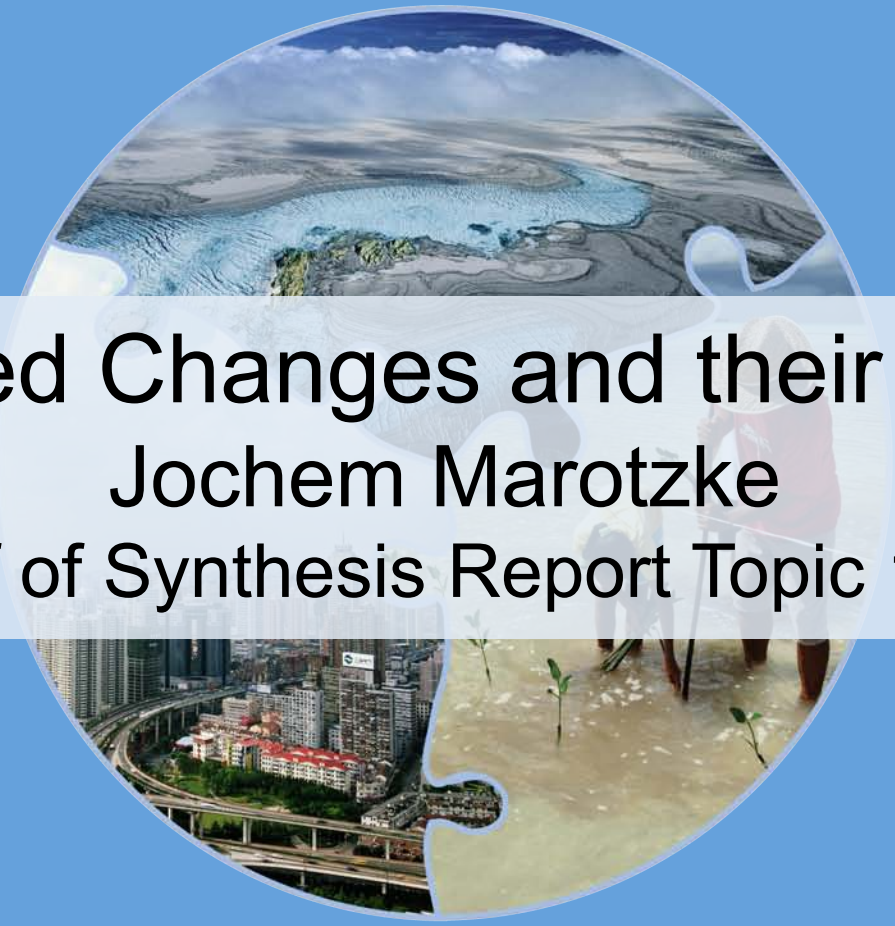
CLIMATE CHANGE 2014
Synthesis Report



Observed Changes and their Causes

Jochem Marotzke
(on behalf of Synthesis Report Topic 1 authors)

Synthesis Report of the
Fifth Assessment Report of the
Intergovernmental Panel on Climate Change

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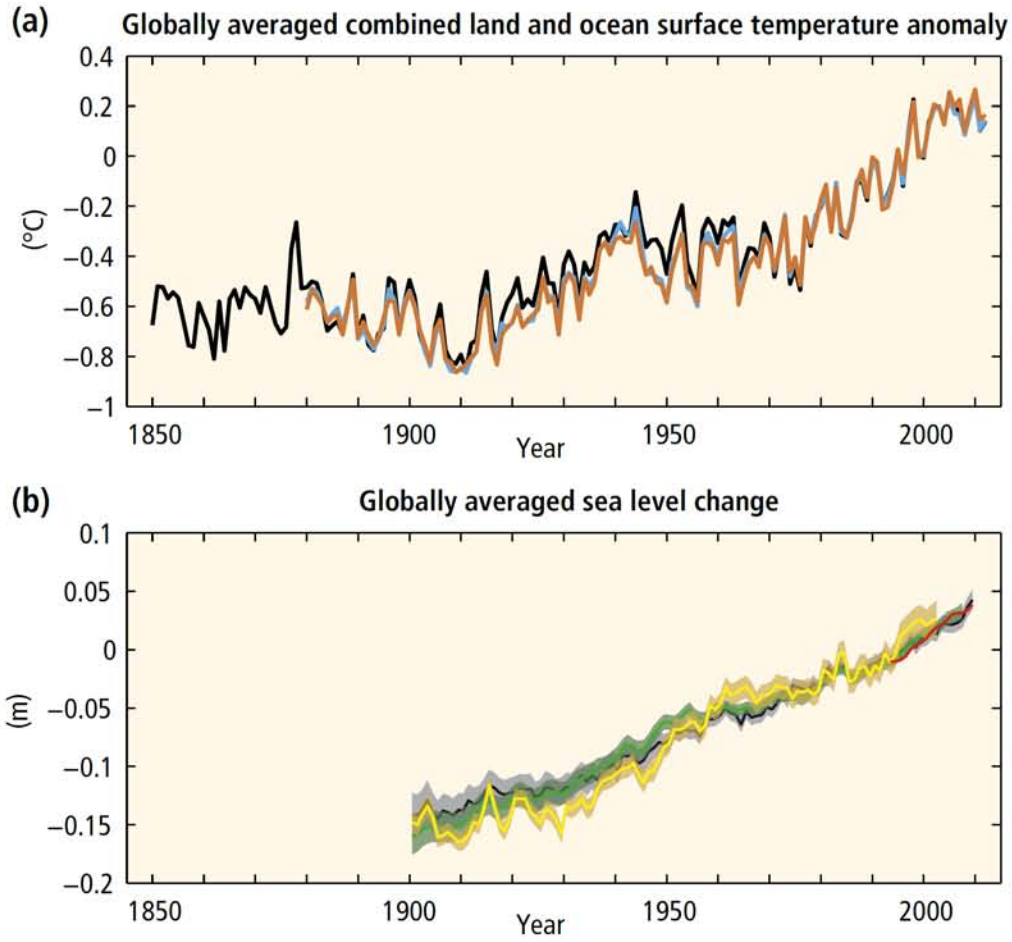

Globally averaged temperature anomaly

AR5 SYR Figure SPM. 1a,b

Globally averaged sea-level change

"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen." *AR5 SYR*

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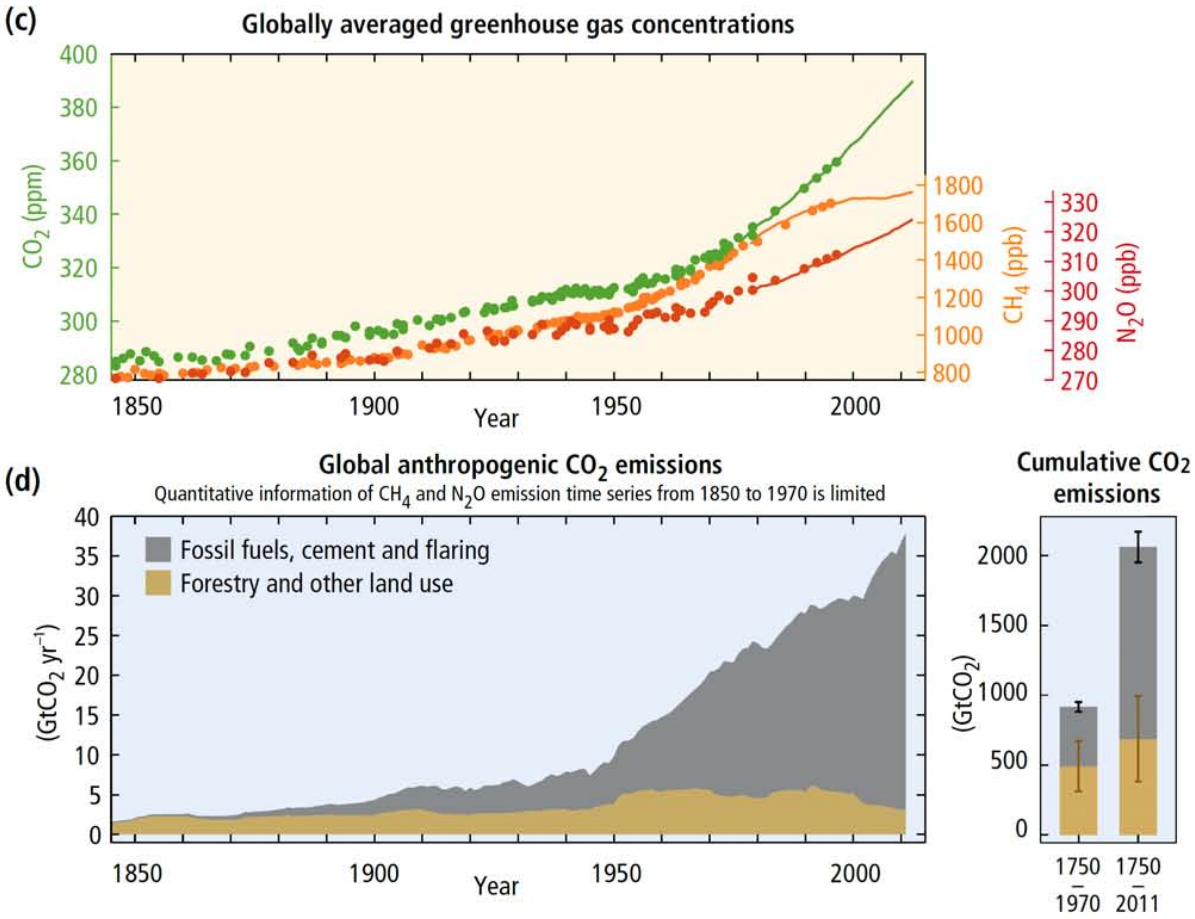

Globally averaged greenhouse gas concentrations

AR5 SYR Figure SPM.1c,d

Global anthropogenic CO_2 emissions

"Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years." *AR5 SYR*

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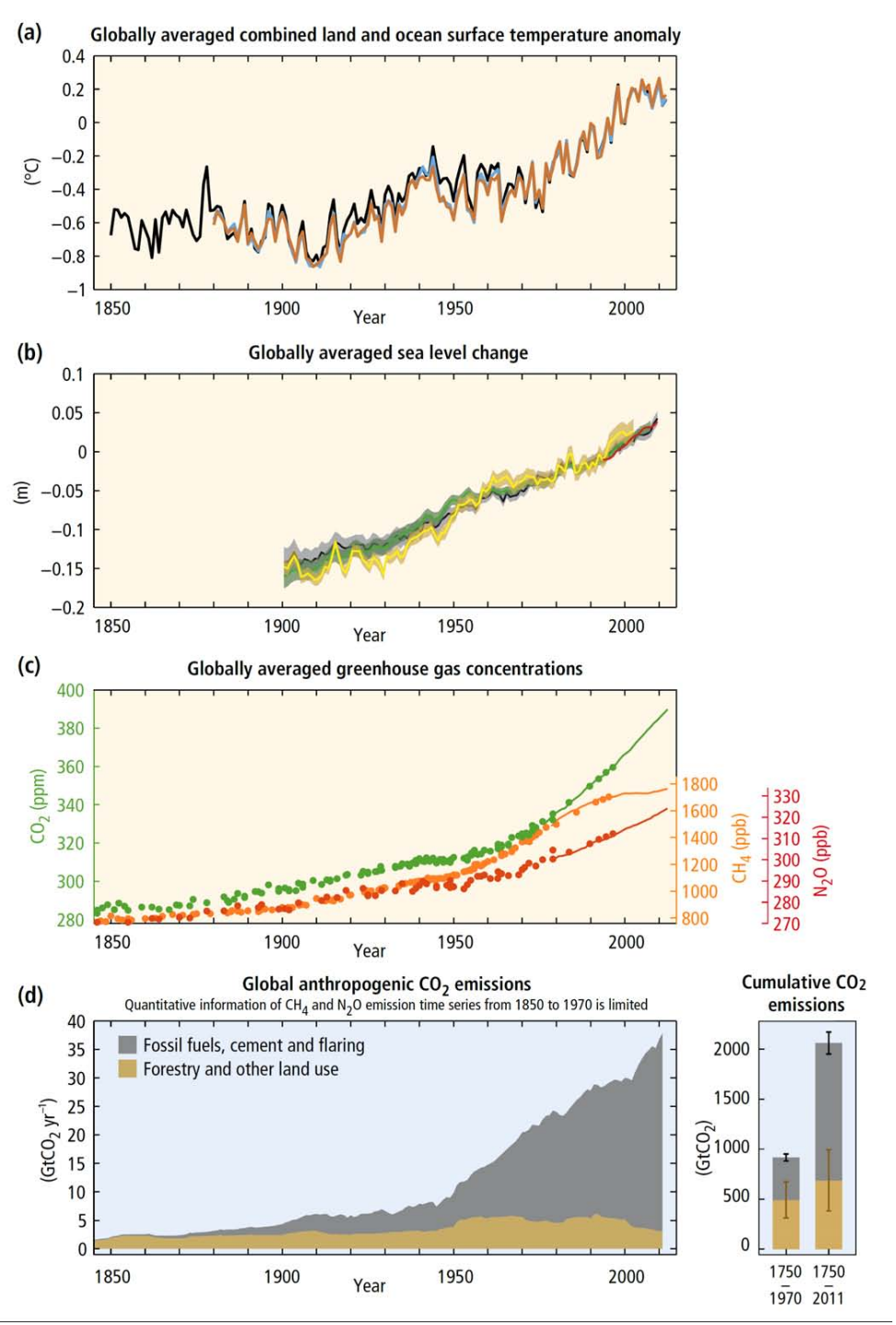

AR5 SYR Figure SPM.1

Globally averaged temperature anomaly

Globally averaged sea-level change

Globally averaged greenhouse gas concentrations

Global anthropogenic CO_2 emissions

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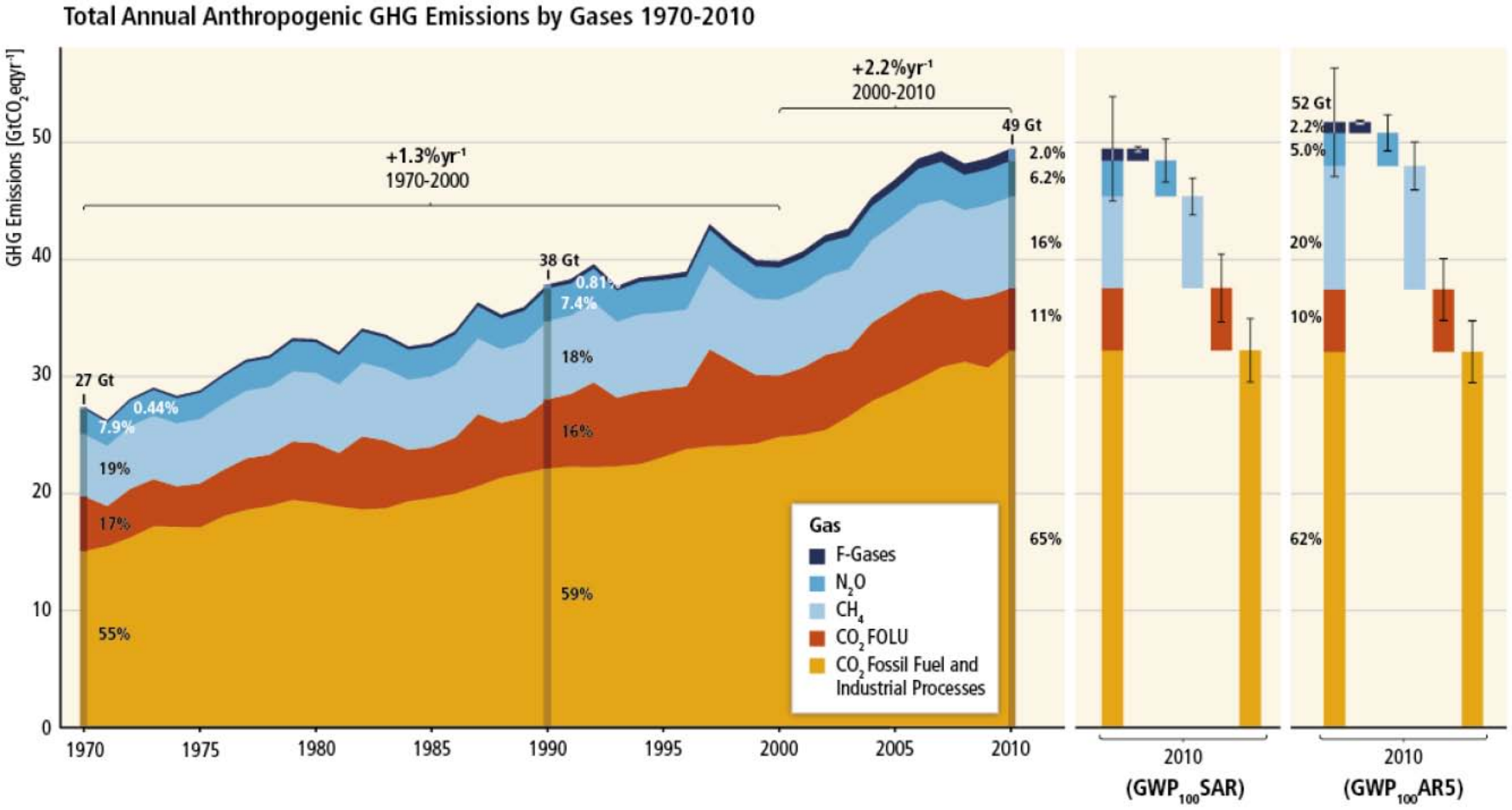
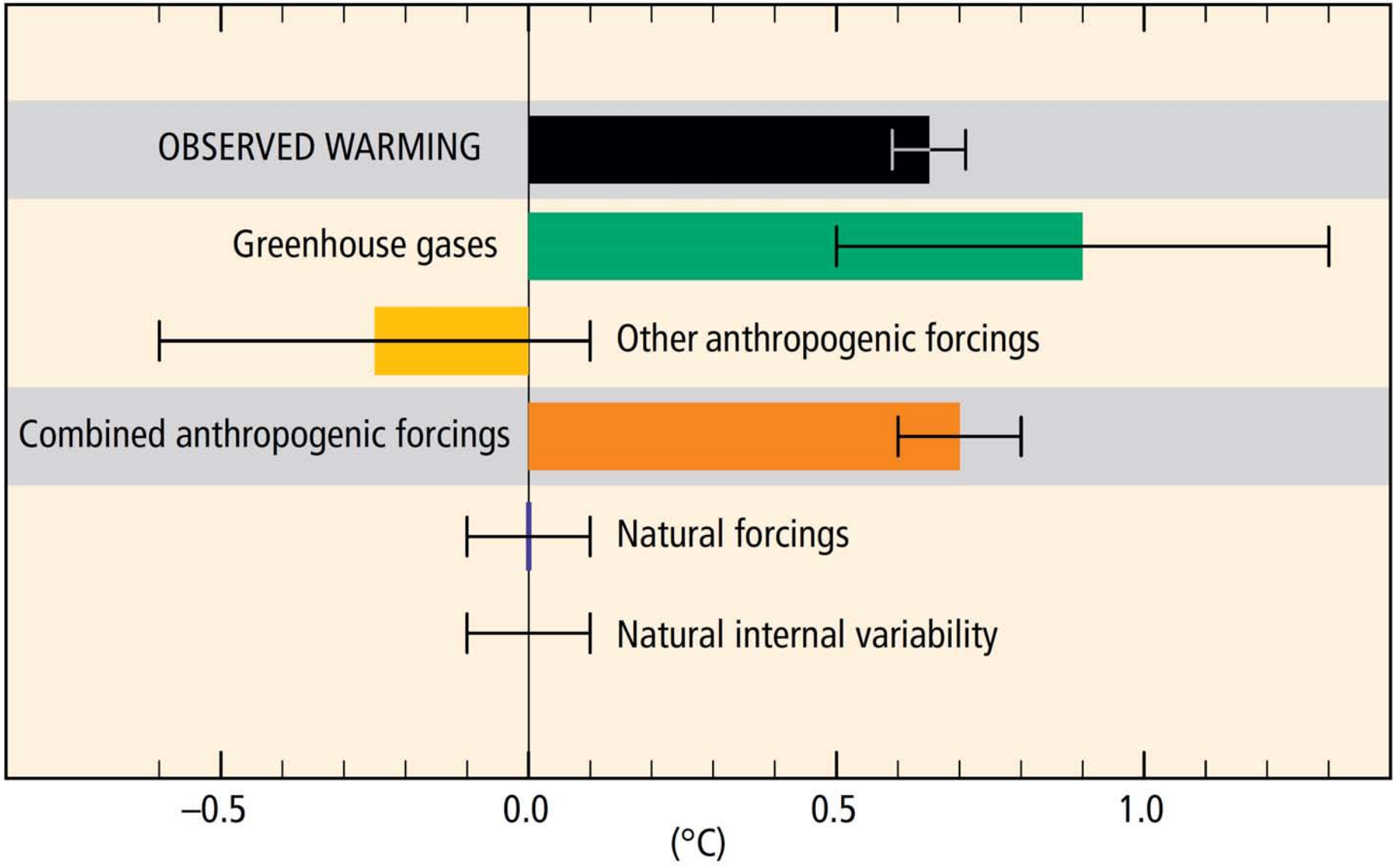
Global Annual Anthropogenic Greenhouse Gas Emissions by Gases, 1970 to 2010 (Figure SPM.2, AR5 Synthesis Report)



Emissions of other gases are shown as their contributions to "CO_2-equivalent" – common "currency" established by considering what the radiative effect would be over 100 years

Contributions to observed surface temperature change over the period 1951-2010



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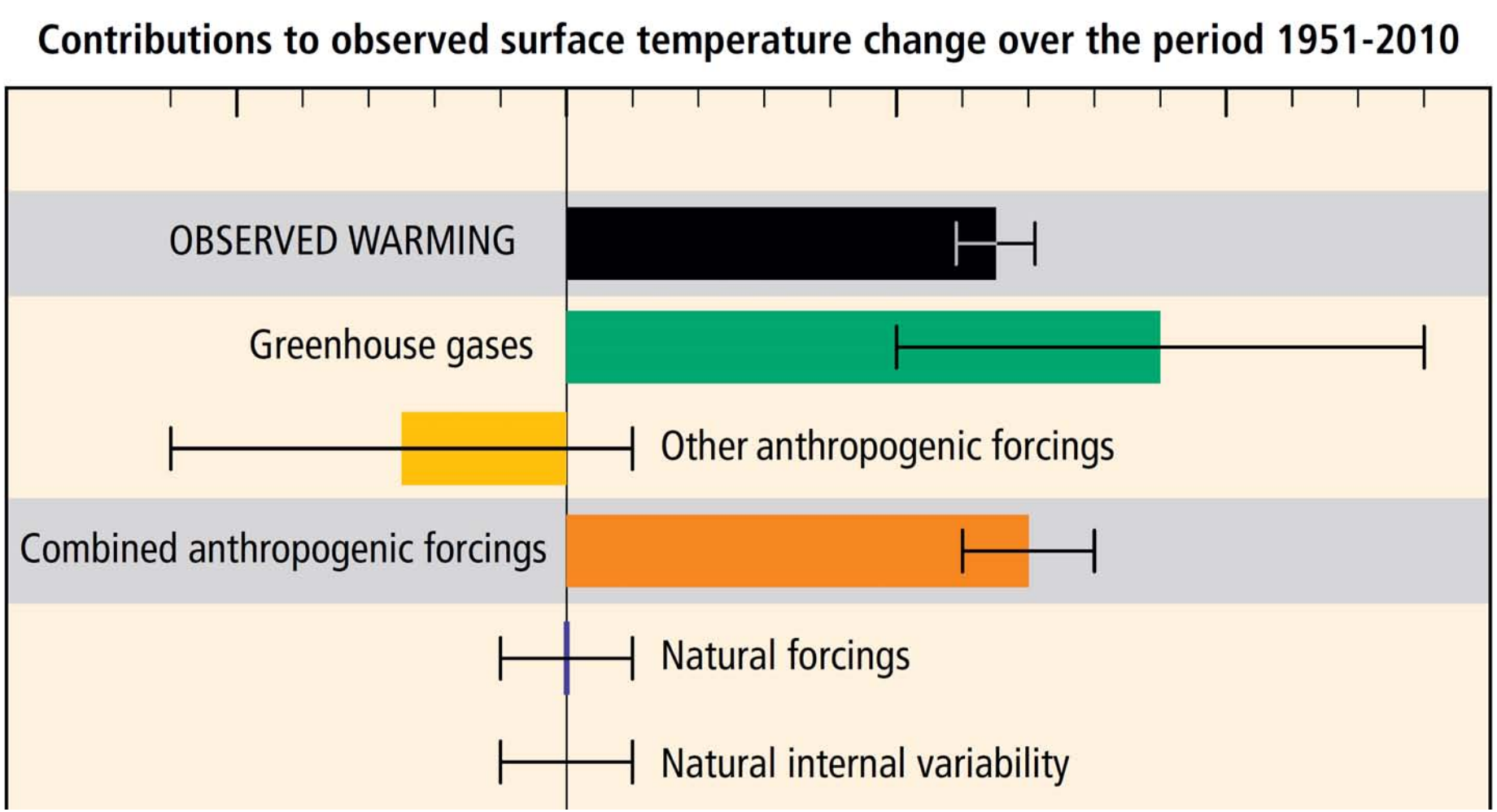
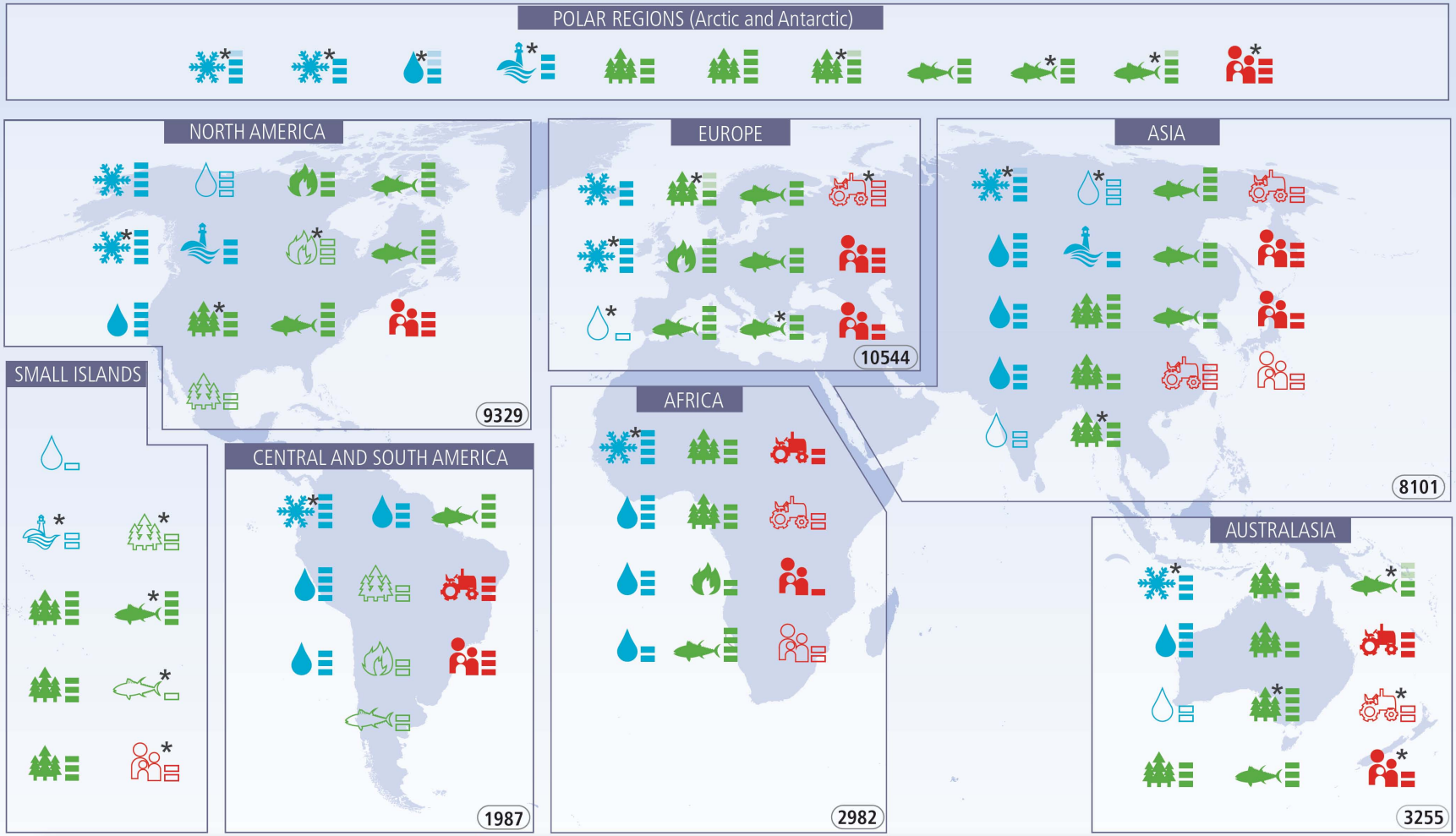


"Their [high concentrations of greenhouse gases] effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century." *AR5 SYR*

Widespread impacts attributed to climate change based on the available scientific literature since the AR4



Confidence in attribution to climate change

very low | low | med | high | very high

indicates confidence range

Observed impacts attributed to climate change for

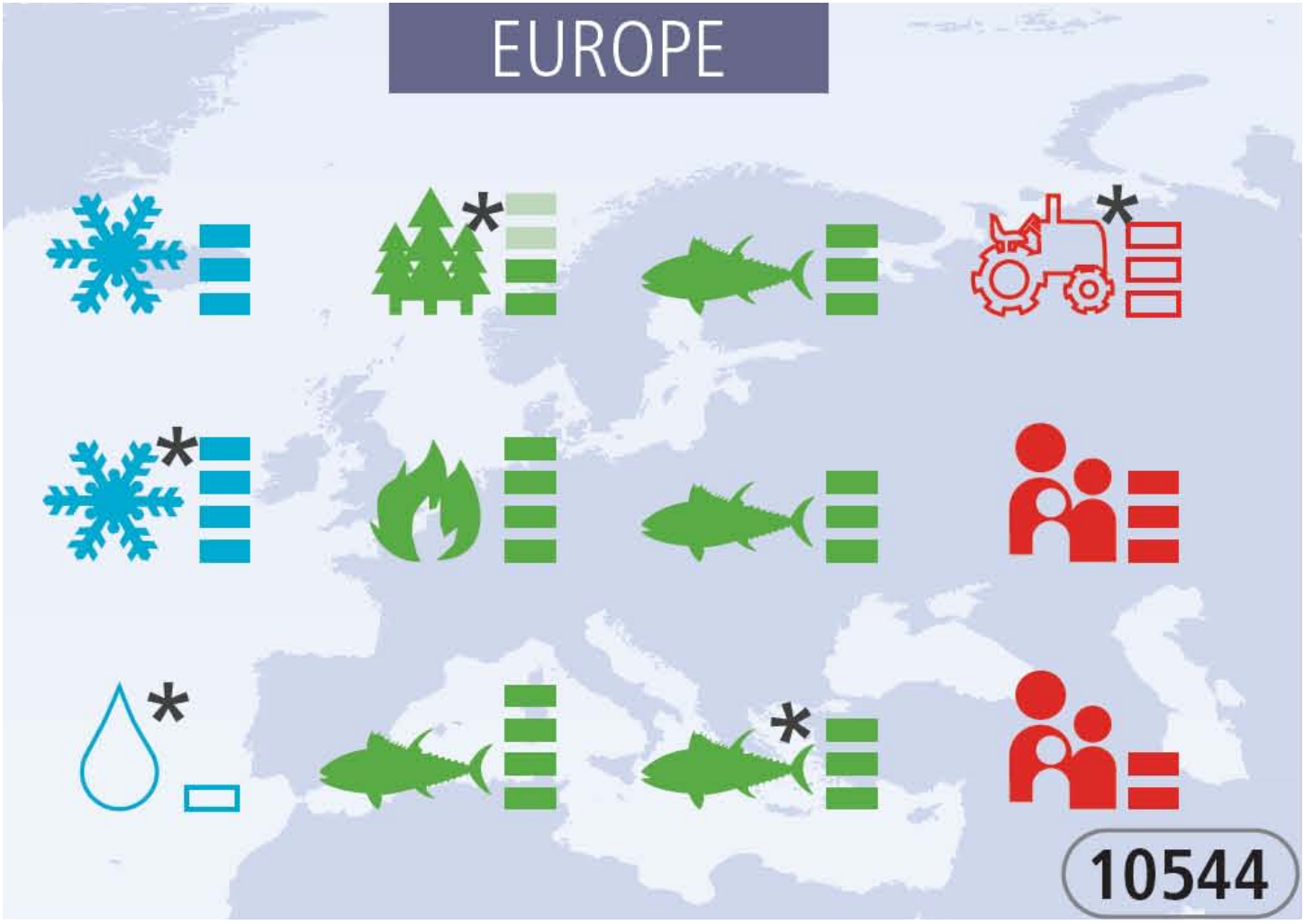
Physical systems
- Glaciers, snow, ice, and/or permafrost
- Rivers, lakes, floods, and/or drought
- Coastal erosion and/or sea level effects

Biological systems
- Terrestrial ecosystems
- Wildfire
- Marine ecosystems

Human and managed systems
- Food production
- Livelihoods, health, and/or economics

* Impacts identified based on availability of studies across a region

Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change



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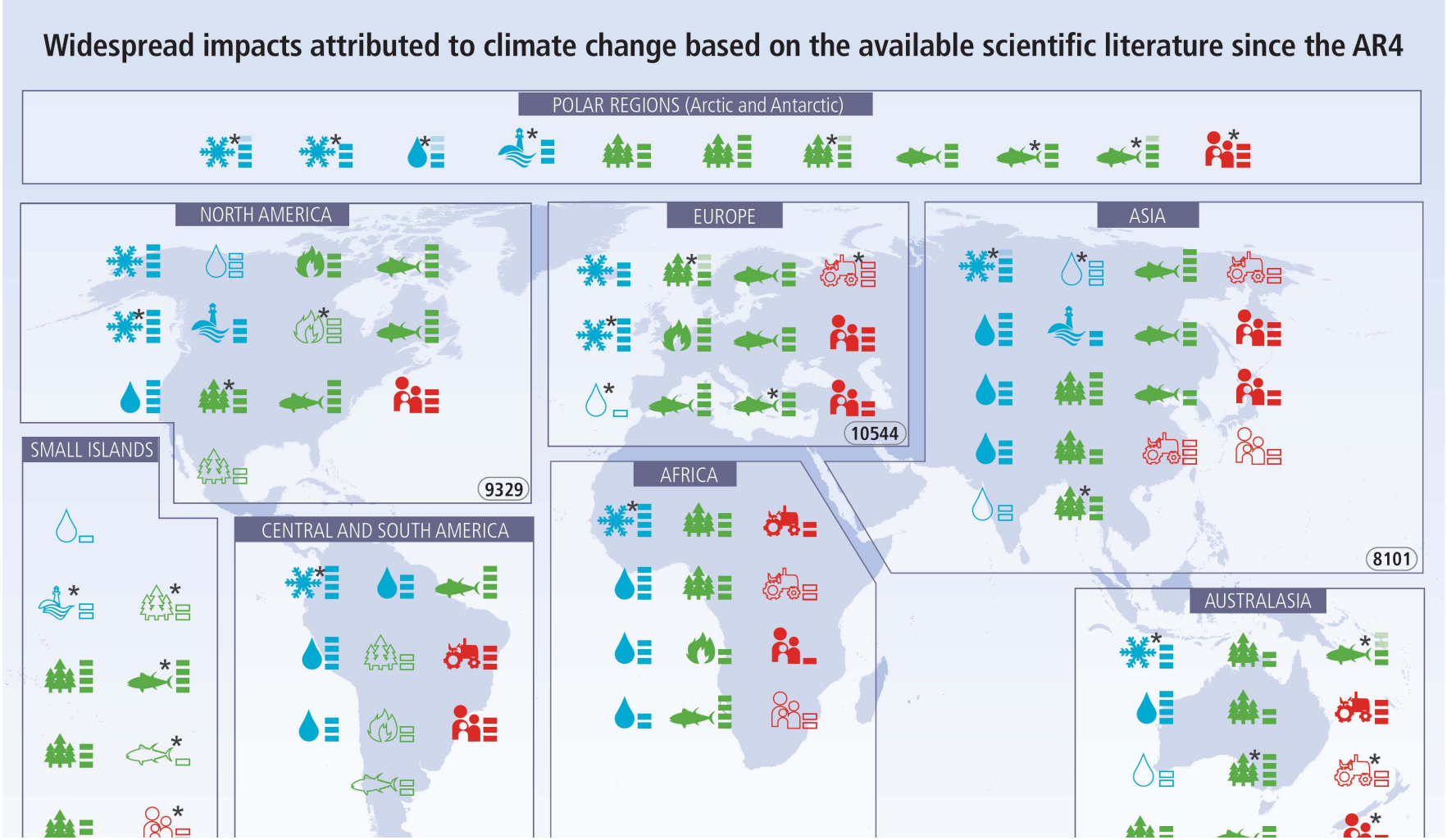

"In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate." *AR5 SYR*

Résumé of Synthesis Report Topic 1, "Observed Changes and their Causes

"Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems."