Water at the center of climate risk

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ADB Water / IWMI Webinar:
Centrality of water to climate resilience

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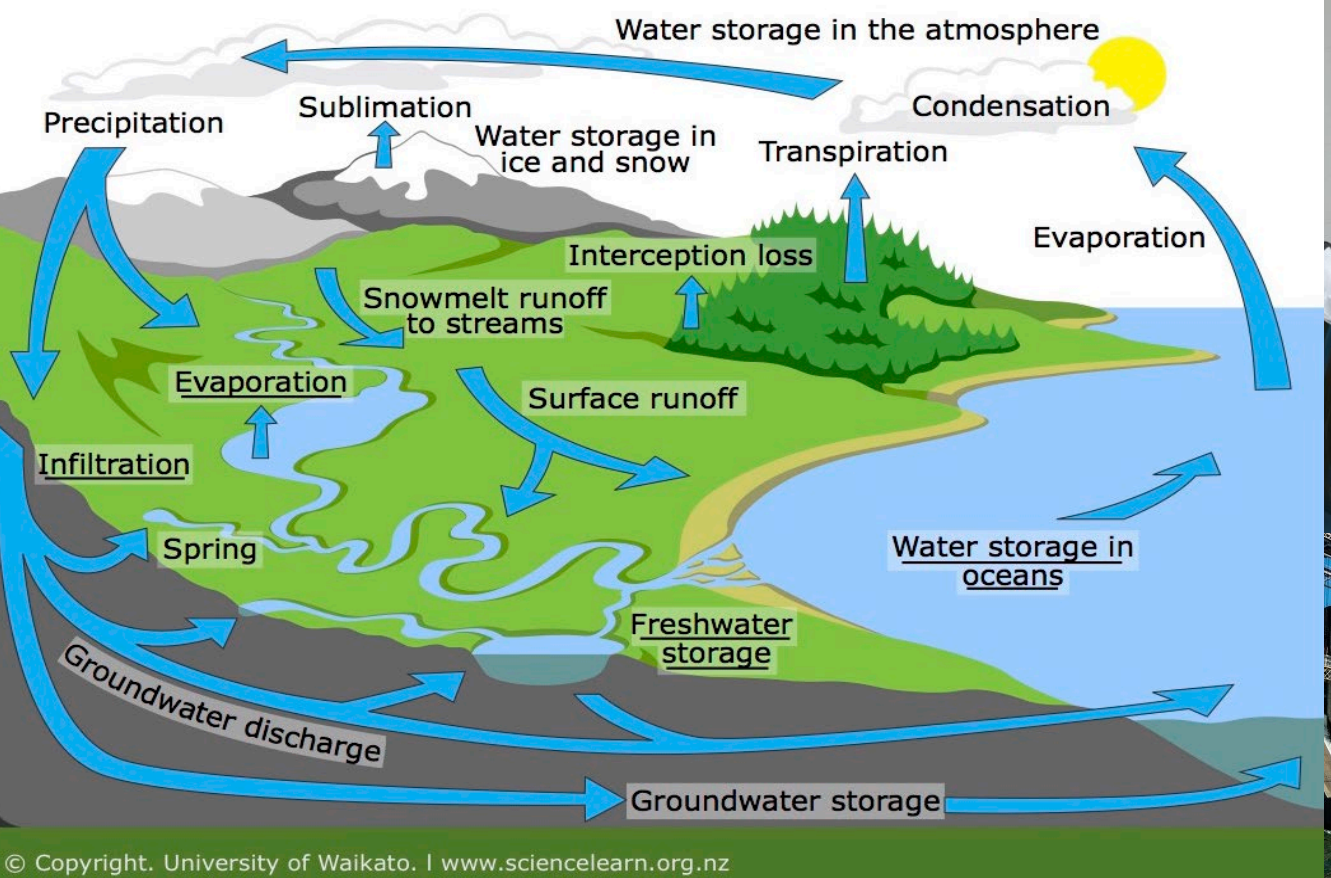
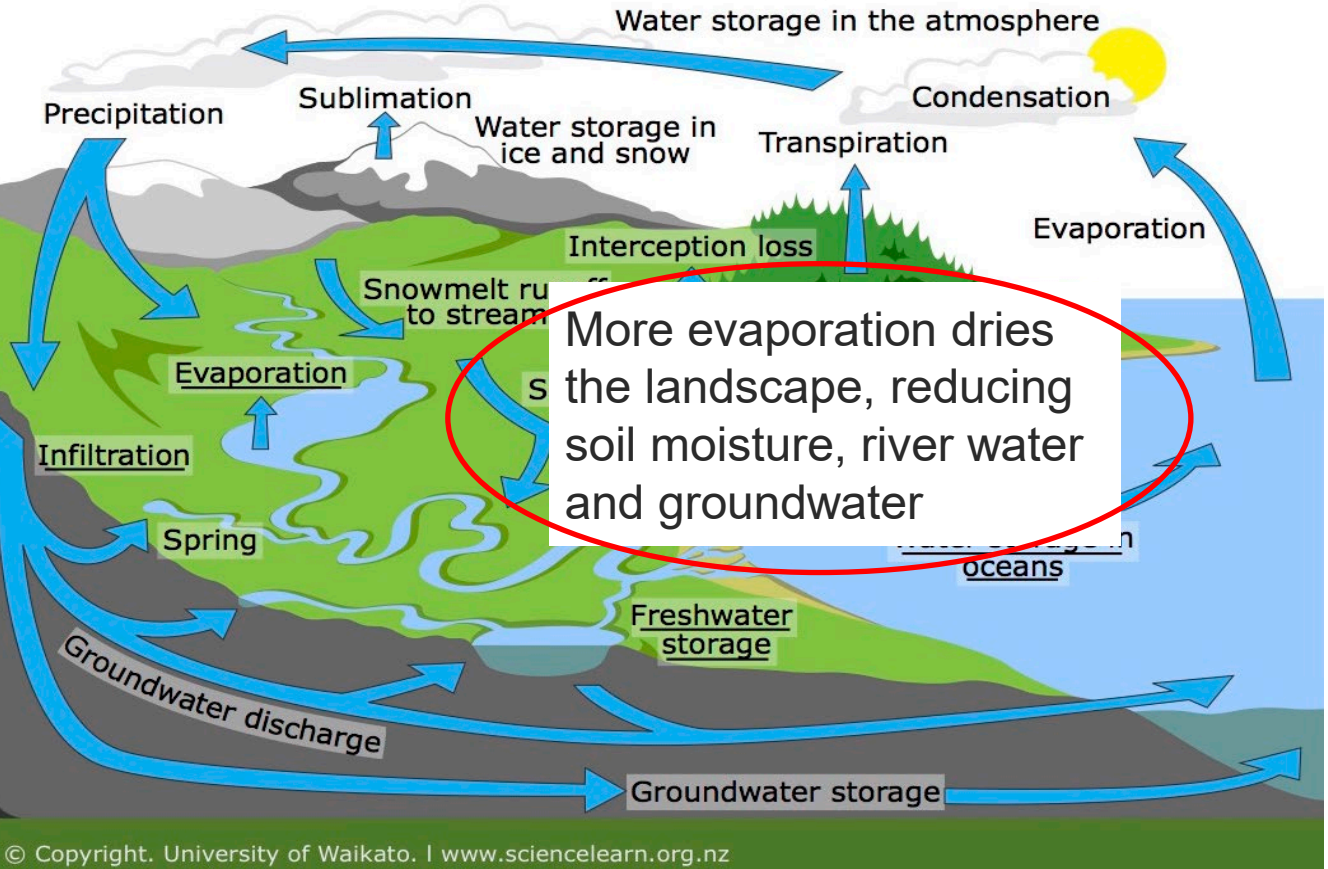


Hotter climate increases rainfall intensity

Atmospheric circulation changes cause shifts in rainfall patterns

LARGE UNCERTAINTIES in future changes



More evaporation dries the landscape, reducing soil moisture, river water and groundwater

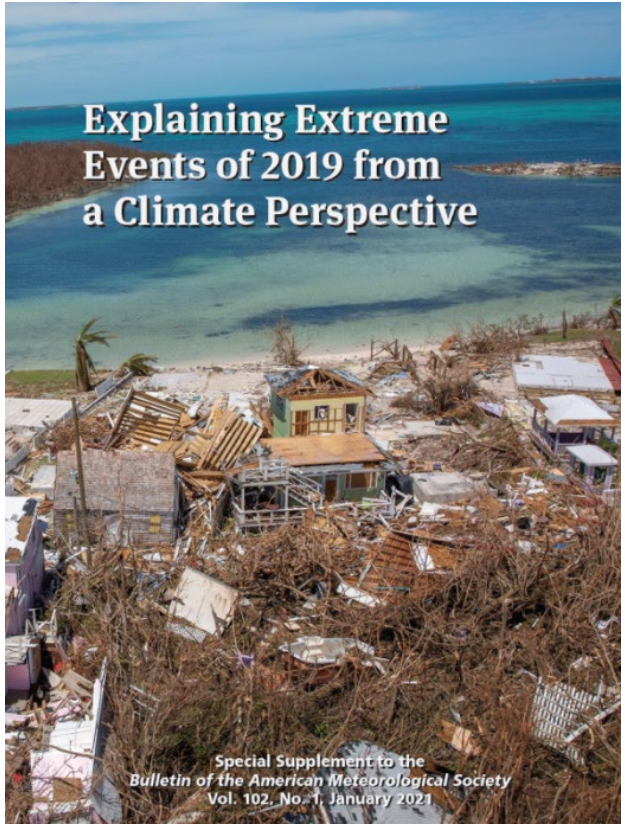
Warmer atmosphere holds more water

Hotter temperatures drive more evaporation from oceans and land

NB. It is possible to get *both* more intense rainfall *and* more severe drought in the same place

Some extreme hydro-meteorological events are already more likely due to human-caused climate change

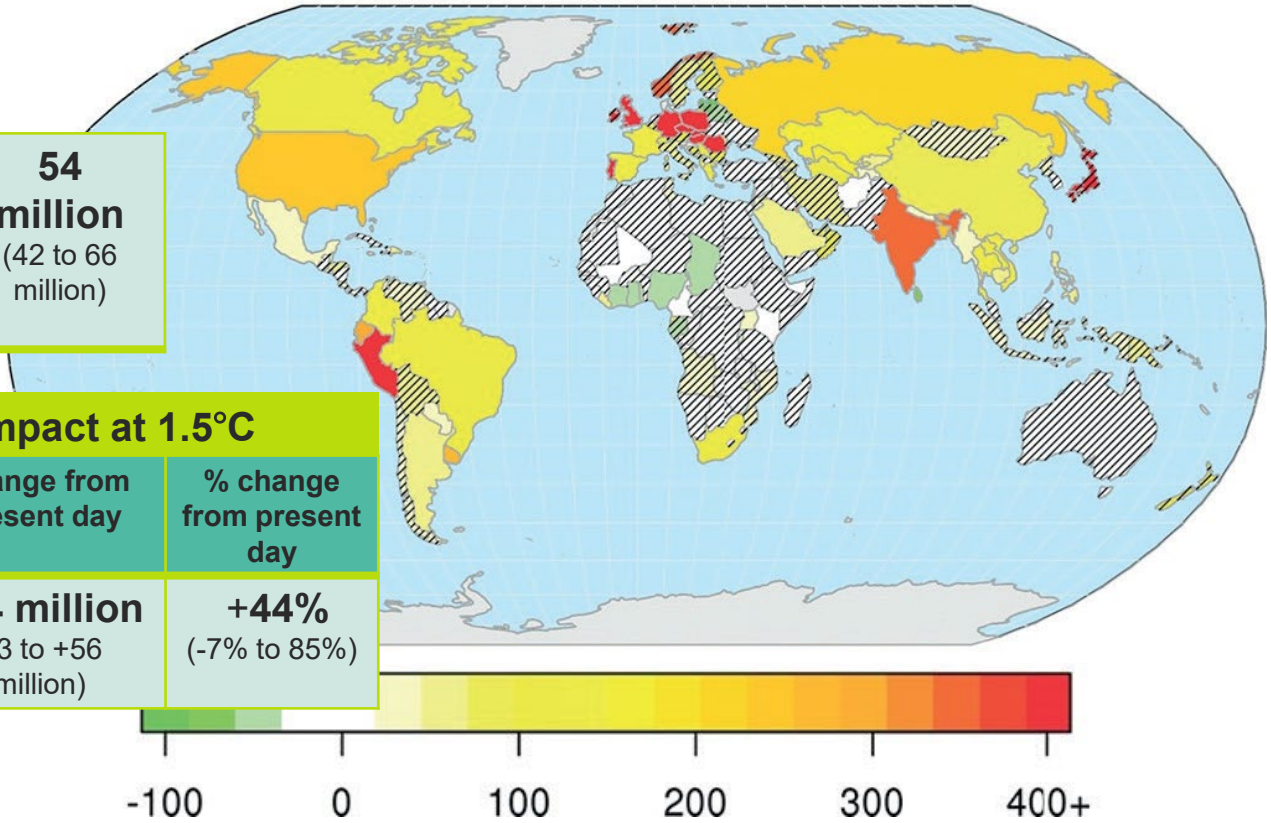
Event	Impacts	Change in likelihood
Heatwave and drought in Yunnan, south-west China	Drinking-water shortages for 2 million people Crop failures over at least 13,500 km^2 of farmland Direct economic loss 6.6 billion yuan	Combination of extreme hot and dry conditions 43% more likely due to climate change
River floods in Ottawa, Canada	1000s of people evacuated Can$200 million insured losses	Heavy rainfall 2-3 times more likely due to climate change
Heavy rainfall from Hurricane Dorian	Half a metre of rain over Bahamas	5 – 10% increase in chance due to climate change



% change in people affected by river flooding at 1.5°C global warming

Number of people affected by flooding per year at present day	**54 million** (42 to 66 million)

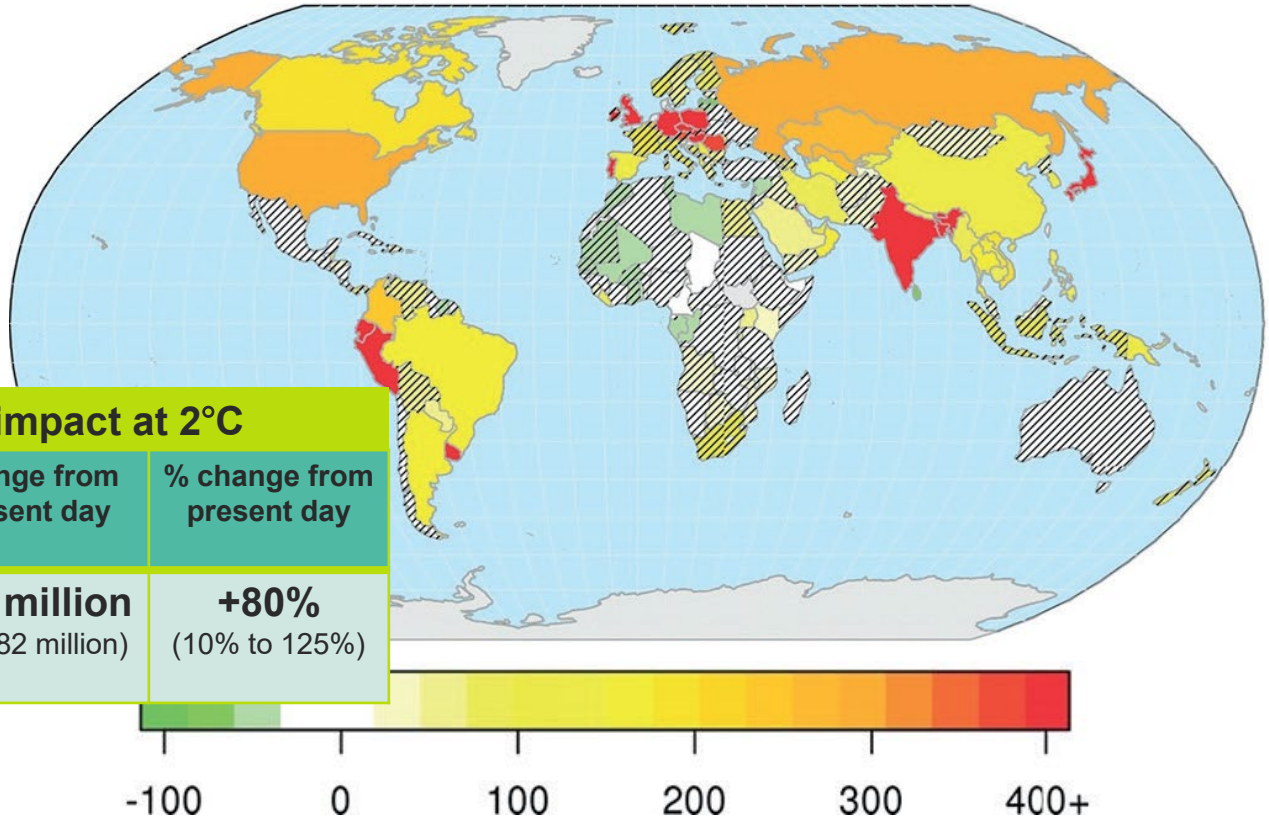
Flooding impact at 1.5°C		
Number of people affected	**Change from present day**	**% change from present day**
78 million (39 to 122 million)	**+24 million** (-3 to +56 million)	**+44%** (-7% to 85%)



Climate change only (present-day population)

Alfieri *et al.* (2016)

% change in people affected by river flooding at 2°C global warming

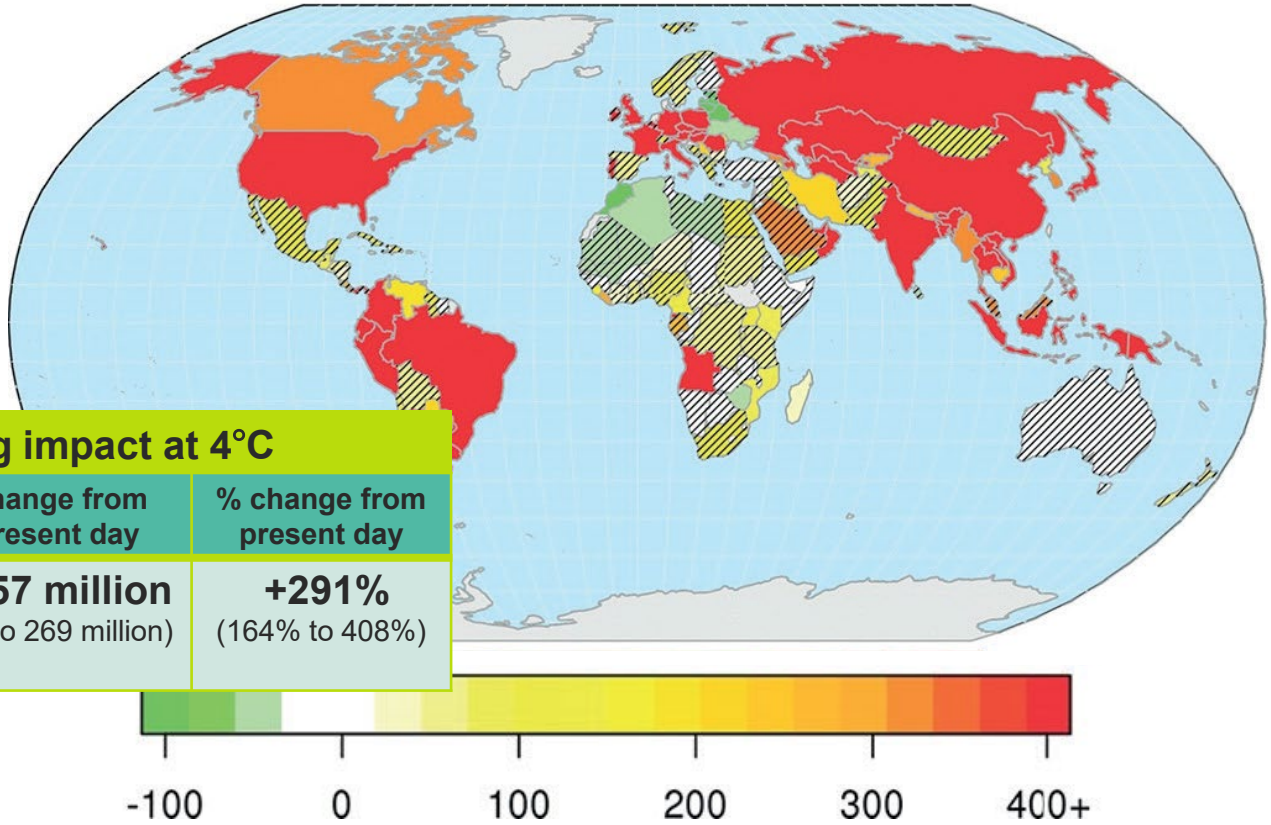


Flooding impact at 2°C		
Number of people affected	**Change from present day**	**% change from present day**
97 million (46 to 148 million)	**+43 million** (4 to 82 million)	**+80%** (10% to 125%)

Climate change only (present-day population)

Alfieri *et al*. (2016)

% change in people affected by river flooding at 4°C global warming



Flooding impact at 4°C

Number of people affected	Change from present day	% change from present day
211 million (111 to 335 million)	**+157 million** (69 to 269 million)	**+291%** (164% to 408%)

Climate change only (present-day population)

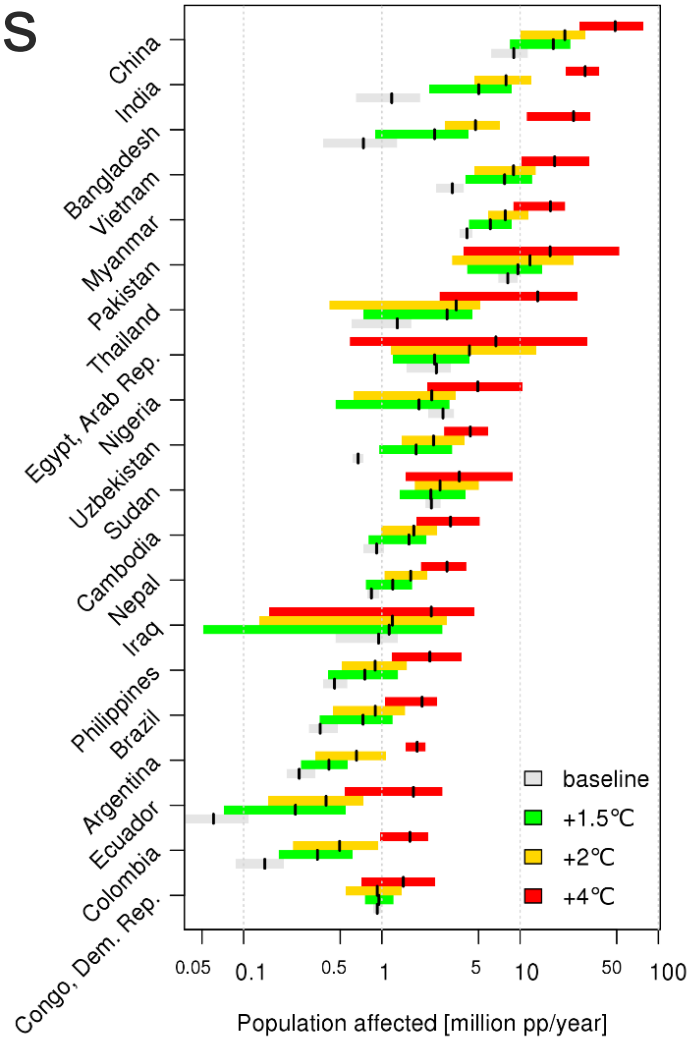
Alfieri *et al*. (2016)

River flooding projections and uncertainties

Projected population affected at 1.5°C, 2°C and 4°C global warming

Mean & range from several model projections

Range arises from uncertainty in regional rainfall projections



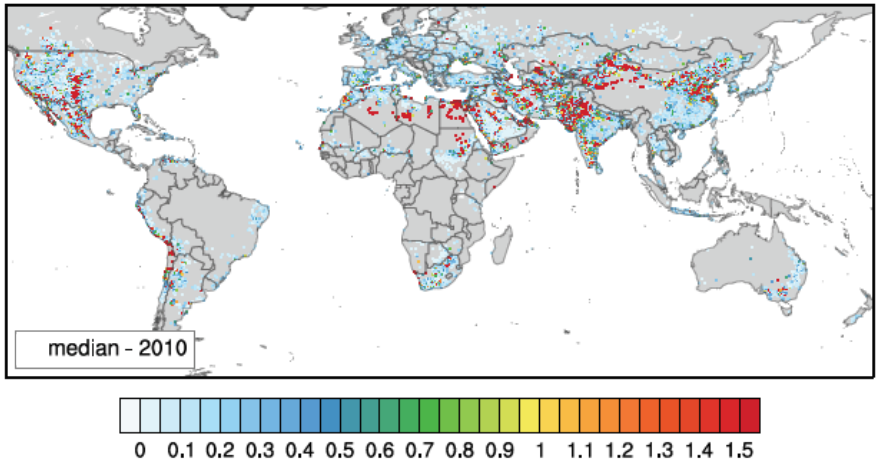
Climate change only (present-day population)

Alfieri *et al*. (2016)

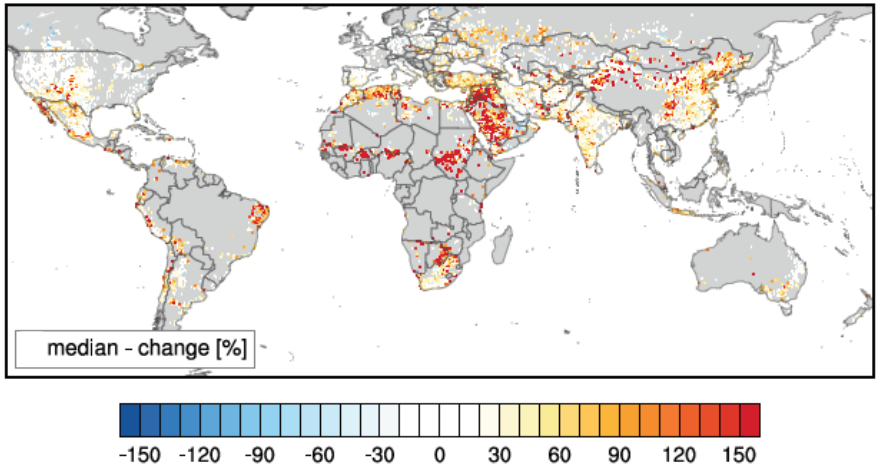
Water Scarcity Index

Ratio of water demand to water supply

Present day



Median projected change by 2050

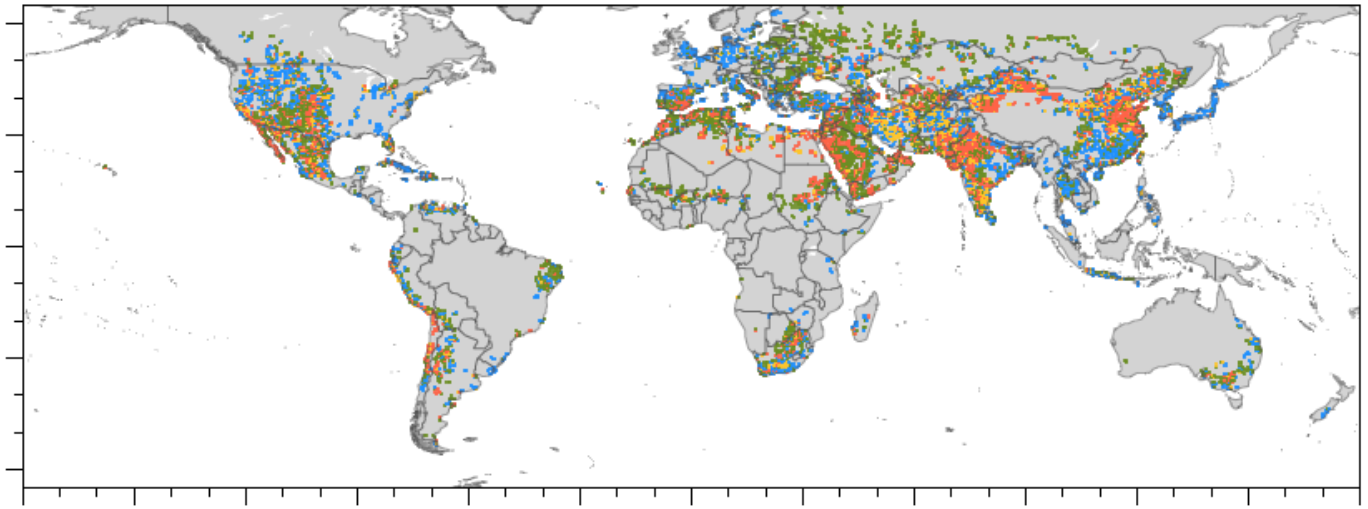


Includes climate change *and* population change

Greve *et al*., 2019

Levels of policy challenges for adapting to water scarcity

Both median projection and uncertainty are crucial



Challenges	low	medium	medium	high
median **water scarcity** (in 2050)	< 0.4 non-, slightly water scarce	< 0.4 non-, slightly water scarce	> 0.4 severely water scarce	> 0.4 severely water scarce
uncertainty changes (2010-50)	relatively stable	medium to high increase	relatively stable	medium to high increase
Policy actions	monitoring and reviewing risks	transitional changes	transitional/ transformational changes	transformational changes

Greve *et al.*, 2019

Met Office Hadley Centre

Summary

- Water is central to human life and society, and its presence and movement are central components of the global climate system
- Human-caused climate change is already affecting extreme events relating to water
- Climate change will continue to shift the presence and movement of water
- However, the details of future changes in water are highly uncertain
- This uncertainty presents a major challenge to adaptation, especially for addressing water scarcity