



Impact of Climate Financing on Economic Development in the Country

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Abstract

Climate financing is a critical component of global economic development strategies, particularly in the face of the complex challenges posed by climate change. This financing involves the allocation of resources to initiatives aimed at mitigating climate change effects and enhancing resilience to its impacts. It plays a vital role in driving transformative changes across various sectors, steering economies toward sustainability and resilience. One primary role of climate financing is to strengthen climate resilience by investing in climate-resilient infrastructure, early warning systems, and housing. These investments not only protect lives and livelihoods but also lay the foundation for sustainable economic growth. Additionally, climate financing supports mitigation efforts, facilitating the transition to low-carbon economies powered by renewable energy sources and sustainable practices. This includes investments in clean energy infrastructure, energy efficiency initiatives, and sustainable transport systems, which not only reduce greenhouse gas emissions but also create new economic opportunities and jobs. Furthermore, climate financing stimulates innovation by incentivizing investments in green technologies and sustainable practices. By supporting research and development in clean energy and climate-smart technologies, it fosters competitiveness and drives economic diversification. Additionally, proactive adaptation measures supported by climate financing help mitigate the economic costs associated with climate change impacts, safeguarding economic productivity and livelihoods. Climate financing promotes inclusive and sustainable development by prioritizing investments in vulnerable communities and ensuring equitable distribution of benefits. Through mechanisms such as climate funds and international cooperation, it channels resources to developing countries to support climate adaptation and mitigation efforts, fostering global collaboration and resilience.

Keywords: *Climate financing, Economic development, Resilience-building, Mitigation efforts, Sustainability*

Introduction

Climate financing is a cornerstone of economic development strategies worldwide, particularly as nations grapple with the multifaceted challenges posed by climate change. At its core, climate financing encompasses the allocation of resources towards initiatives aimed at both mitigating the effects of climate change and fostering resilience to its impacts. This financial commitment is instrumental in driving transformative changes across various sectors, shaping economies towards sustainability and resilience. (Council on Energy, Environment and Water. 2019).

One of the primary roles of climate financing is to bolster climate resilience, equipping communities and infrastructure to withstand the increasingly frequent and severe weather events associated with climate change. Investments in resilient infrastructure, such as flood defenses, early warning systems, and climate-resilient housing, not only protect lives and livelihoods but also lay the groundwork for sustainable economic growth. (Bhushan, C., & Banerjee, S. 2021). By reducing the vulnerability of critical assets and services to climate-related disruptions, countries can safeguard their economic stability and continuity in the face of extreme weather events. Climate financing plays a pivotal role in advancing mitigation efforts, driving the transition to low-carbon economies powered by renewable energy sources and sustainable practices. Investments in clean energy infrastructure, energy efficiency initiatives, and sustainable transport systems not only reduce greenhouse gas emissions but also unlock new economic opportunities and job creation. The renewable energy sector, in particular, has emerged as a significant recipient of climate finance, driving innovation and technological advancements while diversifying energy sources and reducing reliance on fossil fuels. (Kumar, N., Chaturvedi, V., & Dholakia, H. H. 2014).

Beyond immediate economic benefits, climate financing fosters long-term competitiveness and innovation by incentivizing investments in green technologies and sustainable practices. By supporting research and development in clean energy, sustainable agriculture, and climate-smart technologies, countries can position themselves at the forefront of the global green economy. This not only enhances their competitiveness but also opens up new markets for green products and services, driving economic growth and prosperity. (Kayastha, A. 2023).

Climate financing helps countries mitigate the economic costs associated with climate change, which can be substantial if left unaddressed. By investing in proactive adaptation measures, such as ecosystem restoration, water management, and agricultural resilience, countries can reduce the risk of climate-related losses and disruptions. This not only protects critical infrastructure and natural resources but also safeguards economic productivity and livelihoods, particularly in vulnerable communities and sectors. (Chakraborty, L., Garg, S., & Singh, G. 2016). Importantly, climate financing plays a crucial role in promoting inclusive and sustainable development by ensuring that the benefits of climate action are equitably distributed. Investments in climate-resilient infrastructure, renewable energy access, and natural resource management benefit marginalized and vulnerable populations, empowering them to participate in and benefit from sustainable development initiatives. Additionally, climate finance mechanisms, such as climate funds and grants, help channel resources to developing countries and regions most affected by climate change, bridging the gap between financial resources and adaptation needs. (Kamat, A. S., Khosla, R., & Narayanamurti, V. 2020).

Climate Change, the Economy and the Financial Sector

Climate change has significant implications for the economy and the financial sector. Here's a discussion covering various aspects:

- **Economic Impact:** Climate change poses risks to economic stability and growth. Extreme weather events, such as hurricanes, floods, and droughts, can damage infrastructure, disrupt supply chains, and reduce agricultural productivity. These events lead to direct economic losses, increased insurance claims, and decreased investor confidence. Additionally, rising temperatures can affect industries like tourism, agriculture, and energy production, impacting GDP growth and employment rates.
- **Financial Sector Vulnerability:** The financial sector faces both physical and transition risks from climate change. Physical risks include damage to assets from extreme weather events and long-term shifts in climate patterns. Transition risks arise from the shift to a low-carbon economy, such as regulatory changes, technological advancements, and market shifts. These risks can lead to asset devaluation, loan defaults, and liquidity problems for financial institutions.

- **Asset Valuation:** Climate-related risks affect the valuation of assets across various sectors. For instance, fossil fuel assets may lose value as countries transition to renewable energy sources and implement carbon pricing policies. Real estate properties in coastal areas face depreciation due to sea-level rise and increased flood risks. Investors and financial institutions need to incorporate climate-related risks into their risk assessment and valuation processes to avoid sudden asset write-downs and losses.
- **Regulatory Response:** Governments and regulators are increasingly recognizing the importance of addressing climate-related risks in the financial sector. They are implementing policies and regulations to promote climate disclosure, stress testing, and sustainable investing. For example, central banks are conducting climate stress tests to assess the resilience of financial institutions to climate-related shocks. Enhanced transparency and disclosure requirements help investors make informed decisions and incentivize companies to mitigate climate risks.
- **Opportunities for Green Finance:** Climate change also presents opportunities for innovation and investment in green finance. Renewable energy, energy efficiency, and climate-resilient infrastructure projects offer attractive investment prospects. Financial institutions can develop new financial products, such as green bonds and sustainability-linked loans, to finance these projects. Integrating environmental, social, and governance (ESG) factors into investment decisions can enhance long-term financial performance and contribute to sustainable development goals.

Climate change and Its impact on Indian economy

(Source: Report Published in Climate Finance in India 2023)

Climate change will harm India's economy, potentially reducing its Gross Domestic Product (GDP) by 3% to 10% by 2100. This could mean a loss of 2.6% to 16.9% per person by 2100. These effects will spread across different areas like health, farming, work productivity, and infrastructure. If temperatures rise too high, the damage could be permanent, leading to severe problems in nature, society, and the economy. It's crucial to limit warming to 1.5°C and switch to cleaner energy soon. To achieve this, India needs to invest around 7% to 18% of its GDP in climate-friendly projects. Meeting the goals set for reducing emissions will need even more investment. Currently, money flowing into climate projects in India has increased, but it's not enough, mainly focusing on clean energy. Most of this funding comes from within the country, with some from government budgets and private sources. International banks have also pitched in, but it's still not sufficient.

Shifting away from coal, a major source of energy in India, comes with challenges. Many jobs depend on it, and the government has heavily invested in coal-based power plants. Moving to cleaner energy sources will need careful planning to avoid hurting workers and regions dependent on coal. Despite the challenges, it's essential for a fair and sustainable energy future. Transitioning to cleaner energy sources also means rethinking how the economy works. Investments in infrastructure and policies to support this shift are necessary. There's a big gap between what's needed and what's being done for adapting to climate change in India, especially considering the impacts of the COVID-19 pandemic. Both government and private sectors need to step up to the challenge, aligning their actions with climate goals and sustainable development targets. To finance these changes, India will need help from international sources, as its own resources are limited. This support should focus on building resilience and reducing emissions.

Positive Influence

- **Resilience Building:** Climate financing plays a pivotal role in bolstering a country's resilience against the impacts of climate change. Through investments in climate-resilient infrastructure like flood defenses, early warning systems, and resilient housing, nations are better equipped to withstand the increasing frequency and severity of climate-related disasters. These measures not only protect critical infrastructure but also ensure the continuity of essential services, promoting stability and facilitating sustained economic development in the face of climate-related challenges.
- **Promotion of Clean Energy:** A significant portion of climate financing is directed towards promoting clean energy initiatives. By investing in clean energy infrastructure and renewable energy sources such as wind, solar, and hydroelectric power, countries can reduce their dependence on fossil fuels and mitigate greenhouse gas emissions. The expansion of the clean energy sector not only creates employment opportunities and stimulates economic growth but also fosters innovation and technological advancement, positioning the country at the forefront of the global transition to a low-carbon economy.
- **Stimulating Innovation:** Climate financing serves as a catalyst for innovation across various sectors of the economy. By incentivizing investments in green technologies and sustainable practices, it encourages the development and adoption of environmentally friendly solutions. This fosters competitiveness and drives economic diversification, as businesses innovate to meet the growing demand for sustainable products and services. Moreover, by positioning the country as a leader in sustainable innovation, climate financing opens up new market opportunities and drives economic growth.
- **Cost Mitigation:** Proactive adaptation measures, supported by climate financing, help mitigate the economic costs associated with climate change impacts. Investments in climate-resilient infrastructure, ecosystem restoration, and disaster risk reduction reduce the risk of climate-related losses and disruptions. By minimizing damages and increasing preparedness, climate financing contributes to long-term cost savings, ensuring the sustainability of economic development efforts and protecting the country's assets and resources.
- **Equitable Distribution of Benefits:** Climate financing prioritizes investments in vulnerable and marginalized communities, ensuring that the benefits of climate action are equitably distributed. By focusing on climate-resilient infrastructure, renewable energy access, and natural resource management in these areas, climate financing empowers disadvantaged populations and reduces socio-economic disparities. This promotes inclusive development, fostering social cohesion, stability, and resilience, and laying the foundation for sustainable and equitable economic growth.
- **Global Development Impact:** Mechanisms such as climate funds and international cooperation channel resources to developing countries to support climate adaptation and mitigation efforts. By promoting global collaboration and solidarity, climate financing enables countries to address common challenges collectively and build resilience to global environmental threats. This contributes to the achievement of sustainable development goals and fosters a more resilient and prosperous future for all, reinforcing the interconnectedness of global development efforts.

Negative Influence

- **Financial Burden:** Climate financing often requires substantial financial commitments from governments and institutions. Redirecting funds towards climate-related initiatives may strain national budgets, diverting resources away from other essential sectors such as healthcare, education, and infrastructure development. This financial burden can hinder economic development by limiting investments in critical areas necessary for growth and prosperity.

- **Investment Uncertainty:** The implementation of climate financing initiatives may introduce uncertainty for investors and businesses. Regulatory changes, shifts in government priorities, and fluctuations in funding availability can create an unpredictable investment environment. This uncertainty may discourage private sector investment, particularly in industries with high carbon emissions, leading to reduced economic activity and slower job creation.
- **Competitiveness Challenges:** Strict environmental regulations and green standards associated with climate financing can place additional burdens on businesses, particularly small and medium-sized enterprises (SMEs). Compliance costs, technological upgrades, and operational changes required to meet these standards may strain businesses' profitability and competitiveness in the global market. This could result in job losses, reduced productivity, and decreased international competitiveness, ultimately hampering economic development.
- **Impact on Energy Prices:** Transitioning to renewable energy sources and implementing energy efficiency measures, often supported by climate financing, can lead to increased energy costs in the short term. Higher energy prices may negatively affect businesses' operating costs and households' disposable income, reducing consumer spending and investment. This can slow economic growth and hinder development efforts, particularly in energy-intensive industries.
- **Potential for Greenwashing:**
 - In some cases, climate financing initiatives may be susceptible to greenwashing, where projects are misrepresented as environmentally friendly or sustainable to secure funding. This misallocation of resources towards ineffective or tokenistic projects can undermine the effectiveness of climate financing efforts and divert funds away from genuinely impactful initiatives. As a result, economic development may be hindered due to the inefficient allocation of resources and missed opportunities for meaningful climate action.
- **Unequal Access to Funding:**
 - Developing countries and vulnerable communities may face challenges in accessing climate financing due to limited financial resources, institutional capacity, and regulatory frameworks. This unequal access to funding can exacerbate existing socio-economic disparities and hinder efforts to address climate change and promote sustainable development. Without adequate support, these communities may remain disproportionately affected by climate-related risks, hindering their ability to achieve long-term economic development goals.

Potential physical risks from climate change in India

Climate change profoundly affects the Indian economy, with tangible consequences backed by data. Studies indicate that India, being a warmer country, experiences more pronounced short- and medium-term impacts from climate change compared to other regions. For instance, research from the Reserve Bank of India (RBI) suggests that increasing temperatures, volatile precipitation, and extreme weather events can reduce the country's aggregate output across key sectors by significant margins. These effects are quantifiable, with estimates indicating potential GDP per capita losses of 2.6 percent, 6.7 percent, and 16.9 percent by 2030, 2050, and 2100, respectively.

Labor productivity, a crucial economic indicator, also takes a hit due to climate change. High temperatures, particularly in sectors like agriculture, construction, and industry, lead to declines in productivity levels. Studies conducted by the RBI indicate that Indian manufacturing worker efficiency declines by approximately 2.8 percent per degree Celsius temperature elevation. By 2030, it is estimated that India could witness 34 million job losses due to reduced labor productivity linked to heat stress, potentially putting 4.5 percent of the country's GDP at risk. (Chandra., R. 2018).

Moreover, agriculture, a cornerstone of the Indian economy, faces significant challenges due to climate change-induced variability. Extreme weather events such as floods and cyclones wreak havoc on crop production and food security. For instance, high temperatures and erratic rainfall patterns lead to crop losses of around 4 percent during kharif and rabi seasons in districts experiencing extreme weather conditions. These losses not only impact agricultural output but also contribute to food inflation, affecting consumer spending patterns and overall economic stability.

Health outcomes are also adversely affected by climate change. Rising temperatures and changing climatic conditions exacerbate the incidence and spread of infectious diseases, leading to increased morbidity and mortality rates. Studies indicate that heatwaves alone could result in a 146 percent increase in heat-related deaths in India, with vulnerable populations bearing the brunt of these impacts.

Conclusion

Climate change is poised to have significant and enduring effects on India's economy, impacting various sectors and leading to long-term macroeconomic consequences. This will result in substantial GDP per capita losses of 2.6 percent, 6.7 percent, and 16.9 percent by 2030, 2050, and 2100, respectively. Key economic sectors such as agriculture, health, labor productivity, infrastructure, and buildings will bear the brunt of these impacts. Accelerating climate change not only imposes direct economic costs but also heightens systemic risks to the financial sector. These risks encompass adverse effects on agricultural output, labor productivity, human health, investments, and damage to infrastructure from extreme events, all of which may worsen with increasing global warming. (Kamboj, P., & Tongia, R. 2018). Additionally, transitioning to a low-carbon economy poses financial challenges and risks to urban infrastructure, agriculture, industrial systems, and the built environment. These transition risks are exacerbated by unplanned mitigation efforts and may result in asset stranding and losses due to carbon lock-in. The interconnectedness of economic and financial systems gives rise to sub-systemic risks, as physical and transition risks can cascade and amplify each other, magnifying their overall impact.

References

- Abadie, L. M., Sainz de Murieta, E., & Galarraga, I. (2020). The costs of sea-level rise: Coastal adaptation investments vs. inaction in Iberian coastal cities. *Water*, 12(4), 1220.
- Adhikari, B., & Safaee Chalkasra, L. S. (2023). Mobilizing private sector investment for climate action: enhancing ambition and scaling up implementation. *Journal of Sustainable Finance & Investment*, 13(2), 1110–1127.
- Adhvaryu, A., Kala, N., & Nyshadham, A. (2014). Management and shocks to worker productivity: Evidence from air pollution exposure in an Indian garment factory [Unpublished manuscript]. University of Michigan.
- Aggarwal, J., & Prasad, S. (2023). Operationalising the loss and damage fund to address climate impacts. Council on Energy, Environment and Water.
- Aggarwal, P., Goel, S., Laan, T., Mehta, T., Pant, A., Raizada, S., Viswanathan, B., Viswamohannan, A., Beaton, C., & Ganesan, K. (2022). Mapping India's energy policy 2022: Aligning support and revenues with a net-zero future. International Institute for Sustainable Development & Council on Energy, Environment and Water. <https://www.iisd.org/system/files/2022-05/mapping-india-energy-policy-2022.pdf>

- Aggarwal, R. (2019). The impact of climate shocks on consumption and the consumption distribution in India [Doctoral dissertation, Paris School of Economics].
- Akutsu, K., & Koike, Y. (2019). Analysis of private consumption using weather data (Bank of Japan Review Series No. 19-E-1). Bank of Japan.
- Albrecht, J., Marcotullio, P., & Sarzynski, A. (2011). The geography of greenhouse gas emissions from within urban areas of India. *Resources, Energy, and Development*, 8(1), 11–35.
- Allan, S., Bahadur, A. V., Venkatramani, S., & Soundarajan, V. (2019). The role of domestic budgets in financing climate change adaptation. Global Center on Adaptation. https://gca.org/wp-content/uploads/2020/12/The_Role_of_Domestic_Budgets_in_Financing_Paper_Final.pdf
- Alves Dias, P., Kanellopoulos, K., Medarac, H., Kapetaki, Z., Miranda Barbosa, E., Shortall, R., Czako, V., Telsnig, T., Vazquez Hernandez, C., Lacal Arantegui, R., Nijs, W., Gonzalez Aparicio, I., Trombetti, M., Mandras, G., Peteves, E., & Tzimas, E. (2018). EU coal regions: Opportunities and challenges ahead. Publications Office of the European Union.
- Anandarajah, G., & Gambhir, A. (2014). India's CO2 emission pathways to 2050: What role can renewables play? *Applied Energy*, 131, 79–86. doi:10.1016/j.apenergy.2014.06.026
- Anbumozhi, V., & Kawai, M. (2015). Towards a low-carbon Asia: Challenges of economic development. Asian Development Bank.
- Andersson, M., Morgan, J., & Baccianti, C. (2020). Climate change and the macro economy (ECB Occasional Paper No. 2020243). European Central Bank. doi:10.2139/ssrn.3632832
- Asian Development Bank. (2014). Assessing the costs of climate change in South Asia.
- Atre, G., Asapur, S., & Fernandes, A. (2023). Still unprepared. *Climate Risk Horizons*. <https://climateriskhorizons.com/research/Still-Unprepared.pdf>
- Bahinipati, C. S., Rajasekar, U., Acharya, A., & Patel, M. (2017). Flood-induced loss and damage to textile industry in Surat city, India. *Environment and Urbanization ASIA*, 8(2), 170–187.
- Barca, S. (2019). Labour and the ecological crisis: The eco-modernist dilemma in Western Marxism(s) (1970s–2000s). *Geoforum*, 98, 226–235. doi:10.1016/j.geoforum.2017.07.011
- Barnett, J., & O'Neill, S. J. (2013). Minimising the risk of maladaptation: A framework for analysis. In J. Palutikof, S. L. Boulter, A. J. Ash, M. S. Smith, M. Parry, M. Waschka & D. Guitart. *Climate adaptation futures* (pp. 87–93). Wiley.
- Basel Committee on Banking Supervision. (2021). Climate related risk drivers and their transmission channels. Bank for International Settlements.
- Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. *Nature Climate Change*, 7(4), 283–288.
- Bhandari, D., & Shrimali, G. (2018). The perform, achieve and trade scheme in India: An effectiveness analysis. *Renewable and Sustainable Energy Reviews*, 81, 1286–1295.
- Bhushan, C., & Banerjee, S. (2021). Five R's: A cross-sectoral landscape of just transition in India. International Forum for Environment, Sustainability & Technology. <https://iforest.global/ijtc/ijtc-report/ijtc-report-flippable-pdf/>

- Blankenship, B., Aklin, M., Urpelainen, J., & Nandan, V. (2022). Jobs for a just transition: Evidence on coal job preferences from India. *Energy Policy*, 165, 112910.
- Bos, K., & Gupta, J. (2017). Climate change: The risks of stranded fossil fuel assets and resources to the developing world. *Third World Quarterly*, 39(3), 436–453. doi:10.1080/01436597.2017.1387477
- Bos, K., & Gupta, J. (2019). Stranded assets and stranded resources: Implications for climate change mitigation and global sustainable development. *Energy Research and Social Science*, 56, 101215. doi:10.1016/j.erss.2019.05.025
- Bridle, R., Sharma, S., Mostafa, M., & Geddes, A. (2019). Fossil fuel to clean energy subsidy swaps: How to pay for an energy revolution. International Institute for Sustainable Development. <http://fsmountain.org/ce/iisd-fossil-fuel-clean-energy-subsidy-swap.pdf>
- Brown, J., Stadelmann, M., Wang, D., Boni, L., Jachnik, R., & Kato, T. (2015). Estimating mobilized private finance for adaptation: Exploring data and methods. Climate Policy Initiative (CPI) and Organisation for Economic Co-operation and Development (OECD). <https://climatepolicyinitiative.org/wp-content/uploads/2015/11/Estimating-mobilized-private-finance-for-adaptation-Exploring-data-and-methods.pdf>
- Brown, M. A., Soni, A., Lapsa, M. V., Southworth, K., & Cox, M. (2020). High energy burden and low-income energy affordability: Conclusions from a literature review. *Progress in Energy*, 2(4), 042003.
- Buchner, B., Clark, A., Falconer, A., Macquarie, R., Meattle, C., Tolentino, R., & Wetherbee, C. (2020). Global landscape of climate finance 2019. Climate Policy Initiative. <https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/>
- Buckley, T. (2020). Who would still fund a new coal power plant in India? Stranded asset risks continue to rise as solar deflation continues. Institute for Energy Economics and Financial Analysis (IEEFA).
- Buckley, T., Garg, V., Nicholas, S., & Shah, K. (2019). Seriously stressed and stranded: The burden of non-performing assets in India's thermal power sector. Institute for Energy Economics and Financial Analysis (IEEFA).
- Bureau of Energy Efficiency. (2022). Policy paper on Indian carbon market. https://cer.iitk.ac.in/odf_assets/upload_files/blog/Draft_Carbon_Market_Policy_DocumentFor_Stakeholder_Consultation.pdf
- Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, 527, 235–239.
- Busby, J. W., & Shidore, S. (2017). When decarbonization meets development: The sectoral feasibility of greenhouse gas mitigation in India. *Energy Research and Social Science*, 23, 60–73.
- Caldecott, B., & McDaniels, J. (2014). Financial dynamics of the environment: Risks, impacts, and barriers to resilience (Working Paper for the UNEP Inquiry). Smith School of Enterprise and the Environment.
- Campiglio, E., Dafermos, Y., Monnin, P., Ryan-Collins, J., Schotten, G., & Tanaka, M. (2018). Climate change challenges for central banks and financial regulators. *Nature Climate Change*, 8(6), 462–468.
- Carbon Tracker Initiative (2018). Mind the gap: The \$1.6 trillion energy transition risk. <https://carbontracker.org/reports/mind-the-gap/>
- Carley, S., & Konisky, D. M. (2020). The justice and equity implications of the clean energy transition. *Nature Energy*, 5(8), 569–577.

- Cassim, Z., Handjiski, B., Schubert, J., & Zouaoui Y. (2020). The \$10 trillion rescue: How governments can deliver impact. McKinsey & Company. https://www.interest.co.nz/sites/default/files/embedded_images/The-10-trillion-dollar-rescue-How-governments-can-deliver-impact-vF.pdf
- Catalano, M., Forni, L., & Pezzolla, E. (2020). Climate-change adaptation: The role of fiscal policy. *Resource and Energy Economics*, 59, 101111.
- Center for International Climate Research. (2021). Pathways to Paris: A practical guide to climate transition scenarios for financial professionals. CICERO and UNEP-FI.
- Centre for Budget and Governance Accountability & Shakti Sustainable Energy Foundation. (2020). Climate mitigation financing framework in select states. <https://www.cbgaindia.org/wp-content/uploads/2020/09/Consolidated-Report-Climate-Mitigation-Financing-Framework-in-Select-States.pdf>
- Chakraborty, L., Garg, S., & Singh, G. (2016). Cashing in on mining the political economy of mining: Regulations and fiscal policy practices in India [NIPFP Working Paper No. 161]. National Institute of Public Finance and Policy. https://www.nipfp.org.in/media/medialibrary/2016/03/WP_2016_161.pdf
- Chambwera, M., Heal, G., Dubeux, C., Hallegatte, S., Leclerc, L., Markandya, A., McCarl, B. A., Mechler, R., & Neumann, J. E. (2014). Economics of adaptation. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, M. Chatterjee, K. L. Ebi, Y. O. Estrada, R. C. Genova, B. Girma, E. S. Kissel, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & L. L. White (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 945–977). Cambridge University Press. https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap17_FINAL.pdf
- Chandra., R. (2018). Adaptive state capitalism in the Indian coal industry [Doctoral dissertation, Harvard University Graduate School of Arts & Sciences].
- Chari, M. (2020, September 21). How solar farm fuel land conflict. Mint. <https://www.livemint.com/news/india/how-solar-farms-fuel-land-conflicts-11600612526037.html>
- Chaturvedi, V., & Shukla, P. R. (2014). Role of energy efficiency in climate change mitigation policy for India: Assessment of co-benefits and opportunities within an integrated assessment modeling framework. *Climatic Change*, 123(3), 597–609.
- Coal India Limited. (2020). Annual report & accounts, 2019–20. <https://www.coalindia.in/performance/financial/>
- Coal Mines Provident Fund Organization. (2020). Coal mines pension scheme.
- Coalition for Disaster Resilient Infrastructure. (2023). Global infrastructure resilience: Capturing the resilience dividend.
- Coldrey, O., Chatterjee, T., Meattle, C., & Jain, S. (2022). Paris alignment of power sector finance flows in India: Challenges, opportunities and innovative solutions. SEforALL. <https://www.seforall.org/system/files/2022-06/India-power-finance-brief.pdf>
- Colenbrander, S., Vaze, P., Vikas, C., Ayer, S., Kumar, N., Vikas, N., & Burge, L. (2023). Low-carbon transition risks for India's financial system. *Global Environmental Change*, 78, 102634. doi.org/10.1016/j.gloenvcha.2022.102634

- Council on Energy, Environment and Water. (2019). Future skills and job creation with renewable energy in India: Assessing the co-benefits of decarbonising the power sector. <https://www.ceew.in/sites/default/files/future.pdf>
- Kalkuhl, M., von Braun, J., & Torero, M. (2016). Food price volatility and its implications for food security and policy. *Applied Economic Perspectives and Policy*, 38(2), 259–279.
- Kamat, A. S., Khosla, R., & Narayanamurti, V. (2020). Illuminating homes with LEDs in India: Rapid market creation towards low-carbon technology transition in a developing country. *Energy Research & Social Science*, 66, 101488.
- Kamboj, P., & Tongia, R. (2018). Indian railways and coal: An unsustainable interdependency. Retrieved from <http://hdl.handle.net/11540/8571>
- Kamra, P. (2020, March 27). The dark side of thermal power plants: Case studies of thermal power projects and violations of law. Centre for Financial Accountability. Retrieved from <https://www.cenfa.org/the-dark-side-of-thermal-power-plants-case-studies-of-thermal-power-projects-and-violations-of-law/>
- Kanitkar, T., Banerjee, R., & Jayaraman, T. (2018). An integrated modeling framework for energy economy and emissions modeling: A case for India. *Energy*, 167, 670–679. doi.org/10.1016/j.energy.2018.11.025
- Kayastha, A. (2023, Oct 9). Green bond issues to pick up, SBI working on matrix for ESG credits. *The Hindu BusinessLine*. Retrieved from <https://www.thehindubusinessline.com/money-and-banking/green-bond-issues-to-pick-up-sbi-working-on-matrix-for-esg-credits/article67400345.ece>
- Kerr, N., & Levit, J. (2020). Climate risk assessment of India's banking sector. Bank of England. <https://www.bankofengland.co.uk/working-paper/2020/climate-risk-assessment-of-indias-banking-sector>
- Kerr, N., Manfroni, C., & Meier, A. (2020). Climate risk assessment of India's insurance sector. Bank of England. <https://www.bankofengland.co.uk/working-paper/2020/climate-risk-assessment-of-indias-insurance-sector>
- Khanna, N., Purkayastha, D., & Jain, S. Landscape of green finance in India 2022. Climate Policy Initiative.
- Khosla, R., & Janda, K. B. (2019). India's building stock: towards energy and climate change solutions. *Building Research & Information*, 47(1), 1–7.
- Kolusu, S. R., & Mallikarjun, S. (2021). Mitigating the impact of climate change on farmers in India: A sustainable approach. *Journal of Agricultural Extension and Rural Development*, 13(2), 54–60. doi:10.5897/JAERD2020.1203
- Kompas, T., Pham, V. H., & Che, T. N. (2018). The effects of climate change on GDP by country and the global economic gains from complying with the Paris Climate Accord. *Earth's Future*, 6(8), 1153–1173. doi.org/10.1029/2018EF000922
- Kraemer, R. A., Sharma, S., Bhandari, R., Vaidya, A., Nagavarapu, S., & Ramaswami, A. (2018). Domestic resource mobilisation for climate action in India. Climate Policy Initiative. <https://www.climatepolicyinitiative.org/wp-content/uploads/2018/09/Domestic-Resource-Mobilisation-for-Climate-Action-in-India.pdf>
- Kreft, S., & Eckstein, D. (2019). Global climate risk index 2020. Germanwatch. https://www.germanwatch.org/sites/germanwatch.org/files/Global%20Climate%20Risk%20Index%202020_2.pdf

- Kreft, S., & Eckstein, D. (2019). Global climate risk index 2020. Germanwatch. https://www.germanwatch.org/sites/germanwatch.org/files/Global%20Climate%20Risk%20Index%202020_2.pdf
- Krey, V., Luderer, G., Clarke, L., Kriegler, E., McCollum, D. L., Rogelj, J., van Vuuren, D. P., Bauer, N., Cian, E. D., Bertram, C., Eom, J., He, C., Kitous, A., Méjean, A., & Sano, F. (2019). Getting from here to there – Energy technology transformation pathways in the EMF27 scenarios. *Climatic Change*, 163(2), 75–101.
- Krey, V., Luderer, G., Clarke, L., Kriegler, E., McCollum, D. L., Rogelj, J., van Vuuren, D. P., Bauer, N., Cian, E. D., Bertram, C., Eom, J., He, C., Kitous, A., Méjean, A., & Sano, F. (2020). Getting from here to there – Energy technology transformation pathways in the EMF27 scenarios. *Climatic Change*, 163(2), 75–101.
- Kumar, N. (2021). Financing green power for all: How India can boost energy access and renewables. Climate Policy Initiative. <https://www.climatepolicyinitiative.org/wp-content/uploads/2021/07/Financing-Green-Power-for-All-How-India-can-Boost-Energy-Access-and-Renewables.pdf>
- Kumar, N., Chaturvedi, V., & Dholakia, H. H. (2014). Low carbon and climate resilient industry: A review of concepts, policies and strategies. Climate Policy Initiative. <https://www.climatepolicyinitiative.org/wp-content/uploads/2021/07/Low-Carbon-and-Climate-Resilient-Industry-A-Review-of-Concepts-Policies-and-Strategies.pdf>
- Srinivasan, Madhumitha & Ghoge, Ketaki & Haldar, Stuti & Bazaz, Amir & Revi, Aromar. (2023). Climate Finance in India 2023. 10.24943/CFI11.2023.

