Young Scientists Meeting on
Climate Action: Addressing Causes and Impacts

December 10-12, 2024

(Hybrid Mode)

Meeting Overview

Organized by

TWAS Central & South Asia Regional Partner (TWAS-CASAREP)

@ Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru, India

In association with

Divecha Centre for Climate Change, Indian Institute of Science
Bengaluru, India

The three-day hybrid-mode Young Scientist Meeting on "Climate Action: Addressing Causes and Impacts" was hosted by the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India, in association with the Divecha Centre for Climate Change, Indian Institute of Science (IISc), Bengaluru. The meeting, designed to accommodate diverse time zones, was scheduled from 2:30 PM to 5:30 PM IST, creating a broad platform for researchers from Central and South Asia and beyond. The meeting featured twelve insightful lectures delving into a diverse spectrum of topics, encompassing climate change, hydrology, extreme climatic events, disasters, and mitigation strategies. These lectures explored present-day climatic shifts and historical climate variations across regions such as Iran, Bangladesh, Sri Lanka, Nepal, and India.

The event commenced with a warm Welcome Note by Prof. G.U. Kulkarni, President of JNCASR and the host institution of TWAS CASAREP. Prof. Kulkarni extended heartfelt greetings to Dr. Max Paoli, Program Coordinator, and the distinguished members of the TWAS Regional Offices in Trieste, Italy, for their continued support. He warmly welcomed Prof. V. Krishnan, Former President of JNCASR, and the meeting's co-organizers, Prof. J. Srinivasan, Former Chairman of the Divecha Centre for Climate Change, and Prof. Arindam Chakraborty from Centre for Atmospheric and Oceanic Sciences (CAOS), Indian Institute of Science, Bangalore, and Dr. Chetankumar Jalihal from the Indian Institute of Technology Hyderabad. Prof. M. Rajeevan, Former Secretary of the Ministry of Earth Sciences and Vice-Chancellor of Atria University, Bengaluru, was acknowledged for his contributions to the field of Earth Sciences. Prof. Kulkarni extended his appreciation to the distinguished speakers, program officials, session chairs, and participants who joined the event from across the globe, both in person and virtually. He expressed gratitude to TWAS members and young affiliates for their unwavering dedication to fostering international scientific collaboration, which was evident in this significant gathering. Special thanks were directed to Prof. S.K. Satish from the Divecha Centre for Climate Change for his steadfast commitment and active coordination with TWAS CASAREP in organizing impactful events in the past. In his address, Prof. Kulkarni underscored the importance of collective action to tackle the pressing challenges of climate change. He highlighted the critical role of scientific institutions and global partnerships in fostering innovative solutions. As the host institute, JNCASR takes pride in providing a forum for young scientists, researchers, and experts to engage in meaningful discussions, exchange insights, and collaborate on actionable strategies to mitigate and adapt to the impacts of a changing climate. He emphasized that the meeting was not merely an event but a collective opportunity to challenge conventional thinking, inspire transformative ideas, and address the causes and consequences of climate change. He encouraged participants to actively engage, exchange ideas, and forge connections that could lead to collaborations.

Following this, Dr. Jaishri Sanwal Bhatt chaired the session and invited Prof. J. Srinivasan, former Chairman of the Divecha Centre for Climate Change, to deliver the opening remarks. Prof. Srinivasan's address set a compelling tone for the event, providing a thought-provoking foundation for the discussions that followed. His talk provided critical insights into the profound challenges posed by climate change, framing it as one of the most significant threats humanities will face in the 21st century. Prof. Srinivasan highlighted a prevalent misconception: many perceive climate change as a distant, non-urgent issue, believing that humanity can simply adapt over time. However, he cautioned that the impacts of climate change, particularly for developing nations, represent an existential threat due to their limited capacity to cope with the associated risks. Drawing from recent studies of Earth's climate over the past million years, Prof. Srinivasan underscored that the Earth's climate system is inherently unstable and punctuated by numerous tipping points. These tipping points, if crossed, could trigger irreversible and catastrophic changes in the climate system. He emphasized the severe consequences of global warming beyond 2°C, which would disproportionately affect vulnerable populations in developing regions. Prof. Srinivasan also addressed the potential for high-impact but low-probability events, such as the slowing down or collapse of the Atlantic Meridional Overturning Circulation (AMOC). Such disruptions could dramatically alter

tropical climates, exacerbate regional disparities in climate impacts, and challenge the resilience of ecosystems and societies. His remarks served as a poignant reminder of the urgency to prioritize mitigation and adaptation strategies, particularly in the context of protecting those most at risk from the cascading effects of a rapidly changing climate.

Following Prof. J. Srinivasan's address, Dr. Madhavan Nair Rajeevan delivered an insightful talk on the impacts of human-induced climate change. He highlighted that anthropogenic activities are significantly increasing the concentration of greenhouse gases in the atmosphere, resulting in global warming. Since the pre-industrial era, the Earth's average surface temperature has risen by approximately 1.10°C, a change with profound implications for the planet. Dr. Rajeevan underscored the serious consequences of global warming, including the increased frequency and intensity of extreme weather events, rising sea levels, ocean acidification, and substantial biodiversity loss. South Asia, home to 25% of the world's population, is particularly vulnerable to these climate impacts. Observational data from the region already indicate significant alterations in various climate components. Drawing on IPCC model projections, Dr. Rajeevan outlined the anticipated future climate scenarios for South Asia. He emphasized the negative consequences of these changes on key sectors such as agriculture, water resources, energy systems, and public health. In his presentation, Dr. Rajeevan integrated observational evidence with climate model projections to provide a comprehensive overview of observed and future climate changes in South Asia. He highlighted the need for targeted adaptation and mitigation strategies to address these challenges and safeguard the region's environmental and socio-economic resilience.

Building on Dr. Madhavan Nair Rajeevan's presentation, Dr. Arindam Chakraborty provided a detailed analysis of the influence of the El Niño Southern Oscillation (ENSO) on summer monsoon rainfall over South Asia, with a specific focus on the modulation of moisture flux. ENSO, recognized as the most prominent source of interannual climate variability, operates through two distinct phases: El Niño (positive phase), characterized by warmer-than-average sea surface temperatures (SST) in the eastern-central equatorial Pacific Ocean, and La Niña (negative phase), marked by cooler-than-average SSTs in the same region. These oscillations occur quasi-periodically, with a typical cycle of 4–7 years, and are critical predictors of Indian summer monsoon rainfall. Dr. Chakraborty began by elaborating on well-established mechanisms that link ENSO phases to monsoon variability, emphasizing their role in shaping precipitation patterns over the region. He introduced a recently proposed mechanism that focuses on moisture flux convergence, providing a novel perspective on ENSO-monsoon dynamics. This mechanism underscores the importance of moisture transport and exchange between the Pacific and Indian Oceans, offering a more nuanced understanding compared to traditional theories. He further discussed findings from recent studies that reveal the asymmetric response of the Indian summer monsoon to ENSO phases. Research by Chakraborty and Singhai (2021) highlighted contrasting impacts of El Niño and La Niña, while subsequent work by Singhai et al. (2023) demonstrated the hypersensitivity of monsoon systems to moisture interactions with the Pacific Ocean. These insights underscore the critical role of moisture flux dynamics in influencing rainfall patterns and variability across South Asia. Dr. Chakraborty concluded by highlighting the broader implications of these findings for improving monsoon predictability and addressing its socio-economic impacts. Enhanced understanding of ENSO-monsoon interactions, particularly through the lens of moisture flux convergence, offers valuable applications in agriculture, water resource management, and disaster mitigation, contributing to the resilience of South Asia to climate variability.

The first day of the meeting concluded with a thought-provoking talk titled "The Psychology of Climate Change: Why Are We Not Serious (Enough) About Climate Change?" delivered by Dr. Chetankumar Jalihal, who delved into the intricacies of human cognition, highlighting how the brain has evolved to prioritize immediate and tangible threats while struggling to recognize and respond effectively to slow-

moving, complex, and abstract dangers such as climate change. This cognitive limitation creates a significant barrier to fully understanding and addressing the climate crisis. The talk also shed light on how certain individuals, organizations, and groups have capitalized on these cognitive biases, deliberately misrepresenting or minimizing the reality of climate change to obstruct timely action. Dr. Jalihal underscored the consequences of these manipulations, which exacerbate public inertia and hinder global efforts to combat climate change. Concluding the session, Dr. Jalihal proposed strategies to bridge the gap between our brain's evolutionary responses and the pressing need for climate action. These included enhancing public awareness, leveraging behavioral insights to drive change, and fostering a sense of urgency through more effective communication and engagement strategies. This insightful discussion underscored the importance of addressing psychological barriers as part of a comprehensive approach to tackling the climate crisis.

The second day of the event commenced with a scholarly presentation titled "Climate Change in the Context of Palaeoclimate Records in Sri Lanka," delivered by Dr. T. R. Prematilake. The session was chaired by Dr. Jaishri Sanwal Bhatt, who introduced the speaker and facilitated the discussion, setting the stage for an engaging exploration of the intersection between climate change and palaeoclimate records in the region. Dr. Prematilake underscored the critical need for expanded palaeoclimate investigations in southern Asia, a region where long-term climatic variability remains insufficiently analyzed. He explained, while global studies consistently document rising temperatures, accelerating global warming, and hydroclimatic shifts (wet/dry conditions) since the late 19th century, the lack of detailed regional data hinders the development of accurate climate models and future projections for this area. The discussion highlighted the paucity of high-resolution terrestrial records - such as pollen, phytoliths, diatoms, environmental magnetics, geochemical proxies, and radiocarbon dating - that can provide insights into the region's palaeomonsoon dynamics. Dr. Prematilake showcased the Horton Plains peat archive, situated in Sri Lanka's central highlands at an elevation of 2300 - 2600 meters above mean sea level, as a valuable resource offering a 25,000-year-long record of summer monsoon variability. This archive reveals evidence of multiple long- and short-term fluctuations in monsoon intensity, persisting into the late Holocene. A particularly notable observation was the marked increase in the frequency and intensity of short-term climatic events during the late Holocene, suggesting heightened hydroclimatic variability. These findings demonstrate the importance of high-resolution palaeoclimate records for reconstructing past monsoon behavior and improving our understanding of regional climate dynamics to support adaptation and resilience strategies.

The second talk of the day, delivered by Prof. C. Gnanaseelan, provided a comprehensive examination of Tropical Indian Ocean (TIO) variability and its significant influence on the Indian monsoon in the context of climate change. Building seamlessly upon the insights from Prof. J. Srinivasan, Dr. Arindam Chakraborty, and Dr. Madhavan Nair Rajeevan, Prof. Gnanaseelan delved into the intricate relationship between oceanic dynamics and monsoon patterns, further enriching the discussions from earlier in the day. He emphasized the critical role of the TIO in shaping climate variability across Indian Ocean rim countries, primarily driven by two major sea surface temperature (SST) variability modes: the Indian Ocean Basin Mode (IOBM) and the Indian Ocean Dipole (IOD). Prof. Gnanaseelan highlighted that IOBM, characterized by basin-wide warming or cooling, is largely a response to El Niño (warming) and La Niña (cooling) events. However, the internal dynamics of the Indian Ocean significantly modulate the intensity and persistence of the IOBM, thereby influencing the Indian monsoon. In contrast, the IOD is a coupled air-sea mode of variability, which can either be forced remotely by the Pacific Ocean or arise internally within the Indian Ocean. Prof. Gnanaseelan elaborated on the complex processes behind IOD formation, particularly the feedback mechanisms that regulate its behavior. While IOD events are generally positively correlated with Indian Summer Monsoon Rainfall (ISMR), he pointed out that only IODs with strong air-sea coupling consistently produce positive ISMR anomalies. The lecture also addressed significant changes

in the ENSO-monsoon relationship since the mid-1970s, emphasizing the increasing role of IOD in mediating interactions between Pacific SST anomalies and ISMR. Prof. Gnanaseelan identified changes in moisture availability and convergence within the TIO as key factors behind the weakening ENSO-monsoon linkage observed in recent decades. By providing a thorough analysis of TIO variability and its profound connection to monsoon dynamics, the presentation underscored the growing importance of understanding these evolving interactions for improving monsoon predictability in the face of climate change.

Following this, Dr. Parvin Ghafarian from the University of Northern British Columbia delivered a comprehensive presentation on the impact of climate change on long-term meteorological trends in Iran, highlighting the region's complex climate dynamics and the critical factors influencing these changes. Iran's climate, shaped by its varied topography and its position between the northern and southern water borders, is inherently complex. Moreover, Iran's location within the dry and semi-arid belt of the world exacerbates its vulnerability to climate change, making it more susceptible to extreme weather events compared to other regions. Dr. Ghafarian emphasized that extreme weather events, such as intense heatwaves, severe storms, and floods, pose significant threats to human society, highlighting the urgency of understanding their underlying causes and developing effective adaptation strategies to mitigate their impacts. Given their unpredictable nature and the limited understanding of the processes that drive them, predicting these events remains a challenging task. This underscores the pressing need for continued research to enhance the accuracy of predictions and improve preparedness. Her research focused on long-term trends in meteorological phenomena across Iran's diverse regions, with particular attention to the coastal areas and the Urmia Lake Basin, an area that has seen dramatic climate changes. In the Urmia Lake Basin, a significant upward trend in annual temperature anomalies was observed, with maximum temperatures increasing by 0.64°C per decade. While there was no significant long-term trend in annual precipitation, a clear declining trend in annual rainfall was noted. The research further revealed that regional warming has led to a reduction in snowfall frequency, while an increase in showery precipitation has been observed. In the southeastern part of Iran, Dr. Ghafarian shared the records of rise in the number of tropical storms affecting the Iranian coast of Makran over the past two decades, with notable examples such as Cyclones Gonu, Phet, and Shaheen. These findings underscore a broader trend of increasing hazardous meteorological events in the region, including heavy snowfall, floods, and dust storms, which are expected to intensify under changing climate conditions. Dr. Ghafarian’s presentation highlighted the growing frequency and severity of extreme weather events in Iran, emphasizing the critical need for climate adaptation strategies to address the challenges posed by these evolving meteorological phenomena. Her work provides valuable insights into the long-term climate trends in Iran and serves as a call to action for more focused research and policy development to enhance regional climate resilience.

Towards the end of the second day’s meeting, Dr. Shakeel Ahmed delivered an insightful and dynamic presentation on "Tackling Water Disasters Through Geoscientific Knowledge with Groundwater as a Rescuer." His talk underscored the critical role of groundwater in mitigating the impacts of water-related disasters exacerbated by climate change and emphasized the importance of leveraging geoscientific insights to develop sustainable solutions. Dr. Ahmed highlighted that while climate change has been extensively modeled to understand its temporal and spatial dynamics, the real challenge lies in addressing its impacts on natural resources, particularly water, and devising effective mitigation and adaptation strategies. Among the various resources affected, water stands as the most vulnerable to climate change, with significant consequences for rainfall patterns and atmospheric temperatures. He highlighted that the climate change has drastically altered rainfall dynamics, resulting in erratic precipitation patterns characterized by extreme events and prolonged dry spells. These changes have significantly reduced groundwater recharge, leading to alarming declines in groundwater levels. Coupled with rising demand, the delicate balance of groundwater systems has been disrupted, creating negative water budgets in many regions. To address this, Dr. Ahmed advocated for the adoption of Managed Aquifer Recharge (MAR) - a systematic approach to

artificially enhance groundwater recharge. However, he emphasized that MAR requires a comprehensive understanding of subsurface conditions to ensure its effectiveness. Key parameters for successful MAR implementation include identifying favorable recharge zones, ensuring conducive geological mediums, and assessing adequate runoff availability. Dr. Ahmed elaborated on the advantages of storing water in aquifers over surface reservoirs, highlighting reduced evaporation, the absence of surface space requirements, and the natural filtration of groundwater that enhances its quality. Groundwater, with its slow movement and minimal risk of causing disasters, emerges as a critical resource in addressing water-related challenges, particularly during floods, agricultural droughts, and water scarcity scenarios. The talk further showcased the potential of geoscientific tools, particularly advanced geophysical investigations, to visualize aquifers and optimize MAR efforts. By converting devastating surface runoff from erratic rainfall into valuable groundwater reserves, these strategies not only mitigate the risk of floods but also provide a sustainable solution to water scarcity, demonstrating the transformative power of groundwater as a resilient lifeline in the face of climate change.

The second day of the meeting concluded with an engaging Open Discussion Session chaired by Prof. J. Srinivasan, where participants shared their observations and experiences regarding the multifaceted impacts of climate change. The discussions highlighted region-specific manifestations of climate variability, including the increasing frequency and intensity of extreme weather events, notable shifts in seasonal patterns, and significant environmental changes. The session witnessed active participation from numerous young scientists representing diverse countries, fostering a dynamic exchange of ideas. This interactive dialogue between participants and speakers enriched the discussion, offering a platform for collaborative learning and the exchange of region-specific insights. The vibrant engagement underscored the collective commitment of the scientific community to address the pressing challenges posed by climate change through shared knowledge and actionable strategies.

The third day of the meeting began with Dr. Jaishri Sanwal Bhatt providing an overview of the speakers and their respective presentations, thereby establishing a structured framework for the scientific discussions. The first lecture of the day, titled "Overview of Paleoclimate Studies in Iran: Insights and Opportunities," was delivered by Dr. Abdolmajid Naderi-Beni. Dr. Naderi-Beni began by providing a comprehensive introduction to Iran’s unique landform and climate, emphasizing the country’s position at the heart of the world’s Desert Belt, which is typified by high temperatures and low precipitation. Despite these arid conditions, Iran’s diverse hydroclimatic landscape is shaped by its complex orography and local moisture sources, such as the Caspian Sea and the Persian Gulf. Furthermore, Iran's geographical position, acting as a nexus between global climatic systems like the Indian Ocean Summer Monsoon, the Mediterranean Winter System, and the Siberian High-Pressure, results in a wide range of climate variability. Dr. Naderi-Beni also highlighted Iran’s geological and geomorphological features, which offer a wealth of geological archives for paleoclimatic studies. These include cave deposits, lakes, playas, wetlands, glaciers, marine sediments, and tree rings, which provide valuable data for reconstructing past climates. He pointed out the potential for cross-comparative studies between different types of geological archives, each shedding light on various aspects of Iran’s paleoclimate. Additionally, he discussed the significant overlap between water-rich areas - often the sites of human settlements and key archaeological locations in the region. This intersection of human development and hydroclimatic variability, particularly in the context of Iran’s long history and its connections to surrounding regions like Mesopotamia and Transoxiana, presents a unique opportunity to study the relationship between climatic changes and human development. Dr. Naderi-Beni concluded by underscoring Iran's potential for further paleoclimatic research, particularly in understanding the dynamic interplay between past climatic shifts and the evolution of human societies in this region.

The second lecture of the day was presented by Dr. Madan Lall Shrestha, who provided a comprehensive analysis of climate variability, extreme events, and their far-reaching impacts. He highlighted significant alterations in the global climate system, as evidenced by various climate indicators. The global temperature is rising at an unprecedented rate, with each year surpassing its previous record, and 2024 is projected to be the hottest year on record. Dr. Shrestha emphasized that the monsoon, which is crucial for the South Asian region, is undergoing considerable changes. In particular, the duration of the summer monsoon in Nepal has been lengthening due to shifts in both its onset and withdrawal. Simultaneously, the region has experienced intense precipitation, with eastern Nepal recording a record 24-hour rainfall of 624 mm—surpassing the previous record of 540 mm set in 1993. This extreme weather pattern has contributed to devastating flooding and related disasters, causing significant loss of life and property. Dr. Shrestha further noted that the impacts of climate change are increasingly evident across various sectors, including snow and glacier systems, agriculture, forestry, and water resources. Given these profound changes in the climate system, global attention is focused on the outcomes of COP29. However, he pointed out with concern that the global temperature in 2024 has already exceeded the 1.5°C threshold established by the Paris Agreement.

The third lecture was delivered by Dr. Abdullah Harun Chowdhury, who focused on the impact of climate change and the action plan in Bangladesh. His presentation highlighted the global environmental changes driving climate variability, such as the increasing frequency of cyclones, droughts, irregular rainfall patterns, flooding, glacial melt, rising sea levels, and global warming. These changes are contributing to significant biodiversity loss across various regions. Dr. Chowdhury emphasized the role of both planned and unplanned human interventions in exacerbating climate change. These interventions include habitat loss and fragmentation through deforestation, overexploitation of natural resources due to overpopulation and unsustainable practices, pollution from industrial emissions, the construction of dams and embankments, and the genetic modification of crops for monoculture farming. Collectively, these activities amplify the negative effects of climate change. The major impacts of climate change, as outlined in his talk, include extensive damage and losses to populations, health, drinking water sources, housing, infrastructure, agriculture, freshwater availability, industry, transportation, education, and the environment. These disruptions contribute to increased migration, economic imbalance, social conflicts, and insecurity. In response, Bangladesh's Ministry of Environment and Forests (MoEF) developed the Climate Change Strategy and Action Plan in 2009. The plan focuses on six key areas: (1) food security, social protection, and health; (2) comprehensive disaster management; (3) infrastructure development (including embankments and shelters); (4) research and knowledge management; (5) mitigation strategies and low-carbon development; and (6) capacity building and institutional strengthening. Dr. Chowdhury presented research findings that emphasize the need for climate-resilient strategies, such as the cultivation of natural calamity-tolerant, high-yield indigenous crops, the expansion of emergency shelters and safe drinking water sources, and the prioritization of local animal breeds for farming. He also highlighted the importance of protecting natural habitats by restricting commercial activities and promoting professional training for disaster response at the local level. Community-based management approaches are essential for climate disaster risk reduction and adaptation. Furthermore, ongoing public awareness campaigns are crucial to address the impacts of climate change and salinity intrusion, as well as the significance of safe water, sanitation, and hygiene (WaSH) practices. To mitigate the socio-economic impacts of climate change, Dr. Chowdhury suggested implementing a localized weather forecasting system driven by community participation, with the collaboration of government agencies, NGOs, local governments, micro-credit organizations, and intellectual groups in climate-affected areas. Strengthening the indigenous adaptation capacity through community involvement, fostering political commitment, and enhancing inter-ministerial coordination are essential to addressing climate change impacts. He concluded by advocating for integrated

research to develop sustainable climate change mitigation and adaptation strategies, with a focus on safe WaSH and livelihoods management in affected areas.

The final lecture on the third day, marking the successful conclusion of the three-day Young Scientist Meeting, was delivered by Dr. A.P. Dimri on "Climate Vagaries and the Social Impact of Disasters. Dr. Dimri emphasized the profound effects of climate change, particularly in urban settings, on the water cycle and its subsequent impact on human populations and habitats. He noted that climate-induced changes are increasingly triggering floods and cascading disasters across the Indian subcontinent. Notable events, such as the 2010 Leh floods, 2013 Uttarakhand floods, 2014 Srinagar floods, the 2022 Chamoli disaster, and the 2023 floods in Himachal Pradesh and Sikkim, have caused extensive damage to critical infrastructure, including hydropower projects, roads, bridges, and agricultural lands, along with significant loss of life. While the mechanisms driving these disasters may vary, they often result in devastating consequences, including mass movements, damming of river channels, and the subsequent formation of Landslide Lake Outburst Floods (LLOFs) when these natural dams breach. Additionally, the risk of Glacial Lake Outburst Floods (GLOFs) has escalated due to moraine dam degradation and rising water volumes in pro-glacial lakes, further threatening downstream communities. These extreme weather events - such as heavy rainfall, flash floods, landslides, and urban flooding - also disrupt daily life, impairing transportation, aviation, and urban planning, with significant economic and governance impacts. Dr. Dimri called for a comprehensive understanding of the meteorological and geomorphological factors contributing to these disasters, especially in mountainous and plains regions. Such insights are crucial for devising tailored policy recommendations and improving early warning systems. He further emphasized that the socio-economic impacts of these climate-driven disasters are far-reaching, displacing communities and straining local economies. Dr. Dimri stressed the importance of adaptation strategies, including improved early warning systems, sustainable land-use practices, and enhancing community resilience. He concluded by highlighting the need for international cooperation and policy support to address the transboundary nature of these challenges and to promote sustainable development in the Himalayan region.

Concluding Remarks and Vote of Thanks:

Dr. Jaishri Sanwal Bhatt concluded the event, expressing her heartfelt gratitude to all the speakers, participants, and attendees for their invaluable contributions. She acknowledged the diverse range of topics covered during the event, each shedding light on crucial aspects of the current and future global climate challenges. The final sessions, which showcased the work of promising young scientists from developing nations, offered a wealth of knowledge and insights, enriching the experience for everyone involved. Dr. Bhatt extended her deepest appreciation for the active participation and meaningful contributions of all attendees in advancing these important discussions. She emphasized that, through collective dedication and collaboration, we are well-positioned to move toward a more sustainable and resilient future.

Organizers:

The organizers of the event were the TWAS Central & South Asia Regional Partner (TWAS-CASAREP) and the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) in Bengaluru, India, in association with the Divecha Centre for Climate Change at the Indian Institute of Science, Bengaluru, India.

Coordinators:

The event was coordinated by Dr. Jaishri Sanwal Bhatt and Prof. V. Krishnan from JNCASR, Bengaluru, in collaboration with Prof. J. Srinivasan and Prof. Arindam Chakraborty from the Divecha Centre for Climate Change, Indian Institute of Science, Bengaluru, India.

Profile of Speakers

Prof. J. Srnivasan, established the Divecha Centre for Climate Change at Indian Institute of Science in 2009. He was the Chairman of Centre for Atmospheric and Oceanic Sciences from 1997-2005 and Chairman, Mechanical Sciences Division from 2005-2009 at Indian Institute of Science. He was Senior Resident Research Associate at NASA, Langley from 1993-1995. He was a lead author of the 2nd and 4th IPCC reports on Climate change and a review editor of 3rd IPCC report on Climate Change. He was the principal investigator of the Indo-French satellite mission Megha-Tropiques which was launched in October 2011. He obtained bachelor's degree in mechanical engineering from IIT, Madras, M.S. from State University of New York at Stony Brook and Ph.D. from Stanford University. He has published more than 150 research papers in climate and thermal sciences. He is the fellow of the Indian Academy of Sciences, Indian National Science Academy, Indian National Academy of Engineering and Indian Meteorological Society. He was a J.C. Bose National Research Fellow during 2007-2012. He received the life-time achievement award of the Ministry of Earth Sciences in 2019.

Prof. Madhavan Nair Rajeevan, a distinguished climate scientist with over 38 years of research experience in the fields of weather and climate science. Currently serving as the Vice Chancellor of Atria University, Bengaluru, Dr Rajeevan has left an indelible mark during his tenure as Secretary to the Government of India in the Ministry of Earth Sciences from December 2015 to July 2021. Dr Rajeevan's research interests included monsoon variability and seasonal monsoon forecasting, climate change and extreme weather events, and forecasting of mesoscale convective systems, underlining his commitment to the advancement of meteorological sciences. He is credited with the development of daily precipitation and temperature data sets, development of seasonal forecast models for the Indian summer monsoon and the introduction of climate services in India. He has published more than 170 research papers with an h-index of 60 and more than 17,000 citations. He is a Fellow of all three Science Academies of India and an Academician of the International Academy of Astronautics, Paris. Dr Rajeevan is currently an expert member of the Research Board of the UN/World Meteorological Organisation (WMO) in Geneva. He has also been awarded the coveted Sir Gilbert Walker Gold Medal for lifetime achievement by the Indian Meteorological Society. He has edited two books on climate change and the socio-economic benefits of Earth Sciences, published by Springer. He has also recently completed a reference work on the "South Asian Summer Monsoon": Processes, Prediction and Societal Impacts", published by Elsevier.

Prof. Arindam Chakraborty, a distinguished Professor at the Indian Institute of Science (IISc), Bangalore, where he is associated with the Centre for Atmospheric & Oceanic Sciences. With expertise spanning a wide range of atmospheric and oceanic phenomena, his work significantly advances our understanding of complex climatic systems. His research interests include organized tropical convection and global teleconnections, Indian summer monsoon variability, and the theory of monsoon onset and inter-annual variations. He is also an expert on cloud microphysics, cloud-aerosol interactions, monsoon intraseasonal oscillations, and their link to extreme rainfall events. Additionally, Prof. Chakraborty contributes to advancements in seasonal-scale prediction, ensemble forecasting techniques, short-range rainfall prediction, and modeling of the diurnal cycle of the Asian summer monsoon. His expertise extends to developing and applying global and regional atmospheric and oceanic models. Prof. Chakraborty has published extensively in renowned scientific journals. Recent notable works include insights into ENSO-monsoon relationships, the role of southern hemisphere climate modes, and aquifer-soil interactions in land-surface modeling. His research also explores vegetation's influence on the Indian summer monsoon and investigates the dynamics of severe droughts and floods. Through his scholarly contributions and innovative research, Prof. Chakraborty continues to provide critical knowledge that enhances climate modeling and forecasting, addressing challenges at the intersection of atmospheric science and societal needs.

Dr. Chetankumar Adappa Jalihal, a distinguished climate scientist currently serving as a DST-INSPIRE Faculty Fellow at the Department of Climate Change, Indian Institute of Technology Hyderabad. He previously held a Humboldt Postdoctoral Fellowship and a postdoctoral scientist position at the Max Planck Institute for Meteorology. Dr. Jalihal earned his Ph.D. and M.Tech from the Indian Institute of Science, Bangalore, where his research focused on the energetics of monsoon variability and the impact of aerosols on rainfall. With a strong academic foundation, including a B.E. in Electronics and Telecommunication from Goa Engineering College, Dr. Jalihal has published extensively in leading journals such as Nature Communications and Geophysical Research Letters. His work has garnered recognition, including the Roddam Family Medal for the best Ph.D. thesis at IISc and features in the top-read articles of Nature Communications. Dr. Jalihal has received prestigious scholarships and awards, including the

Grantham Fellowship and the Humboldt Fellowship, and his research has been highlighted by prominent media outlets like The Hindu and Deccan Herald. His expertise spans monsoon dynamics, climate variability, and atmospheric processes, with significant contributions to understanding past and future climate changes.

Prof. Rathnasiri Premathilake, a Senior Lecturer at the Postgraduate Institute of Archaeology & Research, University of Kelaniya. He holds the position of Vice-President of the International Union for Quaternary Research-Human and Biosphere Commission & is a member of the Governing Board of the Central Cultural Fund. Dr. Premathilake has also held significant administrative roles, including Acting Director of PGIAR and the Advisory Committee of the International Palaeoclimate Commission (PALCOM). With a robust academic foundation, Dr. Premathilake earned his Ph.D. in Palynology, Quaternary Geology, and Environmental Archaeology from the School of Geoscience, Stockholm University, and the Natural History Museum, Sweden. He has completed two prestigious British Academy-funded postdoctoral fellowships at Queen's University, Belfast, UK, & continues to engage in collaborative research with international institutions such as NASA/MSFC and the United States Space and Rocket Center on the origins of life. His partnerships extend to prominent organizations like the French Institute of Pondicherry and Liverpool John Moores University in the UK. Dr. Premathilake has authored over 35 high-impact journal publications. Beyond research, he has been instrumental in fostering international collaboration, enabling Sri Lankan postgraduate students to participate in global projects. His leadership, dedication, and groundbreaking research continue to leave a lasting impact on both the academic & scientific communities.

Prof. C. Gnanaseelan, a senior scientist and Project Director of Climate Variability and Prediction at Indian Institute of Tropical Meteorology. His research areas include ocean variability, air-sea interaction, climate modelling, decadal climate prediction, and data assimilation. He has successfully guided 20 PhDs and 32 master's students and visiting/adjunct faculty of several universities and IITs. Gnanaseelan successfully led the team that developed India's first Decadal Climate Prediction System. He represents India in the World-Climate-Research-Programme's Decadal Climate Prediction Project. He is an Editor of JGR-Oceans and served as an associate Editor of Journal of Earth System Science.

Dr. Parvin Ghafarian, a meteorologist with over 15 years of experience researching extreme weather phenomena resulting from air-sea interactions and their response to climate change. Her work focuses on using numerical weather prediction and global climate models to investigate the structure and dynamics of extreme climate events. Dr. Ghafarian specializes in studying, monitoring, and simulating wind fields, convective storms, lake-effect snow, and extreme precipitation, particularly in regions with complex topography and coastal influences. A key aspect of her research involves evaluating model sensitivity to initial and boundary conditions, resolution, and physical parameterizations to enhance predictive accuracy. Dr. Ghafarian's work aims to deepen understanding of extreme weather mechanisms and improve model outputs, contributing to the advancement of meteorological and climate modelling sciences.

Prof. Shakeel Ahmed (Ph.D. 1987, Mines Paris Tech, France, a distinguished Earth Scientist specializing in groundwater hydrology, with over 37 years of experience at CSIR-NGRI, Hyderabad, and as MK Gandhi Chair Professor at Jamia Millia Islamia, New Delhi. He has led numerous national and international projects, including India's National Aquifer Mapping program, and established the Indo-French Centre for Groundwater Research, serving as its founding Head for two decades. With nearly 200 SCI publications, five books, and 43 doctoral theses supervised, Prof. Ahmed is recognized as one of the leading publishers in groundwater hydrology in the Indian subcontinent. He has received prestigious honors, including the National Geoscience Award, the International Prize for Water Science, and the INC-IAH Excellence Award, and is an elected Fellow of TWAS, NASI, and other esteemed academies. Listed among the world's top 2% scientists by Stanford-Elsevier data, he ranks prominently in national and global Earth Science metrics. Currently, Prof. Ahmed is a Visiting Professor and Consultant at the Islamic University of Science and Technology, J&K, spearheading the establishment of a Centre for Disaster Risk Reduction.

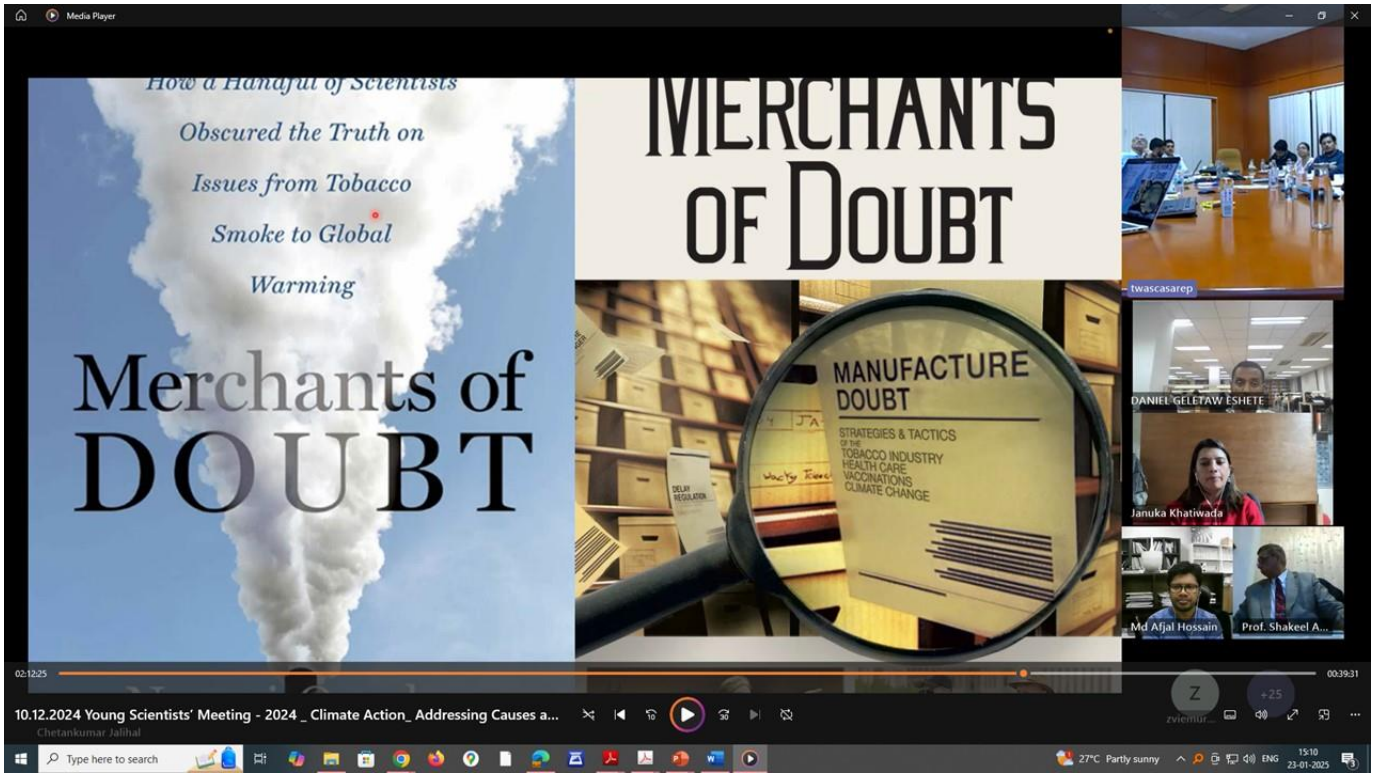
Prof. Abdolmajid Naderi-Beni, an accomplished research scientist and associate professor at the Iranian National Institute for Oceanography and Atmospheric Science (INIOAS) in Tehran, Iran. With a Ph.D. from Ferdowsi University of Mashhad, Dr. Naderi-Beni brings over two decades of expertise to his field. Dr. Naderi-Beni's research focuses on sedimentology, geoarchaeology, paleoclimate reconstruction, and the environmental history of marine and coastal systems, particularly in the Caspian Sea and Persian Gulf regions. His work has yielded significant insights into Holocene climate shifts, sea-level dynamics, and their socio-cultural impacts, as evidenced by numerous high-

impact publications in journals such as Marine Geology, Journal of Quaternary Science, and Geomorphology. His recent studies include geoarchaeological investigations of ancient ports, sedimentary environments, and maritime cultural heritage in the Persian Gulf and Caspian Sea. Notable projects include hydroclimatic reconstructions of Lake Mehregan and Lake Zeribar and the study of the Qoroq shipwreck, demonstrating his interdisciplinary approach and commitment to understanding historical human-environment interactions. Dr. Naderi-Beni has secured funding from prestigious organizations such as the Iran National Science Foundation (INSF), Japan Society for the Promotion of Science (JSPS), and Ports and Maritime Organization of Iran. His contributions extend beyond academia through the promotion of maritime cultural heritage and scientific collaborations. Dr. Naderi-Beni has also authored significant books and book chapters, including Human and Sea, exploring humanity's long-standing relationship with the marine environment.

Prof. Madan Lall Shrestha, an academician at Nepal Academy of Science and Technology (NAST) with Ph. D. degree in Meteorology from University of Hawaii, USA. He served as the Director General of the Department of Hydrology and Meteorology, Nepal and he had been the permanent representative of Nepal to World Meteorological Organization (WMO). He has been the focal point of Nepal to Intergovernmental Panel on Climate Change (IPCC) and contributed to the Working Group II of the Third Assessment Report of IPCC in producing the publication, Climate Change 2001, Impact, Adaptation and Vulnerability. He is the first Nepali to join Glaciological Expedition of Nepal (GEN), the First Joint Scientific Expedition between Nepal and Japan to explore the snow and glaciers of central Nepal Himalaya. He contributed toward the preparation of Initial National communication as well as the Third national communication to be submitted to UNFCCC from Nepal. He is the Scientific Planning Group member of Asia Pacific Network for Global Change Research (APN) representing Nepal. He had been the visiting professor at Nagoya University and also at Tribhuvan University. He is also the Member of the advisory Board of Journal "Scientific World", Nepal and Journal of Meteorology, Pakistan. His fields of research are the meteorology, climate variability, and climate change. He has published many research papers in peer reviewed journals.

Prof. Abdullah Harun Chowdhury, a professor and former Head of Environmental Science at Khulna University, Bangladesh, has dedicated his career to understanding and addressing critical environmental issues. Since 1993, his research has focused on the ecological health of our planet, advocating for sustainable resource management and tackling climate change. Dr. Chowdhury's expertise extends beyond academia. He has actively shared his knowledge by authoring over 65 research papers and books, and by presenting his findings at more than 70 international and national conferences. His impressive record includes 48 research presentations, 19 invited keynote lectures, and participation in 8 panel discussions, showcasing his ability to engage audiences on complex environmental topics. His dedication has been recognized by prestigious awards, including the Bangladesh Academy of Sciences Gold Medal. He has also served as a valuable resource for organizations like the Japan Broadcasting Corporation and the National Biodiversity Strategy and Action Plan of Bangladesh. Dr. Chowdhury's commitment extends beyond research and presentations. He has actively participated in shaping environmental policy by working with the IUCN and serving as an environmental specialist for various government and non-governmental projects. Dr. Chowdhury's extensive experience, research contributions, and dedication to environmental education solidify his position as a leading voice in promoting a sustainable future.

Prof. A. P. Dimri, the Director of the Indian Institute of Geomagnetism, Government of India, Mumbai, and a distinguished Professor at the School of Environmental Sciences, Jawaharlal Nehru University, New Delhi. A renowned scientist in the fields of weather and climate research, he holds Fellow (Elect) positions in prestigious scientific bodies, including the Indian National Science Academy (INSA), the National Academy of Sciences (NASI), the Indian Meteorological Society (IMS), and the Indian Geophysical Union (IGU), where he also serves as Vice President (Elect). His career reflects a global engagement with science, including an association with the International Center of Theoretical Physics in Trieste, Italy, and active memberships in the American Geophysical Union (AGU) and the European Geophysical Union (EGU). Prof. Dimri's contributions have earned him accolades such as the 2022 IMS Award, the 2022 Grove Karl Gilbert Award for Excellence in Geomorphological Research, the 2006 Technology Award of DRDO, and the 1995 Siachen Medal from the Government of India. His involvement with the World Climate Research Program's Scientific Steering Group for the Global Precipitation Experiment underscores his leadership in addressing global climate challenges.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How a Handful of Scientists
Obscured the Truth on
Issues from Tobacco
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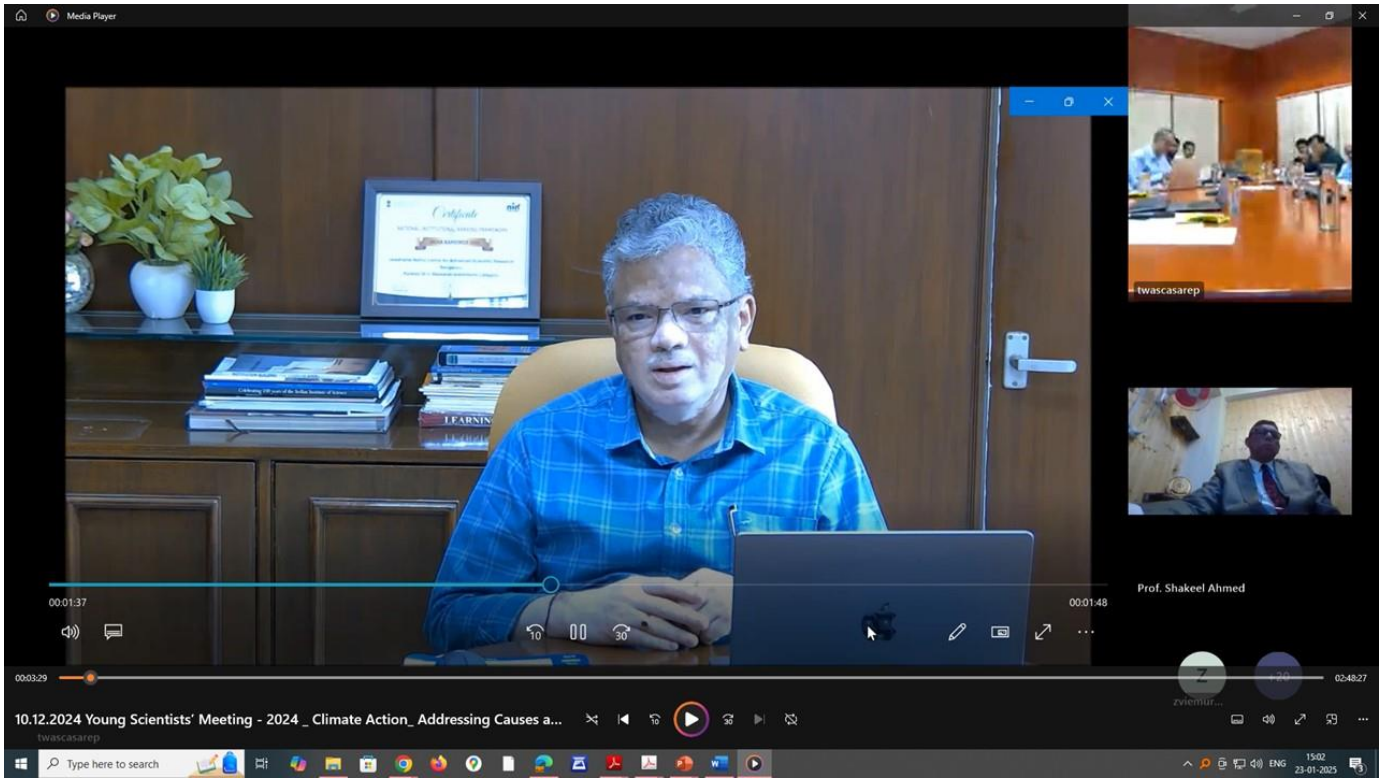
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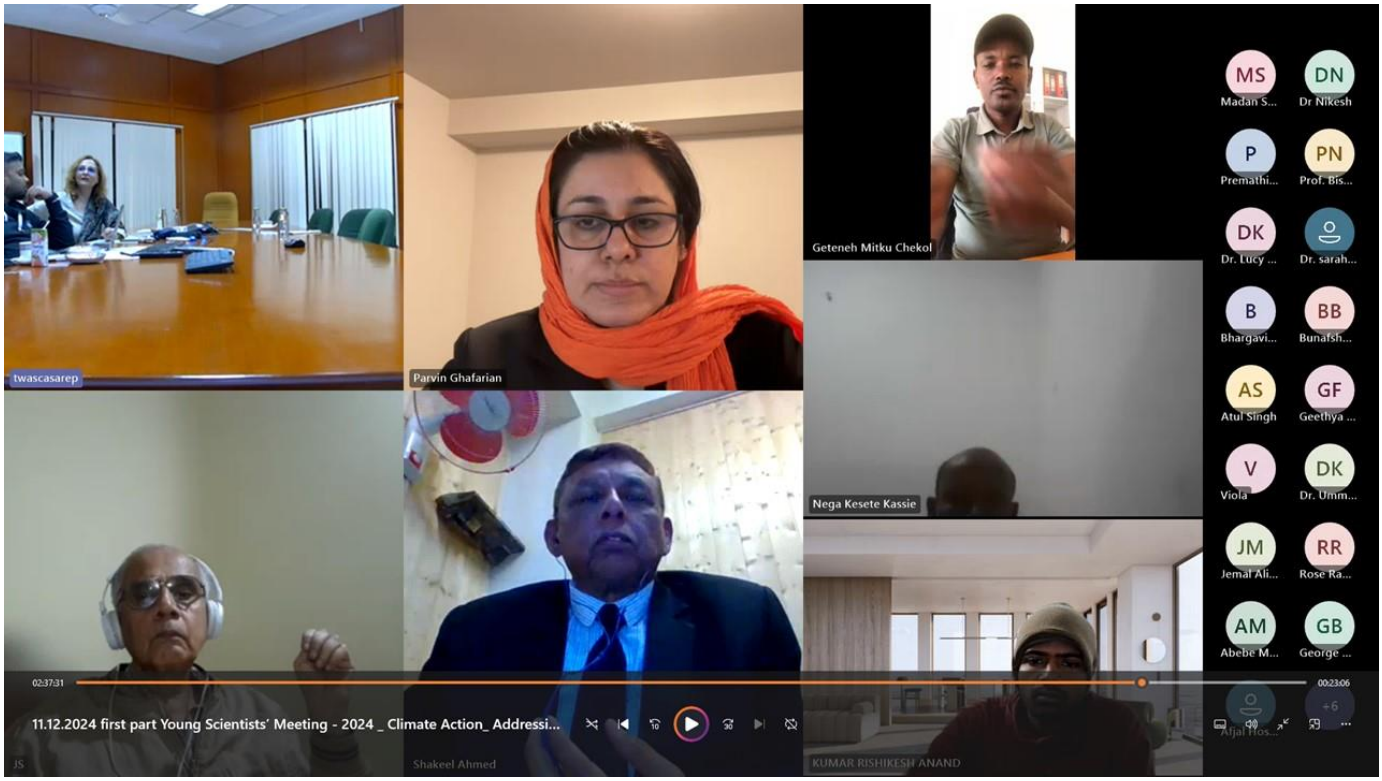
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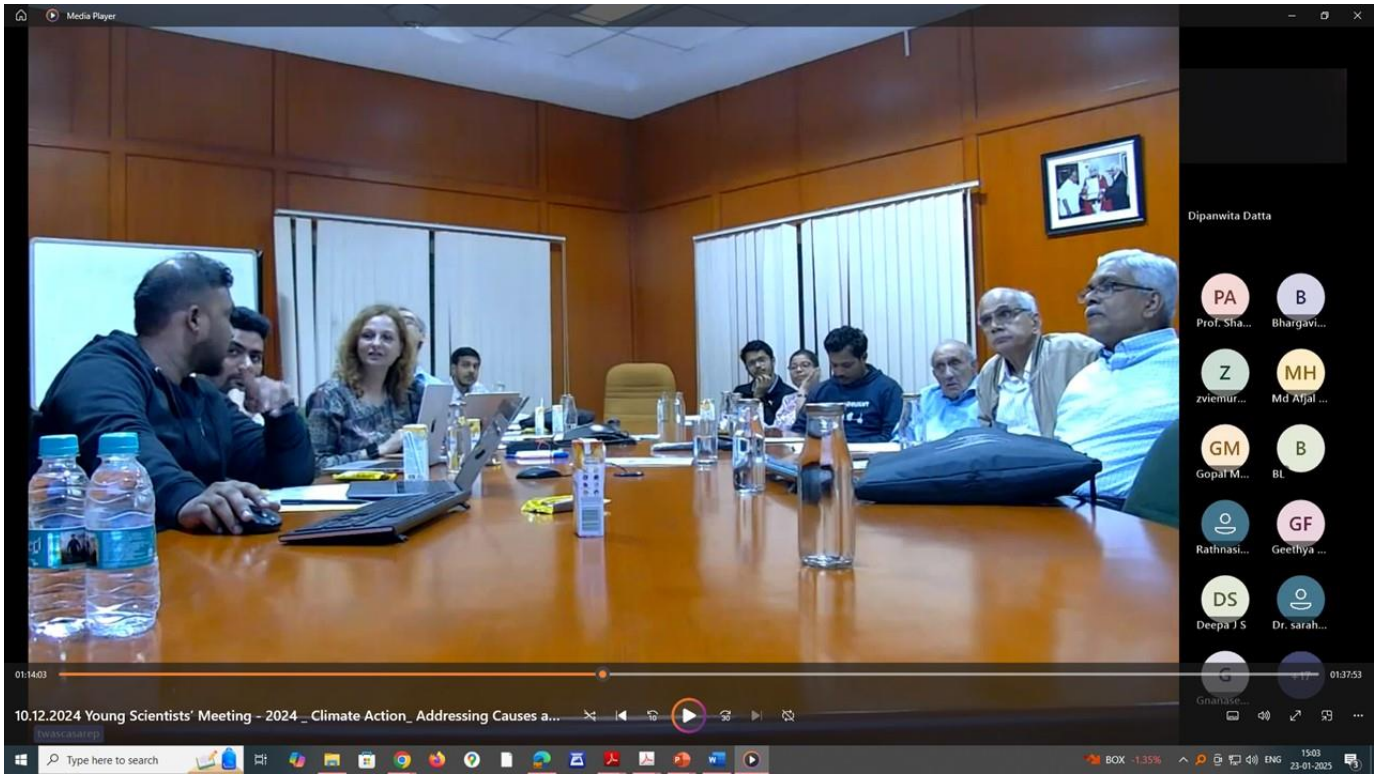
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