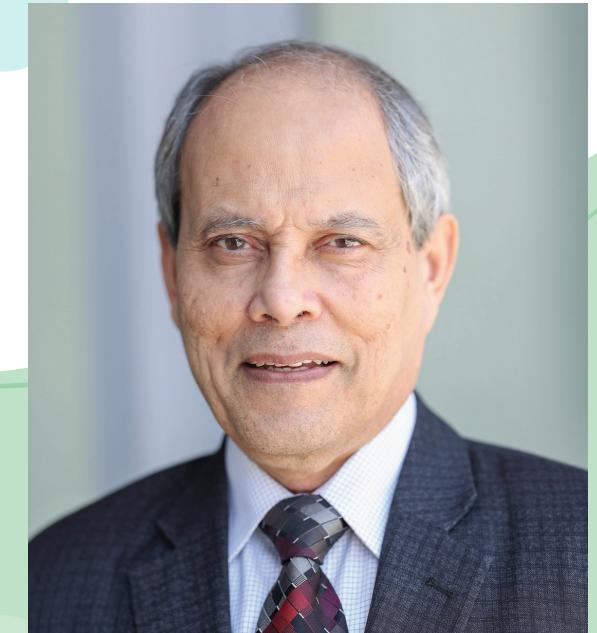


Net-zero Transition to Address Climate Change



*Advancing Technology
for Humanity*

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



Climate
Change

IEEE: Enabling Innovation and Technology Solutions



Flooding in Pakistan 2022



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



2023 January Flooding in New Zealand



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

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

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**

9

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



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

Wildfires in the US



Peaks glowing with thousands of spot fires on 13 June 2022, in Flagstaff, **Arizona**.

Rob Schumacher/The Republic

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



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. -

Copyright AP Photo/Maksim Slutsky, File

2008 China Snowstorm



What is Causing This?

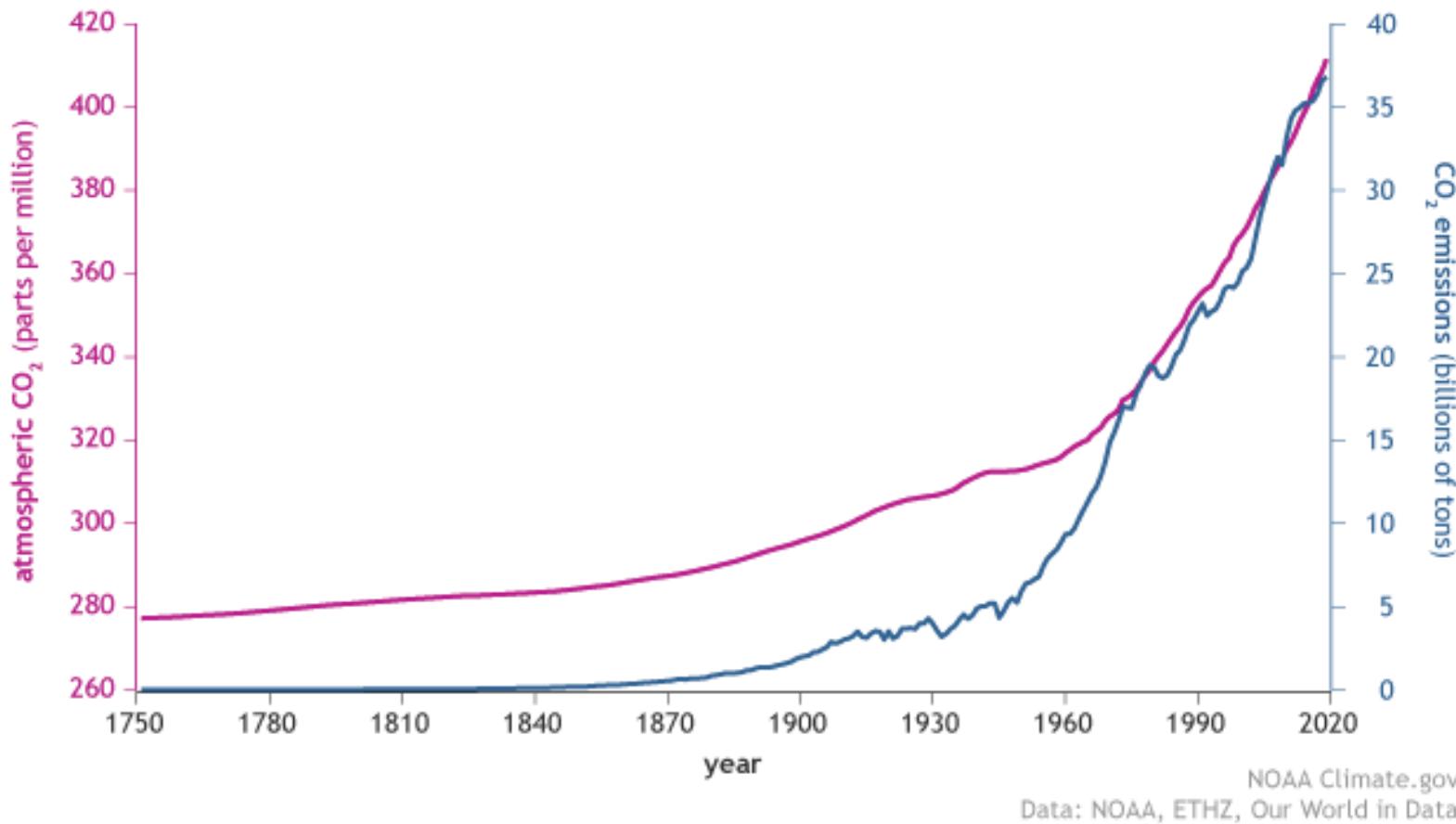
High Anthropogenic CO₂ Emissions



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/>

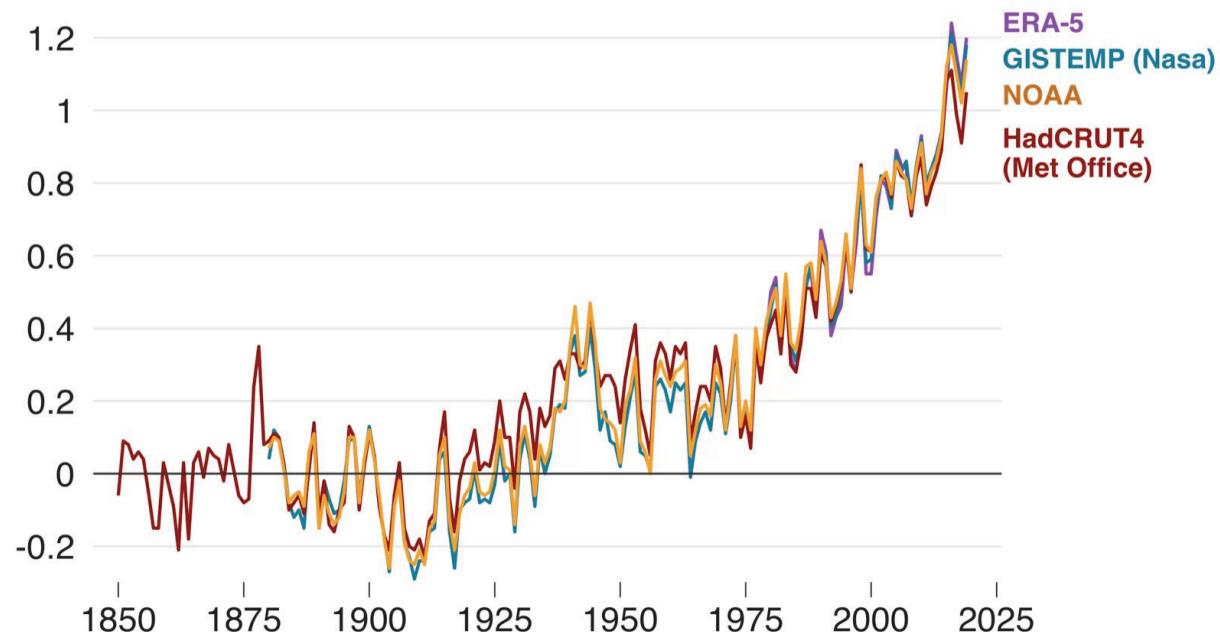
Global CO₂ Emissions Due to Fossil Fuel Use in 2021

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

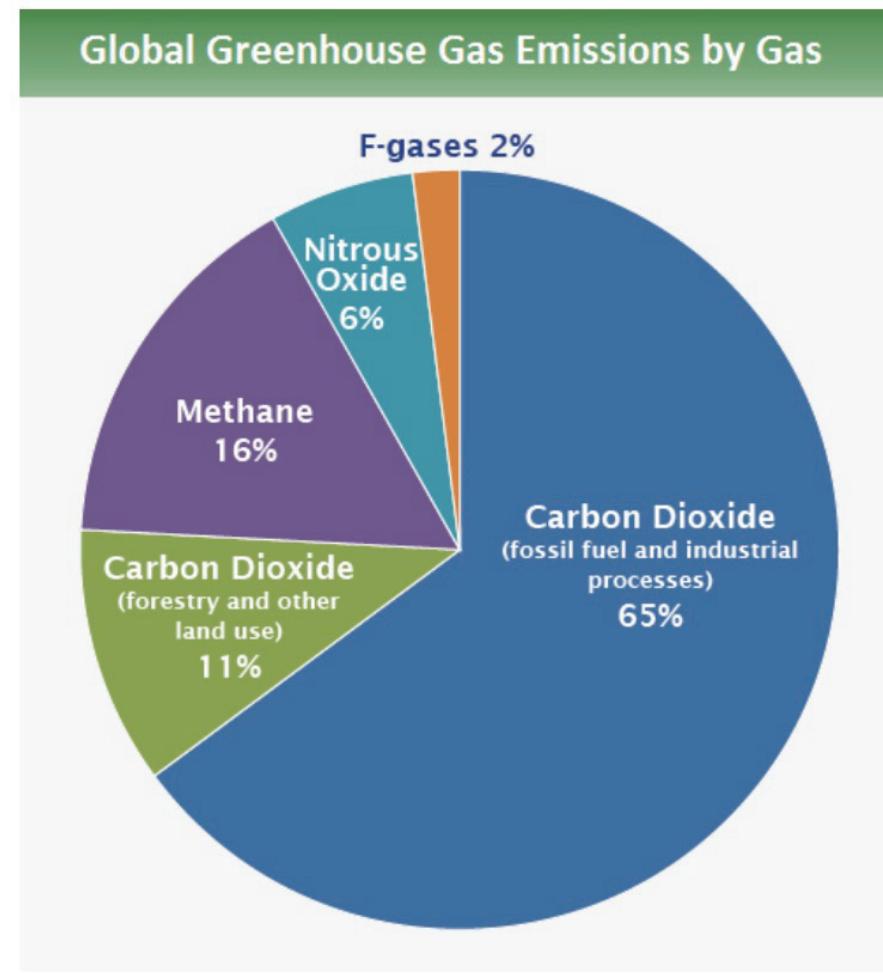


Source: Met Office

BBC

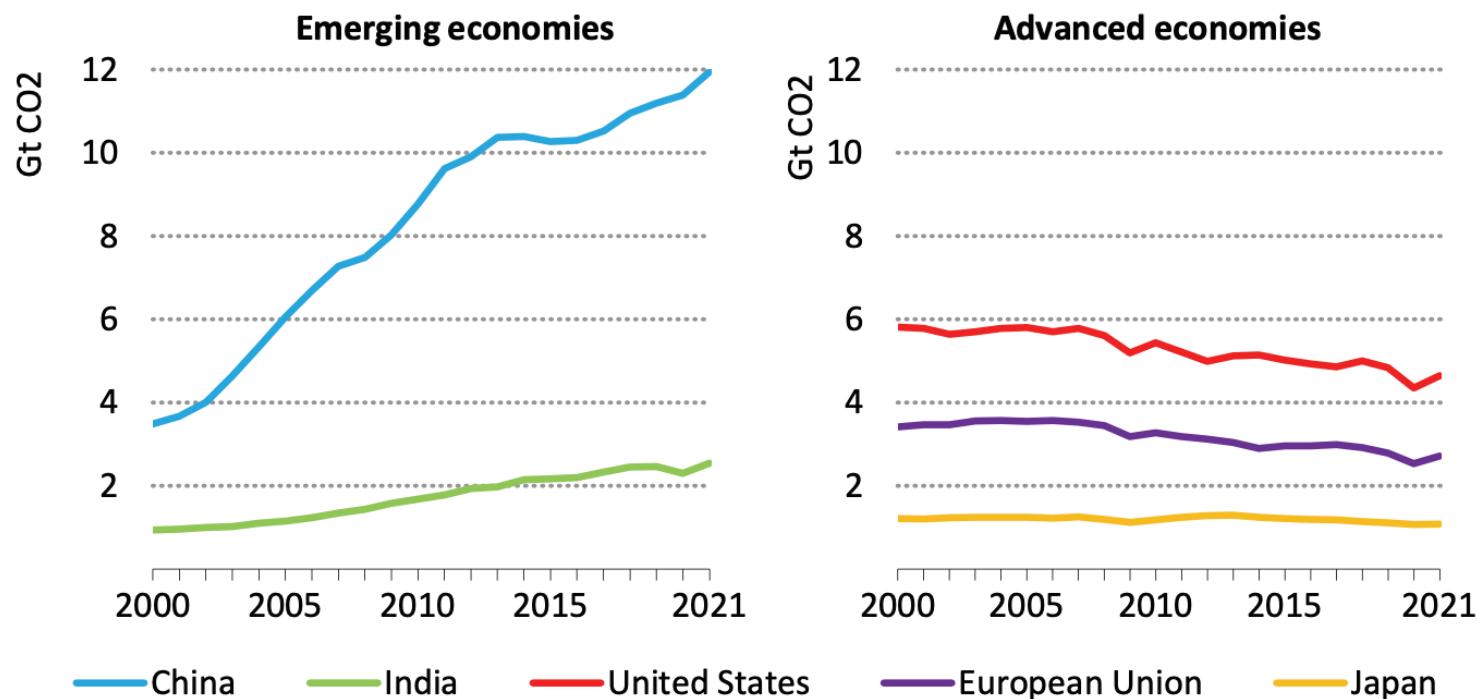
Paris Climate Accord: Limit temperature rise of 1.5 deg C
2.0 deg C rise ➔ Point of No Return

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



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

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



IEA. All rights reserved.

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?

21

Climate
Change

climate-change.ieee.org



IEEE: Enabling Innovation and Technology Solutions

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



IEEE: Enabling Innovation and Technology Solutions

IEEE Climate Change Engagement Opportunities

IEEE Climate Change Program

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



The background image shows a landscape with solar panels in the foreground, wind turbines in the middle ground, and a large concrete dam with water flowing over it in the background. Overlaid on the center of the image is the text "MAKING A DIFFERENCE" in large white letters.

Resources from IEEE **Climate Change in the News** **Contact** **IEEE**

IEEE: Enabling Innovation and Technology Solutions

TECHNICAL Solutions **BUILDING Technical Community** **CLIMATE CHANGE Mitigation**

email: ccirc@ieee.org

The screenshot shows the IEEE Climate Change website. At the top, there's a navigation bar with links for "Resources from IEEE", "Climate Change in the News", and "Contact". To the right is the IEEE logo. Below the header, there's a large image of a microphone in front of a blurred audience. Overlaid on this image is a white rectangular box containing text and a "LEARN MORE" button. The text in the box reads:

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.

[LEARN MORE](#)

At the bottom of the screenshot, the URL climate-change.ieee.org is visible.

IEEE Climate Change Collection

[IEEE.org](#) | [IEEE Xplore Digital Library](#) | [IEEE Standards](#) | [IEEE Spectrum](#) | [More Sites](#)



IEEE: Enabling Innovation and Technology Solutions

Resources from IEEE

Climate Change in the News

Contact



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.

[View the IEEE Climate Change Collection in IEEE Xplore®](#)

Ecosystem for IEEE's Climate Sustainability Work

31



IEEE: Enabling Innovation and Technology Solutions

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

IEEE Discusses 6 Simple Solutions to Climate Change at COP27 > They include switching to LEDs and making coal plants more efficient

BY KATHY FETTER | 26 JAN 2023 | 4 MIN READ

Simple, effective solutions that can help lessen the impact of climate change already exist. Some of them still need to be implemented, though, while others need to be improved.

Social Media



Sponsored Content From Industry

Rohde & Schwarz webinar

Evolution of In-Vehicle Networks to Zonal Architecture

In this webinar, you will learn more about:

- Evolution of In-Vehicle Network architecture
- Autonomous Ethernet characteristics
- Compliance testing of Ethernet
- Practical demonstration

Register now

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

Advancing Technology for Humanity

SEARCH 5,866,681 ITEMS

IEEE CLIMATE CHANGE COLLECTION

Winnie N. Ye, David Scaramuzza, and Fei (Fred) Wang

Making a DIFFERENCE

Resources from IEEE | Climate Change in the News | Contact | IEEE

TECHNICAL Solutions | BUILDING Technical Community | CLIMATE CHANGE Mitigation

IEEE's mission is to advance technology for the benefit of humanity. Today the world faces its largest modern-day threat—climate change. We recognize this global crisis and are committed to helping combat and mitigate the effects of climate change through pragmatic and accessible technical solutions and providing engineers and technologists with a neutral space for discussion and action.

COORDINATING IEEE'S RESPONSE TO CLIMATE CHANGE DEDICATED COMMITTEE

In 2022, an Ad Hoc Committee was formed to Coordinate IEEE's Response to Climate Change, identifying ongoing efforts across IEEE and collaborating with key external partners for a comprehensive response to climate change.

Jobs From IEEE Job Site

FEATURED JOBS

- Image Reconstruction Scientist - Varian Medical Systems Inc., Palo Alto, CA
- Senior Test Systems/Electrical and Instrumentation Engineer - Honeywell Aerospace, Morrisville, NC
- Manager - High-Plant Engineering - Honeywell Aerospace, Morrisville, NC
- Scalable Project Manager - Senior PM - Asst PM - Honeywell Aerospace, Morrisville, NC
- Leadstar - Honeywell Aerospace, Morrisville, NC

Conferences



Standards



Newsletters

Tech Alert 2 FEBRUARY 2023

Here's How Apptronik Is Making Their Humanoid Robots Smarter

All Good To X Street: ChatGPT Turns Lobbyist > Automated influence campaigns could spell trouble for society.



Home

About ▾

Venue ▾

Past Events ▾

Register Now



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.



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>



Climate Change

IEEE: Enabling Innovation and Technology Solutions

Thank You

www.srahman.org

