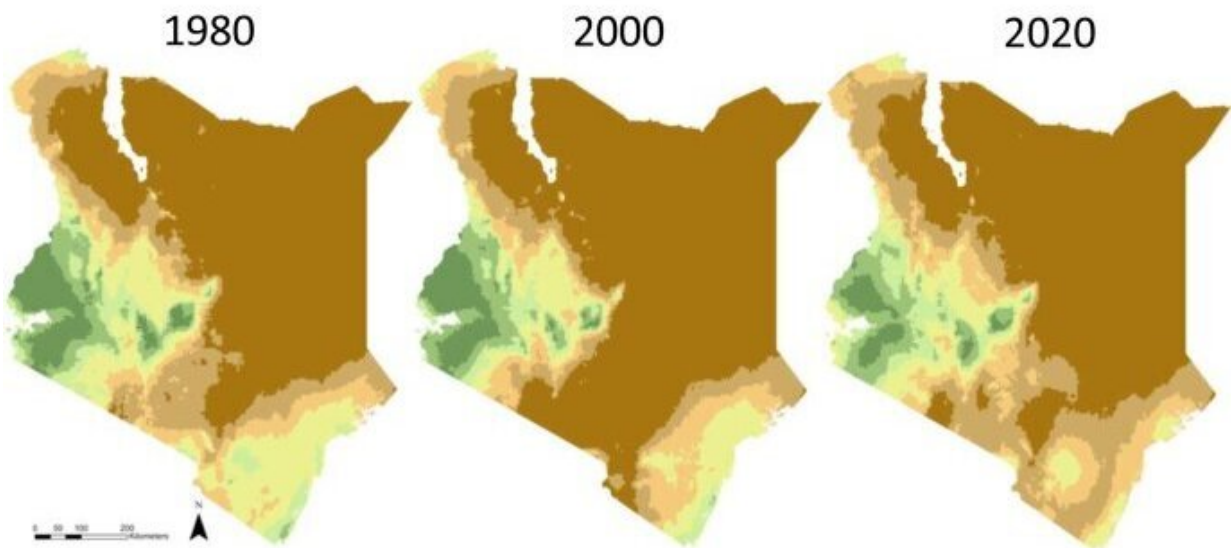


# New study finds shifting climate regions leading to hotter, drier conditions across Kenya

April 20 2023, by Maggie Rotermund



Precipitation Zones	Average Precipitation (mm)	Climate Region Designation	1980 (km <sup>2</sup> )	2000 (km <sup>2</sup> )	2020 (km <sup>2</sup> )	Change (1980-2020)	% Change (1980-2020)
1	>103	Humid	26,654	23,029	12,285	-14,368	-54%
2	80-103	Sub-humid	25,034	23,757	25,640	606	2%
3	65-80	Semi-humid	28,941	20,190	24,537	-4,404	-15%
4	48-65	Semi-humid to Semi-arid	78,493	53,342	46,968	-31,525	-40%
5	36-48	Semi-arid	49,894	52,885	65,509	15,615	31%
6	25-36	Sub-arid	70,832	56,230	101,497	30,665	43%
7	<25	Arid	293,966	344,378	297,376	3,410	1%

Classified precipitation zones, change in areas over time, and pathway of shifting precipitation zones. Maps for each year show the spatial arrangement of the precipitation zones (a). The table of a shows the climate region designation for each zone, area (km<sup>2</sup>) of each zone in each year, the change between 1980 and

2020, and the percent change in the area of each zone over the study period. In the map of b, the colors represent zone designations in 2020 following the shift between zones. The chart of b shows the change in km<sup>2</sup> between precipitation zones in 1980 to precipitation zones in 2020. Numbers above the dotted line represent a shift from drier to wetter zones. Numbers below the dotted line represent a shift from wetter to drier zones. The further a number is from the dotted line, the greater the shift in the number of zones. For each zone, the sum of its row minus the sum of its column equals the total change (1980–2020) for that zone shown in the table of a. Credit: *Regional Environmental Change* (2023). DOI: 10.1007/s10113-023-02055-w

New research published in *Regional Environmental Change* has shown that as climate zones shift toward hotter and drier conditions, ecological diversity will decline, posing a major threat to terrestrial ecosystems with far-reaching social and ecological impacts.

The study, "Shifting [climate zones](#) and expanding tropical and arid climate regions across Kenya (1980-2020)," was published online on April 5.

The research team analyzed Kenya's geographic distribution and arrangement of climate zones between 1980 and 2020. Over that time, tropical climate regions expanded from 91 to 93% with over 13,000 square kilometers shifting from alpine and temperate regions to tropical ones, and arid climate regions expanded from 72 to 81%, a roughly 50,000 km<sup>2</sup> shift from humid and semi-humid-to-semi-arid to arid regions.

"With a better understanding of how climate shifts occurred in an environment like Kenya, we can estimate how food security will be impacted in other regions with similar geographic patterns," said Enbal Shacham, Ph.D., professor of behavioral science and health education at

Saint Louis University's College for Public Health and Social Justice and acting director of strategic initiatives for the Taylor Geospatial Institute.

The first author is Ted J. Lawrence, a former post-doctoral fellow at the Taylor Geospatial Institute. Shacham is the paper's senior author.

The research team looked at how temperature and precipitation trends changed over time and how the geographic distribution and arrangement of climate zones in Kenya shifted due to those trends.

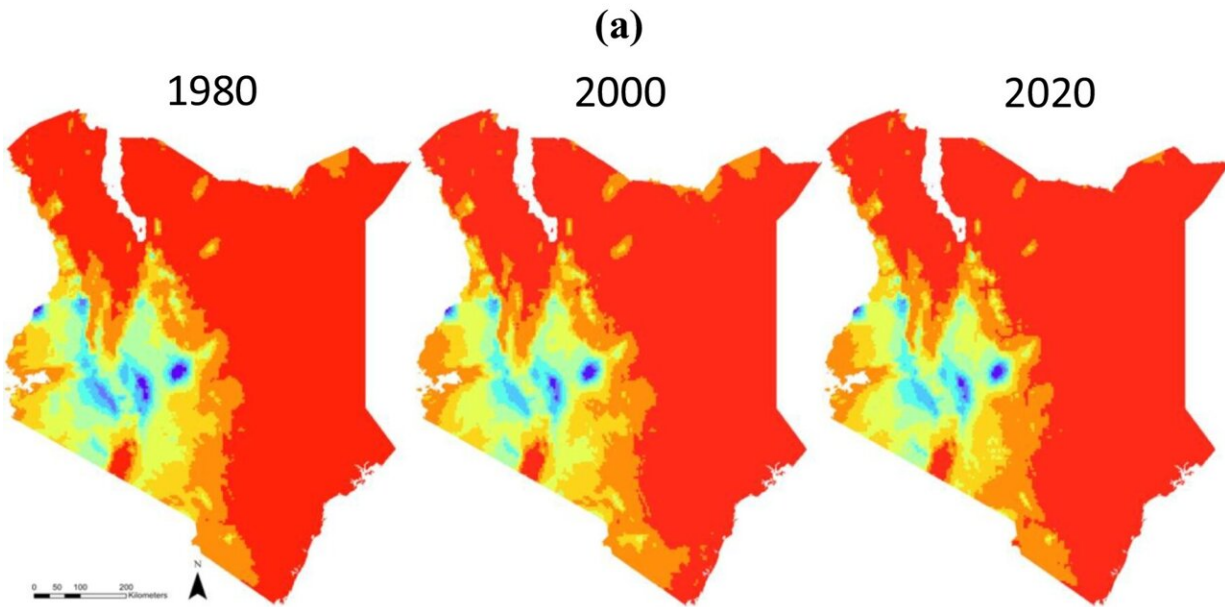
The team focused on Kenya because rain-fed agriculture is central to the country's economy and it is a key food-producing country for the East African region. The findings highlight the urgent need for adaptation strategies that take into account the impacts of shifting climate zones on [food security](#) and the livelihoods of millions of people. They also underscore the importance of developing land use and ecosystem management practices that can help mitigate the [impact of climate change](#) and maintain [ecological diversity](#).

Data showed that in addition to the 1-degree Celsius increase in temperature, there was a decrease in precipitation during the country's primary rainy season (spring) and an increase in precipitation in the secondary rainy season (fall).

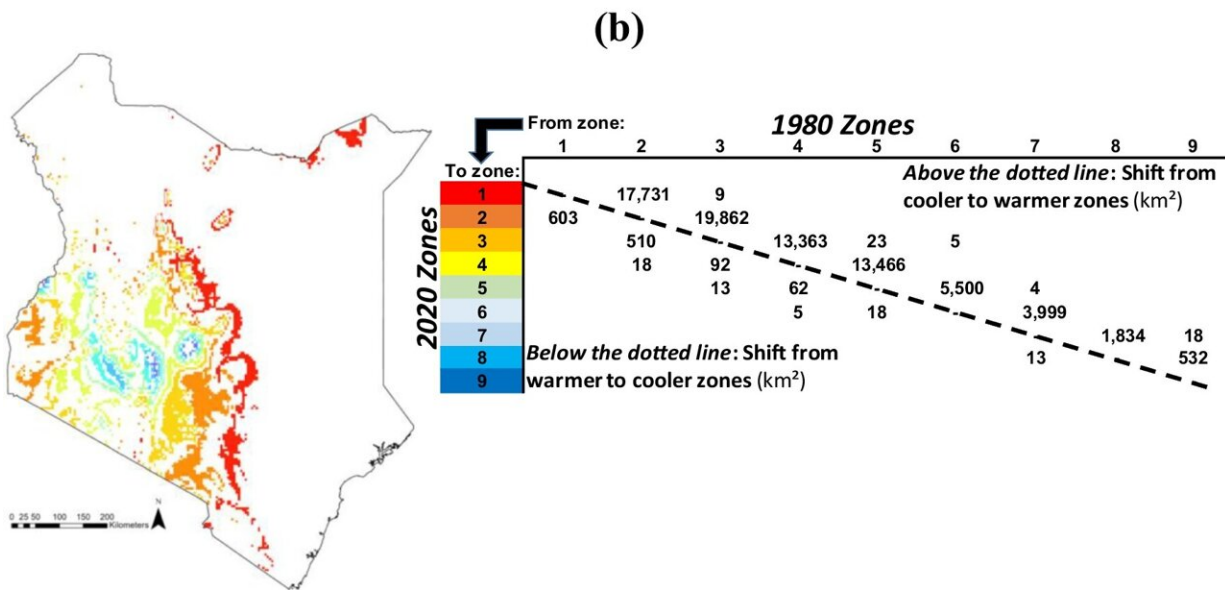
An area of 76,346 square kilometers shifted from cooler to hotter zones, while 1,298 square kilometers shifted from hotter to cooler zones. Human-induced climate change significantly alters the spatial-temporal patterns of climate zones, driving agricultural land use and ecosystem change. Changes to the climate zone alter the biological and physical properties of the ecosystem, leading to a change in what an ecosystem can support.

The researchers reviewed data from a variety of sources, including:

- Average monthly and annual temperature precipitation time series of Kenya between 1975 and 2020, obtained from the Climate Change Knowledge Portal
- Georeferenced average monthly temperature and precipitation across Kenya with a 5-kilometer resolution during 1976-1980, 1996-2000 and 2016-2020 from the TerraClimate dataset
- A digitized version of the georeferenced boundaries of the Kenyan ACZs documented in 1982 and obtained through the IGAD Climate Prediction and Application Centre Portal.



Temperature Zone	Average Temperature (Celsius)	Climatic Designation	1980 (km <sup>2</sup> )	2000 (km <sup>2</sup> )	2020 (km <sup>2</sup> )	Change (1980-2020)	% Change (1980-2020)
1	>25	Tropical-fairly hot to very hot	363,582	359,932	380,718	17,137	5%
2	22-24	Tropical-very warm	74,229	87,472	76,435	2,206	3%
3	20-22	Tropical-warm	46,035	46,409	39,960	-6,075	-13%
4	18-20	Tropical-mild	35,502	38,724	35,648	146	0%
5	16-18	Temperate-mild	32,301	24,216	24,373	-7,928	-25%
6	14-16	Temperate - cool	12,068	10,538	10,585	-1,483	-12%
7	12-14	Temperate - cold	6,452	4,548	4,288	-2,164	-34%
8	10-12	Temperate - very cold	2,400	1,137	1,110	-1,289	-54%
9	< 10	Alpine - extremely cold to frigid	1,264	856	715	-550	-43%



Classified temperature zones, change in areas over time, and pathway of shifting temperature zones. Maps for each year show the spatial arrangement of the temperature zones (a). The table in a shows the climate region designation for each zone, area (km<sup>2</sup>) of each zone in each year, the change between 1980 and 2020, and the percent change over the study period. In the map of b, the colors represent zone designations in 2020 following the shift between zones. The chart in b shows the change in km<sup>2</sup> between temperature zones in 1980 to temperature zones in 2020. Numbers above the dotted line represent a shift from cooler to warmer zones. Numbers below the dotted line represent a shift from warmer to cooler zones. The further a number is from the dotted line, the greater the shift in the number of zones. For each zone, the sum of its row minus the sum of its column equals the total change (1980–2020) for that zone shown in the table of a. Credit: *Regional Environmental Change* (2023). DOI: 10.1007/s10113-023-02055-w

The team assessed the average annual and seasonal temperature and precipitation trends to understand Kenyan climate change between 1975-2020 before creating climate reference maps. The maps represented temperature and precipitation zones in 1980, 2000 and 2020.

Human-induced climate change in Kenya resembles global trends, the research found, with certain regions being more sensitive to the forces of climate change.

As climate zones shift toward hotter and drier conditions, ecological diversity will decline, posing a major threat to [terrestrial ecosystems](#) with far-reaching social and ecological impacts.

Information on [climate change](#) and shifting climate zones in this paper can be used to investigate a variety of ecological questions and aid in the effort to reach the United Nations' Sustainable Development Goals.

**More information:** Ted J. Lawrence et al, Shifting climate zones and expanding tropical and arid climate regions across Kenya (1980–2020), *Regional Environmental Change* (2023). [DOI: 10.1007/s10113-023-02055-w](#)

Provided by Saint Louis University

Citation: New study finds shifting climate regions leading to hotter, drier conditions across Kenya (2023, April 20) retrieved 23 June 2024 from <https://phys.org/news/2023-04-shifting-climate-regions-hotter-drier.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.