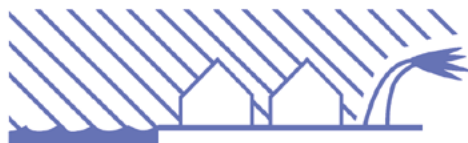


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IPCC 5. ASSESSMENT REPORT

WORKING GROUP 2
IMPACTS, ADAPTATION AND VULNERABILITY

Human interference with the climate system is occurring, and climate change poses risks for human and natural systems. The assessment of impacts, adaptation, and vulnerability in the Working Group II contribution to the IPCC's Fifth Assessment Report (WGII AR5) evaluates how patterns of risk and potential benefits are shifting due to climate change and how risks can be reduced through mitigation and adaptation.



TROPICAL CYCLONE ACTIVITY

IMPACTS

Effects on natural and human systems.



COASTAL FLOODING

RISK

The potential for consequences where something of human value (including humans themselves) is at stake and where the outcome is uncertain.

Risk is often represented as the probability of hazardous events or trends occurring multiplied by the consequences if these events occur. This report assesses climate related risks.



CHANGING INFRASTRUCTURE

ADAPTATION

The process of adjustment to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate.



FLOOD RISK REDUCED

MITIGATION

A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

OBSERVED IMPACTS OF CLIMATE CHANGE

Observed impacts of climate change are widespread and consequential. Recent changes in climate have caused impacts on natural and human systems on all continents and across the oceans.

The following pages explore:

- Observed Impacts on the Ocean
- Observed Impacts in Europe
- Impacts on Crop Yields
- Impacts on Migration Patterns of Species.

OCEAN WARMING, ACIDIFICATION AND LACK OF OXYGEN ARE CRITICAL FOR LIFE IN OCEANS.



Increased movements of plankton, fish and invertebrate communities northwards with warming accompanied by changing seasonal triggers. Increase in biodiversity and fish biomass at high latitude fringes.



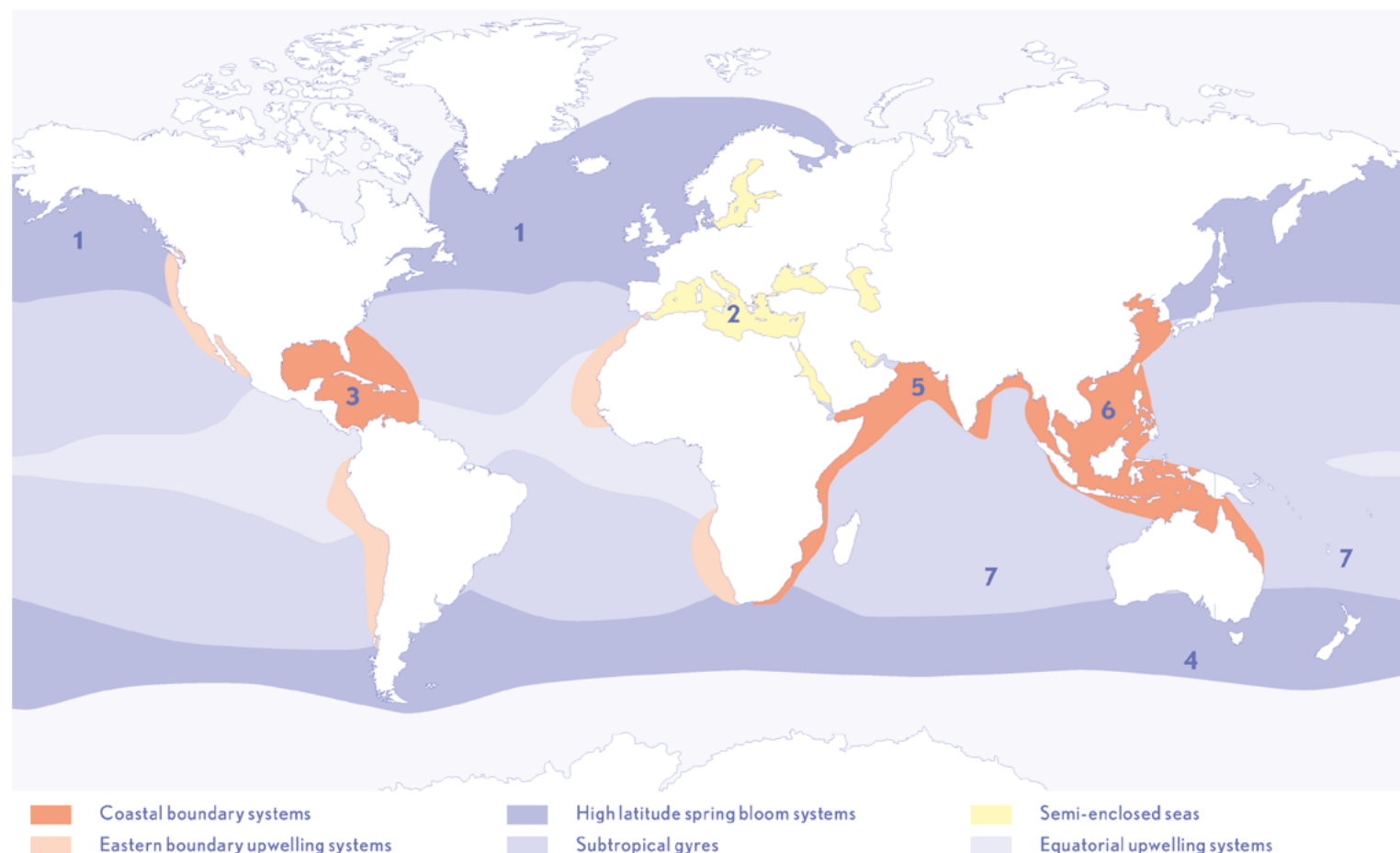
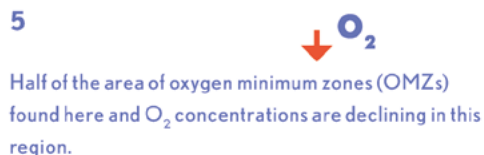
Recent spread of tropical species invading from Indian and Atlantic Oceans. Increased frequency of mass mortality events of benthic plants and animals linked to extreme temperatures.



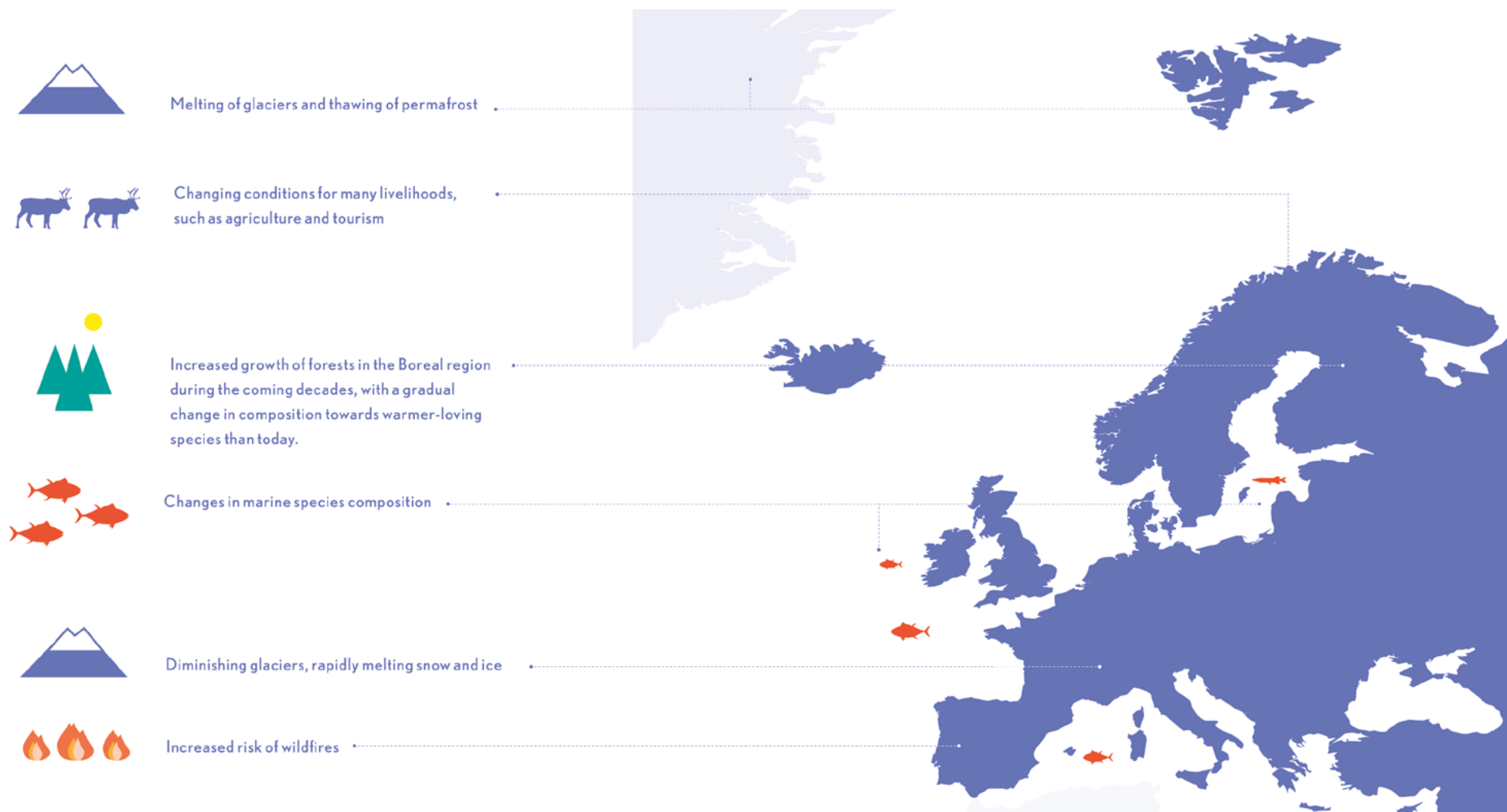
Expansion of seasonal hypoxic areas due to thermal stratification and eutrophication. Mass coral bleaching events leading to degradation of coral reefs and loss of associated biodiversity. Observed shifts in distributions of fish species.



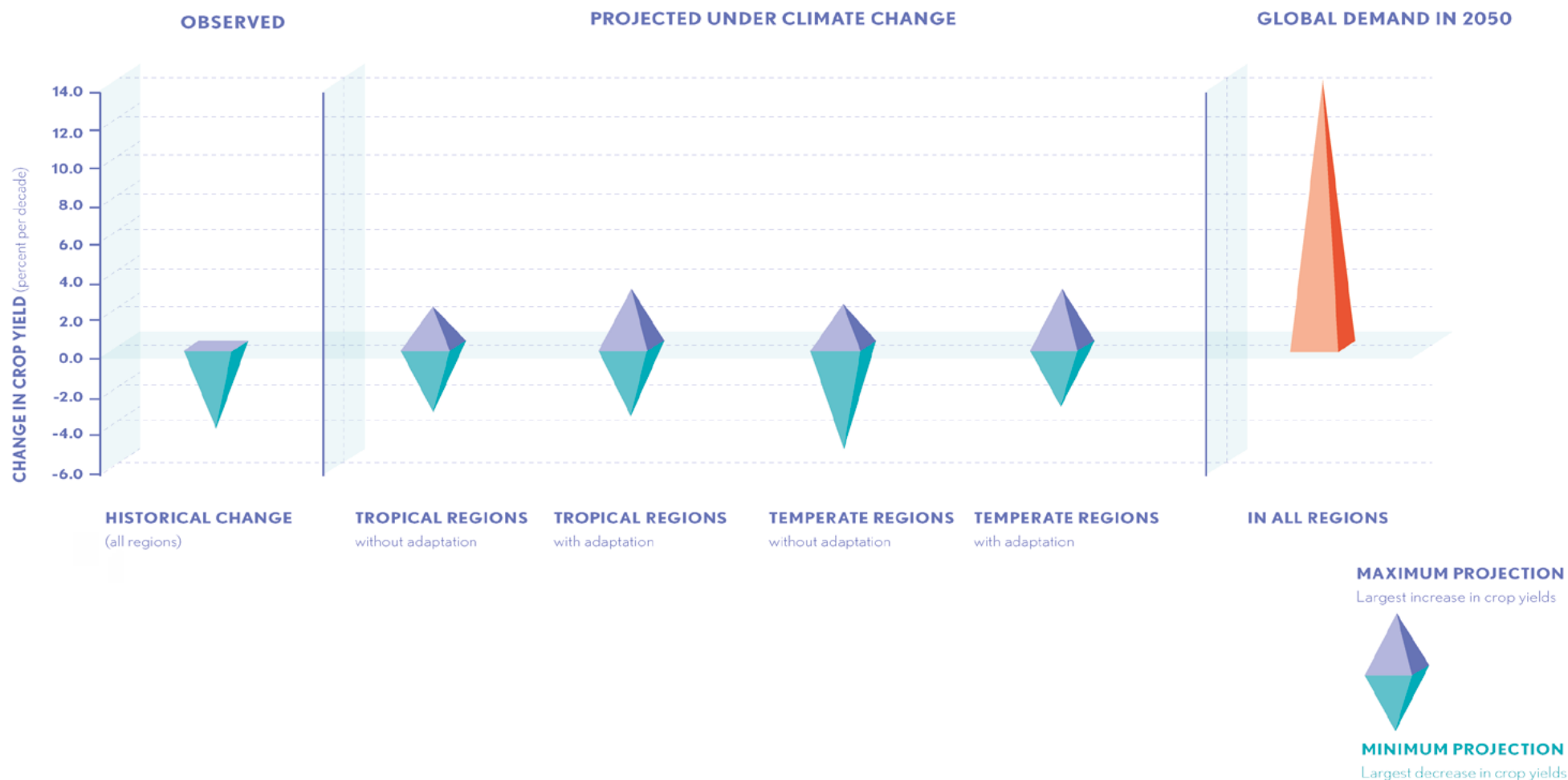
Shoaling of aragonite saturation horizon at high latitudes reduces calcification and changes structure of plankton communities. Observed dissolution of shells of living polar pteropods suggests impacts have started.



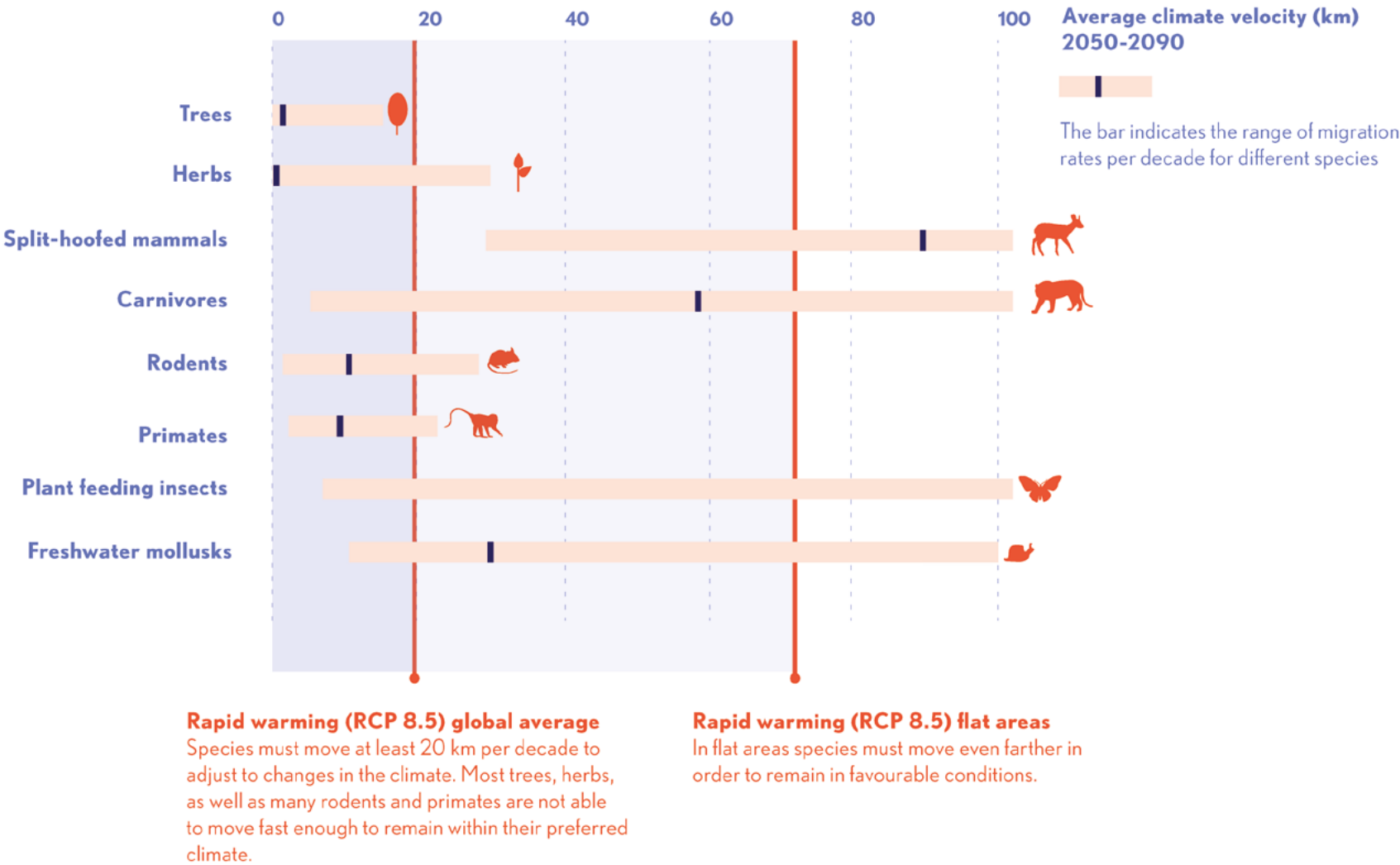
IMPACTS RELATED TO CLIMATE CHANGE IN EUROPE ARE DIVERSE.



PROJECTED GLOBAL DEMAND TO FEED THE WORLD IN 2050 IS GREATER THAN THE HIGHEST ESTIMATES OF PROJECTED CROP YIELDS.



MOVEMENT OF SPECIES Distance that species must displace themselves in order to stay within current preferred climate conditions (km per decade).



RISK

KEY RISKS

Risk of death, injury, and disrupted livelihoods in low-lying coastal zones and small island developing states, due to sea level rise, coastal flooding and storm surges.



Risks due to extreme events leading to breakdown of critical services, such as water, electricity, health and rescue services.



Risk of food insecurity linked to warming, drought, and precipitation variability, particularly for poorer populations.



Risk of loss of marine and coastal ecosystems and the services they provide for coastal livelihoods, especially for fishing communities in the tropics and the Arctic.



Risk of severe harm for large urban populations due to flooding.



Risk of loss of terrestrial and freshwater ecosystems and the services they provide for livelihoods.



Risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers with minimal capital in semi-arid regions.



Risk of mortality and morbidity during periods of extreme heat, particularly for vulnerable urban populations.



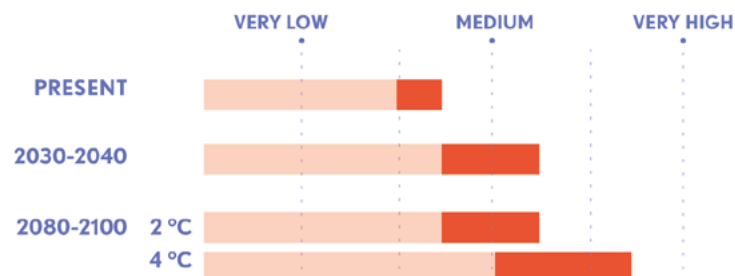
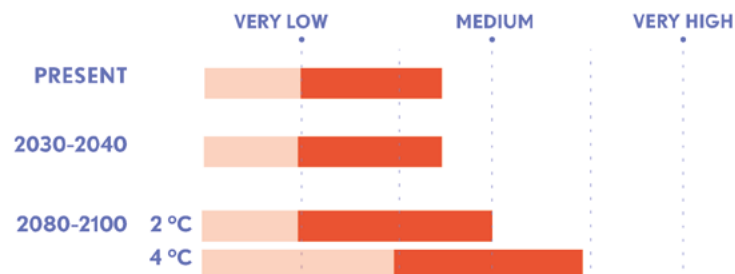
EUROPE

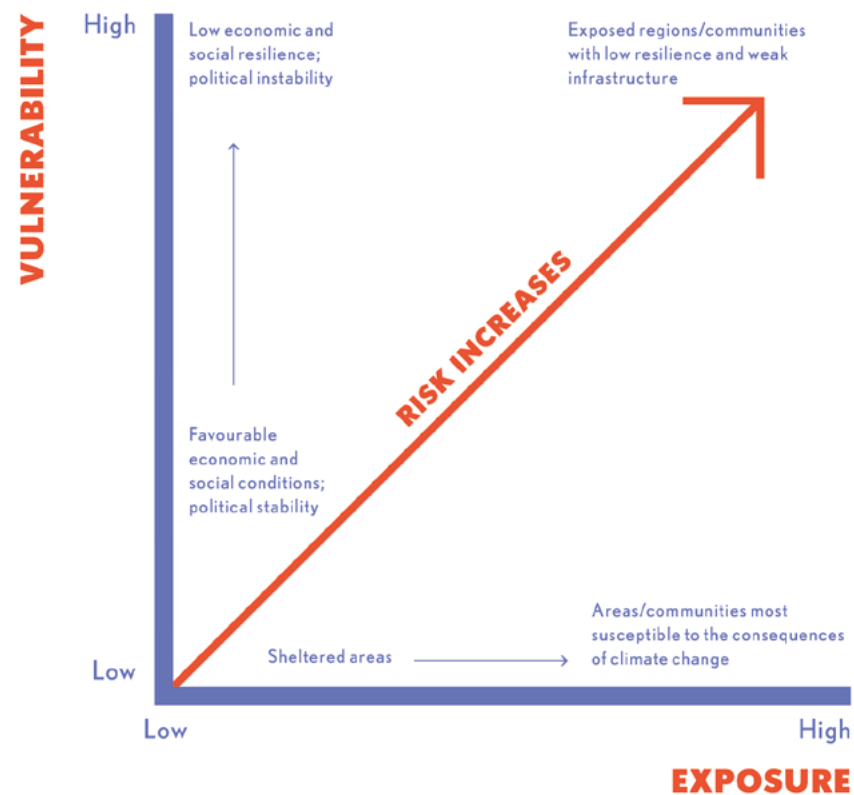
RISK AND POTENTIAL FOR ADAPTATION



KEY RISK

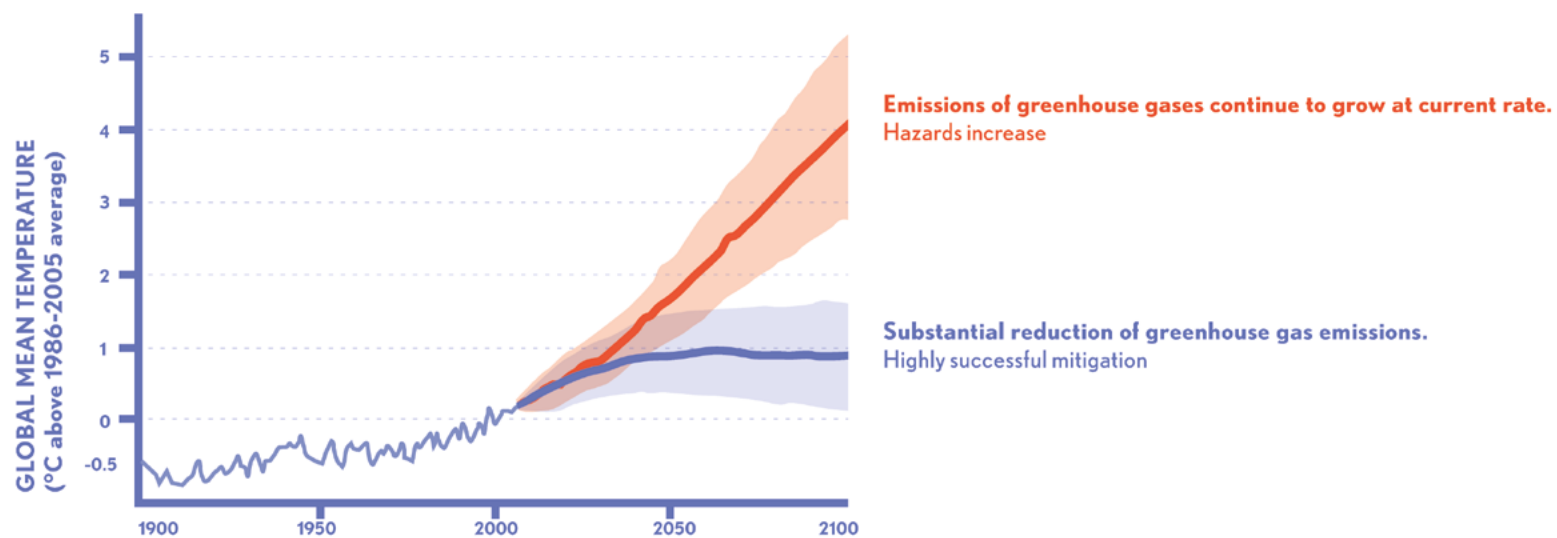
RISK LEVEL



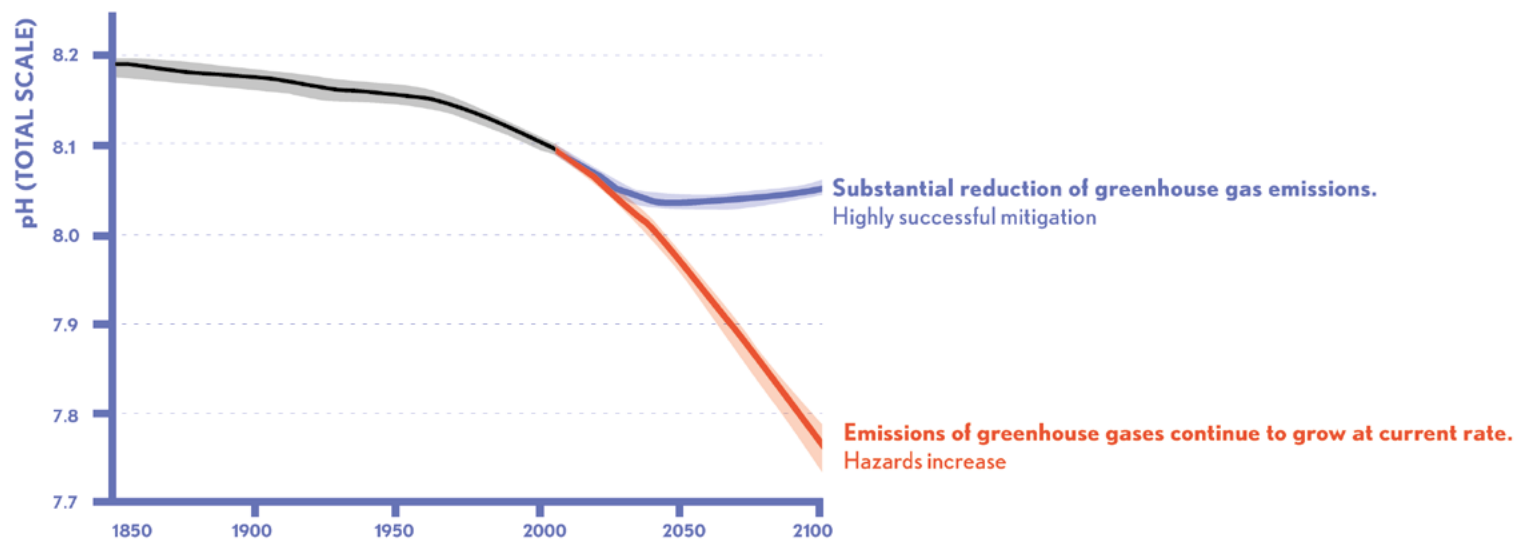


Both vulnerability and exposure contribute to risks. For example low lying coastal regions are exposed to sea level rise, but the risks depend also on the ability of society to cope with the exposure. The poorest and weakest societies face the greatest risks in terms of imperilled or reduced livelihoods due to climate change.

GLOBAL MEAN TEMPERATURE



OCEAN ACIDIFICATION



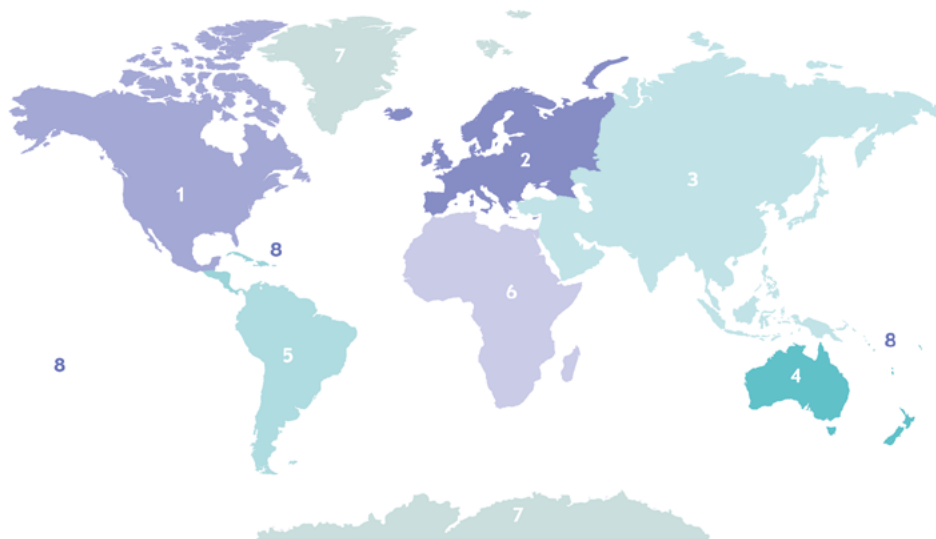
ADAPTATION

PRINCIPLES FOR EFFECTIVE ADAPTATION

From individuals to governments, actors across scales and regions have complementary roles in enabling adaptation planning and implementation, for example through increasing awareness of climate change risks, learning from experience with climate variability, and achieving synergies with disaster risk management.

Transformation in political, economic, and technological systems resulting from changes in world views and goals can facilitate adaptation and mitigation and promote sustainable development.

GOVERNMENTS AT VARIOUS SCALES ARE STARTING TO DEVELOP ADAPTATION PLANS AND POLICIES, AND ADAPTATION EXPERIENCE IS ACCUMULATING ACROSS REGIONS



1. NORTH AMERICA, governments are engaging in incremental adaptation assessment and planning, particularly at the municipal level, with some proactive adaptation anticipating future impacts for longer-term investments in energy and public infrastructure.



2. EUROPE, adaptation policy has been developed across scales, with some adaptation planning integrated into coastal and water management and into disaster risk management.



3. ASIA, water management practices, including water saving technologies and water reuse, offer considerable potential for increasing water productivity.



4. AUSTRALASIA, planning for sea-level rise and, in southern Australia, for reduced water availability is becoming widely adopted.



5. CENTRAL AND SOUTH AMERICA, ecosystem-based adaptation including protected areas, conservation agreements and community management of natural areas is increasingly common, with benefits for improvements in livelihoods and preservation of traditional cultures.



6. AFRICA, most national governments are initiating governance systems for adaptation, and in predominantly isolated efforts, disaster risk management, adjustments in technologies and infrastructure and ecosystem-based approaches.



7. POLAR REGIONS, residents have a history of adapting to change, but the rate of climate change and complex interlinkages with societal, economic, and political factors represent unprecedented challenges for northern communities.

8. IN SMALL ISLANDS, diverse physical and human attributes and their sensitivity to climate-related drivers have been inconsistently integrated into adaptation planning.

Mitigation of greenhouse gas emissions over the next few decades can substantially reduce risks of climate change in the second half of the 21st century.