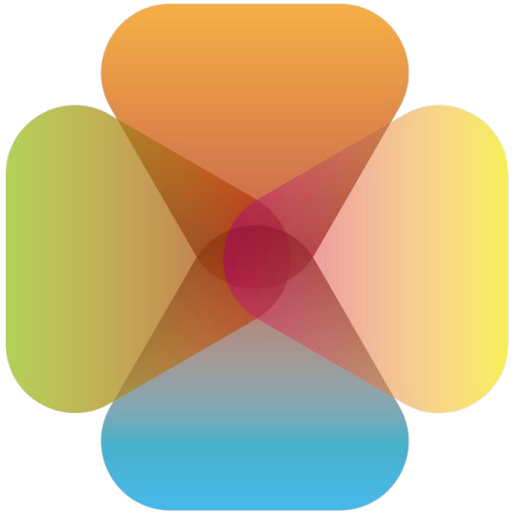

ACCREU
Assessing Climate Change Risk in EUrope

Presentation 1.1: Sectoral impacts: a focus on health and biodiversity

Thematic session 1:
Advancing knowledge in climate change impacts

6th ACCREU final project meeting
Brussels, November 12th-13th 2026

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Gemma Gerber (IIASA)
Elisa Sainz de Murieta (BC3)

Introduction

Climate change affects multiple interconnected sectors

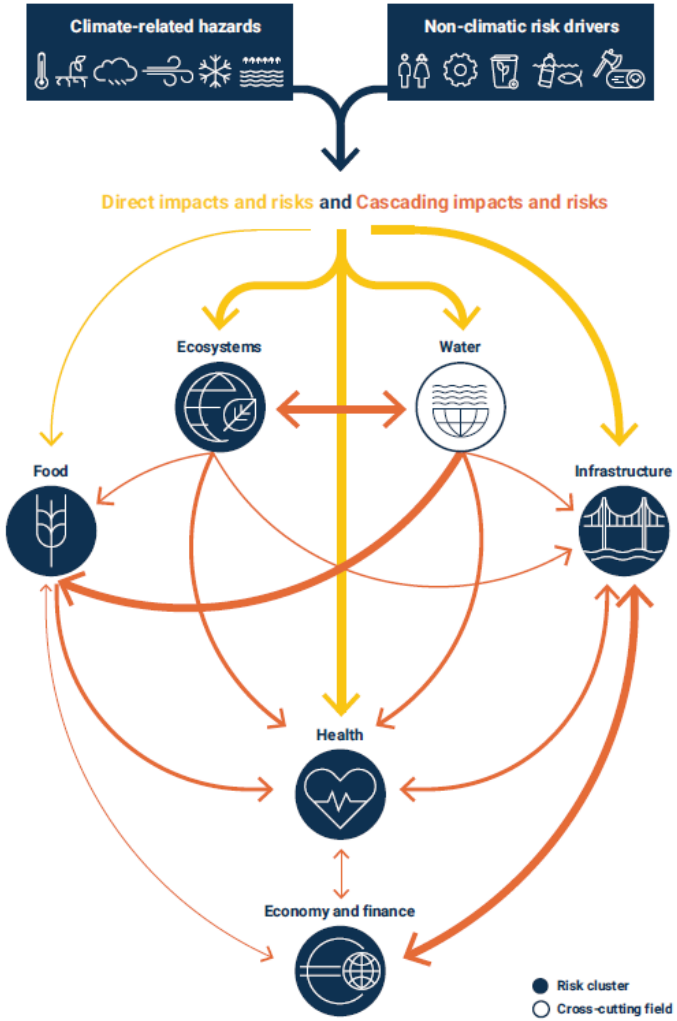
- Agriculture, forestry, water, energy, infrastructure, ecosystems and health

Direct impacts have wider indirect consequences and can cascade across sectors

- Changes in resource/land use, ecosystem services and human well-being

Adaptation responses depend on investment priorities and adaptive capacity

- Different levels of adaptation influence how sectors respond to and cope with climate change.



Source: EEA (2024), European Climate Risk Assessment, Figure ES.3 Direct and cascading climate risks across interconnected sectors.

Overview: Sectoral impacts: a focus on health and biodiversity

- EUCRA highlights ecosystems and human health among its major areas of concern.
- Integrated climate impact modelling still has important knowledge gaps in quantifying the economic consequences of changes in ecosystem services, biodiversity and health.
- ACCREU contributes quantitative evidence on these impacts and the role of adaptation, helping connect environmental and health outcomes with broader economic assessments.

ACCREU Focus Area:

Ecosystem & Biodiversity

ACCREU Focus Area:

Health and Wellbeing

ACCREU Focus Area: Impacts on Ecosystem & Biodiversity

Sectoral impacts: a focus on health and biodiversity

International Institute for Applied Systems Analysis
IIASA

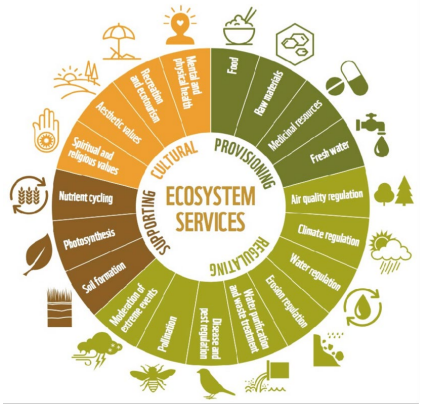
Habitat Suitability
Restoration BTC
Crop Pollination

DTU Denmark Technical University

Wildfire Risk

GCF Global Climate Forum

Coastal Flooding



thewholestory.co.nz/ecosystemservices/

Crop Pollination

- SEEA EA regulating ecosystem service: *"Pollination services are the ecosystem* ***contributions of wild pollinators to the fertilization of crops*** *that maintain or increase the abundance and/or diversity of other species that economic units use or enjoy."*

- Aim: A SEEA EA ecosystem service evaluation of pollination in Europe's field crops



Spatial Modelling Approach

- RCP2.6, 4.5, 7.0
- Agricultural Adaptation (Low, Medium/Reference, High)
- Years: 2020-2050

Supply

- Species distribution models (**ibis.iSDM**, Jung, 2023)
- Bees & Butterflies (n = 153)



Demand

- **GLOBIOM** (Market-driven land use)
- Seven field crops



Biophysical Flow & USD

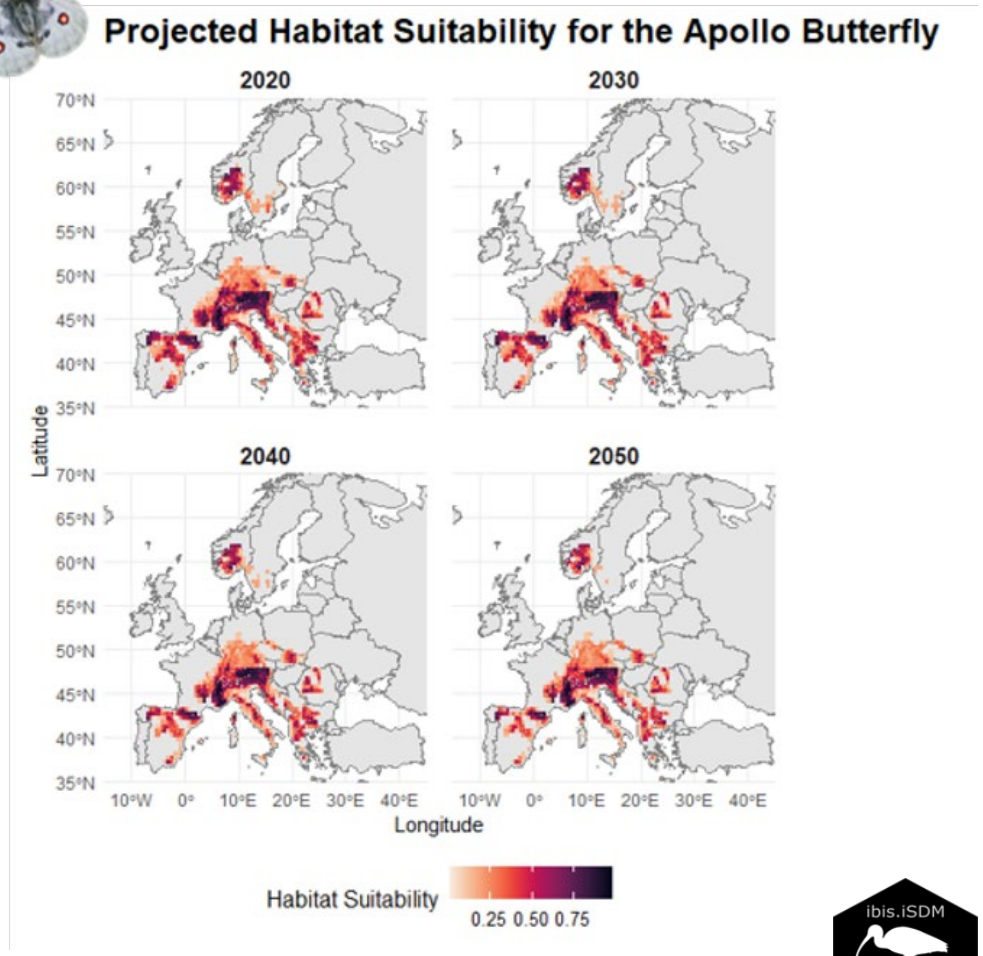
- **KIP INCA** (aligned with SEEA EA)
- Physical tonnes -> Realized exchange value (USD) i.e., ecosystem service contributions to production

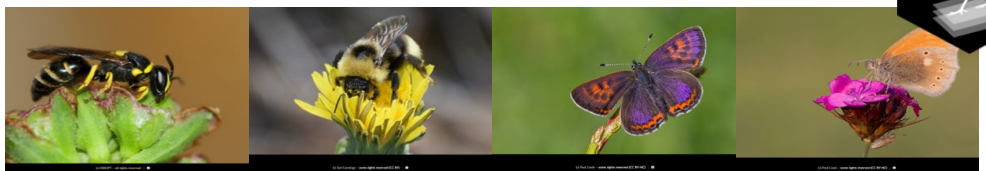
Shifting Supply: Pollinator habitat suitability by 2050

- Habitat suitability for 153 bee & butterfly species

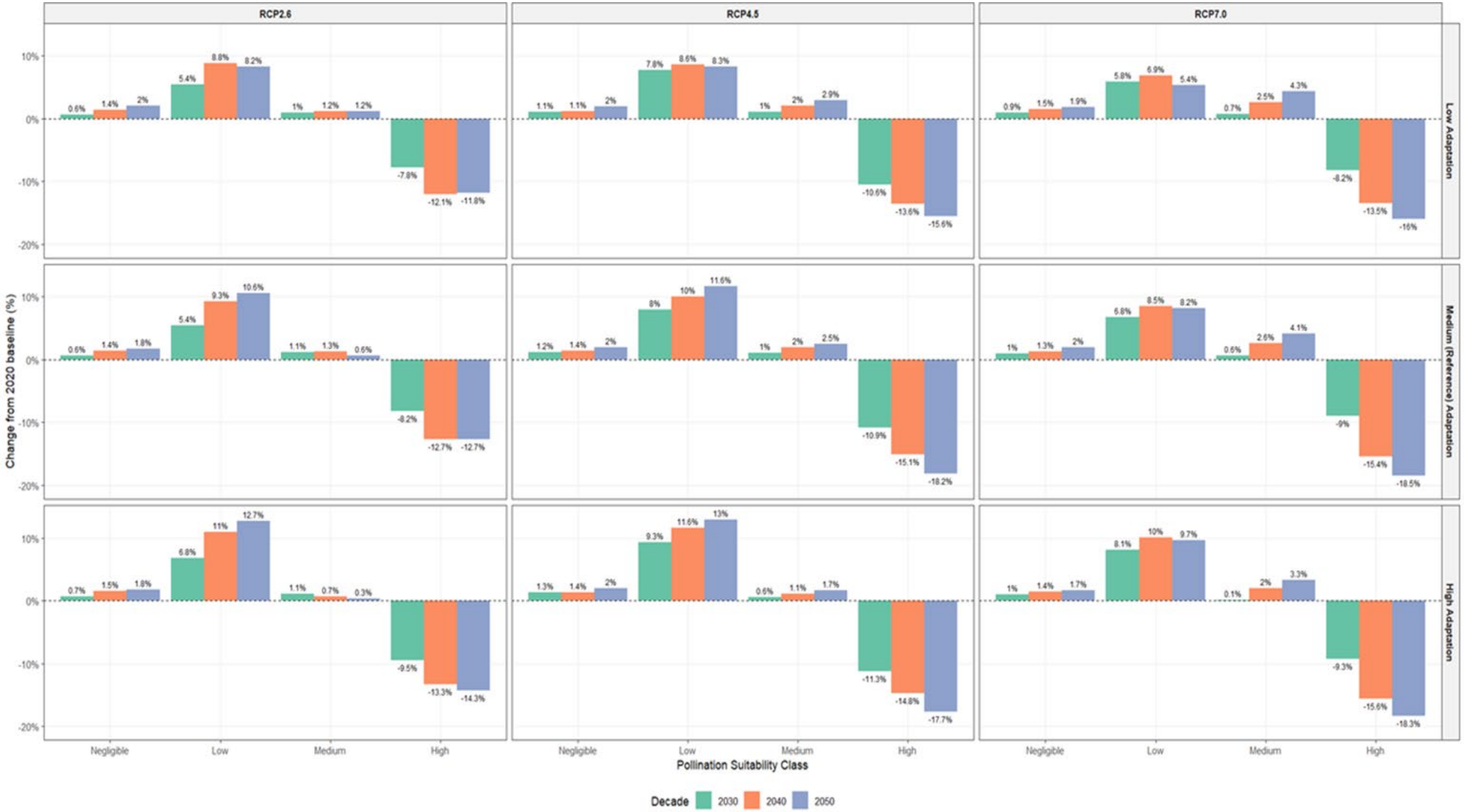
- Pollinator habitat suitability classes
  - >0.3 High
  - 0.2-0.3 Medium
  - 0.1-0.2 Low
  - < 0.1 Negligible







Shifting Supply: Pollinator habitat suitability by 2050



Change in suitable habitat area extent for pollinators (%), by suitability class, relative to 2020 under climate (RCP 2.6; 4.5; 7.0) and agricultural adaptation (high, medium/reference, low) scenarios. Pollinator habitat suitability classes: “High” suitability (>0.3), “Medium” suitability (0.2-0.3), “Low” (0.1-0.2) suitability, and “Negligible” suitability (< 0.1). For country-level data see ACCREU Deliverable 2.4.

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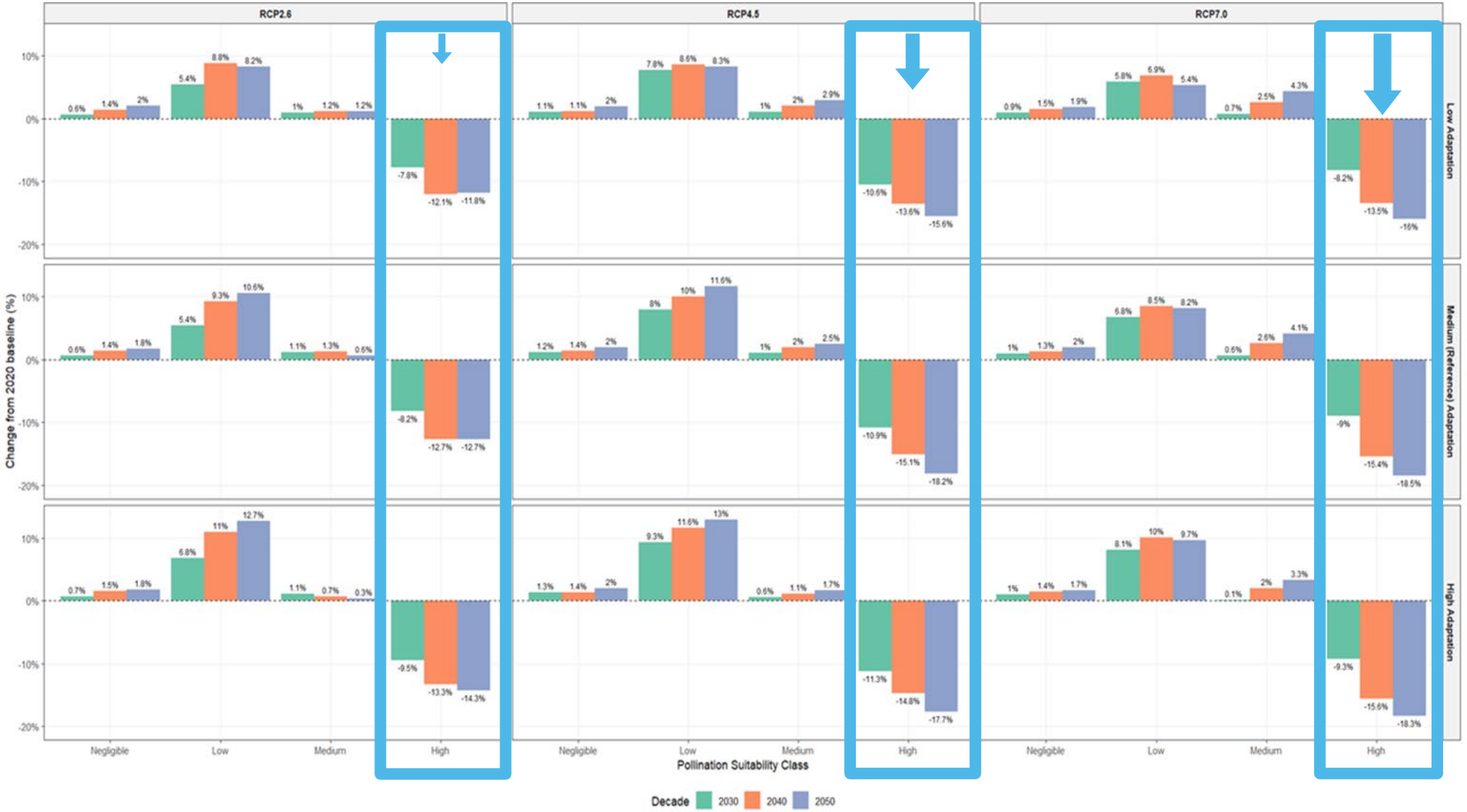

Significant decline in high-quality habitats

Change in suitable habitat area extent for pollinators (%), by suitability class, relative to 2020 under climate (RCP 2.6; 4.5; 7.0) and agricultural adaptation (high, medium/reference, low) scenarios. Pollinator habitat suitability classes: “High” suitability (>0.3), “Medium” suitability (0.2-0.3), “Low” (0.1-0.2) suitability, and “Negligible” suitability (< 0.1). For country-level data see ACCREU Deliverable 2.4.

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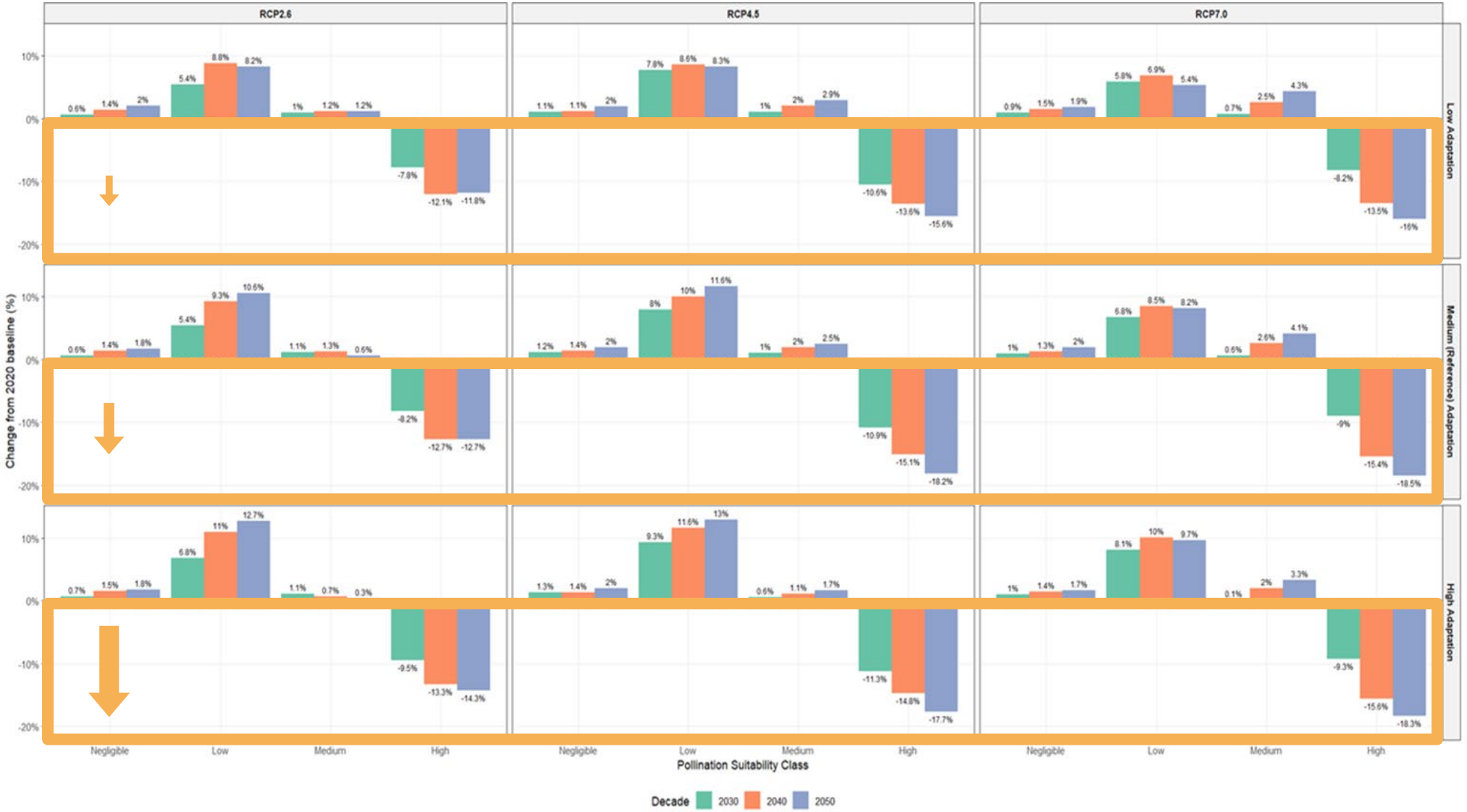

Significant decline in high-quality habitats

Short-term agricultural productivity, long term pollination loss

Change in suitable habitat area extent for pollinators (%), by suitability class, relative to 2020 under climate (RCP 2.6; 4.5; 7.0) and agricultural adaptation (high, medium/reference, low) scenarios. Pollinator habitat suitability classes: “High” suitability (>0.3), “Medium” suitability (0.2-0.3), “Low” (0.1-0.2) suitability, and “Negligible” suitability (< 0.1). For country-level data see ACCREU Deliverable 2.4.

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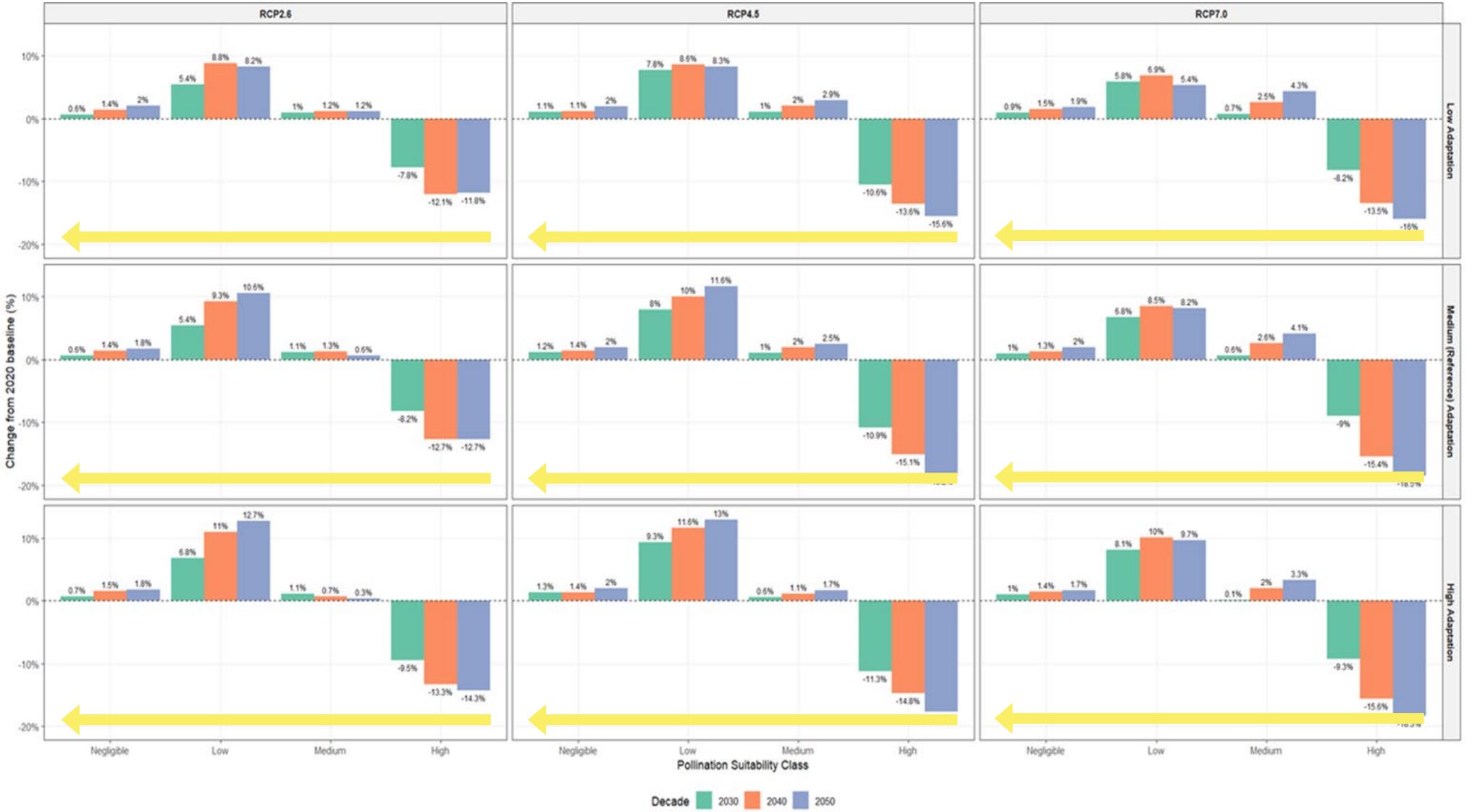


Significant decline in high-quality habitats

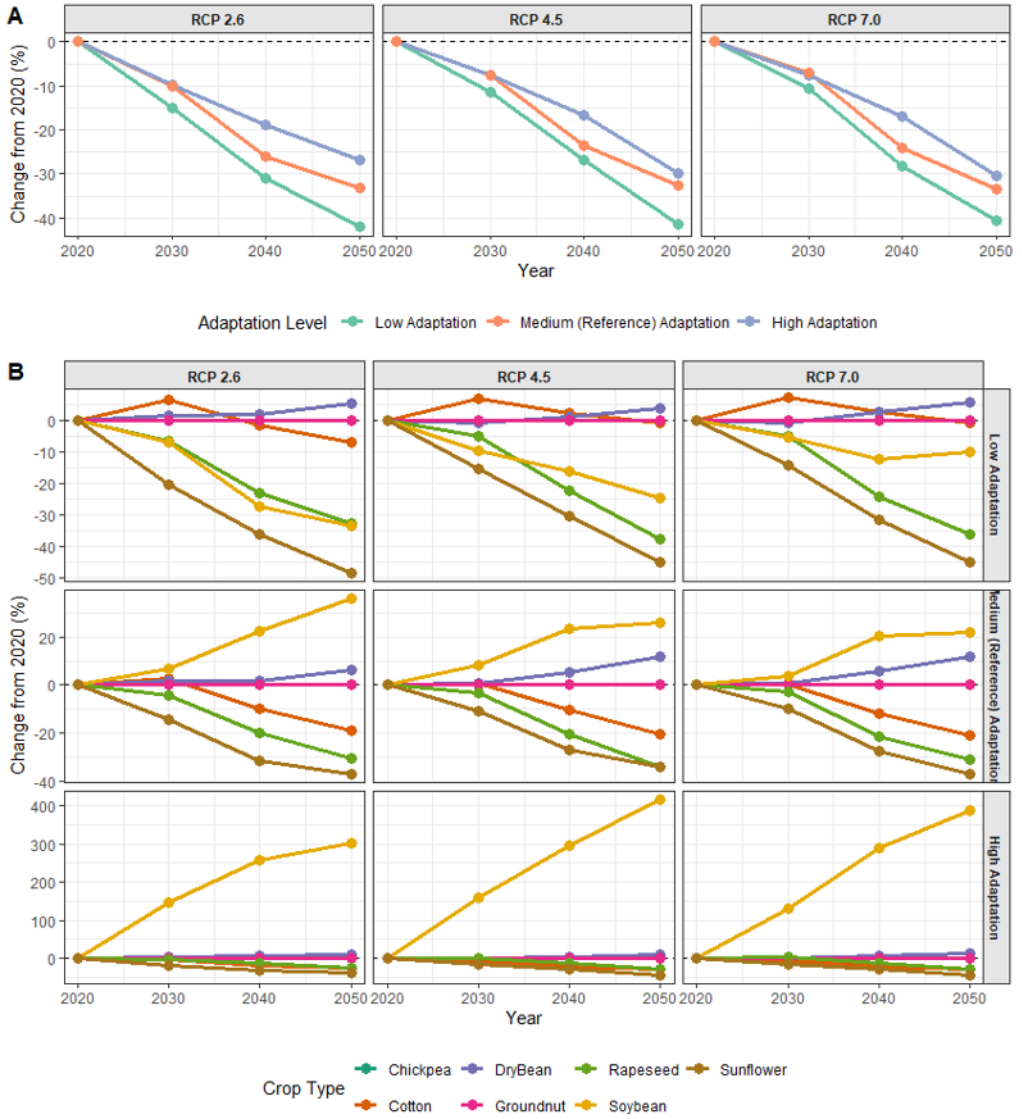
Short-term agricultural productivity, long term pollination loss

Habitat quality "downgrading": gradual degradation of pollination services

Change in suitable habitat area extent for pollinators (%), by suitability class, relative to 2020 under climate (RCP 2.6; 4.5; 7.0) and agricultural adaptation (high, medium/reference, low) scenarios. Pollinator habitat suitability classes: "High" suitability (>0.3), "Medium" suitability (0.2-0.3), "Low" (0.1-0.2) suitability, and "Negligible" suitability (< 0.1). For country-level data see ACCREU Deliverable 2.4.

Moving Demand: Pollinated crop distribution by 2050

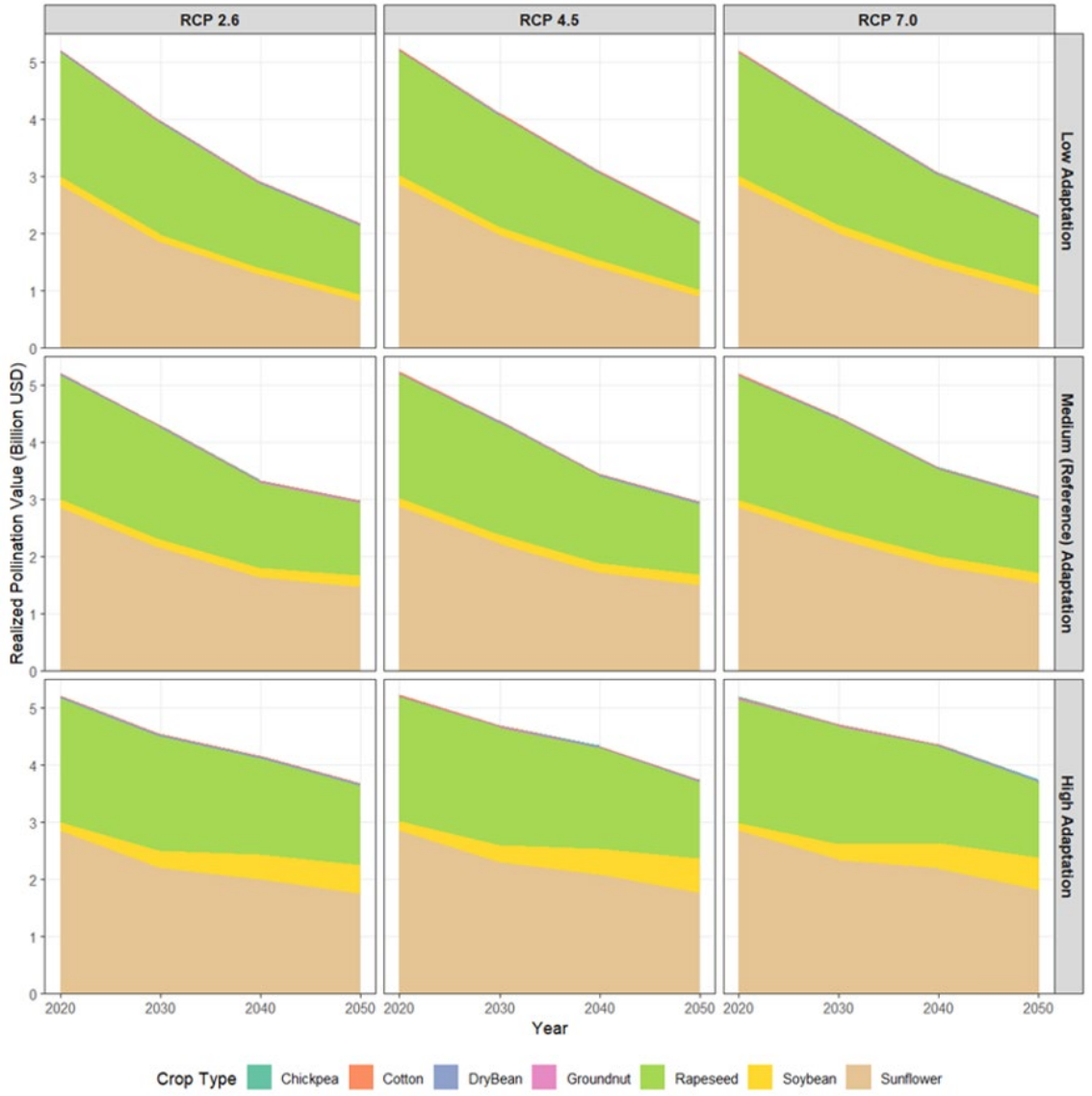
- Effective crop area depending on pollination services (crop area * pollination dependency)
- (A) ↓ pollination demand (27-42%) by 2050
  - Less severe under high adaptation
- (B) Changes in crop composition
  - ↓ high-dependency crops (sunflower)
  - ↑ moderate-dependency crops (soybean)
  - Agricultural adaptation favors moderate-dependency crops



Change in European field crop pollination demand area from 2020 by climate scenario (RCP) and adaptation level for (A) combined pollinator-dependent crops, and (B) Grouped by crop type. Calculated using crop-specific pollination dependency indices: High (65 %; Sunflower), Moderate (25 %; Rapeseed, Soybean, Dry bean, Chickpea), and Low (5 %; Cotton, Groundnut). For country-level data see ACCREU Deliverable 2.4.

Realized Crop Pollination Market Value

- Where pollinator supply meets crop demand
- Annual pollination services: **~5.23B USD (2020)**
- Projected decline: **2.18-3.75B USD by 2050**
- Major crop shifts or shifts in pollinators?
  - *Gerber et al. (in prep). Shifting supply, moving demand: Economic consequences of global change-induced pollination service mismatches for European field crops.*



European realized pollination value (Billion USD) over time per pollinator-dependent field crop type. The realized pollination value represents the financial contribution to agricultural production, accounting for both crop pollination supply and demand. For country-level data see ACCREU Deliverable 2.4.

Crop Pollination Evaluation: Takeaways

- Supply (pollinators) is degrading
- Demand (crops) is moving away from pollination-dependencies

- Why does pollinator biodiversity still matter?
  - Imports of pollinator-dependent crops – pollinators still needed elsewhere!
  - Preserving future flexibility
  - Maintaining nature's safety net
  - Protecting less flexible sectors







ACCREU Focus Area: Health & Wellbeing

CLIMATE ANALYTICS

Wellbeing & Poverty

Economic impacts of compound heatwaves and droughts on household income.

cmcc
Centro Euro-Mediterraneo sui Cambiamenti Climatici

Labour Productivity

Effects of rising temperatures on hours worked and worker productivity.

THE CYPRUS INSTITUTE
RESEARCH•TECHNOLOGY•INNOVATION

Air Quality

Climate projections for air pollution exposure and associated health burdens.

BC3
BASQUE CENTRE FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

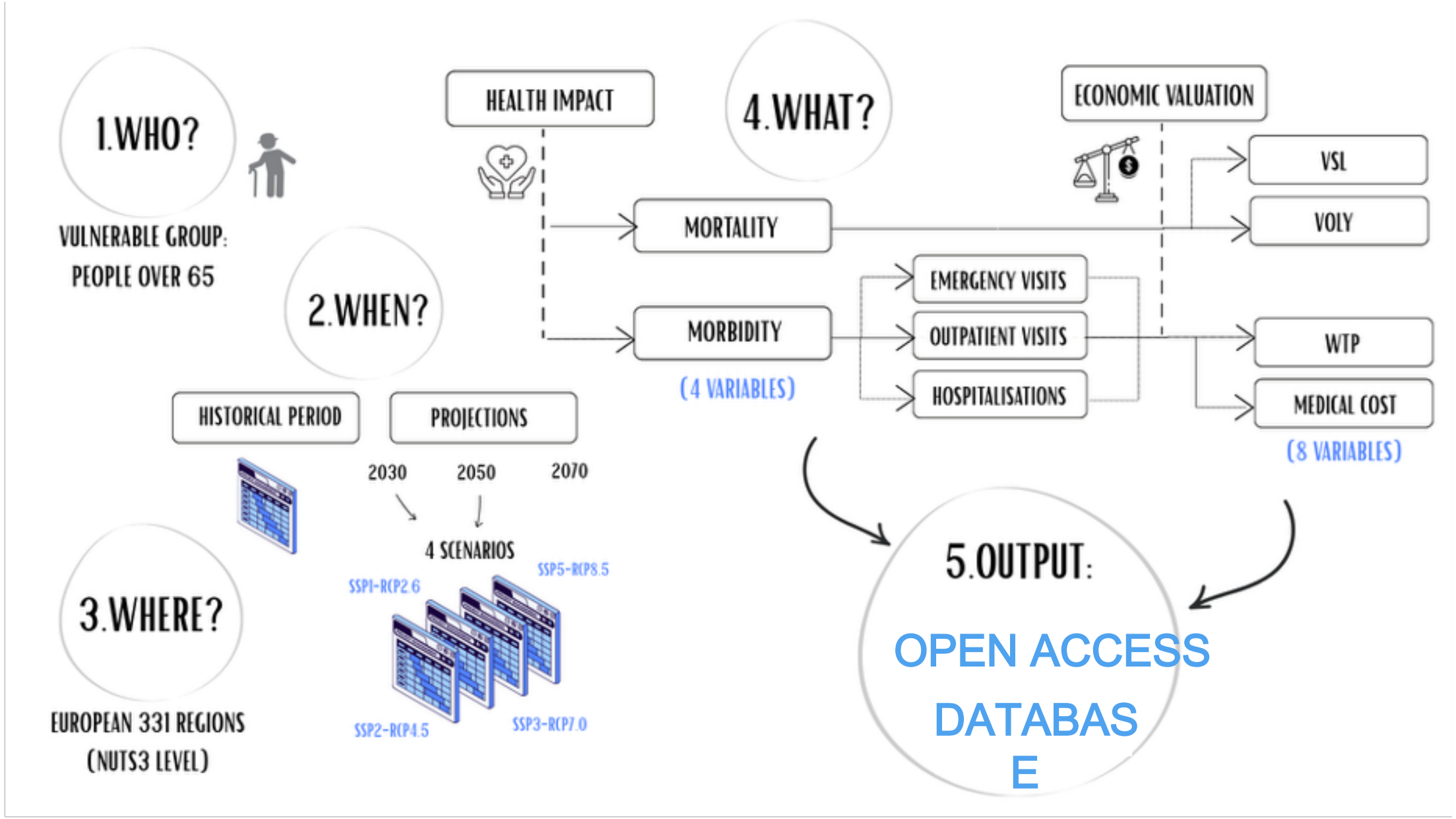
Health Impacts

Heat-related mortality, morbidity, vector-borne diseases, and flood health impacts.



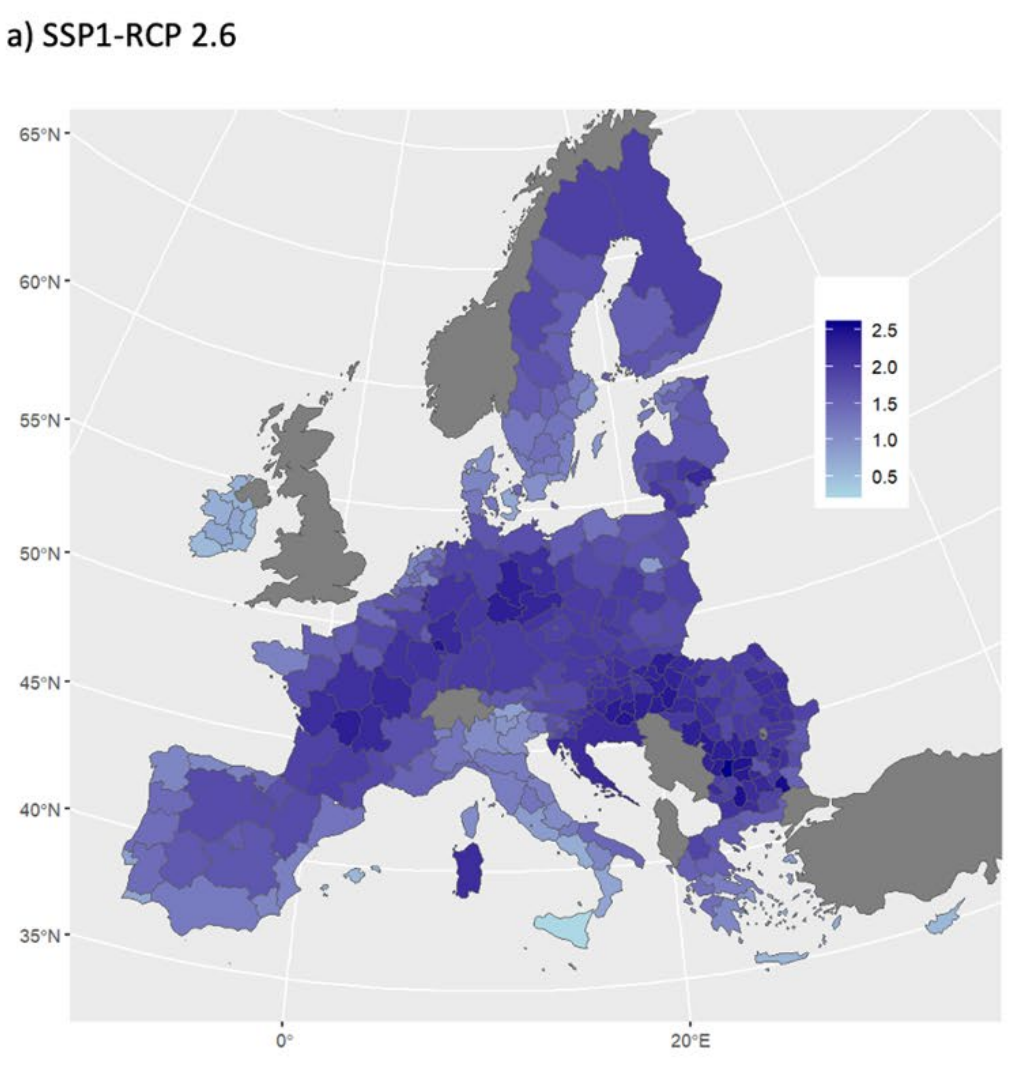
Picture by @PepeBurgos1900, vía Twitter

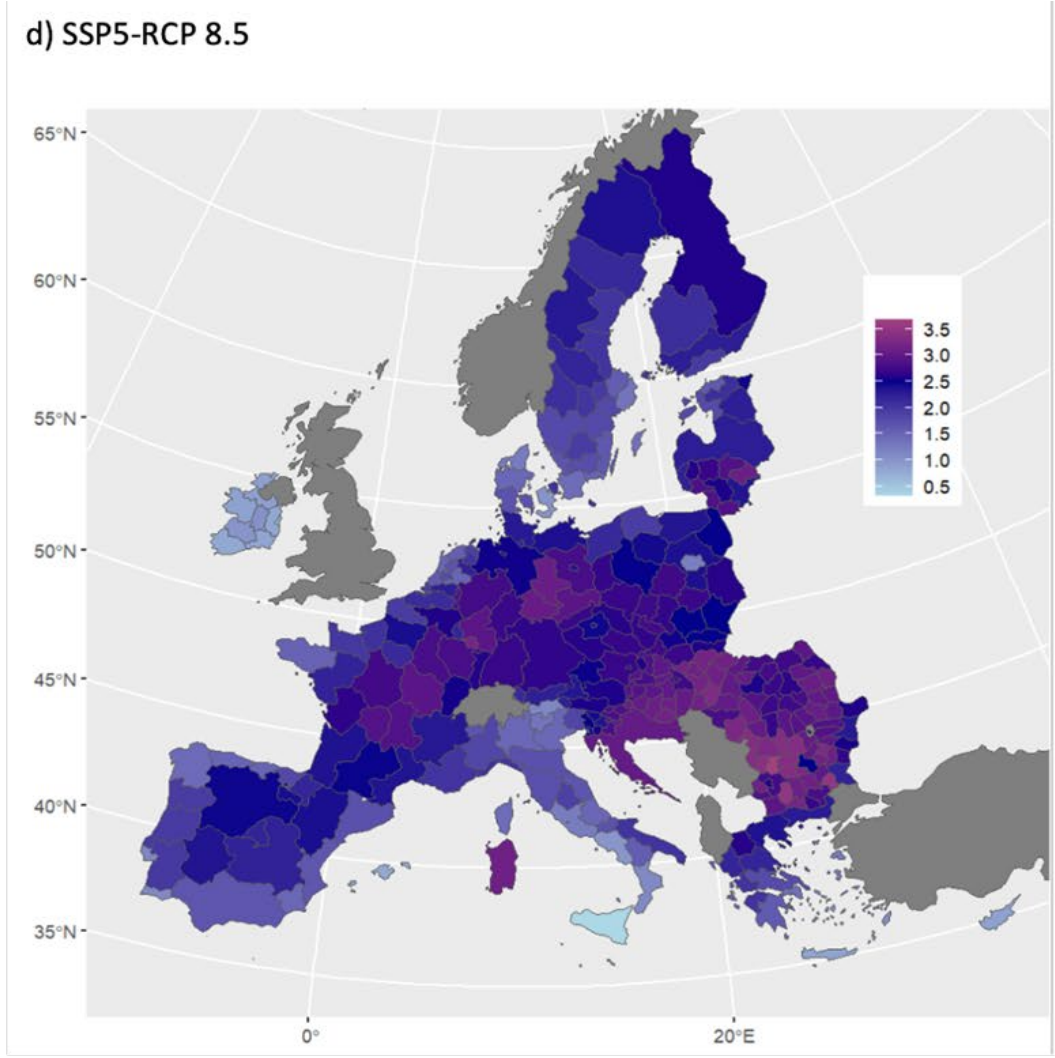
Heat-related mortality, morbidity and their costs



Heat-related **mortality** and its costs

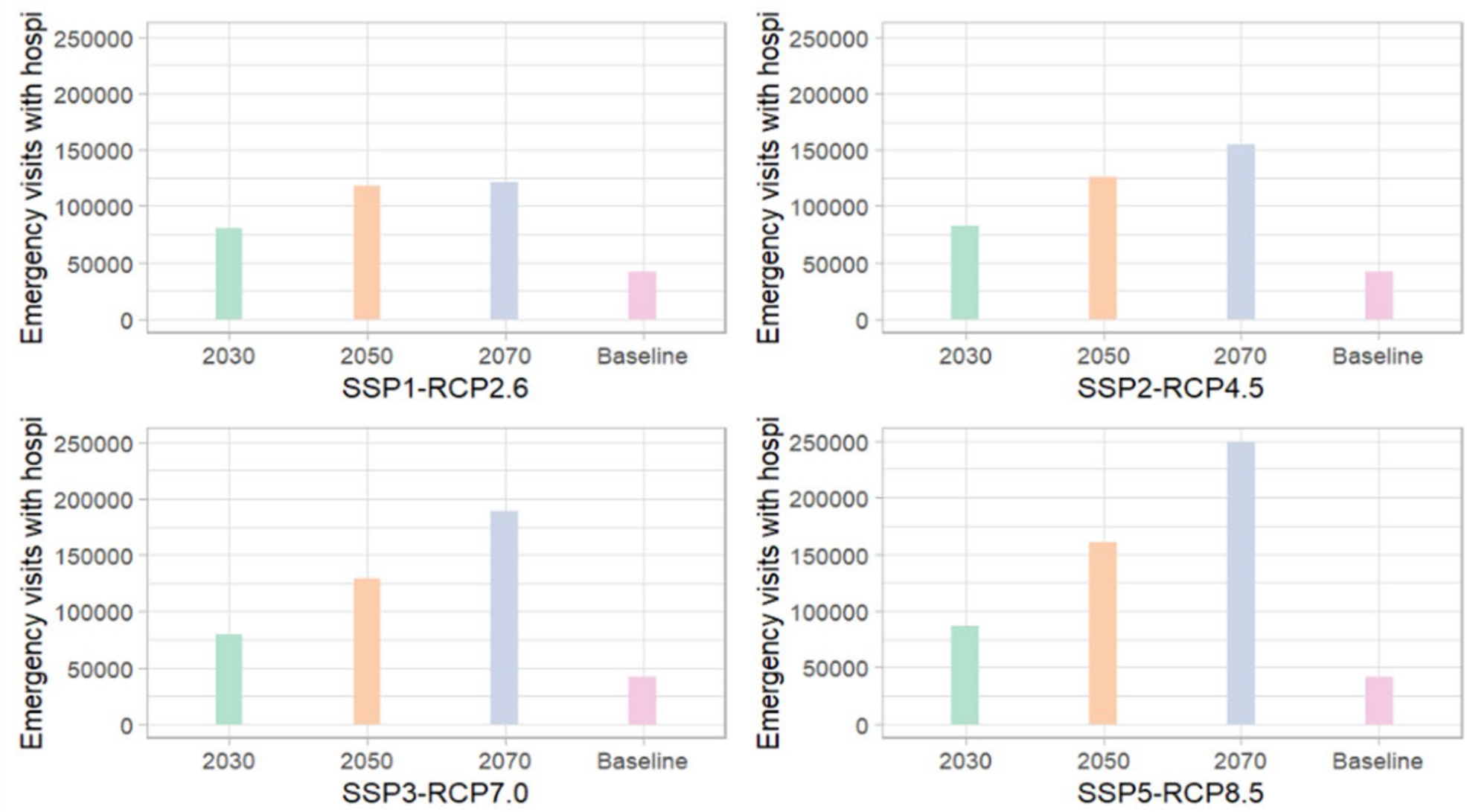
Heat-related mortality among over-65s could triple by 2050, from ~73,000 to 210,000–280,000 a year





Extreme heat and **morbidity** in Europe

Heat-related hospitalisations could reach 120,000–160,000 a year by 2050



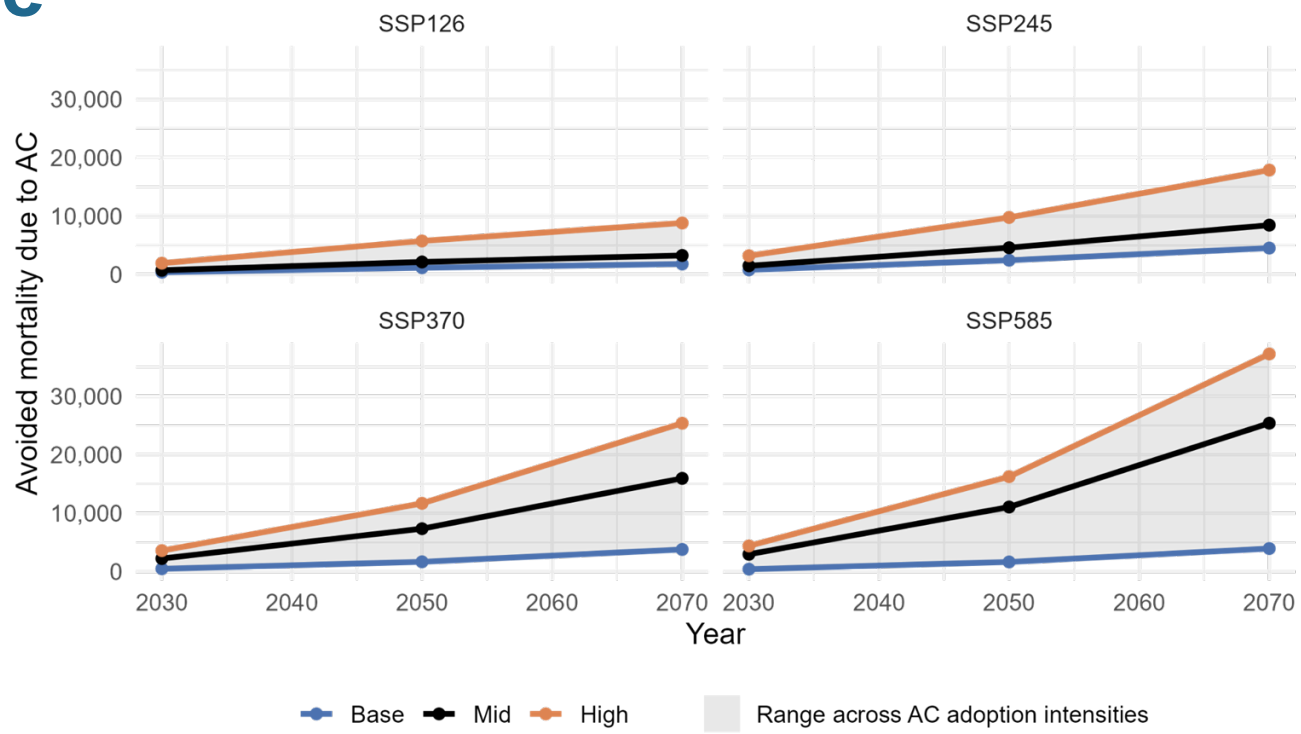
Adapting to extreme heat: the potential role of AC in Europe

Depending on climate and economic development, by 2050:

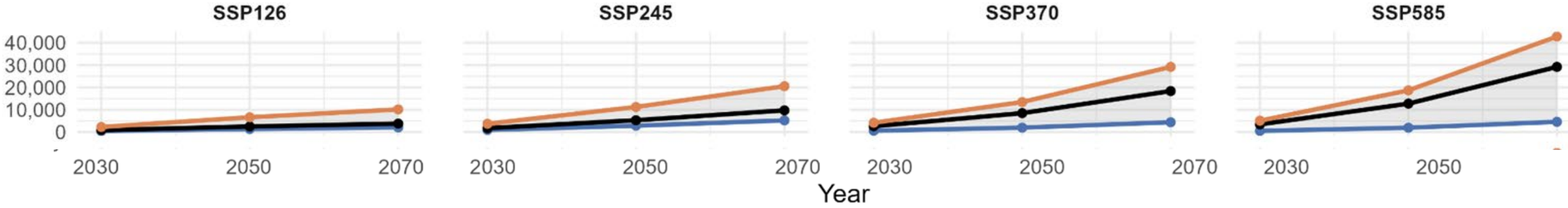
Mortality
High AC uptake could avoid 6,000–16,000 deaths a year.

Morbidity
High AC uptake could avoid 7,000–19,000 emergency department visits a year.

Avoided mortality due to AC



Avoided emergency visits



Key messages

- Climate change poses widespread and interconnected risks that vary across sectors and regions, with consequences for ecosystems, biodiversity and human well-being.

- Direct climate impacts can cascade through economic and environmental systems. Changes in agricultural and forest productivity, water availability and land use can generate indirect consequences for biodiversity and ecosystem services.

- Health impacts depend on more than climate exposure alone. Heat, air pollution and compound extremes affect mortality, productivity and well-being, while population aging, urbanization and socioeconomic inequalities shape who is most affected.

- Adaptation can substantially reduce risks, but benefits in one sector may come with trade-offs elsewhere. For example, maintaining competitive agricultural production may limit opportunities for habitat recovery, while health adaptation raises questions about affordability and equitable access.

Thanks!

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