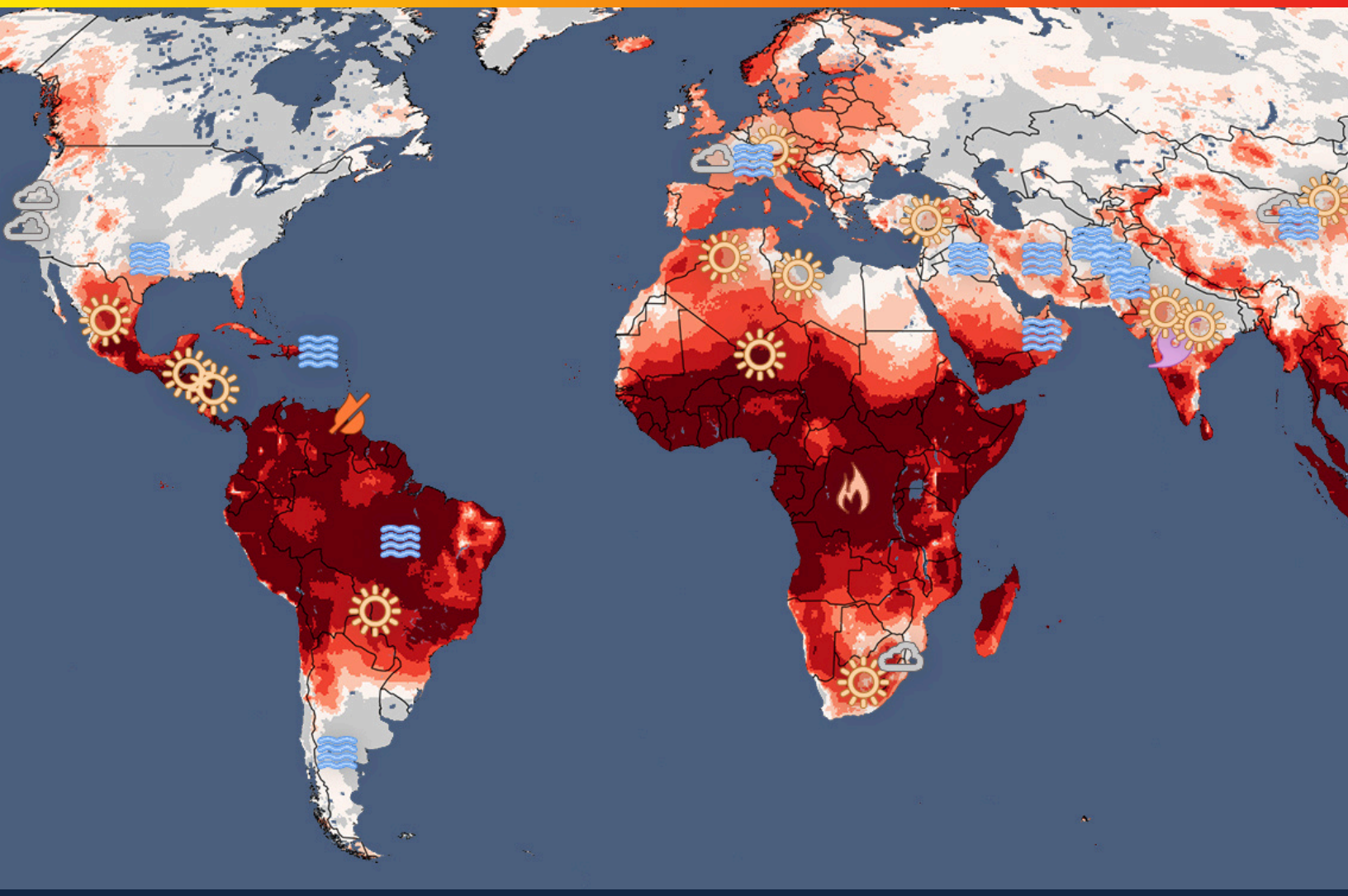
People Exposed to Climate Change: March-May 2024

A Climate Central seasonal analysis of how climate change boosted temperatures worldwide between March 2024 and May 2024



CLIMATE CENTRAL

June 6, 2024

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Key Facts

March, April, and May 2024 each broke monthly global temperature records. During this period, the effects of human-induced climate change, mainly from burning fossil fuels, were evident in all regions of the world, particularly in the form of extreme heat. This analysis uses Climate Central's Climate Shift Index (CSI) to determine the influence of climate change on temperatures around the globe.

About **one in every four people on the planet** experienced temperatures made at least three times more likely because of climate change (CSI level 3 or higher) every day from March 1, 2024 to May 31, 2024. In other words, they experienced temperatures with a *very strong* influence of climate change.

Global exposure peaked on April 6, 2024, when 2.7 billion people (**one in every three people worldwide**) experienced unusual heat at CSI level 3 or higher.

In 58 countries, the average person experienced a *very strong* influence of climate change on **at least two out of every three days** during the last three months. These countries were primarily located in: Central, Eastern, and Western Africa; Southeast Asia; Central America and the Caribbean; South America; and small island developing states within Polynesia and Melanesia.

Notably, about **44% of all people in Africa** and **one in every three people in South America** experienced the most extreme levels of climate-change-driven heat (at least 60 total days at CSI level 5) during the last three months.

The cities with the greatest exposure to attributable heat each felt a *very strong* influence of climate change on **90 or more days**, accounting for **at least 98% of the season**: Quito, Ecuador; Makassar, Indonesia; Guatemala City, Guatemala; Caracas, Venezuela; Kigali, Rwanda; and Monrovia, Liberia.

Data

- **Download data** for March 1, 2024 - May 31, 2024 Climate Shift Index (CSI) levels for 21 major regions, 175 countries, and 684 cities around the world.

INTRODUCTION

Humans have raised the temperature of the planet mainly by burning coal, oil, and natural gas. Global average temperatures in 2023 were 1.5°C warmer[1] than early-industrial (1850-1900) levels.

Earth's record heat streak, which began in June 2023, has continued well into 2024. May 2024 marks 12 consecutive months of record-breaking global temperatures.

From March 2024 to May 2024, the effects of human-induced climate change were evident in all regions of the world, particularly in the form of extreme heat. See ***Heat and Beyond*** box below.

This report documents how human-caused climate change influenced this unprecedented three-month period of heat for people around the world. We use two primary tools for this analysis:

1. Temperature anomalies: this shows how much warmer or cooler conditions were relative to the 1991-2020 average. Note that this baseline already includes about 0.9°C of warming above pre-industrial levels. Temperature anomalies highlight conditions that people would recognize as unusual.

2. Climate Shift Index (CSI): this metric, developed by Climate Central, quantifies the influence of climate change on daily temperatures. Positive CSI levels 1 to 5 indicate temperatures that are increasingly likely in today's climate. A CSI level of 2 (3, etc.) means the temperature is at least 2x (3x, etc.) more likely in today's climate than in a world without human-caused climate change. See ***The Climate Shift Index (CSI)*** box below for details.

This analysis is focused on the average personal experience of unusually warm conditions that were *very strongly* influenced by climate change from March 2024 to May 2024. To do this, we compute the average per capita exposure to CSI level 3 or higher for people in 21 major global regions and 175 countries. We also compute city-wide CSI signals for 684 cities.

GLOBAL CONTEXT

Human-caused emissions of the three most important heat-trapping greenhouse gasses — carbon dioxide, methane, and nitrous oxide — have continued to climb to ever-higher levels. The latest projections gave a 61% chance of 2024 exceeding 2023 as the planet's warmest year on record.

The El Niño Southern Oscillation (ENSO) is one of the best-known natural factors that influence global temperatures year-to-year. El Niño tends to drive global temperatures higher, with winter ENSO having the strongest influence on annual average temperatures. El Niño's contributions to elevated global temperatures could therefore continue despite weakening El Niño conditions and a forecasted transition to ENSO-neutral in June 2024.

[1] This single-year temperature anomaly pushes the planet closer toward the multi-decade average warming limit of 1.5°C that nearly all countries have committed to in the Paris Agreement. Heat-trapping pollution is a leading cause of short-term and long-term warming trends.

It is important to remember, however, that the 2023-2024 El Niño is occurring on top of a climate that has been warmed by human activities. The daily attribution calculations in this report reference observed changes against a 30-year period. This procedure accounts for the variability from ENSO cycles, allowing us to quantify the influence of climate change.

RESULTS

1. One in four people felt a very strong climate change influence each day

About **one in every four people on the planet** experienced temperatures made at least three times more likely because of climate change (CSI level 3 or higher) every day from March 1, 2024 to May 31, 2024. In other words, they experienced temperatures with a *very strong* influence of climate change.

Global exposure peaked on April 6, 2024, when 2.7 billion people — **one in every three people worldwide** — experienced unusual heat at CSI level 3 or higher.

2. Regions with unusual heat boosted by climate change

Over the last three months, there were several large regions with unusually warm conditions (Figure 1).

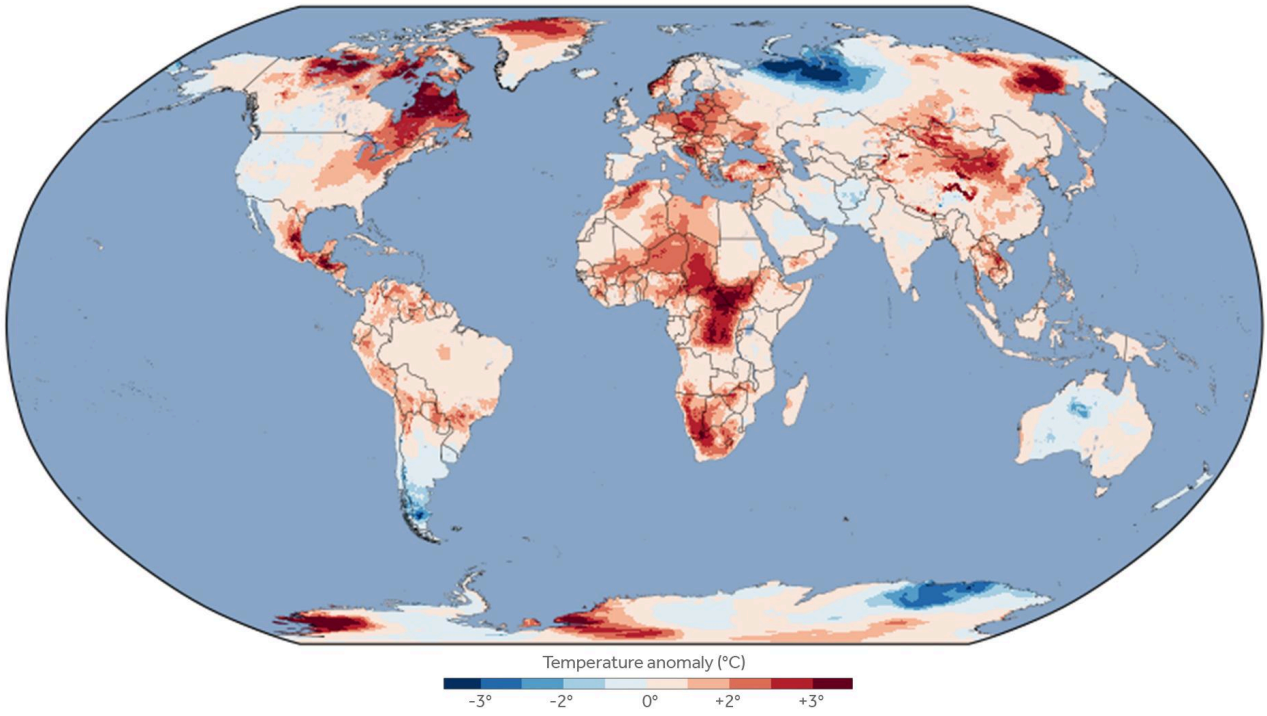

Figure 1. Global temperature anomalies (departures from normal) for March 2024 to May 2024 relative to the 1991-2020 standard normal period. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31). Produced June 3 2024.

The average person in each of the regions listed in Table 1 experienced the highest regional average temperature anomalies observed over the last three months.

Region	Per-capita mean temperature anomaly (°C)	Per-capita days at CSI 3 or higher
Central America	1.8	62
Middle Africa	1.7	74
Western Africa	1.6	71
Southern Africa	1.6	25
Eastern Europe	1.5	8
Northern Africa	1.3	16
Eastern Asia	1.3	5
Western Europe	1.3	9
Northern Europe	1.3	13

Table 1. Major global regions with highest per-capita mean temperature anomalies from March 2024 to May 2024, along with regionally averaged per-capita days at CSI 3 or higher. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31).

The CSI reveals the influence of climate change on unusual heat in each region (Figure 2). Note that locations with relatively large temperature anomalies don't necessarily experience the strongest CSI signals. This is because CSI levels depend on how the daily temperature compares to both: 1) the strength of the local warming trend and 2) the spread, or variance, of possible local temperatures.

Places with strong warming trends and low temperature variance (e.g., tropical regions and many places near the ocean) can have high CSI levels even for modest temperature anomalies. Conversely, places and seasons with high temperature variance (e.g., much of the United States during the spring and fall) require bigger temperature anomalies to produce detectable positive or negative CSI levels.

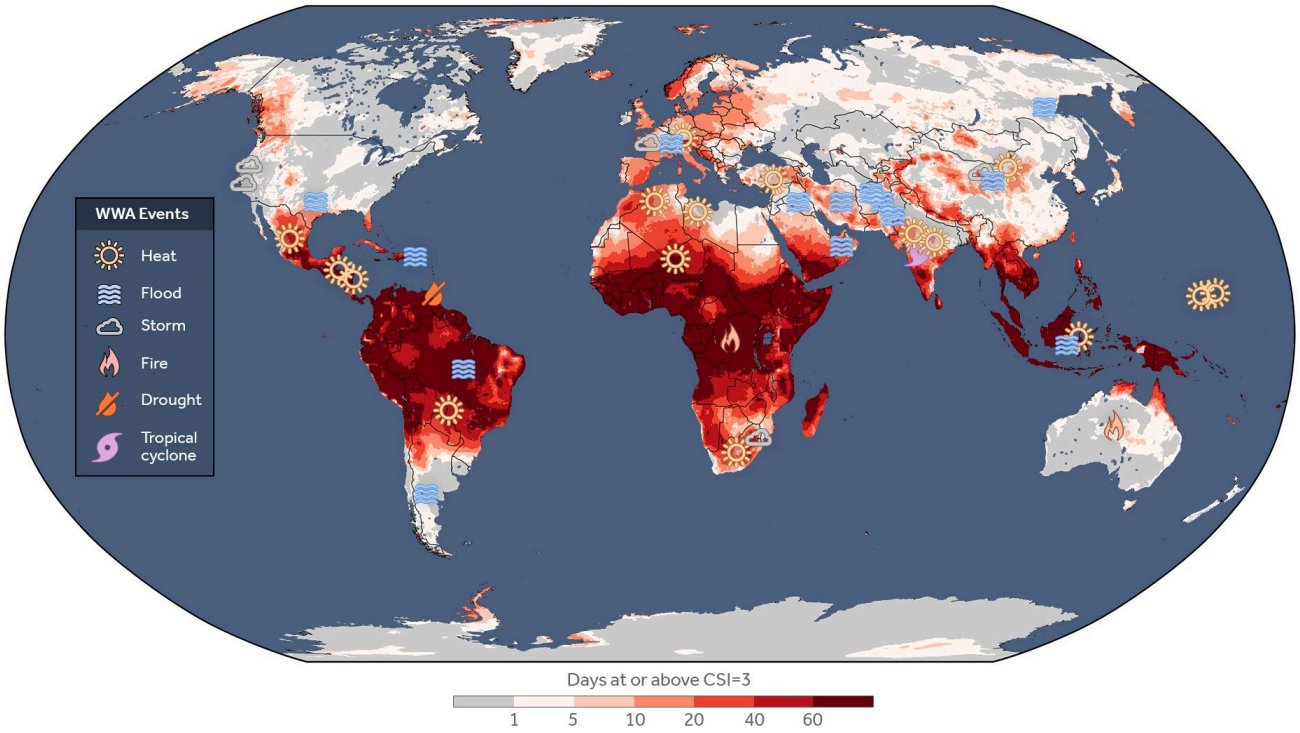

Figure 2. Number of days at Climate Shift Index (CSI) level 3 or higher. Overlaid icons represent the 41 extreme weather events identified by World Weather Attribution that occurred from March 2024 to May 2024. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31). Produced June 3, 2024.

The CSI focuses on temperature, but climate change also drives other weather extremes and impacts. During March 2024 to May 2024, World Weather Attribution identified 41 significant extreme events around the world based on factors such as number of people (or percent of the population) impacted, fatalities, state of emergency declarations, records set, and more. These 41 events included heat waves, floods, fire, drought, hurricane and storms. Many of these occurred in areas with a *very strong* influence of climate change on temperatures as measured by the CSI (Figure 2).

3. Countries with unusual heat boosted by climate change

In 58 countries, the average person experienced a *very strong* influence of climate change on **at least two out of every three days** during the last three months (Table 2). These countries were primarily located in: Central, Eastern and Western Africa; Southeast Asia; Central America and the Caribbean; South America; and small island developing states in Polynesia and Melanesia.

Notably, about **44% of all people in Africa** and **one in every three people in South America** experienced the most extreme levels of climate-change-driven heat (at least 60 total days at the maximum CSI level 5) during the last three months.

Continent	Countries with per-capita CSI at 3 or higher for at least two-thirds of the season	Country with most per-capita days at CSI 3 or higher	Country with most people exposed to CSI 5 for 60+ days	Continent-wide population with at least one day at CSI 3 or higher
Africa	27 out of 52	Sao Tome and Principe (92 days)	Nigeria (117 million)	1.3 billion (95%)
Asia	9 out of 47	Brunei (90 days)	Indonesia (222 million)	3.3 billion (71%)
Europe	0 out of 38	Estonia (24 days)	Not applicable	657 million (88%)
North America*	9 out of 17	Guatemala (89 days)	Mexico (36 million)	405 million (68%)
South America	8 out of 13	Suriname (88 days)	Brazil (45 million)	375 million (86%)
Oceania	5 SIDS out of 8	Samoa (92 days)	Papua New Guinea (6.8 million)	27 million (61%)

Table 2. Summary of countries with highest CSI duration and intensity from March 2024 to May 2024. All CSI values refer to average temperature. *Includes Central America and the Caribbean. SIDS: small island developing states. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31).

3.1. Africa

In 27 countries (51% of 52 total African countries analyzed), the average person experienced a *very strong* influence of climate change (CSI level 3 or higher) on **at least two out of every three days** in the season.

The top five countries on this list were primarily located in Central Africa: the average person in Sao Tome and Principe experienced 92 days at CSI level 3 or higher; Rwanda (91); Burundi (87); Liberia (87); and Equatorial Guinea (86). The average person in each of these countries experienced a *very strong* influence of climate change on **at least 93% of all days in the season**.

Across the continent, **1.3 billion people (95% of the continent's total population)** experienced at least one day of temperatures *very strongly* influenced by climate change (CSI level 3 or higher).

Notably, **44% of the total African population (more than 614 million people)** experienced the most extreme levels of climate-change-driven heat (at least 60 total days at CSI level 5) during the last three months.

3.2. Asia

In nine countries (19% of 47 total Asian countries analyzed), the average person experienced a *very strong* influence of climate change (CSI level 3 or higher) on temperatures on **at least two out of every three days** in the season.

Eight of these nine countries were all located in Southeast Asia, led by: the average person in Brunei experienced 90 days at CSI level 3 or higher; Malaysia (84); East Timor (84); Singapore (82); and Indonesia (81). The average person in each of these countries experienced a *very strong* influence of climate change on **at least 88% of all days in the season**.

Across the continent, **3.3 billion people (71% of the continent's total population)** experienced at least one day of temperatures *very strongly* influenced by climate change (CSI level 3 or higher). About 9% of the total Asian population — primarily in Southeast Asia — experienced the most extreme levels of climate-change-driven heat (at least 60 total days at CSI level 5) during the last three months.

3.3. Europe

In each of the 38 European countries analyzed, the average person did not experience a *very strong* influence of climate change (CSI level 3 or higher) on temperatures on at least two-thirds of all days in the season.

The five countries with the most per-capita days at CSI level 3 or higher were: Estonia (24); Norway (23); Slovenia (20); and Montenegro (20).

Across the continent, over **657 million people (88% of the continent's total population)** experienced at least one day of temperatures *very strongly* influenced by climate change (CSI level 3 or higher). By contrast, none of the European population experienced the most extreme levels of attributable heat during the last three months (at least 60 total days at CSI level 5).

3.4. North America

In nine countries (53% of the 17 total North American countries analyzed), the average person experienced a *very strong* influence of climate change (CSI level 3 or higher) on temperatures on **at least two out of every three days** in the season.

The nine countries on this list were all located in Central America or the Caribbean, led by: the average person in Guatemala experienced 89 days at CSI level 3 or higher; Jamaica (88); Guadeloupe (88); Trinidad and Tobago (86); and Nicaragua (84). The average person in each of these countries experienced a *very strong* influence of climate change on **at least 91% of all days in the season**.

Across the continent, **over 405 million people (68% of the continent's total population)** experienced at least one day of temperatures *very strongly* influenced by climate change (CSI level 3 or higher). The most extreme levels of attributable heat (at least 60 total days at CSI level 5) were experienced by 13% of the North American population — all of whom were in Central America and the Caribbean.

3.5. South America

In eight countries (62% of the 13 total South American countries analyzed), the average person experienced a *very strong* influence of climate change (CSI level 3 or higher) on temperatures on **at least two out of every three days** in the season.

The top countries on this list were: the average person in Suriname experienced 88 days at CSI level 3 or higher; Guyana (86); French Guiana (84); Venezuela (82); Colombia and Ecuador (75). The average person in each of these countries experienced a *very strong* influence of climate change on **at least 82% of all days in the season**.

Across the continent, **over 375 million people (86% of the continent's total population)** experienced at least one day of temperatures *very strongly* influenced by climate change (CSI level 3 or higher).

Notably, **nearly one-third (32%) of the total South American population** experienced the most extreme levels of attributable heat (at least 60 total days at CSI level 5) during the last three months.

3.6. Oceania

In five countries (63% of the eight total Oceanian countries analyzed), the average person experienced a *very strong* influence of climate change (CSI level 3 or higher) on temperatures on **at least two out of every three days** in the season.

The five countries on this list are all small island developing states in Polynesia and Melanesia: the average person in Samoa experienced 92 days at CSI level 3 or higher; Solomon Islands (86); Papua New Guinea (84); Fiji (67); Vanuatu (61). The average person in each of these countries experienced a *very strong* influence of climate change on **at least 66% of all days in the season**.

Across the continent, **over 27 million people (61% of the continent's total population)** experienced at least one day of temperatures *very strongly* influenced by climate change (CSI level 3 or higher). The most extreme levels of attributable heat (at least 60 total days at CSI level 5) were experienced by 17% of the total population of Oceania — mostly in Melanesia.

Heat and Beyond: a global retrospective of extreme weather impacts in the past three months

March, April, and May 2024 were the warmest March, April and May months ever recorded globally, with May marking the 12th consecutive month of record-breaking heat. The effects of human-induced climate change, driven by the burning of fossil fuels, were evident in all regions of the world in the form of extreme heat, unprecedented rainfall, and severe droughts.

In South Sudan and the U.S., extreme weather led to power cuts that forced thousands to face the heat without electricity. Extreme heat forced school closures in the Philippines and India, while in Bangladesh, dangerously high temperatures kept over 33 million children out of classrooms for the second year in a row. In Thailand, parents were urged not to let children play outdoors. Doctors in Pakistan treated hundreds of people affected by heat, including children who suffered from heat-related gastroenteritis.

Extreme temperatures broke records in all continents. In Asia, Myanmar recorded its all-time high April temperature at 48.2°C and Laos broke the all-time national record at 43.6°C. In Oceania, over 70 countries broke heat records in May alone, with all Oceania Pacific islands registering unprecedented monthly temperatures. In Africa, Mali recorded the hottest day in African history — a record that killed at least 100 people, although the death toll is likely under-reported. Thousands of kilometers away, in South America, people in Brazil experienced a thermal sensation of 62.3 °C and several countries suffered from dengue outbreaks. The heat broke records in North America. In Mexico, at least 10 cities set new temperature records, triggering blackouts in a third of states and reports of monkeys dropping dead from trees. In Europe, early high temperatures were recorded in France, Germany, Norway and Spain, where the population faced summer-like heat during their spring season.

At the same time, other regions suffered from rainfall and widespread flooding. In April, Dubai's highways turned into rivers, forcing schools, shopping centers and the airport to shut down. The floods claimed 17 lives in Oman. Extreme rainfall led to the collapse of a highway in China, killing 48, while in Indonesia, heavy rainfall between March and May resulted in an estimated $23 million in economic losses. In Kenya and Tanzania, the death toll from severe flooding caused by the long rains of March-May exceeded 250 and 150, respectively. In Afghanistan, over 300 people died due to flash floods in May.

In Brazil's southern state of Rio Grande do Sul, the country's worst-ever floods killed 161 people and displaced another half a million. Weeks after the floods, more than 60 people are still missing. The tragedy – which has been compared to the widespread devastation after Hurricane Katrina – disrupted 94% of the state's economy, as weeks of flooding caused at least 155,000 people to become homeless.

In the US, over 400 people had to be rescued in Texas after rivers reached levels unseen since 2017, when Hurricane Harvey made landfall. And Europe also suffered the consequences of flooding, with Northern Italy seeing the heaviest rainfall in 170 years.

As for drought, over 60 million people were affected by the long-lasting drying conditions in Southern Africa, the most intense mid-season dry spell in the last decade. In light of this, Zambia's president declared national disaster, as the country faced the worst drought in 40 years, followed by Zimbabwe and Malawi.

Drought also affected South America, where 2 million Bolivians faced the most severe drought in their history, Venezuelans battled record-breaking wildfires caused by the lack of rainfall and heat, and Ecuadorians faced power cuts due to impacts on hydroelectric sources. Bogotá and Mexico City are among the cities with water systems reaching a "Day Zero."

4. Global cities with unusual heat boosted by climate change

The following cities had the **most days at CSI 3 or higher** during the last three months (Table 3). These cities were located across: Southeast Asia (the Philippines and Indonesia), Central America (Guatemala), South America (Ecuador, Venezuela, and Brazil), and Western and Central Africa (Rwanda, Liberia, Nigeria, and Côte d'Ivoire).

City	Country	Days at CSI 3 or higher	Percent of season	Temperature anomaly (°C)
Makassar	Indonesia	92	100%	1.2
Quito	Ecuador	92	100%	1.3
Guatemala City	Guatemala	91	99%	1.9
Kigali	Rwanda	90	98%	1.5
Caracas	Venezuela	90	98%	1.6
Monrovia	Liberia	90	98%	1.3
Vila Velha	Brazil	89	97%	1.2
Lagos	Nigeria	88	96%	1.3
Abidjan	Côte d'Ivoire	88	96%	1.2
Davao	Philippines	88	96%	0.9
Semarang	Indonesia	88	96%	1.4
Barquisimeto	Venezuela	88	96%	1.9

Table 3. Global cities with the longest duration of very strong (CSI at 3 or higher) climate influence on daily temperatures, March 2024 to May 2024. All CSI values refer to average temperature. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31).

4.1. Global megacities

Cities are hotspots of heat risk due to their high population density and land development patterns that intensify heat in urban heat islands. This is especially true for the world's largest cities.

Of the 48 global megacities analyzed (with populations over 10 million), 40 experienced at least one day of temperatures made at least three times more likely because of climate change (CSI level 3 or higher).

Of these, 10 megacities endured heat that was *very strongly* influenced by climate change for at least half (between 52% and 95%) of the entire season (Table 4):

Megacity	Country	Days at CSI 3 or higher (% of season)	Days at CSI 5 or higher	Temperature anomaly (°C)
Lagos	Nigeria	88 (96%)	86	1.3
Kinshasa	Congo	79 (86%)	70	1.6
Mexico City	Mexico	78 (85%)	63	2.5
Jakarta	Indonesia	77 (84%)	69	0.9
Ho Chi Minh City	Vietnam	76 (83%)	62	1.2
Manila	Philippines	75 (82%)	67	1.2
Luanda	Angola	74 (80%)	64	1.2
Bogota	Colombia	71 (77%)	63	0.8
Bangkok	Thailand	69 (75%)	58	0.9
São Paulo	Brazil	48 (52%)	38	1.6

Table 4. Global megacities with CSI 3 or higher for at least half of the March 2024 to May 2024 period. All CSI values refer to average temperature. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31).

These 10 megacities, with a combined population of about 195 million, each reached the maximum CSI level 5 on 38 to 86 days over the three-month period. That equates to between about a month and a half and 95% of the entire season with abnormal warmth made *at least five times more likely* by the influence of climate change.

Despite being areas of concentrated heat risk, cities can also be the focal point for coordinated action to keep residents safe during extreme heat. As human-caused climate change continues to make extreme heat events hotter, longer, and more likely, developing and implementing urban heat action plans can help prevent heat-related illness and keep people cool, safe, and informed during dangerous heat events.

4.2. U.S. cities

There was a strong regional contrast across the U.S. in terms of areas with high-ranking temperature anomalies and areas with high-ranking CSI signals over the last three months.

At the state level, the strongest CSI signals were observed on islands (Puerto Rico and Hawaii) and in coastal states (Florida), despite these areas having relatively low temperature anomalies. By contrast, states with the highest temperature anomalies over the last three months (Michigan, Ohio, and West Virginia) had very few (only one to four) days with a detectable state-wide influence of climate change at CSI level 3 or higher.

These high-anomaly states are all located in the Upper Midwest and Ohio Valley — areas that have relatively high seasonal temperature variance and therefore require even larger anomalies to register a *very strong* (CSI level 3 or higher) influence of climate change during the season. Additionally, parts of the Upper Midwest (especially northern Michigan) have experienced more modest long-term spring warming trends than the rest of the country, which also raises the threshold for detectable CSI signals.

City	State	Days at CSI 3 or higher (% of season)	Temperature anomaly (°C)	City	State	Temperature anomaly (°C)	Days at CSI 3 or higher
San Juan	Puerto Rico	85 (92%)	1.0	Cleveland	Ohio	2.5	2
West Palm Beach	Florida	28 (30%)	1.1	Canton	Ohio	2.4	0
Miami	Florida	26 (28%)	1.1	Erie	Pennsylvania	2.4	1
Sarasota	Florida	25 (27%)	1.0	Youngstown	Ohio	2.4	0
Fort Myers	Florida	23 (25%)	1.1	Toledo	Ohio	2.3	0
Honolulu	Hawaii	22 (24%)	0.1	Traverse City	Michigan	2.3	1
Victoria	Texas	19 (21%)	1.8	Mansfield	Ohio	2.3	0
McAllen	Texas	17 (18%)	1.7	Detroit	Michigan	2.3	1
Corpus Christi	Texas	16 (17%)	1.5	Watertown	New York	2.3	1
Tampa	Florida	15 (16%)	0.8	Pittsburgh	Pennsylvania	2.3	0

Table 5. Highest-ranking U.S. cities in terms of: days at CSI 3 or higher (left) and mean temperature anomaly (right) from March 2024 to May 2024. All CSI levels refer to average temperature. Analysis based on ECMWF ERA5 data (March 1-May 28) and NOAA GFS (May 29-31).

As with the U.S. states, the highest-ranking U.S. cities in terms of CSI (Table 5) were on islands or along coasts, where seasonal temperature variance tends to be relatively low compared with climates in other (more temperate) parts of the country.

By contrast, cities in Ohio and Michigan dominated the mean temperature anomaly rankings, all with relatively large warm departures from the 30-year spring normal. Despite having notably warm spring temperatures, these cities experienced few to no days with a *very strong* (CSI level 3 or higher) influence of climate change on average temperature. This is mainly due to relatively high historical variance in spring temperatures and relatively more modest long-term warming trends in parts of the Midwest (especially the Upper Midwest).

The Climate Shift Index (CSI)

Humans have caused global average temperatures to increase by 1.1°C (2°F) since 1850. But people do not experience global average temperatures. Instead, we mainly experience climate change through shifts in the daily temperatures and weather patterns where we live.

Climate Central's Climate Shift Index (CSI) system quantifies the local influence of climate change on daily temperatures around the world.

The CSI quantifies how much human-caused climate change has shifted the odds of daily temperatures that people experience locally. The CSI is grounded in peer-reviewed attribution science and was launched by Climate Central in 2022. The data are accessible via our free map tool.

The CSI scale is centered on zero. A CSI level of zero means that there is no detectable influence of human-caused climate change. In other words, that day's temperature is equally likely in both the modern climate and one without global warming.

Positive CSI levels 1 to 5 indicate conditions that are increasingly likely in today's climate. A CSI level of 1 means that climate change is detectable (technically, the temperature is at least 1.5x more likely). CSI levels 2 and higher correspond with the multipliers (2 = at least 2x more likely, 3 = at least 3x more likely, etc.). The CSI scale is currently capped at level 5 which means that a CSI of 5 includes higher values and thus should be read as *at least 5*. CSI level 5 events would be very difficult to encounter in a world without climate change—not impossible, but extremely unlikely.

The CSI can also be applied to temperatures that are unusually cool. For instance, a CSI level -2 means that the temperature in question is two times less likely (equivalently 1/2 as likely) due to human-caused climate change.

Climate Central's Climate Shift Index map tool shows which parts of the world are experiencing high CSI levels, every day. Explore the global CSI map for today, tomorrow, and any day this past year.

METHODS

Calculating the Climate Shift Index

All Climate Shift Index (CSI) levels reported in this brief are based on daily average temperatures and ECMWF ERA5 data from March 1-May 28, 2024 and NOAA GFS data from May 29-31, 2024. See the frequently asked questions for details on computing the Climate Shift Index, including a summary of the multi-model approach described in Gilford et al. (2022).

Daily Global Population Exposure

For each day, we identified the grid cells with CSI values of 3 or higher. We then used the proportion of population based on the Gridded Population of the World v4 estimate for 2020 living in each cell,

summed over the globe where CSI values were 3 or higher, and then multiplied by the estimated global population of 8.076 billion to get an up-to-date estimate of the global population distribution and population exposure to CSI 3.

Regional/Country Analysis
The country-level analysis includes 175 countries and territories. It excludes entities that are smaller than 0.25°, the size of a grid cell.

For this analysis, we calculated the temperature anomaly, number of days at or above various CSI thresholds, and population exposure to various CSI levels (all based on average temperature) over the March 1, 2024 to May 31, 2024 period. For each region/country, we then selected the data within its geographical boundary and found the population-weighted temperature anomaly, the population-weighted number of days at various CSI thresholds, and total population exposed to CSI level 5 for one and 60 days. Reported temperature anomalies are relative to each country's or region's 1991-2020 normal daily March-May temperatures.

State/Province Analysis
The state-level analysis includes 84 states and territories in the USA, and India. It excludes entities that are smaller than 0.25°, the size of a grid cell.

For this analysis, we calculated the temperature anomaly, number of days at or above various CSI thresholds, and population exposure to CSI level 5 (all based on average temperature) over the March 1, 2024 to May 31, 2024 period. For each state/province, we then selected the data within its geographical boundary and found the population-weighted temperature anomaly, the population-weighted number of days at various CSI thresholds, and total population exposed to CSI levels of 5 for one and 60 days. Reported temperature anomalies are relative to each state/province's 1991-2020 normal daily March-May temperatures.

City Analysis
We analyzed 684 cities from around the world. These cities are cities with populations exceeding one million people, and various U.S. cities. For each city, we found the CSI and temperature anomaly time series from the nearest 0.25° grid cell. We then computed the mean temperature anomalies over the months of March 2024, April 2024, and May 2024, and the number of days at CSI levels 2, 3, 4, and 5 (all based on average temperature). Reported temperature anomalies are relative to each city's 1991-2020 normal daily March-May temperatures. We also found the 99th percentile daily temperature for every city over the past 30 years, calculating the number of days that every city experienced above that threshold, as well as the number of streaks of days exceeding five and seven days in length. The entire list of cities and their statistics is available for download.

The cities identified in the text above were selected based on the intensity of the particular statistic as well as their population.

REPORT CONTRIBUTIONS

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Climate Central is an independent group of scientists and communicators who research and report the facts about our changing climate and how it affects people's lives. Climate Central is a policy-neutral 501(c)(3) nonprofit.