

India Just Transition Summit

Navigating a people-centered low-carbon transition for India

16 - 17 October 2024 | Hyatt Regency, New Delhi



ABSTRACTS

Theme : Impact on local communities

Date: 16 October 2024 | Time: 11:00 am to 1:30 pm

Chairs:

Dr Purnamita Dasgupta,
Chair in Environmental Economics and Head, Environmental and
Resource Economics Unit Institute of Economic Growth, University of Delhi

Ms Santosh Agarwal,
Deputy Director General and former Coal Controller,
Ministry of Coal, Government of India

1. Socio Economic Impacts of Energy Transition in the Agriculture Sector of India

Tenneti Rathna Kumar, Trupti Mishra, Rayees Sheik, Indian Institute of Technology Bombay

The International Energy Agency defines Energy Transition as the shift from fossil fuel energy sources to renewable and green energy sources (International Energy Agency, 2017). India has set an ambitious target of achieving net zero emissions by 2070. The target can be achieved by taking effective steps of 'Energy Transition' in different sectors of its economy, particularly the ones with high energy intensity. Majority of India's population is engaged in agriculture sector for livelihood. The energy transition in this sector will have large scale implications for achieving the target of net zero emissions. There have been efforts by government to ease the energy transition in agriculture sector. One such scheme focussed on the energy intense irrigation activity in India is PM KUSUM (Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan).

The scheme has three components and is implemented by both central and state governments. In this study we analyzed the impact of PM KUSUM in the state of Maharashtra to explain how energy transition through the PM KUSUM scheme is impacting the socio-economic indicators like health, education, livelihoods, income, housing, mobility etc. in the agriculture households. We used mixed methods in this study. The scope of this study is much wider. We observed there are positive outcomes in income and livelihoods due to the implementation of PM KUSUM scheme. The results are discussed in this paper. The recommendations for effective just energy transition in agriculture sector include availability of the machinery, affordability and accessibility of the skill sets.

2. Incomplete Mine Closure as an impediment to achieving Just Transition goals

Amrita Kaur Slatch, Shiekh Intekhab Alam, RWTH Aachen University

Incomplete mine closure presents significant obstacles to the realization of Just Transition (JT) objectives, particularly in regions dependent on extractive industries. This study investigates the environmental, social, and economic challenges engendered by incomplete mine closures, with a specific focus on the North Karanpura Coalfield in India.

The research methodology integrates secondary analysis of global JT frameworks and primary data collection through interaction with the indigenous communities living in the North Karanpura Coalfield, Jharkhand. Fieldwork conducted in North Karanpura uncovers the lived experiences of indigenous populations, highlighting health risks, loss of ancestral agricultural land, and cultural disruption resulting from abandoned mines. Data were collected through interviews and focus group discussions to capture community perspectives on mine closure and their involvement in transition planning. The secondary research encompasses a comprehensive review of JT policies from diverse geographical contexts, identifying best practices and existing gaps in addressing mine closure issues.

The findings indicate that incomplete mine closure not only impedes environmental restoration but also exacerbates social inequalities, disproportionately affecting marginalized communities. The study concludes that achieving JT goals necessitates the establishment of robust regulatory frameworks mandating comprehensive mine closure and rehabilitation, coupled with inclusive planning processes that actively involve affected communities. Furthermore, the research underscores the importance of integrating traditional ecological knowledge and community-led reclamation initiatives into sustainable transition strategies.

This study contributes to the discourse on Just Transition by elucidating the complexities of mine closure in developing regions and advocating for a holistic approach that harmonizes economic, environmental, and social justice imperatives.

3. Socio-Economic Analysis and Policy Recommendations Towards Low Carbon Transition Replacing Coal in India

Rushalee Gupta, Riya Gupta, Global Green Growth Institute (GGGI)

How crucial is rehabilitation of workers for ensuring low carbon transition in India? It is accounted that coal contributes to meeting 55% of India's energy needs with the country's industrial heritage standing on indigenous coal reserves. The sector provides employment opportunities to more than 2.5 lakh people in India directly annually (Ministry of Coal, 2022), while another huge section of the employment comes from landless laborer's engaged through informal means. With the country transitioning towards just transition and increased environmental impacts e.g. rising pressure of methane gases from underground reserves (the Jharia coal belt rising fire and sinking landscapes), the increasing necessity to uplift these marginalized communities through rehabilitation, socioeconomic advancements and ensuring alternative sources of income and employment are becoming unavoidable. The communities engaged in the coal mines in India often reside in rural areas, small towns or regions with limited amenities like hospitals, adequate clean water etc. This becomes especially true for women employed in the field who lack social security, lack of visibility and limited income potentials and additional burden of housework for their families. Children as young as five years also take part in coal mining operations and expose themselves to severe risks, despite existent laws due to lack of alternative means of livelihood. This paper will undertake expert consultations to demonstrate the current socio-economic status of coal miners in India spread across the major coal field of 7 states, understand the limitations for absorption of laborer's in allied or different sectors and undertake and secondary data analysis to find alternate employment opportunities other than rehabilitation. The paper will investigate the on-ground implementations of the DMF funds and the potential for schemes like MGNREGA in the sector through a cost analysis, and potential for education and skill enhancement amongst the informal youth.

4. Approach to People-Centric Energy Transition: An Empirical Study from Rajahara Coalfield, Jharkhand

Vaibhav Chowdhary and Animesh Ghosh, Ashoka University

India, one of the world's top five mining countries, is grappling with a multifaceted challenge of energy transition, especially regarding coal, which accounts for around 55% of the country's energy requirements. Prime Minister's vision for net-zero economy (NZE) can't be achieved without ramping down coal (including mines). While the closure of mines is important for NZE by 2070, it is likely to seriously impact the lives and livelihoods of communities in the region. This hypothesis was tested through an empirical study of a discontinued coal mine in the Rajahara Coalfield of Palamu district, Jharkhand. For testing this hypothesis, a mixed approach was adopted, where for qualitative data, key informant interviews were designed and conducted for targeted stakeholders (impacted communities, CCL/ CMPDIL/ DMF, policymakers, etc.), and focus group discussions for villagers. Further, for quantitative data, a survey of 201 households in the region was carried out to explore and assess the impact of discontinued coalfield on the lives and livelihoods of communities. The study proposed a framework and approaches for the betterment of life and livelihood of communities.

Besides, mapped the roles and responsibilities of stakeholders associated with the mining ecosystem, including – setting up of Centres of Excellence (CoEs) or National Knowledge Networks (NKNs), recommending for Life Sustenance Action Plan (LSAP), inclusion of local community-based organizations, government bodies, etc. Additionally, produced recommendations for innovative financing models and approaches. The novelty of this research lies in the “empirical study of discontinued mines in India”. The proposed people-centric solutions to identified social, environmental, economic, and technical challenges are to be demonstrated in the second phase of the study. This work addresses the knowledge gap in the literature on just energy transition by analysing realistic data. The study also addressed the methodological limitations of previous works by applying a mixed approach that enhanced the depth and breadth of findings. Lastly, the study bridged the gap between theory and practice in the subject to contribute to academic discourse besides providing tangible benefits to the affected.

5. Diversification, Opportunity, and Willingness: Triple Pillars for Building Socio-Economic Resilience among Coal Mining Communities

Aparna Sajeev, Mandavi Singh, and Vani Pandey, TERI

The coal mining industry in India, originating in the 18th century, captures both the country's industrial growth and the accompanying social commotions. Its chronicle includes pivotal moments such as the rise in demand during the World Wars, nationalization, and the subsequent inefficiencies. The coexistence of organized and unorganized sectors, technological challenges, and the political and economic conditions of the 1960s and 70s shaped the industry's trajectory. This narrative reflects not only the socioeconomic impacts but also the current behavioral dynamics of coal-dependent communities.

The environmental and health risks along with the economic vulnerability, particularly for informal workers in coal-dependent regions necessitate a diversification of livelihoods and enhanced social support systems as a precursor to “just transition” with coal continuing to dominate India's energy mix. The comprehensive survey conducted in Angul and Dhanbad reveals significant socioeconomic disparities and challenges in skill development and employment opportunities. In Angul, young men and women exhibit a better educational profile but face barriers to employment due to a lack of skills and inaccessible training programs. There's a strong demand for vocational skills training aligned with local job market needs. In Dhanbad, the coal sector remains a significant employer, but educational and training opportunities are limited, especially for women.

This paper explores the historical, economic, and behavioral dimensions of coal-mining communities in Angul and Dhanbad. It looks at the multifaceted challenges faced by them as well as their propensity to move up the economic ladder in light of their socio-economic status. Kuppuswami Socio-Economic Scale is used for analyzing the socio-economic status along with primary survey, data analysis, and literature review for assessment. By the exercise carried out, it also discusses whether it is an absence of reskilling opportunities or lack of willingness and mental inertia behind the ineffectiveness of skill diversification efforts in these regions.

Theme : Land-based Transitions

Date: 16 October 2024 | Time: 11:00 am to 1:30 pm

Chairs:

Dr Arjan De Haan,
Senior Program Specialist, Climate Adaptation and Resilience,
International Development Research Centre

Dr Manish Kumar Shrivastava,
Senior Fellow, The Energy & Resources Institute (TERI)

Mr Rajnath Ram, Program Director,
Energy, Natural Resources & Environment, & Island Development,
NITI Aayog, Government of India*

1. Managing Competing Demands: Fair & Equitable Land Use Transitions

Devina Kuttappa and Mekhala Sastry, Vasudha Foundation

Land is an essential provider of resources, ecosystem services and space for human activities. Yet, it is also a finite resource, which is divided and diverted to meet needs, accordingly. In India, a nation witnessing rapid population and economic growth, there is increasing competition for land to meet the ever-growing needs of urbanization, industrialisation, food and fodder production, housing and infrastructure. This competitiveness is only set to increase as the nation embarks on an energy transition to meet its net zero goals. The targets include a commitment to create a carbon sink of 2.5-3 GtCO₂ and have 50% cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030. Both actions require dedicating large swathes of land leading to transitions and changes in existing land use patterns. These land use transitions will impact the local ecology, ecosystem services, and people such as farmers, pastoralists and forest/rural communities dependent on the land for sustenance, income and forest produce. Moreover, land is not just an economic asset but has a social and cultural value which is hard to quantify monetarily. Therefore, this necessitates a need for equitable land transitions.

The objective of this paper is to explore how land transition planning can be carried out in a just and fair manner to meet the needs of affected people and communities. Using secondary literature and data on changing land use trends, the paper will examine the sectors where land based transitions are imminent, like renewable energy expansion, carbon sequestration, AFOLU, and map out the multi-dimensional impacts on natural habitats and populations. Through a comprehensive study of national and international case examples, the paper will then explore innovative solutions and strategies for participatory and inclusive land-based transitions to alleviate ecological and socio-economic disruptions.

2. Addressing Land-use from Renewable Energy deployment via alternative models to reduce on-site conflicts from land-use change

Arvind Poswal, Centre for Science and Environment (CSE)

One of the emerging externalities from deployment of RE is the huge land footprint and the accompanying dilemmas from land-use change. Such as acquisition of arable lands, grasslands and deemed barren wastelands which has led to conflicts over land-use change from RE deployment, this is particularly aggravated in the case of solar energy (Table 1). The requirements of a large and contiguous land parcel for solar energy installations to achieve economies-of-scale in energy generation has a direct impact on the communities living either in the vicinity or with historic use of the land and now stand displaced. The main concerns arising are mainly related with the land-acquisition processes (direct by state agencies, or indirectly via solar park developers), compensation offered for leasing/purchase, conversion of agriculturally fit lands, elimination of grazing rights for livestock herders from community lands including sacred lands. There have also been resource contestations over on-site water extraction and use.

Table 1.

Dominant RE technologies and their land-footprints

RE Technology	Land Requirement (Acres/MW)	Land Requirement for 500 MW as an example
Solar	3-5 Acres	1500-2500 Acres
Wind	2-4 Acres	1000-2000 Acres

Source: Author's adaptation from MNRE and various studies

The presence of such risks in scaling RE solutions highlight the equity component in energy transition and requirement of due impact assessments which currently industry is exempted from. For instance nearly 84 percent of the solar installations in India were built on land with potential food and biodiversity conflicts, of which nearly 68 percent was agricultural land. The land footprint required for 2030 clean energy goals should also factor in environmental and socio-economic risks from large-scale deployments. The Economic Survey 2023-24 mentions the lowest per-capital land availability in India amongst the G20 nations, and risks from locking land in a land scarce nation . Addressing the land-intensive nature of RE requires parallel deliberation and designing of energy solutions which offer multiple uses of land. Such as with farming (Agro-PV), use in degraded lands such as abandoned mines, and extending the co-benefits from energy generation such as employment generation, increased energy access and reliability for the local communities.

3. Interrogating Solar Hotspots: How Land and Caste Institutional Relationships Affect Solar Park Development in Karnataka and Rajasthan

Sukanya Khar and Dr Kaveri Iychettira, IIT Delhi

Several inequalities and unjust outcomes emerging from decarbonization projects are being documented in literature, however, carbon removal projects are driving unprecedented pressures on global farmland and impacting lives, livelihoods and food security of rural populations.

For large-scale solar PV projects in India, availability of vast and contiguous land with solar irradiance has been identified in the Western and Southern parts. However, land is not an ahistorical entity, and constitutes an essential income generating asset in rural areas where populations are largely dependent on agriculture and livestock rearing. In some cases in India, development of large-scale solar projects has resulted in land dispossessions and enclosures, food insecurity, and loss of livelihoods.

However, there is insufficient literature exploring how place-based land histories and caste-based land ownership affect outcomes emerging from large-scale solar projects. Such factors can determine potential for conflicts as well as distributive outcomes emerging from solar parks. This paper uses insights from fieldwork conducted in Karnataka and Rajasthan around large-scale solar development. The methods used include semi-structured interviews, naturalistic observation and desk-based research.

Preliminary findings suggest that certain solar parks in Rajasthan are coming up in ecologically sensitive land types such as Orans, or commons land used for livestock grazing, or government land used for agriculture for which farmers do not have proper land records. This is leading to conflicts and deprivation with pastoralists and landless people suffering the most. In Karnataka, on the other hand, the Pavagada Solar Park, which has come up on drought-stricken agricultural land, the project has become a source of steady income for local communities which they were unable to reap by pursuing agriculture on the same land. Such contrasting outcomes highlight the need to understand the intuitional arrangements that land is embedded in.

4. Convergent innovation for a just food system transition in India: A roadmap for plant-based proteins

Nicole Rocque, Alexander von Humboldt Foundation

India's food system transition must contend with the alleviation of a double burden of malnutrition, while building climate resilience into food production and consumption. Measures promoting food-based dietary diversity and nutritional sufficiency, specifically increased consumption of meat, eggs and dairy, will require innovative, sustainable methods of production so as to not aggravate increased competition for strained natural resources while also delivering employment benefits at-large to marginalised farming communities. New plant-based and alternative protein innovations are making their way into the marketplace as a response to animal agriculture's impact on climate

change-related emissions, deforestation and biodiversity-loss globally. However, these new products are not holistic solutions. They run the risk of reinforcing current food system dynamics that rely on monoculture ingredients and energy intensive processes, having little positive impacts on livelihoods. Further, due to high costs of production they remain inaccessible to the large majority of the population. They need to go further to catalyse the deep and urgent transformation required to bring about a just, low-carbon transition in India's food system. Applying the principles of Convergent Innovation (CI), the paper outlines global initiatives developing and scaling holistic plant-based protein production systems. By converging technological and social innovation, industrial and nature-based approaches, and bringing together cross-sectional actors, food systems can deliver human and economic development impact. The paper goes on to present options for building a just transition roadmap, including increasing the efficiency of indigenous plant-based protein supply chains, encouraging the use of sustainable farming systems, building effective institutional arrangements for rural value-addition, alongside policies, regulations and investments that are eco- and nutrition-sensitive.

Theme : Gender-inclusive Transitions**Date: 16 October 2024 | Time: 11:00 am to 1:30 pm****Chairs:****Ms Zoe Woodlee, First Secretary,
Economic & Trade, Australian High Commission****Mr Kaushik Deb, Executive Director,
Energy Policy Institute at the University of Chicago (EPIC India)****1. Employment Opportunities for Women in Biomass for Power Generation:
A Gender-Focused Study of India***Sunaina Saxena, Shashwat Datta, Power Foundation of India*

Over the years, India has made significant efforts to shift from fossil fuels to renewable sources of energy, with biomass emerging as a promising resource for power generation. While the bioenergy sector holds significant potential for job creation, the gender dynamics within the biomass supply chain have been less explored. This paper aims to provide a practical background on the employment opportunities for women in biomass supply chain and address the associated challenges. Through a review of literature, the study determines women's role in different aspects of power production using biomass and highlights a significant gap on the lack of available information on gender issues in the energy transition.

This paper employs a concurrent research technique- 'Case Study Analysis' to analyse the current scenario of women in biomass and focuses on aspects of biomass utilisation, regular feedstock availability and storage, their role in power generation and meeting public energy needs. It further discusses the technoeconomic barriers that hinder the effective women participation in the sector such as limited access to training, innovation gaps, financial constraints, wealth-disparity, and social and cultural norms. Based on these insights, the study proposes actionable policy recommendations aimed at promoting gender inclusivity in the just-transition process. These include active training programs, awareness campaigns, financial support mechanisms, community engagement programs and a gender focused policy restructuring for policies related to the bioenergy sector.

Ultimately, the study attempts to contribute to the existing literature in energy economics by providing a model for similar settings across the globe. By bridging the gender gap in the biomass supply chain, India can not only expand its renewable energy capacity but also promote a 'just-development' through women empowerment.

2. Empowered Women Key to Climate Adaptation: Preliminary Lessons from India's Agriculture Sector

Sravanthi Choragudi, Divecha Centre for Climate Change, Indian Institute of Science

Women are key to tackle climate change. They are the most vulnerable to inequities and scarcity that is magnified by climate variability. At the same time, as a resource manager, home maker, farmer and entrepreneur, they are crucial in tackling it. In the wake of agriculture distress wrought by frequent droughts and increasing reliance on non-farm income, households are diversifying majority of their workforce away from the farms. As men migrate leaving the farms and families behind, women are taking up farming. In this paper, we examine the role women farmers play as agrarian households adapt to climate change. We observed that, in drought prone areas, when women take up farming responsibilities of the household a) a greater number of the male members diversify away from agriculture b) the household income is significantly higher (when compared to the households where men take up farming responsibilities). More importantly, we found that as women empowerment indicators- decision making ability, better gender relations, freedom to travel, autonomy on earnings, ownership rights-improve across states, gender gap in the farm output narrows down. We demonstrate this by examining the following-net receipts of crop production, yield losses in case of drought and non-farm wages-among men and women across major Indian states. The study uses Farmer Assessment Survey of 2018-19 and the fifth National Family Health Survey (2019-21)

3. Rooted in Finance: Gender-Inclusive Financing for Climate-Smart Agriculture in India

Smitha Hari, auctusESG

Agriculture, employing 45.76% of India's workforce, is crucial to the nation's economy, despite contributing only 15% to GDP. The sector is under significant threat from climate change, accounting for 12.7% of global agricultural emissions and heavily relying on dwindling water resources. Given India's responsibility to sustain 17% of the global population with limited land and water, there is an urgent need to implement Climate Smart Agriculture (CSA) to enhance resilience and sustainability.

Women are central to Indian agriculture, producing 60-80% of the country's food and making up over 75% of the rural female workers. Despite their critical role, they face substantial barriers, such as limited land ownership and access to financing, which restrict their full engagement in CSA initiatives. The current financial landscape exacerbates these challenges, with only Rs. 36,000 crores available annually against the estimated Rs. 85 lakh crores needed for adaptation finance.

This paper argues for a gender-responsive approach to CSA, emphasising the need to overcome the specific challenges faced by female farmers. It examines successful case studies from India and other emerging markets, demonstrating effective strategies for a gender-just transition.

The proposed four-pronged approach includes: 1) implementing policy and regulatory reforms; 2) leveraging robust financial instruments such as Voluntary Carbon Markets (VCMs), gender bonds, Sustainability-Linked Loans (SLLs), blended finance, and Priority Sector Lending (PSL); 3) enhancing monitoring and reporting mechanisms; and 4) mobilising public-private partnerships (PPPs). These interventions are designed to de-risk investments, create new revenue streams for women farmers, and promote sustainable practices.

The establishment of robust institutional frameworks and policies that recognise and empower women as key stakeholders is critical. Thus, this paper outlines a pathway toward a more equitable and resilient agricultural sector in India, ensuring that women can fully participate and benefit from a sustainable transformation.

Theme : Innovative Solutions and Approaches

Date: 16 October 2024 | Time: 11:00 am to 1:30 pm

Chairs:

Mr Ketul Acharya, President, Global Alliance for Mass Entrepreneurship (GAME)

Dr Rohith Jyothish, Assistant Professor, Jindal School of International Affairs

1. Cooperative Pathway to Low-Carbon Future:

Analyzing IFFDC Model Agro-Forestry Approach Towards Net-Zero Emissions

*Sagar Kisan Wadkar, Vaishali Goswami and Naveen Kumar Singh,
National Cooperative Union of India*

Cooperatives, as member-owned and democratically controlled enterprises, have the ability to advance sustainable practices while addressing community needs. This inherent capability aligns with the pursuit of net-zero emissions, where innovative cooperative models can play a significant role by integrating environmental goals with cooperative values. This study investigates the Indian Farm-Forestry Development Cooperative (IFFDC) model, which has been working towards carbon farming and sustainable development. By converting wastelands into productive forests, IFFDC has become the first Indian cooperative in agro-forestry to secure 78,000 carbon credits from VERRA, a leading certification body. This highlights the model's effectiveness in carbon sequestration and mitigating climate change. The research employs a mixed-method approach, centered on a case study of IFFDC, to assess its impact on achieving net-zero emissions and promoting sustainable development. Further, it encompasses review of existing literatures to establish a theoretical foundation. Data collection involves qualitative and quantitative methods, including discussions with key stakeholders and members of the IFFDC.

The study also addresses the implementation challenges and innovative approaches used in the project, including fire protection strategies and community engagement. The findings indicate that the IFFDC model significantly contributes to the generation of carbon credits and integrates effectively with global carbon markets. Furthermore, the model aligns with Sustainable Development Goals (SDGs), out of the total 17, this project is addressing 8 SDGs, especially SDG 13, SDG 15, SDG 1, SDG 3, SDG 5, SDG 8, SDG 10, and SDG 17 showcasing its role in promoting climate resilience, sustainable land management, etc. Moreover, this research underscores the transformative potential of cooperatives like IFFDC in advancing India's low-carbon goals, promoting environmental sustainability, and ensuring social and economic benefits.

2. Attempts to Tackle Extreme Heat Stress in Mine-Side Communities through Better Governance

Mohua Mukherjee, Oxford Institute for Energy Studies

As part of the energy transition, India is boosting its domestic manufacturing sector to avoid importing massive volumes of required hardware for electronics and RE generation and storage. A range of industrial policies have been announced as part of India's aspiration to take the China+1 role in global manufacturing supply chains.

Yet all the land allocation announcements have been conspicuously silent regarding the need for affordable, sustainable rental housing for migrant workers (low and high-skilled) who will surely flock to the manufacturing hubs. The right to access thermally comfortable and affordable rental housing in a dangerously heating climate is an important but overlooked element of the Just Transition.

Buildings lock in their carbon footprints for 50-60 years, and one third of India's electricity consumption comes from buildings. Of that, 75% comes from residential buildings. India's electricity consumption has recently surged beyond all projections: March 2024 was 28% higher than March 2023.

Energy efficient, sustainable buildings take on added importance because India has important NDCs to meet, including reducing the emissions intensity of its GDP by 45% in 2030 relative to 2005 levels. Therefore, BAU in the building sector is unaffordable, both CO₂-wise and financially, for building occupants who must run mechanical cooling devices day and night.

India must show its "green procurement muscle" and put in place stringent technical standards and building codes. PPP business models that will lead to the construction of hundreds of low-carbon rental building complexes, should be supported. This is overdue, for the anticipated surge in rental demand that will accompany the manufacturing sector's growth.

The paper will explore sustainable buildings and delve into innovative business models that seek to offer de-risking to the private sector under B2B arrangements. Thus, low creditworthiness of the occupants of the building cannot continue to create obstacles to the construction of highly sustainable buildings.

3. Steering Responsible Renewable Energy Development in the Global South: A Case Study of India's Green Transition

Dr Nupur Bapuly, The Nature Conservancy, India

Every day, the challenges posed by climate change are becoming more and more adverse, with those living in the Global South bearing the heaviest burden of its negative impacts. The emission of greenhouse gases stemming largely from the burning of fossil fuels, rapid industrialization, and massive deforestation have significantly contributed to these adverse impacts. The 6th Assessment Report of the Intergovernmental Panel on Climate Change has determined that climate change can lead to sea level rise, loss of biodiversity, and fluctuations in agricultural productivity, amongst others. Factors such as population density, socio-economic inequalities, and widespread poverty will further exasperate the situation of the countries of the Global South. In response, countries like India, Brazil, and the Small Island Developing States are spearheading initiatives to mitigate greenhouse gas emissions and transition towards renewable energy sources.

In light of the on-going global transition to greener sources of energy, this paper will explore India's journey towards sustainability, focusing on its renewable energy initiatives and the role of sustainable solutions such as low-impact siting in achieving this transition. By analyzing India's proactive measures, the study seeks to identify potential hurdles in the form of social and environmental challenges and effective mitigation measures for navigating the complexities of sustainable energy adoption. Utilizing a multidisciplinary approach encompassing environment, ecology, policy analysis, and socio-economic perspectives, this study aims to provide valuable insights applicable to other countries in the Global South. The research aims to bridge the gap by focusing on the socio-environmental challenges of solar and wind energy development in India, leveraging advanced technologies to facilitate a smoother transition towards sustainable energy while mitigating social and environmental conflicts.

4. India's priorities and Strategies on International Partnerships on Just Transitions

Vineeth Daniel Vinoy, Manipal Academy of Higher Education

India has resisted committing to a Just Energy Transition Partnership (JETP), yet it has launched various policies and programs aimed at achieving just transitions domestically. These may not officially be designated as just transition initiatives, but they are essentially energy transition policies driven by socio-economic priorities as much as, or at times more than, climate commitments. In this context, the study focuses on government initiatives such as the Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan Yojana (PM KUSUM) Scheme, the Pradhan Mantri Ujjwala Yojana (PMUY) Scheme, and the Jharkhand Just Transition Task Force, which signify some of the principles of just transition, a diversified target demographic, and their engagement with sub-national actors in the process of just transition. This paper will relate these domestic discourses and practices with the positions the Indian government has taken internationally on just transitions, including in the negotiations on the Just Transition Work Programme (JTWP) under the United Nations Framework Convention on Climate Change (UNFCCC) as well as other multilateral and bilateral partnerships on energy transitions. Similarly, it will unpack the lessons learned from some of the other JETPs signed between the G-7 and developing countries such as South Africa and Indonesia, and how India could adapt them into its own bilateral and multilateral partnerships. The paper investigates the challenges and opportunities involved in just transition partnerships, especially with a view to their impact on domestic initiatives. In particular, the article will look into the globalization of just transitions that consider both global and local considerations, focusing on equity, inclusivity, and justice.

Theme : Regional Transitions

Date: 16 October 2024 | Time: 2:30 pm to 5:00 pm

Chairs:

Dr Alexander Fisher, Director Indo-German Coordination on Climate Change, GIZ

Mr Ajay Yadav, Joint Secretary,
Ministry of New & Renewable Energy (MNRE), Government of India*

1. Meghalaya's Just transition through Nature based livelihood solutions

Altaf Azam & Samrat Deb, The Climate Group

As India sets ambitious climate action targets conveyed in its NDC's, states are working to develop and revise their State Action Plan on Climate Change (SAPCC) to conform to these ambitious goals. While most states strive to lower their GHG emissions, Meghalaya is leading the way showcasing how nature-based economics and value chains will not just conserve the vibrant ecological and biotic regimes, but also foster sustainable livelihood opportunities as we seek to transition to a net zero economy.

Meghalaya has adopted a different approach for climate adaptation by evolving an alternative equivalent of a net zero ambition. This is in the form of a new development concept called the 'Environment State' with the objective of integrating nature into economic planning and creating a new paradigm of nature-based economics. It seeks to develop ecological regions as special Climate Action Zones (just like India's Special Economic Zones) as an opportunity to create viable economics around it with incentives, subsidies for climate sensitive brands, products, and organisations. There are initiatives for skilling and training forest dwelling communities into eco-tourism and forest-based livelihoods. This is being done to make forests rather than mining a source of sustainable income & creating sustainable industrial models for extractive bio resources. It has launched the Payment for Eco-System Services (PES) Scheme in East Khasi Hills District which provides remuneration to forest based communities to conserve natural ecosystems along with initiation of a pilot scheme - 'Conservation Basic Income' with more than 14,000 youth being trained in forest management.

Additional initiatives include developing Nature banking i.e. using hyperspectral technology to assess the accurate economic value of forests and biodiversity to create new financial instruments & secure funds, example, carbon farming (natural carbon capture) for regenerative agriculture and reinvigorating soil as additional carbon sink. It is also reinventing its agricultural inventory to connect to climate sensitive value chains. For example, using pineapples for vegan leather. Together with Arunachal Pradesh, Meghalaya forms one of the largest carbon sinks of India. This brand-new paradigm of nature and biodiversity economics will support in creating a slew of nature-based livelihood opportunities to ensure just transition while also facilitating access to global climate finances.

2. Towards a Green Hydrogen Economy: Identifying Externalities and Transition Challenges in Rajasthan

Dhwaj Khattar, Indicc Associates

The paper on managing the impact of transition to Green Hydrogen will attempt to identify externalities and transition challenges at state level with a typology of Rajasthan. Given the state's substantial renewable energy capacity and favourable policy environment, it is strategically positioned to play a pivotal role in leading India's green hydrogen production. Green hydrogen has the potential to emerge as a prominent avenue for energy security, especially for hard-to-abate sectors.

The paper will analyze the state's potential to attain its green hydrogen production target by 2030, leveraging its rapidly growing renewable energy infrastructure. It will examine the burgeoning industrial interest in the region. However, the paper will also evaluate the critical challenges such as high production costs, water scarcity and the need for cohesive policies.

On the demand side, the study will highlight Rajasthan's current status as a consumer of grey hydrogen and explore avenues to stimulate domestic and export markets for green hydrogen. Key interventions will include identifying suitable locations for green hydrogen valleys in Rajasthan on the basis of value-chain criteria.

The paper will propose a framework of financial and non-financial enablers to facilitate this transition and create enabling conditions for the green hydrogen market. These will include innovative financing mechanisms such as PPPs, green finance and catalytic funding from MDBs/BFIs, alongside policy measures such as Green Hydrogen Purchase Obligations and blending mandates. The aim is to lower the levelized cost of hydrogen and create a competitive market landscape.

Through a detailed examination, the paper will endeavour to provide a strategic roadmap for overcoming the identified challenges. It will emphasise a coordinated effort across policy, technology and investment spheres to realise Rajasthan's potential in green hydrogen value-chain. This transition not only supports India's climate goals but also offers significant opportunities for economic growth and energy security.

3. Justice in the City: Framework for a Just Urban Transition in India

Dulari Parmar, Roshni Nuggehalli, Vishwajeet Poojary, YUVA, Asar Social Impact Advisors

The just transition discourse has grown sectorally from a focus on coal and power to all industries transitioning in the face of climate change. At the frontline of these transitions are workers and communities whose livelihoods depend on the transitioning sectors. Spatially, the impacts are likely to be observed beyond the sites of such transitions. Urban regions, in particular, being hotspots of economic activity may have to be prepared to accommodate the demands of such a shift in a just and inclusive manner. Cities then, will experience both a transition in their composition and constitution.

At the same time, cities are transitioning to low-carbon spaces through an emphasis on green infrastructure development, smarter resource management, promotion of green technologies and transportation alternatives. This often positions urban populations as ‘consumers’ of solutions, with the role of the urban poor — who constitute around 25% of India’s urban population (Census 2011) — unclear in planning and decision making. Amidst increasing urbanisation in India accompanied by rising vulnerability (Gogoi et al. 2023), this paper argues that interrogating the contours of ‘just urban transition’, which builds on existing sustainable transition initiatives is both relevant and necessary for Indian cities.

In this context, the paper examines the current global narrative on ‘just urban transitions’ and its relevance in the Indian context. It unpacks existing frameworks through a study of literature, and conversations with key stakeholders. Specifically, it explores the interplay between urban form, governance, and labour dynamics that could influence transitions in cities. Applying these frameworks to existing city development and climate initiatives like Development Plans, the paper indicates potential entry points for effecting just urban transitions at the levels of research, policy and practice. Ultimately, this paper advocates for a more integrated approach to planning and climate action that prioritises justice and equity for the marginalised.

4. People Centric Approach in Decarbonization of Brick Kiln Sector: A Case Exploration in Uttar Pradesh, India

Harpreet Bhullar, Purnabha Dasgupta, Purpose

People centric approach towards just transition in the brick kiln sector underscores the critical importance of transitioning with bottom up vision to cleaner energy sources given its environmental and socio-economic challenges. The core challenges that this sector is currently facing are - recognition by the relevant ministry and or, department as an organized sector, unavailability of financial support, licencing system or red-tapism, non-elastic pricing, competitive market, labour crisis, high fossil fuel consumption and management of socio-environmental standards. Based on critical review of existing literature on just transition, workshops and interviews with different stakeholders, the authors explore the establishment and purpose of overarching principles and context specific criteria for a people centric approach to clean energy transition in the brick kilns sector in Uttar Pradesh, hub of brick production in North India. The proposed approach was then designed into a framework that integrated principles and criteria of distributive, procedural, recognition, and restorative justice dimensions in the brick kiln technology as well as energy transition to ensure that the shift to cleaner technology benefits both workers, owners and communities equitably. Furthermore, we highlight the importance of institutional support, including robust participatory policies, financial mechanisms, and capacity-building initiatives, to facilitate a just transition. This framework is designed with the long-term vision of being adaptable to other sectors and regions facing similar challenges, contributing to the broader discourse on sustainable industrial practices, clean energy transition, people’s unheard voices and social justice. Future research should focus on refining this framework and exploring its application in diverse industrial contexts to promote sustainable development globally. This research has been conducted as part of the Buniyaad initiative which aims to contribute towards an equity-based decarbonisation of the brick industry in Uttar Pradesh.

Theme : Workforce and Livelihoods

Date: 16 October 2024 | Time: 2:30 pm to 5:00 pm

Chairs:

Dr Asmita Kabra, Professor, School of Human Studies, Dr. B.R. Ambedkar University, Delhi

Mr Sanjay Kumar, Director, Curriculum Development,
Ministry of Skill Development and Entrepreneurship (MSDE), Government of India

1. Net Zero: Transportation Reskilling

Rakhi Sharma, Indian Federation of Green Energy

Achieving a net-zero transition in transportation is vital to reducing global greenhouse gas emissions, as the sector contributes approximately 24% of CO₂ emissions from fuel combustion. Efforts to transition from conventional to clean energy are supported by the growth of renewable energy sources like solar and wind, which have significantly increased their global electricity production share. The transition to electric vehicles (EVs) is central to reducing transportation emissions. Countries like the EU and the U.S. have set ambitious targets to reduce emissions and increase the adoption of zero-emission vehicles by 2030. Policy measures, including subsidies for EVs, investments in charging infrastructure, and stricter emissions standards, facilitate this shift. However, the transition may lead to job losses in conventional vehicle manufacturing, estimated at a 5% to 10% workforce reduction.

To counter this, significant reskilling is necessary. The growing EV market, projected to account for 58% of global passenger car sales by 2040, requires workers skilled in battery manufacturing, EV maintenance, and charging infrastructure. Reskilling programs emphasize electronics, software, and battery technology skills essential for EV production and repair. In the U.S., the shift to EVs could create up to 150,000 new jobs in battery manufacturing and assembly by 2030. Investments in training programs by companies and governments are crucial to ensuring a smooth transition and minimizing job losses. Additionally, new roles in developing and managing charging networks highlight the importance of reskilling to support the evolving automotive landscape. Public awareness, international cooperation, and significant investments — estimated at \$4 trillion annually by 2050 — are essential to drive these changes effectively.

2. Enhancing the Socio-Economic Well-being of Brick Kiln Workers in Uttar Pradesh through Data Science and Low-Carbon Transition Strategies

Shrija, Soumen Maity and Doreen Boyd, Development Alternatives

Brick kiln workers in the state of Uttar Pradesh (UP) constitute an important but vulnerable segment of the Indian workforce, marked by unregulated employment conditions, low wages, with limited access to social benefits. This present study uses data science through the GeoAI tool to undertake a comprehensive examination of brick workers socio-economic circumstances, focusing on livelihoods, income sources, and aspirations.

By analysing the complex relationship of gender, caste, education, and migration patterns, the data science research aims to uncover the structural barriers that sustain their vulnerability.

At the core of this study is the use of GeoAI tool to gather, monitor and analyse data. These data will be analysed to explore the economic diversification and financial inclusion strategies. The research investigates potential pathways and evaluates the constraints faced in accessing formal financial services. By assessing the roles of microfinance institutions, self-help groups, and government credit programs, the study seeks to develop a comprehensive framework to support brick kiln workers in transitioning to more sustainable and resilient livelihoods.

Additionally, the study examines the broader implications of these strategies in the context of economic and environmental changes, particularly within marginalized communities. The research aims to address how effective economic diversification can contribute to a low-carbon transition while mitigating socio-economic disparities. By focusing on the experiences and needs of brick kiln workers, the study provides insights into the social and economic impacts of such transitions and seeks to inform the development of targeted policies and programs.

The ultimate goal of this research is to use data science to enhance the well-being and economic stability of brick kiln workers through actionable strategies and informed policy development. By offering a detailed understanding of their challenges and identifying practical solutions for economic empowerment, the study contributes to fostering a just and equitable transition for vulnerable populations in the face of broader environmental and economic shifts.

3. Unlocking Energy Transition Opportunities: Emerging Green Jobs in Jharkhand

Tariq Habib, Manish Kumar, Manika Gupta, Climate Policy Initiative (CPI)

As India strives to meet its ambitious climate commitments and decarbonize its economy – green jobs are a priority for the country. The concept of a Just Transition emphasizes the importance of securing economic livelihoods for workers who rely on traditional solid fossil fuel ecosystems, and are vulnerable to the shifts towards greener practices. In this context, the proposed paper will delve into the implications of a low-carbon energy transition for Jharkhand, a state heavily reliant on solid fossil fuel. The economy of Jharkhand is deeply intertwined in its rich solid fossil fuel reserves, mining activities and associated industries. Inevitably, this dependence leads to significant financial sustainability challenges, contributing to low socio-economic development and a lack of alternative employment opportunities.

Recognizing the need for economic diversification and green energy development, this paper will explore job opportunities arising in Jharkhand from a green technology-driven energy transition. It will examine two different green transition scenarios: an aspirational scenario based on existing national policies, and an accelerated scenario to advocate for more aggressive policy measures and investments. The energy transition is anticipated to stimulate various sectors to create and implement sustainable policies and strategies, resulting in job creation. On this basis, the paper aims to identify emerging green technologies and quantify consequent job creation potential, in both the scenarios mentioned above. The outcomes of this review are intended to provide valuable insights to concerned stakeholders about the employment prospects, challenges, and investment needs associated with the adoption of renewable energy in the state of Jharkhand.

4. Creating Green Livelihood Opportunities for the Coal-Dependent Workforce in Eastern India

Akash Sharma Sanchita Chattarjee, CUTS International

A just transition in coal mining necessitates developing a narrative beyond livelihood, skill development, and social support systems that encompasses innovative re-purposing of abandoned coal mines.

In the coming years, the coal-rich eastern states of India will find themselves in a precarious position as they struggle to mitigate job losses resulting from the gradual reduction of coal mining to address climate change and achieve net-zero goals.

While developing alternative livelihoods and investing in skill development can aid this transition, they will not fully address the significant unemployment, particularly within the informal sector of the coal value chain. This approach could also instigate a large-scale migration, displacing communities that have lived off this land for generations and potentially leading to social unrest.

Against this background, the proposed paper aims to evaluate the potential for re-purposing and generating employment in abandoned coal mines in the eastern states of India. It adopts a mixed research methodology and policy advocacy approach to propose a comprehensive policy framework for re-purposing coal mines, contributing to a just transition in the coal sector.

The analysis will look at innovative strategies for re-purposing abandoned coal mines in addition to alternative employment and re-skilling to mitigate the socio-economic impact of the transition away from coal.

The paper provides insights on engagement with local communities to ensure they benefit from and actively participate in the transition.

The recommendations of the paper include transformation of these sites into economic hubs, such as renewable energy projects and pumped storage hydropower, eco-tourism, or sustainable agriculture initiatives such as agri-PV. Further the paper provides suggestions on developing partnerships among government agencies, private sector entities, civil society organisations, and local populations to develop strategies and initiatives that meet regional needs and harness local potential.

Theme : Industrial Transitions (focusing on textile and mobility)

Date: 16 October 2024 | Time: 2:30 pm to 5:00 pm

Chairs:

Dr Gurudas Nulkar, Director and Head, Centre for Sustainable Development,
Gokhale Institute of Politics & Economics (GIPE)

Mr Arun Goyal, Former Secretary to Govt of India,
Cabinet Secretariat and ex-Member, Central Electricity Regulatory Commission

1. Implications of just transition on the auto and textile industries in India

Saon Ray, Kuntala Bandyopdhyay ICRIER

The issue of just transition in India encompasses multiple dimensions, particularly concerning unorganized workers and communities in various industries. This transition is essential, but it necessitates significant support for these workers, focusing on livelihood diversification, reskilling, and training initiatives. This paper aims to explore the implications of just transition on the auto and textile industries using a value chain approach. This involves identifying the number of people employed in these industries for each node in the value chain, determining the skill gaps and the skill sets required for the transition, and understanding the need for training for each node. While the transition from ICE to EV is well-documented, achieving a low-carbon and sustainable transition in the textile industry requires comprehensive adoption of decarbonization practices to reduce carbon emissions across supply chains. Implementing carbon neutrality measures through strict adherence to green manufacturing codes of conduct is crucial.

Production of ICE vehicles is organized in specific clusters across India with prominent clusters in Delhi NCR, Pune, and Chennai. In the case of EVs too, assembling is being carried out by companies, such as in Tamil Nadu, while some companies started their assembly in Maharashtra and Gujarat. EV auto clusters are also emerging at new locations such as Karnataka. The textile industry has many clusters, the prominent ones being Surat, Mumbai etc.

The experience gained from the Technology Upgradation Funds Scheme (TUFS), which supported textile companies in adopting innovative new technologies, can offer valuable lessons for the techno-commercial upgradation of ICE vehicle factories to include EV manufacturing and assembling. This paper will examine secondary data to understand the just transition requirements for the auto and textile industries in terms of reskilling and livelihood diversification.

2. Just Transition to Zero Emission Trucking

Arun Krishnan, Manish Kumar, Vivek Sen, Climate Policy Initiative

Our paper highlights the critical need for a just transition as India's trucking sector transitions from diesel to electric trucking. India's road logistics industry handles 70% of domestic freight and contributes significantly to CO₂ and particulate matter emissions. With the truck fleet expected to grow four-fold by 2050, transitioning to zero-emission trucking (ZET) is essential for meeting India's climate targets and improving public health.

Battery electric technology is identified as the most viable alternative to internal combustion engine (ICE) trucks, despite challenges such as higher costs and limited charging infrastructure. The transition to ZETs is expected to be gradual, influenced by cost reductions and supportive government policies.

The trucking industry in India employs millions. The shift to ZETs will lead to job losses in ICE-related trades but will also create new opportunities in emerging sectors. The co-benefits of ZET adoption include reduced public health expenditure and improved quality of life.

A people-centric approach is crucial to ensure that the transition does not exacerbate existing inequalities. This involves addressing the social and economic dimensions of the industry's reconfiguration, including the needs of drivers, fleet owners, and workers in manufacturing, aftersales, and service sectors.

Policy and financial interventions are necessary to support direct, indirect, and induced workers through training, reskilling, and job placement programs. Equity considerations should extend to communities near major transportation corridors, which will bear a disproportionate burden of the transition.

Our paper proposes establishing a Just Transition Fund for India (JTFI) under the Ministry of Skill Development and Entrepreneurship to finance these efforts. This fund would leverage existing government schemes to reskill workers and provide loans and grants for alternative livelihoods, ensuring a just transition that aligns with India's environmental goals while protecting the livelihoods of its trucking workforce.

3. Progress towards equitable and inclusive low carbon transition policies in the textile and mobility sectors in India: A review

Safa Khan and Kritika Singh, Oxford Policy Management

India ranks as the fifth largest economy and the third largest CO₂ emitter in the world. It is already experiencing several climate shocks ranging from heatwaves, landslides to flooding and cyclones. India is already taking steps to address these climate challenges by committing to reach net zero by 2070, through scaling up renewable energy capacity, and policy measures to encourage uptake of green technology amongst others.

Whilst it's important to focus on the macro-level to design policy measures, including financial regulations that are supportive of low carbon transition, it is also critical to include voices of people at micro-level especially women and vulnerable people, who bear dual effects of climate change i.e., it's impact and the impact of low-carbon transition. It becomes imperative to ensure that low-carbon transition is sustainable not only for businesses, industries and organizations but is just, equitable and inclusive for the people, particularly those who are vulnerable, as they are key stakeholders of the ecosystem.

This paper, through secondary literature, will review the policy landscape and government support to businesses, industries and organizations for low carbon transition. This paper will focus on two sectors, textiles and mobility, because these are important for the Indian economy such as by providing livelihoods to people, and they also face transition challenges such as access to innovative technology for energy use and production, livelihood upskilling, and access to finance. We will deploy a worker-centric lens by situating workers within the context of low-carbon transition government policies and initiatives to document progressiveness of policies in being

equitable and inclusive, and to identify any gaps. We will further explore potential areas to focus on that will ensure that this low-carbon transition is equitable, inclusive and sensitive to the needs of workers, especially those who are from vulnerable communities and women.

4. Assessment of the impact of the Internal Combustion Engine Vehicles to Zero Emission Vehicles in road transport sector

*Rohit Magotra, Probal Ghosh, Sudershan Singh, Neelakshi Vasnik,
Integrated Research and Action for Development*

India's road transport sector is one of the highest and fastest growing sector contributing to the carbon emissions. The decarbonisation of the sector is critical to achieve targeted NDC goals of 100% EV in commercial sector and 40% in private sector by 2030 set by the Govt. of India. Hence, transition of ICE vehicles with Zero Emission Vehicles (ZEVs) has been given a policy push.

Automobile sector mainly comprises of Internal Combustion Engine (ICE) vehicles which have dominated sales and vehicle stock in India. ICE vehicle manufacturing contributes to 50% of the total manufacturing GDP and creates more than 32 million jobs in India.

The transition to ZEVs may have significant economic and employment losses. Though the Government targets have been set, there is no detailed understanding on how this transition will affect the established automobile sector.

The paper will address the stakeholder perspectives on critical challenges that are likely to be faced by the stakeholders like skilling, economic, social, technological and financing. It will also address key barriers and opportunities for the Sustainable and Just Transition.

Theme : Industrial Transitions

Date: 16 October 2024 | Time: 2:30 pm to 5:00 pm

Chairs:

Dr Ananya Chakraborty, Senior Research Specialist, Climate Resilience Practice WRI India

Mr Manish Mishra, Chief, Regulatory Affairs, Tata Steel

Dr Mercy Epao, Joint Secretary, SME Ministry of MSME, Government of India*

1. Just transition in hard to abate sectors: Need for a separate approach

Jyoti Mukul, Confederation of Indian Industry

The concept of just transition that owes its roots to worker's movement is now a well-accepted pathway for even company managements and countries. The acceptability has come about because green growth goals are being looked at in the context of well being of workforce and the larger society since both the costs of climate change and of reversing it are to be borne by either company balance sheets, or state exchequers. At the same time, employee and social welfare are proven to yield better work performance and lower health cost and overall bring in efficiencies. The paper will go into the various aspects of just transition in hard-to-abate sectors, like oil refineries, steel, cement, and medium, small and micro industry. This is important to examine since even though it may be a mere a fuel or feedstock change for these sectors when they move to low or zero carbon processes, but it will require reskilling and investment in new technologies. The high cost of inducting new technologies always runs the risk of the labour cost being undermined.

The paper will examine the following aspects:

- A. The nature of Just Transition needed in hard to abate sectors
- B. Challenges to just transition in these sectors: The cost of training/reskilling adds to the transition cost. Moreover, job loss due to transition is always a possibility, especially if the same industry is going through a cyclic downturn. In such a scenario, job loss due to transition to green processes could be used as an excuse for retrenchment even though it would have happened otherwise, also.
- C. Themes for Just Transition framework for hard-to-abate sectors
- D. Solutions: Generic versus sector specific

2. Energy Transition in Dairy Cold Chain

Vishal Sukhija, WWF India

India is the world's largest milk producer - with an annual production of 230.6 million MT (2022-23), contributing to approximately 24% share of global milk production. The dairy industry also provides employment and income-generating opportunities, particularly for women and livestock farmers.

Milk is a highly perishable commodity and needs refrigeration facilities to preserve its nutrients and market value.

Largely untouched by technological advancement and reliable energy infrastructure, a farm-level collection centre caters to a few villages in the vicinity. Farmers from these villages deliver milk to the collection point twice a day, morning and evening.

These centres are rudimentary in the facility for refrigeration of the collected milk.

The milk received at dairies/milk collection facilities is at a temperature of about 35°C. It is then required to be cooled to a safe storage temperature of about 4°C to prevent microbial growth and preserve quality.

Bulk Milk Chillers (BMCs) are used for refrigerating milk at the chilling centres. Due to inadequate power supply conditions in these areas, the BMCs only partly run on electricity from the grid. The rest of the time they are powered by diesel generator sets (DG sets), thereby making the chilling process energy-intensive and contributing to about 25% to 30% of the total energy consumption of the dairy farm.

Poor quality of milk due to these infrastructure challenges, as well as high transportation costs and the time needed for delivering the milk to the nearest milk chilling centre, cause a loss of income for the farmers.

RE based Milk Chilling Solutions

WWF-India has been working on providing an innovative solution to the village/farm-based collection centres by installing Instant Milk Chillers (IMCs) powered by a battery-supported solar PV system. As the name suggests, IMC instantly brings down the temperature of the collected milk from around 35°C to 4-6°C preventing microbial growth and thereby significantly improving its shelf life. So far, WWF-India has installed 40 such solar PV-powered IMCs across several dairies/collection centres in Uttar Pradesh and Rajasthan with a total installed capacity of 250 kW, and milk chilling capacity of 35,000 litres per day.

It also results in savings of Rs. 110,000 per site per year. By the end of FY 2024-25, WWF-India aims to expand the installation capacity to up to 650 kW.

3. Just Transition in the Circular Economy: Developing a Comprehensive Policy Framework with an Example of the Construction Industry

Rajvidya Wadalkar, Urvika Goel, Lovish Raheja, IITB-Monash Research Academy

The escalating triple planetary crisis and unsustainable industrial practices necessitate a transition to circular production systems. This transition involves several pathways according to the multi-level perspectives on socio-technical transitions, such as technological substitution, transformation, reconfiguration, dealignment, and realignment. These pathways emerge through the interaction of broader landscape and niche innovations with the socio-technical regime. Such pathways, although inevitable, may lead to negative consequences from just perspectives, including inequitable resource distribution, unfair implementation processes, and global and regional disparities. However, limited guidelines exist to identify these concerns systematically. The present study addresses this research gap by developing a framework that integrates multi-level perspectives on socio-technical transitions with the 'JUST' theory proposed by Heffron. The construction sector has been considered as an example to demonstrate the application of the developed framework.

The construction industry is highly carbon-intensive and resource-demanding, which results in significant waste production demanding a shift towards circularity. Considering this shift to be of a socio-technical nature, the paradigms and practices for a transition towards circularity have been analyzed, and the mentioned integrated framework, which considers the JUST perspectives, has been applied. The shift in construction practices includes adopting energy efficiency, green public procurement, and effective waste management, among others. Based on the analysis, identified risks and concerns include accessibility of green skills and competencies, job risks caused by the technology integration, impacts on the livelihoods of local communities, increased economic vulnerabilities of small and medium enterprises, and safety issues for labor engaged in waste management, among others. The developed framework will help policymakers systematically pre-map the potential concerns related to justice arising from the emerging paradigm shifts, specifically in the cases where examples/guidance are lacking and formulate a holistic policy that deals with ecological, economic, and social challenges.

4. Uncovering Equity in Energy Efficiency: A Business Model Perspective on the Indian Sugar Industry

Kanika Balani, University of Sussex

Exploring energy efficiency in scholarly research has traditionally centred on carbon emissions and energy demand reduction. A significant oversight in the literature pertains to spatial blindness, neglecting the diverse sectoral and regional variations in the value and innovations associated with energy efficiency. This study addresses this gap by delving into industrial energy efficiency within the Indian sugar industry, characterised by its energy-intensive processes. The primary energy source is biomass derived from sugarcane residue — bagasse — which is burned in boilers to produce steam and electricity. Additionally, the industry generates value-added products such as bio-electricity, bio-ethanol, and bio-CNG, significantly contributing to India's decarbonisation efforts.

Using a business models perspective, this study deciphers the patterns in how energy sources and by-products are utilised, influenced by the values prioritised and the stakeholders served by these business models. What is considered efficient, and for whom, varies across the industry, driven by the value created for different stakeholders. This research highlights that while some practices benefit the energy system, they may not create value for farmers or the agricultural system, where efficiency is lost when biomass is burnt in industrial boilers. The study examines these missed values, crucial for a just sustainability transition that offers wider and more equitable benefits.

The Indian sugar industry comprises cooperative, private, and public sector entities, with varying values prioritised by business models depending on the scale and governance of firms. The study acknowledges that a complex interplay of political factors, governance within business models, policy and regulatory institutions, and ecological considerations significantly influence technology adoption and the values driving business models and energy efficiency approaches. This research aims to understand the co-evolution of exogenous and endogenous factors affecting business model approaches, uncovering various socio-technical elements that drive and hinder energy efficiency in the Indian sugar industry.

5. The Impact of the Carbon Credit Trading Scheme (CCTS) on the Indian Steel Industry and Future Technology Trends

Aparna Sharma, Harman Singh, Vaibhav Chaturvedi, Topic: The Council on Energy Environment and Water, New Delhi

To facilitate India's enhanced Nationally Determined Contribution (NDC) targets, the Government has initiated the framework for the 'Indian Carbon Market' (ICM). This will create demand for emission reduction credits through private and public entities. The Central Government notified the Carbon Credit Trading Scheme (CCTS) 2023 on June 28, 2023, under the Energy Conservation Act 2001. This legislation establishes a national framework to reduce, remove, or avoid greenhouse gas (GHG) emissions by pricing and trading carbon credit certificates.

The Indian steel industry, the second largest in the world, has immense growth potential, with capacity projected to double from 154 Mtpa in 2021–22 to 300 Mtpa by 2030. In 2018–19, the steel industry accounted for 12% of India's total CO₂ emissions, highlighting the need for comprehensive decarbonisation measures to achieve the 2070 net-zero emissions goal.

The Government of India released the detailed procedure for the compliance mechanism in July 2024. The steel industry is among the initial four sectors included in the first cycle of the Indian compliance mechanism under CCTS. This work assesses the total emission intensity of steel production in India and analyzes the impact of different caps and the stringency of these caps on the adoption of cleaner technology.

It finds that even a moderate target on emission intensity positively impacts the adoption of energy efficiency (EE) measures. Nearly all EE technologies, except slag waste heat recovery, discussed in this study have a high technological readiness level (TRL) of 11. Therefore, including the steel industry in CCTS would encourage the use of new technologies and modified routes to reduce emissions in the steel production chain. The success of these initiatives is crucial for sustainability, competitiveness, and value generation for the future Indian steel industry.

POSTER PRESENTATIONS

Date: 16 October 2024 | Time: 5:00 pm to 6:00 pm

1. Balancing Equity and Sustainability: Rethinking Urban Transport Planning in India

Megha Kumar, McGill University

This paper explores the implications of a neoliberal, capitalist-reformist approach to urban transport planning in India, particularly in the context of achieving a just transition. By prioritizing market principles and privatization, the state's role in service provision has diminished, undermining the right of urban dwellers to access critical services. This approach is characterized by a focus on user charges, lack of subsidies, and the pursuit of big-ticket projects, often resulting in greenwashing and a disproportionate emphasis on building 'world-class' cities. These strategies further marginalize poor and low-income residents, contrary to the goals of a just transition. Through specific examples of urban transport policies and electric mobility adoption, this paper illustrates how current practices discourage participation and decentralize decision-making, undermining democratic principles and equitable development.

The paper particularly evaluates cities' choices of adopting diesel and electric buses and their implications for a just transition. It acknowledges the difficult trade-offs decision-makers face, such as prioritizing cleaner, more expensive technologies over cheaper, less clean alternatives. This trade-off involves balancing environmental and health benefits with economic and societal considerations. By examining financial and environmental costs alongside the impact on people's mobility and access to opportunities, the paper emphasizes the need to prioritize equity in decision-making.

The paper concludes by advocating for a shift from a purely capitalist-reformist agenda to a more balanced approach, incorporating elements of a socialist-reformist agenda in urban infrastructure development to facilitate a just transition.

2. Assessing the Socio-Economic Implications of Just Energy Transition in the Global South: Navigating India's Policy Challenges and Disparities

Neeti Hardas, Centre for Study of Science Technology and Policy

India is one of the highest net energy consumers, owing to its industrial and urban development, with the projected consumption reaching its peak in 2035. At this stage the majority of energy supply relies on non-renewable sources, and the net-zero target by 2070 requires a just and sustainable transition. Due to a robust economy and strong international relations India possesses the policy frameworks and the economic caliber to initiate energy transitions, although the major concern is to ensure a just and equitable transition across the country.

This paper analyzes the policies around energy transition from a people-centric viewpoint, focusing on disproportionate impact, resource allocations and increased burden on marginalized groups in the country. Building upon the frameworks of the Land Acquisition Act and amendments of the Forest Conservation Act, research evaluates the preparedness and success of current energy transition policies in India, a lack of legal and policy framework for the economic minorities and their rights.

Through a cross-sectional regression analysis, the paper evaluates the socio-economic and cultural impacts of just energy transition. The disparity between urban, rural and tribal populations, dispossession of land, loss of employment, and the erosion of the way of life, proves that energy transition for the urban comes at the expense of the marginalized. Finally, through the lens of climate colonialism, the paper establishes the need of an inclusive development model and policy adaptations to the current framework accommodating the needs of excluded socio-economic groups, by integrating them in the decision-making process rather than considering them as end-product consumers. Ultimately the paper also suggests alterations to the current policy frameworks based on thorough evaluations, to suit the needs of India and the Global South to promote a holistic approach, as opposed to subscribing to the urban and techno-managerial policies of the Global North.

3. A transition towards decentralised Energy- Integrating Solar Power in Grassroot livelihoods

Sanjita Singha, TERI School of Advanced Studies

When addressing sustainability, it is essential to consider several key factors, with decentralized energy being one of the prominent among the 17 Sustainable Development Goals (SDGs). These goals tackle global challenges, including energy-related issues. Decentralized energy, especially solar power, is vital as it reduces dependence on centralized grids, enhances energy security, and offers a reliable power source for remote and underserved areas. Incorporating decentralized energy like solar power into grassroots livelihood sectors can significantly benefit rural communities. In India, for example, micro-businesses such as tailoring, textiles, and crafts are common in many villages. Solar energy can crucially enhance these enterprises' financial stability and promote sustainable practices. Solar-powered technologies enable these small businesses to operate more efficiently and decrease reliance on non-renewable energy sources. Integrating solar energy into grassroots levels can lead to substantial economic and environmental advantages. It can lower operational costs, boost productivity, and foster more sustainable business practices. Furthermore, it supports the broader goal of developing a more resilient and self-sufficient energy system. However, a significant challenge remains in how effectively organizations and social enterprises can reach and support grassroots initiatives. Despite the potential benefits, there are still considerable barriers to accessibility, affordability, and awareness.

Ensuring that solar energy solutions are accessible to these communities requires coordinated efforts from both governmental and non-governmental organizations. This involves not only providing the necessary technology but also offering education and support to ensure sustainable adoption and utilization.

In conclusion, decentralized energy, particularly solar power, has the potential to transform grassroots livelihoods in India and beyond. By focusing on sustainable energy solutions, we can drive economic growth and environmental sustainability in rural communities. Achieving this objective requires collaborative efforts to bridge the gap between technological potential and practical implementation at the grassroots level.

4. Gender Perspectives on Just Transitions: Analyzing the Socioeconomic Impacts on Women in Vulnerable Sectors

Yash Singh Sisodiya, Devi Ahilya University

Carbon Economy transition in India, focusing on women in vulnerable sectors such as agriculture and textiles. This paper attempts to understand how gender inequities shape women's participation and well-being during the transition and to specify special risks and challenges faced by them. The present research draws on a combination of secondary data analysis tools with theoretical frameworks available in feminist sociology. It draws on literature, reports, and statistical data to provide a complete understanding of the issue at hand.

Key objectives include the socio-economic vulnerabilities of women in these sectors, assessment of implications of current policies, and proposing of gender-sensitive policy recommendations for more equitable outcomes. The present research stresses that engendering just transition frameworks with gender dimensions could be a solution to tackle this situation by using tools of inclusive policy design and relevant support programs to empower women.

This study is expected to enhance the current understanding of the interaction between gender and just transitions and also provide policymakers with many useful insights, pointing out the requirement to protect women's participation in decision-making at all levels. In attending to the gendered dimensions of economic transitions, the research shall work towards creating an equitable and sustainable future for Indian women and, by extension, contribute towards more general goals of gender equality and social justice in the context of climate change.

5. Just Transition and Advocacy in the Textile Industry

Akanksha Mary, Fashion Revolution India

The textile industry alone is projected to exceed the 1.5°C limit by 50%, by doubling emissions rather than cutting them in half as the science indicates. To address the climate crisis, it's important to focus on the main cause - fossil fuels. The textile industry is one of the most polluting on the planet, heavily relying on fossil fuels at every stage, from synthetic fibres to dyeing and powering factories. Textile brands can significantly reduce their carbon footprint by transitioning to renewable energy sources like solar and wind power, leading the way towards a more sustainable and fairer future for all, especially those most affected by the climate crisis.

Fashion supply chain countries like Bangladesh and India have been hit by severe climate events, disrupting garment production and causing significant damage to businesses.

One of the crucial intervention to be made is mapping out brand transparency. This includes analysis of scope 1, 2 and 3 emissions, disclose efforts to financially compensation to workers affected by the impacts of the climate crisis, brand's decarbonisation strategy, engagement with workers and communities in their supply chains affected by climate breakdown. Major fashion brands, as the most profitable entities in the supply chain, have a significant obligation to establish fair compensation systems due to the frequency of climate-related disasters affecting the industry and workers' well-being. It is urgent because these brands contribute to the greenhouse gas emissions responsible for the disasters workers are facing. Only a few brands transparently engage with workers and communities in supply chains affected by climate breakdown. They identify impacts, co-create local solutions, and support at-risk supply chain workers. Another indication that policies on freedom of association have a significant impact on workers is the existence of collective bargaining agreements, which are negotiated by unions and employers to improve working conditions and wages.

6. Forecasting the Future of EV and ICE vehicle markets and their associated CO2 emission in Delhi using Deep Learning

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Delhi's rapid urbanization and growth in economic activities have made it a hub for personal motorized vehicles, stressing the city's mobility and transportation network. This has exacerbated its carbon footprint and contributed to severe air pollution issues. In 2023, the number of registered vehicles in Delhi exceeded 12 million, including 3.38 million private cars, compared to 8.2 million vehicles and 2.7 million private cars in 2013 respectively. In the light of this sharp increase it is crucial to shift from Internal Combustion Engine vehicles (ICEVs) to Electric Vehicles (EVs) in order to mitigating air pollution in Delhi, as ICE vehicles are major contributors to CO2 emissions and air pollution due to use of petrol and diesel. Our study aims to forecast the sale of ICEVs and EVs and their respective emissions due to their operations in Delhi using Long Short-Term Memory (LSTM) method which excels at capturing long-term dependencies in sequential data through a memory cell, making them effective for tasks like time series forecasting. Our results provide important insights into the trajectory of ICE and EV sales and their environmental consequences in Delhi and also provide accurate forecasts to the to the broader efforts of mitigating CO2 emissions. The findings may also help policymakers in shaping transportation and environmental policies with optimum vehicle mix for the city of Delhi and to address the complex challenge of air pollution in Delhi. We rely on the potential of advanced deep learning techniques like LSTM in this study which further paves the way for more data-driven decision-making in the field of urban transportation planning.

7. Navigating India's Just Transition to Electric Vehicles: Job Creation, Skills Development, and Inclusive Growth

Neha Gupta, OMI Foundation

The world is increasingly transitioning to decarbonized and cleaner modes of transportation. India, too, is on the verge of an electric vehicle (EV) revolution, with plans to decarbonize its road transport sector and achieve net-zero goals by 2070. This shift will significantly impact not only the producers and users of these new vehicles but also the entire workforce across the EV value chain. Therefore, a people-centric approach is essential to ensure that no one is left behind in this transition.

This paper focuses on the new jobs created in the EV sector and the transition of jobs from the internal combustion engine (ICE) sector to the EV sector. It also explores opportunities in driving and entrepreneurship within the EV ecosystem. A comprehensive mapping of required skills indicates a two-pronged approach to facilitate a just transition: targeting those skills that are transferable and those that are entirely new.

The ideal solution involves upskilling and reskilling the existing ICE workforce while imparting fresh skills to new talent in the EV sector. This includes opportunities in driving EVs and establishing EV-related businesses. The transition plan, through skilling, upskilling, and reskilling, will provide avenues for increased women's participation and alternative livelihood opportunities for vulnerable stakeholders, such as informal and contractual workers, engine and engine component manufacturers, roadside mechanics, and service shop workers.

Through this approach, the paper will offer a comprehensive analysis that addresses the key economic, social, and technological dimensions of the shift, illustrating how this can contribute to India's just and equitable transition towards a decarbonized future.

8. Handloom to Fast Fashion: Paradigm shift in economy and impact traditional textile workers of Bihar and implications of environmental standards

Dhrubo Choudhury / Chander Prakash, Tata Institute of Social Sciences, Mumbai, India

Archaeological evidences suggest that India's history of weaving and spinning since the time of Harappa civilization. Textile manufacturing and trading evolved along with human civilization, and currently textile industry is the largest employer of both skilled and unskilled labour in India after agriculture. With billion US dollar exports, and lakhs of employment generation it is also a largest polluter in the environment, and with the advent of fast fashion the environmental and climatic risk has increased many a fold. Bihar has a rich tradition of handloom industries with generations of weavers and spinners, but with recent development in fashion industries and compliances and policies regarding environmental clauses, it is struggling to survive and sustain itself. This paper will discuss challenges faced by vulnerable labourers of Bihar due to fast fashion, disappearing traditional crafts, impact on Bihar's textile industries and struggle to compete with handloom industries of other states after introduction of new schemes for handloom. We use the secondary data of textile industrial and economic data on textile industries and primary survey data to establish the argument around the parameters to be taken into consideration while making strategies about just transition in textile industry. This paper investigates the vulnerability of textile labourers in Bihar, further enhancing the understanding the better sustainable schemes for them and their economic implications.

9. Low cost high efficiency flexible solar panels as an enabler for just transition

Prateek Khanna, SolFinder Research

This research delves into the potential of low-cost flexible solar panels as a transformative technology for achieving a just transition to renewable energy. By examining the technology's characteristics, applications, and challenges, the study highlights its role in addressing energy access, equity, and environmental sustainability, particularly in rural and marginalized communities. Flexible solar panels offer several advantages over traditional rigid panels, including adaptability, ease of installation, and potential for integration into various surfaces. These characteristics make them suitable for a wide range of applications, from residential rooftops to agricultural fields (agri-PV) and disaster relief efforts. Moreover, their lightweight and durable nature enable deployment in remote and off-grid areas, expanding access to clean energy.

The research explores the economic, social, and environmental impacts of low-cost flexible solar panels, considering factors such as cost-effectiveness, efficiency, and durability. It also examines the role of government policies, market dynamics, and technological advancements in promoting the adoption of this technology. Case studies of ongoing implementations are analyzed to identify best practices and lessons learned.

By overcoming challenges such as initial investment costs, efficiency limitations, and supply chain constraints, the widespread adoption of low-cost flexible solar panels can contribute significantly to a just transition. This research aims to provide insights for policymakers, industry stakeholders, and researchers to accelerate the deployment of this promising technology and create a more sustainable and equitable energy future. Specifically, the study focuses on the potential of flexible solar panels to empower marginalized communities, bridge the energy gap, and contribute to climate change mitigation.

10. Assessing the Impact of Biofuel Policies on Small and Marginal Farmers: Toward a Just Energy Transition in India

Mayank Pandey, South Asian University

The pathway toward achieving an energy transition is far from straightforward; it is riddled with numerous contradictions. Efforts to find alternative fuels and necessary materials for developing technology to drive transitions in sectors like transportation, industry, and electricity generation are often accompanied by debates, such as the conflict between food and fuel, concerns over indirect land use change (ILUC), and the ecological cost associated with mining. India aspires to take the lead in biofuel production, as evidenced by the updated National Policy on Biofuels (2022), which accelerated the target for ethanol volume blending to 20% by 2025-26, along with the launch of the Global Biofuel Alliance (2023). These recent developments also resonate with India's policy to reduce its dependence on crude oil imports, saving costs while fulfilling the objective of doubling farmers' income. This paper will analyze the recent policy and developments in the biofuel sector and their implications for small and marginal farmers. Focusing on small and marginal farmers, the paper will seek to answer questions such as: How much are farmers benefiting from biofuel production? What roles can small and marginal farmers play in biofuel production? Is biofuel production on the way to achieving a just energy transition? The paper will advocate for a bottom-up approach to create an inclusive and just biofuel policy for a just energy transition.

11. Deconstructing Just Energy Transition Partnerships: Needs and Feasibility for India and the Global South

Priyanshu Pandey, Neeti Hardas, OP Jindal Global University

Since 2021, 4 countries have entered JETP (Just Energy Transition Partnerships), namely South Africa, Indonesia, Vietnam and Senegal. The countries financing such shifts are Global North like France, Germany, the United Kingdom, the United States, and the European Union. These countries have seen upward economic growth and are projected to have higher energy demands due to their rising production, rapid urbanization, and industry demands. These energy supplies are necessary for the countries to effectively peak the industrial sector production. All the five countries in the recommended JTEP model at the UN Conference of the Parties COP26 in Glasgow in 2021, are Agrarian like Indonesia and Vietnam, Service economies like South Africa and Senegal, or mixed economies like India. The industrial sector is the second most employing sector in all these nations and its consumption is on an upward trend. At this juncture, defunding coal, the major energy provider, will stunt their economic growth and stagnate industrial development for a significant period.

The paper evaluates the findings of the UN Conference of the Parties COP26 in Glasgow in 2021, and the policies and suggestions of JETP projects to evaluate their validity and feasibility for the Global South. Research also explores the lack of accountability and actionable decisions by the Global North. We also do an in-depth analysis and case-study of the JETP countries to evaluate the outcomes of the policies and propose policies for India to take into account the indigenous population, land ownership issues, and the socio-economic impact of such partnerships, focusing on forming a people-centric approach like retraining and indigenous involvement. Towards the end, the paper seeks to establish an objective view of India's need to be a part of the JETP cooperations and in what capacity, evaluating the feasibility of JETP solutions before the energy peak in 2035.