

Net-zero Transition to Address Climate Change



Prof. Saifur Rahman
2023 IEEE President & CEO
www.srahman.org



Invited Talk
IIT-Bombay, Mumbai, 12 July 2023

Why is Climate Sustainability a Challenge?

Unprecedented Natural Disasters



Source: Craig Dearden-Phillips: Don't be a polar bear
<https://www.thirdsector.co.uk/craig-dearden-phillips-dont-polar-bear/management/article/1488091>

Africa, China and Florida, USA



Flooding in Pakistan 2022



Source: Stringer/Reuters



Source: AP.



Source: Bloomberg

Climate
Change

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Hurricane Isabel struck the Mid-Atlantic region of the USA between 18-19 September 2003



2023 January Flooding in New Zealand



Aljazeera News, The Waiohiki Bridge is washed away in Napier. [Kerry Marshall/Getty Images]



Flash flood caused by torrential rains in Auckland area in late January 2023

Hurricane Sandy New York, New Jersey 2012



Droughts in 2022



<https://idsb.tmgrup.com.tr/ly/uploads/images/2022/07/08/217454.jpg>

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

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



<https://image.cnbcfm.com/>

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 13 June 2022, in Flagstaff, **Arizona**.

Rob 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”

Siberia: Wildfires in June 2021



The Greenpeace Russia team has documented forest fires in the Krasnoyarsk region.

JULIA PETRENKO / GREENPEACE



In this June 16, 2021 photo, firefighters work at the scene of forest fire near Andreyevsky village outside Tyumen, western Siberia, Russia. -

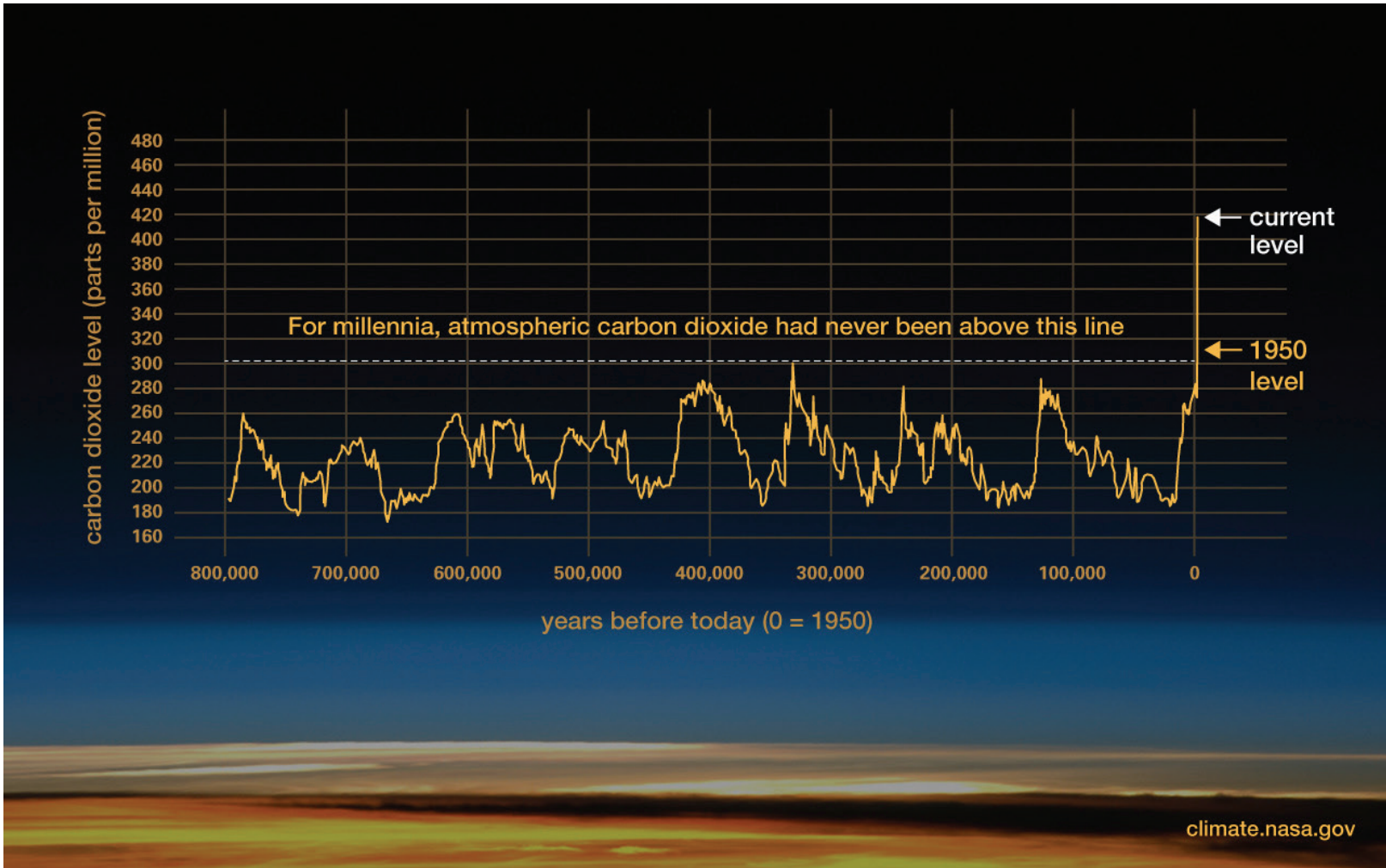
Copyright AP Photo/Maksim Slutsky, File

2008 China Snowstorm



What is Causing This?

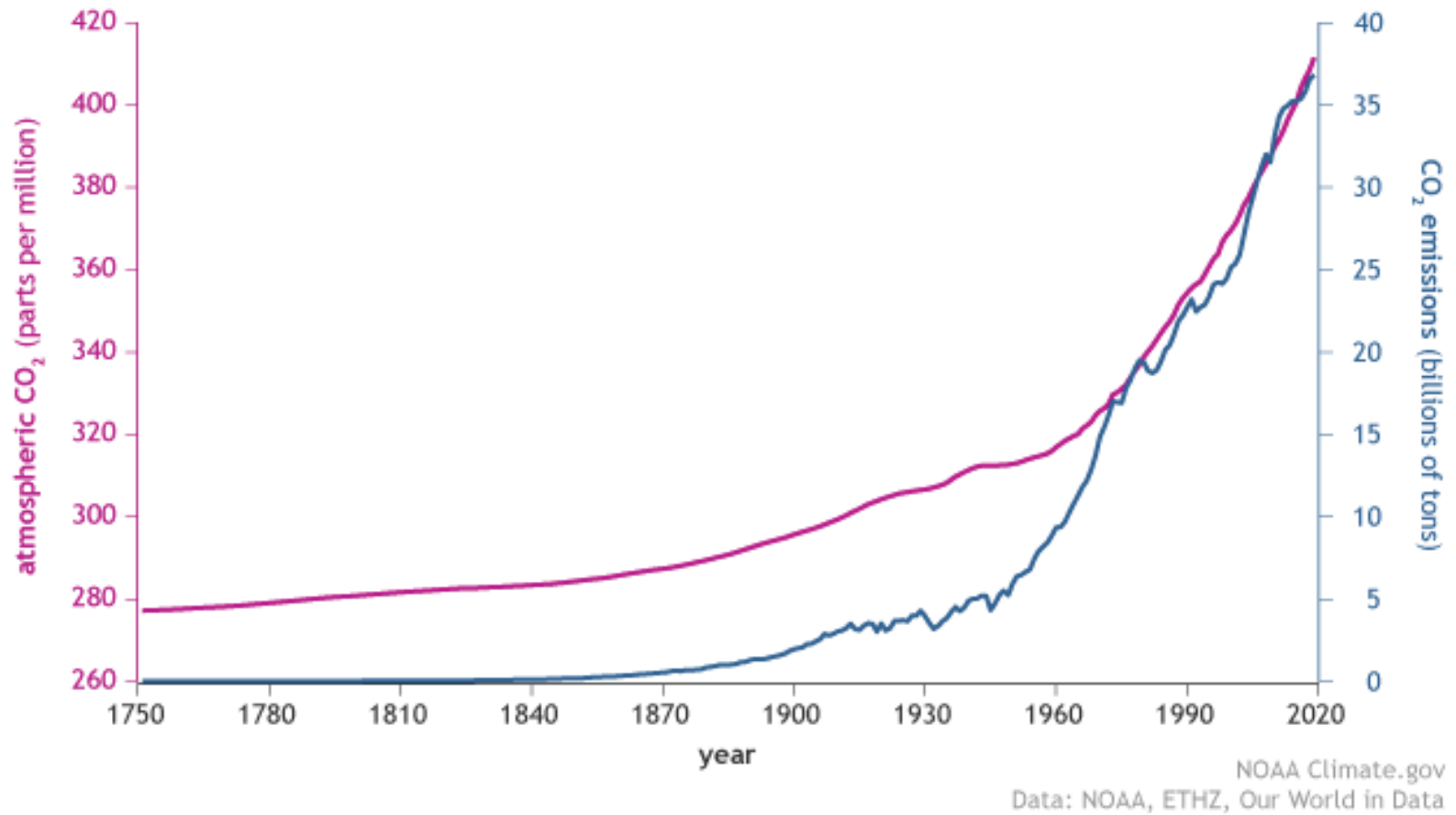
High Anthropogenic CO₂ Emissions



Source: NASA

https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/

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/>

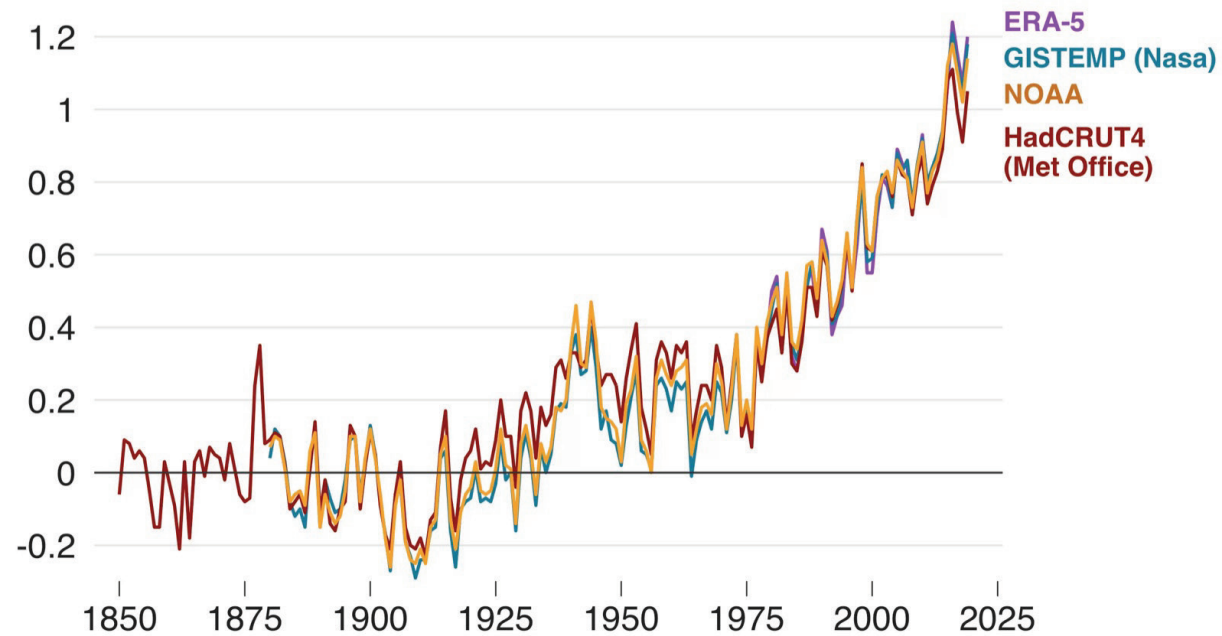
Global CO₂ Emissions Due to Fossil Fuel Use in 2021

Coal	15.3 billion tons
Natural Gas	7.5 billion tons
Oil	10.7 billion tons

Source: IEA Global Energy Review: CO₂ Emissions in 2021
<https://www.iea.org/reports/global-energy-review-co2-emissions-in-2021-22>

Temperature rise since 1850

Global mean temperature change from pre-industrial levels, °C



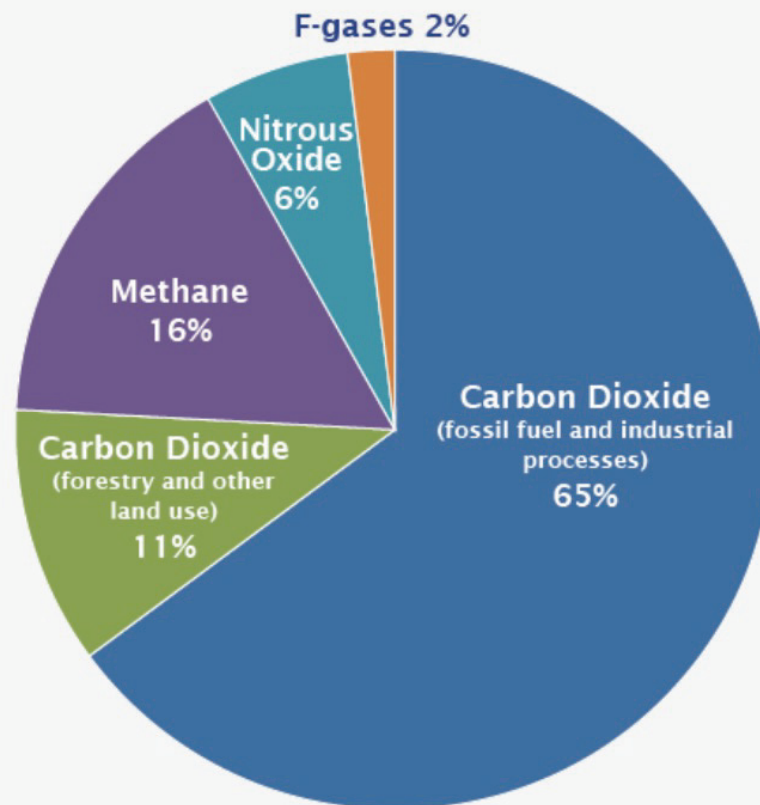
Source: Met Office

BBC

Paris Climate Accord: Limit temperature rise of 1.5 deg C
2.0 deg C rise → Point of No Return

Source: <https://www.bbc.com/news/science-environment-51111176>

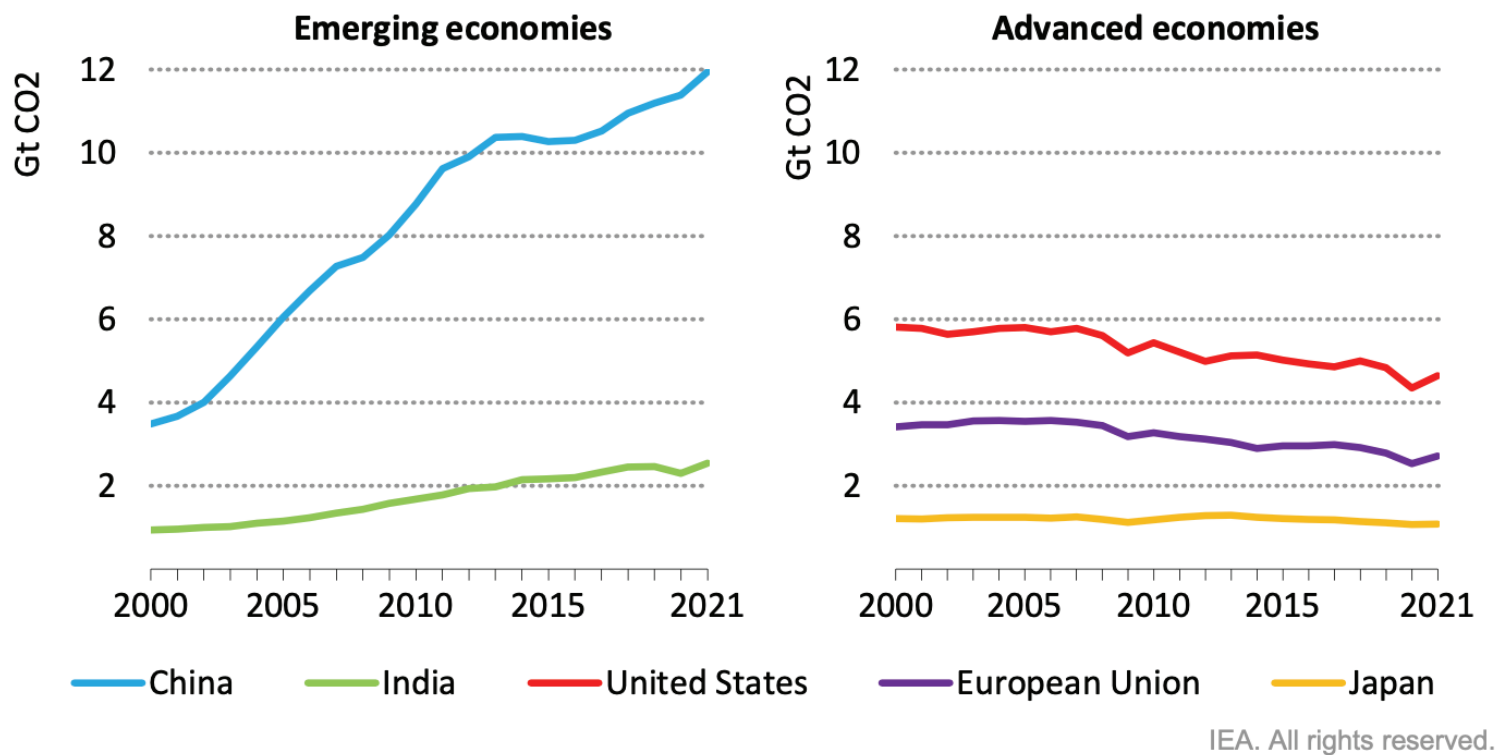
Global Greenhouse Gas Emissions by Gas



Source:

<https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>

CO2 emissions in selected emerging and advanced economies, 2000-2021



Source: IEA Global Energy Review: CO2 Emissions in 2021
<https://www.iea.org/reports/global-energy-review-co2-emissions-in-2021-2>

How Do We Address This Problem?

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climate-change.ieee.org



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Mitigation

Slow down the impact

Adaptation

Take action to live with it

Climate Resilience

Prepare to recover quickly

Mitigation will allow time to adapt by developing new technologies, best practices and policy formulation

What is the Role of the Technologist?

Develop and Promote Universally
Applicable Cleantech Solutions
for Climate Sustainability

Navigating the tension between industrialized nations and emerging economies for global decarbonization efforts requires a diverse portfolio of solutions for low-carbon generation, storage and demand side management with advanced technology focusing on energy efficiency.

To more efficiently facilitate the global shift towards renewable energy adoption, the following six areas should be our priority.

Reduce Carbon Emissions from Electricity Production



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

Climate Change

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IEEE Climate Change Engagement Opportunities



IEEE Climate Change Program

<https://climate-change.ieee.org>



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MAKING A
DIFFERENCE

TECHNICAL
Solutions

BUILDING
Technical Community

CLIMATE CHANGE
Mitigation

email: ccircc@ieee.org

The banner features a composite image of renewable energy sources: solar panels on the left, a row of wind turbines in the center, and a dam with water flowing through its arches on the right. The text "MAKING A DIFFERENCE" is centered over the image in white, with "DIFFERENCE" in a larger, bold font. Below the image are three light gray boxes containing the text "TECHNICAL Solutions", "BUILDING Technical Community", and "CLIMATE CHANGE Mitigation". The email address "email: ccircc@ieee.org" is located in the bottom right corner of the banner area.

IEEE MEETINGS, CONFERENCES & EVENTS—DRIVING INNOVATION IN CLIMATE CHANGE

Register for events from IEEE related to climate change and sustainable resources. IEEE sponsors over 2,000 annual conferences and events worldwide, curating cutting-edge content for all of the technical fields of interest within IEEE.

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RESOURCES FROM IEEE

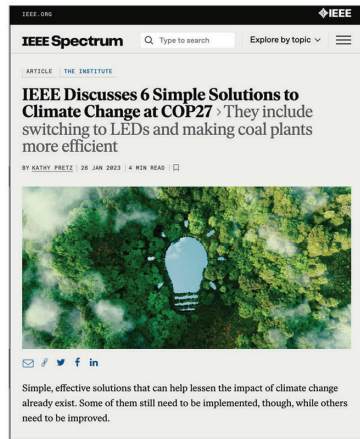
As the world's largest organization of technical professionals, IEEE has both the opportunity and the responsibility to assist in organizing the response of engineers, scientists, and technical professionals across the world to address the causes, mitigate the impact, and adapt to climate change.

IEEE's scholarly publications, 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.

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Ecosystem for IEEE's Climate Sustainability Work

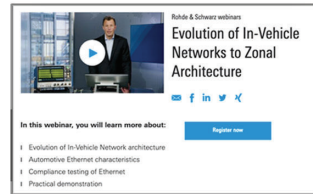
IEEE Spectrum: Climate Change News Feed; Podcasts; Features; Archives; Journal Watch Posts (Xplore); The Institute (Engineers of Climate Change); Coverage of Conferences and Standards)



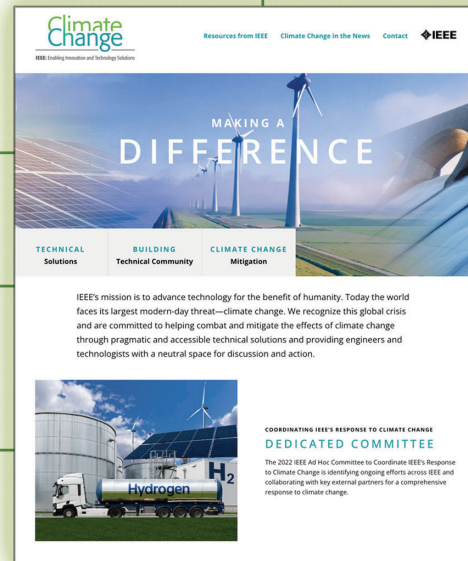
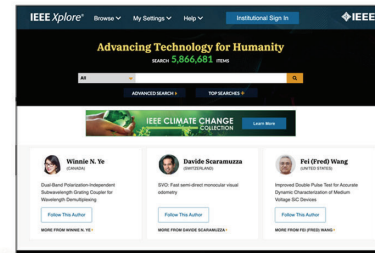
Social Media



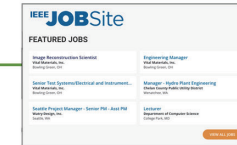
Sponsored Content From Industry



Xplore: Engineers to Follow; Journal Watch Articles (free); Climate Change Articles



Jobs From IEEE Job Site



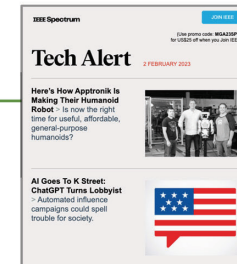
Conferences



Standards



Newsletters





IEEE Sections Congress 2023

The triennial gathering of Section leadership bringing together hundreds of delegates from all ten Regions to network, learn and collectively shape the future of IEEE.

Registration Open

Early bird registration deadline: **21 July 2023**.
Registration fee increases by **US\$ 50** after that.

Date
11-13 August 2023



Location
Ottawa, Canada

Climate Change Pavilion at SC2023

3 2022 IEEE President and CEO Social Media Channels

Follow the President's channels and stay abreast of climate change information

There are four social media channels for the IEEE President:

<https://www.facebook.com/ieeepresident>



<https://www.instagram.com/ieeepresident/>



<https://www.linkedin.com/showcase/ieeepresident>



<https://twitter.com/ieeepresident>



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Thank You

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