



Climate Resilience and the Energy Transition: Converting Risks into Opportunities for Sri Lanka

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Founder-CEO, CEEW

7 May 2024

Sri Lanka Climate Summit – CEO Session

Impacting sustainable development at scale with data, integrated analysis, and strategic outreach

TRANSFORMATIONS

Low-carbon Economy

Energy Transitions

Power Markets

Industrial Sustainability

Sustainable Livelihoods

QUALITY OF LIFE

Clean Air

Sustainable Water

Sustainable Food Systems

Sustainable Cooling

Sustainable Mobility

ENABLERS

Sustainable Finance

Technology Futures

Circular Economy

Climate Resilience

International Cooperation

250+

Multidisciplinary team

380+

Peer-reviewed publications

190+

Instances of increased data transparency

540+

Roundtables & conferences

20+

Indian states engaged

130+

Bilateral & multilateral initiatives promoted

SPECIAL INITIATIVES

CEEW Centre for Energy Finance

Powering Livelihoods

Emerging Economies

UP State Office

WHAT AM I
FORGETTING?

What is the science telling us?

Parul

We are at a critical time frame to address the planetary emergency

Planetary Boundaries

describe limits to the impacts of human activities on the Earth system, beyond which the environment **may not self-regulate**

6/9 scientifically identified Planetary Boundaries breached

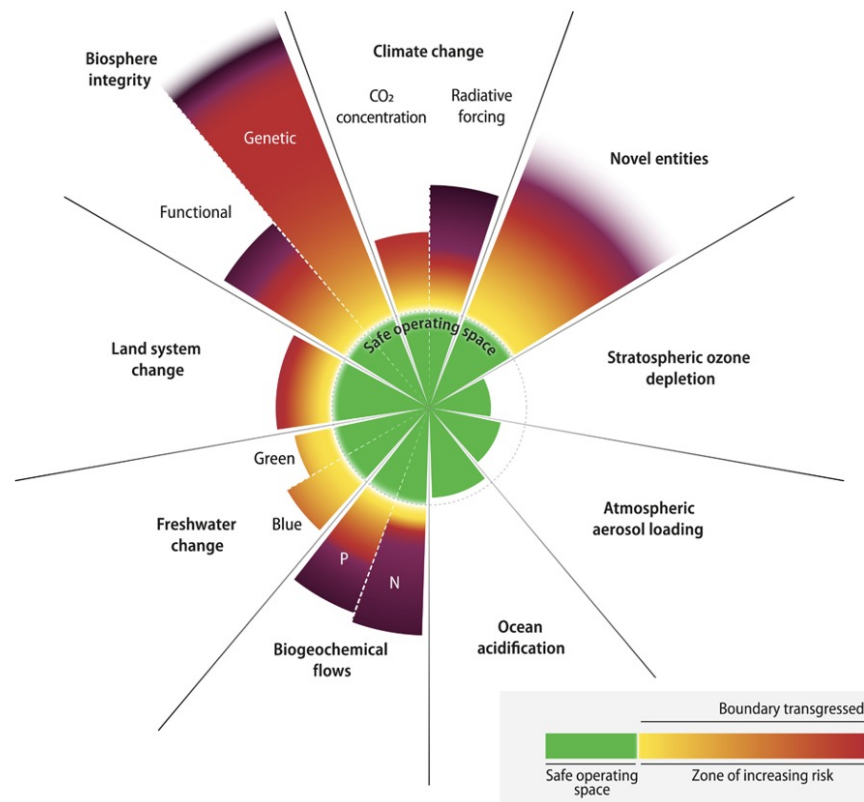
leading to a **Planetary Emergency**

Only 6-7 years remain

to implement action to stabilise global temperatures near 1.5°C, and **prevent climate overshoot**; currently, we are on track for ~2.7°C

Cause for urgency

- **Developed countries will overshoot** targets by 38% by 2030 and are projected to collectively emit ~3.7 Gt of extra CO₂ in 2030
- **Remaining carbon budget of 500 Gt of CO₂** will be depleted by 2030



Numerous climate overshoot implications for EMDEs & SIDS

WHO WE AREWHAT WE DOOUR IMPACTGET INVOLVED

HOME / BLOG / AFFORDABLE CLIMATE INSURANCE IS NEEDED IN THE POOREST AND MOST VULNERABLE COMMUNITIES.

Affordable climate insurance is needed in the poorest and most vulnerable communities.

NOVEMBER 17, 2022

TOPICS ▾REGIONS ▾

GREEN JOBS

Green jobs: A solution to youth employment and the climate crisis?

10 August 2023

ARTICLE

The Geopolitical Challenges of Geoengineering—and Geoengineering’s Challenge to Geopolitics

By [Oliver Morton](#) on September 30, 2020

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PRESS

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Press release

Weather-related disasters led to 43.1 million displacements of children over six years - UNICEF

River floods alone projected to displace almost 96 million children over next 30 years, new analysis shows

06 October 2023

in stories

dia ▾

‘World's breadbaskets’ are sinking, General Assembly chief warns

Coastal protection measures are being undertaken in India due to rising sea levels.

51

Source: Birkmann, Joern, et al./ Poverty, livelihoods and sustainable development/ IPCC (2023); Reducing the Risks of Climate Overshoot/ Climate Overshoot Commission (2023); Prasad, Sumit, et al./ Unpacking Pre-2020 Climate Commitments/ CEEW (2021); Mycoo, Michelle, et al./ Small Islands: Impacts, Adaptation and Vulnerability/ IPCC (2022). Thomas, Adelle, et al./ Climate Change and Small Island Developing States/ Annual Review of Environment and Resources

CEEW
THE COUNCIL

Climate risks for Sri Lanka

30/180

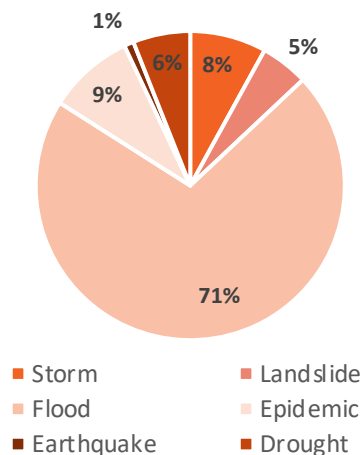
Global Climate Risk Index 2021

62nd most vulnerable and the 99th most ready country

Climate vulnerabilities and country readiness (2021)

- Total recorded direct economic damage (1990-2018):
~USD 7 billion
- Costs due to flood-related calamities (1990-2018):
~USD 2 billion

Frequency of disasters (1990-2020)



Key trends and projections



0.8-2°C increase in temperatures by 2060; increase in both daily maximum and minimum temperatures



Number of days surpassing 35°C, could rise from **20 days to more than 100 days** by 2090



20-58 cm rise in sea levels by 2060 (compared to 1971-2010)



Expected increase in frequency and severity of **extreme weather events** (drought and cyclones)



Decrease in water availability for drinking, agriculture, power, and hydropower generation



Loss of **ocean biodiversity**, damage to **coastal infrastructure** and **groundwater salinisation**



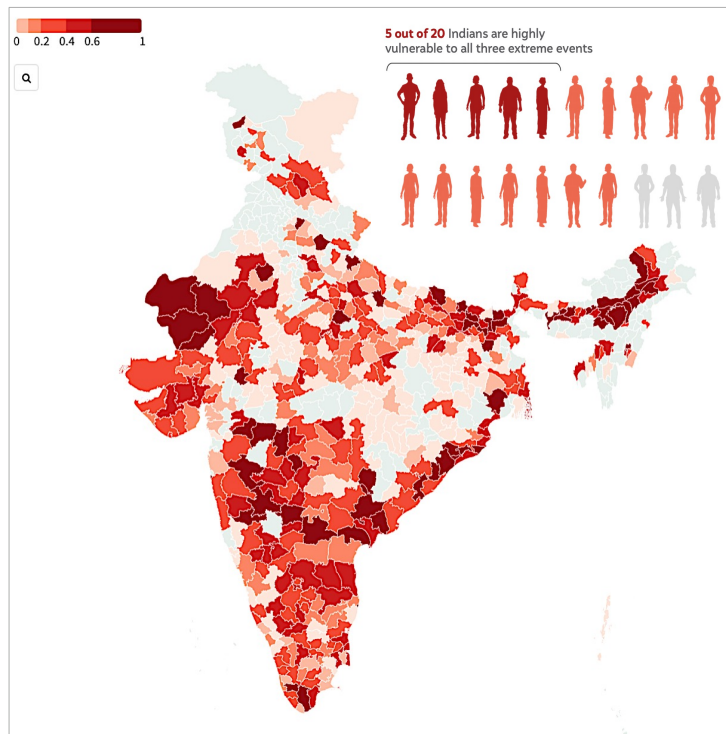
Increase in energy costs and **decrease in economic output**

Annual expected sector-specific loss from natural disasters = **0.50% of GDP, 3% of total government expenditure**

India remains highly vulnerable to the changing climate

As analysed by hyper-local assessments

More than 75% of Indian districts are extreme events hotspots



80%

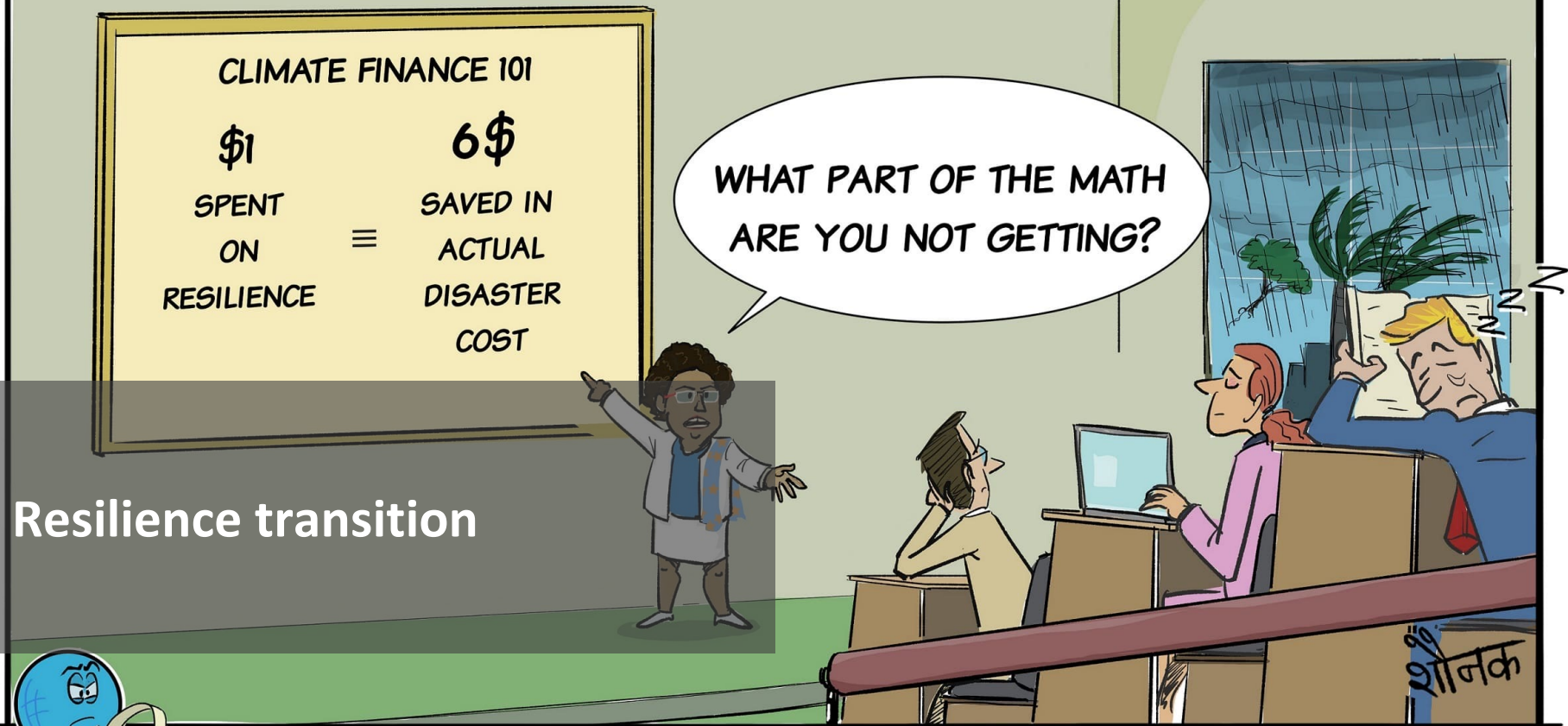
Population residing in districts highly vulnerable to extreme hydro-met disasters

12x

Increase in associated cyclonic events between 1970-2019

20x

Increase in associated flood events between 1970-2019



Risk Assessment Framework

Risk translates to vulnerability with increased exposure to hazards

The **potential occurrence** of climate-related physical events or trends or their physical impacts.
Eg. floods, cyclones, droughts



$$\text{Risk}^* = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability}$$

The **propensity** or predisposition to be adversely affected



The **presence** of people, livelihoods, species or **ecosystems**, environmental functions, services, resources, **infrastructure**, or economic, social, or cultural **assets** in places and settings that could be adversely affected

Eg. percentage of industries located in the flood-prone area

Sensitivity

The **degree** to which a system or species is **affected**, by climate change

Eg. LULC pattern, slope, elevation



Adaptive Capacity

The ability to **adjust to potential damage**, to take advantage of opportunities, or to **respond** to consequences

Eg. how quickly does the industry regain function?



The building blocks of climate resilience



The infographic features a central title 'The building blocks of climate resilience' in blue text. Below the title are four 3D blocks of different colors (orange, blue, grey, and green) arranged in a staggered fashion. Each block contains text describing a specific component of climate resilience. The background consists of a light grey grid pattern.

Heat action plans for cities

City-level heat action plans considering the current and projected impacts of felt heat

Vulnerability assessments and periodic updates

Hyper-local climate risk and vulnerability indexes and assessments of changing patterns

Industrial resilience

Strengthening supply chains, institutional readiness, structural safety, and financial preparedness

Building resilience at the district and city levels

State government capacity building and comprehensive state action plans for climate change

The need for climate risk assessment of Sri Lanka's industries

GDP growth rate for 2023 = **-2.3%**

Sectors contributing to Sri Lanka's GDP	Services 59.9%	Industry 25.6%	Agriculture 8.3%
Growth in 2023	- 0.2%	- 9.2%	+2.6%
Labour force share	49.6%	25%	25.4%

Climate-resilient industries could prevent economic losses

Physical risks

Risk of **physical damage and disruption** to people, property and productivity

E.g., damage to property and infrastructure due to floods, droughts, and wildfires

Transition risks

Risks arising from **policy changes** for transition away from fossil fuels

E.g., decarbonisation of a firm's portfolios accrues costs, exposing them to transition risks

Direct impact of climate change on industries

Floods & extreme rain



Water logging in industrial facilities



Supply chain risk due to transportation challenges

Cyclones



Damage to physical assets



Power outages

Heat stress



Decrease in worker productivity



Industrial explosions or chemical leaks

Droughts



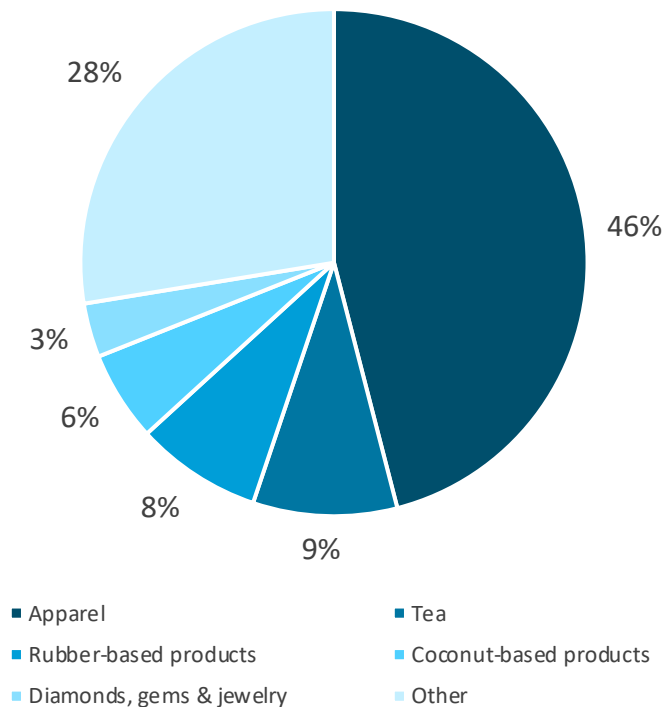
Reduced agricultural productivity



Water supply risks

Sri Lanka's major industries and how they will be impacted

Export composition for Sri Lanka



~19.5%

of Sri Lanka's GDP is through its exports

66%

of Sri Lanka's exports is composed of its top 5 exports

Due to industrial climatic risk –

Climate risk & vulnerability

Impact on raw materials, water stress, supply chain risks, decline of worker productivity, damage to physical assets

Dip in exports and decline in GDP

Schroders

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FOOD AND ECOLOGY

\$65 billion in apparel export earnings at risk due to extreme heat and flooding

13/09/2023



Tea industry contends with environmental and social problems

Solutions lie in reducing the sector's environmental footprint and building resilience against climate change effects in a rapidly warming world, say experts.

Sean Mowbray

Mar 23, 2024 · 10:00 pm



Examples of global best practices to manage industrial climate risks

Global best practices



- Water management plan
- Reduced water intake by 6 million m3/year



- Use real-time data to identify climate-related events and map them against the suppliers



- Insurance cover and in house veterinary care for livestock

Indian best practices



- Analyse hazards and their hotspots for operation locations
- Maximise water recycling within the plants



- Risk management process which informs about climate change risks on their assets and supply chain



- Builds resilience of farmers by choosing varieties with different growth durations, or changing crop rotation

Climate adaptation strategies for industries

 Institutional mechanisms	 Structural safety	 Institutional readiness	 Financial preparedness	 Technology & innovation
Emergency plan/ business continuity plan	Raised platform for major capital assets	Recovery time objective for critical operations	Presence of emergency funds	Climate-controlled warehouse and distribution centres
Climate-related disclosures focused on physical risks	Presence of storm water drains	Alternative sourcing for raw materials from high-risk areas	Assets covered under insurance	Industrial research & development

Tap into international initiatives for resilience

Coalition for Disaster-Resilient Infrastructure (CDRI) and Infrastructure for Resilient Island States (IRIS)

CDRI is a **global partnership** that aims to promote the **resilience of infrastructure systems** to climate and disaster risks, ensuring sustainable development

Sri Lanka has been a member of CDRI since November 2019



India jointly introduced IRIS during
COP26's World Leaders Summit
as a flagship programme under CDRI

2023: Funding for 11 projects in 15 countries

Intended outcomes

- 1 Improve climate resilience of SIDS infrastructure
- 2 Strengthen knowledge and partnerships for SIDS
- 3 Promote gender equality and disability inclusion

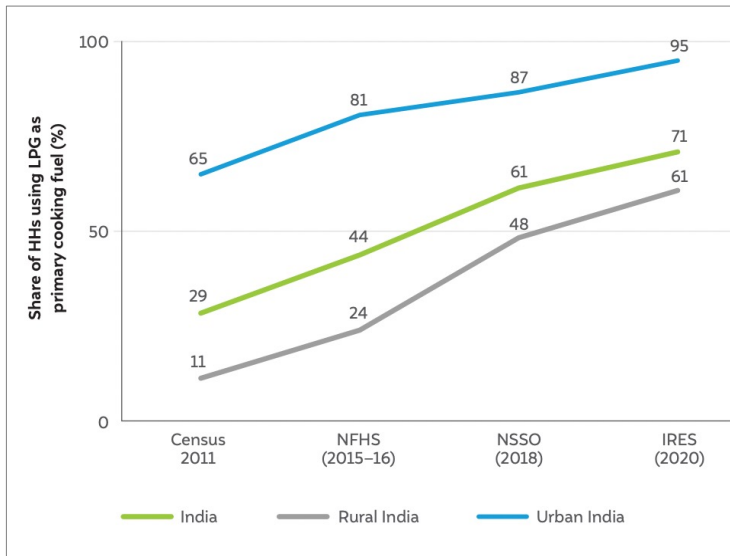
I'D LIKE
MORE SOLAR
AND WIND,
PLEASE!

Energy transition

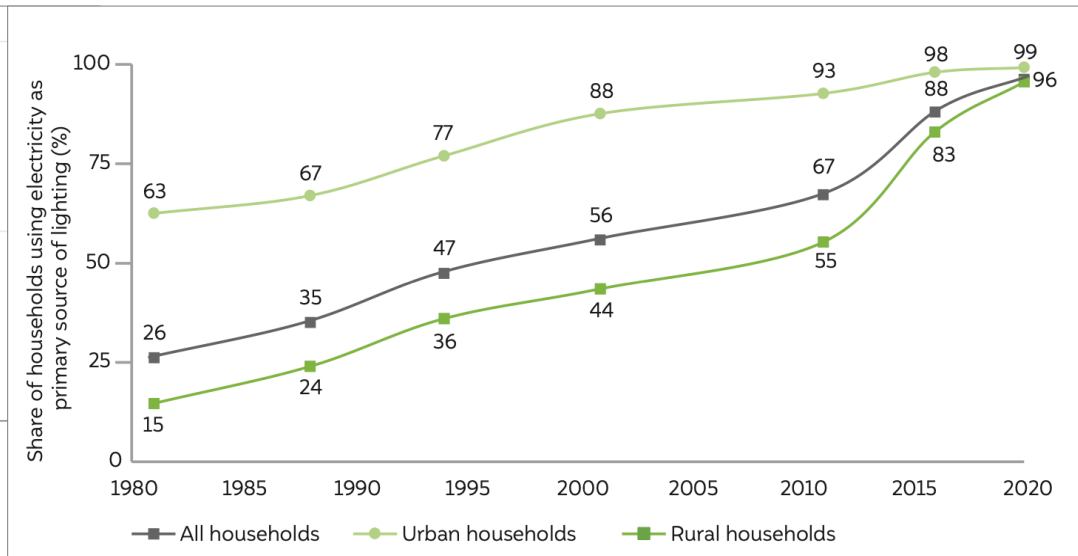
⚡ THE POWER MEAL ⚡

Access to energy as the first of many energy transitions for India

Three out of every four Indian homes use LPG as their primary cooking fuel



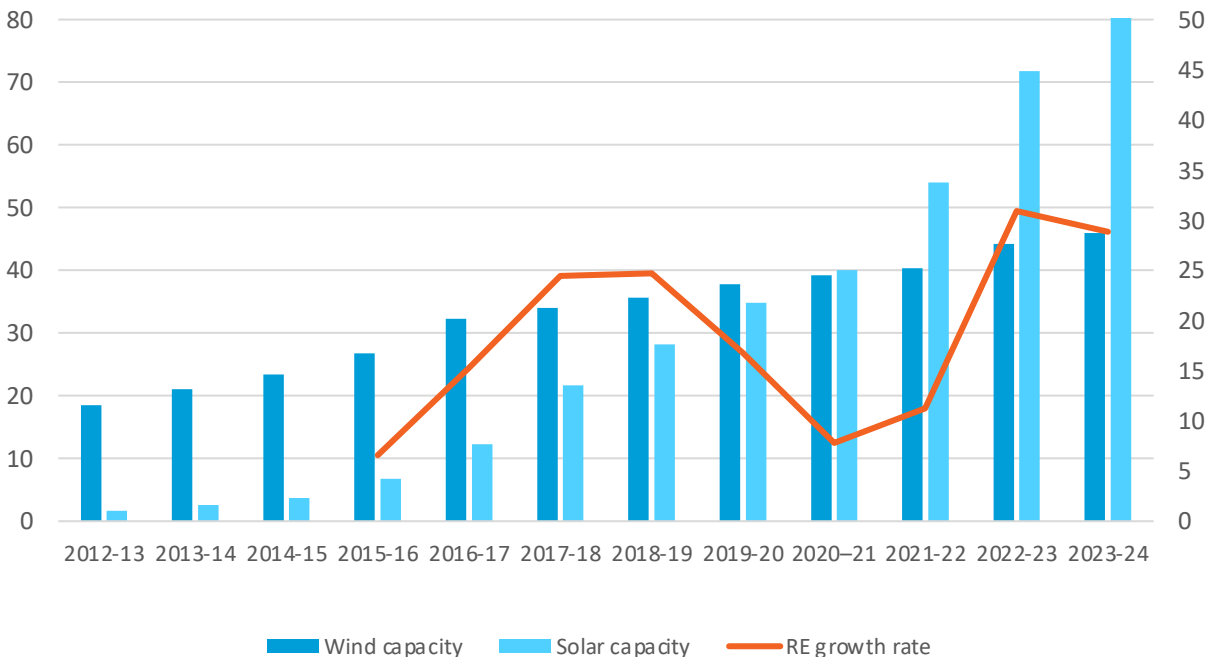
800 million Indians have been brought out of darkness over the last two decades



India's (RE)volution

India's total non-fossil installed capacity stands at **198.75 GW**, making up **~45%** of the installed generation capacity

Renewables installed capacity growth rate for India, focusing on solar and wind



4th
Largest renewable
energy installed
capacity globally

4th
Largest wind
energy installed
capacity globally

388%
Increase in installed
RE capacity since
2014

4th
Largest solar
energy installed
capacity globally

Energy-efficient appliances: Sri Lanka's commitments and India's progress

Sri Lanka's NDCs commit to energy efficiency (EE) and demand-side management:

Energy saving of **2,603 GWh** by phasing out incandescent bulbs, of **5,189 GWh** through efficient lighting, fans, refrigerators, and chillers

India's progress in energy efficiency and demand-side management:

EE lighting

- **Deployment:** ~370 million LEDs (bulbs + streetlights) since 2015
- **Price reduction:** From INR 400 in 2014 to INR 40-60 by 2020
- **Market growth:** 130x growth in LED market in 5 years
- **Energy savings :** 47,773 million kWh
- **Cost savings per year:** USD 2.2 billion (INR 19,109 crore)



EE cooling

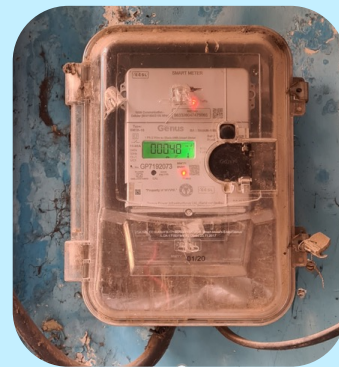
- **Market share for EE inverter split ACs:** 77%
- **Deployment of EE fans in 2023:** 10 million
- **Emission reduction:** ~300 million tonnes CO2 annually by 2040
- **Investment potential:** USD 1.6 trillion



Smart meters

Smart metering status as of May 2024:

- **Target:** 250 million by 2025-26
- **Sanctioned:** 222 million
- **Installed:** ~11 million



Sri Lanka's NDC targets reflect its renewables potential

- 1 **70% RE in electricity generation by 2030**
- 2 **Carbon neutrality by 2050 in electricity generation**
- 3 **No capacity addition of coal power plants**

Hydro-power: Additional 300 MW
Wind power: 800 MW
Solar power: 2,000 MW

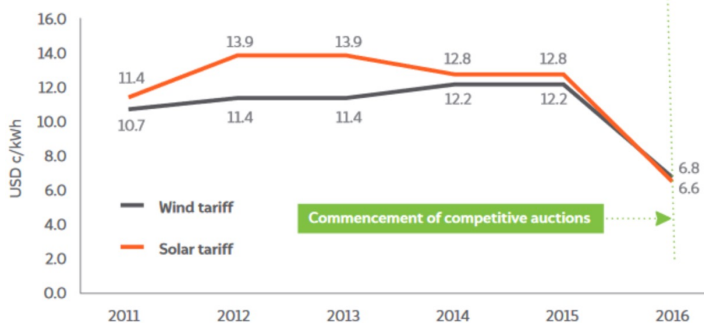
**Carbon
Neutrality by
2050**

Sector-wise • **Power:** 25%
GHG emissions reduction • **Mobility:** 4%
• **Industry:** 7%

USD 140 billion
is the total investment required to implement the strategic plan

USD 54-56 billion
is the total investment required for 100% RE in electricity generation in the power sector

Sri Lanka's wind and solar market opportunity



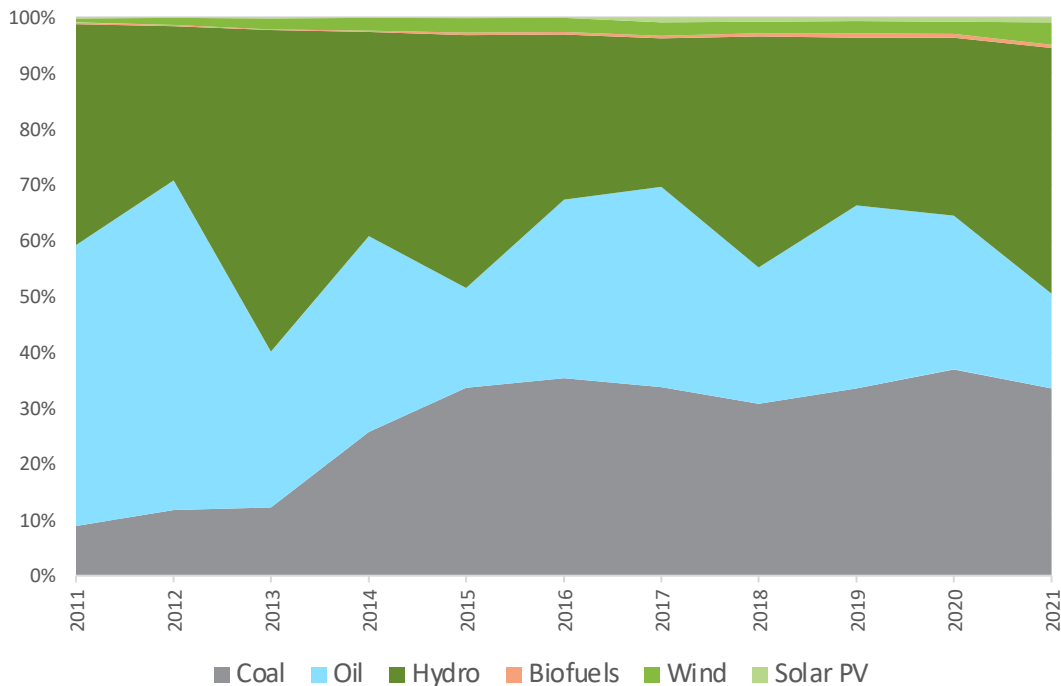
- Competitive auctions facilitated **sharp declines in solar and wind tariffs**
 - Current solar tariffs in India are at **3 USD c/kWh**
- **Estimated potential:**
 - **16,000 MW solar**
 - **30,000 – 50,000 MW wind**

Overall trend of decline in the cost of RE (2010 – 2022)

- **LCOE of onshore wind cost 52% less** than the cheapest fossil fuel-fired solutions, in contrast to being 95% higher
- **LCOE of solar PV cost 29% less** than the cheapest fossil fuel-fired solution, in contrast to being 710% higher

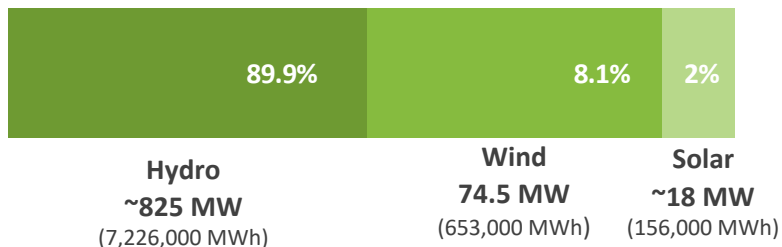
Sri Lanka's energy mix calls for a boost in renewables

Evolution of electricity generation sources in Sri Lanka (2011 – 2021)



Renewables' **share of electricity generation** in 2021 was **49.5%**

Most of this is owed to hydro



But, to tap into this market opportunity, Sri Lanka needs more grid capacity

Sri Lanka would need *policy support* and *financing* to implement solutions:

- 1 **Interconnection of transmission grids**
with neighbouring countries like India, to enable power trading and increase overall grid capacity
- 2 **Implementation of smart grid technology**
to increase grid reliability, cost-effectiveness and efficiency, and enable demand-side management through smart meters

India-Sri Lanka power grid connectivity plans

News / Business / India, Sri Lanka working to link power grids via undersea transmission line

India, Sri Lanka working to link power grids via undersea transmission line

The proposal is to link Sri Lanka's north central town of Anuradhapura and Chennai, the capital of Tamil Nadu state in India through a direct power line. After a 130-km overland transmission line in India, an undersea line will emerge at Thiruketheeswaram in Mannar in northeast Sri Lanka.

By PTI
New Delhi | Updated: March 5, 2024 18:13 IST

NewsGuard



Key features

- **USD 1.2 billion** undersea transmission line investment
- **Cost reductions** for Sri Lanka's RE
- **Investment opportunity** for the private sector

Ensuring success and returns through precedents & expertise

Business News > Industry > Energy > Power > India emerges reliable cross-border electricity provider to Nepal & South Asian partners

India emerges reliable cross-border electricity provider to Nepal & South Asian partners

By Dipanjan Ray Chaudhury, ET Bureau · Last Updated Oct 13, 2021, 10:14:00 PM IST

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Success Story of India-Nepal Power System Operation

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Abstract—This paper traces the evolution of India-Nepal electricity interconnection over the years. The authors outline the key aspects for ensuring the reliability and security of the interconnection. The important aspects for synchronous operation of the India-Nepal interconnection are also mentioned in the paper. The authors conclude with the benefits accrued cross-border interconnection and explore the future opportunities.

Keywords—Cross-Border, India, International, Market, Nepal

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The study by National Renewable Energy Laboratory (NREL) [1] examined the technical and economic impacts of trade on both systems in the year 2022 through production cost modelling. The study finds significant opportunities for increased trade between Nepal and India.

II. INTERCONNECTIONS BETWEEN INDIA AND NEPAL

As depicted in Fig.1, the Western and Eastern part of Nepal electricity grid is interconnected in radial mode with the Northern and Eastern regional grid of India respectively at 11 kV, 33 kV, 132 kV and 220 kV (soon to be unravalled to

Home > Economy

India working on connecting South East Asian power grids to Europe via Middle East

Updated - September 15, 2023 at 10:17 PM.

Power Minister RK Singh said that India recently signed a memorandum of Understanding with Saudi Arabia,

Success Story of India-Bangladesh Power System Operation

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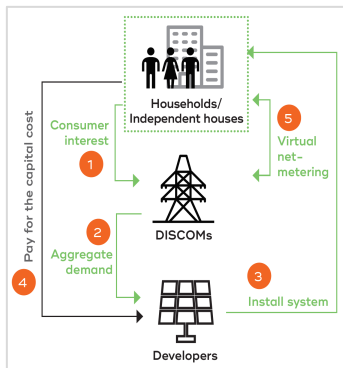
Abstract—This paper follows the evolution of electricity grid interconnections between India and Bangladesh over time. The governance, policy, and regulatory framework facilitating the cross-border exchange is elaborated. The power system scenario in terms of demand and generation of both countries is also discussed. The major operational aspects, viz. operational coordination, data & voice communication, scheduling & dispatch, reactive power management, protection aspects, system protection schemes, outage coordination, and resilience are examined. Future outlook for examining the energy

resources, pooling of reserves, improving resilience, avoiding renewable curtailment. An NREL study found that import of 1 GW wind power from Tamil Nadu (India) would offset 3.4 TWh of peaking power from oil-based generation in Bangladesh, resulting in savings of US \$175 per MWh substituted, while reducing CO2 emissions by 5.5% at the same time [4]. An ITRADE study modeling the 2030 and 2045 scenarios concluded that import from India is the second most economical option for meeting future demand in Bangladesh.

DISCOM-led business models and government schemes for rooftop solar

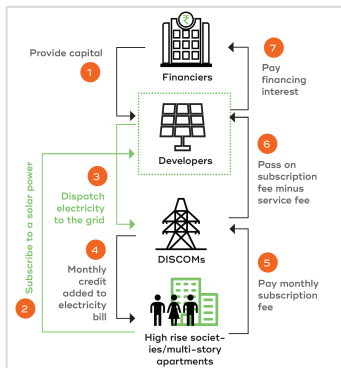


For the roofless: Community solar – upfront payment



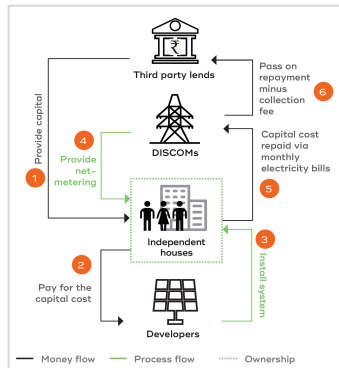
Consumers realise 5-10% savings on a monthly bills

For the roofless: Community solar – subscription mode



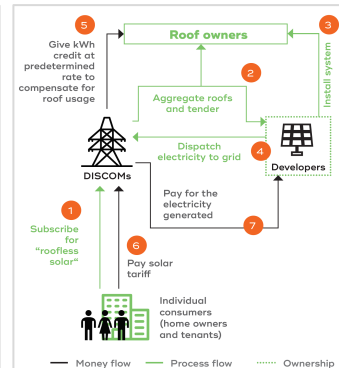
DISCOMs can realise a profit of INR 0.37/kWh

For the creditless: On-bill financing model



Suitable for large consumers with independent rooftops

For all: Solar partners model



Savings are independent of the system size and of community load savings

Lessons from India, opportunities for Sri Lanka to develop RTS

- Scale via savings for utilities
- RTS, an integral part of RE policies
- Subsidies for grid-connected RTS projects

PM
Suryoday
Yojana

USD 1.2 bn (INR 10,000 crore) allocated

Up to 300 units of free electricity every month for 10 million households

Savings up to **USD 180-215** (INR 15,000-18,000) p.a. for households; **USD 26 billion** (INR 2 lakh crore) for DISCOMS in the next 25 years

20-25 GW of rooftop solar capacity would be supported

Opportunities to leverage – ISA, green ammonia and hydrogen, hybrid RE



- Launched at COP21 to mobilise **USD 1 trillion** for **solar energy solutions by 2030**
- **119 countries** signed the ISA Framework Agreement
- **97 countries** are full members
- Achieved '**observer**' status at the UNGA in 2021
- **For Sri Lanka:** Global Solar Facility, task force for feasibility studies and project design, USD 1.4 billion line of credit by India

July 2023: Implementation of the Sampur Solar power project and LNG infrastructure, cooperation in green hydrogen and green ammonia

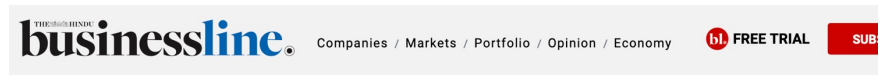
News / India / Ports to UPI to green energy, India and Sri Lanka deepen economic ties

Premium

Ports to UPI to green energy, India and Sri Lanka deepen economic ties

Vision document based on five pillars unveiled by two sides

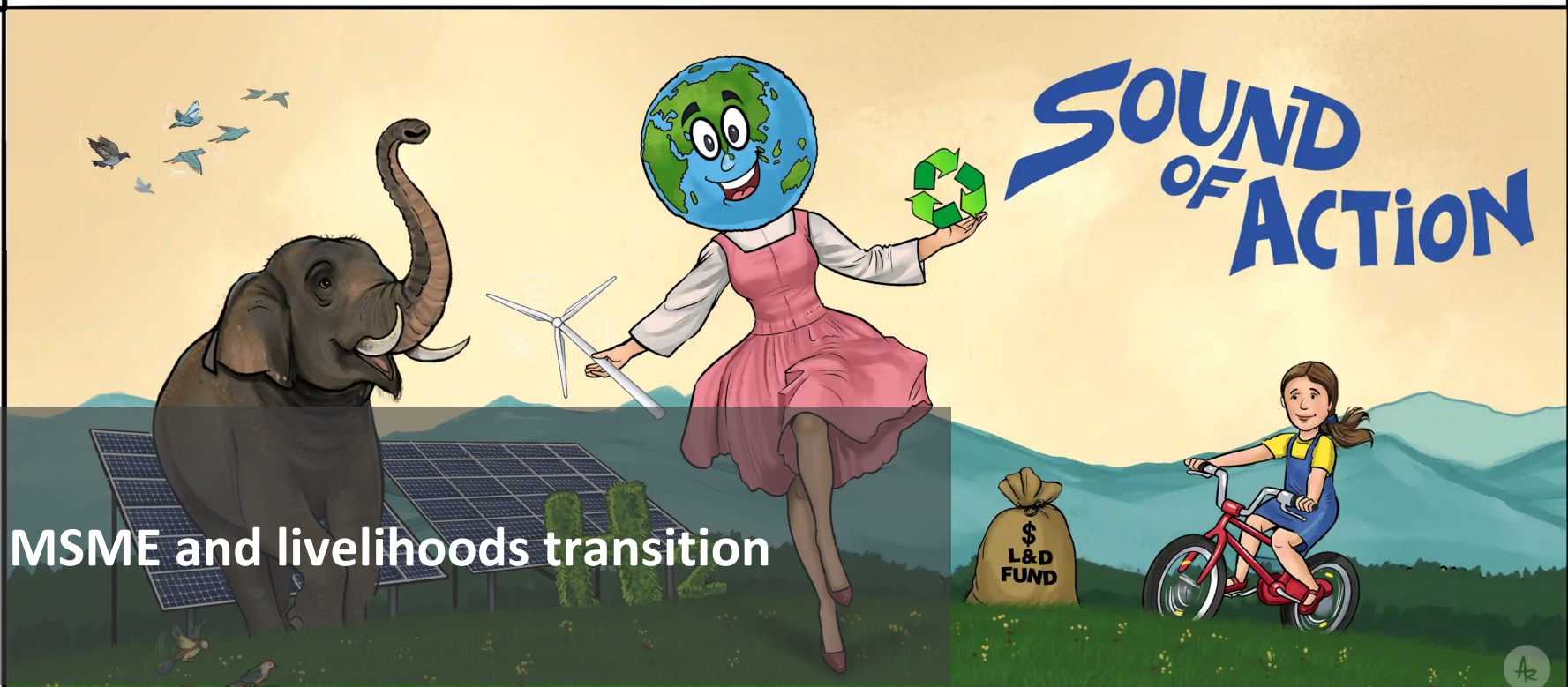
March 2024: Hybrid RE system; USD 11 million grant from India to Sri Lanka



Home » News » National

Indian firm set to build hybrid power systems in Sri Lanka's northern islands

Updated - March 01, 2024 at 09:10 PM.



MSME and livelihoods transition

Starring **RENEWABLES** **GREEN FINANCE** **CIRCULAR ECONOMY** **CLEAN AIR**
Carbon Credits **DECARBONISED INDUSTRY** **SUSTAINABLE MOBILITY** **SUSTAINABLE FOOD**



Need for Sri Lanka's MSMEs to transition for sustainable development

- MSMEs contribute to **over 52% of Sri Lanka's GDP**, and are the backbone of the Sri Lankan economy
- Risk to MSMEs means **risk to more than half of Sri Lanka's GDP**
- MSMEs employ **over 45% of Sri Lanka's labour force**
- Transition of MSMEs provides an **investment opportunity** for public and private stakeholders



Decarbonisation through electrification & cleaner fuels

- Reduced reliance on fossil-fuel-based energy sources
- Reduced costs



Adoption & innovation of energy efficiency technology

- Reduced energy consumption due to increased efficiency
- Reduced operation and management costs



Skilling and capacity building for livelihoods transition

- Better adoption of clean energy alternatives
- Creating livelihoods for a just transition

How can MSMEs transition and increase incomes?

A phase-wise solution to Moradabad brass cluster's energy transition from coal to natural gas

BEFORE: Brass-casting artisans operating in their units using coal



AFTER: New natural gas-based furnace design for *green brass*



India is powering livelihoods through DRE

CHALLENGES AND POTENTIAL

770 million

People lack access
to electricity

2.6 billion+

People do not have
access to clean cooking

150 million

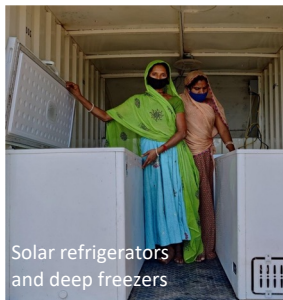
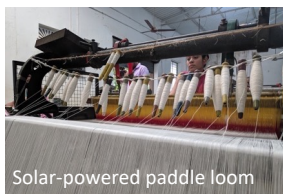
People benefited
around the world in
2019 by DRE solutions

50 billion+

market opportunity for
cleantech to power
livelihoods in rural India

Powering Livelihoods

A CEEW-VILLGRO INITIATIVE



IMPACT*

~19,700+

Clean energy-powered livelihoods enabled; **69% women**

~12,500+

New technology **deployments**

8 (5 are PL enabled)

Commercial funding deals unlocked

2.3x

Increase in annual revenue of enterprises in **three years**

USD 7.3 mn (USD 1.5 mn is PL enabled)

Follow-up capital raised by programme enterprises

1st in world

Policy framework to support DRE for livelihoods

70%

End-users' income increased by **35% (median)****

16,800 MT

CO2 emissions mitigated via DRE technology adoption

In summary,

- 1 The planetary emergency poses grave climate risks to Sri Lanka and India
- 2 Industries need to assess and manage climate risks via resilience strategies
- 3 Sri Lanka's NDC targets can be met and create expanded markets — opportunity for bilateral learnings and investments
- 4 Sri Lanka's MSMEs and livelihoods can transition in a just manner to ensure sustainable development amid the energy transition

Thank you!

ceew.in | @CEEWIndia | @GhoshArunabha