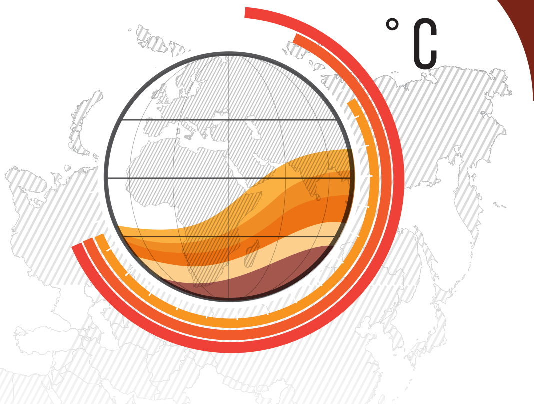
# WHAT GLOBAL WARMING OF 1.5°C AND HIGHER MEANS FOR GHANA




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 Ghana, local warming will be greater than the global average. Even a 1.5°C increase in global temperature will have severe local impacts, affecting water resources, agriculture, sea level rise, fisheries, 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]. This means there is an urgent need to accelerate Ghana's adaptation responses to support its development agenda.

## GLOBAL WARMING ABOVE PRE-INDUSTRIAL LEVELS

## LOCAL IMPACTS IN GHANA

| | | | 1.5°C | VS 2°C | VS 2.5°C | VS 3°C |
|---|---|---|---|---|---|---|
| Projected climate changes[3] | CLIMATE | Mean temperature (°C) | ▲ 1.7 | ▲ 2.3 | ▲ 2.9 | ▲ 3.3 |
| | | Heat waves (days) | ▲ 62 | ▲ 109 | ▲ 155 | ▲ 197 |
| | | Annual rainfall | ▼ 3% | ▼ 3% | ▼ 1% | ▼ 2% |
| | | Dry spells (days) | ▲ 1 | ▲ 2 | ▲ 2 | ▲ 2 |
| | | Wet spells (days) | ▼ 6 | ▼ 7 | ▼ 8 | ▼ 9 |
| | | Percentage of total rainfall falling in heavy downpours | 20% | 22% | 23% | 23% |
| Estimated impacts[4] | WATER | Precipitation over Volta Basin[4] | no change | ▲ 1% | ▲ 2% | ▲ 2% |
| | | Volta Basin[5] (streamflows) | ▼ 6%[6] | ▼ 9%[6] | ▼ 8% | ▼ 20% |
| | | Lake Volta[7] (inflows) | ▲ 1%[6] | ▲ 2%[6] | ▲ 1% | ▲ 3%[6] |
| | | White Volta River[8] (streamflow) | ▼ 22% | ▼ 33%[6] | ▼ 44%[6] | ▼ 50% |
| | | Pra River[8] (streamflow) | ▼ 22% | ▼ 28%[6] | ▼ 37%[6] | ▼ 40% |
| | | Groundwater recharge[9] | ▼ 17%[6] | ▼ 25%[6] | ▼ 35% | ▼ 43%[6] |
| | SEA LEVEL RISE | Sea level rise in Takoradi[10] (cm) | ▲ 8 | ▲ 14 | ▲ 18 | ▲ 36[6] |
| | | Sea level rise in Tema[10] (cm) | ▲ 17 | ▲ 31 | ▲ 34 | ▲ 61[6] |
| | AGRICULTURE | Maize[11] (yield) | ▼ 5% | ▼ 5% | ▼ 6% | ▼ 8% |
| | | Cassava[12] (yield) | ▼ 3% | ▼ 16%[6] | ▼ 14% | ▼ 31%[6] |
| | MARINE FISHERIES | Total catch[13] | ▼ 22%[6] | ▼ 42% | ▼ 55% | ▼ 64%[6] |
| | | Economic impact[13] (per year) | ▼ $20 million[6] | ▼ $35 million | ▼ $54 million | ▼ $60 million[6] |
| | HEALTH | Malaria[14] (months of risk) | ▼ 1%[6] | ▼ 2%[6] | ▼ 2%[6] | ▼ 3%[6] |
| | | Heat stress[15] (days of exposure to dangerous temperatures) | ▲ 124[6] | ▲ 157[6] | ▲ 190[6] | ▲ 222[6] |

[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.
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ASSAR
Adaptation at Scale in Semi-Arid Regions

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# IMPACTS OF GLOBAL WARMING THRESHOLDS ON GHANA'S CLIMATIC ZONES

| | SEMI ARID | | | | SUB-HUMID NORTH | | | | SUB-HUMID COAST | | | | HUMID NORTH | | | | HUMID SOUTH | | | | GHANA 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 | 1.5°C | 2°C | 2.5°C | 3°C |
| Annual rainfall (%) | +1 | +1 | +3 | +3 | -1 | 0 | +1 | +1 | -2 | -3 | -2 | -2 | -3 | -2 | -1 | -1 | -5 | -5 | -5 | -5 | -3 | -3 | -1 | -2 |
| Duration of dry spells (days) | 0 | 0 | -1 | +1 | 0 | +1 | 0 | -1 | +3 | +3 | +3 | +5 | +1 | +2 | +1 | +1 | +2 | +3 | +3 | +3 | +1 | +2 | +2 | +2 |
| Duration of wet spells (days) | -2 | -2 | -3 | -3 | -4 | -5 | -5 | -5 | -6 | -7 | -9 | -9 | -6 | -8 | -8 | -9 | -7 | -8 | -10 | -10 | -6 | -7 | -8 | -9 |
| Heavy rainfall days (>10mm/day) | 0 | 0 | +1 | +1 | 0 | 0 | +1 | +1 | -1 | 0 | +1 | +2 | 0 | 0 | 0 | +1 | -1 | -1 | +1 | +1 | 0 | 0 | 0 | +1 |
| Extreme heavy rainfall days (>20mm/day) | 0 | 0 | 0 | +1 | 0 | +1 | +1 | +1 | +1 | +1 | +1 | +2 | 0 | +1 | +1 | +1 | 0 | 0 | +1 | +1 | 0 | +1 | +1 | +1 |
| Amount of rain in heavy rainfall events (%) | +15 | +18 | +21 | +28 | +9 | +15 | +22 | +27 | +22 | +21 | +32 | +34 | +10 | +20 | +28 | +28 | +13 | +20 | +26 | +31 | +11 | +20 | +28 | +28 |
| Amount of rain in extremely heavy rainfall events (%) | +24 | +22 | +32 | +48 | +25 | +37 | +43 | +55 | +41 | +40 | +49 | +56 | +31 | +47 | +43 | +56 | +33 | +35 | +41 | +59 | +35 | +45 | +42 | +54 |
| Amount of rain in highest rainfall day (%) | +9 | +6 | +11 | +19 | +11 | +13 | +17 | +23 | +10 | +12 | +17 | +21 | +10 | +19 | +16 | +20 | +9 | +12 | +14 | +15 | +10 | +15 | +16 | +20 |
| Amount of rain in highest five consecutive rainfall days (%) | +4 | +6 | +6 | +13 | +4 | +7 | +11 | +14 | +5 | +7 | +12 | +13 | +5 | +11 | +11 | +12 | +3 | +7 | +8 | +10 | +4 | +10 | +6 | +12 |
| Temperature change (°C) | +1.9 | +2.5 | +3.2 | +3.8 | +1.8 | +2.4 | +3.1 | +3.6 | +1.5 | +2.0 | +2.5 | +3.0 | +1.7 | +2.3 | +2.9 | +3.3 | +1.7 | +2.2 | +2.7 | +3.1 | +1.7 | +2.3 | +2.9 | +3.3 |
| Number of hot days (>90th percentile) | +99 | +141 | +183 | +214 | +109 | +159 | +198 | +227 | +140 | +196 | +229 | +257 | +106 | +152 | +192 | +230 | +126 | +173 | +214 | +239 | +112 | +155 | +195 | +231 |
| Number of hot nights (>90th percentile) | +120 | +178 | +220 | +252 | +141 | +196 | +240 | +272 | +211 | +277 | +305 | +321 | +167 | +225 | +262 | +287 | +214 | +266 | +298 | +315 | +171 | +231 | +265 | +291 |
| Number of cold days (<10th percentile) | -31 | -36 | -39 | -43 | -32 | -37 | -41 | -43 | -46 | -49 | -51 | -53 | -37 | -41 | -44 | -46 | -43 | -49 | -53 | -55 | -38 | -43 | -45 | -48 |
| Number of cold nights (<10th percentile) | -51 | -55 | -56 | -56 | -61 | -63 | -64 | -65 | -77 | -79 | -80 | -80 | -69 | -72 | -73 | -73 | -76 | -79 | -80 | -80 | -69 | -71 | -72 | -72 |
| Duration of heat waves (days) | +48 | +90 | +138 | +181 | +53 | +95 | +141 | +180 | +94 | +149 | +192 | +230 | +60 | +100 | +148 | +190 | +77 | +132 | +177 | +208 | +62 | +109 | +155 | +197 |