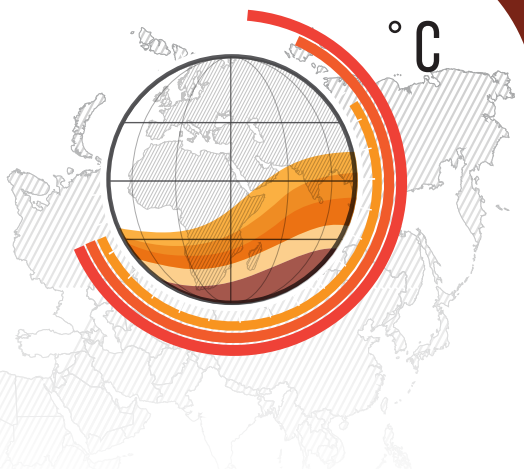
WHAT GLOBAL WARMING OF 1.5°C AND HIGHER MEANS FOR MALI



The Paris Agreement has a goal of limiting global warming well below 2°C, ideally 1.5°C. Understanding the local-level impacts of these global temperature targets is crucial for informing climate change adaptation needs and actions. To date, mitigation pledges by nations fall far short of what is needed, with the world on track to warm by 3.2°C by the end of the century[1]. For Mali, local warming will be greater than the global average. Even a 1.5°C increase in global temperature will severely affect water resources, agriculture, health, and other vulnerable sectors.

Under an increasing emissions trajectory, the 1.5°C threshold could be breached within the next decade, and the 2°C threshold the decade after[2]. As impacts on climate extremes and vulnerable sectors will worsen with each half degree increment, and compromise Mali's development, there is an urgent need to accelerate the country's adaptation responses.

LOCAL IMPACTS IN MALI

		GLOBAL WARMING ABOVE PRE-INDUSTRIAL LEVELS			
		1.5°C	2°C	2.5°C	3°C
Projected climate changes[3] — CLIMATE	Mean temperature (°C)	▲ 2.3	▲ 3	▲ 3.7	▲ 4.4
	Heat waves (days)	▲ 62	▲ 103	▲ 145	▲ 181
	Annual rainfall	▼ 3%	▼ 2%	▼ 2%	▼ 5%
	Dry spell length (days)	▲ 1	0	▼ 1	0
	Percentage of total rainfall falling within heavy downpours	20%	20%	20%	21%
Estimated impacts[4] — WATER	Precipitation in Upper Niger Basin[3]	▼ 4%	▼ 1%	▼ 2%	▼ 2%
	Niger River (streamflow)	▲ 9%[5]	▲ 12%[5]	▲ 7%[6]	▲ 6%[6]
	Drought frequency[7] (months per year)	1[8]	2	2	3[8]
	Groundwater recharge[9] (Klela Basin)	▼ 38%[8]	▼ 61%[8]	▼ 83%[8]	▼ 100%[8]
AGRICULTURE	Maize[10] (yield)	▼ 27%[8]	▼ 51%	▼ 57%	▼ 76%[8]
	Millet[10] (yield)	▼ 5%[8]	▼ 7%	▼ 12%	▼ 15%[8]
	Wheat[11] (yield)	▼ 2%	0	▼ 5%	▼ 10%
	Forage for livestock[12] (yield)	▼ 17%[8]	▼ 26%[8]	▼ 35%[8]	▼ 43%[8]
HEALTH	Heat stress[13] (days of exposure)	▲ 20	▲ 20	▲ 30	▲ 46
	Malaria[14] (months of risk)	▼ 2%[8]	▼ 4%[8]	▼ 5%	▼ 5%

[1] Climate Action Tracker. https://climateactiontracker.org/global/cat-thermometer.
[2] Nkemelang, T. et al. 2018. Determining what global warming of 1.5°C and higher means for the semi-arid regions of Botswana, Namibia, Ghana, Mali, Kenya and Ethiopia: A description of ASSAR's methods of analysis. https://bit.ly/2yHbWPf.
[3] Based on climate modelling by T. Nkemelang. University of Cape Town, South Africa.
[4] Based on data analysis by R. Bouwer. University of Cape Town, South Africa.
[5] Betts, R.A. et al. 2018. Changes in climate extremes, fresh water availability and vulnerability to food insecurity projected at 1.5° C and 2° C global warming with a higher-resolution global climate model. *Philosophical Transactions A. Mathematical, physical and engineering sciences*. https://dx.doi.org/10.1098%2Frsta.2016.0452.
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[14] Tanser, F.C., Sharp, B. and le Sueur, D. 2003. Potential effect of climate change on malaria transmission in Africa. *The Lancet*. https://doi.org/10.1016/S0140-6736(03)14898-2.

ASSAR
Adaptation at Scale in Semi-Arid Regions

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IMPACTS OF GLOBAL WARMING THRESHOLDS ON MALI'S CLIMATIC ZONES

	HYPER ARID				ARID				SEMI ARID				SUB HUMID				MALI OVERALL			
	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C	1.5°C	2°C	2.5°C	3°C
Annual rainfall (%)	+3	+4	+3	+5	+4	+7	+7	+5	-4	-4	-4	-6	-4	-4	-4	-5	-3	-2	-2	-4
Duration of dry spells (days)	2	-1	-1	-1	0	-1	-2	-1	3	2	2	4	3	1	3	5	1	0	-1	0
Duration of wet spells (days)	0	0	0	0	0	0	0	0	-2	-2	-3	-3	-4	-4	-6	-6	-1	-1	-1	-1
Heavy rainfall days (>10mm/day)	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-2	0	0	0	0
Extreme heavy rainfall days (>20mm/day)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amount of rain in heavy rainfall events (%)	+3	+22	+13	+6	+13	+14	+14	+25	-+1	+3	+5	+4	-+2	+0	-+1	+7	+6	+6	+7	+8
Amount of rain in extremely heavy rainfall events (%)	+9	+32	+45	+41	+16	+19	+16	+39	+6	+17	+26	+22	+10	+12	+16	+18	+17	+14	+24	+30
Amount of rain in highest rainfall day (%)	+4	+7	+2	+0	+7	+9	+4	+13	+4	+8	+11	+11	+5	+6	+9	+14	+4	+6	+6	+15
Amount of rain in highest five consecutive rainfall days (%)	+3	+6	+1	-2	+3	+5	+3	+9	-1	+0	+3	+7	+1	+2	+5	+5	+2	+1	+2	+6
Temperature change (°C)	+2.3	+3.1	+3.9	+4.6	+2.3	+3.0	+3.7	+4.5	+2.1	+2.9	+3.5	+4.2	+2.0	+2.7	+3.3	+4.0	+2.3	+3.0	+3.7	+4.4
Number of hot days (>90th percentile)	+94	+137	+171	+196	+94	+134	+174	+203	+107	+148	+189	+226	+110	+158	+198	+231	+98	+142	+178	+208
Number of hot nights (>90th percentile)	+93	+133	+178	+213	+97	+140	+186	+222	+107	+157	+204	+235	+120	+175	+223	+259	+99	+147	+194	+226
Number of cold days (<10th percentile)	-31	-36	-39	-42	-32	-35	-38	-40	-34	-38	-42	-45	-36	-40	-43	-44	-32	-37	-41	-43
Number of cold nights (<10th percentile)	-46	-51	-53	-54	-49	-52	-55	-56	-51	-55	-56	-57	-56	-61	-62	-63	-49	-52	-56	-57
Duration of heat waves (days)	+62	+103	+145	+182	+57	+96	+135	+180	+56	+106	+150	+196	+63	+105	+159	+200	+62	+103	+145	+181