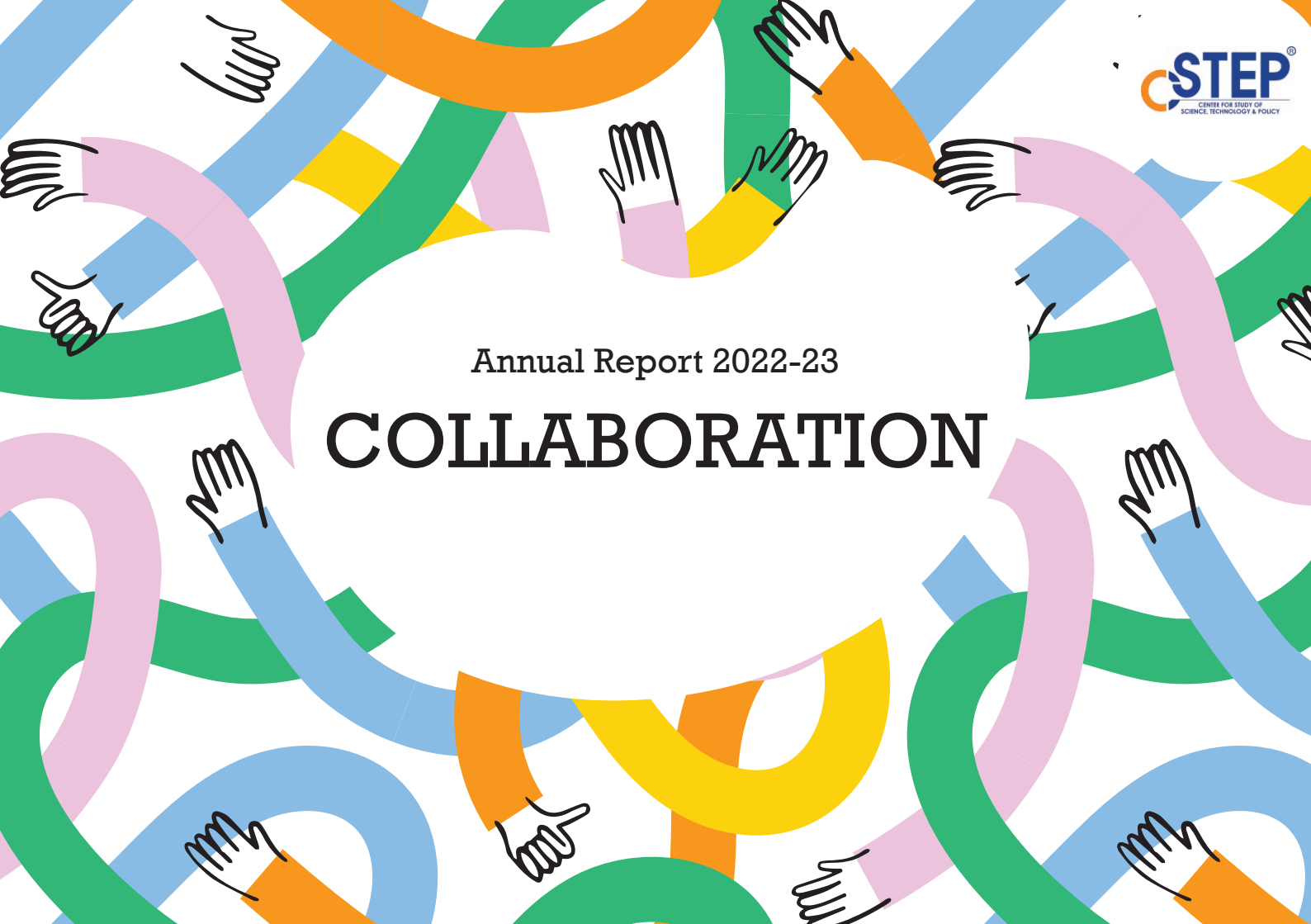


Annual Report 2022-23

COLLABORATION





Note from the Chairman

Shaping India's Development Story

Many decades ago, I submitted an annual report to Dr Brahm Prakash, who was then the head of the metallurgy department at the Bhabha Atomic Research Centre, arguing that the availability of coal and iron drove the first industrial revolution with coal providing the energy we need and iron providing the material. But our quest did not end there. We invented new materials and new applications to drive revolutions in societal progress.

What will be the shape of future solutions to the critical problems our society faces today, such as global warming and air pollution? This is the question we at CSTEP must try to answer in the coming years as we help usher in the next era of progress.

I feel immense pride as I watch CSTEP today and am amazed at how it has grown from a small organisation with a handful of visionary researchers to a thought leader in the policy space, contributing to India's critical goal of net-zero transition. Policymakers reach out to us today with diverse requests, from seeking clarity in decision-making to organising capacity-building sessions for government entities. It is a testament to the rigour and quality of our scientific research.

Over the past few years, we have faced risks presented by the pandemic and the economic crisis. While continuing to produce world-class research, this past year, we have built up our internal capacity, solidified our financial outlook, and consolidated research groups to align with different challenges facing the country today, such as climate vulnerability, transition to renewables, and air pollution.

With these improvements, we are in a strong position to focus completely on our mission. Let us continue to shape India's development story and play a leading role in bringing science and technology to the heart of policymaking.



- Dr V S Arunachalam

From the ED's Desk

Partnering for Change

Close to two decades of working at the intersection of science, technology, and policy has taught us an important lesson: transformation cannot be achieved by a single entity. Today, the sheer scale of the challenges we encounter—be it the planetary crisis or the human crisis—puts us at risk of being left behind as a country. Challenges such as the climate crisis, deteriorating air quality, and the complexity of green energy transition to meet India's climate goals cannot be solved by working in silos. Building partnerships for change is critical. The recognition of this has led us towards a strategy that focuses on building 'ecosystems' that can trigger change.



Through 2022-2023, we have been exploring and cementing partnerships with like-minded organisations to scale up solutions to the grand challenges we are working on. These have taken various forms. With our implementing partners, we are exploring how policy can be effectively implemented and studying the impact on the ground. With government officials, we conduct capacity-building programmes to empower them with the scientific know-how needed to work efficiently. We are sensitising the general public and journalists on climate change and on reporting on relevant activities. With educational institutions, we are building knowledge transfer programmes to equip today's young leaders to understand how technology can shape society and how we can leverage it to propel development in a sustainable manner. This year, our annual report documents these partnerships for change.

I would like to thank Dr Dipankar Banerjee, Mr Munish Sapra, and the Management Committee of CSTEP for their continued support and collective effort towards building a sustainable organisation.

- Dr Jai Asundi

Board of Directors

Chairman, CSTEP



Dr V S Arunachalam
Former Scientific
Advisor to Raksha
Mantri (1982-92),
Padma Vibhushan



Shri Suresh Prabhu
Former Member of Parliament
and PM's Sherpa to G7 & G20
Summits; Former Minister of
Environment & Forests,
Government of India



Shri Prafull Anubhai
Educationist and
Corporate Advisor

Co-Chairman, CSTEP



Dr Dipankar Banerjee
Former Chief Controller
- R&D, DRDO,
Padma Shri



Mr Rajat Gupta
Senior Partner,
McKinsey & Company



Ms Soumya Rajan
Founder, MD & CEO,
Waterfield Advisors



Dr Jai Asundi
Executive Director,
CSTEP

Funders

Domestic

Jamsetji Tata Trust

Narotam Sekhsaria
Foundation

Rainmatter Foundation

Rohini and Nandan Nilekani
Philanthropies

Shakti Sustainable Energy
Foundation (SSEF)

Shri Sivasubramaniya Nadar
Educational and Charitable
Trust

WIPRO

International

Agence Française de
Développement (AFD)

Bill & Melinda Gates Foundation

Bloomberg Philanthropies

British High Commission

Children's Investment Fund
Foundation (CIFF)

Climate Parliament

EDF

European Climate Foundation

European Union

German Corporation for
International Cooperation (GIZ)

Good Energies Foundation

IBM

International Development
Research Centre (IDRC)

International Institute for
Sustainable Development (IISD)

MacArthur Foundation

Next Generation Infrastructures

Oak Foundation

Open Philanthropy

Overseas Development Institute

SED Fund

Sequoia Climate Fund

The Global Green Growth Institute

The Nature Conservancy (TNC)

The World Bank

United Nations Democracy Fund
(UNDEF)

United Nations Development
Programme (UNDP)

United States-India Educational
Foundation (USIEF)

William and Flora Hewlett
Foundation

International Sustainable Energy
Foundation

Collaborations

Government Institutions

Bangalore Electricity Supply Company Limited (BESCOM)

Bureau of Energy Efficiency (BEE)

Central Power Research Institute

Chamundeshwari Electricity Supply Corporation (CESC)

Defence Research and Development Organisation (DRDO)

Department of Defence

Department of Science & Technology (DST)

Government of Karnataka

Gulbarga Electricity Supply Company Limited (GESCOM)

Hubli Electricity Supply Company (HESCOM)

Karnataka Electricity Regulatory Commission (KERC)

Ministry of Environment, Forest and Climate Change (MoEFCC)

Ministry of New and Renewable

Energy (MNRE)

NITI Aayog

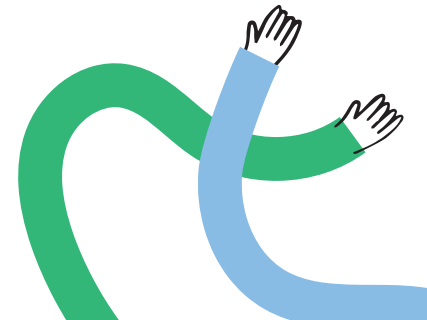
Planning Commission

Power Finance Corporation

Society for Elimination of Rural Poverty (SERP)

The Indo-U.S. Science and Technology Forum (IUSSTF)

University Grants Commission (UGC)



Other Collaborations

Asian Institute of Technology

Atria Power

BRAC University

Carnegie Mellon University

Centre for Policy Dialogue,
Bangladesh

CEPT University

Clean Air Task Force

CEEW

Ecole Polytechnique Federale
de Lausanne (EPFL)

EMPRI

Forge Accelerator, Coimbatore

Indian Institute of Science (IISc)

IIT Bombay

IIT Guwahati

IIT Kanpur

IIT Mandi

Institute for Social and
Economic Change

Institute for Social and
Environmental Transition-Nepal

Integrated Research and Action
for Development (IRADe)

International Institute of
Information Technology
Bangalore (IIIT-B)

Karnataka State Pollution
Control Board (KSPCB)

M.S. Ramaiah University of
Applied Sciences

Pacific Northwest National
Laboratory (PNNL)

PLR Chambers

RAND Corporation

Royal Society of Netherlands

Shell India

St. John's Institutions

Tata Consulting Engineers

TERI

The University of British Columbia

The University of Texas

University of Agricultural
Sciences, Bangalore

University of California, Berkeley

University of Pennsylvania

University of Washington

Urban Emissions

Vellore Institute of Technology

Incorporated under Section 25 of the Companies Act, 1956 (equivalent to Section 8 under Companies Act 2013)

Registered under the Foreign Contribution (Regulation) Act, 2010

Registered as a Wholly Charitable Trust under Section 12A(a) of the Income Tax Act, 1961

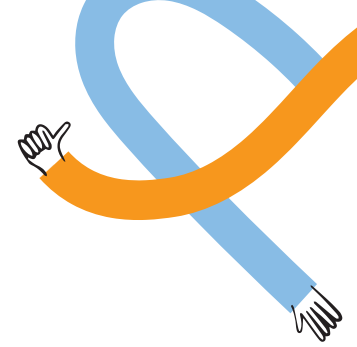
Approved under Section 80G of the Income Tax Act, 1961

Recognised as a Scientific and Industrial Research Organization (SIRO) by the Ministry of Science and Technology

Scroll of Honour



CSTEP has been recognised as one of the 'Top 20 Best Public Policy Companies in India 2023' by Inventiva, a business magazine.



Mr Thirumalai N C, Sector Head, Strategic Studies, and Mr Murali Ananthakumar, Research Scientist, have been nominated as members of the committee constituted by the Department of Science and Technology for preparing a roadmap for the hydrogen valley platform. CSTEP Advisor Dr N Rajalakshmi is the chairperson of the committee.



Dr Indu K Murthy, Sector Head, Climate Environment and Sustainability, has been invited by UNEP, Nairobi, Kenya, to be one of the lead authors for preparing the next Global Environment Outlook (GEO-7) Report, which will focus on finding solutions to the triple planetary crisis faced by humankind, that is, climate change, biodiversity loss, and pollution.



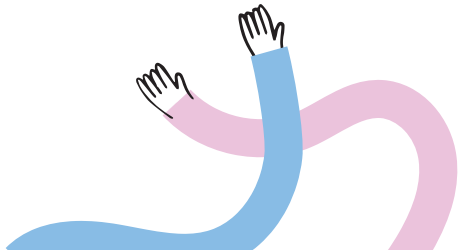
Policy Engagement

Government

1. Member of the Technical Advisory Committee of Experts, MoEFCC
2. Member of the Himalayan Ecosystem Sectoral Working Group of the DST for developing Adaptation Communication to be submitted to UNFCCC by MoEFCC
3. Committee for Hydrogen Valley Ecosystem, DST
4. R&D Task Force, Government of Karnataka
5. Member, Technical Air Research Unit, DST
6. Member of the core group for preparation of the Karnataka State Action Plan on Climate Change
7. Member of India Climate and Energy Modelling Forum, NITI Aayog—a platform for developing policy solutions to support decarbonisation, clean energy transition, and net-zero pathways
8. Green Hydrogen Ecosystem, NITI Aayog
9. BESCOM Rooftop Solar Committee

International

1. Member of Task Group to facilitate work of Inter-Departmental Steering Committee for preparation of India's Long-Term Low Greenhouse Gas Emissions Development Strategy (LT-LEDS) for submission to the UNFCCC Technical Advisory Committee for India's Third National Communication and BURs to UNFCCC
2. Member of Technical Advisory Committee for preparation of India's Third National Communication and BURs to UNFCCC
3. Air Pollution Action Forum Group, UNEP





India's Green Energy Transition

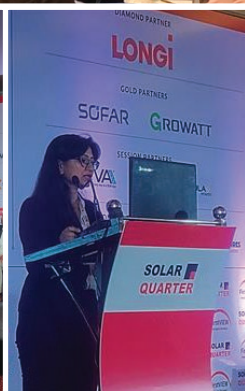
Sunny Days

CSTEP has developed the Rooftop Solar Explorer tool to help policy decisions on scaling rooftop solar. This tool was launched by the Government of Madhya Pradesh in March 2023.

At the event, Shri Sanjay Dubey, Principal Secretary, Department of Energy, Government of Madhya Pradesh, lauded the tool for doing the groundwork to help Madhya Pradesh scale up rooftop solar in the state in its ambitious plan to become the renewable energy hub of India. He said, 'With the Rooftop Solar Explorer, we now have a ready reckoner for understanding MP's rooftop solar situation. Using the tool, we can now develop models that ensure a win-win scenario for all—distribution companies, developers, and consumers.'

Using drones, CSTEP conducted aerial imagery of some cities in Madhya Pradesh to capture their rooftop solar potential. The RTS Explorer draws on CSTEP's experience of using LiDAR (light detection and ranging) technology to map Bengaluru's rooftop solar potential, helping consumers make informed choices on installing solar panels on their roofs.

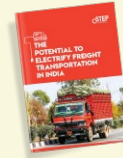
CSTEP is also building an ecosystem of stakeholders invested in the development of the rooftop solar segment. In August 2022, we conducted a round-table conference with these stakeholders and developed a framework to address the low uptake of rooftop solar. We are in the process of engaging with the Ministry of New and Renewable Energy to take the framework ahead.



Highlights



Organised a demonstration of the SiteRight tool along with The Nature Conservancy, Foundation for Ecological Security, and Vasudha Foundation. The tool identifies areas for solar and wind development with less likelihood of socio-ecological conflicts



CSTEP's policy brief 'The Potential to Electrify Freight Transport in India' looked at ways to electrify the freight sector, given its huge environmental burden



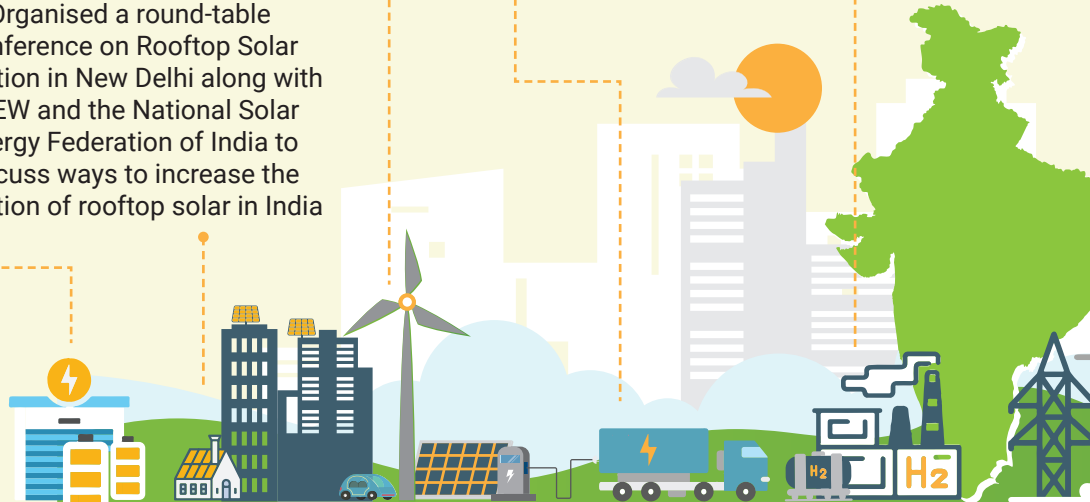
Our report 'Macroscopic Analysis of a Hydrogen Economy' examined the status of hydrogen technologies and envisaged what a hydrogen economy could look like for India



Organised a round-table conference on Rooftop Solar Coalition in New Delhi along with CEEW and the National Solar Energy Federation of India to discuss ways to increase the adoption of rooftop solar in India



CSTEP signed an MoU with the Maharashtra State Electricity Transmission Company to assess energy storage requirements for the state transmission network





We organised a round-table meeting of distribution companies to discuss and understand the challenges faced by them in implementing the PM KUSUM scheme and to chalk out the way forward



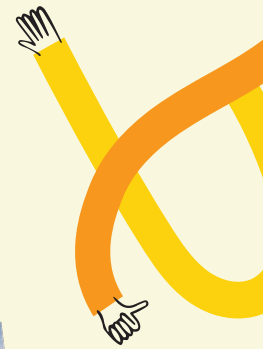
CSTEP was the knowledge partner for the India Rooftop Solar Congress 2023 organised by *Solar Quarter* in Delhi and the Solar Quarter State Business Meet-Kerala in Kochi



Our report 'Techno-economic Modelling of Onshore Wind Power' explored options to optimise wind farms in India



Submitted 'Karnataka Power Sector Roadmap 2032' to the Power Company of Karnataka Limited (PCKL) for the state's smooth transition to renewables





Clean Air for All

Air Lift

CSTEP's flagship event, the India Clean Air Summit (ICAS), has been instrumental in shaping the narrative and driving action on air quality in India. Since its inception in 2019, ICAS has brought together people across disciplines to facilitate meaningful discussions grounded in reality on air pollution challenges, and solutions based on scientific evidence. With UC Davis Air Quality Research Center joining hands with CSTEP to bring its Air Sensors International Conference (ASIC) to India for the first time ever, ICAS 2022 (23-26 August 2022) turned out to be bigger and better than ever.



CSTEP has also been actively engaging with various pollution control boards to come up with city-specific strategies to combat air pollution. Currently, we are working on clean air action plans for 76 non-attainment cities in India.



Following the launch of CSTEP's Emission Inventory and Source Apportionment studies for Bengaluru by the then Karnataka Chief Minister Basavaraj Bommai, we organised a data dissemination and capacity-building event in April along with the Karnataka State Pollution Control Board and the Bruhat Bengaluru Mahanagara Palike to discuss the key findings and challenges with the state government departments.



In Punjab, too, we organised a series of capacity-building workshops in five districts in December for citizen groups, NGOs, and various institutions to create awareness about the health impacts of air pollution.



Highlights



The Centre for Air Pollution Studies (CAPS) team at CSTEP organised a series of capacity-building workshops across Punjab to create awareness around air pollution challenges



The fourth edition of the India Clean Air Summit (ICAS) brought the Air Sensors International Conference (ASIC) to India for the first time. The theme was 'Looking at Air Pollution Through the Climate Lens'



CSTEP is collaborating with IIT Bombay, the University of California, Berkeley, and the University of Washington to develop PAVITRA, an innovative solution to combat air pollution in India





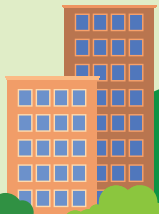
We collaborated with the Ministry of Environment, Forest and Climate Change to conduct a sensitisation workshop for the Tamil Nadu Pollution Control Board



CSTEP conducted a data dissemination workshop to discuss the findings of Emission Inventory and Source Apportionment studies done for Bengaluru



CSTEP partnered with Google to assess the performance of low-cost sensors in Bengaluru



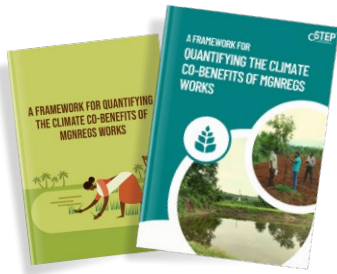


Sustainable and Secure Future

Green Gains

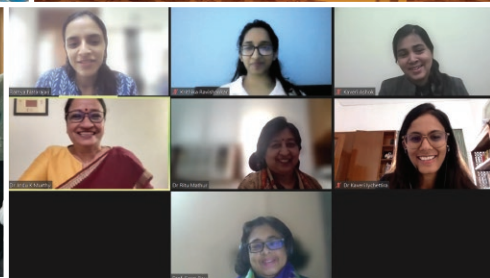
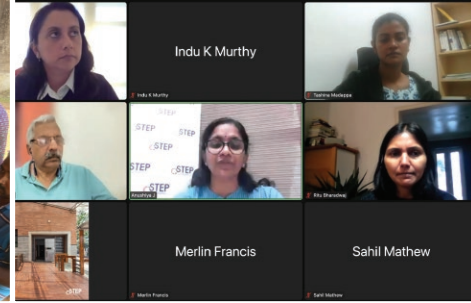
The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), the world's largest public works programme, is reckoned as a rural employment provider. Due to the design of the programme that incorporates land- and water-based asset creation, rejuvenation, and conservation, it delivers substantial climate co-benefits—both adaptation and mitigation—while also building the resilience of the resources and the beneficiaries dependent on them.

CSTEP collaborated with Hindustan Unilever Foundation, Pradan, and Awadh Research Foundation to conduct a field-based rapid assessment of the climate co-benefits from Usharmukti—a massive river rejuvenation programme launched by the Government of West Bengal. Under the assessment, 541 land- and water-based works under the Usharmukti programme were sampled in four districts of



West Bengal (Jhargram, Bankura, Purulia, and Paschim Bardhaman) for their potential to deliver climate resilience, adaptation, and mitigation co-benefits.

Based on the study, CSTEP put forth a monitoring and evaluation framework to guide states in quantifying and reporting the resilience, adaptation, and mitigation co-benefits arising from MGNREGS works. The study highlighted the scheme's potential to enhance rural resilience and aid India's progress toward achieving its climate goals. This is especially crucial in light of India's Nationally Determined Contributions, Sustainable Development Goals, and the reporting requirements for adaptation communications to the United Nations Framework Convention on Climate Change (UNFCCC) from 2024.



Highlights



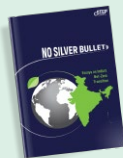
Conducted capacity-building workshops for NGOs on climate change and climate co-benefits of development programmes such as MGNREGS



Published climate atlases for the North Eastern states and Northern states of India, projecting district-level changes up to 2050



Brought out a policy brief on the likely economic impacts of low-carbon policies



Our study 'No Silver Bullet: Essays on India's Net-Zero Transition' asked hard-hitting questions about India's net-zero pathways





Participated in a COP27 side event to discuss the usability of climate models to effectively tackle the climate crisis



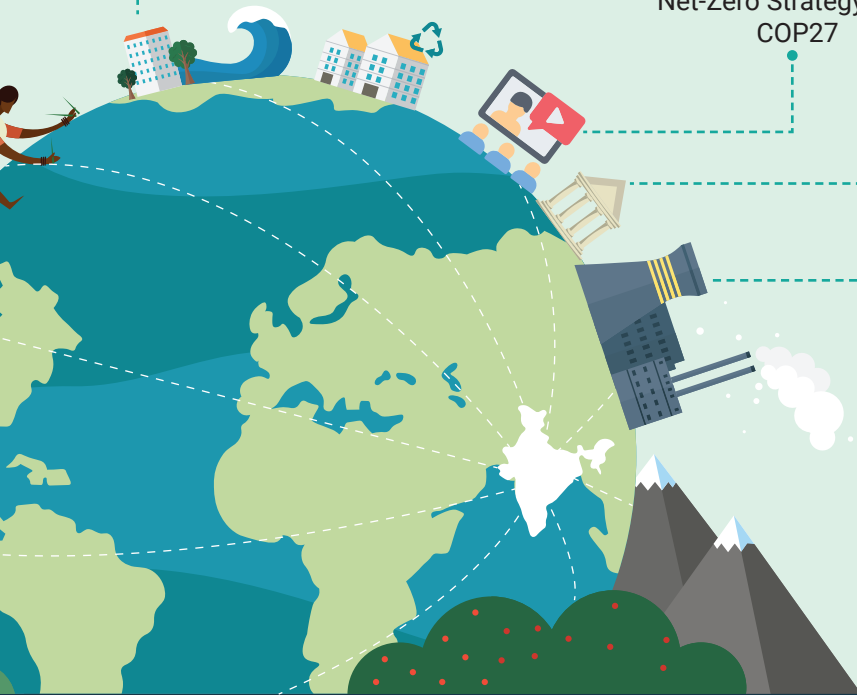
Hosted two webinars—Reflections on Adaptation and Loss and Damage and Considerations for India's Net-Zero Strategy—post COP27



Collaborated with IIT Mandi and IIT Guwahati to conduct capacity-building workshops on climate risk assessment for State Climate Change Cells of the Indian Himalayan Region



Organised and hosted a panel on 'Decarbonising Hard-to-abate Sectors' at the Annual Gas Conclave organised by media house *ETEnergyWorld*





Digital Transformation

Impact Story

Published a report titled 'Artificial Intelligence for Climate Change Mitigation and Adaptation'. The report defined a framework to examine and prioritise use cases, applied the framework to classify use cases in transportation and water management, and made recommendations for the future. The report was featured on the INDIAai portal.



Conducted several Proof of Concepts to test and implement ideas such as models to calibrate low-cost sensors, Google Earth Engine for climate adaptation, and AI for automating solar farm detection and estimating the solar potential



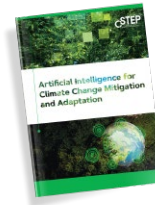
Highlights



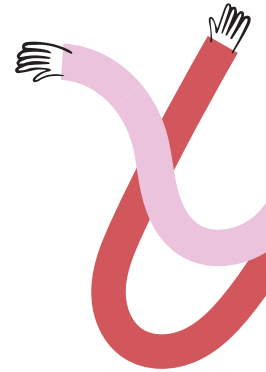
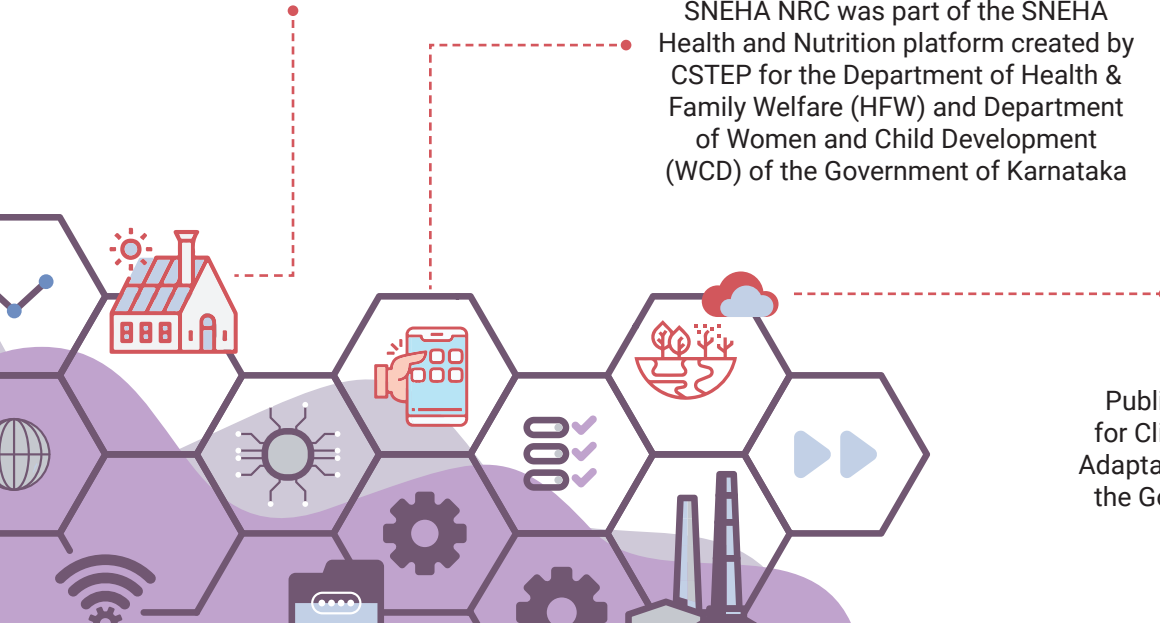
Developed the Rooftop Solar Explorer tool, which was launched for select cities in Madhya Pradesh. The tool enables energy consumers to assess the solar potential of their rooftops and make informed decisions on solar PV installation



Extended support and training to users of the SNEHA NRC app, which is being used in district and taluk Nutritional Rehabilitation Centres in Karnataka. SNEHA NRC was part of the SNEHA Health and Nutrition platform created by CSTEP for the Department of Health & Family Welfare (HFW) and Department of Women and Child Development (WCD) of the Government of Karnataka



Published a report on using AI for Climate Change Mitigation & Adaptation, which was featured on the Government of India's portal for AI, INDIAai



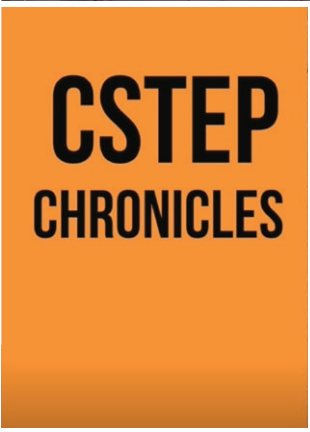


Communication and Policy Engagement

Circle of Influence

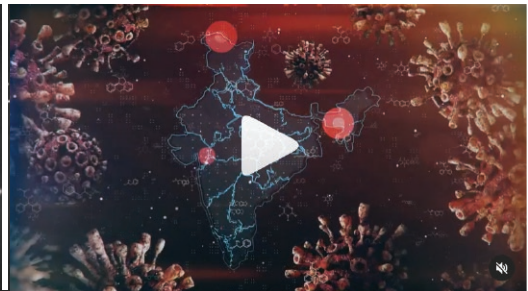
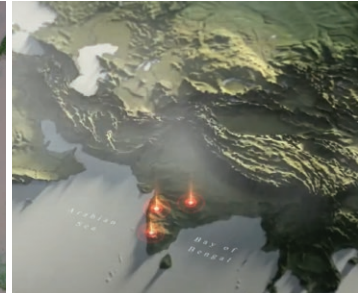
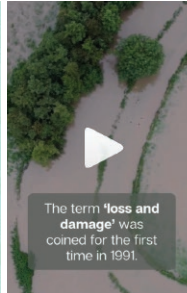
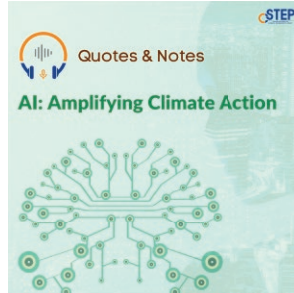
CSTEP has been consistently engaging with media houses to raise awareness on issues such as climate change and India's green energy transition. These engagements have strengthened into partnerships and events.

We partnered with *Mongabay India* to conduct a media sensitisation workshop 'Connecting the Dots'. The event saw the participation of researchers, communicators, and journalists from organisations across India.



We were invited by *ETEnergyWorld* to host a panel on 'Decarbonising Hard-to-abate Sectors' at the World Gas Conclave 2022. Apart from this, CSTEP was also a knowledge partner for *Solar Quarter* and contributed to discussions on national and state solar policies at their India Rooftop Solar Congress 2023 in Delhi and the Solar Quarter State Business Meet-Kerala in Kochi.

CSTEP also collaborated with the Department of Science and Technology to create a promotional video, 'India's Hydrogen Valley Platform', demonstrating how the entire value chain of hydrogen (production, storage, and transportation) fits together in an integrated system approach. This video was screened at the launch of the Hydrogen Valley Platform, India.



Highlights



Collaborated with the Department of Science and Technology, Government of India, to create a promotional video on 'India's Hydrogen Valley Platform', demonstrating how the entire value chain of hydrogen (production, storage, and transportation) fits together in an integrated system approach



Conducted a media sensitisation workshop, 'Connecting the Dots', along with *Mongabay India*, for researchers and communicators across organisations



Kick-started 'CSTEP Chronicles', a new video series where researchers share their work with the next generation of science enthusiasts

Number Crunching

04 Media Partnerships

09 Guest Lectures

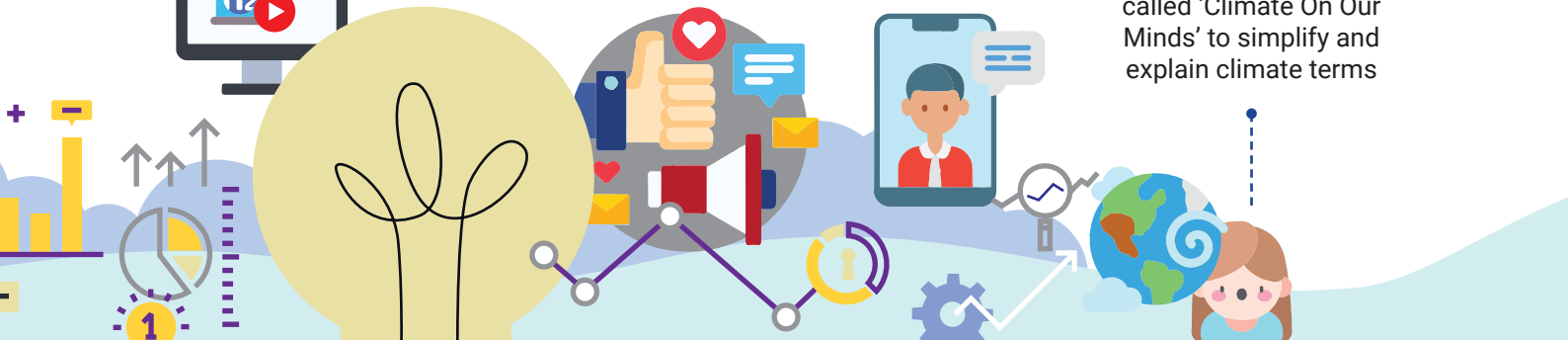
05 Group Talks

06 Podcasts

55 Videos



In the run-up to COP27, ran a series of blogs called 'Climate On Our Minds' to simplify and explain climate terms



Footprint

Publications

70 
Opinion Pieces


10 
Journal Articles

324 
Media Citations

10 
Research Reports

07 
Policy Briefs

20 
Blogs

02 
Technical Notes

Events

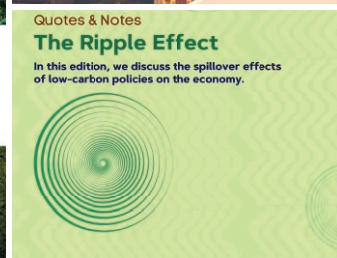
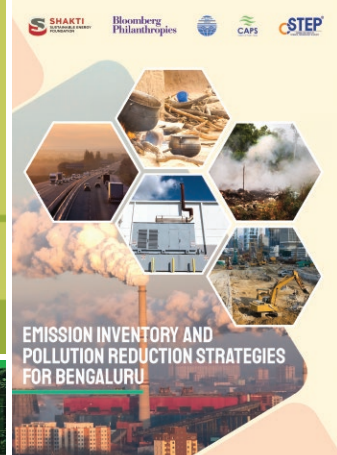
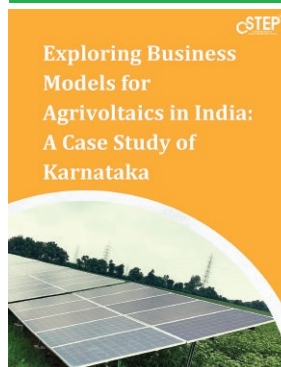
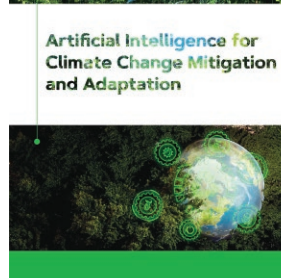
17 
Hosted/Co-organised

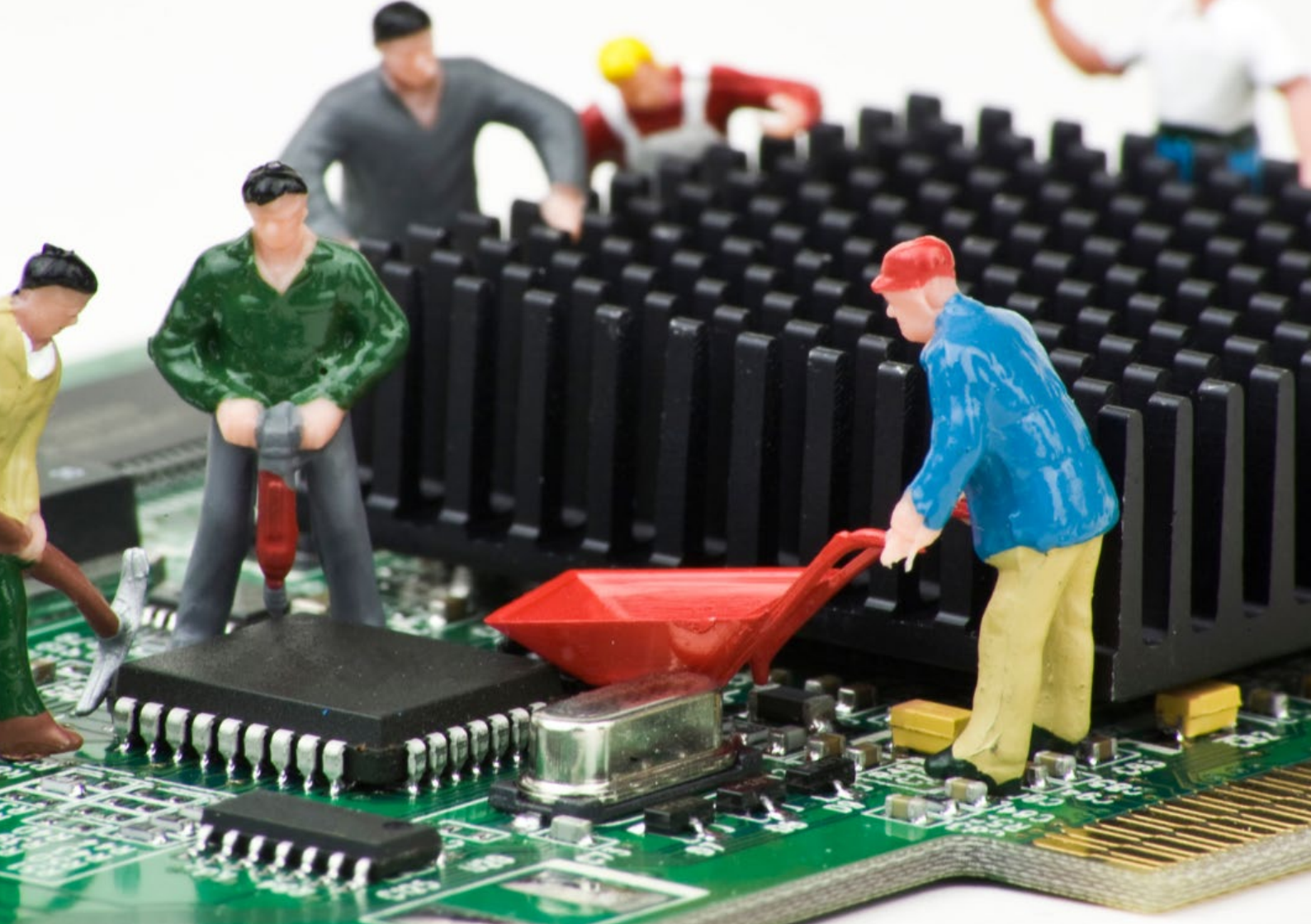
Trainings

11 
Capacity-buiding Workshops
for External Entities

MoUs

08 





IT



Increased Compute Capability

Added an 8-node high-performance computing (HPC) cluster with 25 teraflops to the existing HPC capability. This takes the total HPC capacity to 35 teraflops, enabling researchers to run advanced weather and air quality simulations and modelling with improved speed and efficiency.



Secured the IT Infrastructure

Multi-factor authentication has been used to prevent unauthorised access and secure internal applications. Email threat policies were updated and proactive security measures implemented to foster a culture of cybersecurity awareness among the staff.

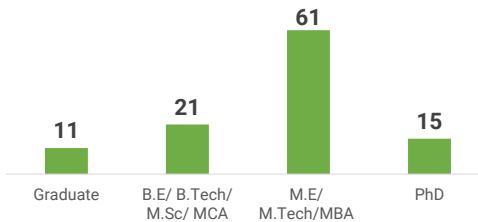
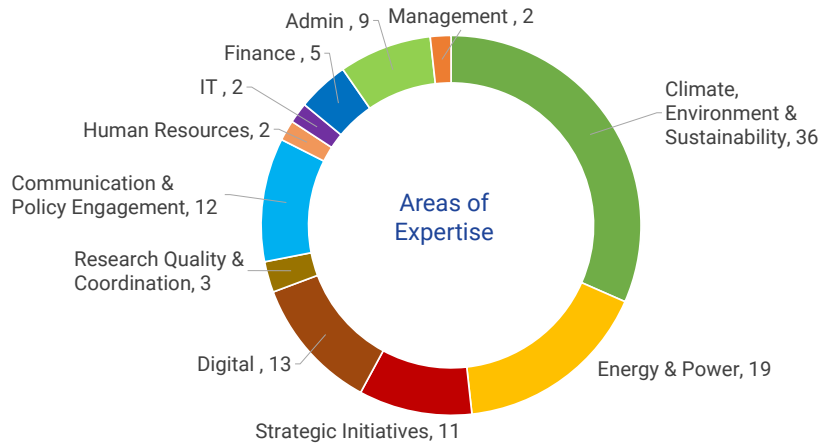


Improved Reliability

Monitoring tools such as Zabbix have been installed to monitor physical and virtual workloads. With real-time monitoring capabilities, potential anomalies get detected and flagged early on, enabling the IT team to address issues before they disrupt operations, thus improving the availability and reliability of the service. Backup procedures have also been upgraded to improve data security and archiving.



Human Resources



Educational Qualification



Gender Ratio





CENTER FOR STUDY OF SCIENCE, TECHNOLOGY & POLICY

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