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COLLABORATIVE GOVERNANCE AND HUMAN RESOURCES CAPACITY IN CLIMATE CHANGE MITIGATION: STUDY OF NRDC AND THE GOVERNMENT OF INDIA

[1*]Heriyanto, [2]Made Marup Wirasenjaya

[1*]Master in Human Resources Development, Post-Graduate School, Airlangga University

[2] International Relations, Faculty of Social and Political Science, Muhammadiyah Univrsity of Yogyakarta

*Corresponding Email: heriyanto16@ugm.ac.id

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ABSTRAK

Perubahan iklim di negara berkembang menuntut kerangka tata kelola kolaboratif yang mengintegrasikan aktor negara dan non-negara untuk membangun kapasitas sumber daya manusia berkelanjutan. Artikel ini mengkaji kemitraan antara Natural Resources Defense Council (NRDC) dengan Pemerintah India periode 2009 hingga 2016. Menggunakan perspektif teori transnasionalisme dan kerangka kemitraan Philip Eldridge, penelitian analisis dokumen kualitatif ini menganalisis bagaimana mekanisme kolaborasi mampu meningkatkan kapasitas melalui transfer pengetahuan, bantuan teknis, dan penguatan kelembagaan dalam delapan inisiatif strategis. Temuan menunjukkan bahwa model *High-Level Partnership, Grassroots Development* memungkinkan NRDC memberikan keahlian teknis tanpa mengendalikan proses kebijakan India, sehingga meminimalkan ancaman kedaulatan dari intervensi eksternal. Pendekatan ini berkontribusi pada peningkatan signifikan energi terbarukan (energi angin: 11 menjadi 28 GW; energi surya: minimal menjadi 9 GW), efisiensi energi skema *Perform, Achieve, and Trade* (PAT), serta ratifikasi *Paris Agreement*. Sinergi keahlian internasional NRDC dengan otoritas regulatif India memperkuat posisi India sebagai salah satu pemimpin global dalam isu perubahan iklim.

Katakunci: Tata Kelola Kolaboratif, Mitigasi Perubahan Iklim, Transnasionalisme, Kapasitas Sumber Daya Manusia, Organisasi non-Pemerintah

ABSTRACT

Climate change in developing countries demands a collaborative governance framework that integrates state and non-state actors to build sustainable human resource capacity. This article examines the partnership between the Natural Resources Defense Council (NRDC) and the Government of India from 2009 to 2016. Utilizing a transnationalism theory perspective and Philip Eldridge's partnership framework, this qualitative document analysis research analyzes how collaborative mechanisms enhance capacity through knowledge transfer, technical assistance, and institutional strengthening across eight strategic initiatives. Findings indicate that the *High-Level Partnership, Grassroots Development* model enables the NRDC to provide technical expertise without controlling India's policy processes, thereby minimizing sovereignty threats from external intervention. This approach contributed to a significant increase in renewable energy (wind energy: 11 to 28 GW; solar energy: minimal to 9 GW), energy efficiency under the *Perform, Achieve, and Trade* (PAT) scheme, and the ratification of the *Paris Agreement*. The synergy of NRDC's international expertise with India's regulatory authority strengthens India's position as a global leader in climate change issues.

Keywords: Collaborative Governance, Climate Change Mitigation, Transnationalism, Human Resource Capacity, Non-Governmental Organizations

BACKGROUND

Climate change represents one of the most pressing challenges of the 21st century, requiring coordinated action across multiple levels of governance and diverse stakeholder groups (Badu et al., 2025). The complexity of climate mitigation demands innovative collaborative frameworks that transcend traditional state-centric approaches (Hale & Roger, 2014). Bradley et al. (2022) describe collaborative governance, defined as processes and structures of public policy decision-making and management that engage people constructively across organizational boundaries, as a critical mechanism for addressing global environmental challenges. The most critical challenge in contemporary climate governance lies in the implementation gap, the discrepancy between internationally agreed climate targets and the actual outcomes achieved at the national level (Tan et al., 2022). This gap is exacerbated by financial constraints, technological limitations, institutional deficiencies, and governance fragmentation, particularly across developing countries. As a result, climate change has become an issue that demands urgent collaborative action (Ardoin & Bowers, 2025). Research by Aysan et al. (2023) Given its multidimensional and transboundary nature, no single actor possesses sufficient resources, expertise, or authority to address the problem independently. Therefore, effective climate mitigation depends on sustained cooperation among state and non-state actors to mobilize finance, transfer knowledge and technology, and enhance the institutional capacity required to translate climate commitments into tangible outcomes.

India presents a particularly compelling case for examining collaborative governance in climate action (Gogoi & Sarmah, 2023). As the world's third-largest greenhouse gas emitter and a rapidly developing economy, India faces the dual challenge of sustaining economic growth while reducing carbon emissions (Gupta, 2024). The country's vulnerability to climate impacts, including water scarcity, agricultural disruption, and extreme weather events, further complicates its development trajectory (Hussain et al., 2024). These challenges have necessitated partnerships with international organizations to build capacity and implement effective mitigation strategies. Since the 1990s, India has increasingly experienced the adverse effects of climate change, including recurring droughts, unpredictable monsoon patterns, intensified cyclones, and the retreat of Himalayan glaciers (Ahmed, 2025; Mall et al., 2022). The escalating impacts of these events exposed limitations in domestic capacity, leading policymakers in the mid-2000s to engage with external partners for technical expertise and institutional support (Marquardt et al., 2025). This shift was reflected in the development of the National Action Plan on Climate Change (NAPCC) in 2008, which marked a more collaborative approach to addressing climate challenges (Pandve, 2009). Thus, the establishment of the NAPCC not only reflected India's recognition of climate change as a pressing national challenge but also signaled

the growing importance of collaborative governance in bridging domestic capacity gaps and advancing effective climate action.

The Natural Resources Defense Council (NRDC), an international environmental non-governmental organization, has been instrumental in supporting India's climate mitigation efforts (Limaye et al., 2025). Since establishing operations in India in 2009, NRDC has worked collaboratively with the Government of India to develop clean energy policies, improve energy efficiency, and build institutional capacity for climate action (NRDC et al., 2022). This partnership exemplifies how transnational collaborative governance can enhance human resource capacity and facilitate knowledge transfer in climate mitigation. A notable example of successful collaboration can be observed in India's industrial energy sector, where NRDC India worked closely with the Bureau of Energy Efficiency (BEE) to support the development of the Perform, Achieve and Trade (PAT) scheme (Tyagi et al., 2022). Following the launch of the NRDC India Initiative in 2008, the organization began working closely with government agencies and local partners to support India's transition toward a low-carbon economy (Hu, 2025). Beginning in 2009, NRDC India assisted and advised government stakeholders by providing technical expertise, policy recommendations, and capacity-building support to advance India's climate and energy goals. Through this collaborative approach, which emphasized capacity building and locally driven solutions, the PAT scheme was successfully launched in 2012 as a market-based energy efficiency mechanism (R. Kumar & Agarwala, 2013). During its first implementation cycle (2012–2015), the program covered 478 energy-intensive industrial units and achieved energy savings of approximately 8.67 million tonnes of oil equivalent (Department of New & Renewable Energy, 2023). This outcome demonstrates how collaborative governance enables the integration of external expertise with domestic policy priorities, producing tangible results while maintaining national ownership of climate policy implementation.

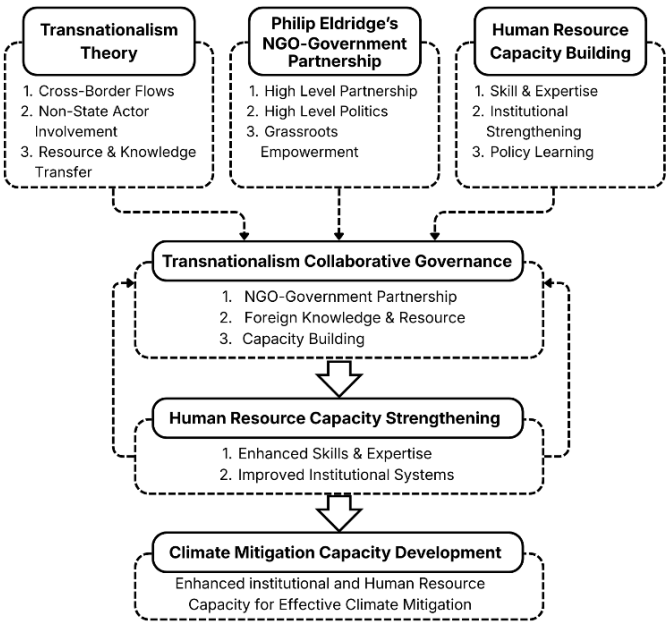
This article examines the collaborative governance mechanisms employed in the NRDC–India partnership and their contribution to strengthening human resource capacity for climate change mitigation. By analyzing this case, the study demonstrates how collaboration between non-governmental organizations and state actors can facilitate knowledge transfer, capacity building, and policy implementation, thereby enhancing national climate action while supporting broader global climate goals.

THEORETICAL FRAMEWORK

Integrating three perspectives to analyze the NRDC–India partnership, this theoretical framework combines transnationalism theory, Philip Eldridge's NGO–government partnership typology, and human resource capacity building concepts. Transnationalism explains how cross-border flows of knowledge, resources, and expertise enable non-state actors to influence domestic climate governance (Barbi &

Macedo, 2019). Eldridge's framework clarifies the nature of the NGO–government relationship, positioning the partnership within a high-level collaborative model that respects state authority while leveraging NGO technical capacity (Phan, 2012). These dynamics collectively strengthen human resource capacity, ultimately enhancing climate mitigation capacity in developing-country contexts. The analytical framework employed in this study views climate mitigation capacity development as the outcome of a sequential and interconnected process. First, transnationalism explains how knowledge, technical expertise, financial resources, and policy ideas move across national borders through interactions between NRDC and Indian institutions. These cross-border exchanges create opportunities for collaboration but do not automatically generate policy outcomes (Huang & Lu, 2026). Second, Eldridge's High-Level Partnership model explains how such interactions are institutionalized through a collaborative governance arrangement in which the Indian government retains policy authority while NRDC provides technical and advisory support. This governance structure facilitates coordination, trust-building, and knowledge transfer while preserving national ownership of climate policies (Lah, 2025; Mukhlis & Perdana, 2022). Third, sustained collaboration within this framework contributes to human resource strengthening by enhancing the knowledge, skills, technical competencies, and organizational capacities of government officials and related stakeholders. Over time, these strengthened human resources improve institutions' ability to design, implement, and monitor climate policies effectively (R. Singh et al., 2025). Consequently, human resource strengthening serves as the mechanism through which transnational collaborative governance ultimately contributes to broader climate mitigation capacity development.

Figure 1: Theoretical Framework



Source: Author's elaboration

Transnationalism and Non-State Actors in Global Governance

Transnationalism theory provides essential insights into how non-state actors participate in global governance. Nye & Keohane (1971) defined transnational relations as 'regular interactions across national boundaries when at least one actor is a non-state agent.' This perspective recognizes that significant political, economic, and social interactions occur across borders through networks of non-governmental actors (de Jong & Dannecker, 2018). In environmental governance, transnational actors have become increasingly influential (Hale, 2020; Tallberg & Jonsson, 2010). Environmental INGOs operate across multiple scales from local communities to global institutions, facilitating knowledge exchange and coordinating action (Cadman et al., 2020). Their transnational character enables them to mobilize resources, expertise, and advocacy across jurisdictions while connecting local initiatives with global frameworks.

Nye & Keohane (1971) identified four types of transnational flows: communication (movement of information and ideas), transportation (movement of physical objects), finance (movement of money and credit), and travel (movement of people across borders). In the NRDC-India partnership, all four flows occur: knowledge transfer from NRDC to Indian stakeholders, technical equipment supporting renewable energy deployment, foundation grants funding capacity building, and staff exchanges between organizations (Administrative Staff College of India & Natural Resources Defense Council, 2012).

NGO-Government Partnership Framework: Philip Eldidge

Philip Eldridge developed an influential framework for analyzing NGO-government relationships in developing countries, identifying three partnership models (Bahar et al., 2025). First, High-Level Partnership: Grassroots Development involves NGOs working directly with government agencies on specific programs and policies, providing technical expertise while respecting government authority. Second, High-Level Politics: Grassroots Mobilization characterizes NGOs that maintain good relationships with the government while also mobilizing civil society. Organizations like Greenpeace exemplify this approach. Third, Empowerment at the Grassroots describes NGOs that minimize government engagement and instead focus on building strong community-based movements.

The NRDC-India partnership exemplifies the High-Level Partnership: Grassroots Development model. NRDC works directly with Indian government agencies, including the Bureau of Energy Efficiency and the Ministry of New and Renewable Energy, providing technical assistance in policy design while respecting Indian sovereignty and the government's ownership of climate programs (Ganeshan & Bhattacharjya, 2022).

Human Resource Capacity for Climate Mitigation

Human resource capacity encompasses the knowledge, skills, competencies, and professional networks necessary for individuals and organizations to engage effectively in climate action (Rosyafah et al., 2025). Research by Gui et al. (2024) explained climate mitigation, relevant capacities include (a) technical expertise in climate science and energy systems; (b) analytical capabilities in policy analysis and program evaluation; (c) regulatory experience with policy instruments and implementation mechanisms; (d) institutional knowledge of organizational processes and coordination; and (e) professional networks facilitating knowledge exchange and collaboration.

Developing countries often face critical gaps in these capacities (Cirera & Maloney, 2017). Capacity building initiatives aim to address these gaps through formal training programs, technical assistance, institutional strengthening, knowledge networks, and learning-by-doing approaches (UNFCC, 2024). However, effective capacity building requires sustained engagement and attention to organizational systems that enable capacity utilization (Ramadhani & Yuliansyah, 2024).

RESEARCH METHOD

This study employs a qualitative document analysis to investigate the collaborative governance partnership between NRDC and the Government of India during 2009–2016. The analysis draws upon a range of primary and secondary sources, including NRDC reports and program documents, Government of India climate and development policy documents, publications from the Bureau of Energy Efficiency (BEE), and relevant scholarly literature. These sources were selected to capture both the institutional dynamics of the partnership and its contributions to climate governance and capacity development.

Data were analyzed through thematic coding guided by the study's analytical framework. The first stage examined transnational processes, focusing on the movement of knowledge, expertise, financial resources, and policy ideas across national boundaries. The second stage analyzed the collaborative governance structure using Eldridge's High-Level Partnership model, with particular attention to the roles, interactions, and boundaries between NRDC and Indian government institutions. The third stage assessed human resource strengthening by identifying evidence of knowledge transfer, organizational learning, skill development, network formation, and learning-by-doing processes. Finally, these findings were evaluated in relation to their contribution to climate mitigation capacity development, particularly in enhancing institutional capabilities to formulate, implement, and sustain climate policies. Through this analytical process, the study identifies key collaborative initiatives and examines how transnational collaborative governance contributes to India's long-term climate mitigation capacity.

India's Climate Challenge and Development Context

1. India's Development Trajectory and Carbon Emissions

India's rapid economic development has been accompanied by significant increases in greenhouse gas emissions (Saranga et al., 2024). As of 2016, India ranked as the world's third-largest emitter of CO_2, driven primarily by coal-dependent energy systems, expanding industrial production, and growing transportation demand (Bilandani & Jain, 2025). The country's development strategy has historically prioritized economic growth and poverty alleviation, often resulting in environmental externalities that contribute to climate change.

Infrastructure development, particularly in the energy and transportation sectors, has been central to India's growth strategy (Ministry of Information & Broadcasting, 2025). The expansion of coal-fired power plants, industrial complexes, and urban infrastructure has generated substantial carbon emissions. Simultaneously, India faces enormous challenges in energy access, with hundreds of millions lacking reliable electricity (Dey et al., 2022). This creates a complex policy environment in which climate mitigation must be balanced against development imperatives and energy security concerns.

2. Climate Vulnerability and Adaptation Needs

India's geographical and socioeconomic characteristics make it highly vulnerable to the impacts of climate change (Majra & Gur, 2009). The country experiences diverse climate-related challenges, including water scarcity, agricultural disruption, coastal erosion, and extreme weather events (Basistha et al., 2025). The agricultural sector, which employs nearly half of India's workforce, is particularly vulnerable to changing precipitation patterns and rising temperatures (Dubey, 2025). These climate impacts threaten food security, livelihoods, and economic stability, disproportionately affecting vulnerable populations.

The climate vulnerability context shapes India's approach to climate mitigation (Rani & Tiwari, 2024). Recognizing both its responsibility as a major emitter and its vulnerability to climate impacts, India has committed to ambitious climate targets while emphasizing the principle of common but differentiated responsibilities (V. Kumar & Chaturvedi, 2025). This position reflects the tension between development needs and climate obligations, a tension that collaborative governance mechanisms must navigate.

3. Policy Framework: National Action Plan on Climate Change

In 2008, India launched its National Action Plan on Climate Change (NAPCC), establishing eight national missions addressing solar energy, energy efficiency, sustainable agriculture, water resources, Himalayan ecosystems, forestry, sustainable habitat, and strategic knowledge (Pandve, 2009b). The NAPCC represents India's

comprehensive framework for climate action, integrating mitigation and adaptation objectives (Pandve, 2009b). However, implementing this ambitious agenda requires substantial capacity building, technical expertise, and institutional coordination, areas where collaborative partnerships with organizations like NRDC prove valuable. The plan's implementation has been supported through India's Five-Year Plans, which have increasingly incorporated climate considerations into development planning (Planning Commission of India, 2011). The collaboration between NRDC and the Government of India began in 2009, following the launch of the National Action Plan on Climate Change (NAPCC) in 2008 (Mavalankar et al., 2012; Pandve, 2009). As India sought to operationalize the objectives of the NAPCC, particularly through the National Mission for Enhanced Energy Efficiency, government agencies recognized the need for specialized technical expertise to design and implement market-based energy-efficiency mechanisms (Ministry of Power, 2008). In response to this need, NRDC's India Program, established through the organization's broader international climate initiative, was invited to provide technical and policy support to the Bureau of Energy Efficiency (BEE) (Steiner & Kwatra, 2022). NRDC was considered a valuable partner due to its experience in developing and advising on energy efficiency policies in other countries, including China (Natural Resources Defense Council, 2007). The origins of this partnership are particularly significant because they demonstrate that the collaboration emerged from India's own policy priorities and capacity needs rather than external intervention (Chakrabarty, 2022). As such, the relationship exemplifies a government-led, NGO-supported model of collaborative governance in which international expertise was mobilized to strengthen the implementation of domestic climate policy while preserving national ownership of the policy process.

NRDC as a Transnational Actor in Climate Governance

1. Organizational Structure and Mission

The Natural Resources Defense Council, founded in 1970, has evolved into one of the world's leading environmental advocacy organizations (Abreu et al., 2012). With a staff of lawyers, scientists, and policy experts, NRDC combines legal advocacy, scientific research, and grassroots mobilization to address environmental challenges. Abreu et al. (2012) reported that the organization's work spans climate change, clean energy, oceans, water resources, wildlife, and public health, and that it operates through offices in the United States, China, and India.

NRDC's organizational structure reflects its transnational character. The organization maintains thematic programs on climate and clean energy, nature, communities, and health, each operating across multiple geographic areas (Blair, 2019). This structure enables NRDC to leverage expertise developed in one context to inform work in other contexts, facilitating knowledge transfer and the dissemination of best practices. The organization's funding model, drawing from foundations, individual donors, and government grants, provides financial independence while

enabling sustained engagement in long-term environmental challenges (Goenka et al., 2025).

2. NRDC's Approach to International Collaboration

NRDC's international work emphasizes collaborative partnerships with governments, local NGOs, and scientific institutions. Rather than imposing external solutions, NRDC seeks to build local capacity by working within existing policy frameworks and institutional structures. This approach recognizes that sustainable environmental outcomes require local ownership, contextual adaptation, and long-term institutional commitment. In India, NRDC has positioned itself as a technical partner providing expertise and resources to support government initiatives rather than as an external critic or independent implementer (Zachariah et al., 2023).

The organization's work in India focuses on several strategic areas: promoting renewable energy deployment, improving industrial energy efficiency, advancing clean transportation, strengthening environmental regulations, and building capacity for implementing climate policy (Bureau of Energy Efficiency, 2023). These focus areas align with India's National Action Plan on Climate Change while leveraging NRDC's technical expertise and international experience. By working collaboratively with Indian government agencies, NRDC contributes to policy development while respecting national sovereignty and development priorities (Jha et al., 2026). Rather than being governed by a single overarching memorandum of understanding, the NRDC–India partnership evolved through a series of project-based collaborations, technical advisory arrangements, joint studies, and cooperative work plans with government agencies such as the Bureau of Energy Efficiency (BEE) and the Ministry of New and Renewable Energy (MNRE) (Abreu et al., 2012; Jaiswal & Mukerjee, 2022; Joshi, 2023; Knowlton et al., 2022; Tyagi et al., 2023). Rather than being based on a single overarching cooperation agreement, the partnership was operationalized through a series of project-based collaborations involving Indian government agencies and intermediary institutions such as ASCI and TERI (Bowman, n.d.; The Energy and Resources Institute (TERI) & Natural Resources Defense Council (NRDC), 2025). These arrangements specified technical support activities, funding mechanisms, and shared deliverables, as documented in joint publications, program reports, and policy initiatives. Such evidence illustrates the institutionalized nature of collaborative governance between NRDC and Indian stakeholders.

3. Resources and Expertise

NRDC brings substantial resources to its collaborative work in India (Jaiswal, 2009). The organization employs technical experts with deep knowledge of energy systems, environmental law, climate science, and policy analysis. This expertise enables NRDC to provide sophisticated technical assistance on complex policy challenges, from designing renewable energy incentive programs to developing air

quality regulations. Additionally, NRDC's international network facilitates knowledge exchange, enabling Indian policymakers to learn from other countries' experiences while adapting solutions to local contexts (Limaye et al., 2024). The organization's research capacity generates data and analysis that inform policy debates and strengthen evidence-based decision-making.

Eight Strategic Initiatives and Collaborative Mechanisms

The NRDC-India partnership implemented eight strategic initiatives from 2009-2016, each targeting specific capacity needs while contributing to overall climate mitigation objectives. These initiatives demonstrate the High-Level Partnership: Grassroots Development model, in which NRDC provides technical support to government-led programs rather than engaging in independent advocacy or implementation.

Table 1: Eight Strategic Initiatives of NRDC-India Partnership

Initiative	Key Activities
Comprehensive Policy Framework	Supporting NAPCC implementation, state climate action plans, and policy coordination mechanisms
International Climate Leadership	Technical support for UNFCCC negotiations, INDC development (20-25% emissions intensity reduction), and Paris Agreement ratification
Green Building Standards	Strengthening Energy Conservation Building Code (ECBC), supporting LEED and GRIHA certification programs (potential 3,453 TWh savings by 2030)
Sustainable Transportation	Supporting fuel efficiency standards (mandatory by 2011), CNG vehicle programs, metro rail and BRT systems
Clean Energy Deployment	Technical support for National Solar Mission (20 GW target by 2022), renewable energy financing mechanisms, coal tax and National Clean Energy Fund
Energy Efficiency Programs	Designing PAT (Perform, Achieve and Trade) scheme, appliance standards, market transformation programs (5% annual energy consumption reduction target)

Initiative	Key Activities
Research and Monitoring Capacity	Supporting Indian Network for Climate Change Assessment (INCCA), emissions inventory development (first biannual reporting), and climate monitoring satellite planning
US-India Bilateral Cooperation	Facilitating Green Partnership (2009), PACE initiative, ECO-III program, SEAD (Super-Efficient Equipment and Appliances Deployment) initiative

Sources: Blueprint NRDC-India's Partnership

The partnership employed multiple mechanisms to build human resource capacity. Knowledge transfer occurred through explicit channels (formal methodologies, data, and analytical frameworks), tacit channels (experiential knowledge through embedded advisors), organizational learning (institutionalization through systems and procedures), network development (professional communities that enable ongoing exchange), and learning-by-doing (practical engagement in policy development). Institutional strengthening involved monitoring and evaluation frameworks, inter-agency coordination platforms, regulatory structures, professional development support, and knowledge management systems. The eight initiatives were implemented through a multi-level governance approach that combined national policy design with sectoral and regional implementation. Most initiatives originated from collaborations between NRDC and central government agencies in New Delhi, where technical analyses, policy recommendations, and implementation frameworks were jointly developed. Once adopted at the national level, these policies and programs were executed by state governments, regulatory agencies, local authorities, and sectoral stakeholders across different regions of India.

Implementation varied according to the nature of each initiative. For example, the Perform, Achieve and Trade (PAT) scheme targeted energy-intensive industries and was implemented through designated industrial facilities in states such as Gujarat, Maharashtra, and Tamil Nadu (Bandyopadhyay, 2016; Central Electricity Regulatory Commission (CERC), 2016). Clean energy initiatives supported the deployment of solar and wind power through renewable energy projects in Rajasthan, Gujarat, Karnataka, and Tamil Nadu (Ministry of New and Renewable Energy, 2024; K. Singh & Jana, 2026). Green building programs were translated into state-level building regulations and pilot projects in urban centers, while sustainable transportation initiatives were implemented through public transit systems, including metro rail and bus rapid transit networks in cities such as Delhi, Ahmedabad, and Bengaluru (Dawda, 2024; Harsha, 2022; Pal et al., 2015). Across these initiatives, NRDC primarily contributed technical expertise, international best practices, policy analysis, and

capacity-building support, while Indian government institutions retained responsibility for policy adoption, implementation, and enforcement. This process enabled national climate objectives to be translated into concrete actions across multiple sectors and regions.

Partnership Outcomes and Impacts

1. Renewable Energy Development

The NRDC-India partnership has made substantial contributions to India's renewable energy development, particularly in the wind and solar energy sectors. NRDC provided technical support for policy frameworks that have helped India become one of the world's fastest-growing renewable energy markets. This support included analysis of renewable energy potential, design of financial incentive mechanisms, development of grid integration strategies, and capacity building for regulatory agencies. The support was primarily directed toward the renewable energy sector, specifically solar and wind energy development (Prajapati et al., 2026; Tyagi et al., 2022, 2023). Notable outcomes were recorded in solar parks located in Rajasthan and Gujarat and large-scale wind energy projects in Tamil Nadu and Gujarat (JSW Energy, 2026; Motiwala et al., 2024; National Institute of Solar Energy, 2025; Rao et al., 2025). These impacts materialized through the implementation of NRDC-backed regulatory frameworks and policy mechanisms that facilitated private investment, improved the enabling environment for renewable energy projects, and accelerated the expansion of utility-scale renewable energy generation capacity.

Specific achievements include contributions to India's National Solar Mission, which set ambitious targets for solar energy deployment (Richhariya, 2025). NRDC's technical analysis helped demonstrate the feasibility of large-scale solar deployment and informed policy design for solar parks and rooftop solar programs. Similarly, in wind energy, NRDC supported the development of repowering policies and advanced wind energy technologies. These initiatives have contributed to dramatic growth in India's renewable energy capacity, with wind power exceeding 30 GW and solar capacity growing exponentially during the partnership period.

2. Energy Efficiency Programs

Energy efficiency is another major focus area where the partnership has delivered significant results. NRDC worked closely with the Bureau of Energy Efficiency to strengthen India's energy efficiency framework, including the development and implementation of the Perform, Achieve and Trade (PAT) scheme for industrial energy efficiency (Park, n.d.). This market-based mechanism requires large energy-intensive industries to meet energy-efficiency targets, with trading of energy-savings certificates providing flexibility and reducing compliance costs. The PAT (Perform, Achieve, and Trade) scheme operates within the industrial sector, targeting energy-intensive industries such as thermal power generation, cement,

fertilizer, iron and steel, and textiles, particularly in industrial hubs such as Gujarat, Maharashtra, and Tamil Nadu (Chakraborty & Bhattacharjee, 2012; Kajol et al., 2018; Yadav et al., 2021). The scheme promotes energy efficiency by assigning specific energy consumption reduction targets to participating facilities and allowing the trading of energy-saving certificates (Chakraborty & Bhattacharjee, 2012). This market-based mechanism incentivizes industries to adopt energy-efficient technologies and practices, thereby reducing energy consumption and improving overall industrial performance.

NRDC contributed technical expertise on target-setting methodologies, monitoring systems, and trading mechanisms for the PAT scheme. The organization also supported the development of energy efficiency standards for appliances, buildings, and industrial equipment. These standards have resulted in substantial energy savings while building India's regulatory capacity in energy efficiency. The success of these programs demonstrates how collaborative governance can leverage NGO expertise to enhance government program design and implementation.

3. Climate Policy and International Climate Commitment

The partnership has also influenced India's engagement in international climate negotiations and the development of domestic climate policy. NRDC provided analytical support for India's positions in UNFCCC negotiations, including contributions to India's Intended Nationally Determined Contribution (INDC) under the Paris Agreement (Chen, 2017). This support included greenhouse gas emissions projections, analysis of mitigation options, and assessment of finance and technology needs. Additionally, NRDC worked with Indian stakeholders to strengthen domestic climate policies, including support for state-level climate action plans and sector-specific mitigation strategies. These contributions enhanced India's capacity to participate effectively in global climate governance and to develop robust domestic climate policies aligned with national development objectives. This domestic policy support was concentrated in the energy and climate governance sector, specifically in renewable energy and energy efficiency policy development (Abhyankar et al., 2023; Steiner & Kwatra, 2022). NRDC contributed technical analyses and policy recommendations to State Action Plans on Climate Change in Gujarat, Maharashtra, and Rajasthan (Government of Rajasthan, 2014; Mavalankar et al., 2012; Natural Resources Defense Council, 2022). Through this process, state governments were able to strengthen climate-related planning, adopt more coherent energy efficiency and renewable energy targets, and ensure greater consistency between state-level strategies and India's national INDC commitments.

India's international climate position has evolved significantly. At the 2009 Copenhagen conference, India announced its first voluntary emissions-reduction target a 20-25% reduction in emissions intensity from 2005 levels by 2020. The culmination came with India's INDC submission in 2015, which committed to a 33-

35% emissions-intensity reduction by 2030, achieving 40% electric power capacity from non-fossil sources, and creating an additional carbon sink of 2.5-3 billion tonnes of CO_2 equivalent through forest expansion. India ratified the Paris Agreement in 2016, demonstrating a commitment to global climate action while aligning its commitments with national development priorities.

DISCUSSION

1. Collaborative Governance in Practice

The NRDC-India partnership exemplifies Philip Eldridge's High-Level Partnership: Grassroots Development model in several key ways. NRDC limited its engagement to direct collaboration with government agencies, rather than broader political advocacy or grassroots mobilization, working primarily with the Bureau of Energy Efficiency, the Ministry of New and Renewable Energy, and the Planning Commission to provide technical assistance on specific programs. The partnership maintained clear boundaries, respecting Indian sovereignty and the government's authority over climate policy. NRDC positioned itself as a technical partner supporting government-led initiatives rather than an independent implementer, avoiding power asymmetries and legitimacy concerns common in North-South environmental partnerships. The partnership created synergies through the complementarity of resources. NRDC contributed international experience, technical expertise, analytical capacity, and comparative knowledge from other contexts. The Government of India provided regulatory authority, implementation capacity, local knowledge about conditions, political feasibility, and democratic legitimacy. Neither actor could achieve outcomes independently, creating a genuine collaborative advantage.

2. Challenges and Limitations

Several factors facilitated effective collaboration. First, aligning priorities between NRDC's focus areas and the Indian government's priorities, as identified in the NAPCC and the Five-Year Plans, ensured government ownership and sustained commitment. Second, long-term engagement over multiple years (2009-2016) enabled deep capacity development rather than superficial interventions, with trust-building over time enabling more substantial collaboration. Third, mutual respect, in which NRDC recognized Indian sovereignty and technical capabilities while offering complementary expertise, created productive relationships. Fourth, the timing of political opportunity, when India was actively developing climate policy frameworks, created openness to external technical assistance. Fifth, development co-benefits where climate initiatives delivered tangible benefits like energy security, air quality improvements, and employment strengthened political support beyond environmental constituencies

Despite its achievements, the partnership faces several challenges inherent to collaborative governance arrangements. Power asymmetries between international NGOs and developing-country governments can create tensions over agenda and priority setting. While NRDC has worked to align with Indian priorities, questions persist about whose interests are ultimately served by collaborative initiatives. Additionally, sustainability concerns arise regarding whether capacity built through external partnerships will persist after NGO engagement concludes. Choquez-Millan et al. (2024) argue that power asymmetries in North–South collaborations often manifest through unequal control over funding, agenda setting, and knowledge production, with Northern actors frequently occupying leadership roles while Southern partners assume implementation responsibilities. In contrast, the NRDC–India partnership showed limited evidence of pronounced power asymmetries because Indian government institutions maintained primary authority over policy priorities and implementation (Mininni, 2024). As a result, donor influence was moderated by strong domestic ownership and a government-led governance structure. For instance, when an international NGO controls substantial financial and technical resources, governments in developing countries may become dependent on that support for policy development or project implementation (Gul & Morande, 2023; Khieng & Dahles, 2015). In such situations, policy areas aligned with donor funding priorities, such as renewable energy mitigation, may receive greater technical assistance and institutional attention than equally important domestic priorities, such as agricultural adaptation or rural resilience (Meraj & Hashimoto, 2025). Consequently, donor preferences can indirectly influence policy agendas and resource allocation, even in the absence of explicit pressure or formal restrictions on national decision-making.

Coordination challenges also emerge in collaborative governance arrangements. Multiple stakeholders with different organizational cultures, decision-making processes, and time horizons must coordinate effectively for partnerships to succeed. The NRDC-India partnership has navigated these challenges through deliberate relationship-building, clear communication protocols, and flexible engagement modalities. However, the coordination transaction costs remain significant and require sustained commitment from all parties.

3. Implications for Climate Governance

This research demonstrates the continued relevance of Philip Eldridge's NGO-government partnership framework for contemporary transnational environmental cooperation. The study extends transnationalism theory by providing empirical analysis of how the four transnational flows, communication, transportation, finance, and travel, facilitate climate governance capacity building in developing countries (Tedeschi et al., 2022). In the NRDC–India case, all four channels of transnational policy transfer were identifiable. Communication occurred through the exchange of

technical expertise, including technical reports, policy consultations, training workshops, and the placement of advisors who worked closely with Indian agencies (Vertovec, 2003). Transportation was reflected in the transfer and deployment of technologies, equipment, and infrastructure associated with renewable energy projects and sustainable transportation initiatives (Sandoz et al., 2024). Finance was evident in the provision of foundation grants and financial support that enabled capacity-building programs, including the development of the Perform, Achieve and Trade (PAT) scheme and green building standards (Kawabata, 2023). Travel took place through staff exchanges, study visits, and joint missions involving NRDC experts and Indian government officials, facilitating face-to-face collaboration and knowledge sharing throughout the partnership (Vertovec, 2003). The research contributes to understanding human resource capacity development by illuminating specific mechanisms through which collaborative governance builds sustainable competencies and institutional capabilities. The multi-dimensional approach that combines explicit and tacit knowledge transfer, organizational learning, network development, and learning-by-doing offers insights for designing effective capacity-building initiatives in climate and other policy domains.

CONCLUSION

This research examined how the collaborative partnership between NRDC and the Government of India contributed to building human resource capacity for climate change mitigation from 2009 to 2016. The partnership exemplified the High-Level Partnership Grassroots Development model, with NRDC providing technical expertise while respecting Indian sovereignty. This collaborative approach avoided power asymmetries common in North-South partnerships while creating synergies through complementary resources and capabilities.

The partnership built human resource capacity through multiple interconnected mechanisms: explicit knowledge transfer through formal training and documentation, tacit knowledge transfer through embedded advisors and collaborative work, organizational learning manifesting as adoption of new analytical approaches and systems, network development creating professional communities for ongoing exchange, and learning-by-doing through practical engagement in policy development. These mechanisms reinforced each other, creating sustainable capacity gains beyond short-term training interventions.

The partnership generated substantial outcomes, including comprehensive climate policy frameworks, international climate leadership demonstrated through Paris Agreement ratification, green building standards with significant energy savings potential, sustainable transportation initiatives, dramatic clean energy deployment with wind and solar expansion, innovative energy efficiency programs through the PAT scheme, enhanced scientific and monitoring capacity, and strengthened bilateral cooperation between the US and India on climate action.

India's emergence as a global climate leader, evident in ambitious renewable energy targets, innovative policy mechanisms, and constructive engagement in international negotiations, reflects the fruits of sustained capacity-building through collaborative governance. The lessons from this partnership offer valuable insights for other developing countries seeking to enhance their climate mitigation capabilities while advancing broader development objectives. As the global community works toward achieving the Paris Agreement goals, such partnerships will be essential to building the distributed capacity needed for universal climate mitigation.

This study highlights the strategic importance of international collaboration for developing countries pursuing climate and sustainability goals. While governments in developing countries often possess contextual knowledge, policy authority, and implementation capacity, they may face constraints in accessing specialized technical expertise, international best practices, and financial resources required to design and implement complex climate policy instruments. In such contexts, collaboration with international NGOs and technical organizations can play a catalytic role by providing knowledge, technical assistance, and capacity-building support that complements domestic capabilities. The NRDC–India partnership demonstrates that effective collaboration does not require sacrificing national sovereignty, rather it can strengthen domestic policymaking when external expertise is integrated within a government-led framework. This finding suggests that collaborative governance arrangements that combine local ownership with international technical support may offer a practical pathway for other developing countries seeking to accelerate climate action while maintaining control over their policy priorities. For policy and practice, the study suggests several lessons such as align partnership priorities with national development objectives to ensure government ownership, invest in long-term engagement rather than short-term projects, employ multiple capacity building mechanisms that reinforce each other, emphasize learning-by-doing through actual policy development, respect developing country sovereignty while offering technical expertise, and frame climate action in terms of development co-benefits to build broader political coalitions.

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This article builds on an earlier undergraduate thesis on environmental cooperation and climate policy. The present study substantially extends the original work by adopting a human resource development perspective, with particular attention to how human resource capacity strengthens collaborative governance in climate change mitigation. The authors also disclose that ChatGPT was used solely to support language editing and to enhance the manuscript's clarity and readability. The tool was limited to improving grammar, wording, and textual flow and did not contribute to developing research ideas, conducting data analysis, interpreting findings, or drawing scholarly conclusions.

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