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NATIONAL INVESTMENT & INFRASTRUCTURE FUND

Annual Report

NIIF Chair in ESG

2022-23 & 2023-24

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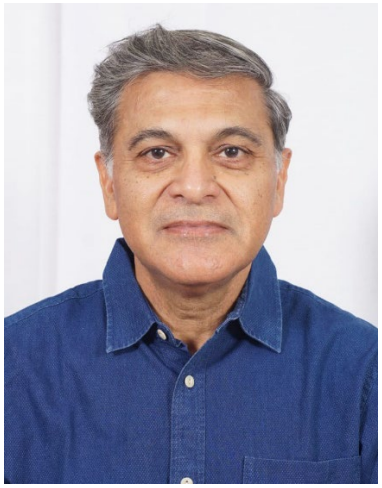
Citation: Garg A., Avashia V., Arora D., Upadhyay K., Shah J., Jain S.K., Chauhan J., Vishwanatahn S.S., Maheshwari J., Verma R., Patel R., and Thakkar D. (2024). Annual Report (2023-24) NIIF Chair in ESG at IIMA. A report prepared towards activities undertaken as a part of the NIIF Chair in ESG at IIMA.

Disclaimer : The results presented in this report are outputs of the academic research conducted as a part of the NIIF Chair in ESG at IIMA. The academic work does not in any way reflect the official policy or position of the Institute and Government of India.

From the Desk of NIIF Chair in ESG, Prof. Amit Garg



Environmental, Social and Corporate Governance (ESG) have become almost de-facto standards for investing internationally. Globally, sustainable investing has gained considerable traction, with a total market size of $30.3 trillion as reported in the Global Sustainable Investment Review 2022 (GSIR). The report also highlights a 20% growth in assets under management (AUM) for sustainable investments compared to the 2020 levels[1]. Increasingly more investors are deeply looking at ESG rating and ESG risks before considering fresh investments. These coupled with Sustainable Finance Disclosure Regulations (SFDR) aim to enhance sustainability disclosures in financial markets and reorient capital towards sustainability, thus reducing material risks.

National Investment and Infrastructure Fund Limited (NIIF) has created a Research Chair Professor position in ESG at the Indian Institute of Management Ahmedabad and I am honoured to be its first occupant.

The NIIF Chair in ESG position entails conducting research on crucial, globally relevant ESG issues, engaging with Industry to create long-term ESG oriented business strategies and practices, being a knowledge partner to Government(s) in relation to policy formulation, and engaging with international think tanks and agencies to create knowledge and experience sharing opportunities and platforms. I present a report on our works in 2022-23 and 2023-24, as well as looking at 2024-25 for expanding the horizons of our work.

We have been interacting regularly and also conducting formal meetings with NIIF. The work documented here is a testimony to our fruitful coordination and walking together to demystify ESG, carrying the NIIF Chair in ESG flag to all the international discussions and speaker events I participate, and also in my writings to the extent possible and allowed by other clients.

We aspire to take NIIF Chair in ESG's work further to support NIIF funds towards SFDR compliance, GHG emissions disclosure by NIIF investee companies, and learning for Indian companies and investors therein through analysing ESG data from large players such as Bloomberg and Refinitiv. We also propose to continuously analyse the Indian BRSR reporting by Indian companies and suggest critical ESG indicators.

I acknowledge and thank my colleagues for their continued deep involvement with my research work – Dr. Vidhee Avashia (overall ESG coordination along with disclosures and sustainable finance, Climate change risks and IVA), Ms. Divya Arora (ESG database assimilation and analysis), Ms. Kruti Upadhyay (ESG reporting), Mr. Jigar Shah (ESG database analysis, Admin lead), Mr. Sanjay Kumar Jain (sustainable finance,

[1] Global Sustainable Investment Review - https://www.gsi-alliance.org/members-resources/gsir2022/

investments and disclosures), Mr. Jaypalsinh Chauhan (GHG inventory and mitigation), Prof. Saritha Sudharmma Vishwanathan (overall Net Zero and Energy transition team lead), Dr. Jyoti Maheshwari (GHG mitigation assessments, energy efficiency and energy and technology transitions), Ms. Ritwika Verma (climate and RE policy analysis), Ms. Rutva Patel (GIS lead), and Ms. Dhara Thakkar (admin and finance). They all are pushing their own professional domains and expanding their knowledge bases and analytical competence. This work would not have been possible without their involvement and support. I thank Mr. Paresh Amleshwarwala for support received in designing this report.

I also acknowledge and thank our PGPX students, Mr. Jaimin Shah, Mr. Ishan Katariya and Ms. Suneetha Thodima for their contributions towards NIIF GHG emissions estimates and Vibrant Gujarat report preparation.

We look forward to working together with NIIF on ESG and related themes.

Message - Prof. Bharat Bhasker, Director, IIMA

Industries have started prioritising the incorporation of ESG principles as the core of their business strategies. Implementation of these strategies and progress towards a more sustainable future are vital elements that contribute to success in both the short and long run. Recognising the industry's need and in alignment with IIM Ahmedabad's vision to impact the policy and practice, we are delighted to establish the country's first "Research Chair in ESG" in collaboration with the National Investment and Infrastructure Fund Limited (NIIF). It aims to function as a principal hub for providing insights and knowledge-sharing to businesses and policymakers to support the integration of ESG principles in both short and long-term decision-making for businesses and governance and strategic decisions for policymakers.

This annual report includes a compilation of the "NIIF Chair in ESG's" various stakeholder engagements, research endeavours, activities undertaken as a knowledge partner and international engagements, showcasing the outstanding excellence of the NIIF Chair's work. It highlights the excellent efforts made to bridge the crucial gap in attaining ESG integration by various stakeholders.

The report also shares crucial insights from the analysis undertaken to understand the ESG initiatives by companies, their commitments, and the performance of ESG practices of the early adaptors of the ESG principles/ practices. This cutting-edge research also provides a deeper understanding by identifying the key parameters that play a pivotal role in shaping our analysis of ESG practices.

This report further shows that such an extensive and ambitious endeavour can be achieved due to the continuous engagement and generous backing of a committed and enthusiastic partner like NIIF and an excellent research team at IIMA. This collaboration is an example of the institute's efforts to deepen work on ESG in India's business landscape while exploring meaningful engagement with one of the most important stakeholders in the country.

I am sure that readers will find the content of this report engaging and enriching.

Message- Shri Sanjiv Aggarwal, CEO and MD, NIIF

The focus on sustainable practices intensifies as India ascends to a top-three global economy. Given its rapid growth in energy demands, India's commitment to achieving net zero carbon emissions by 2070 is significant. This transition requires an annual investment of $40-$50 billion until 2070, highlighting the necessity for foreign investment, innovation, and energy diversification.

At NIIF, we prioritise Environmental, Social, and Governance (ESG) integration for sustainable and commercial returns. Through the NIIF Chair in ESG at the Indian Institute of Management, Ahmedabad (IIMA), we promote ESG best practices on our platforms and companies.

By championing top-tier Environmental & Social (E&S) standards, we not only foster responsible investing but also create a multiplier effect through our funds and their portfolio companies. This presents a unique opportunity for investors and partners to contribute to sustainable development while reaping significant returns.

The NIIF Chair, led by Prof. Garg, enhances our focus on ESG with insightful publications and events, including an analysis of India's Net Zero 2070 pathways.

At NIIF, we believe in the power of collaboration. Our team works hand in hand with the Chair to advance discussions and actions on climate preservation and sustainable development, inviting all interested parties to join us in this important mission.

We anticipate deeper collaboration with investors and partners, leveraging the Chair as a focal point for NIIF's climate and green initiatives engagement.

Executive Summary

With a vision to stimulate conversations for a progressive national Environment, Social and Governance (ESG) framework focussed towards Indian companies and investors, the National Investment and Infrastructure Fund Limited (NIIF) and the Indian Institute of Management Ahmedabad (IIMA) established a Research Chair in ESG in 2022. Some of the activities envisaged as part of the NIIF Chair in ESG at IIMA include: conducting research on crucial, globally relevant ESG issues, engaging with industry to create long-term ESG oriented business strategies and practices, acting as a knowledge partner to government(s) in relation to policy formulation and engaging with international think tanks and agencies to create knowledge and experience sharing opportunities and platforms. This collaboration between IIMA and NIIF has been facilitated by the IIMA Endowment Fund (IIMA EF). Prof. Amit Garg was appointed as NIIF Chair in ESG at IIMA from July 1, 2022.

The works initiated towards the NIIF Chair in ESG cover the spectrum of activities laid out at the outset of the Chairship.

Research on globally relevant ESG issues:

As a part of the objective to enhance research and knowledge related to globally relevant ESG issues, an analysis on understanding the performance of companies and their ESG compliance was undertaken. A three-part assessment of the ESG data for Indian companies has been undertaken to comprehensively assess the ESG performance and understand how Indian companies have evolved. The data has been collected from three different sources – Bloomberg terminal at IIMA, Refinitiv terminal at IIMA, and BRSR reports. These datasets are available for different numbers of companies and for varied timelines. The dataset collected from Bloomberg consists of 445 Indian companies over the eight year time span between 2014 and 2022. The second dataset comprised of 716 companies, extracted from Refinitiv, spanning the years 2018 to 2022. The third dataset assessed is created using the reports voluntarily submitted by 61 companies for the years 2021-2022 as a part of the Business Responsibility and Sustainability Report (BRSR) Guidelines as introduced by the Securities and Exchange Board of India (SEBI) two years back. A detailed outline of the outcomes of these analyses, the concerns and constraints observed have been described in Section 3 of this report. An attempt at identifying parameters that are common across the industries was made for the dataset accessed through Refinitiv. For all three E, S and G components, there are 16, 8 and 29 parameters respectively that were observed to be common. A list of these common parameters has been included in the report as Annexure A.

A comparison was also made to identify common parameters reported through BRSR and those available in Refinitiv data for all the three E, S and G components. There are 14, 10 and 6 parameters common in these two datasets for E, S and G components respectively.

This process led to distilling 33 most crucial additional ESG parameters and indicators which would provide a more comprehensive evaluation of sustainability practices. These parameters have been collated through a combination of industry insights, best practices, and our understanding of ESG frameworks, augmenting our analysis to provide a more comprehensive evaluation of sustainability practices. These are 20, 8 and 5 parameters for E, S and G components respectively.

Another research work undertook an estimation of GHG emissions and the creation of a ESG framework for NIIF with a focus on sustainability. The team created an emissions inventory by analysing Greenhouse Gas (GHG) Scope 1, 2 and 3 emissions[2], Water consumption and Waste generation patterns by gathering data on

[2] Scope 1: Direct GHG Emissions- Direct GHG emissions occur from sources that are owned or controlled by the company

NIIF's operations and emissions records. Further, a standardized framework was developed for estimating Scope 1 & 2 emissions. The study report also proposed specific GHG mitigation opportunities and its financial implications as well as identified potential risks and opportunities associated with value chain emissions.

Works include co-authoring a report related to disclosures of climate risks in collaboration with the UNEP Copenhagen Climate Centre (UNEP-CCC). The study concluded that almost 50% of the companies disclose information on climate-related risks and opportunities most often.

Another research work was undertaken to explore mitigation scenarios for India towards its net-zero 2070 goal while balancing the deep emission cuts and domestic development needs. This study was supported by the Office of the Principal Scientific Adviser to the Government of India and the Nuclear Power Corporation of India. Seven future scenarios (up to 2070), three based on current NDC commitments and four focused on achieving net-zero (NZ) emissions by 2070 have been assessed here. While NZ scenarios are targeted toward 2070, the trajectories by 2030 show the achievement of the NDC target of 50%. This could also be used as pointers for future investment decisions.

During this period, eight peer-reviewed articles were published in various international journals of repute, and a monograph chapter was published on the topic "How are the adequacy and effectiveness of adaptation and support made manifested in national submissions?" in a perspectives collection titled – "Perspectives: Adequacy and Effectiveness of Adaptation in the Global Stocktake."

Engagement with Stakeholders:

The NIIF Chair in ESG has engaged with various stakeholders ranging from industry, policymakers and civil servants, academia and research, NIIF leadership team as well as the general audience through participation in lectures, speaker sessions, panel discussions, seminars and workshops as well as opinion pieces in leading news media outlets. The subjects ranged from "Environmental Sustainability", "Economic Development and Energy Consumption", "Energy Transitions", "Sustainability, Adaptation and Mitigation Measures", "Sustainable Coal Pathways for India" and "Climate and Renewable Energy Policies" to name a few. A total of nine such engagements including participation in and support for have been undertaken so far.

As a part of the engagement with industry, a three-day on campus customised ESG Programme for the NIIF investee company's environment and social practitioners was organized at IIM Ahmedabad between June 11-13, 2023. Undertaken by 30 participants representing various sectors ranging from healthcare and life sciences, renewables and cleantech, infrastructure and logistics as well as finance. The programme offered the participants a deep dive into crucial aspects of Environmental, Social, and Governance practices. The training concluded with a thorough exploration of investment and financing challenges, on Environmental, Social and Governance factors and their effects on valuation.

An OpEd titled "MDBs Must Synchronize Projects with Countries' NDCs for Impactful Climate Financing" was published in the Financial Express on September 28, 2023. This insightful piece was jointly authored by Professor Amit Garg, Mr. Akhilesh Tilotia, and Mr. Sanjay Kumar Jain.

Scope 2: Electricity Indirect GHG Emissions- Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by a company.

Scope 3: Other Indirect GHG Emissions - Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

A strategic meeting was held with the leadership team of NIIF in its Mumbai office on October 5, 2023. Prof. Garg presented the recent work on India's net zero target and possible pathways to achieve it. Another set of discussions centred around climate risk disclosures for the road sector and solar assets.

Engagement as Knowledge Partner:

The NIIF Chair in ESG has acted as a knowledge partner with various agencies and government bodies such as NITI Aayog, Ministry of Environment, Forest and Climate Change, Ministry of Finance, Ministry of Power, National Thermal Power Corporation, Gujarat Energy Development Agency, Climate Change Department and Government of Gujarat to name a few. The engagements include development of input papers and study reports for the activities undertaken by the Government of India as a part of its G20 presidency – specifically for the Sustainable Finance Working Group (SFWG) and Energy Transitions Working Group (ETWG). The NIIF Chair in ESG was also involved with NSE IFSC's international sustainability platform.

International engagements:

For 2022-23, Prof. Garg was appointed as the Co-Chair IPCC Emission Factor Database Editorial Board – the apex custodian of all GHG emission factors at IPCC. Almost 16 other international engagements were undertaken by the Chair including participation at COP28. During 2-6 December 2023, the NIIF Chair in ESG participated in six side events at COP28 that included panel discussions organised at different pavilions, including talks on varied subjects related to decarbonization goals, GHG emissions mitigations, net-zero ambitions, Global Stocktake and its outcomes, and long-term climate action and developmental goals.

A collaborative effort was initiated with Stanford University by NIIF, involving the NIIF Chair in ESG , Mr. Ashok Emani (Principal–- ESG, NIIF), and Mr. William Streeter (Senior Infrastructure Advisor and visiting scholar at the Global Projects Center, Stanford University). The objective of this collaboration is to investigate and explore potential avenues for future collaborative efforts and projects. The discussion began by highlighting Stanford University remarkable accomplishments in climate risk analysis and sustainability initiatives, setting the stage for the exploration of their ongoing commitment. Further progress on the collaboration will be undertaken by NIIF.

Planned Activities for 2024-25

The tentative (but not limited to) activities in plans for the upcoming fiscal year are as listed here:

- An assessment of BRSR Reports for 2022-23: This aims to provide insights into the extent to which companies have addressed the mandated ESG disclosures in India by analysing their BRSR submissions for 2022-23 and other relevant sources of information. This report would offer a comprehensive assessment of ESG performance at both the overarching level and individual E, S and G component level reporting.
- Executive Education: A 5-day Open Enrolment Programmes (OEP) on "Environmental Social and Corporate Governance (ESG) & Sustainable Finance" is being planned around August-September 2024 at IIMA Dubai Campus. NIIF investee companies could also participate.
- Industry Note on Road Infrastructure in India and Climate Risks: A study to undertake an in-depth understanding of the road infrastructure sector in India and the climate risks they face. Some of the topics that the note would try to explore include–- 1. How does the pricing/ valuation of assets change in light of climate risks? 2. Would operating expenses change in the case of higher climate risks? 3. In case of a greenfield/brownfield expansion, what could be the implications on capex? 4. Should the regulatory/policy landscape change to include the above concerns?

- Dissemination seminars for the report on "Synchronizing energy transitions toward possible Net Zero for India: Affordable and clean energy for all" are planned at Mumbai and Ahmedabad. An engagement is being planned to communicate the results from the research work undertaken on assessing energy transitions towards Net Zero for India. NIIF is requested to take a lead in this engagement.
- SFDR Articles 6,8 and 9: NIIF Chair in ESG will be working with NIIF to understand (a) whether the funds are currently ready to be classified under any of the SFDR articles, and (b) if not, what steps and actions need to be taken, when, and by whom.

Content

1 Introduction to the NIIF Chair in ESG and his activities

Indian Institute of Management Ahmedabad (IIMA) established the country's first Research Chair in ESG in collaboration with the National Investment and Infrastructure Fund Limited (NIIF) in 2022. The Chairship was established with the intent to function as the principal hub of knowledge and insights that allows businesses and policymakers incorporate ESG principles in their long term business and governance decisions.

Some of the activities envisaged as part of the of the NIIF Chair in ESG at IIMA include.

- Conducting research on crucial and globally relevant ESG issues
- Engaging with industry to create long-term ESG oriented business strategies and practices.
- Acting as a knowledge partner to government(s) in relation to policy formulation
- Engaging with international think tanks and agencies to create knowledge and experience sharing opportunities and platforms.

Prof. Amit Garg was appointed as NIIF Chair in ESG at IIMA on July 1, 2022.

Team at IIMA:

ESG and Research Team Members

Front Row (L to R): Ms. Rutva Patel, Dr. Jyoti Maheshwari, Prof. Amit Garg, Mr. Sanjay Kumar Jain, Dr. Vidhee Avashia, Ms. Dhara Thakkar

Top Row (L to R): Ms. Divya Arora, Mr. Jaypalsinh Chauhan, Mr. Jigar Shah, Ms. Kruti Upadhyay, Ms. Ritwika Verma, Dr. Saritha Sudharmma Vishwanathan

2 Activities Undertaken in 2022-23

2.1 Research on globally relevant ESG issues

- Until December 31, 2022, the activities initiated towards the NIIF Chair in ESG include a set of analyses on understanding the performance of companies, ESG compliance and ESG platform creation for sustainable finance facilitation for companies.
- The team was involved in crafting a report related to disclosures of climate risks in collaboration with the UNEP Copenhagen Climate Centre (UNEP-CCC). The study concluded that almost 50% of the companies disclose information on climate-related risks and opportunities most often. The use of metrics and, to a lesser extent, targets is also relatively high among the climate-related disclosures. However, information relating to climate risk management and governance of climate risk is less commonly disclosed. For instance, information about climate-related risk management is only provided by less than one-third of the reviewed companies. Meanwhile, only 25% of companies are providing information on the board's oversight of climate-related risks and opportunities.

Further, the following peer- reviewed publications were undertaken in 2022:

- Patange, O. S., Garg, A., & Jayaswal, S. (2022). An integrated bottom-up optimization to investigate the role of BECCS in transitioning towards a net-zero energy system: A case study from Gujarat, India. Energy, 255, 124508. https://doi.org/10.1016/j.energy.2022.124508

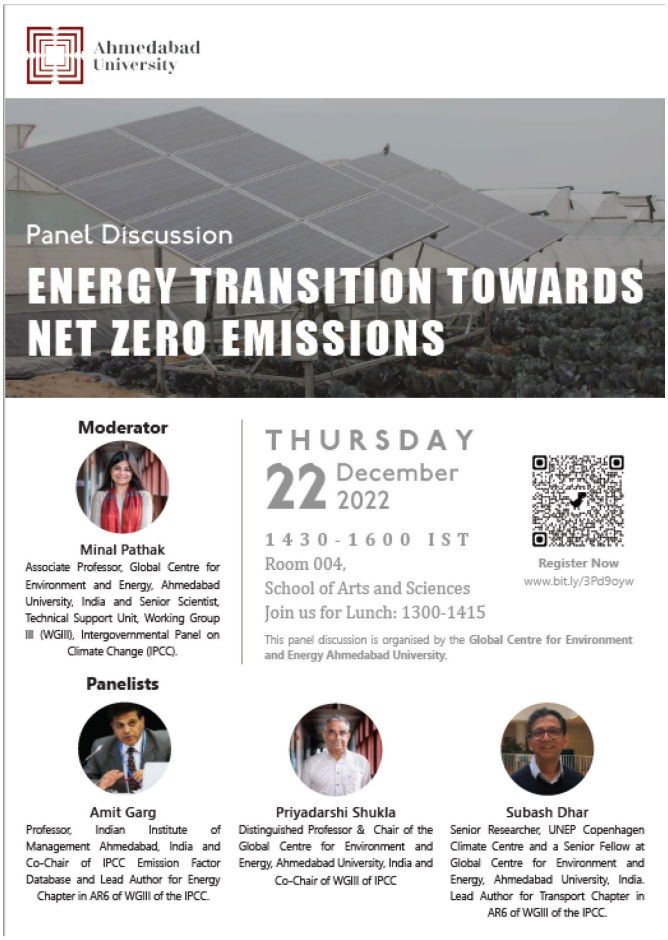
India recently initiated a carbon dioxide-based enhanced oil recovery (CO2-EOR) project in the matured oil wells of western India. Using this project, we propose a bioenergy-CO2-EOR system to study the techno-economic feasibility and potential of BECCS towards net-zero emissions from energy systems. The proposed system breaks even, without any carbon price, at an oil price of around 56 USD per barrel (USD/bbl) if using CO2 from bioethanol fermentation and at around 90 USD/bbl for bioelectricity plants. A carbon price between USD 20 to 40 per tonne of CO2 makes the system feasible even below the oil price of 45 USD/bbl for the ethanol route. The system has net negative CO2 emissions after accounting for the lifecycle emissions of produced oil, assuming a sequestration rate of 0.5 tonne of CO2 per barrel of recovered oil.

- Hermwille, L., Lechtenböhmer, S., Åhman, M., van Asselt, H., Bataille, C., Kronshage, S., Tönjes, A., Fischedick, M., Oberthür, S., Garg, A. and Hall, C., 2022. A climate club to decarbonize the global steel industry. Nature Climate Change, 12(6), pp.494-496. https://doi.org/10.1038/s41558-022-01383-9

Decarbonizing global steel production requires a fundamental transformation. A sectoral climate club, which goes beyond tarifs and involves deep transnational cooperation, can facilitate this transformation by addressing technical, economic and political uncertainties.

2.2 Engagement with Stakeholders

- On the December 26, 2022, delivered Lectures on "**Economic Development and Energy Consumption" and "Climate Change and Energy Transition**" at Lal Bahadur Shastri National Academy of Administration in Mussoorie, India. This was an invited lecture and interaction with mid-career IAS officers of India. Two sessions were conducted intertwined with detailed discussions on Economic Development and Energy Consumption, Climate Change and Energy Transition Pathways, and a panel discussion on the way forward for the electricity sector in India.
- Panel Discussion on "**Energy Transition Towards Net Zero Emissions**" at Ahmedabad University, Ahmedabad, Gujarat India Organized by Global Centre for Environment and Energy at Ahmedabad University on December 22, 2022



- Events: Stakeholder workshop on "**Sustainable Coal Pathways for India**" during October 11 – 12, 2022 at Kolkata

IIM Ahmedabad in collaboration with IDDRI Paris and PMRC, Dhanbad organized a two-day Stakeholder workshop (seminar) on Sustainable Coal Pathways for India on 11 and 12 October 2022 at The Westin, New Town, Kolkata.

At the event, various domain experts discussed the possible energy transitions for the Indian energy sector towards meeting India's Net Zero 2070 transition and aimed to draw cross-sectoral insights into the challenges and opportunities for India.

- Panel Discussion on "**Sustainability, Adaptation and Mitigation Measures**" at the National Conference on "**Akash for Life**" during November 4-6, 2022, at Uttaranchal University, Dehradun. About 500 scientists, researchers, policymakers, students, professionals and practitioners from India and abroad attended this event.

2.3 Engagement as Knowledge Partner

- Coordinator, NITI Aayog's India Energy Modelling Forum Task Force on Economic Analysis (2021-2022)
- Co-chair of NSE IFSC's international sustainability platform, 2022
- Member of Technical Advisory Committee of Experts (TACE), Ministry of Environment, Forest and Climate Change, Government of India, for India's Low Emissions Long Term Strategy creation (LeLTS) 2022
- Member, Steering Committee, India Climate and Energy Modelling Forum (ICEMF), NITI Aayog, Government of India (2021 onwards), and coordinator of Task Group 3 on development, climate change and energy transitions.

2.4 International Engagements

- Co-Chair IPCC Emission Factor Database Editorial Board (Energy Sector), 2022-2023
- Co-Chair, Adaptation Working Group (AWG) of the Independent Global Stocktake (iGST) (2021-2022)

3 Activities Undertaken in 2023-24

3.1 Research on globally relevant ESG issues

3.1.1 Assessment of ESG data for Indian companies

3.1.1.1 Bloomberg data for 2014 to 2022

The objective of this study is to comprehensively assess the Environmental, Social, and Governance (ESG) performance of 445 Indian companies over the time frame of 2014 to 2022. ESG has gained prominence globally as key indicator of a company's sustainability and ethical practices. In order to conduct an in-depth analysis to understand how Indian companies have evolved in terms of ESG criteria over the past eight years, data has been collected from Bloomberg Terminal for the years 2014 to 2022. The data encompassing a wide array of financial and non-financial metrics, including key ESG indicators was classified based on financial factor such as market capital. Since, the goal was to have a comprehensive understanding of the central tendencies and variability of the ESG metrics over time, key statistical measures such as mean, median, mode, maximum, and minimum values for each parameter of interest across the 445 companies for each year in the study period.

Upon deeper exploration into the data, it became evident that a substantial portion of the parameters recorded significant null values or contained trivial data, rendering them unsuitable for meaningful analysis. The issue primarily revolves around the data quality, where numerous parameters lack the necessary depth and reliability for robust assessments. This challenge has, unfortunately, hindered our ability to achieve our objective of conducting a comparative analysis among companies by examining year-on-year changes and determine whether these companies have made progress in aligning with global ESG standards or if there are notable fluctuations in their sustainability efforts.

3.1.1.2 Sector-wise Analysis of Refinitiv dataset for 2018 to 2022

The objective of this study was to conduct a comprehensive analysis of Environmental, Social, and Governance (ESG) practices across diverse industries and sectors. The study focuses on a dataset comprising 716 companies, extracted from Refinitiv, spanning the years 2018 to 2022. The aim was to identify commonalities and variations in ESG performance, discerning industry-specific trends, and providing valuable insights for stakeholders in understanding the sustainability landscape.

The dataset encompasses a wide range of parameters i.e., 415, offering a holistic view of each company's sustainability practices. Since, the focus here was a sector-wise analysis to uncover sector-specific ESG patterns and assess how different sectors address environmental impact, social responsibility, and governance practices, the 716 companies were categorised into respective industries. Further, a temporal dimension - spanning the years 2018 to 2022 has been included to identify trends and changes in ESG practices over time.

There was an active engagement in efforts to harmonise and standardise the data. This involves identifying commonalities and disparities in reporting across industries and sectors. By aligning parameters at a deeper level, we aim to enhance the comparability of sustainability practices and facilitate more meaningful cross-sector analysis. Within industries, a set of 53 common parameters were identified and strategically categorised into 16 from the environmental domain, 8 from social aspects, and 29 from governance practices. Furthermore, from the comparison of the BRSR and Refinitiv datasets, 30 common parameters were identified – 14 related to environmental factors, 10 to social aspects and six to governance practices. These parameters form a cohesive framework that reflects the shared priorities and reporting criteria among diverse industries.

Despite the initial variations in reporting practices observed, we have identified a harmonized set of parameters common to both industries and sectors. This achievement lays the groundwork for more meaningful and standardized cross-industry and cross-sector comparisons.

3.1.1.3 Data from BRSR reports submitted during 2021-2022

The Securities and Exchange Board of India (SEBI) introduced the Business Responsibility and Sustainability Report (BRSR) through a notification in May, 2021 to enable companies to comply with the National Guidelines on Responsible Business Conduct (NGRBC) introduced by Ministry of Corporate Affairs, Government of India in 2019. The reporting under BRSR guidelines was voluntary for FY 2021-22 and became mandatory from FY 2022-23. The reports voluntarily submitted by 61 companies for the years 2021-2022 are the focus of this work. The aim here was to gain insights into the ESG initiatives, commitments, and performance of ESG practices of these early adaptors of BRSR guidelines. A sector-wise breakdown of the number of companies that submitted the report is as described in Figure 1 below. Finance sector has the highest number of the companies reporting as per the dataset considered. Computer software, pharmaceuticals and power generation sectors have 5 companies each reporting under BRSR voluntarily. Chemical and steel sectors have 4 and 3 reporting companies respectively. Each cement, computer, computer hardware, diversified and retail sectors have 2 companies each that have reported under BRSR. 16 sectors have one company each and there are 3 companies falling under the miscellaneous sector.

For a detailed examination of the companies' disclosures related to environmental impact, social responsibility, and governance practices, manual tracking and extraction of relevant ESG information from the BRSR reports available in PDF formats has been undertaken. It involved meticulous parameter selection based on key ESG factors, including but not limited to carbon emissions, social impact, diversity and inclusion, governance structure, and adherence to ethical standards. Each parameter outlined in the BRSR reports was systematically examined and efforts were put in to capture detailed information under the broad categories of Environmental, Social, and Governance factors, covering a standardized set of 140 data points as outlined by the BRSR reporting framework.

The companies' performance was segmented based on various ESG factors. Key segments include Greenhouse Gas (GHG) Emissions, Energy Consumption, Waste Management, Water Usage, Training Initiatives for Employees, CSR Net Worth, International and National Offices, and the Number of Plants. This segmentation approach enables a more granular analysis of each company's performance in specific sustainability domains. Figure 2 shows the Scope 1, Scope 2 and Scope 3 emissions reported by the companies. This figure also displays the Scope 1 and 2 emission intensity and Scope 3 emission intensity for reporting companies. It also shows how many companies are reporting GHG parameters. Waste related parameters such as E-waste, Construction and Demolition waste, Battery waste, Plastic waste, Bio Medical waste, Hazardous waste, Non-Hazardous waste for reporting companies have been covered in Figure 3. Reporting levels of Water Consumption related parameters like groundwater, surface water, seawater, third party water, Others- rainwater or municipal water have been captured in Figure 4. While we have meticulously aligned with the BRSR requirements and tracked data points accordingly, variations in reporting formats, units, and methodologies have introduced complexities in our comparative analysis. In some instances, the lack of uniformity has made it challenging to bring companies onto a similar scale, hindering a straightforward comparison of their sustainability performance. Furthermore, situations where companies do not consistently provide clear information about the units in which they report specific ESG metrics have been observed.

Figure 1 Sectoral breakdown of BRSR reporting companies

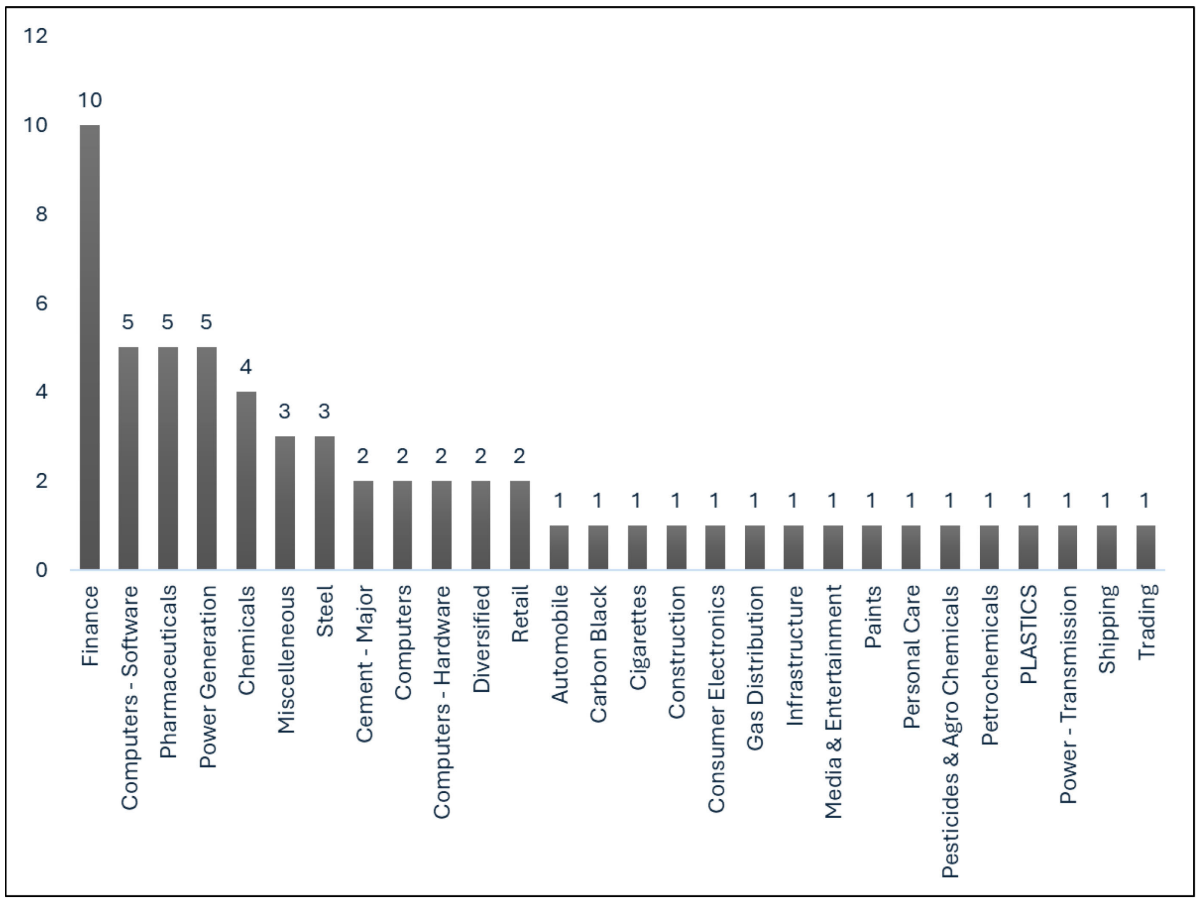


Figure 2 GHG Emission (MT): Scope 1, Scope 2, Scope 3, Scope 1 and Scope 2 Emission per rupee of turnover, Scope 3 Emission per rupee of turnover for reporting companies.

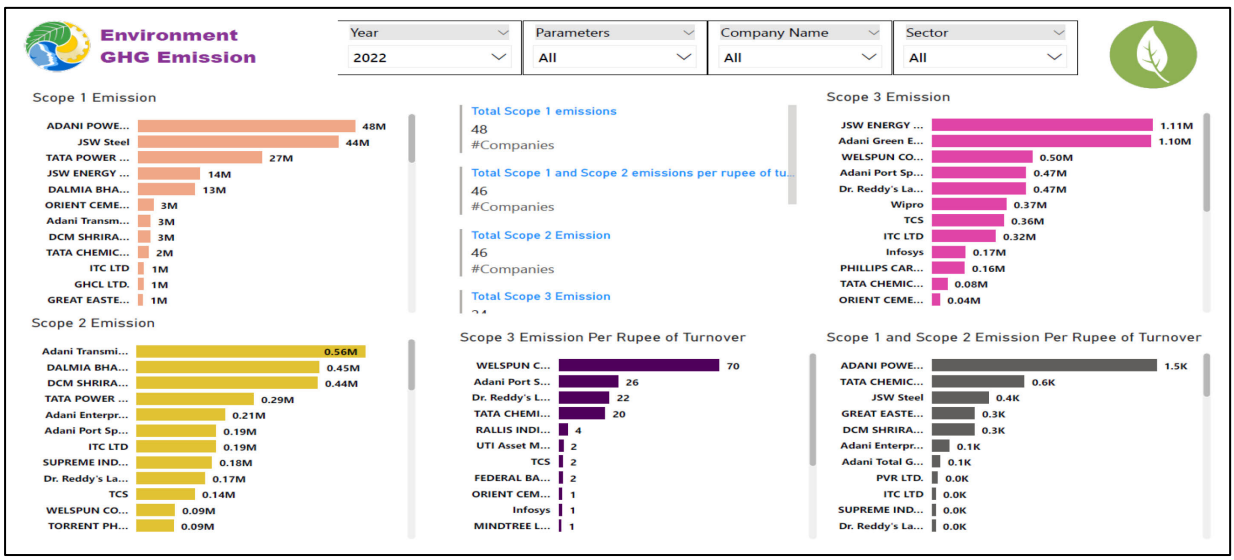


Figure 3 Waste (MT) – E-waste, Construction and Demolition waste, Battery waste, Plastic Waste, Bio Medical waste, Hazardous waste, Non-Hazardous waste for reporting companies.

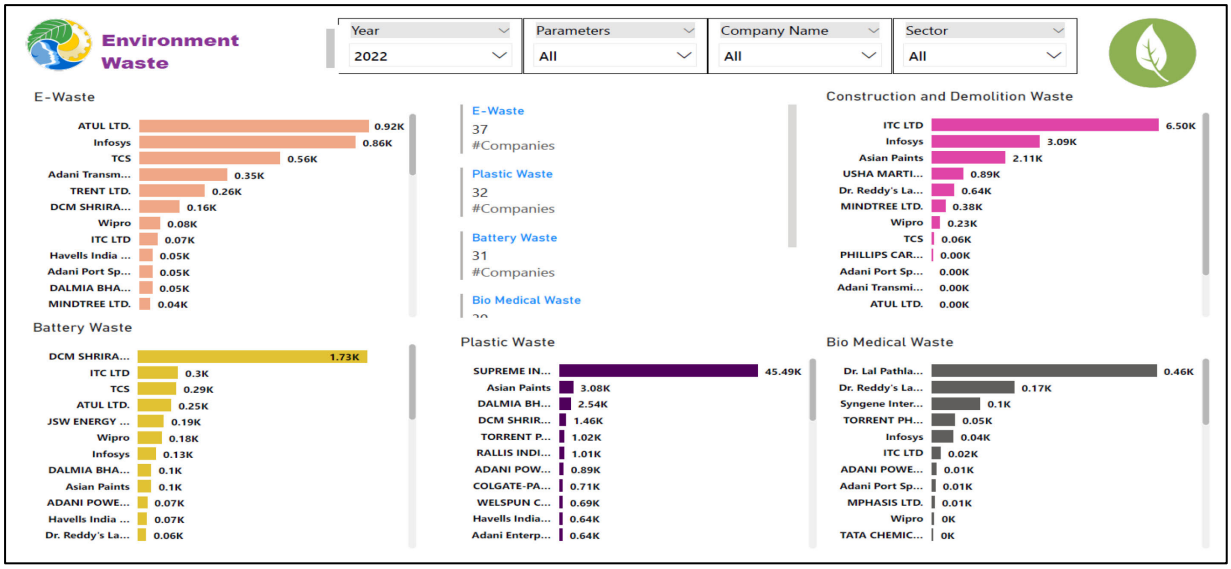
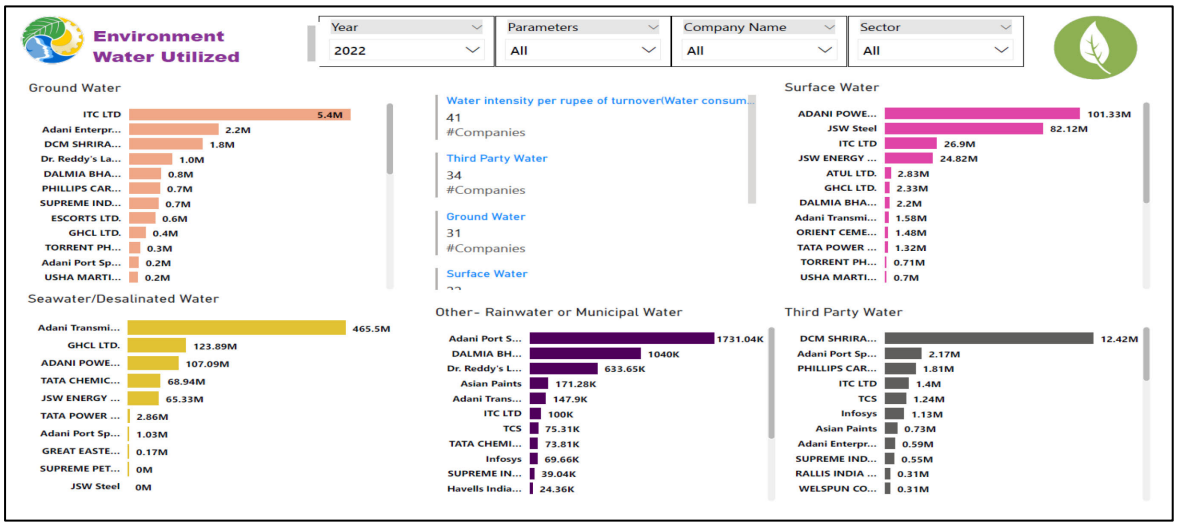


Figure 4 Water Consumption (Kl) – Ground water, surface water, seawater, third party water, Others- rainwater or municipal water for reporting companies.



3.1.1.4 Indicators

- **Companies and their Emission Intensity**

This section of the report provides insights into the emission intensity (Scope 1 and Scope 2 emissions divided by the turnover) of the Indian companies. Data has been collected from five different data sources – Bloomberg terminal, Refinitiv terminal, BRSR reports, Prowess database and Capitaline databases to conduct the analysis.

- **Bloomberg data for 2014 to 2022**

Figure 5 Distribution of emission intensity of companies from Bloomberg

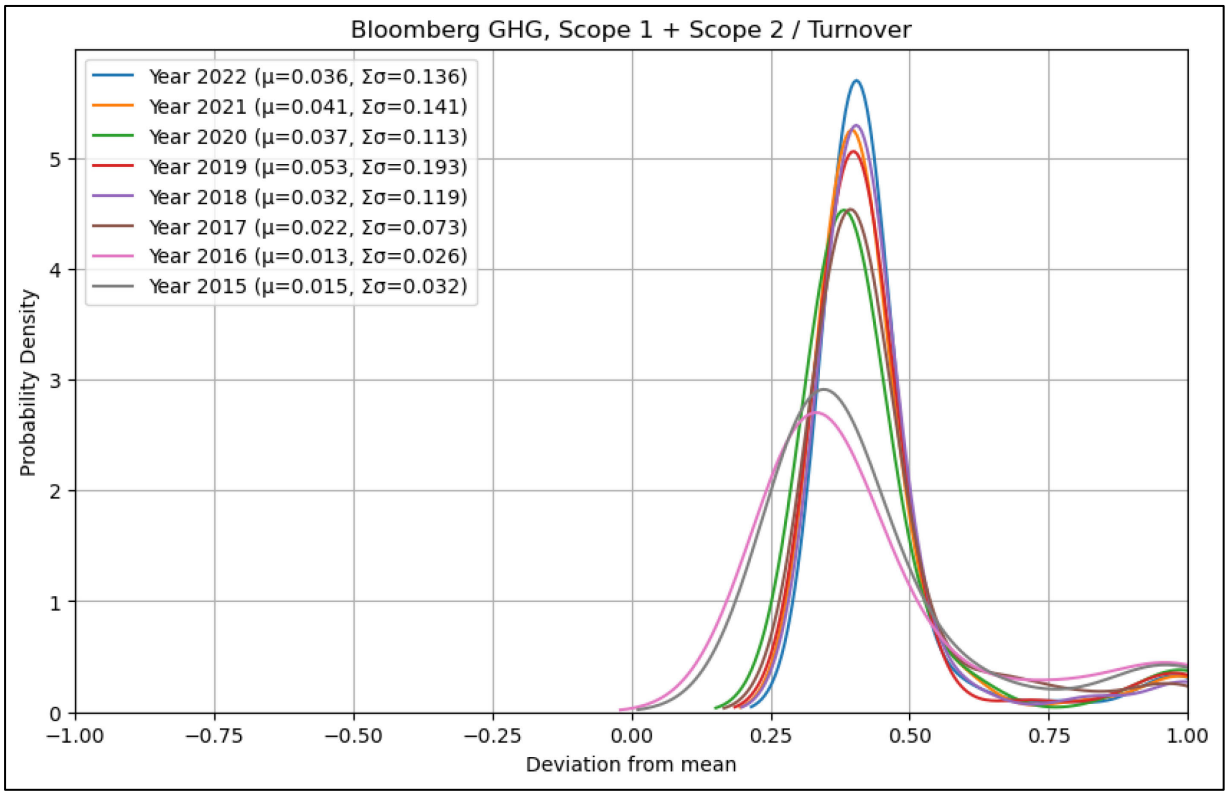


Table 1 Company distribution around the mean emission intensity for Bloomberg dataset

Year	N (No of Companies)	Average emission intensity in (MT/ INR million)	Standard Deviation of emission intensity in (MT/ INR million)	No of Companies Lower than Average (left curve)	No of Companies Greater than Average (right curve)
2022	71	0.036	0.136	63	8
2021	70	0.041	0.141	61	9
2020	62	0.037	0.113	53	9
2019	56	0.053	0.193	50	6
2018	45	0.032	0.119	40	5
2017	40	0.022	0.073	34	6
2016	39	0.013	0.026	30	9
2015	34	0.014	0.031	27	7
2014	26	0.015	0.032	21	5

Note: MT- Million Tonnes
1 USD = 83 INR (exchange rate for March 2024)

Figure 5 is a visual representation of the data captured by the Table 1. Figure 5 shows the yearly trend of emission intensity for the Bloomberg dataset from 2014 to 2022. Table 1 shows that the mean values for emission intensity for the period between 2014 and 2022 have increased over the years. The segregation of the companies based on the mean values of emission intensity for the period of 2014 to 2022 shows that the number of companies to the left of the curve (performance values lower than mean performance) has gradually increased from 21 in 2014 to 63 in 2022 indicating a gradual shift towards improved performance in the overall emission intensity. However, the number of low-performing companies (performance values higher than mean performance) did not see a drastic/dramatic change.

Table 2 Company distribution around the mean Average Scope 1 and 2 emissions for Bloomberg dataset

Year	N (No of Companies)	Average of Scope 1 and 2 emissions in MT	No of Companies Lower Than Average	No of Companies Greater Than Average
2022	69	1,70,381.80	51	18
2021	68	1,75,115.95	50	18
2020	58	1,64,850.50	44	14
2019	53	5,06,261.59	49	4
2018	43	1,56,722.93	31	12
2017	37	8,56,875.30	26	11
2016	37	1,55,138.31	26	11
2015	33	1,76,816.08	22	11
2014	25	2,07,190.57	16	9

Note: MT- Million Tonnes

As presented in Table 2, in 2022, 61 companies were analysed, with 51 companies emerging as better performers with their emissions falling below the average of Scope 1 and 2 emissions. These companies displayed a strong commitment to environmental sustainability. Conversely, 18 companies had higher emissions than average Scope 1 and 2 emissions. Analysis of 2021 revealed similar trends, with 50 better-performing companies demonstrating environmental responsibility, while the other 18 companies grappled with high emissions. In 2020, the assessment included 58 companies, among which 44 reported low emissions and 14 companies disclosed emissions above the mean values. The trend continued from 2014 to 2019 as well, demonstrating a consistent pattern of better-performing companies with lower emissions, while a small number of companies reported very high emissions. The CAGR of the number of companies reporting lower than average Scope 1 and 2 emissions is 15.59%. For this analysis, the authors have removed outliers from the data to make data more robust and accurate. For years 2017 and 2019 three outliers were excluded from the analysis. Similarly, two outliers were not included in the analysis for each 2020, 2021 and 2022 year. For the remaining years – 2014, 2015, 2016 and 2018 one outlier for each year was excluded to make the data more accurate and robust.

- **Performance analysis of companies from Refinitiv dataset between 2018 - 2022:**

Figure 6 Year-wise mean, minimum and maximum emission Intensity for the Refinitiv dataset

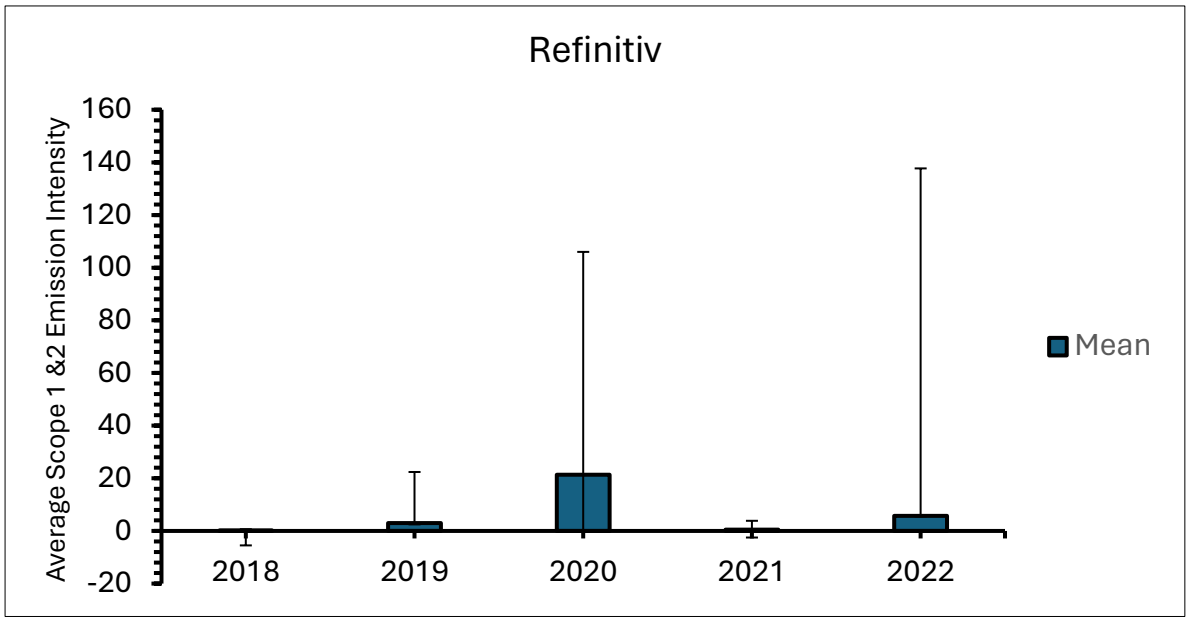


Table 3 Company distribution around the mean of emission intensity for Refinitiv dataset

Year	N (No of companies)	Average emission intensity (MT/ INR million)	Standard Deviation of emission intensity in (MT/ INR million)	Maximum emission intensity (MT/ INR million)	Minimum emission intensity (MT/ INR million)
2022	45	5.71	22.7	137.71	0.00
2021	17	0.50	0.92	3.85	0.00
2020	5	21.38	47.3	106.00	0.00
2019	8	3.00	7.83	22.39	0.00
2018	8	0.22	0.24	0.65	0.01

Note: MT- Million Tonnes

1 USD = 83 INR (exchange rate for March 2024)

Figure 6 shows, the average Scope 1 and 2 emission intensity of the companies over 2018 to 2022. Table 3 presents data values for the figure above for better understanding. It is difficult to observe any trend due to limited data availability. In 2022, the maximum emission intensity stood at 137.71 MT/ INR million. However, the average emission intensity is just 5.71 MT/ INR million indicating a huge spread as visible in the spread lines mapped in Figure 6.

Table 4 Company distribution around the mean Average Scope 1 and 2 Emissions for Refinitiv dataset

Year	N (No. of companies)	Average of Scope 1 and 2 emissions in MT	No of Companies Less than Average	No of Companies Greater than Average
2022	44	3,71,979	35	8
2021	222	12,48,250	183	32
2020	212	44,53,253	172	38
2019	97	41,30,884	80	16
2018	66	57,69,419	52	13

Note: MT- Million Tonnes

As presented in Table 4, in 2022, 44 companies were analysed and 35 companies emerged as better performers with their emissions falling below the average of Scope 1 and 2 emissions. These companies demonstrated environmental stewardship. Conversely, 8 companies reported emissions higher than average Scope 1 and 2 emissions. For the year 2021, 222 companies were analysed. Analysis revealed similar trends, with 183 companies reporting emissions lesser than average Scope 1 and 2 emissions, however, the other 32 companies grappled with high emissions. The trend continued from 2018 to 2020 as well highlighting a consistent pattern of better-performing companies with lower emissions, while a very small number of companies reported very high emissions. However, it is important to note that very few companies are pulling the average higher. For this analysis, the authors have removed outliers from the data to make it more robust and accurate. For the year 2019, seven outliers were excluded from the analysis. Similarly, two outliers were not included in the analysis for the year 2020. For the remaining three years – 2018, 2021, and 2022, one outlier for each year was excluded to make the data more accurate and robust.

- **Data from BRSR reports submitted during 2021-2022**

Figure 7 Distribution of Emission Intensity for BRSR dataset

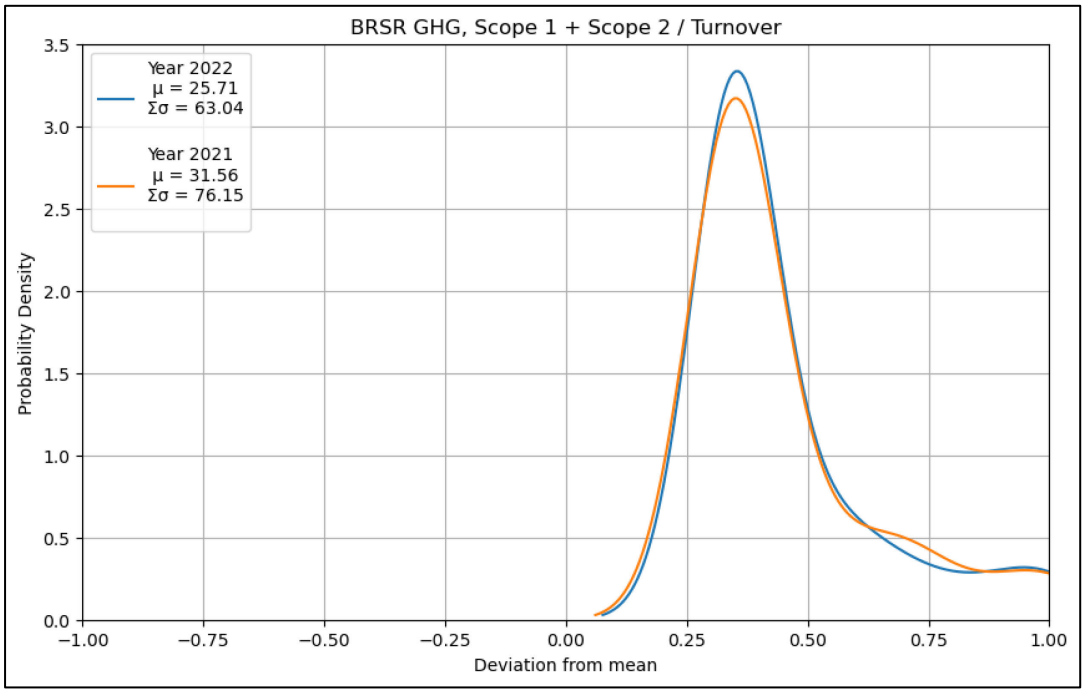


Table 5 Company distribution around the mean emission intensity for BRSR dataset

Year	N (No of Companies)	Average emission intensity in (MT/ INR million)	Standard Deviation of emission intensity in (MT/ INR million)	No of Companies Lower than Average (left curve)	No of Companies Greater than Average (right curve)
2022	42	25.71	63.04	32	10
2021	37	31.56	76.15	28	9

Note: MT- Million Tonnes
1 USD = 83 INR (exchange rate for March 2024)

Figure 7 shows the emission intensity distribution for 2021 and 2022. Almost the same emission values have been recorded for both years. There is no huge variation in the reporting levels. As highlighted in Table 5, in the year 2022, the emission intensity of 42 companies was considered for analysis. Among them, 32 companies stood out as better performers, exhibiting lower emission intensity values than average emission intensity and showcasing a strong commitment to environmental sustainability. On the other hand, 10 companies reported higher emission intensity than average emission intensity. For 2021, data of 37 companies was analysed. Among these, 28 companies demonstrated exemplary environmental performance by maintaining lower emission intensity values than average emission intensity. 9 companies reported higher emission intensity than average emission intensity in the year 2021. For this analysis, the authors have removed outliers from the data to make data more robust and accurate. For the year 2022 four outliers and for 2021 three outliers were excluded from the analysis.

Table 6 Company distribution around the mean Average Scope 1 and 2 Emissions for BRSR dataset

Year	N (No. of Companies)	Average of Scope 1 and 2 emissions in MT	No. of Companies Less than Mean	No. of Companies Greater than Mean
2022	41	4,11,686	32	9
2021	36	3,90,5145	28	8

Note: MT- Million Tonnes

As highlighted in Table 6, in the year 2022, a total of 41 companies were assessed for their environmental performance. Among them, 32 companies stood out as better performers, exhibiting lower emission values than average emission values. Conversely, 9 companies reported with high Scope 1 and 2 emissions. For the year 2021, data of 36 companies was analysed. Among these, 28 companies demonstrated consistent performance by maintaining low Scope 1 and 2 emissions. However, 8 companies reported high emission values, emphasizing the need for comprehensive strategies to address emissions and promote sustainable practices. For this analysis, the authors have removed outliers from the data to make data more robust and accurate. For the year 2022 five outliers and 2021 four outliers were excluded from the analysis.

- **Common Indicators across Industries and different data sources**

An attempt at identifying parameters that are common across the industries was made for the dataset accessed through Refinitiv. For all three E, S and G components, there are 13, 6 and 29 common parameters respectively that were observed to be common. The environment component covers Emissions (e.g. CO2 equivalent emissions total) and Resource use (e.g. water withdrawal total) categories. Both Emission and Resource use categories have 8 parameters each. There is only one category "Workforce" (e.g. women

employees) in the Social component and it has 8 parameters. The Governance component is also segregated into two categories – Management (e.g. Independent Board Members) and Shareholders (e.g. Voting Cap Percentage). The Management category includes 24 parameters and the shareholders category has 4 parameters. Annexure A provides all the parameters and their description.

A comparison was also made across to identify common parameters reported through BRSR and those available in Refinitiv data for all three E, S and G components. There are 14, 10 and 6 parameters common in these two datasets for E, S and G components respectively.

- **Additional parameters**

As part of our ongoing research on Environmental, Social, and Governance (ESG) practices, we have internally finalised 33 additional parameters based on cumulative experience in the ESG domain.

These parameters, curated through a combination of industry insights, best practices, and our understanding of ESG frameworks, augment our analysis to provide a more comprehensive evaluation of sustainability practices. The inclusion of these additional parameters reflects our commitment to refining and enriching our research methodology.

Environment (20)

1- Total Scope 1 Emission Per Turnover

2- Total Scope 1 and Scope 2 Emission Per Turnover

3- Total Scope 1, Scope 2, Scope 3 Emission Per Turnover

4- Total Scope 1 and Scope 2 Emission Per Electricity Consumption

5- Total Renewable Energy Per Turnover

6- Total Renewable Energy Per Total Energy Consumption

7- Total Non-Renewable Energy Per Turnover

8- Total Non-Renewable Energy Per Total Energy Consumption

9- Total Electricity Consumption Per Turnover

10- Total Energy Consumption Per Turnover

11- Total Water Utilized Per Turnover

12- Total Water Utilized Per Energy Consumption

13- Total Water Utilized Per Scope 1 and Scope 2 Emission

14- Total Waste Generated Per Turnover

15- Total Recycled, Reused and Recovery Waste Per Total Waste

16- Total Waste Discharged by No Treatment - No-Treatment/(No-Treatment + With Treatment)

17- Plastic Waste - (Recycled + Reused + Safely Disposed)/Total Plastic Waste

18- E-Waste - (Recycled + Reused + Safely Disposed)/Total E-Waste

19- Hazardous - Waste - (Recycled + Reused + Safely Disposed)/Total Hazardous-Waste

20- Other - Waste - (Recycled + Reused + Safely Disposed)/Other-Waste

Social (8)

1- Percentage of permanent vs temporary or permanent vs outsourced employees. This could be critical.
2- Percent Female Employees
3- Percent Unionized Employees
4- Sexual Harassment Complaints per 100 Employees
5- Percent Differently Abled Employees
6- Percentage of Females in Board of Directors (above minimum requirement)
7- Ratio of Remuneration of Managing Director to Median Remuneration*
8- Ratio of Percentage increase in Managing Director's Remuneration to increase in Profit before Tax

Governance (5)

1. Cash Yield
2. Depreciation Rate
3. Auditor Cost as a % of Net Sales
4. EBITDA as a % of cash flow operations (CFO)
5. Related Party Transactions as a % of 3-yr cumulative cash flow operations (CFO)

ESG Ratios

The ESG ratios have been sourced from the "CLP Holdings Ltd" case study. These ratios, derived from the tracking of CLP HOLDING's environmental, social, and governance performance, which can be served as a valuable benchmark while doing metrics assessment within our framework. Leveraging the lessons and insights gleaned from the case study, we aim to enhance the depth and relevance of our ESG analysis, aligning with industry best practices and real-world applications.

Environment (Green House Gases)

1. GHG Intensity of Energy (Implied Emission Factor)
2. GHG Intensity of Sales
3. GHG Scope 1 Intensity of Sales
4. GHG Scope 2 Intensity of Sales
5. GHG Intensity of EBITDA
6. GHG Intensity per Employee
7. GHG Intensity of Assets
8. GHG Intensity of Electricity Sold
9. GHG Intensity per Unit
10. Scope 3 GHG per Employee

Environment (Carbon dioxide)

1. CO2 Intensity of Energy Consumed
2. CO2 Intensity of Sales
3. CO2 Intensity of EBITDA
4. CO2 Intensity of Energy

5. CO2 Intensity per Employee
6. CO2 Intensity per Asset
7. CO2 Intensity per Unit
8. CO2 per KWH Sold

Environment (Energy)

1. Energy Intensity of Sales
2. Energy Intensity of EBITDA (RHS)
3. Energy Intensity per Employee
4. Energy Intensity per Asset

Environment (Water)

1. Water Use per Unit
2. Water Intensity of Sales
3. Water Intensity of EBITDA
4. Water Intensity of Energy
5. Water Intensity per Employee
6. Water Intensity per Asset
7. Water Usage Efficiency Rate

Environment (Waste)

1. Waste Intensity per Employee
2. Waste Generated per Asset
3. Waste Generated per Sales

Environment (Others)

1. NOx Intensity per Unit
2. NOx Emissions per Sales
3. SO2/SOx Intensity per Unit
4. SOx Emissions per Sales

Social (13)

1. Women Management to Employees Ratio
2. Fatalities per 1000 employees
3. Accidents per 1000 employees
4. Lost Time per Employee
5. Sustainable Investment / Capital Expenditure
6. Community Spend % PTP
7. Community Spend % EBITDA
8. Community Spend % Equity
9. Political Donations % PTP
10. R&D Expenditures per Cash Flow
11. Actual Net Income per Employee
12. Actual Cash Flow per Employee
13. Actual Personnel Expenses per Employee

Governance (15)

1. Percentage of Non-Executive Directors on Board
2. % Independent Directors
3. % Women on Board
4. Percentage of Female Executives
5. Board of Directors Age Range
6. Board Average Age
7. Board Meeting Attendance %
8. Independent Directors Board Meeting Attendance %
9. Percentage of Independent Directors on Audit Committee
10. Audit Committee Meeting Attendance Percentage
11. % of Ind Directors on Compensation Committee
12. Compensation Committee Meeting Attendance %
13. % of Ind Directors on Nomination Committee
14. % Ownership Required for Special Meeting
15. % Poison Pill Trigger Threshold

Conclusive Parameters Distilled from Analysis

This is the culmination of our extensive research efforts, resulting in the identification and finalization of key parameters that play a pivotal role in shaping our analysis for ESG practices. These parameters, meticulously derived from our research findings, represent a comprehensive framework for our evaluation. The inclusion of these parameters is reflective of our commitment in capturing the critical dimensions of ESG. Table 7 given below is the consolidated list of parameters that constitute the foundation of our research framework. Annexure A covers a list of parameters common across industries.

Table 7 Conclusive parameters distilled from the analysis

ESG Pillars	Common (Across Industries)	Common (BRSR and Refinitiv)	Additional Parameters Suggested	ESG Ratios
Environment	16	14	20	36
Social	8	10	8	13
Governance	29	6	5	15
Total	53	30	33	64

3.1.2 Estimation of GHG emissions and Creation of a ESG framework - For NIIF with a Focus on Sustainability

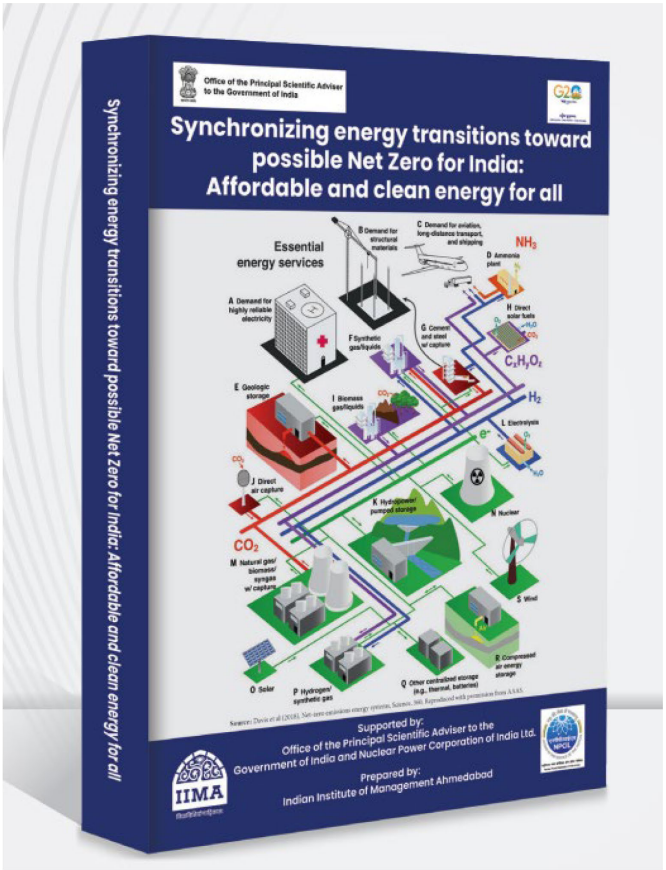
Amit Garg, Jaimin Shah, Ishan Katariya, Thodima Suneetha

This research project undertaken by PGPX students under the guidance of Prof. Amit Garg focused on 2 aspects - Accurate emission measurement for effective management and Creation of a framework for ESG Scoring for NIIF. The team created an emissions inventory by analyzing Scope 1, 2 and 3 emissions, Water consumption and Waste generation patterns by gathering data on NIIF's operations and emissions records. Further, a standardised framework was developed for estimating Scope 1 & 2 emissions. The study report also proposed specific reduction opportunities and its financial implications as well as identified potential risks and opportunities associated with value chain emissions. The study concluded that average per-employee emissions stood at 11.5 Metric tons, where air travel contributed the highest emissions, followed by car travel emphasizing the need for sustainable transportation practices. The water footprint was found to be 15KL per employee yearly and the waste generation was 3.75 KL per person annually.

3.1.3 Synchronizing energy transitions toward possible Net Zero for India: Affordable and clean energy for all

Garg A., Patange, O., Vishwanathan S.S., Nag, T., Singh, U., and Avashia V., (2023). Synchronizing energy transitions toward possible Net Zero for India: Affordable and clean energy for all.

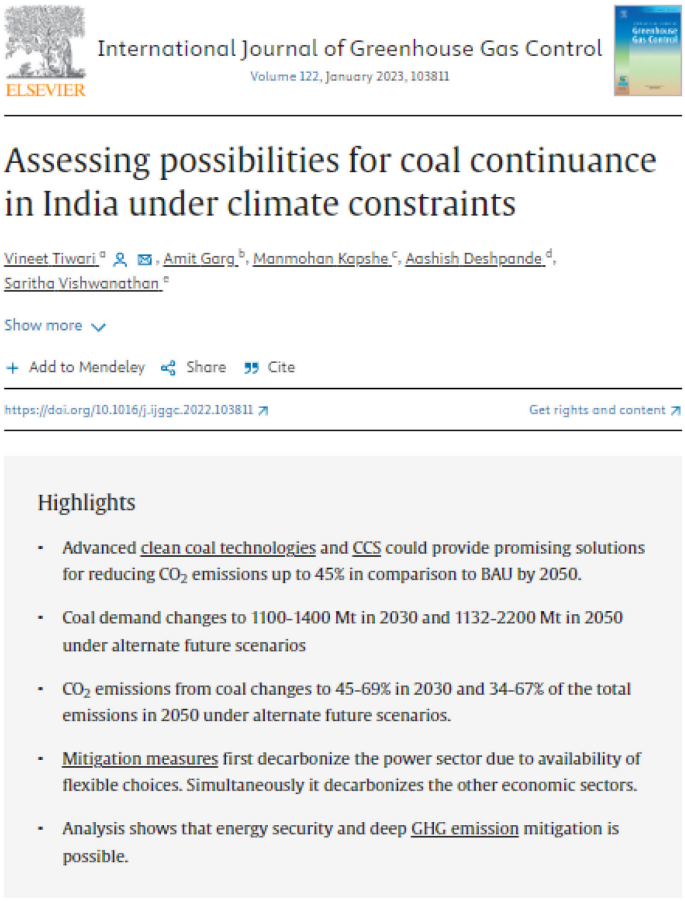
The study explores mitigation scenarios for India towards its net-zero 2070 goal while balancing the deep emission cuts and domestic development needs. Firstly, the energy needs for development needs were estimated. Our findings show that a very high HDI of 0.800 may be achieved at a minimum per-capita energy consumption of 37 GJ/year. The per-capita energy consumption is an estimated 56 GJ/year for achieving an HDI of 0.9 and above. Seven future scenarios (upto 2070), three based on current NDC commitments and four focused on achieving net-zero (NZ) emissions by 2070 have been assessed here. While NZ scenarios are targeted toward 2070, the trajectories by 2030 show the achievement of the NDC target of 50%. Thus, this indicates that India may push for higher economic growth supported by a higher share of non-fossil sources of electricity to achieve its NDC targets by 2030. One of the modelling results indicates that no NZ is possible without substantial nuclear power generation in 2070. If India plans to phase down coal in the next three decades, it will need to build adequate infrastructure for alternative sources such as nuclear power, in addition to flexible grid infrastructure and storage to support the integration of renewable energy. Our findings indicate that in the projected base case in 2030, up to 50 GW of RE curtailments/storage may be required. Alternatively, the RE may be used for hydrogen generation. With further demand-side management, it may be possible to shift 50 GW of load to solar hours, thereby avoiding RE curtailment. Time-of-day tariffs may also help flatten the load curve further. Additionally, the coal phase-down will require undertaking



significant imports of critical minerals to fulfill the needs of RE and battery storage sectors. If India intends to follow coal-dependent pathways, it will need to explore carbon dioxide technologies (CDRs) as well, such as bioenergy with carbon capture and storage (BECCS) and CCUS, to fully understand their long-term potential. Another key finding of this study is that clean, affordable electricity at the lowest levelised cost of electricity (for consumers) can be achieved in Net Zero pathways, especially with a focus on nuclear power and renewable power. Widespread electrification of end-use sectors, especially transport and residential, and eventually low-carbon and/or green hydrogen production will lead to a rapid increase in electricity demand after 2050 but not a corresponding increase in the carbon footprints of the power sector.

3.1.4 Peer-reviewed Publications

3.1.4.1 Tiwari, V., Garg, A., Kapshe, M., Deshpande, A., & Vishwanathan, S. (2023). Assessing possibilities for coal continuance in India under climate constraints. *International Journal of Greenhouse Gas Control, 122,* 103811,



In this paper we have used AIM/End-use, a bottom-up, techno-economic model to analyze India's energy security and greenhouse gas (GHG) emissions from the year 2000 to 2050 with a focus on possibilities of coal continuance in India. Our analysis shows that by adopting advanced coal technologies and carbon dioxide capture and sequestration (CCS) options, up to 45% CO2 emission reduction can be achieved over business-as-usual scenario (BAU) by 2050. The paper concludes that a win-win integration of energy security and deep GHG emission mitigation is possible through a large-scale integration of advanced coal technologies and CCS in Indian energy systems.

3.1.4.2 Singh, U., Singh A., Garg, A. (2024). Sustainable development goals as means to motivate CO2 capture and storage in Indian geologic formations, Marine and Petroleum Geology (160), https://doi.org/10.1016/j.marpetgeo.2023.106668

Ensemble modeling scenarios consistent with the Paris Agreement indicate that investments by the end of this decade towards CO2 transport and geologic storage would need to be $1–8 billion/year in India. These large-scale investments are accompanied by multiple technical, environmental, financial and societal interlinkages that interface with sustainable development. This review begins by summarizing some of these considerations in context of geologic CO2 storage. It then devotes individual sections to discussing how

Marine and Petroleum Geology

Volume 160, February 2024, 106668

Sustainable development goals as means to motivate CO_2 capture and storage in Indian geologic formations

Udayan Singh [a], Amit Garg [a], Ajay K. Singh [b]

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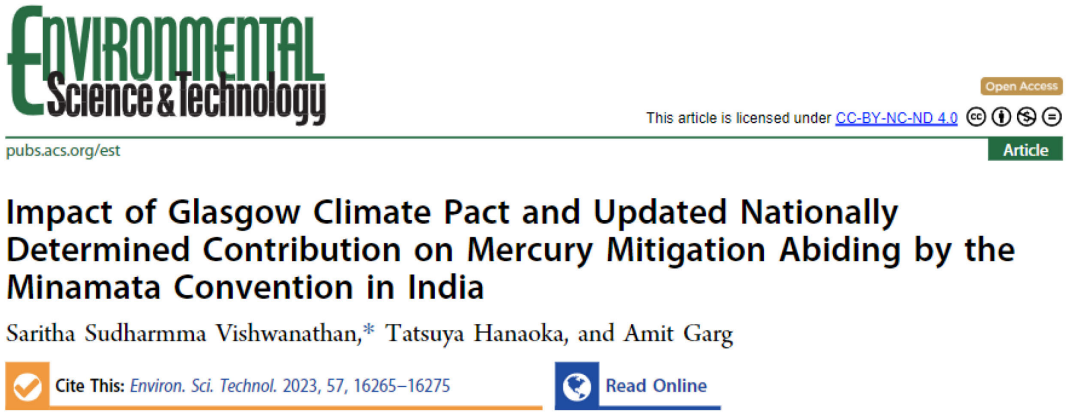
Highlights

- Contextually-explicit linkages between SDGs and CCS are discussed.
- SDG-17 is critical for financing CCS in developing countries such as India.
- SDGs 6, 8 and 9 are particularly relevant for understanding holistic benefits of CCS.
- Illustration of CCS in aiding just transition and industry decarbonization is provided.

sustainable development goals (SDGs) could align with these projects and play a synergistic role for decarbonization. Four SDGs are particularly of interest. SDG-17 on global partnerships would be instrumental in facilitating low-cost financing for CCS investments. At the same time, other SDGs could be strategically used as co-benefits to CCS projects. These include SDG-8 on decent work, SDG-6 on clean water and SDG-9 on industry.

3.1.4.3 Vishwanathan, S.S., Hanaoka, T., Garg, A. (2023). Impact of Glasgow Climate Pact and Updated Nationally Determined Contribution on Mercury Mitigation Abiding by the Minamata Convention in India, Environmental Science & Technology, 57 (43), 16265-16275, https://doi.org/10.1021/acs.est.3c01820

India is one of the largest emitters of atmospheric anthropogenic mercury (Hg) and the third-largest emitter of greenhouse gases in the world. More than 70% to 80% of India's mercury and carbon dioxide emissions occur because of anthropogenic activities from coal usage. This study explores nine policy scenarios, the nationally determined contribution (NDC) scenario, and two deep decarbonization pathways (DDP) with and without mercury control technologies in the energy and carbon-intensive sectors using a bottom-up, techno-economic model, AIM/Enduse India. Increase in the renewables share (power sector) can result in a significant reduction in the costs of additional pollution-abating technologies in the DDP-R scenario when compared with the coal intensive DDP-CCS scenario. However, the industry sector, especially iron and steel and metal production, will require stringent policies to encourage installation of pollution-abating technologies to mitigate mercury emissions under all the scenarios.



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Article

Impact of Glasgow Climate Pact and Updated Nationally Determined Contribution on Mercury Mitigation Abiding by the Minamata Convention in India

Saritha Sudharmma Vishwanathan,* Tatsuya Hanaoka, and Amit Garg

Cite This: *Environ. Sci. Technol.* 2023, 57, 16265−16275 Read Online

3.1.4.4 Vishwanathan, S.S., Fragkos, P., Fragkiadakis, K., Garg, A. (2023). Assessing enhanced NDC and climate compatible development pathways for India, Energy Strategy Reviews (49), https://doi.org/10.1016/j.esr.2023.101152


Energy Strategy Reviews 49 (2023) 101152

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Assessing enhanced NDC and climate compatible development pathways for India

Saritha Sudharmma Vishwanathan [a,*], Panagiotis Fragkos [b], Konstantinos Fragkiadakis [b], Amit Garg [c]

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[c] Public Systems Group, Indian Institute of Management Ahmedabad, Gujarat, India

India has indicated a strong commitment towards mitigating climate change not only through its Nationally Determined Contribution (NDC) but also reiterating on raising its climate ambitions and committing towards Net Zero (NZ) in Glasgow. This study couples the bottom-up technology-rich energy system model with a macroeconomic computable general equilibrium model to assess the socio-technical, financial and macro-economic implications of India's energy sector transformation away from coal. In order to move towards its NZ target by 2070, India will need to restructure its coal-based power and industry sector. This study provides insights on the challenges (stranded assets, loss of revenue) as well as the opportunities from energy sector restructuring (job creation, energy import reduction, improvement of local environment and human health).

3.1.4.5 Prusty, D., Garg, A., Solanki, U., & Maheshwari, J. (2023). An accounting framework for implementing India's NDCs and reporting the capacity building needs in the context of the Paris rulebook. Climate and Development, https://doi.org/10.1080/17565529.2023.2247388


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Received 29 Aug 2022, Accepted 06 Aug 2023, Published online: 05 Sep 2023
Research Article

An accounting framework for implementing India's NDCs and reporting the capacity building needs in the context of the Paris rulebook

Debasish Prusty, Amit Garg, Umesh Solanki & Jyoti Maheshwari

Cite this article https://doi.org/10.1080/17565529.2023.2247388

The purpose of this paper is to suggest an accounting framework for India for implementation of its nationally determined contributions (NDCs) and design the appropriate modality for reporting its capacity building needs and priorities in a manner that is in consonance with the provisions of the Paris Rule book from the perspective of a developing country. The suggested accounting methodology considers India's national greenhouse gas (GHG) inventory and climate mitigation policies. The Key Category Analysis concept of the Intergovernmental Panel on Climate Change for accounting GHG inventory estimation at the national level is used to identify and rank the key inventory categories for India. Accounting of various national level mitigation policies is undertaken by assessing their impact on the key categories, subsequently recognizing 'Key Policies' in accordance with the provisions of the Paris rulebook. 'Key Policies' are found to have a definite role in driving the progress of implementation of NDCs. The study recommends a modality that developing countries can use to report their needs for capacity building support for full implementation of their 'key policies' while accounting their future NDCs, using the flexibilities provided under the Paris Rule book.

3.1.4.6 Yann Briand, Steve Pye, Marcio de Almeida D'Agosto, George Vasconcelos Goesc, Daniel Neves Schmitz-Gonçalvesc, Amit Garg, Dipti Gupta, Saritha Sudharmma Vishwanathand, Ucok W.R. Siagiang, Fadiel Ahjumh and Hilton Trollip (2023). Passenger transport decarbonization in emerging economies: policy lessons from modelling long-term deep decarbonization pathways, Climate Policy, Taylor & Francis Group, April 04, 2023., https://doi.org/10.1080/14693062.2023.2194859

In this paper, we apply the Deep Decarbonization Pathways (DDP) approach to develop and report scenarios on the passenger transport sector in Brazil, India, Indonesia, and South Africa. This approach supports an increase in the sectoral ambition of covering all drivers of change in transport mobility and facilitating collective comparison and policy discussions on the barriers and enablers of transitions. The scenario analysis illustrates that all four countries can achieve reductions in emissions per passenger kilometres of 59% and up to 92% by 2050 while meeting growing mobility needs. Lastly, the analysis identifies short-term policy needed to address barriers and promote enablers.

3.1.5 Monograph: How are the adequacy and effectiveness of adaptation and support made manifested in national submissions?"

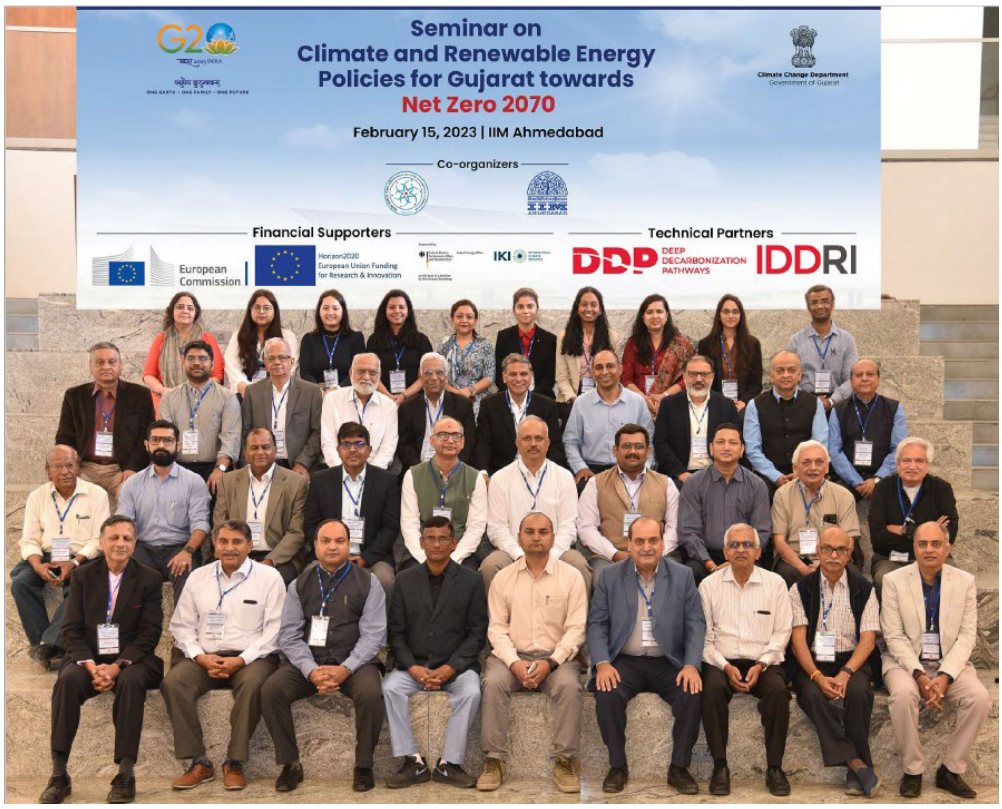
Avashia, V. & Garg, A (2023) "**How are the adequacy and effectiveness of adaptation and support made manifested in national submissions?**" in Gao. J., Christiansen. L. (eds.) "Perspectives: Adequacy and Effectiveness of Adaptation in the Global Stocktake." UNEP Copenhagen Climate Centre, Copenhagen. https://www.iima.ac.in/sites/default/files/2023-03/perspectives-adequacy-and-effectiveness-of-adaptation-in-the-global-stocktake-web.pdf

The Paris Agreement provides for a collective assessment of progress in achieving its long-term goals through the mandate on the Global Stocktake (GST). A critical challenge for the GST is to operationalize answers to fundamental questions such as how can we assess whether we are making progress in enhancing adaptive capacity, reducing vulnerability, and enhancing resilience; what does an adequate adaptation response imply and how can it be defined; how do we define and measure adaptation effectiveness, and what can meaningfully be assessed at the global level and what cannot? This paper explores the UNFCCC reporting needs on adaptation, and how and where countries report their adaptation actions and support. The insights are reinforced through interview-based case studies of Ghana's and Nigeria's respective experiences of developing their ADCOMs.

3.2 Engagement with Stakeholders

3.2.1 Seminar on Climate and Renewable Energy Policies for Gujarat towards Net Zero 2070 (February 15, 2023) at Ahmedabad

Co-organizing Institutions: IIMA, IIT Gandhinagar, ITF, under the aegis of Climate Change Department, Government of Gujarat



The objective of this event is to discuss the various new technical paradigms in the areas of energy policy and renewable energy, under an overarching framework of climate change using the current trends and emerging ecosystems that are implementable on ground. The seminar looked towards answers to the following:

- How can we enhance development indicators even with lower energy consumption in Gujarat through energy efficiency practices both on the supply and demand sides?
- What is the future for energy efficiency obtained through demand side management?
- What could be the role of non-fossil energy sources in a Net Zero emission scenario through appropriate policies in Gujarat?
- What role would Electric Vehicles play in optimizing the logistics and supply chains?
- What are up-and-coming practical renewable energy policy suggestions in solar, wind, bioenergy, and green hydrogen?
- What are the possible integration areas for energy, water use efficiency and agriculture?
- How can we utilize the AYUSH Ministry in achieving the Prime Minister's LiFE Mission goals?
- What are additional policies needed over and above the existing policies and what are the specific implementation challenges in existing policies Gujarat would need to address in renewables, climate change and Net Zero domains?

3.2.2 Customised Programme on Environment, Social & Corporate Governance (ESG) for National Investment and Infrastructure Fund Limited (NIIF) (June 11-13, 2023)

A three-day on campus customised ESG Programme for the NIIF investee company's environment and social practitioners was organised at IIM Ahmedabad between June 11-13, 2023. Undertaken by 30 participants representing various sectors ranging from healthcare and life sciences, renewables and cleantech, infrastructure and logistics as well as finance. The programme offered the participants a deep dive into crucial aspects of Environmental, Social, and Governance practices. It began with a solid foundation in the Basics of ESG, followed by sessions on ESG strategy and its seamless integration with business operations. Exploring ESG as a value creator, the training featured insightful case discussions, including a spotlight on Barry Callebaut and Project Financing for a Sustainable Railways Project. Participants gained an understanding of Climate Risks, encompassing identification, assessment, and mitigation, with a special focus on vulnerability and exposure. The innovative financing of Climate Resilience Infrastructure, exemplified by a case study on Travelers Insurance, added a real-world perspective. Discussions on Disruptive Businesses in Public Mobility, eBuses in India, and group-wise Climate Risk assessments provided a holistic view. The program also addressed the intersection of ESG, climate change, and business risks, culminating in discussions on Net Zero initiatives and firm-level mitigation strategies through a video case on Amplus Solar. The training concluded with a thorough exploration of investment and financing challenges, featuring a compelling case study on CLP Group's Environmental, Social, and Governance factors and their effects on valuation.

Executive Education

Indian Institute of Management Ahmedabad

A Programme on Environment, Social & Corporate Governance (ESG) for National Investment and Infrastructure Fund Limited (NIIFL)

June 11 – 13, 2023

Sitting First Row (L to R)	Sundar Manohar Polakampalli, Shivarama M. S., Vidhee Avashia, Akshata Kalloor, Prof. Vimal Mishra, Mahua Acharya, Prof. Amit Garg, Rakhee Sunar, Kavya Sajwan, Raju Singh, Divya Arora, Jigar Shah
Standing Second Row (L to R)	S. V. Koteswara Rao, Hitesh Lachhwani, Nirmalya Malakar, Vishal Bhavsar, Prafulla Chandra Saurabh, Rajeshkumar R. Rathva, Ashok Emani, Dr. Sandeep Padmakar Sohani, Zulfikar Mustabhai Trivedi, Anshul Agarwal, Vikas Jaybhaye, Prasanna Kumar, Pranay Krishnan
Standing Third Row (L to R)	Selva Joyson, Saiyam Jain, Sanjay Kumar Jain, Leo Jacob Ambooken, Manoraj M. S., Sanchit Jain, Arun Shiva Balasubramanian, Mangesh Dakhore, Khushal V. Tipre, Abhishek Ganguli, Prasanna Kumar Gudaloor, Binod Singh Alchouni, Kumud Ranjan, Nishant Kumar

Classroom Sessions:

Valedictory Session:

IIMA Heritage and New Campus tour:

3.2.3 NIIF Leadership Team Meeting Held in Mumbai (October 5, 2023)

A strategic meeting was held with the leadership team of NIIF in its Mumbai office on October 5, 2023. Prof. Amit Garg presented the recent work on India's net zero target and possible pathways to achieve it. Discussions covered the current scenarios for GHG emission intensity and India's performance on its commitments towards the Paris Agreement highlighting India's ability to decouple economic growth from GHG emissions, a feat underscored by the country's GDP growth outpacing emissions growth. His discussion focused on a wide variety of issues such as energy requirements, net zero emissions and low-cost electricity, and investment requirements.

Another set of discussions centred around climate risk disclosures for the road industry and solar assets.

3.2.4 Environmental Sustainability Summit 2024 (January 9, 2024) at Mumbai

The day-long symposium called "Environmental Sustainability Summit 2024" with a special focus on harnessing bamboos' potential, was organised by the Phoenix Foundation, Lodga, Latur in association with Maharashtra's Environment and Climate Change Department and the Maharashtra Pollution Control Board. The event was graced by several high-level dignitaries such as His Excellency Hon'ble Governor of Maharashtra, Shri Ramesh Bais, Hon'ble Chief Minister of Maharashtra, Shri Eknath Shinde; Principal Secretary, Environment and Climate Change Department, Government of Maharashtra, and Mr Praveen Darade; Secretary, Ministry of Agriculture and Farmer Welfare, Government of India. A panel discussion on bamboo-based solutions was organised in this event where, Prof. Amit Garg intervened that bamboo is a versatile commodity however developing a market for bamboo-based products is also a challenge. Thus,

proper marketing is the need of the hour to promote bamboo-based products. Also, 50% of coal could be replaced by bamboo-based biochar that makes it a good future investment.

3.2.5 Towards Net Zero at Vibrant Gujarat Global Summit 2024 (January 12, 2024) at Gandhinagar

Gujarat is progressing with its contribution to the achievement of India's NDCs with its involvement in Renewable Energy, Energy Efficiency, Electric Vehicles, Industrial Decarbonisation, and other initiatives. Gujarat has implemented policies for the promotion of various activities that can help achieve Net Zero targets. Hence, as a part of the 10th Vibrant Gujarat Global Summit 2024 held between January 10 to 12, 2024, an event on "Towards Net Zero" was organized by the Gujarat Government. The event aimed to have a strong participation from the industry sector in discussing potential solutions for the decarbonisation of the economy and exploring possibilities of Carbon Trading. Prof. Amit Garg participated in the 2nd Plenary session on Carbon Trading. He emphasized that the call for transparency and integrity in carbon credit pricing is pivotal for ensuring fairness within the market. India requires about 45-50 billion dollars per year for the next 50 years, of which Gujarat requires 4-5 billion dollars per year to achieve net zero targets, necessitating significant private-sector involvement. Further, it was highlighted that due to rating discrepancies, emerging economies face challenges accessing affordable financing, underscoring the need for a common-ground taxonomy. While carbon markets offer opportunities, they alone may not suffice to achieve net-zero goals, especially for developing countries where carbon taxes could be regressive. Initiatives such as bamboo-based biochar in the steel sector can contribute to carbon reduction and directly benefit grassroots communities, emphasising the importance of connecting industries with local stakeholders for sustainable development.

3.2.6 Op-Ed: MDBs Must Synchronize Projects with Countries

An OpEd titled "MDBs Must Synchronize Projects with Countries' NDCs for Impactful Climate Financing" was published in the Financial Express on September 28, 2023. This insightful piece was jointly authored by Professor Amit Garg, Akhilesh Tilotia, and Sanjay Kumar Jain. Available at https://www.financialexpress.com/opinion/for-impactful-climate-financing-mdbs-must-synchronise-the-projects-they-fund-with-countries-ndcs/3256817/

For impactful climate financing: MDBs must synchronise the projects they fund with Countries' NDCs

In addition to this $206 billion of net worth, MDBs hold commitments from their key shareholders, known as callable capital, amounting to $890 billion (as of 2021)—over four times their net worth.

Written by Guest
September 28, 2023 06:15 IST

Follow Us

ODI, a global affairs think tank, pegged the cumulative paid-in capital across MDBs at $79 billion, with accumulated reserves of $127 billion.

By Amit Garg, Akhilesh Tilotia, & Sanjay K Jain

One of the significant outcomes of the New Delhi Leaders' Declaration at the recent G20 summit was the Green Development Pact for a Sustainable Future. It helps build crucial momentum in the world's race to fulfill the temperature targets in the Paris Agreement. As part of this Green Development Pact, the Declaration highlighted the importance of mobilising timely and adequate low-cost climate financing through blended finance and risk-sharing facilities.

The gist of the piece is as follows: The recent G20 declaration has cast the spotlight on the critical role of MDBs in climate financing. It has highlighted a golden opportunity to facilitate action-oriented outcomes for MDBs and speed up the transition to a low-carbon world. Acting with urgency can mitigate future global costs associated with delayed transitions, lock-ins, asset stranding, loss and damage. The time is ripe for action and MDBs stand at the forefront of this shift towards a greener future.

3.2.7 NIIF Leadership Team Meeting Held in Mumbai (March 2024)

A strategic meeting was held with the leadership team of NIIF in its Mumbai office on 20th March 2024. Prof. Amit Garg presented the NIIF Chair in ESG's annual plan update to Shri Sanjiv Aggarwal (CEO, NIIF, IIMA). A call with International Energy Agency (IEA) on cost of capital for renewable energy and an internal team discussions between NIIF and IIMA was also held. Prof. Garg has also discussed about our recent work on India's net zero target and possible pathways to achieve it.

3.3 Engagement as Knowledge Partner

3.3.1 Participation at G20 Events

3.3.1.1 First Energy Transitions Working Group (ETWG) Meeting

The first Energy Transitions Working Group (ETWG) meeting under India's G20 Presidency was organised during February 5 - 7, 2023 in Bengaluru, India. The first ETWG meeting focused on six key priority areas such as Energy Transition through Addressing Technology Gaps; Low-cost Financing for Energy Transition; Energy Security and Diversified Supply Chains; Energy Efficiency, Industrial Low Carbon Transitions and Responsible Consumption; Fuels for Future (3F), Universal Access to Clean Energy and Just, Affordable, and Inclusive Energy Transition Pathways. Also, a high-level international seminar on 'Carbon Capture, Utilization and Storage (CCUS)' was organised as a side event to first ETWG meeting. The CCUS seminar focused on highlighting the importance of CCUS for achieving India's net-zero target.

Ministry of Power

The First Energy Transitions Working Group Meeting to be held in Bengaluru on February 5-7, 2023

Posted On: 04 FEB 2023 6:38PM by PIB Bengaluru

The first G20 Energy Transition Working Group (ETWG) Meeting under India's Presidency will be held in Bengaluru, from Feb 5-7, 2023.

The priority areas for the Energy Transitions Working Group (ETWG) include the following: (i) Energy Transition through Addressing Technology Gaps (ii) Low-cost Financing for Energy Transition (iii) Energy Security and Diversified Supply Chains (iv) Energy Efficiency, Industrial Low Carbon Transitions and Responsible Consumption, (v) Fuels for Future (3F) and (vi) Universal Access to Clean Energy and Just, Affordable, and Inclusive Energy Transition Pathways.

The Energy Transitions Working Group while retaining focus on achieving energy transition, will emphasize on addressing technology gaps and financing to ensure that it is delivered across countries in a time-bound and affordable manner without compromising the energy needs of the communities.

The expected outcomes of the deliberations would include agreement to advance cooperation initiatives under RD20 Platform (Research and Development 20), roadmap for channelizing adequate low-cost international finance towards deployment of critical technologies, declaration on collective efforts to ensure energy security and diversified supply chains of new energy sources, roadmap for doubling global rate of improvement in energy efficiency by 2030, action plan for enhancing and promoting

bio-energy cooperation, and recommendations on global best practices for supporting Just, Affordable, and Inclusive energy transitions.

On the sidelines, a high-level international seminar on 'Carbon Capture, Utilization and Storage (CCUS)' has been organized at the 1st ETWG. The seminar will focus on highlighting the importance of carbon capture, utilization, and storage, considered vital for achieving net-zero targets.

To set the agenda and identify action areas for the planned Energy Transition Ministerial Meeting (ETMM), ETWG will conduct four (4) working group meetings. The meetings will take place as follows:

1st ETWG Meet – Bengaluru, February 5-7, 2023

2nd ETWG Meet – Gandhinagar, April 2-4, 2023

3rd ETWG Meet – Mumbai, May 15-17, 2023

4th ETWG Meet – Goa, July 19-20, 2023

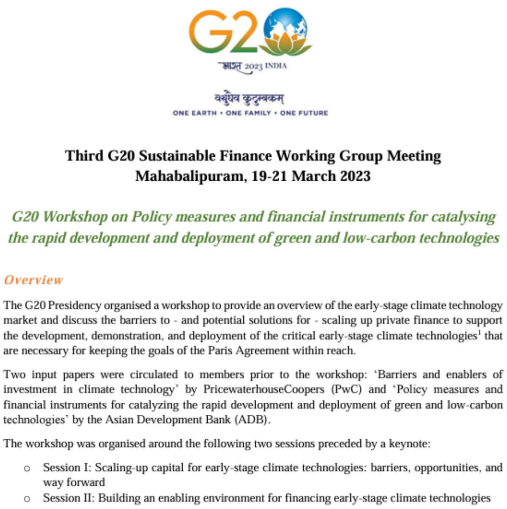
ETMM – Goa, July 22, 2023

India is hosting 150+ delegates from 19 countries, European Union and 9 guest countries. In addition, leading International Organisations and Regional Organisations and knowledge partners will be part of the meeting.

India's G20 Presidency will share, collaborate, and build on the sense of trusteeship amongst the member countries to help build a sustainable future for all.

3.3.1.2 Building an enabling environment for financing early-stage climate technologies

A roundtable on 'Building an enabling environment for financing early-stage climate technologies' was organised at the G20 workshop on policy measures and financial instruments for catalysing the rapid development and deployment of green and low-carbon technologies on June 19, 2023, at the Third G20 Sustainable Finance Working Group Meeting held at Mahabalipuram. The roundtable was moderated by Mark Daly, Head of Technology & Innovation from BloombergNEF. The discussions covered the contribution of various stakeholders in creating an enabling environment for financing early-stage climate



Third G20 Sustainable Finance Working Group Meeting
Mahabalipuram, 19-21 March 2023

G20 Workshop on Policy measures and financial instruments for catalysing the rapid development and deployment of green and low-carbon technologies

Overview

The G20 Presidency organised a workshop to provide an overview of the early-stage climate technology market and discuss the barriers to - and potential solutions for - scaling up private finance to support the development, demonstration, and deployment of the critical early-stage climate technologies[1] that are necessary for keeping the goals of the Paris Agreement within reach.

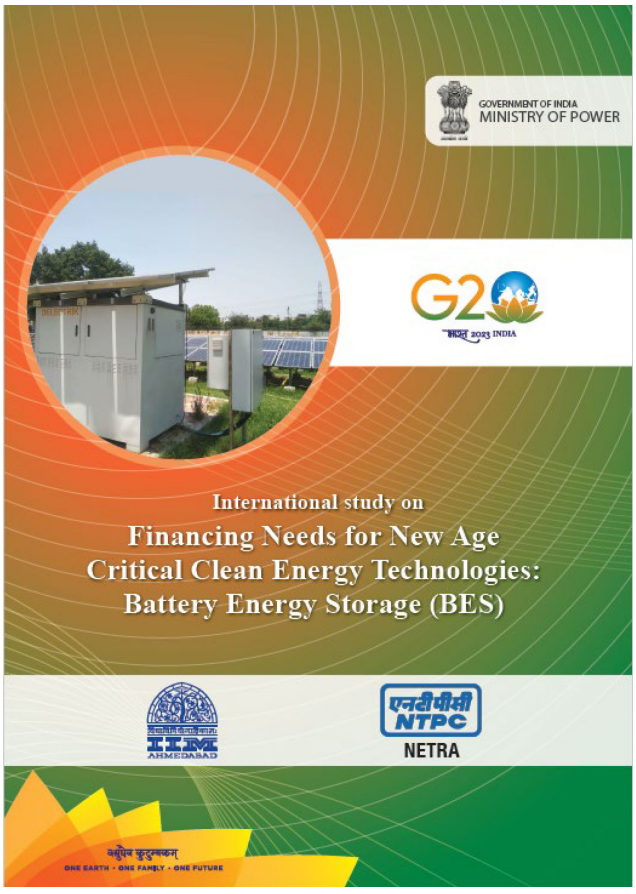
Two input papers were circulated to members prior to the workshop: 'Barriers and enablers of investment in climate technology' by PricewaterhouseCoopers (PwC) and 'Policy measures and financial instruments for catalyzing the rapid development and deployment of green and low-carbon technologies' by the Asian Development Bank (ADB).

The workshop was organised around the following two sessions preceded by a keynote:

- Session I: Scaling-up capital for early-stage climate technologies: barriers, opportunities, and way forward
- Session II: Building an enabling environment for financing early-stage climate technologies

technologies. The interventions from IIMA pointed out the inefficient capital allocation across sectors and across countries and the need for de-risking through first loss capital from MDBs and philanthropic sources. The panelists also argued on the advantages of issuing sovereign green debt in local currencies in emerging economies in the midst of monetary tightening and rising interest rates, pointing to the non-monetizable nature of many adaptation-related investments. The critical role that the insurance sector can play in adaptation finance was also highlighted.

3.3.2 International study on financing needs for new age critical clean energy technologies: Battery Energy Storage (BES)



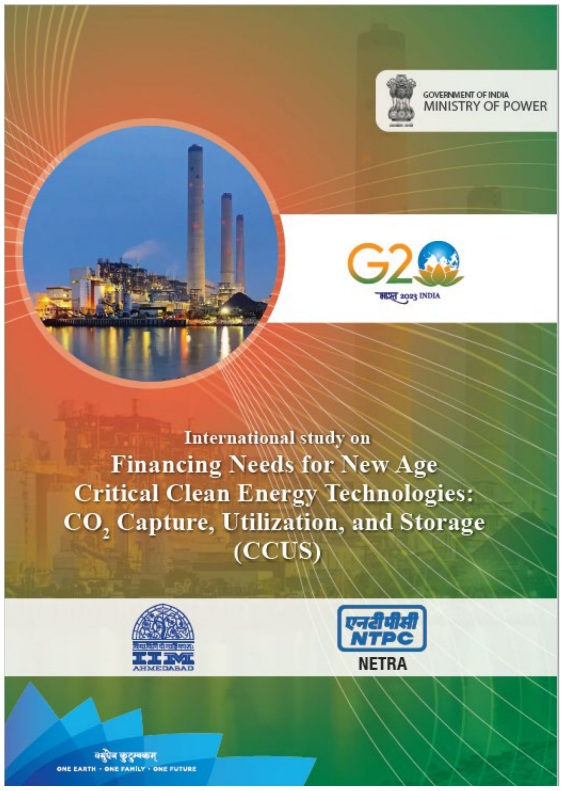
Garg, A., Patange, O., Jain, S. K., Nag, T., Maheshwari, J., Avashia, V., Arora, D., Ghosh, N., & Kushabaha, A. (2023). International study on financing needs for new age critical clean energy technologies: Battery Energy Storage (BES). International study report prepared for India's G20 presidency under the aegis of 'Energy Transition Working Group'.

Energy storage is important for large-scale deployment and grid integration of renewable energy sources like solar and wind. Although pumped hydro storage is the dominant technology for energy storage, battery energy storage (BES) is catching up due to falling costs, suitable characteristics, and scalability. In the past decade, the cost of Li-ion battery storage technology has declined by over 90% and most of the new investments have also come up in BES. The BES capacities are projected to reach up to 3000 GW by 2030 and further rise to 6000 GW by 2050 in the ambitious mitigation scenarios that meet the Paris Agreement goals. This study provides encouragements for discussion and adoption by G20 countries to support BES projects. These are as outlined here:

- As the demand for BES increases in the future, G20 countries could build an international consortium to research, develop and finance alternatives technologies like flow batteries and sodium sulphur batteries.

- Since the technology landscape is changing rapidly, efforts to update the future BES projections under different scenarios and the underlying demand for critical minerals could be supported for G20 countries through collaborations like the Network for Greening the Financial System.
- G20 countries could invest in technology development and build international cooperation to share critical minerals resources due to their scarcity. Further, refurbishing, recycling, and mineral recovery would play a vital role in the sustainable use of mineral resources.
- Since there are multiple technologies at the development stage, the scalability of BES technologies at commercial scale in various countries poses a significant risk to the project developers. Financing mechanisms and regulatory support could ease the future development of these technologies.
- Governments could consider grid-scale battery storage as part of their long-term energy transitions.
- For low-cost financing of BES, it is recommended that -
    - A dedicated fund supported by Multilateral Development Banks (MDBs) could be created to finance BES projects globally, especially in the emerging markets and developing countries (EMDCs)
    - Capital resources of MDBs and other funds should be increased substantially to scale up funding for BES projects globally. Paid-in capital and callable capital of MDBs should be increased periodically to fund BES projects in EMDCs
    - International financing instruments such as green bonds (loans), outcome-based sustainability debts, structured equity funds, co-financing, guarantees, BES investment trusts, and credit default swaps may be adopted to de-risk investment in BES projects and crowd-in private investments

3.3.3 International study on financing needs for new age critical clean energy technologies: CO2 Capture, Utilization, and Storage (CCUS)



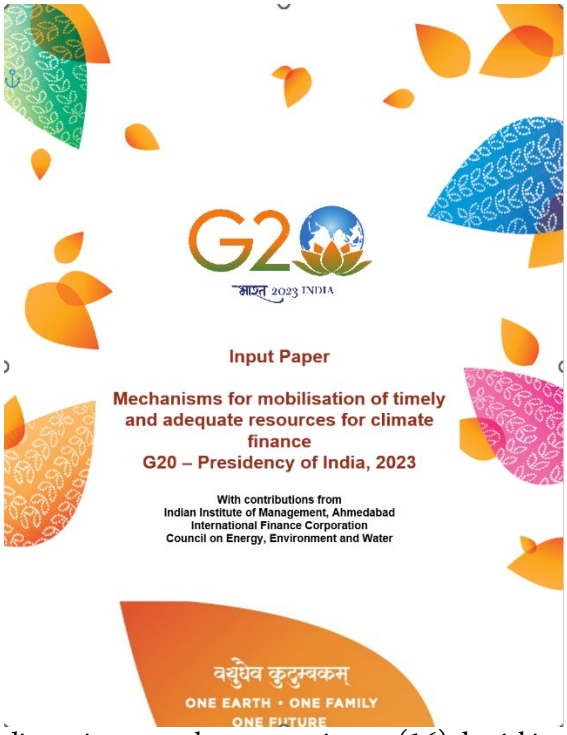
Garg, A., Singh, U., Jain, S. K., Maheshwari, J., Vishwanathan, S. S., and Singh, A. K. (2023). International study on financing needs for new age critical clean energy technologies: CO2 Capture, Utilization, and Storage (CCUS). International study report prepared for India's G20 presidency under the aegis of 'Energy Transition Working Group'.

Energy systems mitigation with CO2 capture, utilization, and storage (CCUS) will be increasingly important over the next three decades as unabated fossil fuel use would look incompatible with Paris climate targets. CO2 capture and utilization (CCU) could be an important form of GHG mitigation opportunity and could lead to 50-70% reduction in GHG emissions of key industrial products (e.g., cement, methanol). Availability of CCUS likely reduces stranding of power plants and fossil reserves by more than 50% across modelling results. Globally, CCUS is expected to be a key part of

future clean energy investments for the 1.5°C scenario. These include investments in coal power plants ($1-16B annually in 2030), gas power plants ($7-22B annually in 2030) and biomass power plants ($1-46B annually in 2030). This study suggests the following recommendations which are encouraged for discussion and adoption by G20 countries to support CCUS projects.

- Grant-based financing through a specialised fund by pooling public funds from OECD countries and other donors must be created to scale up the deployment of CCUS projects. The scope of the Asian Development Bank CCS fund is very limited. Grants-based funding for capacity building and technical assistance will immensely benefit emerging markets and developing countries (EMDCs) in assessing the technical feasibility of CCUS technologies. Specialized funds should be created under the aegis of Multilateral Development Banks (MDBs). Global Environment Facility, Climate Investment Funds, Green Climate Fund, and other funds can direct grants through this specialised fund, so that recipient countries don't have to apply to each fund separately, thereby reducing transaction costs and documentation requirements.
- MDBs can provide guarantees to deal with technology risks associated with CCUS demonstration projects, especially CCU projects.
- Research efforts into CCU must be diversified for better inclusion of the chemicals and materials sector into model frameworks, developing better catalysts and reagents for facilitating individual CO2 utilization pathways and improved global market assessment.
- It is essential that CCUS is brought within the ambit of carbon markets in the medium-to-long term. While the EUETS and some other markets include CCUS, it should be considered whether the geographical boundary of such projects may be outside such that carbon credits may be traded across G20 countries.
- Technical assistance should be provided to G20 countries where an effective assessment of sink potential is not present. The storage capacity in saline aquifers in developing countries may not have been assessed properly because such reservoirs have not been explored for commercial reasons.

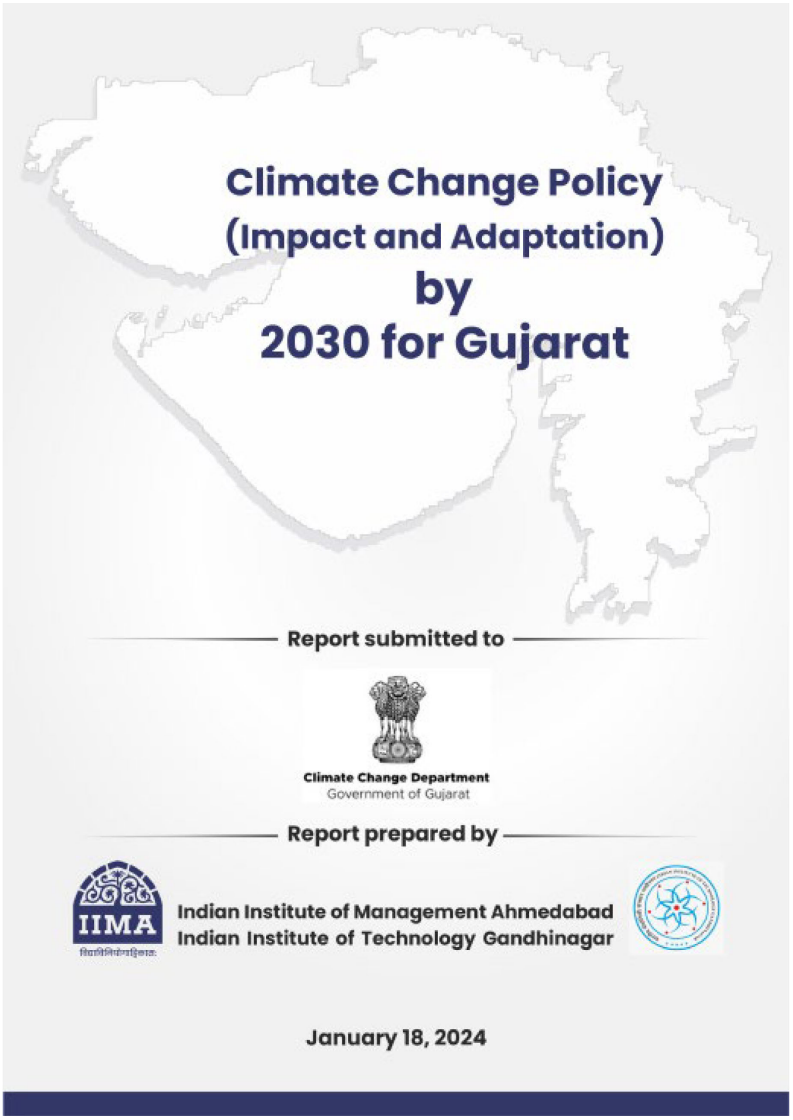
3.3.4 Mechanisms for the mobilization of timely, fair, and adequate financial resources for climate action projects



Garg, A., Avashia, V., Jain, S. K., and Maheshwari, J. (2023). Mechanisms for the mobilization of timely, fair, and adequate financial resources for climate action projects. A discussion paper prepared for India's G20 presidency under the aegis of 'Sustainable Finance Working Group for Department of Economic Affairs, Government of India.

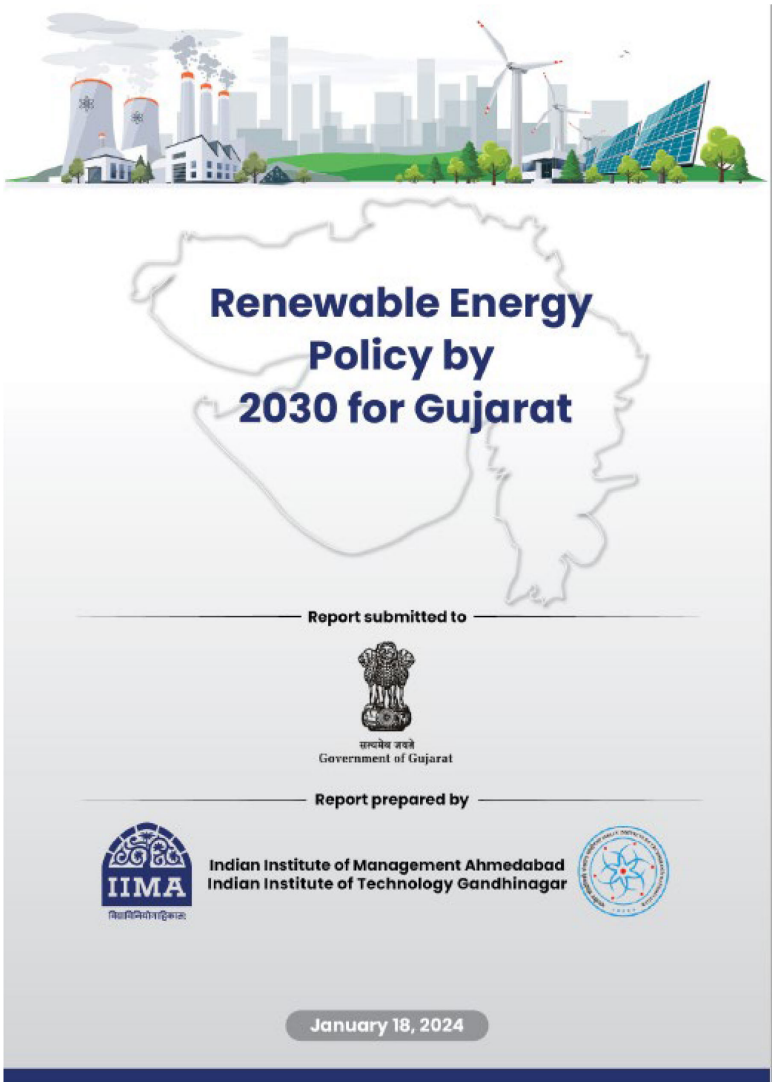
The discussions paper was prepared as a contribution towards "Input Paper: Mechanisms for mobilisation of timely and adequate resources for climate finance" by the G20 – Presidency of India, 2023. This discussion paper proposes a risk management-based strategy to understand different aspects of risks associated with a country and the project and allocate risks to the market participants who are most suitable and willing to take the respective risks by leveraging public funds and resources of Multi-lateral Development Banks (MDBs). Traditionally, MDBs have been providing funding through concessional loans and grants. However, this discussion paper h suggests sixteen (16) de-risking and blended finance instruments that MDBs can adopt in financing low-carbon and climate-resilient development as per the risk profile of the country and the project. At the same time, MDBs should leverage their expertise, experience, and resources to reduce information asymmetries and develop multiple blended finance instruments. This discussion paper proposes to increase the paid-in and callable capital of MDBs to increase their financial capacity and leverage additional private investment in climate financing. MDBs may consider climate financing through equity investment and derivative instruments such as swaps to de-risk and crowd-in private investment. Also, MDBs can promote adaptation finance by adopting blended finance instruments such as co-financing (loan syndication), securitization, outcome-based sustainability loans/bonds, risk-sharing facility, and private equity funds. Public funds from OECD countries can be deployed in multiple instruments, such as guarantees, structured funds, first-loss capital, loan syndication, and credit default swaps.

3.3.5 Climate Change Policy (Impact and Adaptation) by 2030 for Gujarat



The report on climate change policy for Gujarat stresses the urgent need for proactive measures to address climate-related challenges in the region, including rising temperatures, precipitation changes, and extreme weather events. It advocates a dual strategy focusing on both mitigation and adaptation. Mitigation efforts, such as expanding renewable energy sources and promoting energy efficiency, are essential to limit greenhouse gas emissions. The report highlights the potential economic benefits of transitioning to a low-carbon economy. Effective policy frameworks, institutional coordination, and collaboration among stakeholders are emphasised, including government agencies, local communities, research institutions, and the private sector. The report also encourages the use of innovative technologies, like climate data analytics and remote sensing, for informed decision-making and policy support. Gujarat should continue to prioritise the expansion of renewable energy sources, such as solar and wind power, while promoting energy efficiency measures, sustainable transportation systems, green hydrogen utilisation, etc. Continuous monitoring, evaluation, and adaptive management are underscored for ensuring the efficiency and effectiveness of climate change policies in Gujarat, with regular assessments to refine strategies and make informed decisions.

3.3.6 Renewable Energy Policy by 2030 for Gujarat



The report on renewable energy policy for Gujarat underscores the state's potential for a diversified and sustainable energy mix, emphasizing abundant solar and wind resources, along with possibilities in bioenergy, waste to energy, offshore wind, and green hydrogen. Gujarat has made significant progress in solar and wind power, attracting investments, creating jobs, and reducing greenhouse gas emissions. The report stresses the importance of expanding beyond solar and wind and exploring bioenergy and waste-to-energy technologies. It advocates for accelerating the deployment of emerging technologies like offshore wind, floating photovoltaics, geothermal, and ocean energy. Green hydrogen is highlighted as a promising avenue, produced using renewable electricity and it also explores the potential of bioenergy and waste-to-energy technologies to convert organic waste into valuable energy resources. Finally, it focuses on the importance of an integrated approach to renewable energy policy in Gujarat, taking into account technological advancements, market dynamics, and grid integration challenges. It highlights the need for collaboration among government agencies, industry stakeholders, research institutions, and communities to create an enabling environment for renewable energy development.

3.3.7 Decarbonizing Gujarat Towards Net Zero 2070: A White Paper on Climate Policies and Climate Actions in Gujarat

The whitepaper highlights the Gujarat government's pioneering efforts in sustainable initiatives undertaken through a meticulous endeavor to map out climate policies aimed at greenhouse gas (GHG) emissions mitigation, Impact, Vulnerability, and Adaptation (IVA), and Resilience. These policies, implemented and planned by the Gujarat Government, played a pivotal role in laying the foundation for achieving the 2070 Net Zero target. Estimations of GHG emissions from 2005 to 2030 were diligently conducted, providing a historical perspective crucial for evaluating progress. It highlights the way forward through short-term, medium-term, and long-term climate policies, introducing innovations like offshore wind power, green hydrogen, green ammonia, battery energy storage systems, carbon capture utilization and storage, and the transformative potential of Industry 4.0. These have been tailored for various sectors and businesses, aimed to encourage specific climate actions. Recognising Gujarat's financial landscape, low-cost climate finance instruments, reflecting a commitment to making sustainability a feasible reality have also been studied. Moreover, it also delves into the initiatives undertaken by the state government, local communities, and

various stakeholders to curtail carbon footprints, promote renewable energy sources and build climate resilience.

3.3.8 Net Zero 2070 Policy for Gujarat

The report diligently addresses various research objectives aimed at attaining the goal of Net Zero in Gujarat by 2070. Firstly, it formulates a comprehensive vision document outlining the roadmap for achieving Net Zero emissions by the specified target year or potentially earlier. Secondly, the report involves the development of a robust modeling framework for estimating greenhouse gas emissions in Gujarat until 2050, extending the trends to 2070 to provide a forward-looking perspective. Thirdly, it focuses on constructing a long-term framework and pathway to enhance Gujarat's resilience to climate change. Moreover, the report provides strategic recommendations for new policies, encompassing short-term, medium-term, and long-term measures, covering areas such as offshore wind, green hydrogen, green ammonia, BES, CCUS, industry 4.0 and carbon market among others. Additionally, it proposes low-cost financing mechanisms to facilitate the implementation of these policies, contributing to the overall objective of achieving Net Zero in Gujarat.

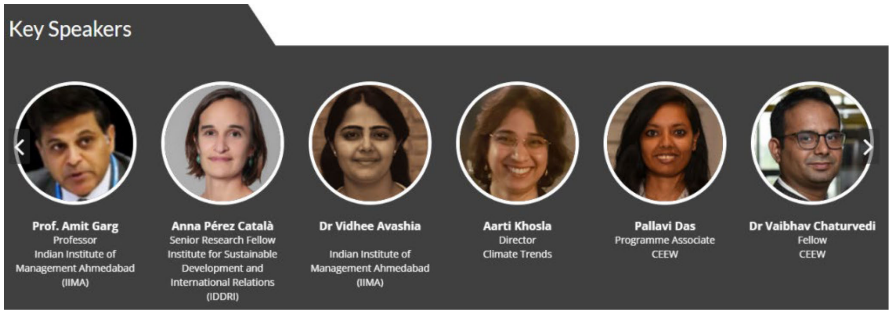
3.4 Engagement at International Levels

3.4.1 Stanford Collaboration (May, 2023)

A collaborative effort was initiated with Stanford University, involving Prof. Amit Garg (IIM Ahmedabad), Mr. Ashok Emani (Principal - ESG · NIIF), and Mr. William Streeter (Senior Infrastructure Advisor and visiting scholar at the Global Projects Center, Stanford University). The objective of this collaboration is to investigate and explore potential avenues for future collaborative efforts and projects. The discussion began by highlighting Stanford University's remarkable accomplishments in climate risk analysis and sustainability initiatives, setting the stage for the exploration of their ongoing commitment. IIM Ahmedabad also highlighted their work and achievements in the field of sustainability and climate change. This provided the discussion pointers for possible collaboration on research projects, exchange programs and offering courses.

3.4.2 Workshop: What does the Global Stocktake (GST) mean for India? (March 16, 2023) at New Delhi

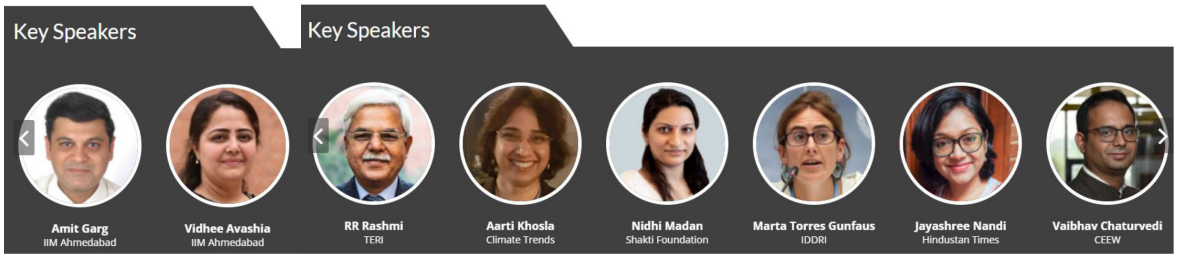
Co-organising institutions: IIMA, CEEW and IDDRI



As one of the largest emerging economies with increasing experience, India will have a key role to play as the outcomes of the GST take shape throughout the year. Further, outcomes of the GST at the international level could spur action at the domestic action and accelerate on-ground action. Hence a workshop was organized on what would the Global Stocktake (GST) mean for India. The workshop discussed the Global Stocktake process and its relevance for India, the opportunities and challenges that it offers for India, the key recommendations that India has for the GST and how can the outputs of the GST be made robust so that it can spur action, accountability and international cooperation for climate action. The participants included officials from the government, members and experts from academia, civil society organizations, and media including representatives from the Embassy of the United Arab Emirates- host to COP28 and the Ministry of Environment, Forest and Climate Change, Government of India.

3.4.3 Workshop: How can we operationalise equity in the Global Stocktake (GST) debate? (July 11, 2023) at New Delhi

Co-organising institutions: IIMA, CEEW and IDDRI



The Global Stocktake (GST) will evaluate progress made across mitigation, adaptation and means of implementation, finance, technology and capacity in the light of the best available science and equity, to spur increased ambition and international cooperation. Equity and historical responsibility always takes centre stage in climate change negotiations and the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC) is enshrined in the United Nations Framework Convention on Climate Change (UNFCCC). However, climate equity in reality is far from achieved. This workshop explored how to operationalise equity in the GST and how finance can play a role. This is especially important as GST will take stock of collective action – both past and planned for the future and countries will not be named. Equity must be reflected in all the recommendations and political messages delivered by the GST. With rising developmental needs and voices from the global south, the workshop discussed the opportunities for the GST to deliver on equity and accountability. The workshop covered two in-depth discussions on "Deepening equity in the GST debate" and "Finance as a bridge to equity".

3.4.4 From G20 to COP28: international finance as a global enabler of ambitious national pathways (October 31, 2023) at New Delhi

Co-organising institutions: IIMA, CEEW and IDDRI under the aegis of Department of Economic Affairs, Government of India

COP28 marked the conclusion of the first instance of the Global Stocktake (GST), a mechanism established by the Paris Agreement to ratchet up collective ambition by fostering cooperation and support countries' transformations as required by long-term low GHG emission development. This milestone presented a

unique opportunity for establishing collective processes to collect information from countries on the priority actions to raise their respective climate ambition, on the current barriers to these actions, and on the cooperation needs, including on finance, to effectively close the climate ambition- and action gap, global cooperation. Hence, a closed-door dialogue amongst experts from various emerging economies was organized to discuss Overcoming boundaries: the respective roles of public and private financing, How to coordinate different financial initiatives and avoid fragmentation, Ensuring transparency of financial initiatives to push for continued progress, and Way forward, including support for the development, demonstration, and deployment of early-stage climate technologies and deliberation on emerging sustainable financial market instruments. The event was conducted over three sessions including an opening plenary, a session on "Perspectives on the ways forward for international finance agenda to better support national priority transformations" and expectations on the "Political outcomes of the Global Stocktake at COP28".

3.4.5 Stakeholder Engagement Workshop on Sustainable Decarbonisation Pathways for Gujarat at Ahmedabad (November 1, 2023)

Co-organising institutions: IIMA and IDDRI Paris under the aegis of Industries & Mines Department, Climate Change Department and Forests & Environment Department, Government of Gujarat

The stakeholder engagement workshop on 'Sustainable Decarbonisation Pathways for Gujarat', was organized with the support of the Industries & Mines Department, Climate Change Department and Forests & Environment Department, Government of Gujarat. The workshop brought together a diverse group of stakeholders including top officials from the state government, industry and academia, along with international participants to share their perspectives and insights on the way forward for Gujarat in meeting Nationally Determined Contributions (NDC) targets. The workshop aimed to stimulate open and constructive deliberations among policymakers, industry leaders, and researchers on critical aspects such as Gujarat's current status and progress towards NDC targets, the potential implications and opportunities derived from India's Net Zero commitments, essential policy interventions, and actions required to expedite Gujarat's transition to a low-carbon and resilient economy. A focal point of discussion was also the pivotal role that stakeholders play in supporting Gujarat's journey towards achieving Net Zero and NDC targets. The inaugural event was followed by a series of sessions where the international experts chaired sessions on Accelerating clean energy transition, Technical and financial challenges involved in decarbonisation, Assessing opportunities for Impact, Vulnerability, Adaptation and Climate Resilience.

3.4.6 International Knowledge Dissemination Seminar on Sustainable Energy Transitions in India Towards Net Zero 2070 (November 3-4, 2023) at Ranchi

Co-organising institutions: IIMA and IDDRI Paris

This event aimed to discuss current trends, elicit feedback from key stakeholders and draw insights from international experiences to enhance the understanding of sustainable energy transition at subnational and local levels. The seminar brought together a diverse group of stakeholders, including international climate experts from G20 member countries such as France, Mexico, South Africa, China, and Indonesia, top officials from the state government, industry, and academia to share their perspectives and insights on the way forward for Jharkhand and India in meeting Nationally Determined Contributions (NDC) targets towards Net Zero 2070. The seminar covered a range of significant topics, including 1. Sustainable Energy Transition (SET) – Experiences from Jharkhand, 2. International Perspectives and Takeaways for a Climate, 3. Resilient Development and Just Energy Transitions, 4. Implications of Net Zero 2070 for the Energy Transitions on Employment, 5. Financing Sustainable Transitions for Global South, 6. Technical Challenges for a Sustainable Transition: Grid, 7. Issues and Availability of Critical Minerals and Policy Implications and The Way Forward.

Group Photograph of the Workshop:

Group Photograph on Seminar Day-1 (November 03, 2023)

Group Photograph on Seminar Day 2 (November 04, 2023)

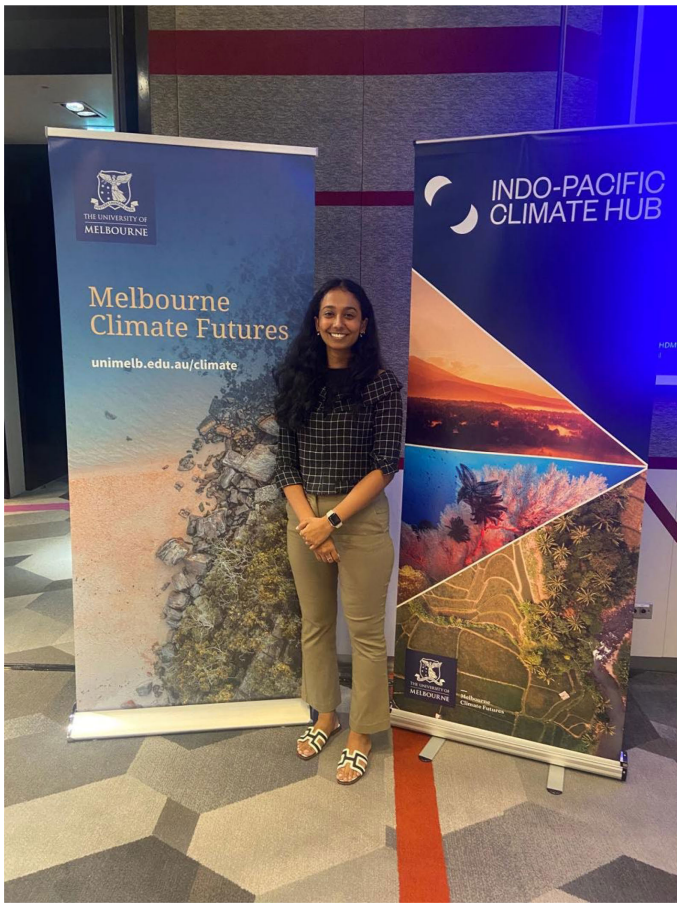

nternational Knowledge Dissemination Seminar on
Amit Garg


International Knowledge Dissemination Seminar on
Akhilesh Tilotia
Shantanu Srivastava
Sanjay Kumar Jain


IIMA
IDDRI
International Knowledge Dissemination Seminar on
Sustainable Energy Transitions in India Towards Net Zero 2070

3.4.7 Indo-Pacific Climate (INPACC) Hub Inception Workshop (November 8-10, 2023) at Bangkok

The INPACC is a collaborative regional network of researchers, practitioners and policy-makers lead by Melbourne Climate Futures (MCF), University of Melbourne. The launch workshop for the hub was held at Bangkok from 8 to 10 November, 2023 where IIMA was invited to participate.



A collaborative effort among 40 experts from the Indo-Pacific region took shape during the Inception Workshop, resulting in the co-design of the INPACC Hub. This expert network, spanning the Pacific, Southeast Asia, and South Asia, aims to foster research, knowledge sharing, and leadership on adaptation, resilience, and justice, with a focus on expediting a positive climate future. The INPACC Hub has identified initial focal areas, including health, governance and regulation, agriculture, water, and just energy transitions, signalling its commitment to comprehensive climate action.

During the three-day workshop, participants contextualized regional perspectives, prioritized needs, and activities, and outlined governance mechanisms crucial for effective implementation. The gathering facilitated knowledge exchange, with experts sharing successful climate action examples across the Hub's focal areas and addressing cross-cutting issues like biodiversity, informal settlements, climate finance, disaster risk reduction, and gender equity. The workshop involved group discussions to identify regional needs and gaps and to propose key activities to address them.

Ms. Ritwika Verma represented IIMA at the workshop and participated in various discussions in order to refine the focus areas of the Hub. She presented the works undertaken by IIMA and the NIIF Chair in ESG during the workshop.

3.4.8 Participation at COP28, UAE

During December 2-6, 2023, several side events were held at COP28 where Prof. Amit Garg participated in panel discussions organised at different pavilions. These events included talks on varied subjects related to decarbonisation goals and emissions mitigations, net-zero ambitions, Global Stocktake and its outcomes, and long term climate action and development goals. The events are as listed here:

- "What comes after the Global Stocktake? A vision for COP28 and beyond",
- How to raise ambition? New research on deepening emission cuts and enhancing economic opportunities, (Deep Decarbonization Pathways) Sectoral Transformations report,
- Beyond the Global Stocktake to create feasible and just transitions,
- "Beyond the GST outcome: a vision for accelerating the transition to net zero",

- Bridging the gap between the 'Fit for 55' package and the 2050 ambition of a net- zero EU economy",
- Aligning Climate Action with Long-Term Climate and Development Goals

3.4.9 International Consultative Workshop on "Role of Forestry, Agroforestry, and Land Restoration in Achieving Net Zero in the Asian Region (December 12, 2023) at Goa

The one-day workshop organised at BITS-Pilani, K K Birla Goa Campus, was primarily aimed to prepare a roadmap or guideline document for the assessment of the role of forestry and agroforestry-based strategies in supporting national Net Zero Goals. The workshop also aimed to identify challenges, hurdles, and roadblocks in realizing the mitigation potential from these sectors and strengthen the collaboration and partnerships between different organizations in Asia working in these sectors. The workshop was attended by delegates from various prestigious national and international organizations, Government officials and academics from key forestry nations in Asia. IIMA's was invited here to discuss the role of agroforestry and the LULUCF sector in achieving Net Zero goals at national and global levels.

3.4.10 Roundtable Discussion on Reflections from the first Global Stocktake (March 22, 2024) at New Delhi

The Global Stocktake (GST) has been successfully completed at COP28, and there have been mixed responses on the final outcome. While the discussions continue on the progress made so far, there is a need to critically evaluate the GST process, the first of many to come. This workshop explored what has been the process of the GST so far and whether the process has been effective in achieving the outcomes. What could be potential areas of improvement in the GST process, and how could the next cycle be made more ambitious, inclusive and effective? The roundtable discussed international experiences with the GST process from those directly involved with it. Further, various stakeholders including industry, academia and think tanks, civil society, media, philanthropic foundations from India as well as the Government of India were invited to express their views and experiences of the first GST process and inputs to improve the next GST process.


IDDRI
CEEW
Roundtable Discussion on Reflections from the First Global Stocktake
22 March 2024 | New Delhi


CEEW
IIMA
Amit Garg

4 Activities Planned for 2024-25

4.1 Research on globally relevant ESG issues

4.1.1 How are Indian companies performing on BRSR disclosures?- An assessment for reports from 2022-23.

In 2021, the Securities and Exchange Board of India (SEBI) of India introduced the Business Responsibility and Sustainability Reporting (BRSR) framework with the primary objective of facilitating companies in reporting their performance related to sustainability. SEBI has mandated the top 1000 listed companies (as per market capitalization) to submit BRSR fillings for financial year 2022-23 and onwards. This framework is structured around nine core principles that comprehensively cover all three pillars of ESG – Environment, Social, and Governance. In a first of its kind, we are crafting a comprehensive report focused on BRSR Reporting of the top 1000 Indian Companies. This report aims to provide insights into the extent to which companies have addressed the ESG disclosures by analysing their BRSR submissions and other relevant sources of information. This report would offer a comprehensive assessment of ESG performance at both the overarching level and individual E, S and G component level reporting. Additionally, this report would provide principle specific (included in the BRSR framework) and industry-specific insights. In doing so, it would contribute to a deeper understanding of how Indian companies are navigating the landscape of sustainability reporting and their commitment to Environmental, Social, and Governance considerations.

4.2 Engagement with Stakeholders

4.2.1 Executive Education- ESG and Sustainable Finance at Dubai Campus

A 5-day Open Enrolment Programmes (OEP) on "Environmental Social and Corporate Governance (ESG) & Sustainable Finance" through a mixture of pedagogies including case sessions, lectures, exercises, presentations, and discussions through IIMA's Executive Education Programmes is being planned around August-September 2024 at IIMA Dubai Campus. The Programme is designed for participants with basic/intermediate knowledge of governance & finance, this course will provide the basics of ESG, sustainable finance, emerging trends in this space (domestic and international), new financial instruments under development, trends of investors, considerations for stock exchanges, banks, and the role of regulators. It will also set up the critical link between international policy developments and the consequent emergence of sustainable finance. The motivation of such a programme is to expose decisionmakers in the workplace with the tools and knowledge of the types of issues that affect responsible governance, green assets, ways to mobilize financing for such assets, and provide some tools that can be employed by companies. It will also, importantly, focus on risk mitigation for green projects – in line with India's economic development plans. Further details may be found at https://www.iima.ac.in/executive-education in due course of time.

4.2.2 Industry Note: Road Infrastructure in India and Climate Risks

Climate change is projected to have severe adverse impacts on India's population, natural eco-systems, and socio-economic parameters. The changing climate is posing unprecedented challenges to existing human and economic activities, natural ecosystems, and man-made ecosystems in many ways. Firstly, it is creating new risks for their existence as well as safe and economically viable operations. For instance, infrastructure assets are planned with some visibility of magnitude and type of potential climate induced risks. However, due to climate change, new dimensions are being added to the risk profile of these assets. Climate is changing the conceptual basis of risks and some specific risks may become more critical for the asset in future, which are either not visible today or do not hold importance in the basket of risks that the asset currently faces.

India has the second largest road network in the world, spanning about 63.73 lakh kilometres, which includes national highways, state highways, district roads, and rural roads. National Highways (NH) play a vital role

in the economic and social development of the country by enabling efficient movement of freight and passengers and improving access to market. They account for 2% of the total road network and carry over 40% of total traffic. Thus, we try to undertake an in-depth understanding of the road infrastructure sector in India and the climate risks they face. Some of the topics that the note would try to explore include - 1. How does the pricing/ valuation of assets change in light of climate risks? 2. Does operational expenditure change in case of higher climate risks? 3. In the case of a greenfield/brownfield expansion, what are the implications on the capital expenditure? 4. Should the regulatory/policy landscape change to include the above concerns?

4.2.3 Dissemination seminars for the report on "Synchronizing energy transitions toward possible Net Zero for India: Affordable and clean energy for all" at Mumbai and Ahmedabad

Two events are being planned at Mumbai and Ahmedabad with an objective to communicate the results from the research work undertaken on assessing energy transition towards Net Zero for India and learn the investors perspectives on the same during June-July 2024.

4.2.4 SFDR Articles 6,8 and 9

SFDR is a part of the EU's Financing Sustainable Growth Action Plan and was established to reorientate capital flow towards sustainable finance. SFDR requires asset managers and other financial market participants to provide transparency on sustainability and imposes mandatory ESG disclosure obligations. Articles 6, 8 and 9 of the SFDR provide for the classification of funds depending on their characteristics and level of sustainability:

Article 6: Transparency of the integration of sustainability risks

Article 8: Transparency of the promotion of environmental or social characteristics in pre-contractual

Article 9: Transparency of sustainable investments in pre-contractual disclosures requires disclosures

NIIF Chair in ESG will be working with NIIF to understand (a) whether the funds are currently ready to be classified under any of the SFDR articles, and (b) if not, what steps and actions need to be taken, when, and by whom.

4.3 Engagement at International Levels

4.3.1 Engagement with IEA

An engagement is being planned to communicate the results from the research work undertaken on assessing energy transitions towards Net Zero for India. NIIF is requested to take a lead in this engagement.

Annexures

Annexure A - Common parameters across industries for Environment, Social and Governance

Table 1 Common parameters across Industries – Environment (16 Indicators)

SR. No.	Parameter Name	Parameter Description
1	Estimated CO2 Equivalents Emission Total	The estimated total CO2 and CO2 equivalents emission in tonnes.
2	Total CO2 Equivalent Emissions to Revenues USD in million	Total CO2 and CO2 equivalents emission in tonnes divided by net sales or revenue in US dollars in million.
3	CO2 Equivalent Emissions Total	Total Carbon dioxide (CO2) and CO2 equivalents emission in tonnes. - following gases are relevant : carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), nitrogen trifluoride (NF3) - total CO2 emission = direct (scope1) + indirect (scope 2) - we follow green house gas (GHG) protocol for all our emission classifications by type
4	Total CO2 Equivalent Emissions to EVIC USD in million	Total CO2 and CO2 equivalents emission in tonnes divided by EVIC in US dollars in million.
5	CO2 Equivalent Emissions Direct, Scope 1	Direct of CO2 and CO2 equivalents emission in tonnes. - direct emissions from sources that are owned or controlled by the company (scope 1 emissions) - following gases are relevant : carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), nitrogen trifluoride (NF3) - we follow green house gas (GHG) protocol for all our emission classifications by type
6	CO2 Equivalent Emissions Indirect, Scope 2	Indirect of CO2 and CO2 equivalents emission in tonnes. - indirect emissions from consumption of purchased electricity, heat or steam which occur at the facility where electricity, steam or heat is generated (scope 2 emissions) - following gases are relevant : carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), nitrogen trifluoride (NF3) - we follow green house gas (GHG) protocol for all our emission classifications by type
7	GHG Emissions Indirect, Scope 2 to Revenue USD in million	Indirect Scope 2 emissions in tonnes divided by revenue in US dollars in million.

SR. No.	Parameter Name	Parameter Description
8	GHG Emissions Direct, Scope 1 to Revenue USD in million	Direct Scope 1 emissions in tonnes divided by revenue in US dollars in million.
9	Energy Use Total	Total direct and indirect energy consumption in gigajoules. - the total amount of energy that has been consumed within the boundaries of the company's operations - total energy use = total direct energy consumption + indirect energy consumption - purchased energy and produced energy are included in total energy use - for utilities, transmission/ grid loss as part of its business activities is considered as total energy consumed and data not to consider electricity produced to answer energy use (utility company produce to sell) - for utilities, raw materials such as coal, gas or nuclear used in the production of energy are not considered under 'total energy use'
10	Total Energy Use to Revenues USD in million	Total direct and indirect energy consumption in gigajoules divided by net sales or revenue in US dollars in million.
11	Total Energy Use to EVIC USD in million	Total direct and indirect energy consumption in gigajoules divided by EVIC in US dollars in million.
12	Water Withdrawal Total	Total water withdrawal in cubic meters. - the total volume of water withdrawn from any water source that was either withdrawn directly by the reporting organization or through intermediaries such as water utilities - different sources of water like well, town/utility/municipal water, river water, surface water, etc are considered
13	Water Use to Revenues USD in million	Total water withdrawal in cubic meters divided by net sales or revenue in US dollars in million.
14	Water Use to EVIC USD in million	Total water withdrawal in cubic meters divided by EVIC in US dollars in million.
15	Total Renewable Energy	Total primary renewable energy purchased and produced in gigajoules.
16	Fresh Water Withdrawal Total	Total fresh water withdrawal in cubic meters. - freshwater refers to water with low salt contents - sources of fresh water: surface, underground, well, boreholes, rain and distributed/purchased water. - include water from the supply of municipal water, industrial water and tap/drinking water - saline, grey and brackish water are not considered

Table 2 Common parameters across Industries – Social (8)

SR. No.	Parameter Name	Parameter Description
1	Announced Layoffs to Total Employees	Total number of announced lay-offs by the company divided by the total number of employees.
2	Net Employment Creation	Employment growth over the last year.
3	Salary Gap	CEO's total salary (or the highest salary) divided by average salaries and benefits.
4	Women Employees	Percentage of women employees. - percentage of women employees to the total number of employees of the company - percentage of women employees = number of women/total number of employees*100
5	Employees with Disabilities	Percentage of employees with disabilities or special needs. - percentage of disabled employees or special needs to the total employees of the company - percentage of disabled employees=number of disabled employees/total number of employees*100
6	Training Hours Total	Total training hours performed by all employees. - consider only employee training hours - include all types of training given to general employees (such as health & safety, environmental, emergency response, skills & career development training) - if the value is given in days, multiply by 8, assuming that 1 day = 8 hours worked
7	Average Training Hours	Average hours of training per year per employee. - if the company has reported the total training hours, divide the value by total number of employees and not employees trained only - consider only employee average training hours - include all types of training given to general employees (such as health & safety, environmental, emergency response, skills & career development training) - if the value is given in days, multiply by 8, assuming that 1 day = 8 hours worked
8	Turnover of Employees	Percentage of employee turnover. - include employees who left the company for any reason (voluntary or involuntary) such as resignations, retirement, natural departure/death, medical incapacitation, redundancy, layoffs, restructuring, dismissal, retrenchment or end of a fixed-term contract - employees turnover rate= (employees leaving/average number of employees)*100 - where the average number of employee = (employees at the end of the current year + employees at the end of the previous year)/2 - employees at the end of the current fiscal year = employees at the end of the previous fiscal year + new employees - employees leaving

Table 3 Common parameters across Industries – Governance (29)

SR. No.	Parameter Name	Parameter Description
1	Board Size More Ten Less Eight	Total number of board members which are in excess of ten or below eight.
2	Executive Members Gender Diversity, Percent	Percentage of female executive members.
3	Board Gender Diversity, Percent	Percentage of female on the board.
4	Board Specific Skills, Percent	Percentage of board members who have either an industry specific background or a strong financial background.
5	Non-Executive Board Members	Percentage of non-executive board members.
6	Board Member Affiliations	Average number of other corporate affiliations for the board member.
7	Independent Board Members	Percentage of independent board members as reported by the company.
8	Audit Committee Independence	Percentage of independent board members on the audit committee as stipulated by the company.
9	Board Meeting Attendance Average	The average overall attendance percentage of board meetings as reported by the company. - overall board members conduct regular meetings during the year, board meeting average is the attendance average provided details of members attended versus the total number of board meetings held
10	Audit Committee Non-Executive Members	Percentage of non-executive board members on the audit committee as stipulated by the company. - number of nonexecutive directors among all the board audit committee members(percentage)
11	Compensation Committee Independence	Percentage of independent board members on the compensation committee as stipulated by the company.
12	Compensation Committee Non-Executive Members	Percentage of non-executive board members on the compensation committee as stipulated by the company. - number of nonexecutive directors among all the compensation or remuneration committee members in percentage representation
13	Nomination Committee Independence	Percentage of non-executive board members on the nomination committee.
14	Nomination Committee Non-Executive Members	Percentage of non-executive board members on the nomination committee as stipulated by the company. - number of nonexecutive directors among all the nomination committee members in percentage representation
15	Average Board Tenure	Average number of years each board member has been on the board.

SR. No.	Parameter Name	Parameter Description
16	Total Senior Executives Compensation To Revenues in million	The total compensation paid to all senior executives as reported by the company divided by net sales or revenue in million.
17	Total Senior Executives Compensation	The total compensation paid to all senior executives as reported by the company.
18	Board Member Compensation	Total compensation of the board members in US dollars.
19	Committee Meetings Attendance Average	The average overall attendance percentage of board committee meetings as reported by the company. - various committees formed by the board, conduct regular meetings during the year, committee meeting average is the attendance average provided details of members attended versus the total number of meetings held
20	Highest Remuneration Package	Highest remuneration package within the company in US dollars.
21	Board Member Membership Limits	The maximum number of years a board member can be on the board as stipulated by the company. - 1 to 30 years /insufficient information/no limit - when the company has explicitly mentioned that board members will be on board only for a certain maximum number of years - when the maximum term is different for a different class of directors, use the one given for the independent/nonexecutive directors - if there is a law provision that says that directors have to retire after a number of years, then answer as per the provision
22	Board Member LT Compensation Incentives	The maximum time horizon of the board member's targets to reach full compensation.
23	Nomination Committee Involvement	Percentage of nomination committee members who are significant shareholders (more than 5%).
24	Board Member Term Duration	The smallest interval of years in which the board members are subject to re-election. - the smallest interval of years of board members re-election - annual re-election for board members who have served for a long-time is accepted as "1" year - if data mentions about one-third of board members who must retire at the AGM, then it is 3 years
25	Anti-Takeover Devices Above Two	The number of anti-takeover devices in place in excess of two.
26	Auditor Tenure	The number of year's current auditor is serving the organization.
27	Voting Cap Percentage	The percentage of maximum voting rights allowed or ownership rights. - limitation or cap on voting rights as reported in annual reports and bylaws

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