Rainfall and Water Availability

A Summary of key findings from the United Nations **Intergovernmental Panel on Climate Change's** (IPCC) Sixth Assessment Report (AR6) on the Physical Science Basis

The **Western and Equatorial Pacific** are likely to experience **more rainfall**

Drier conditions are projected for the **subtropical Southern and Eastern Pacific**

20% **decline in groundwater availability** projected in Federated States of Micronesia by 2050

With high sea level rise, expect more than a **50% decline**

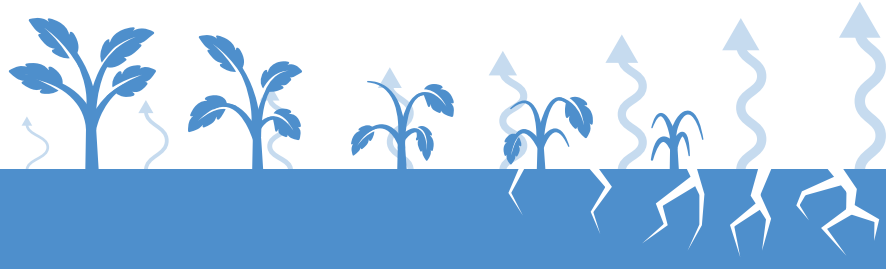
Although the Pacific will become wetter, **fresh water availability will decline** due to salt water intrusion from sea level rise

Extreme rainfall events would become **more frequent and intense** with additional warming

Extreme rainfall events could intensify by about **7% per degree of warming**

There is a **1 in 2 chance** of drought conditions increasing in the Pacific

Higher temperatures **increase the rate of evaporation** further contributing to lowered freshwater availability and increased water stress



Rainfall and Water Availability

A Summary of key findings from the United Nations **Intergovernmental Panel on Climate Change's** (IPCC) Sixth Assessment Report (AR6) on the Physical Science Basis

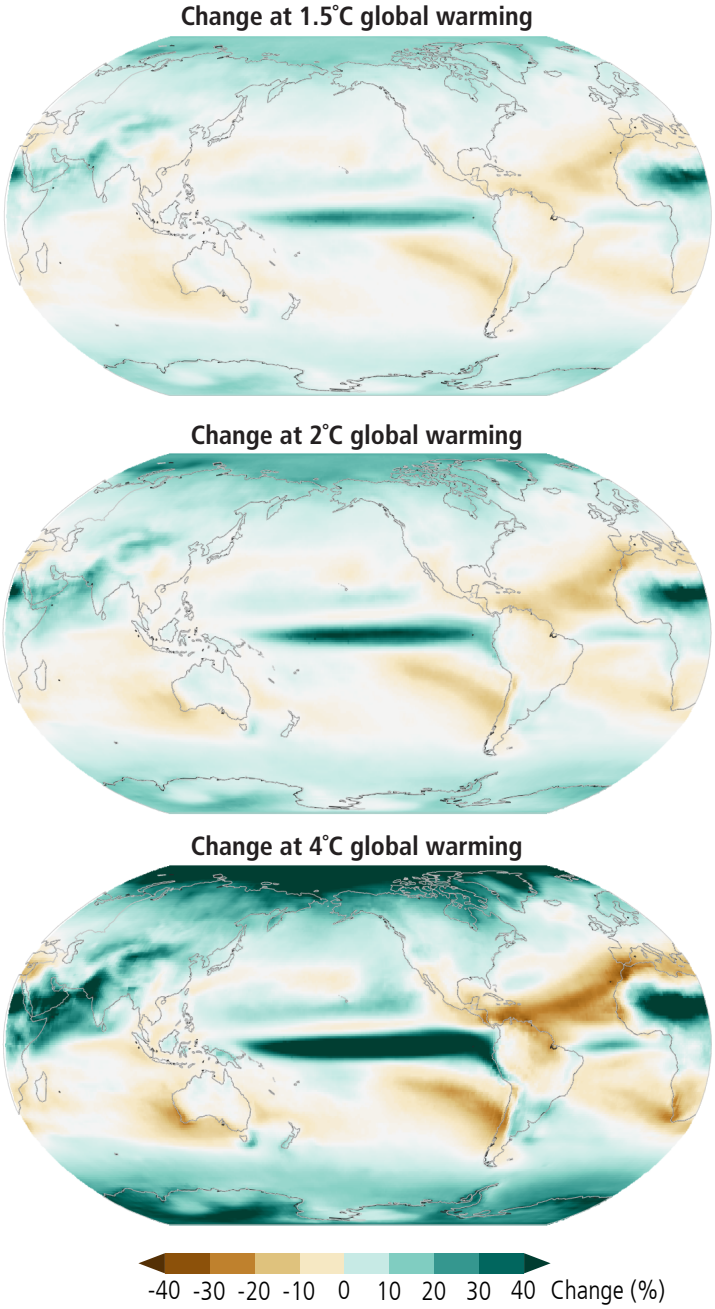
Although the Pacific may generally become wetter as the planet warms, fresh water availability could decline in many areas due to salt water intrusion resulting from sea level rise.[1]

CHANGES SO FAR

Rainfall changes in the Pacific are strongly linked with sea surface temperature and regional climate driver. The primary Pacific climate driver is the El Niño–Southern Oscillation (ENSO). When in an El Niño phase, this increases the chance of drought in the Western Pacific and increased rainfall, cyclones/typhoons and storm surges in the Central Pacific. La Niña conditions tend to increase rainfall and storm activity in the Western Pacific but increase drought in the Central Pacific.[2] The range of ENSO variability has increased since 1950, but there is no definitive evidence of human influence.[3]

The Pacific is already highly vulnerable to changes in water availability. For example, over half of the Marshall Islands are currently vulnerable to droughts due to limited groundwater availability.[4] Rainfall trends vary across the Pacific and are dependent on season, with a lack of historical rainfall trends in the tropical Western Pacific contrasting with significant drying trends in the Southern Pacific subtropics and southwestern French Polynesia between 1951-2015. Past drought and flood trends vary regionally.[5]

Annual mean precipitation change (%) relative to 1850-1900 at three global warming levels.



Adapted from Figure SPM.5 from the IPCC's *AR6 Physical Science Basis* report.

Content sourced from the IPCC's AR6 Physical Science Basis report:

1 12.4.7.2 2 Atlas.10.1.1 3 8.3.2.9.1 4 Cross-Chapter Box Atlas.2 5 12.4.7.2

FUTURE PROJECTIONS

The Western and Equatorial Pacific are *likely* to experience more rainfall under all emission scenarios.[6] As human-induced warming grows towards the end of the century, atmospheric moisture will increase in this region. Drier conditions are projected for the subtropical Southern and Eastern Pacific Ocean.[7]

Extreme rainfall events will become more frequent and intense with additional warming. There is *high confidence* that the frequency and intensity of extreme rainfall will increase in the tropical Western Pacific in the 21st century even for a very low-emission scenario, but there is *low confidence* in the size of these changes.[8] Extreme rainfall events will intensify by about 7% per degree of warming at the global scale due to the increased capacity of warmer air to hold moisture.[9]

ENSO's influence on rainfall in the Pacific is projected to strengthen and shift eastward in the future, with the average ENSO pattern more resembling the El Niño phase in the long-term.[10] This will change the location and intensity of rainfall and storms with less rainfall and more intense drought in the Western Pacific and increased rainfall, cyclones/typhoons and storm surges in the Central and Eastern Pacific.

There is a 1 in 2 chance of drought conditions increasing in the Pacific.[11] Even if future rainfall increases in line with projections in the Pacific, higher temperatures increase the rate of evaporation from plants and soil on land, offsetting the benefits of potential rainfall increases and further contributing to lowered freshwater availability and increased water stress. For example, a 20% decline in groundwater availability is projected by 2050 in the coral atoll islands of Federated States of Micronesia (FSM). Under a high sea level rise scenario, availability of fresh groundwater in FSM could decline by more than half due to ocean water intrusion and drought events.[12]

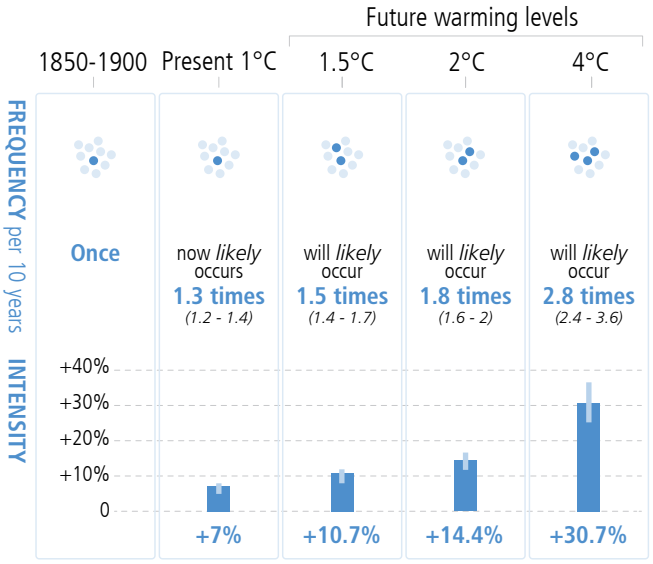
Projected changes in extreme rainfall are larger in frequency and intensity with every additional increment of global warming

Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

Extreme precipitation over land

10-year event

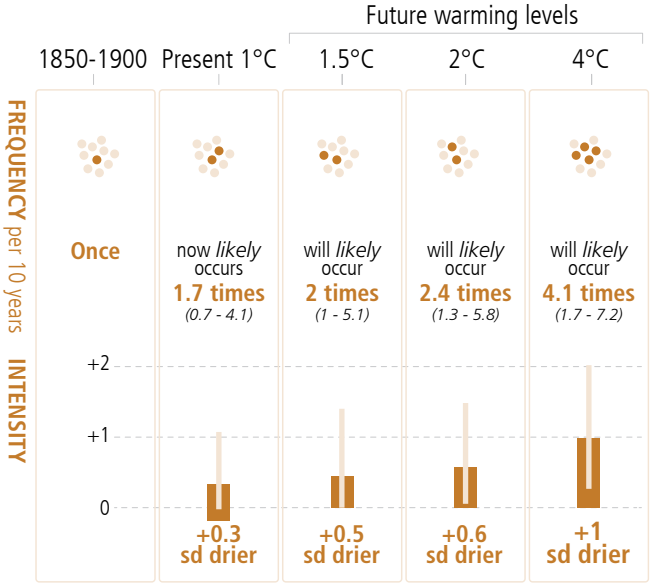
Frequency and intensity of an extreme precipitation event that occurred **once in 10 years** on average **in a climate without human influence**



Drought

10-year event

Frequency and intensity of a drought event that occurred **once in 10 years** on average **across drying regions in a climate without human influence**



Excerpts from Figure SPM.6 from the IPCC's *AR6 Physical Science Basis* report.

6 Atlas.10.4 7 12.4.7.2 8 12.4.7.2 9 B.2.4 10 8.4.2.9.1 11 12.4.7.2 12 Cross-Chapter Box Atlas.2