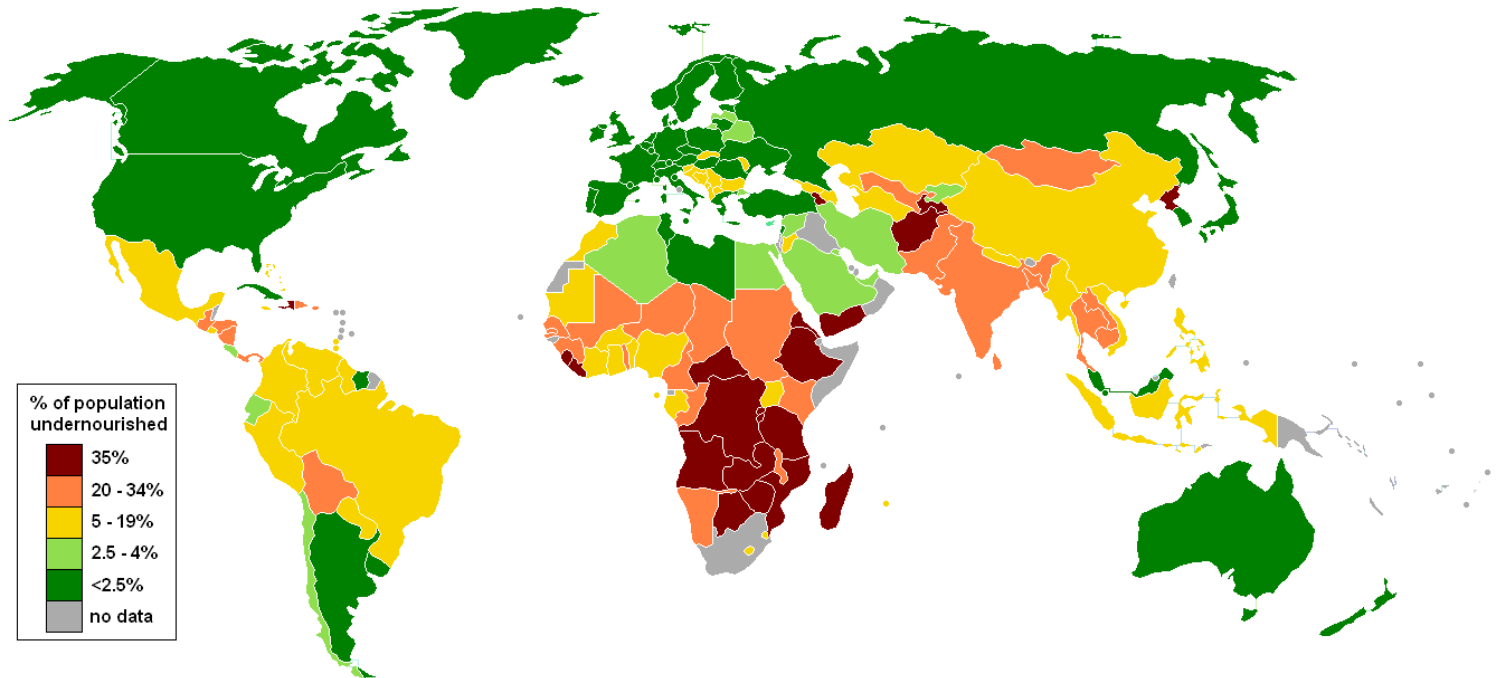
Climate and Food Production

Yield change - 2050



Climate and Food Production

Hunger map - 2013



➡ Largest yield decreases in the poor areas

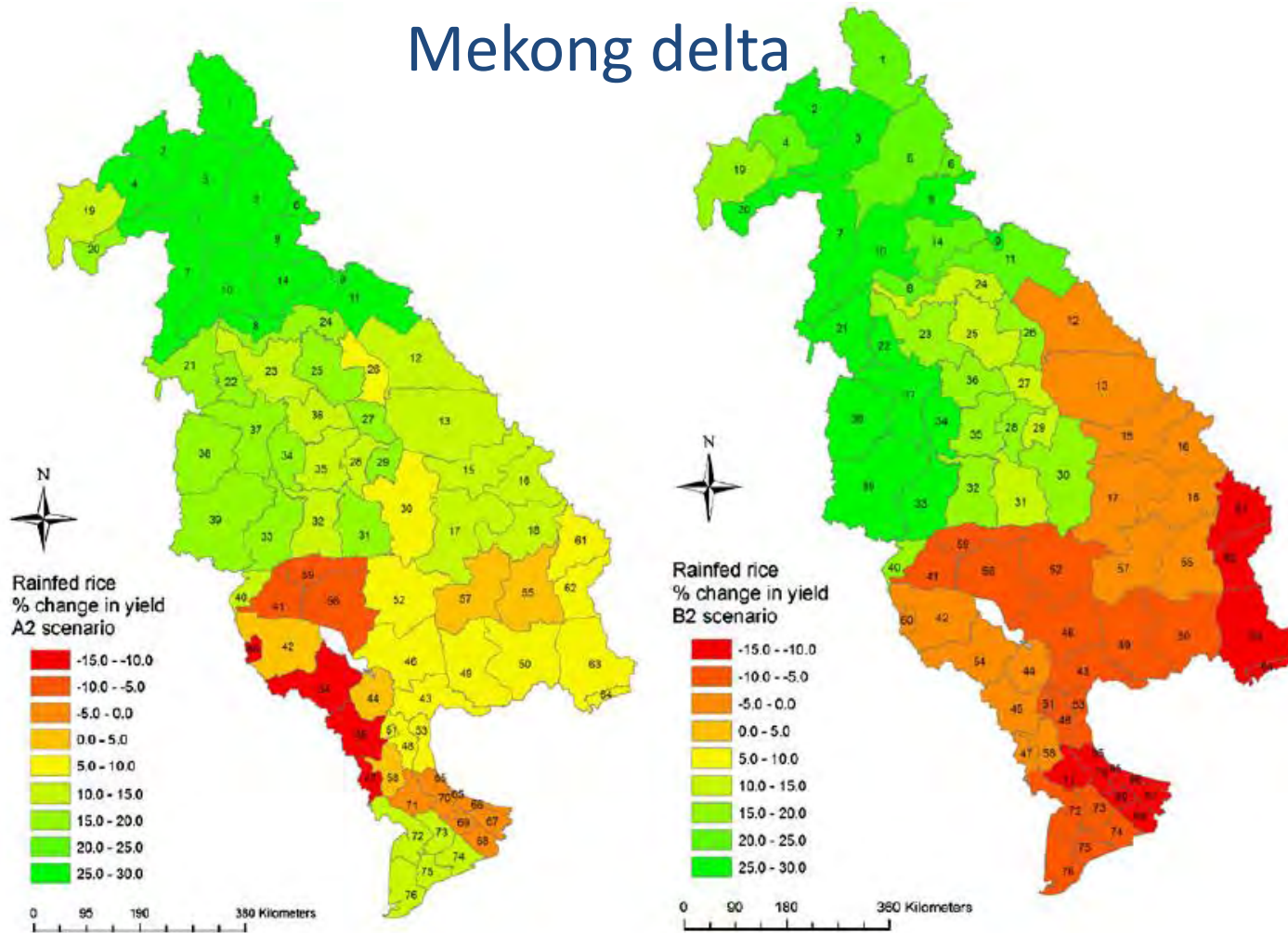
Climate and Food Production

What can be done?

Management option	Cultivar adjustment (n=56)	Planting date adjustment (n=19)	Planting date and cultivar adjustment (n=152)	Irrigation optimisation (n=17)	Fertiliser optimisation (n=10)	Other (n=9)
Benefit (%) from using adaptation	23 (6.8, 35.9)	3 (2.1, 8.3)	17 (9.9, 26.1)	3.2 (2, 8.2)	1 (0.25, 4.8)	6.45 (3.2, 12.8)

Climate and Food Production

Yield change without adaptive planting date
Mekong delta



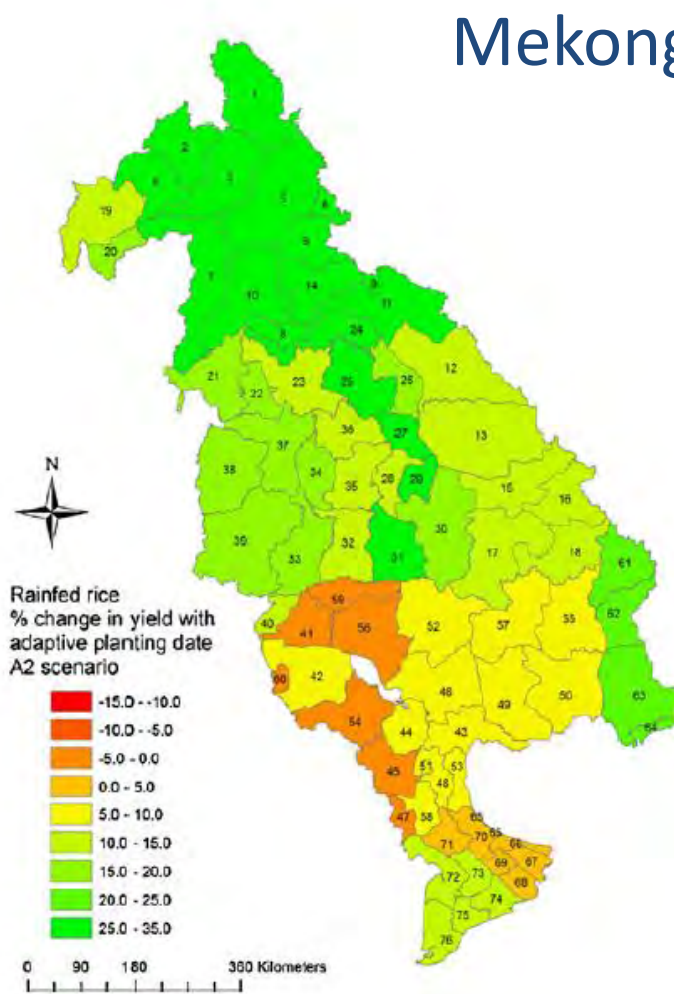
(a) A2 Scenario

(b) B2 Scenario

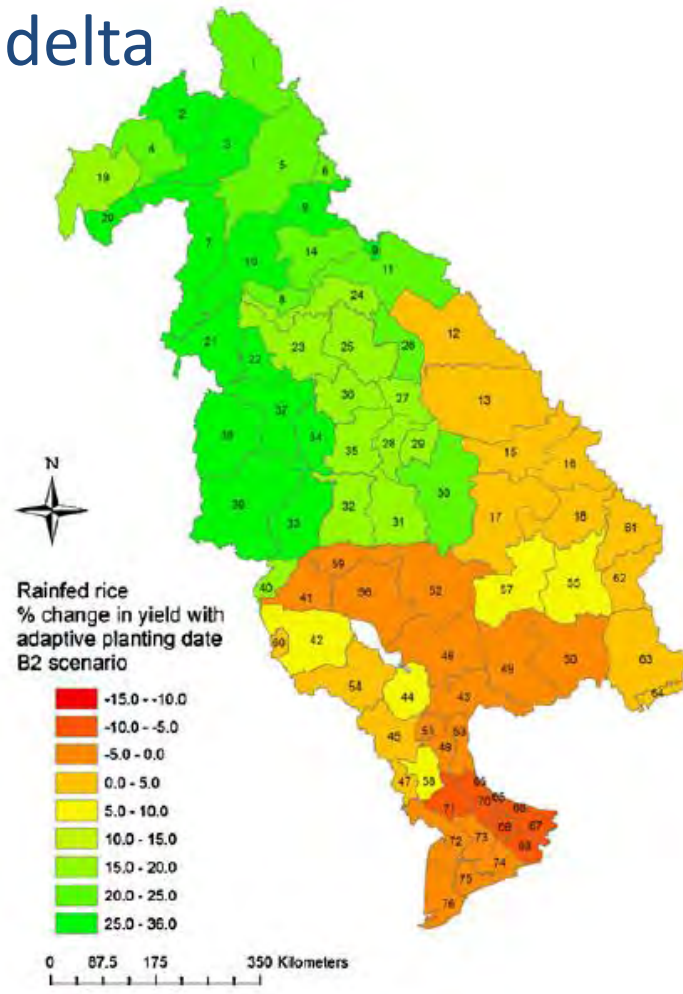
Climate and Food Production

Yield change with adaptive planting date

Mekong delta



(a) A2 Scenario



(b) B2 Scenario

Climate and Food Production

Summary

- ➡ **Risk of food insecurity**
- ➡ **Rural areas:** disproportionately affect the welfare of the **poor in rural areas**
- ➡ **Human health:** increased likelihood of **under-nutrition** resulting from **diminished food production** in poor regions (high confidence); **geographical shifts** in food production (medium confidence)



WIDESPREAD
OBSERVED IMPACTS

A CHANGING WORLD

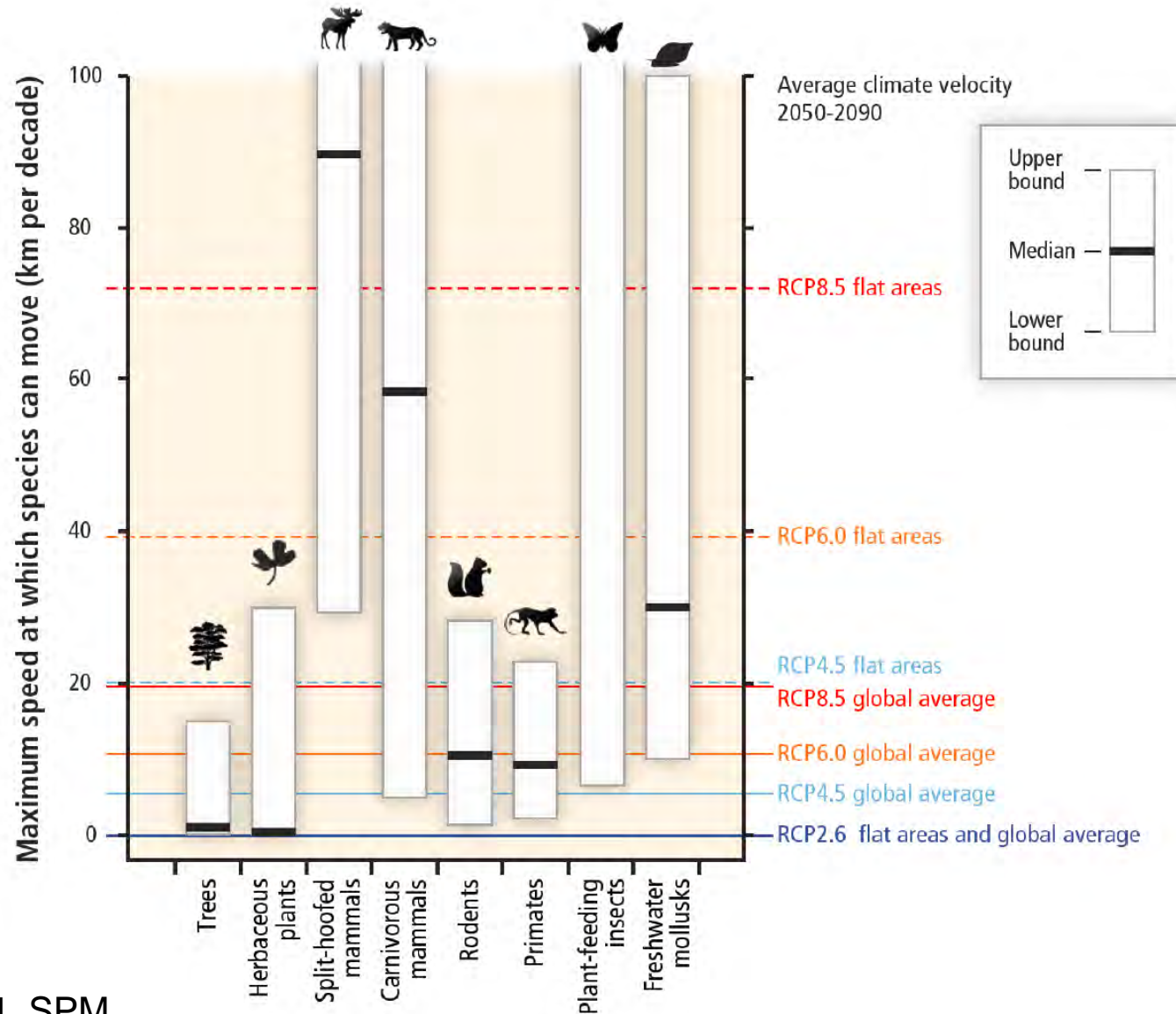
Climate and biodiversity

Many terrestrial, freshwater, and marine ***species*** ***have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions*** in response to ongoing climate change (high confidence)

Some species will **adapt to new climates**. Those that cannot adapt sufficiently fast ***will decrease in abundance or go extinct in part or all of their ranges.***

Climate and biodiversity

Maximum speed at which species can move (km per decade)

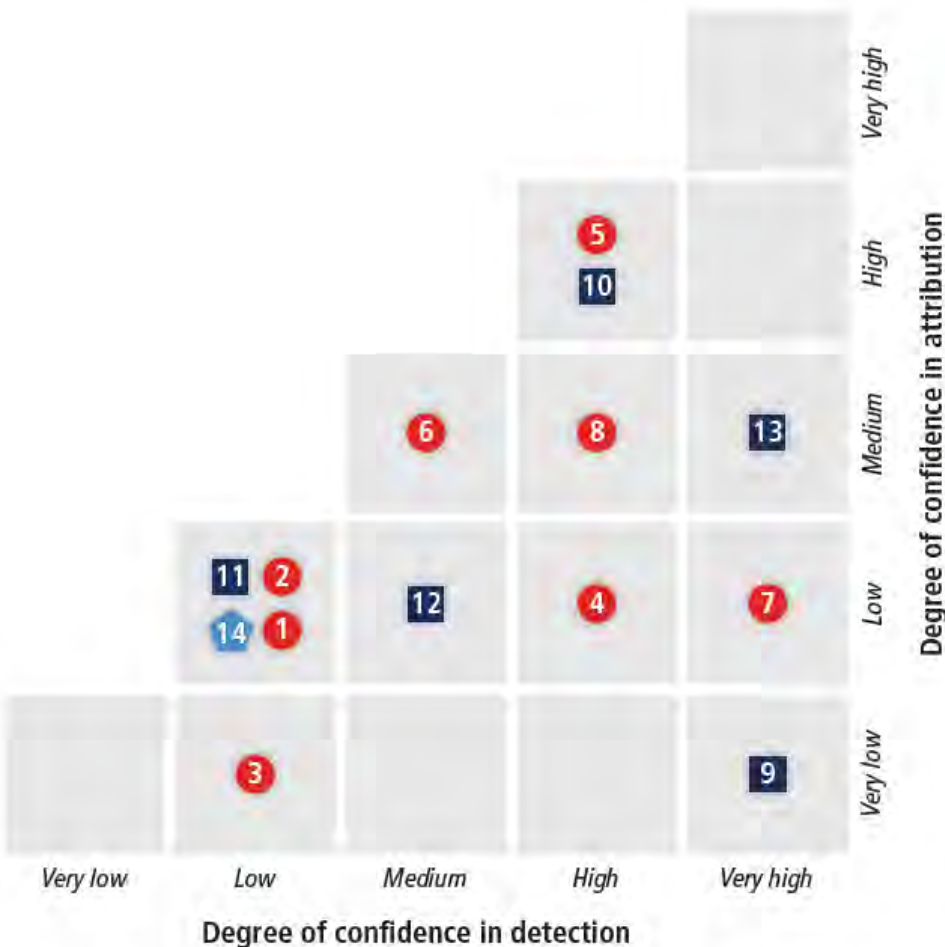


Climate and biodiversity

A large fraction of both terrestrial and freshwater species faces **increased extinction risk** under projected climate change during and beyond the 21st century, **especially as climate change interacts with other stressors, such as habitat modification, over-exploitation, pollution, and invasive species** (high confidence).

Within this century, ... (RCP4.5, 6.0, and 8.5) pose **high risk of abrupt and irreversible regional-scale change in the composition, structure, and function of terrestrial and freshwater ecosystems, ...** (medium confidence)

Detection and Attribution



Evidence of change in species and ecosystems

1. Changes in evapotranspiration (Section 4.3.2.4)
2. Increased tree mortality (Section 4.3.3.1, Box 4-2)
3. Increased extinctions (Section 4.3.2.5)
4. Increased primary productivity (Section 4.3.2.2) and carbon stocks (Section 4.3.2.3)
5. Changes in phenology (Section 4.3.2.1)
6. Species range shifts (Section 4.3.2.5)
7. Invasive species (Section 4.2.4.6)
8. Flow-related impacts on freshwater ecosystems (Section 4.3.3.3)



Impacts on major systems *including early signs of regime shifts*

9. Cultural landscapes – species composition changes (Section 4.3.3.5)
10. Tundra – increase in shrubs, melting of permafrost (Section 4.3.3.4, Box 4-4)
11. Boreal – tree mortality (Section 4.3.3.1.1, Box 4-4)
12. Amazon – tree mortality (Section 4.3.3.1.3, Box 4-3)
13. Savannas – woody encroachment (Section 4.3.3.2.2)



Adaptation

14. Evolutionary and genetic adaptation (Section 4.4.1)

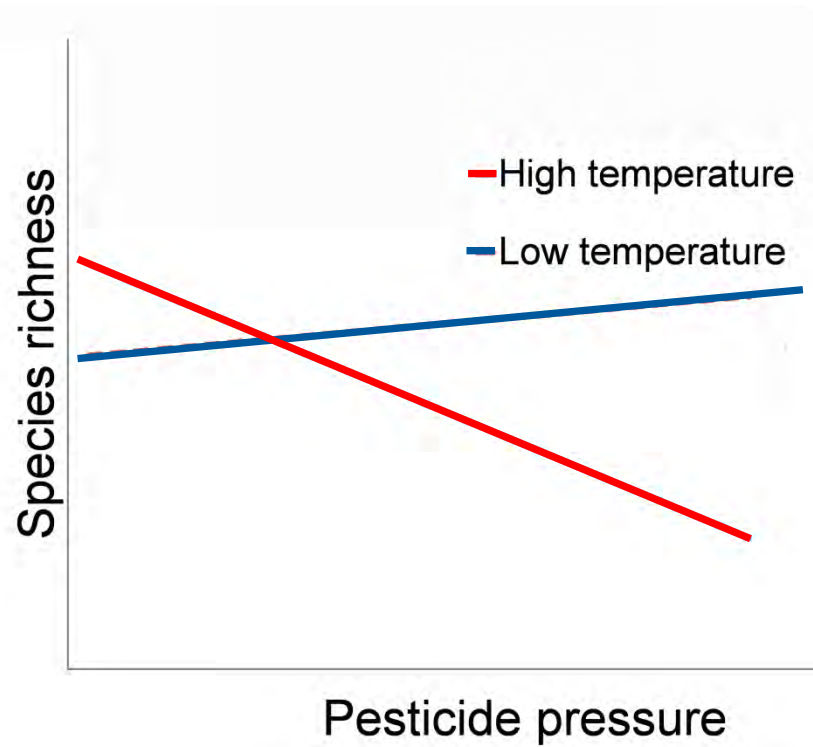
Terrestrial and Inland Water Systems

Management actions,....., and ***reduction of other stressors***, can ***reduce, but not eliminate, risks*** of impacts to terrestrial and freshwater ecosystems due to climate change, ...

Climate and land use intensity



Wild bees



- Pesticides are more severe when **temperatures are high**

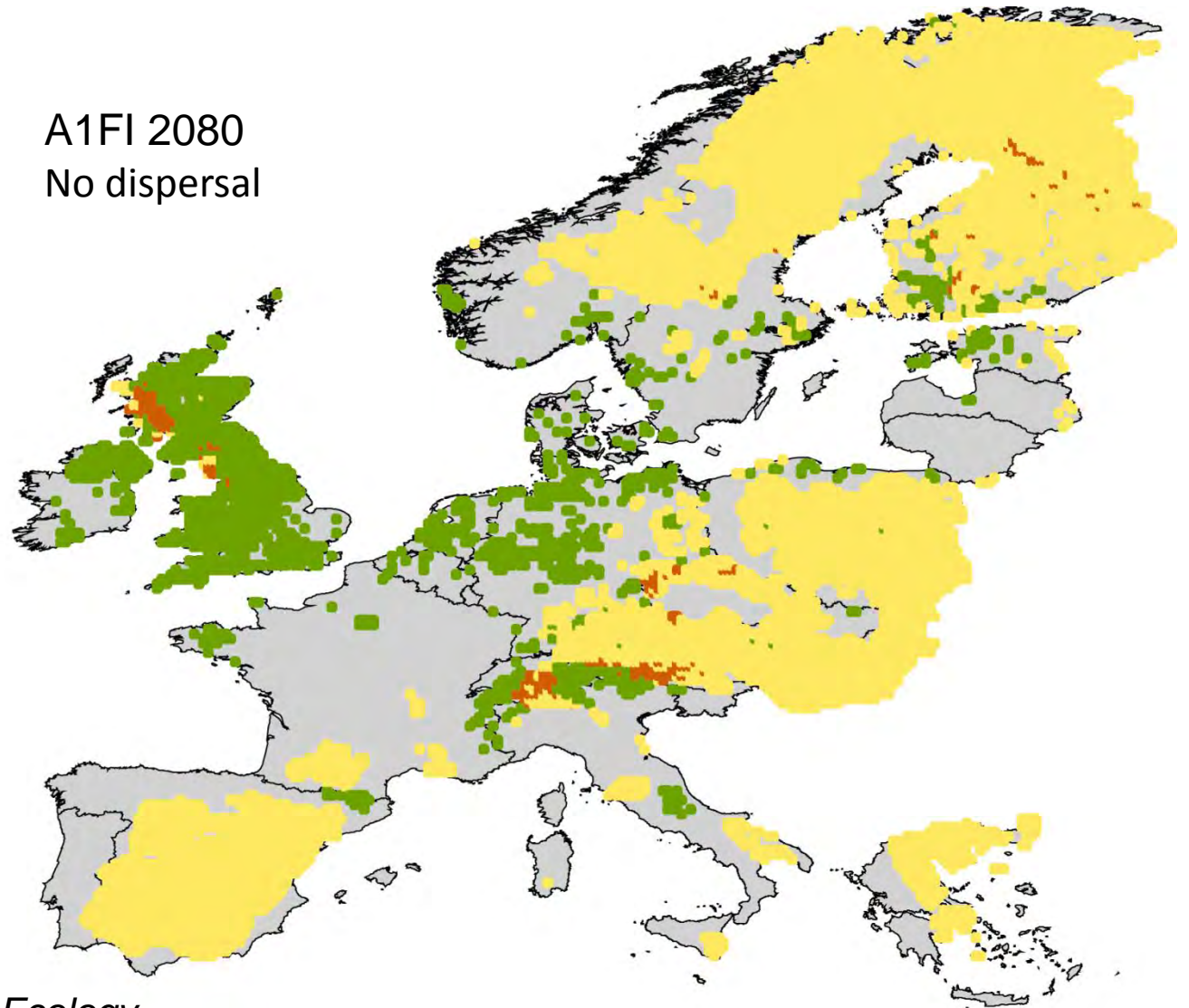
Climate and biodiversity

Boloria titania and *Polygonum bistorta*



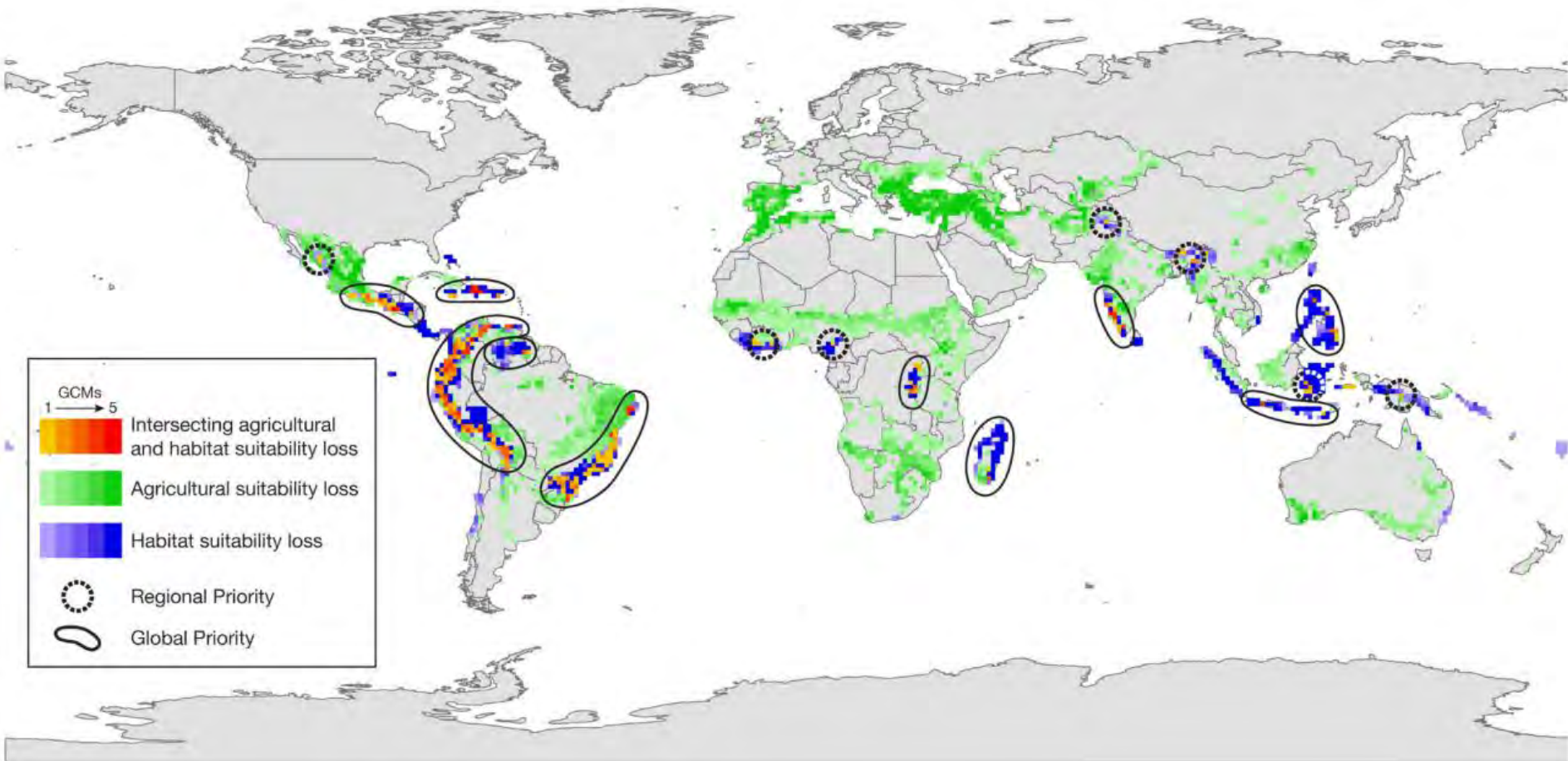
A1FI 2080
No dispersal

- Plant
- Butterfly
- Overlap of both

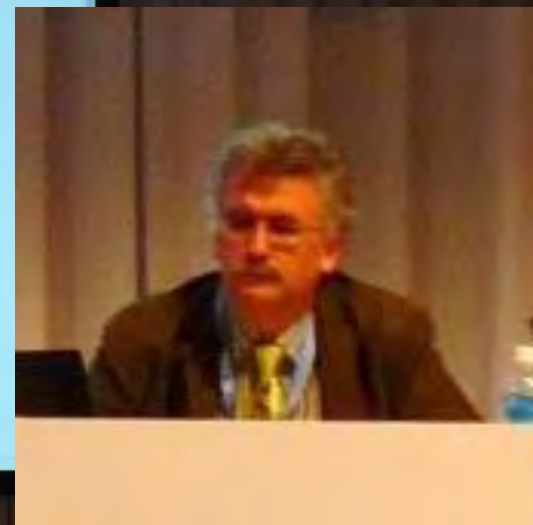
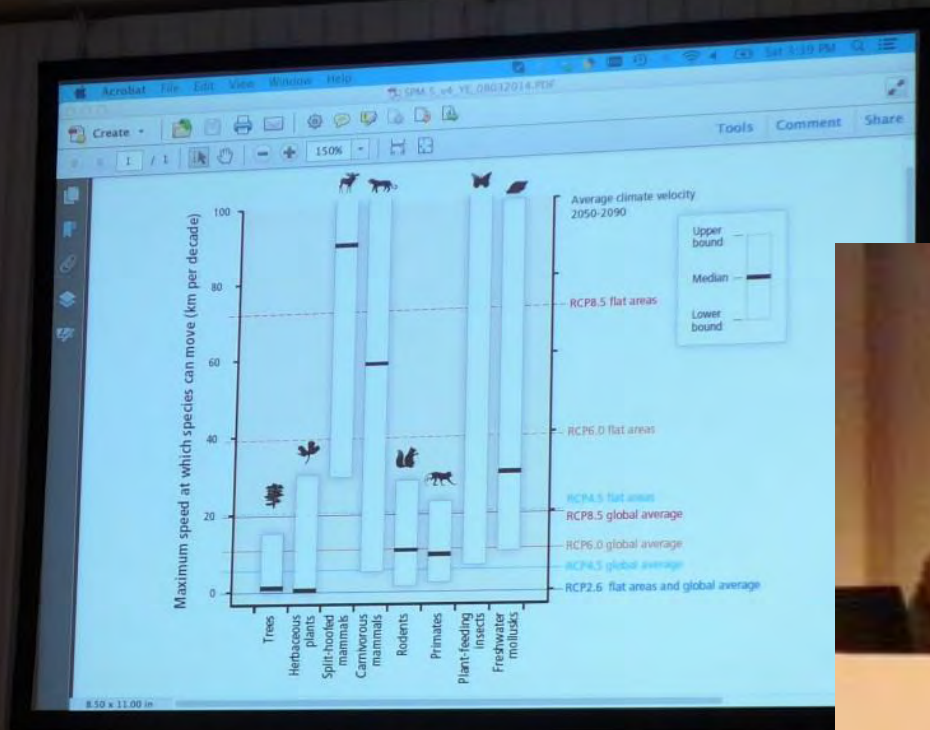


Climate, food production and biodiversity

Priority setting – Yield and biodiversity



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e IPCC



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