

Table SPM.A1.

Africa	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Retreat of tropical highland glaciers in East Africa (<i>high confidence</i>, Major contribution from climate change) Reduced discharge in West African rivers (<i>low confidence</i>, Major contribution from climate change) Lake surface warming & water column stratification increases in the Great Lakes & Lake Kariba (<i>high confidence</i>, Major contribution from climate change) Increased soil moisture drought in the Sahel since 1970, partially wetter conditions since 1990 (<i>medium confidence</i>, Major contribution from climate change) [22.2-3, Tables 18-5, 18-6, & 22-3]
Terrestrial Ecosystems	<ul style="list-style-type: none"> Tree density decreases in western Sahel & semi-arid Morocco, beyond changes due to land use (<i>medium confidence</i>, Major contribution from climate change) Range shifts of several southern plants & animals, beyond changes due to land use (<i>medium confidence</i>, Major contribution from climate change) Increases in wildfires on Mt. Kilimanjaro (<i>low confidence</i>, Major contribution from climate change) [22.3, Tables 18-7 & 22-3]
Coastal Erosion & Marine Ecosystems	Decline in coral reefs in tropical African waters, beyond decline due to human impacts (<i>high confidence</i> , Major contribution from climate change) [Table 18-8]
Food Production & Livelihoods	<ul style="list-style-type: none"> Adaptive responses to changing rainfall by South African farmers, beyond changes due to economic conditions (<i>very low confidence</i>, Major contribution from climate change) Decline in fruit-bearing trees in Sahel (<i>low confidence</i>, Major contribution from climate change) Malaria increases in Kenyan highlands, beyond changes due to vaccination, drug resistance, demography, & livelihoods (<i>low confidence</i>, Minor contribution from climate change) Reduced fisheries productivity of Great Lakes & Lake Kariba, beyond changes due to fisheries management & land use (<i>low confidence</i>, Minor contribution from climate change) [7.2, 11.5, 13.2, 22.3, Table 18-9]
Europe	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Retreat of Alpine, Scandinavian, & Icelandic glaciers (<i>high confidence</i>, Major contribution from climate change) Increase in rock slope failures in western Alps (<i>medium confidence</i>, Major contribution from climate change) Changed occurrence of extreme river discharges & floods (<i>very low confidence</i>, Minor contribution from climate change) [18.3, 23.2-3, Tables 18-5 & 18-6; WGI AR5 4.3]
Terrestrial Ecosystems	<ul style="list-style-type: none"> Earlier greening, leaf emergence, & fruiting in temperate & boreal trees (<i>high confidence</i>, Major contribution from climate change) Increased colonization of alien plant species in Europe, beyond a baseline of some invasion (<i>medium confidence</i>, Major contribution from climate change) Earlier arrival of migratory birds in Europe since 1970 (<i>medium confidence</i>, Major contribution from climate change) Upward shift in tree-line in Europe, beyond changes due to land use (<i>low confidence</i>, Major contribution from climate change) Increasing burnt forest areas during recent decades in Portugal & Greece, beyond some increase due to land use (<i>high confidence</i>, Major contribution from climate change) [4.3, 18.3, Tables 18-7 & 23-6]
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Northward distributional shifts of zooplankton, fishes, seabirds, & benthic invertebrates in northeast Atlantic (<i>high confidence</i>, Major contribution from climate change) Northward & depth shift in distribution of many fish species across European seas (<i>medium confidence</i>, Major contribution from climate change) Plankton phenology changes in northeast Atlantic (<i>medium confidence</i>, Major contribution from climate change) Spread of warm water species into the Mediterranean, beyond changes due to invasive species & human impacts (<i>medium confidence</i>, Major contribution from climate change) [6.3, 23.6, 30.5, Tables 6-2 & 18-8, Boxes 6-1 & CC-MB]
Food Production & Livelihoods	<ul style="list-style-type: none"> Shift from cold-related mortality to heat-related mortality in England & Wales, beyond changes due to exposure & health care (<i>low confidence</i>, Major contribution from climate change) Impacts on livelihoods of Sámi people in northern Europe, beyond effects of economic & sociopolitical changes (<i>medium confidence</i>, Major contribution from climate change) Stagnation of wheat yields in some countries in recent decades, despite improved technology (<i>medium confidence</i>, Minor contribution from climate change) Positive yield impacts for some crops mainly in northern Europe, beyond increase due to improved technology (<i>medium confidence</i>, Minor contribution from climate change) Spread of bluetongue virus in sheep & of ticks across parts of Europe (<i>medium confidence</i>, Minor contribution from climate change) [18.4, 23.4-5, Table 18-9, Figure 7-2]

Asia	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Permafrost degradation in Siberia, Central Asia, & Tibetan Plateau (<i>high confidence</i>, Major contribution from climate change) Shrinking mountain glaciers across most of Asia (<i>medium confidence</i>, Major contribution from climate change) Changed water availability in many Chinese rivers, beyond changes due to land use (<i>low confidence</i>, Minor contribution from climate change) Increased flow in four rivers due to shrinking glaciers in the Himalayas & Central Asia (<i>high confidence</i>, Major contribution from climate change) Earlier timing of maximum spring flood in Russian rivers (<i>medium confidence</i>, Major contribution from climate change) Reduced soil moisture in north-central & northeast China (1950-2006) (<i>medium confidence</i>, Major contribution from climate change) Surface water degradation in parts of Asia, beyond changes due to land use (<i>medium confidence</i>, Minor contribution from climate change) <p>[24.3-4, 28.2, Tables 18-5, 18-6, & SM24-4, Box 3-1; WGI AR5 4.3, 10.5]</p>
Terrestrial Ecosystems	<ul style="list-style-type: none"> Changes in plant phenology & growth in many parts of Asia (earlier greening), particularly in the north & east (<i>medium confidence</i>, Major contribution from climate change) Distribution shifts of many plant & animal species upwards in elevation or polewards, particularly in the north of Asia (<i>medium confidence</i>, Major contribution from climate change) Invasion of Siberian larch forests by pine & spruce during recent decades (<i>low confidence</i>, Major contribution from climate change) Advance of shrubs into the Siberian tundra (<i>high confidence</i>, Major contribution from climate change) <p>[4.3, 24.4, 28.2, Table 18-7, Figure 4-4]</p>
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Decline in coral reefs in tropical Asian waters, beyond decline due to human impacts (<i>high confidence</i>, Major contribution from climate change) Northward range extension of corals in the East China Sea and western Pacific, and of a predatory fish in the Sea of Japan (<i>medium confidence</i>, Major contribution from climate change) Shift from sardines to anchovies in the western North Pacific, beyond fluctuations due to fisheries (<i>low confidence</i>, Major contribution from climate change) Increased coastal erosion in Arctic Asia (<i>low confidence</i>, Major contribution from climate change) <p>[6.3, 24.4, 30.5, Tables 6-2 & 18-8]</p>
Food Production & Livelihoods	<ul style="list-style-type: none"> Impacts on livelihoods of indigenous groups in Arctic Russia, beyond economic & sociopolitical changes (<i>low confidence</i>, Major contribution from climate change) Negative impacts on aggregate wheat yields in South Asia, beyond increase due to improved technology (<i>medium confidence</i>, Minor contribution from climate change) Negative impacts on aggregate wheat & maize yields in China, beyond increase due to improved technology (<i>low confidence</i>, Minor contribution from climate change) Increases in a water-borne disease in Israel (<i>low confidence</i>, Minor contribution from climate change) <p>[7.2, 13.2, 18.4, 28.2, Tables 18-4 & 18-9, Figure 7-2]</p>
Australasia	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Significant decline in late-season snow depth at 3 of 4 alpine sites in Australia (1957-2002) (<i>medium confidence</i>, Major contribution from climate change) Substantial reduction in ice & glacier ice volume in New Zealand (<i>medium confidence</i>, Major contribution from climate change) Intensification of hydrological drought due to regional warming in southeast Australia (<i>low confidence</i>, Minor contribution from climate change) Reduced inflow in river systems in southwestern Australia (since the mid-1970s) (<i>high confidence</i>, Major contribution from climate change) <p>[25.5, Tables 18-5, 18-6, & 25-1; WGI AR5 4.3]</p>
Terrestrial Ecosystems	<ul style="list-style-type: none"> Changes in genetics, growth, distribution, & phenology of many species, in particular birds, butterflies, & plants in Australia, beyond fluctuations due to variable local climates, land use, pollution, & invasive species (<i>high confidence</i>, Major contribution from climate change) Expansion of some wetlands & contraction of adjacent woodlands in southeast Australia (<i>low confidence</i>, Major contribution from climate change) Expansion of monsoon rainforest at expense of savannah & grasslands in northern Australia (<i>medium confidence</i>, Major contribution from climate change) Migration of glass eels advanced by several weeks in Waikato River, New Zealand (<i>low confidence</i>, Major contribution from climate change) <p>[Tables 18-7 & 25-3]</p>
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Southward shifts in the distribution of marine species near Australia, beyond changes due to short-term environmental fluctuations, fishing, & pollution (<i>medium confidence</i>, Major contribution from climate change) Change in timing of migration of seabirds in Australia (<i>low confidence</i>, Major contribution from climate change) Increased coral bleaching in Great Barrier Reef & western Australian reefs, beyond effects from pollution & physical disturbance (<i>high confidence</i>, Major contribution from climate change) Changed coral disease patterns at Great Barrier Reef, beyond effects from pollution (<i>medium confidence</i>, Major contribution from climate change) <p>[6.3, 25.6, Tables 18-8 & 25-3]</p>
Food Production & Livelihoods	<ul style="list-style-type: none"> Advanced timing of wine-grape maturation in recent decades, beyond advance due to improved management (<i>medium confidence</i>, Major contribution from climate change) Shift in winter vs. summer human mortality in Australia, beyond changes due to exposure & health care (<i>low confidence</i>, Major contribution from climate change) Relocation or diversification of agricultural activities in Australia, beyond changes due to policy, markets, & short-term climate variability (<i>low confidence</i>, Minor contribution from climate change) <p>[11.4, 18.4, 25.7-8, Tables 18-9 & 25-3, Box 25-5]</p>
North America	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Shrinkage of glaciers across western & northern North America (<i>high confidence</i>, Major contribution from climate change) Decreasing amount of water in spring snowpack in western North America (1960-2002) (<i>high confidence</i>, Major contribution from climate change) Shift to earlier peak flow in snow dominated rivers in western North America (<i>high confidence</i>, Major contribution from climate change) Increased runoff in the midwestern and northeastern US (<i>medium confidence</i>, Minor contribution from climate change) <p>[Tables 18-5 & 18-6; WGI AR5 2.6, 4.3]</p>
Terrestrial Ecosystems	<ul style="list-style-type: none"> Phenology changes & species distribution shifts upward in elevation & northward across multiple taxa (<i>medium confidence</i>, Major contribution from climate change) Increased wildfire frequency in subarctic conifer forests & tundra (<i>medium confidence</i>, Major contribution from climate change) Regional increases in tree mortality & insect infestations in forests (<i>low confidence</i>, Minor contribution from climate change) Increase in wildfire activity, fire frequency & duration, & burnt area in forests of the western US and boreal forests in Canada, beyond changes due to land use & fire management (<i>medium confidence</i>, Minor contribution from climate change) <p>[26.4, 28.2, Table 18-7, Box 26-2]</p>
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Northward distributional shifts of northwest Atlantic fish species (<i>high confidence</i>, Major contribution from climate change) Changes in musselbeds along the west coast of US (<i>high confidence</i>, Major contribution from climate change) Changed migration & survival of salmon in northeast Pacific (<i>high confidence</i>, Major contribution from climate change) Increased coastal erosion in Alaska & Canada (<i>medium confidence</i>, Major contribution from climate change) <p>[18.3, 30.5, Tables 6-2 & 18-8]</p>
Food Production & Livelihoods	<ul style="list-style-type: none"> Impacts on livelihoods of indigenous groups in the Canadian Arctic, beyond effects of economic & sociopolitical changes (<i>medium confidence</i>, Major contribution from climate change) <p>[18.4, 28.2, Tables 18-4 & 18-9]</p>

Central & South America	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Shrinkage of Andean glaciers (<i>high confidence</i>, Major contribution from climate change) Changes in extreme flows in Amazon River (<i>medium confidence</i>, Major contribution from climate change) Changing discharge patterns in rivers in the western Andes (<i>medium confidence</i>, Major contribution from climate change) Increased streamflow in sub-basins of the La Plata River, beyond increase due to land use change (<i>high confidence</i>, Major contribution from climate change) [27.3, Tables 18-5, 18-6, & 27-3; WGI AR5 4.3]
Terrestrial Ecosystems	<ul style="list-style-type: none"> Increased tree mortality & forest fire in the Amazon (<i>low confidence</i>, Minor contribution from climate change) Rainforest degradation & recession in the Amazon, beyond reference trends in deforestation & land degradation (<i>low confidence</i>, Minor contribution from climate change) [4.3, 18.3, 27.2-3, Table 18-7]
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Increased coral bleaching in western Caribbean, beyond effects from pollution & physical disturbance (<i>high confidence</i>, Major contribution from climate change) Mangrove degradation on north coast of South America, beyond degradation due to pollution & land use (<i>low confidence</i>, Minor contribution from climate change) [27.3, Table 18-8]
Food Production & Livelihoods	<ul style="list-style-type: none"> More vulnerable livelihood trajectories for indigenous Aymara farmers in Bolivia due to water shortage, beyond effects of increasing social & economic stress (<i>medium confidence</i>, Major contribution from climate change) Increase in agricultural yields & expansion of agricultural areas in southeastern South America, beyond increase due to improved technology (<i>medium confidence</i>, Major contribution from climate change) [13.1, 27.3, Table 18-9]
Polar Regions	
Snow & Ice, Rivers & Lakes, Floods & Drought	<ul style="list-style-type: none"> Decreasing Arctic sea ice cover in summer (<i>high confidence</i>, Major contribution from climate change) Reduction in ice volume in Arctic glaciers (<i>high confidence</i>, Major contribution from climate change) Decreasing snow cover extent across the Arctic (<i>medium confidence</i>, Major contribution from climate change) Widespread permafrost degradation, especially in the southern Arctic (<i>high confidence</i>, Major contribution from climate change) Ice mass loss along coastal Antarctica (<i>medium confidence</i>, Major contribution from climate change) Increased river discharge for large circumpolar rivers (1997–2007) (<i>low confidence</i>, Major contribution from climate change) Increased winter minimum river flow in most of the Arctic (<i>medium confidence</i>, Major contribution from climate change) Increased lake water temperatures 1985–2009 & prolonged ice-free seasons (<i>medium confidence</i>, Major contribution from climate change) Disappearance of thermokarst lakes due to permafrost degradation in the low Arctic. New lakes created in areas of formerly frozen peat (<i>high confidence</i>, Major contribution from climate change) [28.2, Tables 18-5 & 18-6; WGI AR5 4.2-4, 4.6, 10.5]
Terrestrial Ecosystems	<ul style="list-style-type: none"> Increased shrub cover in tundra in North America & Eurasia (<i>high confidence</i>, Major contribution from climate change) Advance of Arctic tree-line in latitude & altitude (<i>medium confidence</i>, Major contribution from climate change) Changed breeding area & population size of subarctic birds, due to snowbed reduction &/or tundra shrub encroachment (<i>medium confidence</i>, Major contribution from climate change) Loss of snow-bed ecosystems & tussock tundra (<i>high confidence</i>, Major contribution from climate change) Impacts on tundra animals from increased ice layers in snow pack, following rain-on-snow events (<i>medium confidence</i>, Major contribution from climate change) Increased plant species ranges in the West Antarctic Peninsula & nearby islands over the past 50 years (<i>high confidence</i>, Major contribution from climate change) Increased phytoplankton productivity in Signy Island lake waters (<i>high confidence</i>, Major contribution from climate change) [28.2, Table 18-7]
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Increased coastal erosion across Arctic (<i>medium confidence</i>, Major contribution from climate change) Negative effects on non-migratory Arctic species (<i>high confidence</i>, Major contribution from climate change) Decreased reproductive success in Arctic seabirds (<i>medium confidence</i>, Major contribution from climate change) Decline in Southern Ocean seals & seabirds (<i>medium confidence</i>, Major contribution from climate change) Reduced thickness of foraminiferal shells in southern oceans, due to ocean acidification (<i>medium confidence</i>, Major contribution from climate change) Reduced krill density in Scotia Sea (<i>medium confidence</i>, Major contribution from climate change) [6.3, 18.3, 28.2-3, Table 18-8]
Food Production & Livelihoods	<ul style="list-style-type: none"> Impact on livelihoods of Arctic indigenous peoples, beyond effects of economic & sociopolitical changes (<i>medium confidence</i>, Major contribution from climate change) Increased shipping traffic across the Bering Strait (<i>medium confidence</i>, Major contribution from climate change) [18.4, 28.2, Tables 18-4 & 18-9, Figure 28-4]
Small Islands	
Snow & Ice, Rivers & Lakes, Floods & Drought	Increased water scarcity in Jamaica, beyond increase due to water use (<i>very low confidence</i> , Minor contribution from climate change) [Table 18-6]
Terrestrial Ecosystems	<ul style="list-style-type: none"> Tropical bird population changes in Mauritius (<i>medium confidence</i>, Major contribution from climate change) Decline of an endemic plant in Hawai'i (<i>medium confidence</i>, Major contribution from climate change) Upward trend in tree-lines & associated fauna on high-elevation islands (<i>low confidence</i>, Minor contribution from climate change) [29.3, Table 18-7]
Coastal Erosion & Marine Ecosystems	<ul style="list-style-type: none"> Increased coral bleaching near many tropical small islands, beyond effects of degradation due to fishing & pollution (<i>high confidence</i>, Major contribution from climate change) Degradation of mangroves, wetlands, & seagrass around small islands, beyond degradation due to other disturbances (<i>very low confidence</i>, Minor contribution from climate change) Increased flooding & erosion, beyond erosion due to human activities, natural erosion, & accretion (<i>low confidence</i>, Minor contribution from climate change) Degradation of groundwater & freshwater ecosystems due to saline intrusion, beyond degradation due to pollution & groundwater pumping (<i>low confidence</i>, Minor contribution from climate change) [29.3, Table 18-8]
Food Production & Livelihoods	Increased degradation of coastal fisheries due to direct effects & effects of increased coral reef bleaching, beyond degradation due to overfishing & pollution (<i>low confidence</i> , Minor contribution from climate change) [18.3-4, 29.3, 30.6, Table 18-9, Box CC-CR]