

IMPACTS OF CLIMATE CHANGE AT 1.5°C WARMING

EVENT	IMPACT	REFERENCE
6) Sea level rise	Total : 48cm	Rasmussen, D. J. et al. (2018) Extreme sea level implications of 1.5C, 2.0C, and 2.5C temperature stabilization targets in the 21st and 22nd centuries, Environmental Research Letters https://doi.org/10.1088/1748-9326/aaac87
	Antarctic ice sheet :6cm	
	Greenland ice sheet: 7 cm	
	Thermal expansion: 19 cm	
	Glaciers and ice caps: 11cm	
Land water storage: 5 cm		
Sea level rise	Area exposed = 562-575 km ² Population exposed = 128-143 million Population at risk accounting for defences= 2-28 million Most affected: Asia, small islands.	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.
7) Heatwaves	13.8% of the world population would be exposed at least once every 5 years	Dosio, A., L. Mentaschi, E.M. Fischer, and K. Wyser, 2018: Extreme heat waves under 1.5°C and 2°C global warming. Environmental Research Letters,13(5),054006, doi 10.1088/1748-9326/aab827
	Heatwaves like the one that hit Europe in 2018 will occur every 3 years. Power outages in Los Angeles due to high demand in Los Angeles (air conditioning) affected 34000 people	Vogel, M. M., Zscheischler, J., Wartenburger, R., Dee, D., & Seneviratne, S. I. Concurrent 2018 hot extremes across Northern Hemisphere due to human-induced climate change. Earth's Future. https://doi.org/10.1029/2019EF001189
8) Suitability for malaria transmission	12.5 & increase (averaged between 19% from drylands and 6% from humid lands)	Huang, J. et al. (2017) Drylands face potential threat under 2C global warming target, Nature Climate Change. Data provided by Jianping Huang of Lanzhou University https://doi.org/10.1038/nclimate3275
9) Annual cases of dengue fever in Latin America in year 2050	Increases by 6.4 million	Colón-González, F. J. et al. (2018) Limiting global-mean temperature increase to 1.5–2C could reduce the incidence and spatial spread of dengue fever in Latin America, PNAS
10) Species range loss	6% insect, 4% vertebrates, 8% plants	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.
11) Warming and stratification of ocean: coral reefs	70-90% loss	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate

		change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.
Antarctic ice sheet	Melting of the Antarctic ice sheet may become irreversible, contributing to 1 meter of sea level rise by 2100	DeConto, R. M., & Pollard, D. (2016). Contribution of Antarctica to past and future sea-level rise. <i>Nature</i> , 531(7596), 591. https://doi.org/10.1038/nature17145
Heavy precipitation	Increases in frequency, intensity and positive trends in several regions	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijikata, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.
Heatwave event exposure	3960 million people exposed (1187 vulnerable)	Byers, E., Gidden, M., Leclère, D., Balkovic, J., Burek, P., Ebi, K., ... & Johnson, N. (2018). Global exposure and vulnerability to multi-sector development and climate change hotspots. <i>Environmental Research Letters</i> , 13(5), 055012. https://doi.org/10.1088/1748-9326/aabf45
Crop yield change	35 million people exposed (8 vulnerable)	Byers, E., Gidden, M., Leclère, D., Balkovic, J., Burek, P., Ebi, K., ... & Johnson, N. (2018). Global exposure and vulnerability to multi-sector development and climate change hotspots. <i>Environmental Research Letters</i> , 13(5), 055012. https://doi.org/10.1088/1748-9326/aabf45
Heatwaves	13.8% of the world population would be exposed at least once every 5 years	Dosio, A., L. Mentaschi, E.M. Fischer, and K. Wyser, 2018: Extreme heat waves under 1.5°C and 2°C global warming. <i>Environmental Research Letters</i> ,13(5),054006, doi 10.1088/1748-9326/aab827
	Heatwaves like the one that hit Europe in 2018 will occur every 3 years. Power outages in Los Angeles due to high demand in Los Angeles (air conditioning) affected 34000 people	Vogel, M. M., Zscheischler, J., Wartenburger, R., Dee, D., & Seneviratne, S. I. Concurrent 2018 hot extremes across Northern Hemisphere due to human-induced climate change. <i>Earth's Future</i> . https://doi.org/10.1029/2019EF001189
Habitat degradation	91 million people exposed (10 vulnerable)	Byers, E., Gidden, M., Leclère, D., Balkovic, J., Burek, P., Ebi, K., ... & Johnson, N. (2018). Global exposure and vulnerability to multi-sector development and climate change hotspots. <i>Environmental Research Letters</i> , 13(5), 055012. https://doi.org/10.1088/1748-9326/aabf45
Drought	350.2 ± 158.8 million, changes in urban population exposure to severe drought at the globe scale	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijikata, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.
Species range loss	6% insect, 4% vertebrates, 8% plants	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijikata, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.

Warming and stratification of ocean: coral reefs	70-90% loss	O. Hoegh-Guldberg, D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K. Ebi, F. Engelbrecht, J. Guiot, Y. Hijikata, S. Mehrotra, A. Payne, S. I. Seneviratne, A. Thomas, R. Warren, G. Zhou, 2018, Impacts of 1.5°C global warming on natural and human systems. In: Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty[V. Masson-Delmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla,A. Pirani, W. Moufouma-Okia, C.Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield(eds.)].In Press.
Water scarcity	Population exposed: 271 million	Naumann, G. et al. (2018) Global Changes in Drought Conditions Under Different Levels of Warming, Geophysical Research Letters https://doi.org/10.1002/2017GL076521
Global population flooded in coastal areas	By 2055: 28millions/year By 2095: 60 millions/year	Nicholls, R. J., Brown, S., Goodwin, P., Wahl, T., Lowe, J., Solan, M., ... & Wolff, C. (2018). Stabilization of global temperature at 1.5 C and 2.0 C: implications for coastal areas. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2119), 20160448. https://doi.org/10.1098/rsta.2016.0448
Proportion of species losing >50% of their climatic range	Invertebrates: 6%	Warren, R. et al. (2018) The projected effect on insects, vertebrates, and plants of limiting global warming to 1.5C rather than 2C, Science. https://doi.org/10.1126/science.aar3646
	Vertebrates: 4%	
	Plants: 8%	
	Insects: 6%	
	Mammals: 4%	
	Birds: 2%	
	Butterflies and moths: 4%	
Dragonflies and damselflies:1 %		
Annual flood damage losses from sea level rise (global)	\$10.2tn	Pretis, F. et al. (2018) Uncertain Impacts on Economic Growth When Stabilizing Global Temperatures at 1.5C or 2C Warming, Philosophical Transactions of the Royal Society. https://doi.org/10.1098/rsta.2016.0460
Annual hot days >30C per year in the British Isles	Increase by 1	Teichmann, C, et al. (2018) Avoiding extremes: Benefits of staying below +1.5C compared to +2.0C and +3.0C global warming, Atmosphere https://doi.org/10.3390/atmos9040115
Annual tropical nights (Tmin>20C) in British Isles	Increase by 1	Teichmann, C, et al. (2018) Avoiding extremes: Benefits of staying below +1.5C compared to +2.0C and +3.0C global warming, Atmosphere https://doi.org/10.3390/atmos9040115
Summer maximum daily temperature in B.I	Increase by 0.6C	Dosio, A. & Fischer, E. M. (2017) Will Half a Degree Make a Difference? Robust Projections of Indices of Mean and Extreme Climate in Europe Under 1.5C, 2C, and 3C Global Warming, Geophysical Research Letters https://doi.org/10.1002/2017GL076222
Winter frost days in B.I	Decrease by 6 days	Dosio, A. & Fischer, E. M. (2017) Will Half a Degree Make a Difference? Robust Projections of Indices of Mean and Extreme Climate in Europe Under 1.5C, 2C, and 3C Global Warming, Geophysical Research Letters https://doi.org/10.1002/2017GL076222
Winter minimum temperature in B.I	Increase by 1.3C	Dosio, A. & Fischer, E. M. (2017) Will Half a Degree Make a Difference? Robust Projections of Indices of Mean and Extreme Climate in Europe Under 1.5C, 2C, and 3C Global Warming, Geophysical Research Letters https://doi.org/10.1002/2017GL076222

Warm spell duration in Northern Europe	Increase by 14 days	King, A. D. et al. (2018) Reduced heat exposure by limiting global warming to 1.5C, Nature Climate Change https://doi.org/10.1038/s41558-018-0191-0
		King, A. D. & Karoly, D. J. (2017) Climate extremes in Europe at 1.5 and 2 degrees of global warming, Environmental Research Letters
Winter maximum daily rainfall increase over B.I.	6.00%	Dosio, A. & Fischer, E. M. (2017) Will Half a Degree Make a Difference? Robust Projections of Indices of Mean and Extreme Climate in Europe Under 1.5C, 2C, and 3C Global Warming, Geophysical Research Letters
Frequency of rainfall extremes over land in Northern Europe	Increases by 21%	Aerenson, T. et al. (2018) Changes in a suite of indicators of extreme temperature and precipitation under 1.5 and 2 degrees warming, Environmental Research Letters. Data provided by Claudia Tebaldi of the National Center for Atmospheric Research.
Population exposed to water scarcity in Northern Europe	Increase by 2 million	Naumann, G. et al. (2018) Global Changes in Drought Conditions Under Different Levels of Warming, Geophysical Research Letters
Area burned by wildfires in average mediterranean summer	increase by 41%	Turco, M. et al. (2018) Exacerbated fires in Mediterranean Europe due to anthropogenic warming projected with nonstationary climate-fire models, Nature Communications. Data provided by Marco Turco of the University of Barcelona
Economic damages from river flooding in the UK	Increase by 1206%	Alfieri, L. et al. (2016) Global projections of river flood risk in a warmer world, Earth's Future
Annual average number of excess summer heatwave deaths in London	Increase by 65	Mitchell, D. et al. (2018) Extreme heat-related mortality avoided under Paris Agreement goals, Nature Climate Change
Excess deaths due to heat in the UK	Increase by 0.3%	Vicedo-Cabrera, A. M. et al. (2018) Temperature-related mortality impacts under and beyond Paris Agreement climate change scenarios, Climatic Change Letters. Data provided by Ana Maria Vicedo-Cabrera of the London School of Hygiene & Tropical Medicine
Length of tropical rain season in the Amazon	Decrease by 9 days	Saeed, F. et al. (2018) Robust changes in tropical rainy season length at 1.5C and 2C, Environmental Research Letters
Population exposed to water scarcity in Central North America	Increase by 15 million	Liu, W. et al. (2018) Global Freshwater availability below normal conditions and population impact under 1.5C and 2C stabilization scenarios, Geophysical Research Letters

Population exposed to water scarcity (East +Southern Africa)	Increases by 11 million	Naumann, G. et al. (2018) Global Changes in Drought Conditions Under Different Levels of Warming, Geophysical Research Letters Liu, W. et al. (2018) Global Freshwater availability below normal conditions and population impact under 1.5C and 2C stabilization scenarios, Geophysical Research Letters
Glacier mass loss in the high mountains of Asia	36.00%	Kraaijenbrink, P. D. A. et al. (2018) Impact of a global temperature rise of 1.5 degrees Celsius on Asia's glaciers, Nature
Maximum population exposed to heatwaves in India	2050: x9, 2100:x19	Mishra, V. et al. (2017) Heat wave exposure in India in current, 1.5C, and 2.0C worlds, Environmental Research Letters
Population exposed to water scarcity (North Asia, West, Central, Tibetan Plateau, Eastern, Southern and Southeastern)	Increase by 182 million people	Liu, W. et al. (2018) Global Freshwater availability below normal conditions and population impact under 1.5C and 2C stabilization scenarios, Geophysical Research Letters
Population affected by river flooding in Bangladesh	Increase by 227%	Alfieri, L. et al. (2016) Global projections of river flood risk in a warmer world, Earth's Future