Decarbonizing Energy System in India: A Critical Assessment of the Performance of National Clean Energy and Environment Fund (NCEEF)

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Outline

- Introduction to NCEEF
- Evidence from theory and practice
- Review of performance of NCEEF
- Evaluation of NCEEF
- Discussion
- Conclusion
- Policy implications
- Recommendations for enhanced framework

Introduction: Key features of NCEEF policy

- National Clean Energy and Environment Fund (NCEEF) was constituted as a non-lapsable corpus in 2010
- It was funded through an implicit carbon tax levied on coal, peat and lignite produced or imported in India
  - Based on *polluter pays* principle
- The objective of the fund was to invest in research and development, and innovative and entrepreneurial projects pertaining to clean energy in India
- Applications were screened by an Inter-Ministerial Group (IMG) chaired by the Finance Secretary of India and comprising of Secretary (Expenditure), Secretary (Revenue) and representatives from pertinent ministries
- Projects could be submitted by any person, organization or their group in either of public or private sector through a ministry

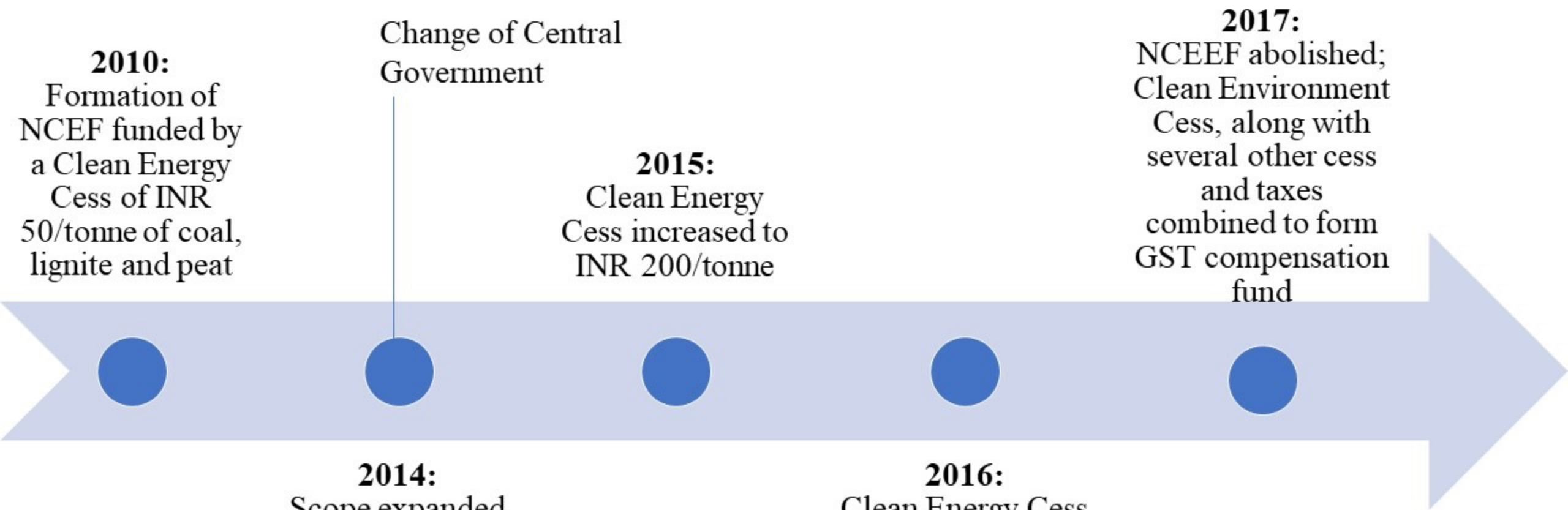
Source: Pandey et al., 2014; CBGA 2012

Eligible projects

- Broad list of eligible projects:
  - Advanced technologies in clean fossil energy
  - Advanced technologies in renewable energy
  - Basic energy sciences
  - Projects related to environment management in geographical areas around energy projects
  - Pilot and demonstration projects for commercialization
  - Projects relating to research and development to make existing technologies more climate-friendly

Source: Pandey et al., 2014; CBGA 2012

Timeline and key changes to NCEEF



Theories in support of NCEEF (Source: Daly 1990; Tietenberg and Lewis 2015; van Ewijk 2018; Turner 2005)

- Hartwick's Rule:
  - Rents from exhaustible resources should be invested in development of technologies to ensure that a constant level of consumption can be maintained indefinitely
  - Assumes substitutability between natural and physical capital i.e., weak sustainability
- Daly's Principle:
  - Assumes complementarity between natural and physical capital
  - Non-renewable resources should be exploited at a rate equal to the creation of their renewable substitutes
- Other theories and frameworks have approached categorization and use of exhaustible resources and ultimately reinforce the idea that rents from fossil fuels should be re-invested to develop their renewable alternatives

Carbon tax in practice

- Carbon tax is generally considered to be a strong fiscal measure to reduce emissions, but there is little consensus on magnitude of carbon tax and the utilization of the revenue generated thereof
- Studies show that carbon tax is usually associated with economic and welfare losses as well, so the utilization of the revenue needs to be carefully considered
- International studies for developed countries typically show that public acceptance of carbon tax tends to increase when the revenue is used for transition to green energy
- In the context of India, studies show that fears of economic and welfare loss due to carbon tax may be exaggerated and revenue recycling mechanisms can help mitigate this loss.

Source: Andersson 2019; Carhart et al 2022; Timilsina 2018

Carbon tax & innovation

- Most studies agree that carbon tax alone is not sufficient for encouraging innovation
  - Being a pure price mechanism (or a market-driven mechanism), it can promote diffusion of existing technologies only
- Since green energy technologies are emerging, they do not have established markets and need dedicated measures for their diffusion
- Innovation theories like Technology Innovation System (TIS) or Innovation Ecosystem suggest that such measures should be designed such that:
  - They can alleviate barriers in the entire value chain of the innovation
  - They can create incentives for all actors involved in the corresponding innovation system
- Such measures can include innovation subsidy, direct public participation, production linked incentives, other subsidies, etc.

Source: Pandey, de Coninck and Sagar 2021; Zhang et al., 2020; Gerlagh,Kverndokk and Rosendahl 2007; Adner and Kapoor 2016; Wieczorek and Hekkert 2012

Learnings from similar funds in other countries

Several countries across the world have funds like NCEEF which work through different funding mechanisms and across different geographies

- Thailand's Energy Conservation Promotion Fund (ENCON) is funded through a petroleum cess and works on the national level
- Canada's Green Municipal Fund (GMF) is a municipal level fund operated through seed capital from the central government
- Australia's Clean Energy Finance Corporation (CEFC) receives seed fund from the government and operates at the national level
- California's Clean Energy Fund (CalCEF) works for the state of California based on funding received from the shareholders of the fund
- Malaysian Electricity Supply Industries Trust Account (MESITA) is a national level fund which operates using funds generated by power generating companies and independent power producers

Source: Pandey et al., 2014

Learnings from similar funds in other countries

Despite dissimilarities, their working mechanisms offer unique insights:

- Managing Committee: Each of these funds have a diverse expert committee which includes stakeholders from public, private, academic and environment sectors to evaluate the projects based on financial, technical and environmental feasibilities.
- Investment Strategy: Each of these funds have a clear investment strategy that engages the private sector and helps them access the market and industrial network.
- Investment tools: These funds use a variety of tools to provide financial assistance, e.g., low interest loans and grants (GMF), angel funding and equity investment (CalCEF), soft-loans, co-investments, insurance products (CEFC).
- Other features: Transparency, accountability and timely evaluation of investment

Source: Pandey et al., 2014

Review of Performance of NCEEF

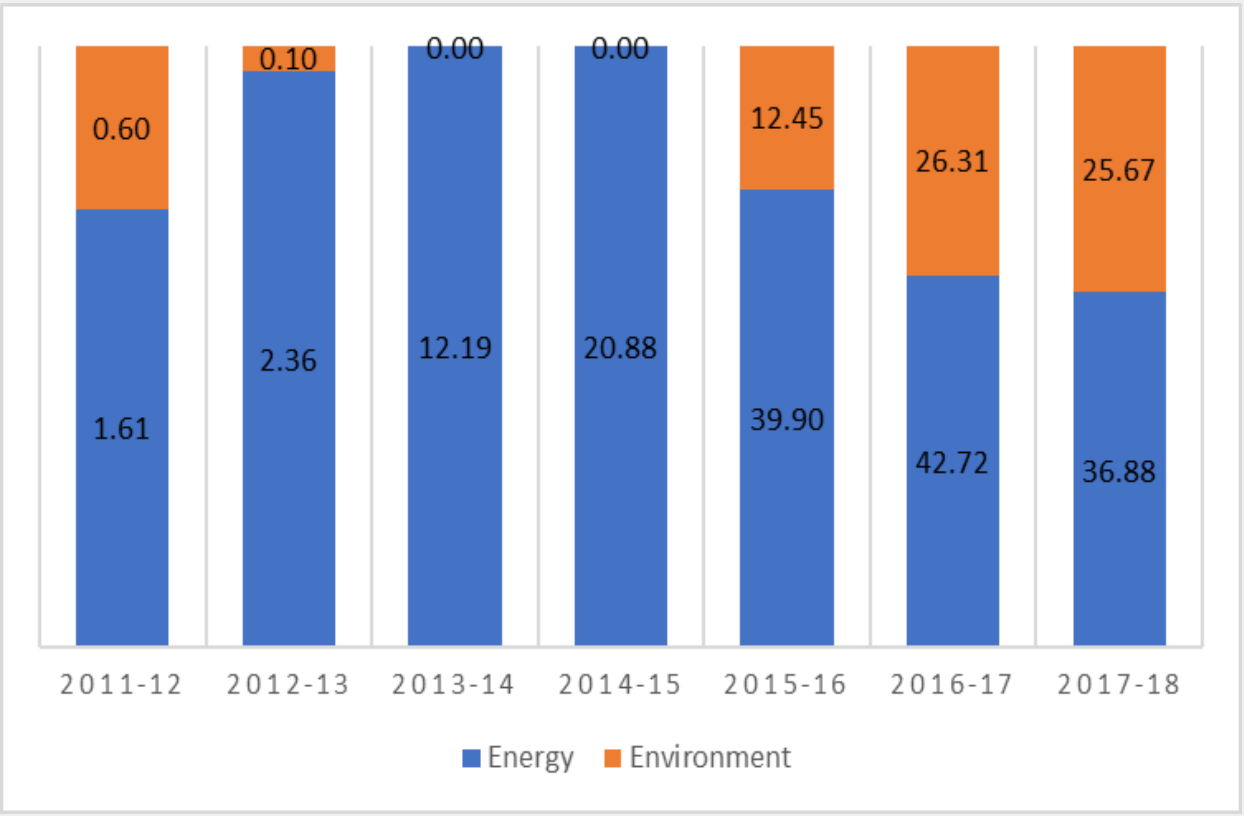
Fund position of NCEEF

Year	Cess Collected (Billion INR)	Amount transferred to NCEEF (Billion INR)	Amounts financed from NCEEF for projects (Billion INR)
2010-2011	10.66	0.00	0.00
2011-2012	25.80	10.66	2.21
2012-2013	30.53	15.00	2.46
2013-2014	34.72	16.50	12.19
2014-2015	53.93	47.00	20.88
2015-2016	126.76	51.23	52.35
2016-2017	261.17	64.67	69.03
2017-2018	114.63	54.43	-
2018-2019	0.05	-	-
Total	**658.26**	**296.50**	**159.10**

- Total collection between 2010-11 and 2018-19: INR 658.26 billion (USD 10.11 billion)
- Only 45% of this amount (INR 296.50 billion or USD 4.55 billion) was transferred to NCEEF
- Only 54% of this amount (INR 159.10 billion or USD 2.44 billion) was used to finance relevant projects
- In effect, only 24% of the total collection was utilized

Source: Government of India 2017

Utilization of funds- energy versus environment

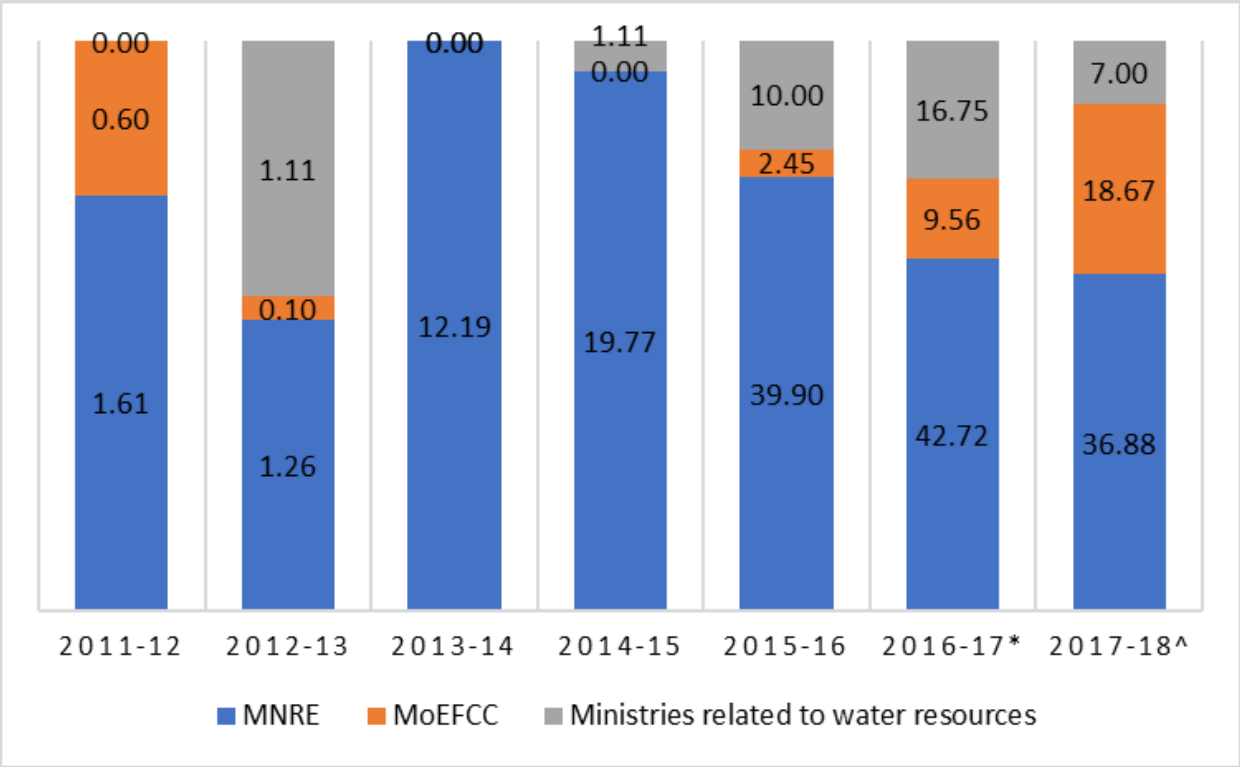


NCEEF fund allocated between energy & environment projects (numbers are the respective amounts in billion INR)

- Before 2014, most of the fund was spent on projects pertaining to energy
- After 2014, the share of environmental projects started increasing and went up to 41% of the total fund utilized

Source: Union Budget of India 2013-14 to 2019-20

Utilization of fund as an extra-budgetary corpus

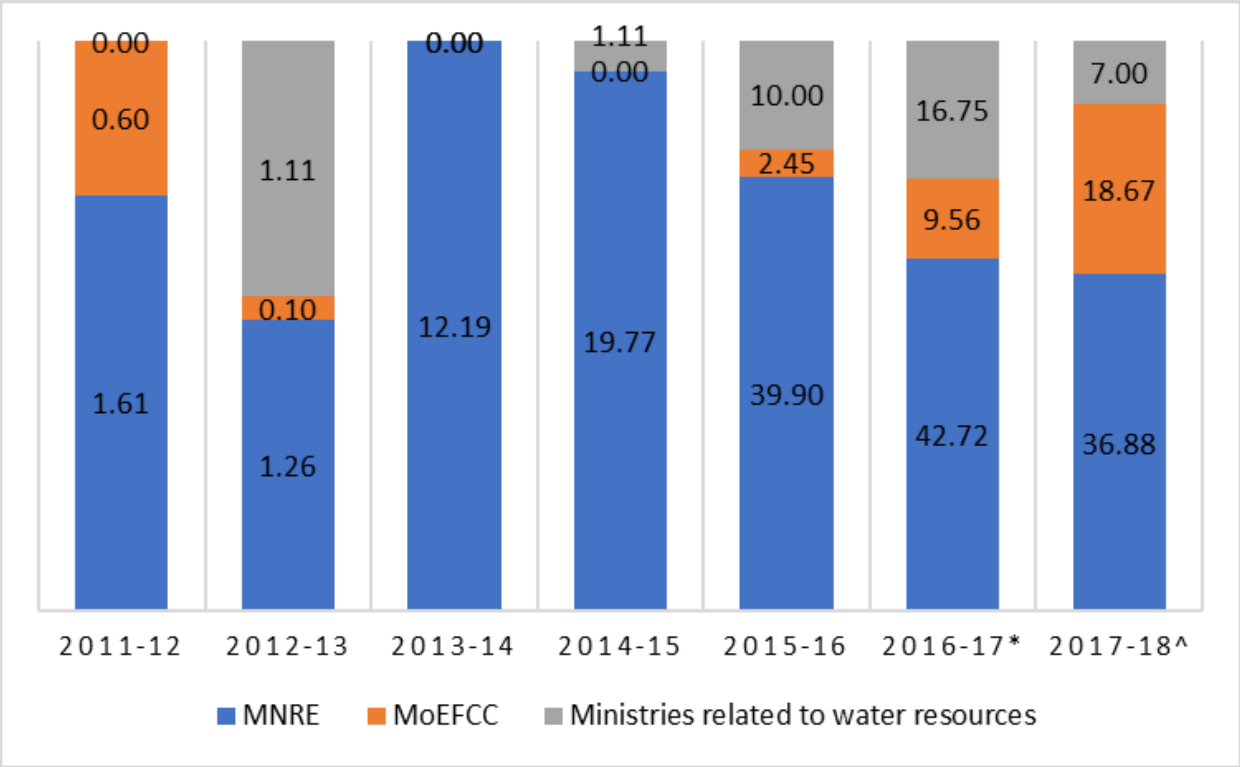


Ministry-wise allocation of NCEEF funds (numbers are the respective amounts in billion INR)

- Most projects of NCEEF were routed through MNRE
  - By 2017-18, almost entire budget of MNRE was funded through NCEEF
  - Between 2011-12 and 2015-16, NCEEF funded 48 (out of 55) projects in MNRE worth a total viability gap funding of INR 330.70 billion
  - Most of these projects were already planned in the union budget

Source: Government of India 2017; 2021

Utilization of fund as an extra-budgetary corpus



Ministry-wise allocation of NCEEF funds (numbers are the respective amounts in billion INR)

- MoEFCC received second highest funding through NCEEF
  - Between 2011-12 and 2014-15, INR 3.8 billion allocated to 3 projects for remediation of hazardous waste dump sites
  - Between 2015-16 and 2017-18, INR 30.68 billion allocated for environment and river conservation, especially Ganga rejuvenation

Source: Government of India 2017; 2021

Evaluation of NCEEF

1. Projects funded under NCEEF
2. The policy itself

Through the lens of project eligibility: 2011-12 to April 2015

Eligible Projects	2011-12	2012-13	2013-14	2014-15	2015-16
Advanced Technologies in clean fossil energy	1	0	0	0	0
Advanced technologies in renewable energy	3	3	8	18	10
Basic energy sciences	0	0	0	0	0
Projects related to environment management in geographical areas around energy projects	1	0	0	0	0
Pilot and demonstration projects for commercialization	1	1	0	0	0
Projects relating to research and development to make existing technologies more climate-friendly	1	0	0	0	0
Other projects	2	2	3	1	0
Total Projects financed through viability gap funding	**9**	**6**	**11**	**19**	**10**

Most of the projects funded till April 2015 were related to renewable energy technologies, especially solar energy

Source: Government of India (2017)

Through the lens of project eligibility: 2015-16 to 2017-18

- Ministry of New and Renewable Energy:
  - Grid connected & distributed generation renewable energy: INR 111.4 billion
  - Research, development & international co-operation: INR 2.2 billion
  - Public sector undertakings & other supporting programmes: INR 1.5 billion
- Ministry of Water Resources, River Development and Ganga Rejuvenation
  - National River Conservation Programme: INR 1.7 billion
  - Namami Gange: INR 32.1 billion
- Ministry of Environment, Forest & Climate Change:
  - Hazardous substance management: INR 22.6 billion
  - Integrated Development for Wildlife Habitats: INR 12.1 billion
  - National Mission for Green India: INR 5.2 billion
  - Other programmes: INR 8.8 billion
    - E.g., climate change action plan, conservation of natural resources and ecosystems, etc.

Source: Union Budgets 2013-2019

Through the lens of innovation

- None of the environmental projects had any value from the perspective of innovation
- Barring two projects between 2011-13, none of the projects catered to pilots or demonstrations aiming at commercialization of clean energy technologies
- Barring one project in 2011-12, none of the projects catered to research and development for technologies that would help with climate change
- All the energy projects could be categorized as ‘direct public participation’ because they dealt with installation of solar energy technologies through public funding
  - E.g., installation of solar PV plants of varying capacity across various states, installation of solar pumps for agriculture, etc.
- Instead of stimulating innovation, the fund was used as an extra-budgetary corpus to fund planned budgetary activities

Through the lens of governance

- Managing committee: NCEEF worked through an Inter-Ministerial Group (IMG) which consisted primarily of bureaucrats. While there was provision for inclusion of topic experts, it was never exercised.
- Eligible Parties: While the projects could be submitted by any public or private individual or corporation, it had to be routed through a ministry which hampered independent private participation.
- Investment Strategy: NCEEF provided viability gap funding up to 40% of the total project cost and laid additional constraints regarding where the rest of the funding could be obtained from.
- Investment tools: Only one investment tool- viability gap funding
- Other features: There was no clear direction on how to promote transparency and accountability or conduct evaluation of the investments

Evaluation of NCEEF

A policy like NCEEF, that intends to stimulate decarbonization of the energy system, needs to have three characteristics:

1. Should prevent the growth of carbon intensive technologies

   Clean energy/environment cess was aimed at reducing the growth of coal consumption, however the increase in demand for energy in India outpaced any reduction in coal consumption emanating from the cess

2. Should stimulate innovation in green technologies by encouraging research, development, demonstration and deployment (RDD&D) of these technologies

   NCEEF was barely used for RDD&D of these technologies. Instead, it was used for installation of already existing technologies. Several projects had zero value from an innovation standpoint

Evaluation of NCEEF

A policy like NCEEF, that intends to stimulate decarbonization of the energy system, needs to have three characteristics:

3. Should incentivise the diffusion of such technologies through appropriate demand side stimulations

   The fund was used for installing technologies related to solar energy. While these technologies were already available, there installation in various states helped mobilize other market players towards these technologies

Discussion

- The (implicit) carbon tax on coal currently stands at INR 400/ tonne (~US$ 5/ tonne) of coal, peat and lignite
  - Rate of growth of energy demand is high in India due to which such a small tax has little perceptible effect on coal consumption
- Recent years have witnessed a very strong growth in solar energy which was possible due to several government interventions to mobilize private investment in this sector
  - Other sectors which did not have enough support (e.g., nuclear) did not show any significant change despite NCEEF
  - The projects funded under NCEEF, whether related to energy or environment, were also budgeted in the Union Budgets separately (e.g., JNNSM, Namami Gange, Green India Mission, Green Energy Corridor, etc.)

Source: Karan 2019; Bhatt & Mishra 2020; Parry et al., 2021

Discussion

- The framework of the policy was both weak and inconsistent which emerged as a major drawback of NCEEF
  - Scope of the fund was too broad
  - Funding limit was both arbitrary and regressive
  - Application mechanism through government ministries deterred private participation
  - Lack of impact assessment or performance monitoring
- Research & development was largely ignored while implementing NCEEF
  - R&D is a slow and time-taking process with high risk of failure
  - Ministries typically have low risk appetite and very little patience
- The Inter-Ministerial Group in-charge of disbursing the fund comprised only of bureaucrats from the relevant ministries

Source: Goyal and Paliwal 2013; Pandey, Bali and Mongia 2014; Panda and Jena 2012

Conclusion

- NCEEF was an innovative and forward-looking policy geared at enhancing the energy transition of India
- A flawed implementation at the outset coupled with weak and inconsistent framework of the fund paved way to its progressive misuse
- The fund was consistently used to meet budgetary shortfalls, as noted in the very first IMG meeting
- Hardly any project under NCEEF was related to research and development
- Clean Environment Cess, the source of NCEEF, was redirected towards the GST Consolidation Fund till 31 March 2022
- Currently, there is no directive for using the Clean Environment Cess and it has become just like any other fuel tax

Policy Implications

- Policies like NCEEF have several implications beyond their primary objectives:

  - Studies show that investing in green innovation leads to creation of green jobs which is a more sustainable way of poverty reduction
  - It can also boost India's spending in R&D which has consistently been low
  - It can help India reduce its dependence on fossil fuels for revenue generation
  - By strengthening India's research infrastructure, it can help retain the young talent within the country and prevent brain drain

Source: Kamoun et al., 2020; Garg & Geddes 2019; Gambhir et al., 2021; UNESCO Institute of Statistics 2021

Recommendations for an enhanced framework

An enhanced framework for NCEEF must do the following:

1. Redefine the scope of clean energy such that it includes an update suite of technology and research avenues concomitant with the current status of energy evolution in India
2. Develop a clear investment strategy for the fund by formulating appropriate vision, aims and objectives of the fund
3. Equip the fund with appropriate investment tools to enable risk diversification as well as to attract private players

Recommendations for an enhanced framework

An enhanced framework for NCEEF must include the following:

4. Involve a more diverse set of players in the decision-making process
   - Government bodies like Department of Science and Technology (DST) & NITI Aayog
   - Stakeholders from academia and think tanks
   - Relevant private entities including NGOs
5. Form a competent monitoring and evaluation committee to track and review the progress of the investments
6. Implement a strategy to maintain transparency and accountability

Thank you!

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