How climate extremes are endangering millions in Africa

openaccessgovernment.org/article/how-climate-extremes-are-endangering-millions-in-africa/189524

11 March 2025

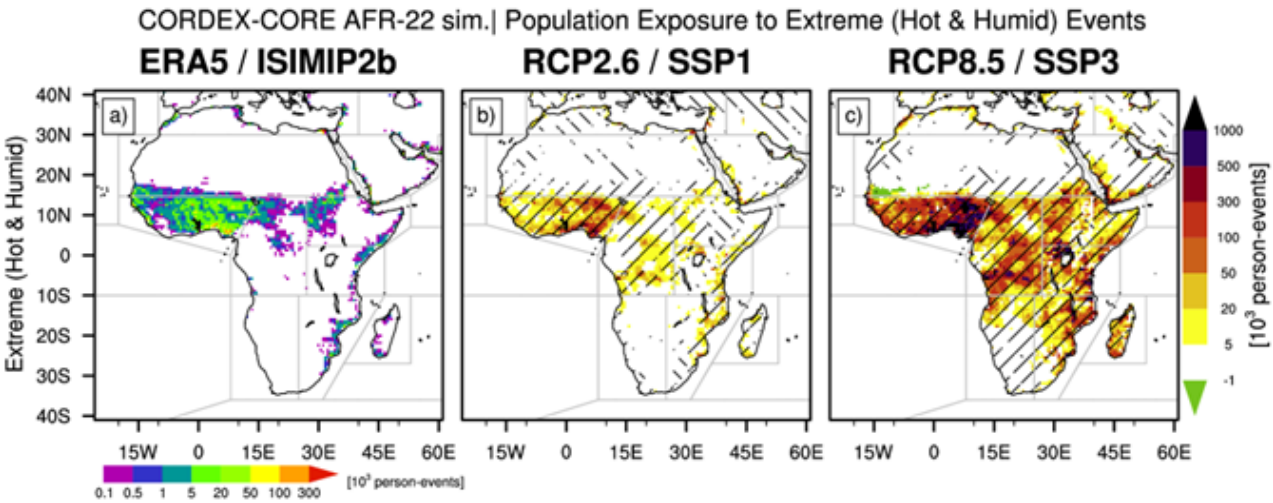

Fig. 1: The average number of people affected yearly (from 1981 to 2010) by extreme heat and humidity co-occurring (a). The expected change in the number of people exposed to these extreme conditions by 2069–2098 is shown for two scenarios: one with strong climate action (c) and one with little or no action (b).

Alain Tamoffo, Postdoctoral Researcher at the Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon, discusses how climate extremes are endangering millions in Africa

Understanding the growing threat of climate extreme events

Africa faces an increasing risk of extreme weather events due to climate change (IPCC, 2021). These events, which include dangerous combinations of heatwaves, humidity, heavy rainfall, droughts and strong winds, threaten millions of people across the continent. If no urgent action is taken, the number of people affected by these extreme conditions will increase dramatically by the end of the century.

A recent study examined how these compound extreme events, i.e., situations where multiple extreme weather conditions happen simultaneously, will change in the coming decades.

Researchers from the Climate Service Center Germany (GERICS) found that exposure to these events could increase to 47 times in some regions if emissions and population growth continue unchecked (Weber et al., 2020). The most affected areas will be West Africa, Central-East Africa, and parts of Southern Africa, where rapid population growth and changing climate patterns create a dangerous mix.

What are compound climate extreme events?

Contrary to traditional climate extremes, which are often studied in isolation, compound extreme events involve multiple hazards occurring together or one after the other, amplifying their impacts (Seneviratne et al., 2012). For instance:

- Extreme heat and high humidity:
  when elevated temperatures combine with high moisture levels in the air, the human body struggles to cool down, increasing the risk of heatstroke and other health issues.
- Heavy rainfall and intense winds:
  this combination can lead to severe flooding, destruction of homes, disruption of maritime and aviation activities, and damage to infrastructure, making recovery even more difficult.
- Droughts followed by intense storms:
  dry conditions can weaken soil, making sudden heavy rains more likely to cause landslides
  and flash floods.

These events pose a serious challenge for governments, businesses, and communities. Understanding how and where they will become more frequent is crucial for designing effective policies to protect people and economies.

The impact on people and infrastructure

The research highlights that the number of people exposed to these extreme weather events will rise significantly (Fig 1). By the end of the 21st century, up to 668 million people across Africa could experience dangerous heat and humidity events (Tamoffo et al., 2024). Some regions, such as the Sahara and West Africa, will see increased exposure primarily due to rapid population growth (Fig 1b,c). In other areas, such as Central and Southeast Africa, the combination of climate change and urban expansion will make the risks even greater.

These events will have profound consequences, including:

- Health issues:
  heatwaves and humidity will increase cases of heatstroke, dehydration, and respiratory illnesses.
- Food insecurity:
  droughts and floods will disrupt agriculture, leading to lower crop yields and food shortages.
- Economic losses:
  infrastructure damage from extreme storms and flooding will strain already limited financial resources.
- Mass displacement:
  as living conditions become unbearable, many people may be forced to migrate, leading to social and political challenges.

What can be done?

Addressing these challenges requires urgent action in some key areas:

1. Reducing greenhouse gas emissions: the research shows that the worst-case scenario can be avoided if strong action is taken to limit emissions. Under a low-emission scenario, the increase in exposure to extreme weather events would be significantly lower than in a high-emission future.
2. Investing in adaptation strategies: governments and international organisations must prioritise measures to protect vulnerable populations, such as:
    - Building resilient infrastructure to withstand extreme weather.
    - Developing early warning systems to alert communities before disasters strike.
    - Improving water management to cope with droughts and floods.
    - Supporting farmers with climate-smart agriculture techniques.
3. Develop and disseminate climate services across the continent as proposed by Vogel et al. (2019). Actions may include, but are not limited to:
    - Expansion of climate services to sectors like health, infrastructure and disaster management.
    - Integrating local knowledge and context into climate services.
    - Making climate services more accessible and ensuring that all regions can benefit.
    - Disseminating co-production/ co-engagement to foster the delivery of climate services and avoid maladaptation, i.e., negative effects that happen when planned actions to adapt to climate change unintentionally make people or communities more vulnerable.
    - Address shortcomings and explore new approaches for improving the delivery and effectiveness of climate services.

The findings from these studies provide a clear indication that climate change is making extreme weather events more frequent and dangerous: without immediate action, millions of people will face increased risks to their health, livelihoods, and security. Policymakers, businesses, and communities must work together to reduce emissions and build resilience against these growing threats.

References

1. IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3−32, https://doi.org/10.1017/9781009157896.001

2. Seneviratne, S.I., N. Nicholls, D. Easterling, C.M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang, 2012: Changes in climate extremes and their impacts on the natural-physical environment. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 109-230.
3. Tamoffo, A. T., Weber, T., & Saleem, F. (2024). Population exposed to compound extreme hot & humid and wet & windy events in Africa. Environmental Research Letters, 20(1), 014038. https://doi.org/10.1088/1748-9326/ad9d5f
4. Vogel, C., Steynor, A., & Manyuchi, A. (2019). Climate services in Africa: Re imagining an inclusive, robust and sustainable service. Climate Services, 15, 100107. https://doi.org/10.1016/j.cliser.2019.100107
5. Weber, T., Bowyer, P., Rechid, D., Pfeifer, S., Raffaele, F., Remedio, A. R., … Jacob, D. (2020). Analysis of compound climate extremes and exposed population in Africa under two different emission scenarios. Earth's Future, 8(9). https://doi.org/10.1029/2019ef001473