ipcc
INTERGOVERNMENTAL PANEL ON climate change

THE WORKING GROUP II

CONTRIBUTION TO THE IPCC'S FIFTH ASSESSMENT REPORT

J.A. Marengo
LA SPM W2
CLA Chapter 27 WG2

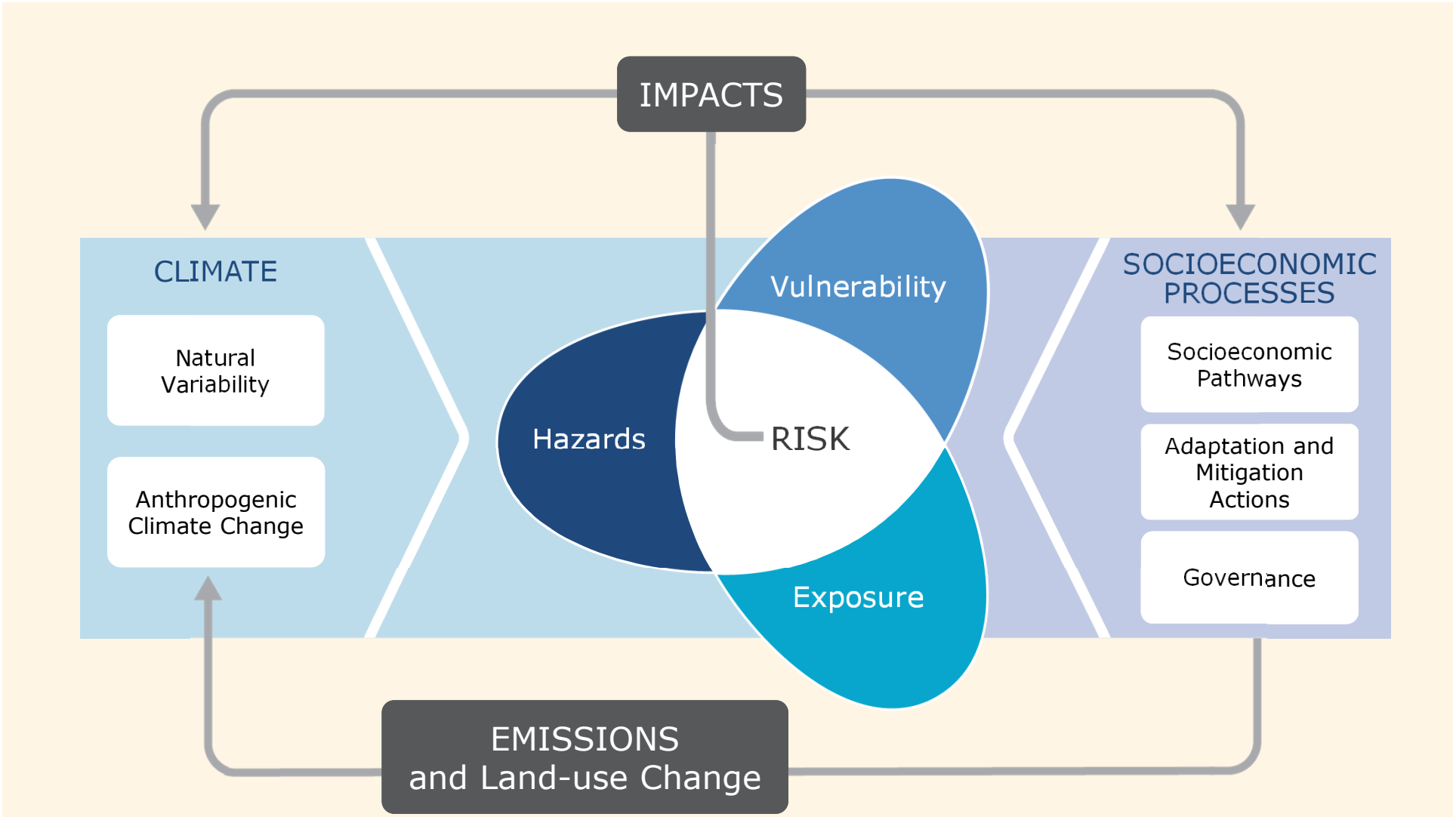
ipcc
INTERGOVERNMENTAL PANEL ON climate change

CLIMATE CHANGE 2014:

IMPACTS, ADAPTATION, AND VULNERABILITY

KEY MESSAGES

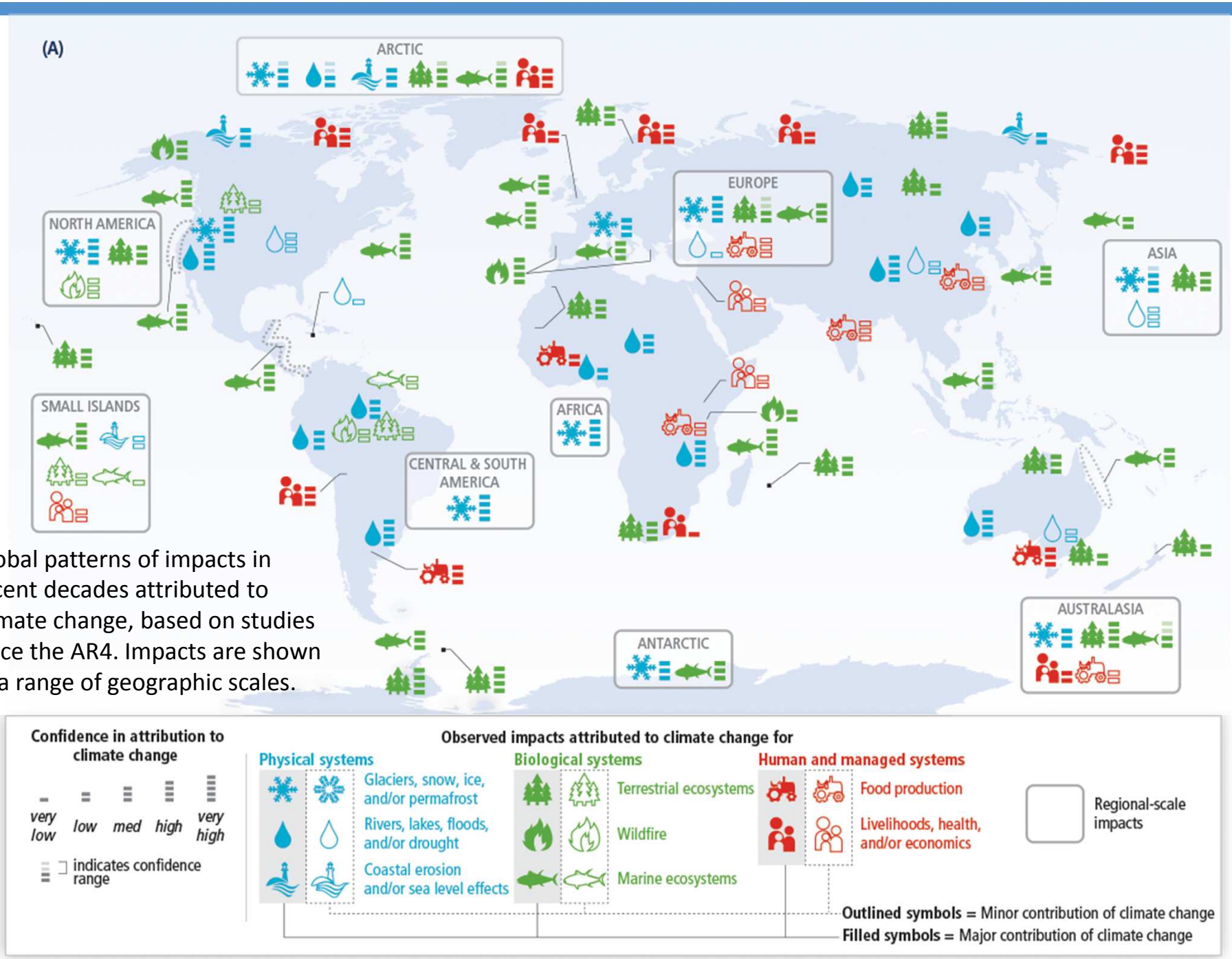
- **Climate change is already causing harm.**
- **The more we warm the climate the more risks we will face including the possibility of Irreversible damage.**
- **Effective and inclusive climate-change adaptation can help build a richer more resilient world n the near-term and beyond.**


IMPACTS
CLIMATE
Natural Variability
Anthropogenic Climate Change
Vulnerability
Hazards
RISK
Exposure
SOCIOECONOMIC PROCESSES
Socioeconomic Pathways
Adaptation and Mitigation Actions
Governance
EMISSIONS and Land-use Change

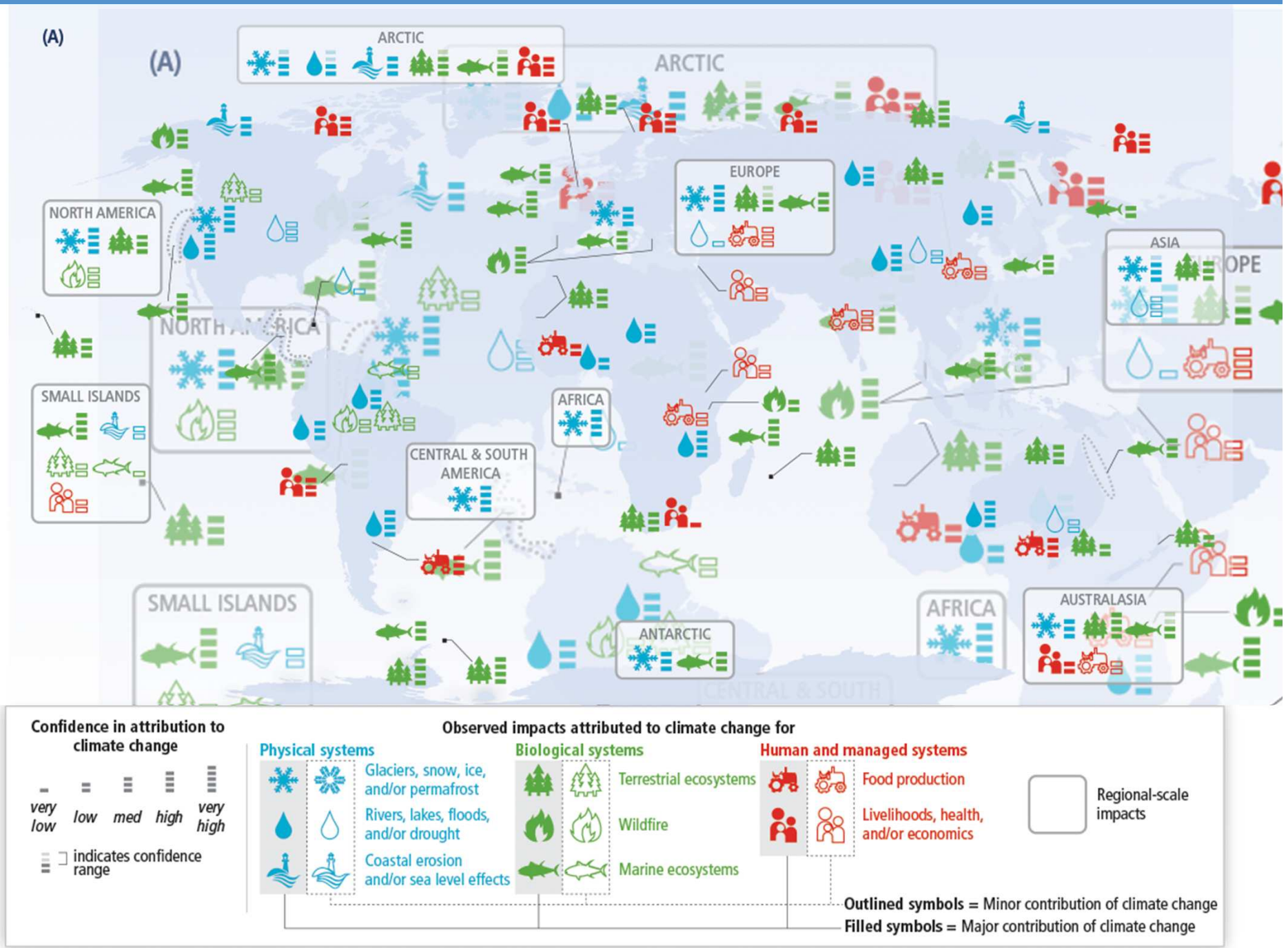
WIDESPREAD OBSERVED IMPACTS

A CHANGING WORLD

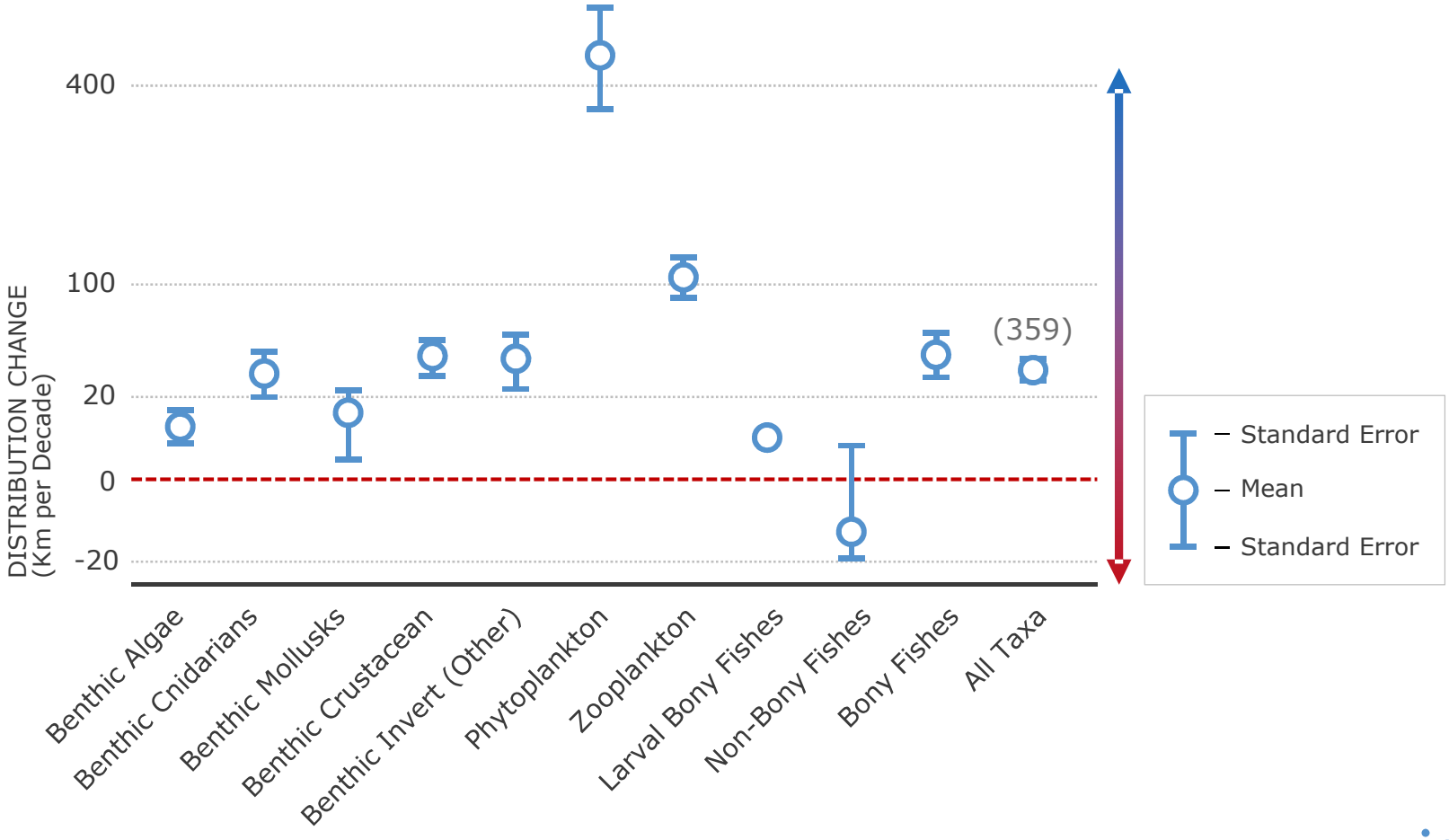
ipcc
INTERGOVERNMENTAL PANEL ON climate change



Global patterns of impacts in recent decades attributed to climate change, based on studies since the AR4. Impacts are shown at a range of geographic scales.

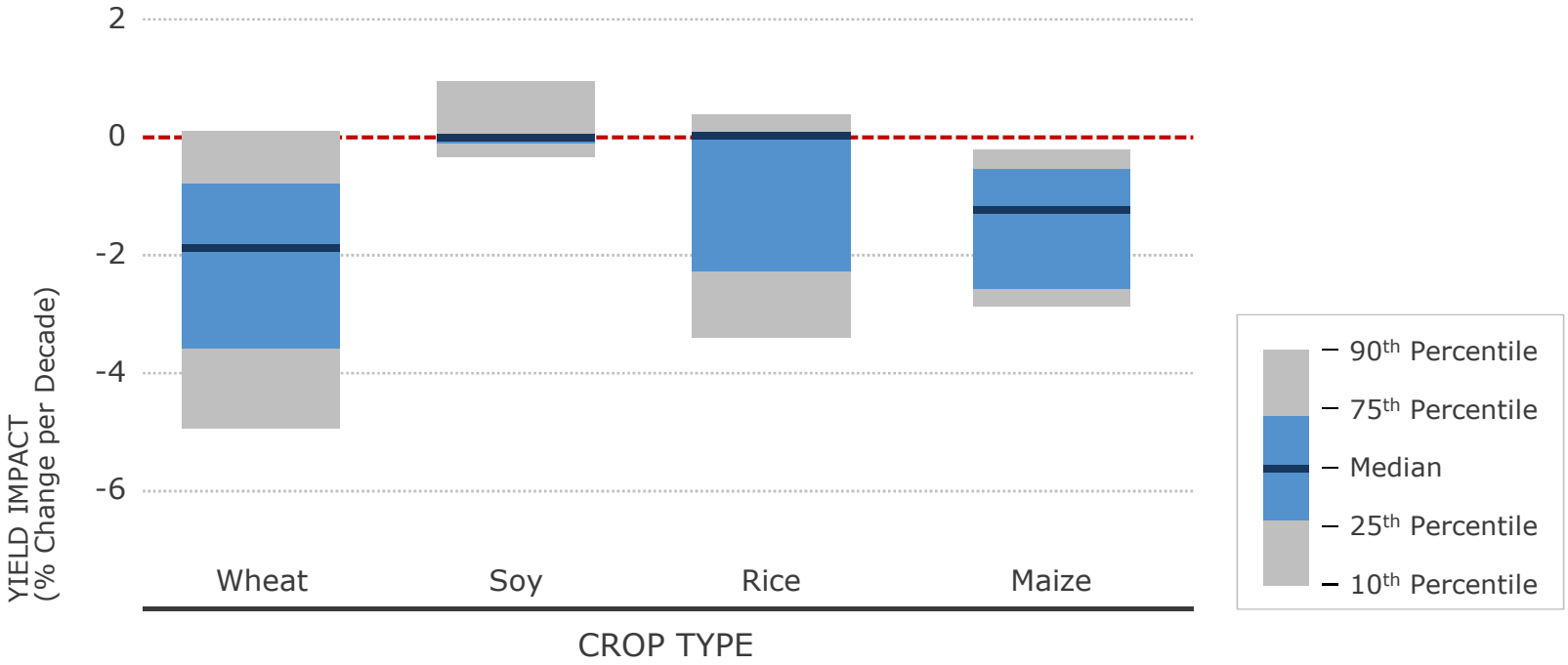

(A)
(A)
ARCTIC
ARCTIC
NORTH AMERICA
EUROPE
ASIA
SMALL ISLANDS
AFRICA
CENTRAL & SOUTH AMERICA
SMALL ISLANDS
ANTARCTIC
AFRICA
AUSTRALASIA
Confidence in attribution to climate change
very low
low
med
high
very high
indicates confidence range
Observed impacts attributed to climate change for
Physical systems
Glaciers, snow, ice, and/or permafrost
Rivers, lakes, floods, and/or drought
Coastal erosion and/or sea level effects
Biological systems
Terrestrial ecosystems
Wildfire
Marine ecosystems
Human and managed systems
Food production
Livelihoods, health, and/or economics
Regional-scale impacts
Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change

Average rates of change in distribution (km per decade) for marine taxonomic groups based on observations over 1900-2010. Positive distribution changes are consistent with warming (moving into previously cooler waters, generally poleward). The number of responses analyzed is given within parentheses for each category.



ipcc
INTERGOVERNMENTAL PANEL ON climate change

Summary of estimated impacts of observed climate changes on yields over 1960-2013 for four major crops in temperate and tropical regions, with the number of data points analyzed given within parentheses for each category



ipcc
INTERGOVERNMENTAL PANEL ON climate change

VULNERABILITY AND EXPOSURE

AROUND THE WORLD

ipcc
INTERGOVERNMENTAL PANEL ON climate change

VULNERABILITY AND EXPOSURE

AROUND THE WORLD

ipcc
INTERGOVERNMENTAL PANEL ON climate change

ADAPTATION IS

ALREADY OCCURING

ipcc
INTERGOVERNMENTAL PANEL ON climate change

ADAPTATION IS
ALREADY OCCURING

ipcc
INTERGOVERNMENTAL PANEL ON climate change

CLIMATE CHANGE

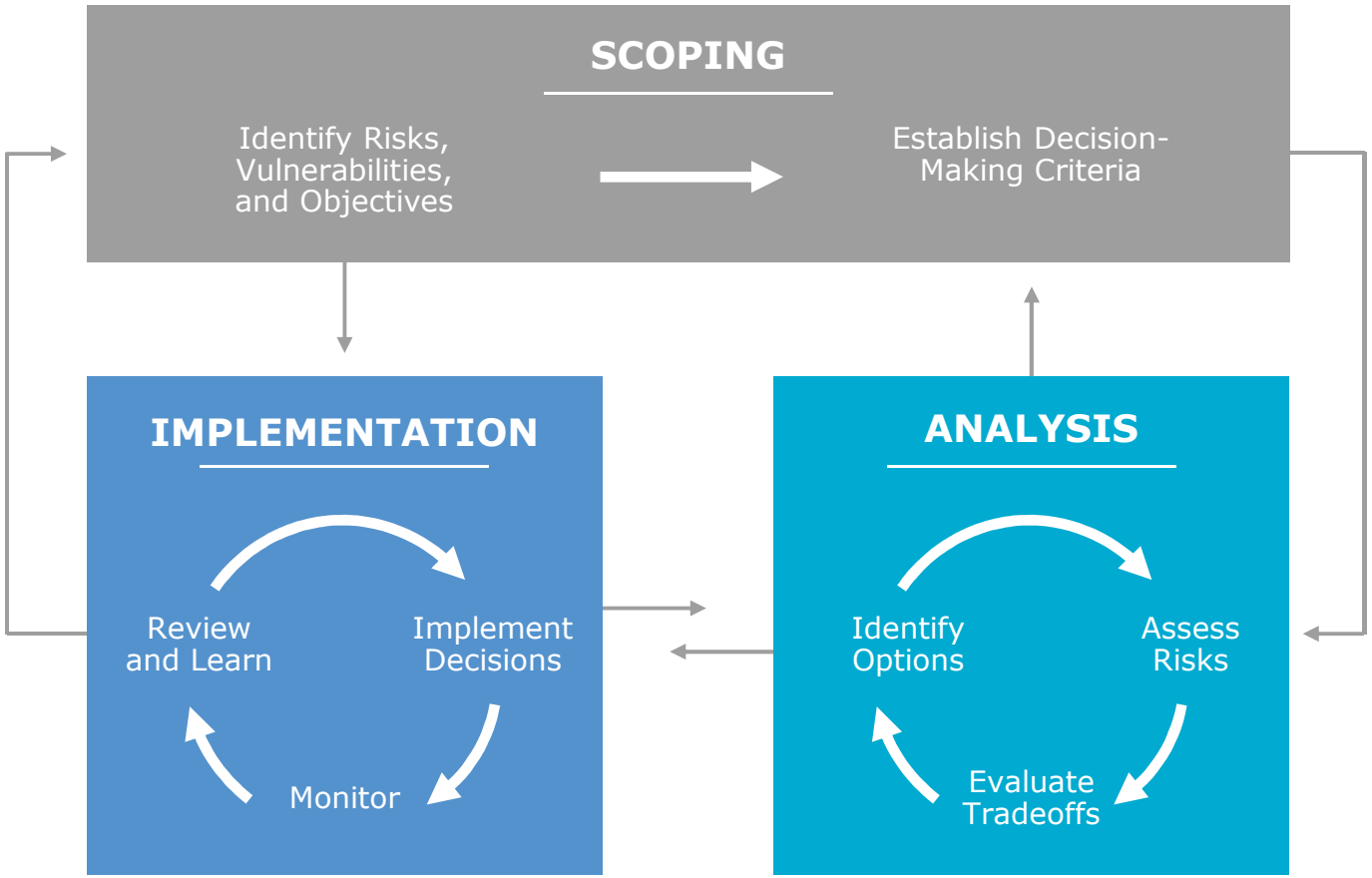
REDUCING AND MANAGING RISKS

ipcc
INTERGOVERNMENTAL PANEL ON climate change

INCREASING MAGNITUDES OF WARMING INCREASE THE LIKELIHOOD OF

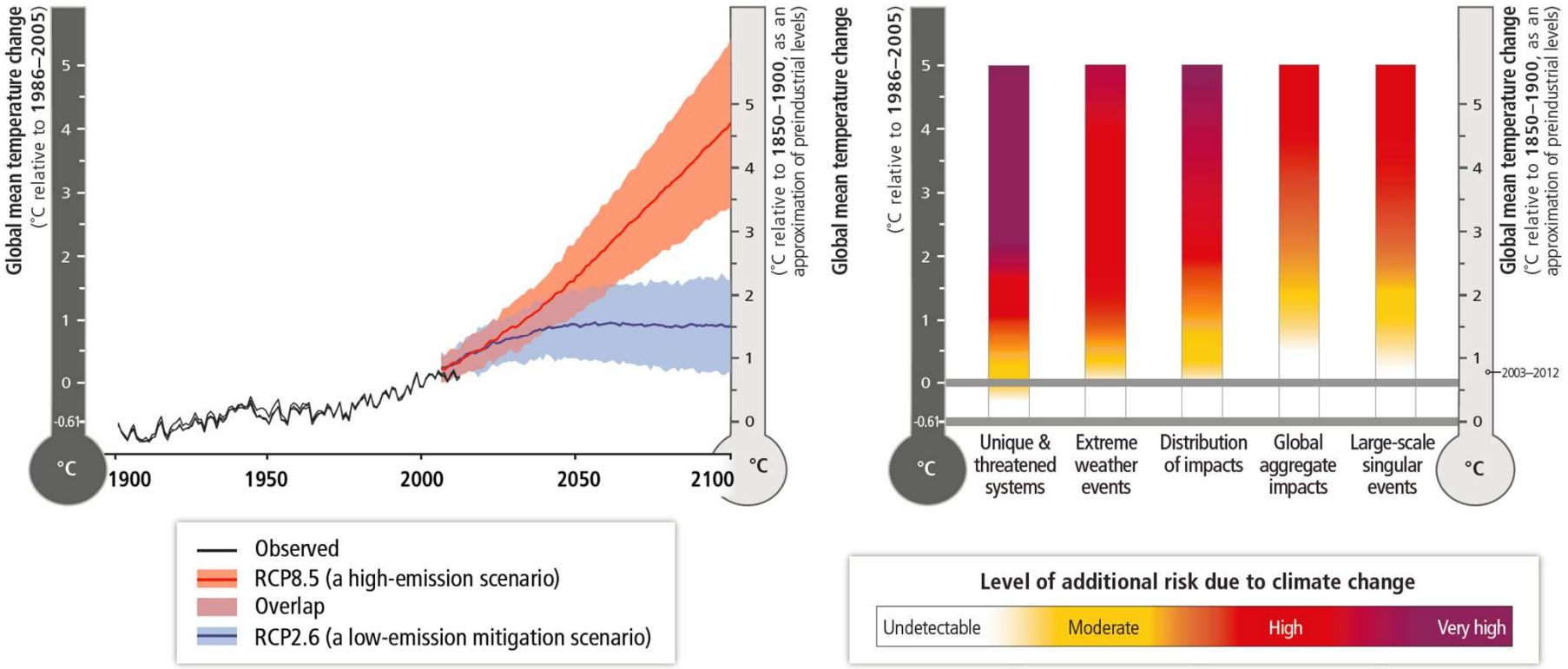
SEVERE AND PERVASIVE IMPACTS

ipcc
INTERGOVERNMENTAL PANEL ON climate change


SCOPING
Identify Risks, Vulnerabilities, and Objectives
Establish Decision-Making Criteria
IMPLEMENTATION
Review and Learn
Implement Decisions
Monitor
ANALYSIS
Identify Options
Assess Risks
Evaluate Tradeoffs

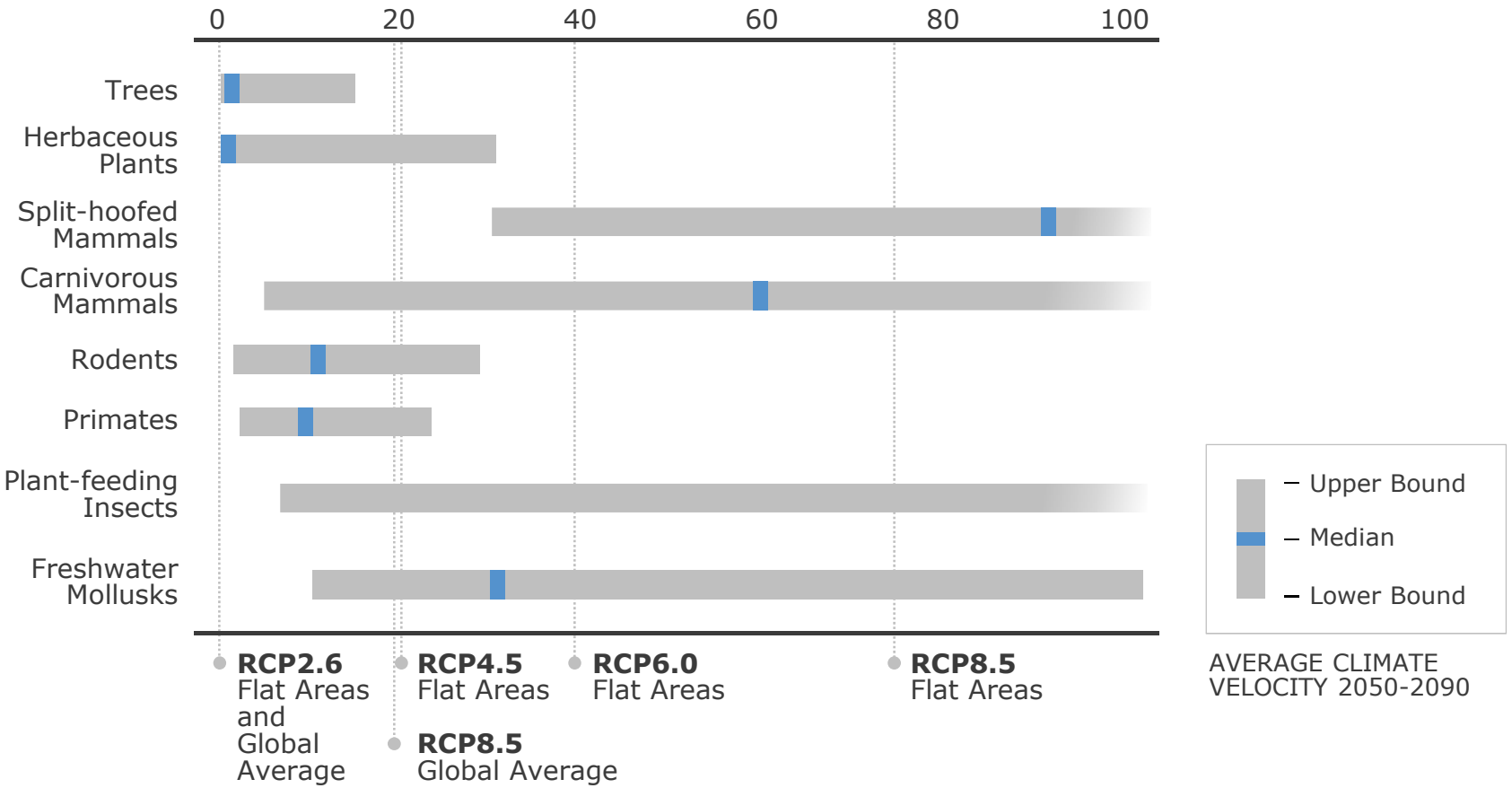
RISKS OF
CLIMATE CHANGE
INCREASE
WITH CONTINUED
HIGH EMISSIONS

Risk of climate-related impacts results from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems. Changes in both the climate system (left) and socioeconomic processes including adaptation and mitigation (right) are drivers of hazards, exposure, and vulnerability.



ipcc
INTERGOVERNMENTAL PANEL ON climate change

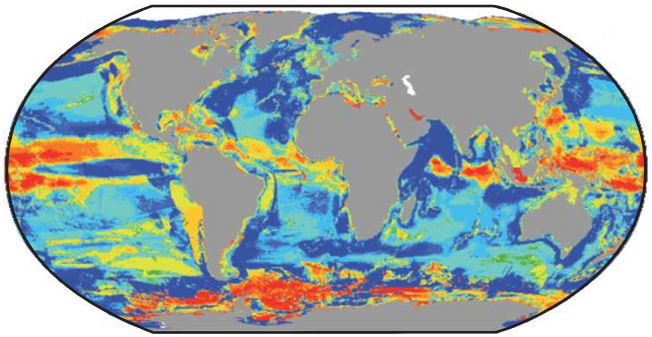
MAXIMUM SPEED AT WHICH SPECIES CAN MOVE
(km per decade)



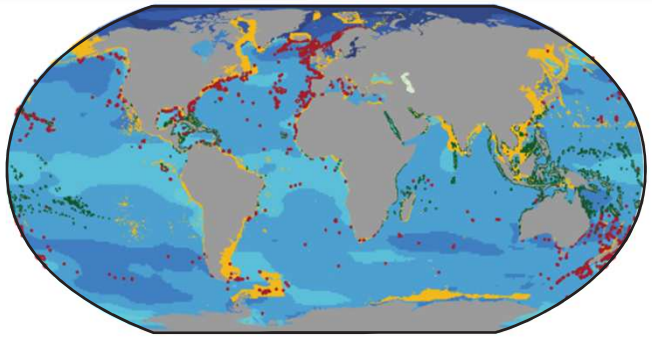
AVERAGE CLIMATE VELOCITY 2050-2090

ipcc
INTERGOVERNMENTAL PANEL ON climate change

CHANGE IN MAXIMUM CATCH POTENTIAL (2051-2060 COMPARED TO 2001-2010, SRES A1B)



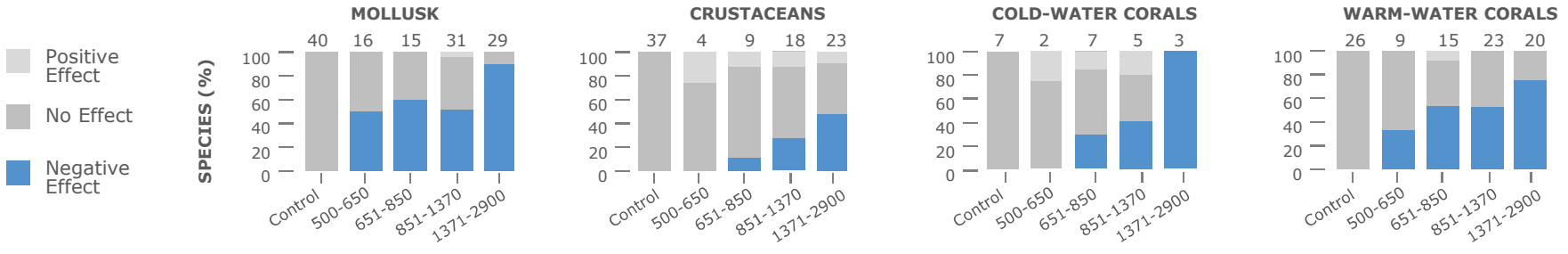
CHANGE IN pH (2081-2100 COMPARED TO 1986-2005, RCP 8.5)



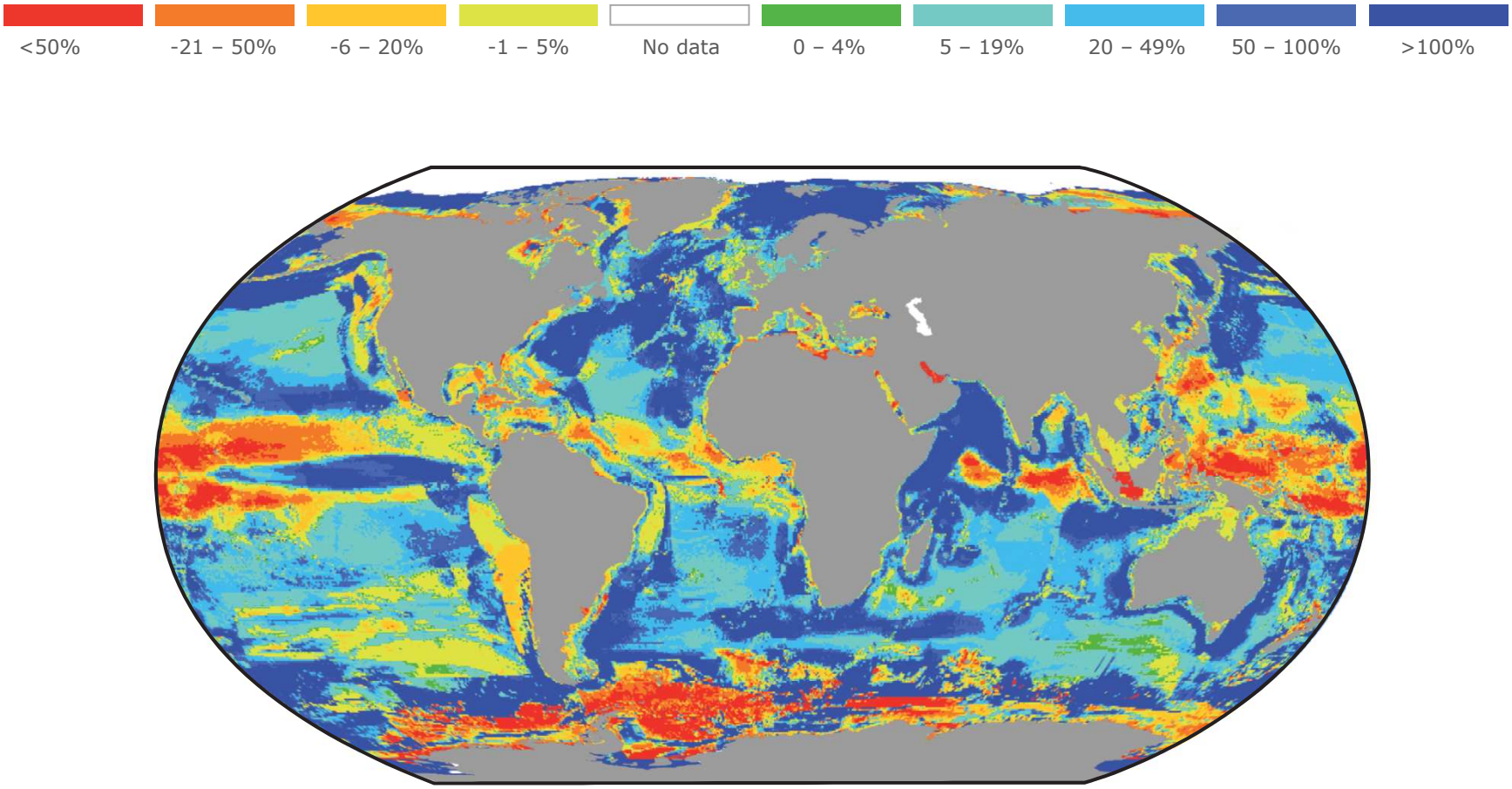
Mollusk and Crustacean Fisheries
Present-day annual catch rate ≥0.005 tonnes km^2

Cold-Water Corals

Warm-Water Corals

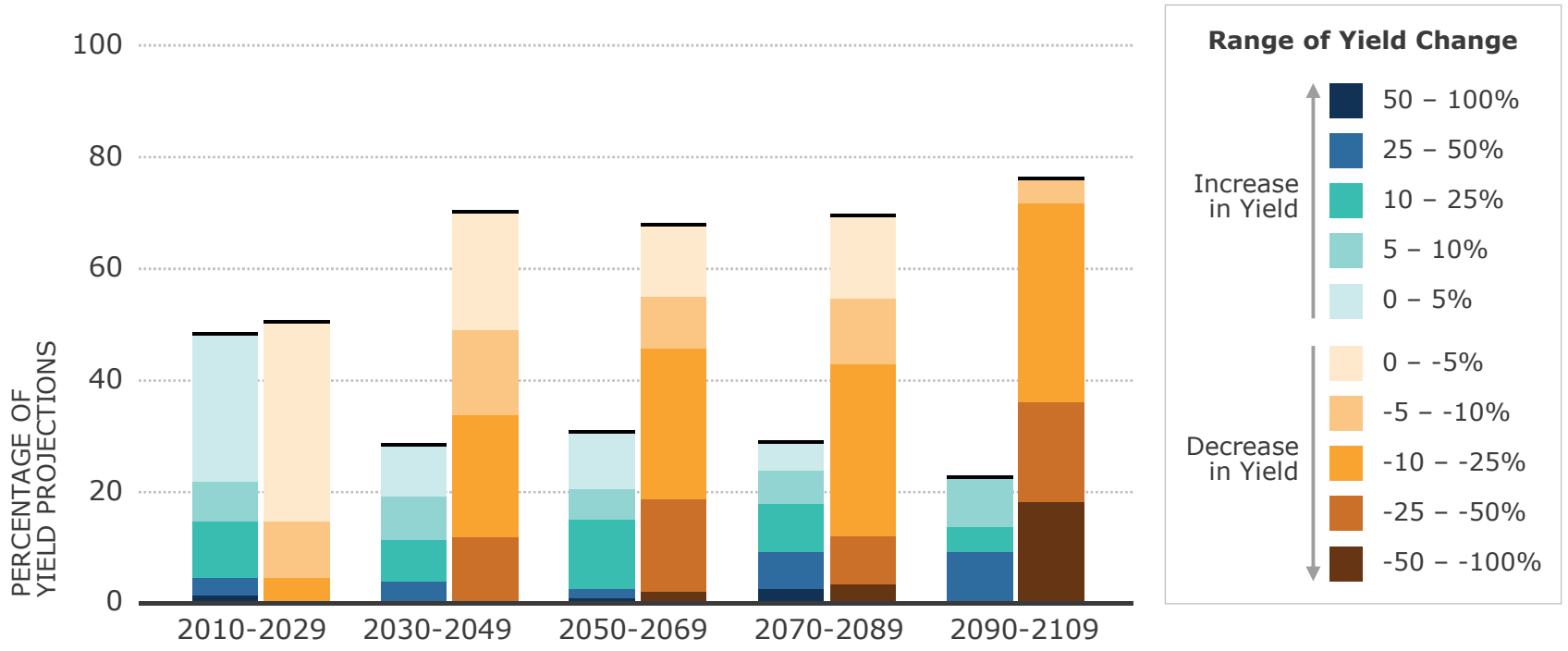


CHANGE IN MAXIMUM CATCH POTENTIAL (2051-2060 COMPARED TO 2001-2010, SRES A1B)



ipcc
INTERGOVERNMENTAL PANEL ON climate change

Summary of projected changes in crop yields, due to climate change over the 21st century. The figure includes projections for different emission scenarios, for tropical and temperate regions, and for adaptation and no-adaptation cases combined. Relatively few studies have considered impacts on cropping systems for scenarios where global mean temperatures increase by 4oC or more.



ipcc
INTERGOVERNMENTAL PANEL ON climate change


Risk-Level
Very Low
Med
Very High
Present
Near Term (2030-2040
Long Term (2080-2100 2°C 4°C
Risk Level with High Adaptation
Potential for Additional Adaptation to Reduce Risk
Risk Level with Current Adaptation
POLAR REGIONS
Risks for Ecosystems
Risks for Health and Well-Being
Unprecedented Challenges, Especially from Rate of Change
NORTH AMERICA
Increased Risks from Wildfires
Heat-Related Human Mortality
Damages from River and Coastal Urban Floods
EUROPE
Increased Flood Losses and Impacts
Increased Losses and Impacts from Extreme Heat Events
Increased Water Restrictions
ASIA
Increased Flood Damage to Infrastructure , Livelihoods, and Settlements
Heat-Related Human Mortality
Increased Drought-Related Water and Food Shortage
THE OCEAN
Reduced Fisheries Catch Potential at Low Latitudes
Increased Mass Coral Bleaching and Mortality
Coastal Inundation and Habitat Loss
CENTRAL AND SOUTH AMERICA
Reduced Water Availability and Increased Flooding and Landslides
Reduced Food Production and Quality
Vector-Borne Diseases
AFRICA
Compounded Stress on Water Resources
Reduced Crop Productivity and Livelihood and Food Security
Vector- and Water-Borne Diseases
SMALL ISLANDS
Loss of Livelihoods, Settlements, Infrastructure, Ecosystem Services, and Economic Stability
Risks for Low-Lying Coastal Areas
AUSTRALASIA
Significant Change in Composition and Structure of Coral Reef Systems
Increased Flood Damage to Infrastructure and Settlements
Increased Risks to Coastal Infrastructure and Low-Lying Ecosystems

EFFECTIVE CLIMATE CHANGE ADAPTATION

A MORE VIBRANT WORLD

ipcc
INTERGOVERNMENTAL PANEL ON climate change