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Renewables and water desalination

By
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Renewables and Water desalination

• Andre Langwost, Eurosolar France

• 13 September 2021
Germany's deadly floods were up to 9 times because of climate change, study estimates

By Angela Dewan, CNN
Updated 09:00 GMT (17:00 HKT) August 24, 2021.

In July, around 1,700 people died in Germany after heavy rain and floods. A new study suggests climate change is responsible for the heavy rainfall.

The floods in western Europe are just the latest in a series of extreme weather events linked to climate change. But how much of the flooding can be attributed to climate change?

A new study, published in September in Nature Climate Change, finds that climate change significantly increased the risk of heavy rainfall in July in western Europe.

The researchers analyzed data from 80 weather stations across the area, comparing rainfall patterns before and after the mid-1980s, when climate change started to have a noticeable impact.

They found that the risk of heavy rainfall more than doubled between the two periods. This increase in risk is statistically significant, meaning it is unlikely to be due to chance.

The researchers also found that climate change increased the risk of heavy rainfall in the UK, Belgium, and the Netherlands.

"We found that climate change has increased the risk of heavy rainfall in western Europe," said lead author Dr. Roberta Aina from the University of Reading in the UK.

"This is an important finding because it suggests that climate change is already having a significant impact on rainfall patterns in the region."

In addition to the increased risk of heavy rainfall, the researchers found that climate change also had a significant impact on the intensity of the floods. They found that the average rainfall intensity increased by 17% between the two periods.

The researchers say their findings support the idea that climate change is a significant contributor to extreme weather events.

"Our results indicate that climate change is a major driver of extreme rainfall events," said Dr. Aina.

"This is a worrying trend, as it suggests that we are likely to see more extreme weather events in the future."

The researchers say their findings have important implications for policymakers and the general public.

"This research provides important evidence that climate change is already having an impact on rainfall patterns in western Europe," said Dr. Aina.

"It is important that we take action now to reduce our greenhouse gas emissions to mitigate the effects of climate change."
**Water Scarcity**

Water scarcity can mean scarcity in availability due to physical shortage, or scarcity in access due to the failure of institutions to ensure a regular supply or due to a lack of adequate infrastructure.

Water scarcity already affects every continent. Water use has been growing globally at more than twice the rate of population increase in the last century, and an increasing number of regions are reaching the limit at which water services can be sustainably delivered, especially in arid regions.

**Challenges**

Water scarcity will be exacerbated as rapidly growing urban areas place more pressure on neighboring water resources. Climate change and bio-energy demands are also expected to amplify the already complex relationship between world development and water demand.

Drought in Niger in 2011. Photo: WWF/NH Belcher

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**FACTS AND FIGURES**

- 72% of all water withdrawals are used by agriculture, 16% by municipalities for households and services, and 12% by industries. ([UN-Water](https://unwater.org))
- When a territory withdraws 25% or more of its renewable freshwater resources it is said to be “water stressed.” Five out of 11 regions have water stress values above 25%, including two regions with high water stress and one with extreme water stress. ([UN-Water](https://unwater.org))
- 2.3 billion people live in water-stressed countries, of which 730 million live in high and critically water-stressed countries. ([UN-Water](https://unwater.org))
- 3.2 billion people live in agricultural areas with high to very high water shortages or scarcity, of whom 1.2 billion people – roughly one-third of the world’s population – live in severely water-constrained agricultural areas. (FAO, 2020)
- Today, 1.42 billion people – including 450 million children – live in areas of high or extremely high water vulnerability. ([UN-Water](https://unwater.org))

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**Scarcity | UN-Water (unwater.org)**
In 2020, 138 countries had estimates for safely managed drinking water

Proportion of population using safely managed drinking water services, 2020 (%)

- Source: WHO/UNICEF JMP (2021), Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs
- Progress on household drinking water, sanitation and hygiene, 2000-2020 - UNICEF DATA

In 2020, 120 countries had estimates for safely managed sanitation

Proportion of population using safely managed sanitation services, 2020 (%)

In 2020, 79 countries had estimates for basic hygiene services

Proportion of population with basic handwashing facilities at home, 2020 (%)

Andre Langwost, Eurosolar France
The Facts

• “A global transition to 100% renewable energy across all sectors – power, heat, transport and desalination before 2050 is feasible...The energy transition is not a question of technical feasibility or economic viability, but one of political will.”

• By 2050, water desalination will be nearly 40 times the amount of 2015. This will require substantial desalination capacities and some water storage. Desalination will account for approximately 4% of total primary energy demand in 2050, which can be fully met with renewables.

• Eurasia, the Middle East and North Africa, SAARC with India, Northeast Asia and North America will demand 91% of the global energy used for desalination. Europe, Southeast Asia, Sub-Saharan Africa, and South America share just 9%.

• New Study: Global Energy System based on 100% Renewable Energy | Energy Watch Group
Different systems of water desalination

• Schematic of solar power coupled with desalination

• Operating principle of the solar-powered reverse osmosis (RO) system

Source: „Sustainably integrating desalination with solar power”
Project examples from Africa: Pembane, Mozambique

„Dirty water holes are now a thing of the past in Pembane. The fountain raises solar-powered clean fresh water into a 10-meter-high reservoir and distributes it from there over a radius of 1.5 kilometers via a water network to the village, to eight easily accessible kiosks, the Fontenarias: Clean water for 6000 people”
Waterkiosk, Kenya and Tanzania

Several installations already commissioned in hospitals in Mombasa County, Kenya in March 2021. A total of 23 systems will be installed in the East African country. Boreal Light also plans to install five desalination units in neighbouring Tanzania. Of the 28 kiosks, “seven will have a capacity of 10 m³ per hour and will be powered by 60 kWp solar photovoltaic systems. The other installations will have a capacity of 3 m³ per hour, with 11 kWp solar systems.”

Technology: Reverse osmosis system directly on solar panels – no batteries, grid or diesel needed

- Africa’s largest solar desalination solution brings COVID-19 relief (h2oglobalnews.com)
- KENYA: Boreal inaugurates a new solar-powered water desalination system | Afrik 21
- The Smarter E Award 2021, Outstanding Project Award Winner WaterKiosk project of Boreal Light GmbH - YouTube
Large Scale Water desalination

- **Sorek: Israel, 2013**
  - seawater treatment capacity of 624,000m³/day, Feed water for the process is taken from two open sea intake heads located around 1.15km offshore, seawater reverse osmosis (SWRO) process providing water to Israel’s national water carrier system.

- **Large-Scale Desalination | WWD (wwdmag.com)**

- **Al Khafji Saudi Arabia, 2017**
  - first large-scale solar-powered desalination plant, located in Al Khafji north-eastern Saudi Arabia, capacity 60,000m³/day of desalinated seawater providing a regular supply of water to the region throughout the year. New Solar Saline Water Reverse Osmosis (Solar SWRO) desalination method using ultra-filtration (UF) for the pre-treatment process.
Key elements of success:

- Good team of specialists to work in a team for a good holistic solution, integrating as well „annex-needs“: A larger PV-System, battery/ and or water storage could help neighbouring structures
- There is no „one-solution fits all“
- Solar PV is easiest and cheapest energy source for local energy production: Large variety of storage facilities available: Battery storage, thermal storage (heat, i.e. hot water, cold, i.e. cooling containers)
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