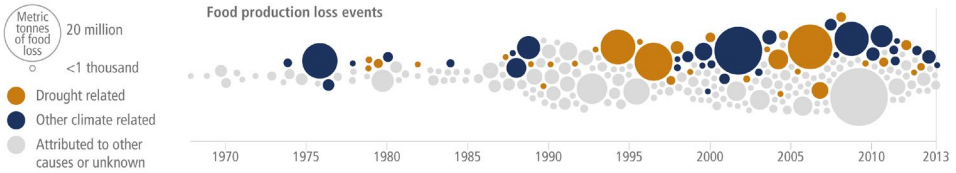
Fact sheet - Food and Water

Climate Change Impacts and Risks

Food production losses

Climate change impacts are negatively affecting agriculture, forestry, fisheries and aquaculture, increasingly hindering efforts to meet human needs *(high confidence)*. Human-induced global warming has slowed growth of agricultural productivity over the past 50 years in mid and low latitudes *(medium confidence)*. Warming is negatively affecting crop and grassland quality and harvest stability *(high confidence)*. Ocean acidification and warming have already affected farmed aquatic species *(high confidence)*. {TS.B.3.1} Some current global crop and livestock areas will become climatically unsuitable depending on the emissions scenario (*high confidence*; 10% globally by 2050, by 2100 over 30 % under SSP-8.5 vs below 8% under SSP1-2.6). Compared to 1.5°C global warming level, 2°C global warming level will even further negatively impact food production where current temperatures are already high as in lower latitudes *(high confidence)*. {TS.C.3.1}

The frequency of climated-related food production losses in crops, livestocks, fisheries and aquacultures has been increasing over the last decades.



Climate-related extremes have affected the productivity of all agricultural and fishery sectors, with negative consequences for food security and livelihoods *(high confidence)*. The frequency of sudden food production losses has increased since at least mid-20th century on land and sea *(medium evidence, high agreement)*. {TS.B.3.3}

Figure 1: {5.4.1.1, Box 5.1, FAQ 5.1, SM5.1, Figure AI.20} {Figure TS.6a}

The impacts of climate-related extremes on food security, nutrition and livelihoods are particularly acute and severe for people living in sub-Saharan Africa, Asia, small island, Central and South America and the Arctic and small-scale food producers globally *(high confidence)*. {TS.B.3.3}

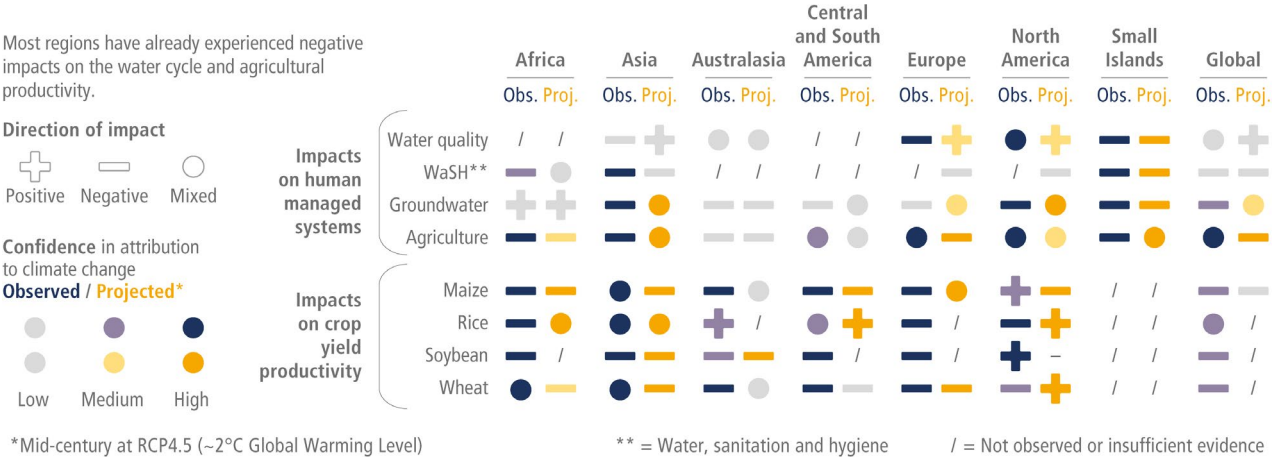
Reduced water security due to water scarcity

Currently, roughly half of the world's population are experiencing severe water scarcity for at least one month per year due to climatic and other factors *(medium confidence)*. {TS.B.4}

Water insecurity disproportionately impacts the poor, women, children, Indigenous Peoples and the elderly in low-income countries *(high confidence)* and specific marginal geographies (e.g., small island states and mountain regions). Water insecurity can contribute to social unrest in regions where inequality is high and water governance and institutions are weak *(medium confidence)*. {TS.B.4.1}

Drought and flood risks and societal damages are projected to increase with every degree of global warming *(medium confidence)*. Over large areas of northern South America, the Mediterranean, western China and high latitudes in North America and Eurasia, extreme agricultural droughts are projected to be at least twice as likely at 1.5°C global warming, 150 to 200% more likely at 2°C warming, and over 200% at 4°C *(medium confidence)*. Due to the combined effects of water and temperature changes, risks to agricultural yields could be three times higher at 3°C compared to 2°C *(medium confidence)*. {ES-Ch4}

Observed and projected impacts from climate change in the water cycle for human managed systems and crop yield productivity.



*Mid-century at RCP4.5 (~2°C Global Warming Level) ** = Water, sanitation and hygiene / = Not observed or insufficient evidence

Figure 2: Projected impacts are for RCP4.5 mid 21st century, taking into account adaptation and CO_2 fertilisation for the crop yield productivity {4.3.1, 4.2.7, 4.5.1, Figure 4.2, 5.5.3, 5.4.1, Figure 5.3, Figure 9.22, 15.3.3, 15.3.4} {Figure TS.6c}.

Drought is exacerbating water management challenges which vary across regions with respect to anticipated water scarcity conditions by 2050.

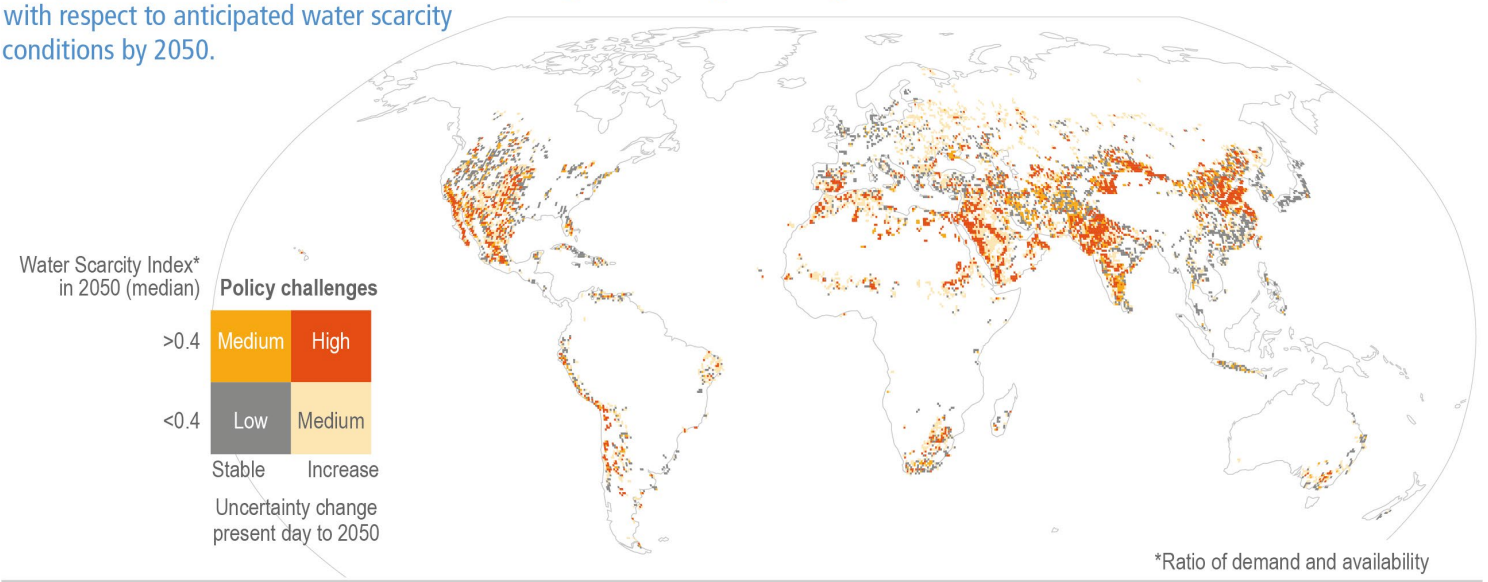


Figure 3: Projections used five CMIP5 climate models, three global hydrological models from ISIMIP, and three Shared Socioeconomic Pathways (SSPs). {Box 4.1, Figure Box 4.1.1, Figure AI.48, Figure TS.6d}

Food insecurity and malnutrition

Climate change has contributed to malnutrition in all its forms in many regions, including undernutrition, overnutrition and obesity, and to disease susceptibility *(high confidence)*, especially for women, pregnant women, children, low-income households, Indigenous Peoples, minority groups and small-scale producers *(high confidence)*. Extreme climate events have been key drivers in rising undernutrition of millions of people, primarily in Africa and Central America *(high confidence)*. {TS.B.5.4}

Climate impacts on food systems are projected to increase undernutrition and diet-related mortality and risks globally *(high confidence)*. Reduced marine and freshwater fisheries catch potential is projected to increase malnutrition in East, West and Central Africa *(medium to high confidence)* and in subsistence-dependent communities across North America *(high confidence)*. {TS.C.6.4}

Climate change is projected to put 8 million (SSP1-6.0) to 80 million people (SSP3-6.0) at risk of hunger in mid-century, concentrated in Sub-Saharan Africa, South Asia and Central America *(high confidence)*. {TS.C.6.4}

Climate-related emerging food safety risks are increasing globally in agriculture and fisheries *(high confidence)*. Higher temperatures and humidity caused by climate change increases toxigenic fungi on many food crops *(very high confidence)*. Harmful algal blooms and water-borne diseases threaten food security and the economy and livelihoods of many coastal communities *(high confidence)*. {TS.B.3.4}

Water-related economic impacts and risks

Future water-related impacts of climate change on various sectors of the economy are projected to lower global gross domestic product (GDP), with higher projected losses expected in low-and middle-income countries *(medium confidence)*. Projected increases in hydrological extremes pose increasing risks, with a potential doubling of flood risk between 1.5°C and 3°C of warming and an estimated 120-400% increase in population at risk of river flooding at 2°C and 4°C, respectively. Projected losses include a 1.2 to 1.8-fold increase in GDP loss due to flooding between 1.5°C and 2°C warming *(medium confidence)*. {ES-Ch4}

Adaptation Options and Barriers

Adaptation options

On-farm water management, water storage, soil moisture conservation and irrigation are some of the most common adaptation responses and provide economic, institutional or ecological benefits and reduce vulnerability *(high confidence)*. Irrigation is effective in reducing drought risk and climate impacts in many regions and has several livelihood benefits, but needs appropriate management to avoid potential adverse outcomes, which can include accelerated depletion of groundwater and other water sources and increased soil salinization *(medium confidence)*. Large scale irrigation can also alter local to regional temperature and precipitation patterns *(high confidence)*, including both alleviating and exacerbating temperature extremes *(medium confidence)*. The effectiveness of most water-related adaptation options to reduce projected risks declines with increasing warming *(high confidence)*. {SPM.C.2.1}

Effective adaptation options, together with supportive public policies enhance food availability and stability and reduce climate risk for food systems while increasing their sustainability *(medium confidence)*. Effective options include cultivar improvements, agroforestry, community-based adaptation, farm and landscape diversification, and urban agriculture (*high confidence)*. Agroecological principles and practices, ecosystem-based management in fisheries and aquaculture, and other approaches that work with natural processes support food security, nutrition, health and well-being, livelihoods and biodiversity, sustainability and ecosystem services *(high confidence)*. These services include pest control, pollination, buffering of temperature extremes, and carbon sequestration and storage (*high confidence)*. {SPM.C.2.2}

Water-related adaptation responses.

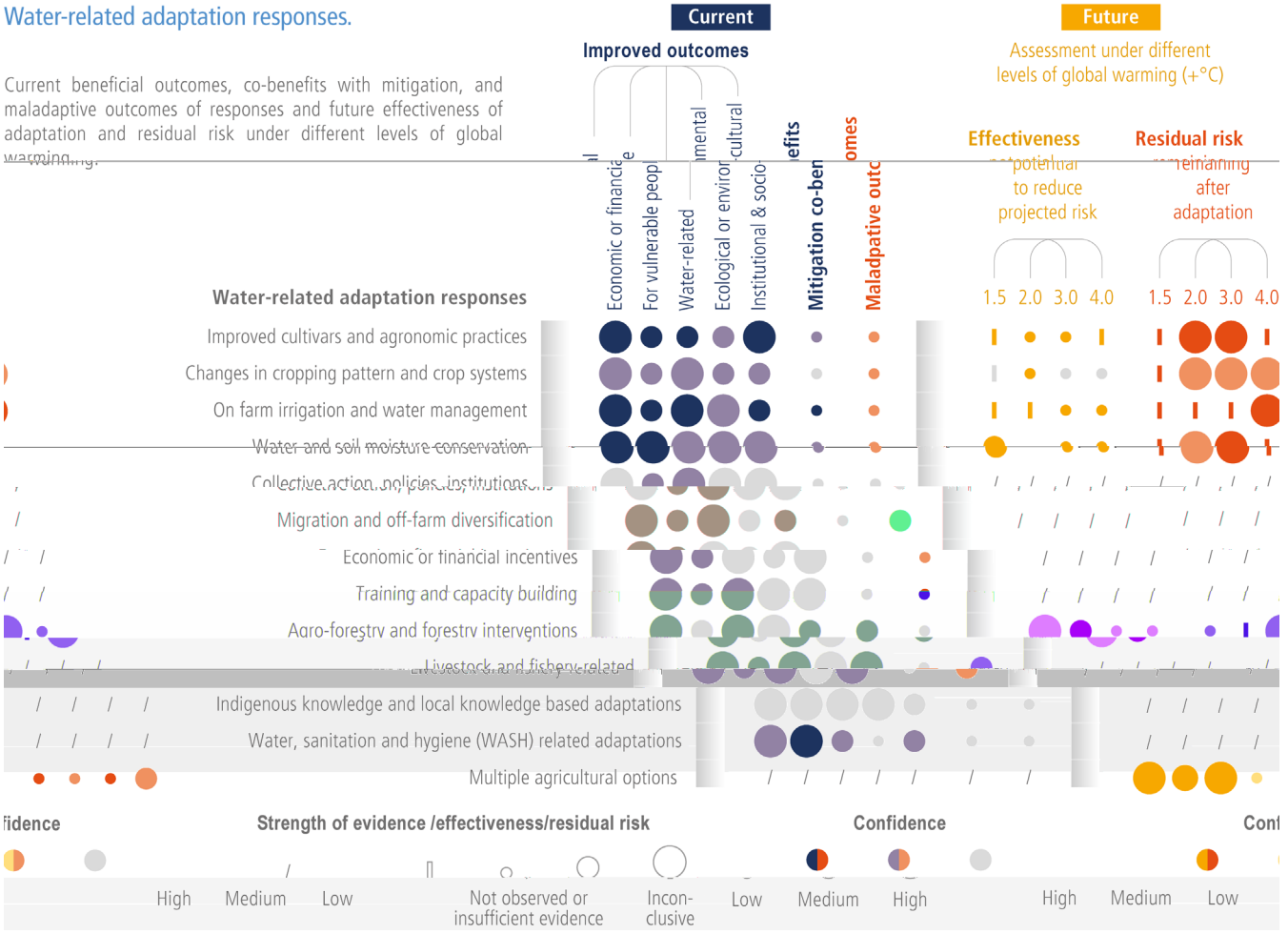


Figure 4: {4.6.2, Figure 4.29, Figure 4.28, SM4.7, SM4.8, 5.5.4, 5.6.3}. {Figure TS.6 panel (d)}.

Financial barriers

Water garners a significant share of public and private adaptation funds *(high confidence)*. However, barriers remain for low-income countries to access funds *(medium confidence)*, and there is insufficient evidence on benefits for marginalised groups *(medium confidence)*. {ES-Ch4}

Financial barriers limit implementation of adaptation options in agriculture, fisheries, aquaculture and forestry and vastly more public and private investment is required *(high confidence)*. {ES-Ch5}

Climate Resilient Development

Water security is critical for meeting Sustainable Development Goals (SDGs) and systems transitions needed for climate resilient development, yet many mitigation measures have a high water footprint which can compromise SDGs and adaptation outcomes *(high confidence)*. {ES-Ch4}

Climate-resilient development pathways offer a way forward to guide climate action in food system transitions, but operationalisation is hampered by limited indicators and analyses *(medium confidence)*. Robust analyses are needed that detail plausible pathways to move towards more resilient, equitable and sustainable food systems in ways that are socially, economically and environmentally acceptable through time *(high confidence)*. {ES-Ch5}