IEEE’s Role in Climate Change Mitigation and Resilience

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Promote Clean-tech Solutions for Climate Sustainability
Climate Change and CO\textsubscript{2} Emissions

History of CO\textsubscript{2} Emissions
For millennia, atmospheric carbon dioxide had never been above this line.

Source: NASA
CO₂ in the atmosphere and annual emissions (1750-2019)

Source: State of the Planet
https://news.climate.columbia.edu/2021/02/25/carbon-dioxide-cause-global-warming/
Impacts of Carbonization
Temperature rise since 1850
Global mean temperature change from pre-industrial levels, °C

Temperature rise of 1.5 – 2.0 °C = Point of No Return

Global Climate Summary for July 2023

The July global surface temperature was 1.12°C (2.02°F) above the 20th-century average of 15.8°C (60.4°F), making it the warmest July on record. This marked the first time a July temperature exceeded 1.0°C (1.8°F) above the long-term average.

July 2023 was 0.20°C (0.36°F) warmer than the previous July record from 2021. July 2023 marked the 47th-consecutive July and the 533rd-consecutive month with temperatures at least nominally above the 20th-century average.

Monthly temperature anomalies from 1880 to August 2023 measured with respect to the baseline period 1951-1980.

This graph includes the seasonal cycle showing that June 2023, July 2023, and August 2023 were each consecutively the warmest month on record.

Source: https://svs.gsfc.nasa.gov/14407
Climate-change Impacts
Flooding in Delhi

Source: BBC News

Source: Reuters
Flooding in Bangladesh
Flooding in Pakistan – August 2022

Source: https://www.npr.org/sections/pictureshow/2022/08/30/1119979965/pakistan-floods-monsoon-climate

Beijing

Floods inundate a village in Baoding city, Hebei province, on 02 August 2023.

Zhuozhou, north China’s Hebei Province, 02 August 2023
Brazil

Aerial view of the area affected by an extratropical cyclone in Rio Grande do Sul State, Brazil (AGENCIA RBS/AFP via Getty Images) Sept 2023
A vehicle crosses a flooded road in the city of Volos, central Greece (AFP via Getty Images) Sept 2023

Cars in a flooded road in the city of Volos, central Greece (AFP via Getty Images) Sept 2023
Thousands of Lives Lost
Droughts in 2022

Dry river bed in **Italy** (Po River) due to worst drought in 70 years, June 2022

The Jialing Riverbed at the confluence with the Yangtze River is exposed due to drought on August 18, 2022 in Chongqing, **China**.
Wildfires in the US

July 2021 - The Dixie fire burned close to a million acres in California’s Lassen county over three months and became the first fire to cross the Sierra Nevada. Photograph: Noah Berger/AP

Peaks glowing with thousands of spot fires on June 13, 2022 in Flagstaff, Arizona. Schumacher/The Republic
Wildfires in Europe - Summer of 2022

Southwestern France, July 17, 2022
Central Portugal, July 13, 2022
Brandenburg, Germany, August 2022

Greece, July 2022
Northern Spain, June 2022
Central Italy, July 2022

“The number of wildfires in 2022 in the EU have nearly quadrupled the 15-year average”
Source: CNN according to Copernicus, EU Earth observation program
Opportunities of Decarbonization in the Electric Power Supply Industry

Reduce Carbon Emissions

1. Use less electricity, energy efficiency
2. Use low carbon fossil fuel power plants
3. Use H₂ & other storage technologies
4. Promote more renewables
5. Accept some nuclear
6. Promote cross-border power transfer

Source: IEEE Spectrum, Jan 2023
Cross-border Power Transfer

- As we are in this fight together, our solutions should be collaborative to secure better outcomes for all countries, regardless of location
- The International Energy Agency (IEA) has identified three main modes of cross-border energy integration:
  - Bilateral
  - Multilateral
  - Unified
Bangladesh-India Interconnection (HVDC link)

Bangladesh-India 400 KV Double-Circuit 1,000 MW Line

Allows Bangladesh to buy cheaper electricity and solar electricity when available
Nepal, India reach ‘milestone’ deal on trade, transmission of electricity

Nepal to be permitted to participate in real-time trade in the Indian market, an upgrade from existing day-ahead energy trade.

Import of Hydropower will Reduce India’s Dependency on Coal-fired Power Stations

Source: Kathmandu Post
Nepal needs to attract investment by developing a market outside Nepal needs less electricity in summer than in winter It is opposite in India and Bangladesh due to high air conditioning load
IEEE at UN Climate Change Conference
Global Alliance of Universities on Climate
Presentation at GAUC
Partnership with International Renewable Energy Agency (IRENA)

Energy Transition Education Network
COP27 Event by IRENA

Energy Transition Education Network
IEEE at UN COP28
Dubai, December 2023
Clean-tech Solutions for Climate Sustainability
https://climate-change.ieee.org
IEEE Climate Change Program

https://climate-change.ieee.org

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RESOURCES FROM IEEE

As the world's largest organization of technical professionals, IEEE has both the opportunity and the responsibility to assist in organizing the response of engineers, scientists, and technical professionals across the world to address the causes, mitigate the impact, and adapt to climate change.

IEEE's scholarly publications, events, conference proceedings, technical standards, and other materials help foster the exchange of technical knowledge and information for the critical climate issues that our planet faces today.

https://climate-change.ieee.org
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Thank you

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