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BRIDGING INNOVATION AND SCALE

A Framework for India-Canada Climate Technology Partnership

CSDR
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ABOUT THIS REPORT

India and Canada possess complementary strengths in climate technology that present significant untapped partnership potential. India offers a rapidly expanding clean energy market with over 200 startups and pressing needs for climate-resilient agriculture, smart urban infrastructure, and energy transition solutions. Canada brings advanced R&D capabilities in AI-enabled energy efficiency, carbon capture and storage, green hydrogen, and precision agriculture technologies.

Despite promising foundations—including significant Canadian investments like CPPIB's 53% stake in ReNew Power and Brookfield's $1 billion commitment to Avaada's green ammonia projects—bilateral cooperation remains fragmented. Current challenges include weak implementation of existing MoUs, funding gaps for Indian startups, misaligned regulatory frameworks, and recent diplomatic tensions that have slowed investment flows.

This report identifies strategic opportunities across three key sectors: climate-resilient agriculture, urban planning and smart infrastructure, and industrial decarbonization. It proposes moving from dialogue to action through dedicated bilateral mechanisms, enhanced technology transfer frameworks, and coordinated funding approaches to unlock transformative climate solutions for both nations' net-zero commitments.

ABOUT THE INDIA CANADA RESEARCH INITIATIVE AT CSDR

The India-Canada Research Initiative (ICRI) at CSDR is a project designed to strengthen bilateral relations between India and Canada. This initiative aims to unlock the true potential of the partnership by creating a platform for scholarly exchange, policy research, and strategic engagement. The ICRI was established in Sept 2024 with a grant from the Asia Pacific Foundation of Canada.

ABOUT COUNCIL FOR STRATEGIC AND DEFENSE RESEARCH

Founded in January 2020 by Lt. Gen. D.S. Hooda (Retd.) and Dr. Happymon Jacob, CSDR is an innovative think tank and consultancy specializing in foreign policy, geopolitical risk, connectivity, and critical areas of defense and aerospace. With a focus on the Indian subcontinent, Eurasia, and the Indo-Pacific, CSDR is committed to generating strategic insights that drive meaningful change. Read more at www.csdronline.com

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Executive Summary

- India offers a burgeoning clean energy sector and a vibrant startup ecosystem, making it an ideal market for scalable climate solutions. Canada boasts extensive R&D expertise, a robust institutional climate policy framework, and innovations in AI-enabled energy efficiency and low-carbon fuels.
- India's clean energy sector comprises over 200 startups, with significant involvement from Canadian investors. CPPIB holds a 53% stake in ReNew Power, while Brookfield has invested USD 1 billion in Avaada's green ammonia plans and USD 361 million in CleanMax, supporting over 5 GW of renewable capacity.
- Challenges include a lack of standardized climate investment frameworks, long investment gestation periods that discourage funding, CSR-driven rather than committed climate finance, and diplomatic tensions that cause restrictions and slow investment flows.
- India's climate-resilient agriculture requires precision irrigation, satellite-based weather forecasting, and smart farming to mitigate crop yield losses and water stress.
- Canada excels in carbon capture, clean hydrogen, AI-driven energy efficiency, and smart infrastructure, backed by doubling its international climate finance to CAD 5.3 billion (2021-26).
- Climate impacts could reduce rainfed rice yields by up to 47% and wheat yields by 40% by 2080 in India, underscoring the urgent need for adaptive technologies such as precision agriculture and smart irrigation.
- Rapid urbanization in Indian cities, such as Mumbai, where 70% of the area is impermeable concrete, and Delhi, which still uses drainage plans from 1976, has intensified heat island effects and flooding due to outdated infrastructure, high population density, and vehicular emissions.
- Technologies such as smart grids under India's National Smart Grid Mission and Canada's Green Infrastructure Smart Grid Program, along with digital twin AI tools, are being deployed to enhance urban energy efficiency, flood resilience, and climate-adaptive planning.
- India's industrial and energy sectors remain heavily reliant on coal, posing a significant challenge to its net-zero target by 2070. Despite a 7.93% reduction in GHG emissions from 2019 to 2020, fossil fuel lock-in persists due to the lack of affordable and scalable clean alternatives, particularly in hard-to-abate sectors such as steel and cement.
- Technologies like Carbon Capture and Storage (CCS) and green hydrogen are gaining traction but face major hurdles — India lacks a strategic CCS roadmap and suffers from high deployment costs, while green hydrogen ambitions under the National Green Hydrogen Mission risk falling short due to low demand, weak policy frameworks, and insufficient manufacturing capacity.
- Despite multiple MoUs and existing research programs, India-Canada climate tech cooperation remains fragmented due to weak implementation, limited joint initiatives, and a lack of dedicated working groups. Structural barriers—such as funding gaps for Indian startups, misaligned trade and regulatory policies, and recent diplomatic tensions—have further constrained the scaling of partnerships and technology transfer, particularly in areas like vocational training and access to climate finance.

Introduction

Climate change impacts are evident worldwide, affecting nations with diverse climatic conditions. Rising greenhouse gas emissions, increasing global temperatures, growing environmental pollution, and negative effects on agriculture collectively pose a significant shared challenge, although countries like India and Canada experience these impacts in distinctly different ways.

India, with its large agricultural population and heightened vulnerability to extreme weather events, faces escalating temperatures, altered monsoon patterns, and resulting challenges to water scarcity and food security. These climatic shifts include systematic changes in regional temperature and precipitation patterns, along with an increased frequency of extreme weather events, which threaten agricultural productivity and socioeconomic stability in vulnerable regions.

Canada, on the other hand, is already experiencing the intensifying effects of climate change. The Northern region of Canada, which is largely covered by thick layers of permafrost, is warming at a rate more than twice the global average.[1] Rising temperatures lead to melting icecaps, rising sea levels, strong heatwaves, and forest fires, among other severe impacts.

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Increases in permafrost temperatures across Canadian regions

Region	Sites	Increase per decade, °C	
		Entire record	Since 2000
Central Mackenzie Valley	Norman Wells, Wrigley	Up to 0.1	< 0.1 to 0.2
Northern Mackenzie	Norris Ck, KC-07	NA	0.5 to 0.9
Baffin Island	Pond, Arctic Bay, Pangnirtung	NA	0.5 to 0.7
High Arctic	Resolute, Eureka	NA	0.4 to 0.7
High Arctic	Alert	0.5 (15 m), 0.3 to 0.4 (24 m)	1.2 (15 m), 0.7 to 0.9 (24 m)
Northern Quebec (Nunavik)	Archifok/Salluit, Quaqtaq, Puvimatuq, Tasiujaq, Umiujaq (11-30 m)	0.7 to 1.0	0.5 to 0.9

Source: : Canada's Changing Climate Report; Government of Canada, Ottawa

Despite their differing geographies and developmental contexts, both countries are grappling with climate risks that demand urgent and systemic responses. This urgency has heightened the importance of climate technologies—solutions that harness innovation to help reduce emissions or adapt to climate impacts. Whether through AI-enabled precision agriculture technology, carbon capture and storage (CCS), or green hydrogen, climate technology is becoming a significant method of reaching global decarbonization goals. Unlike traditional aid-based models of climate cooperation, climate tech offers a framework for mutual benefit, supporting innovation, generating employment, and creating commercially viable pathways to sustainable growth, particularly through bilateral and multilateral engagement.

In this case, India and Canada are particularly well-positioned to collaborate, given the complementarity of their resources. India brings to the table a thriving domestic market, a vibrant innovation and start-up ecosystem, and a pressing need for scalable, cost-effective climate solutions. Its rapidly growing clean energy sector and elaborate digital infrastructure make it an ideal testing ground for new technologies. Canada, in contrast, offers deep expertise in climate research and development (R&D), a globally recognized clean technology sector, and strong institutional frameworks for climate policy. It is home to world-class innovations in AI for energy efficiency, low-carbon fuels, and green infrastructure, marketed by its generous private and public sector investments in the global climate tech arena.

Against this backdrop, bilateral cooperation on climate technology is not only timely but also strategic. It aligns economic opportunity with environmental necessity, presenting a forward-looking partnership model founded on innovation and sustainability.

Prime Minister Narendra Modi and his Canadian counterpart, Mark Carney, during a key bilateral meeting on the sidelines of the G7 Summit in June 2025. *Source: DD News*

Current Landscape of Bilateral Climate Tech Cooperation

Recognizing a mutual need to develop a sustainable climate tech infrastructure, India and Canada have laid some groundwork for a strong collaborative relationship in the areas of environmental protection and climate action, with a growing emphasis on technology-driven solutions. In June 2022, at the margins of the Stockholm +50 meeting, both countries signed a Memorandum of Understanding (MoU)[3] on Climate Action and Environmental Protection, outlining cooperation on issues such as renewable energy, decarbonization of heavy industries, and strengthening climate resilience in communities. This MoU included provisions for bilateral exchanges of technical experts, joint projects, and private sector engagement, aiming to enhance both nations' capacities to meet their climate goals through technological innovation and knowledge-sharing. The signing of the MoU also marked a significant step towards a budding collaborative partnership between India's clean energy transition needs and Canada's areas of expertise, and strengthened both countries' resolve to achieve their climate goals, particularly under the Paris Agreement.

Academic and scientific research partnerships have also played a significant role in laying the foundation for strong climate tech cooperation backed by people-to-people ties. One such example is a recent Memorandum of Understanding (MoU) signed between the Visvesvaraya National Institute of Technology (VNIT) in India and Canada-based research organization IC-IMPACTS. Through this collaboration, both organizations aim to facilitate joint research and development projects, faculty and student exchanges, and the deployment of technology in climate-relevant sectors, such as water management and clean energy infrastructure.[4]

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Investments in the Indian renewable energy industry by the Canada Pension Plan Investment Board (CPPIB), with a 53% stake in ReNew Power, and the Caisse de dépôt et placement du Québec (CDPQ), with a 53% stake in Azure Power, have also attracted private sector investors.[5] Brookfield has diversified investments in India's clean energy and climate tech space, investing USD 1 billion in Avaada to support green ammonia plans[6] and USD 361 million in CleanMax[7] to help it become a platform exceeding 5 GW.

Even during continuing diplomatic tensions between the two nations, Brookfield continued to solidify their investment portfolio by funding Tamil Nadu-based Leap Green Energy with a USD 550 Mn equity investment, bringing its Indian renewable energy portfolio to an impressive 25 GW.[8] Such developments highlight a growing synergy between India's climate priorities and Canada's technological and investment capabilities. While much of the engagement remains at the MoU and institutional investment level, the foundation is being laid for more targeted, tech-enabled cooperation.

However, as India finds its feet in the world of renewable energy and climate technologies, building a strong domestic energy framework with international investors (in this case, Canada) becomes difficult due to a few reasons:

- Due to the lack of a standardized framework defining terminologies in climate investments, investors may struggle to assess technological impacts and find it challenging to overcome such teething problems to secure investment.
- Established international players with lucrative deals and investment portfolios in clean technologies often create a narrow entry space for Canadian investors.
- Due to the long gestation periods of these investments, a consistent flow of funds is often retracted because of the lack of short-term returns. In India, where the start-up ecosystem is still in its nascent stages, short-term returns are an unlikely outcome.
- India's energy projects operate at a large scale and are highly volume-driven, making cost a critical factor. Canadian technologies, while high-quality, are often priced higher than Indian technologies and could face the impact of a price-conscious Indian market.
- Unfriendly visa regimes and a lack of trust between authorities often cause hesitation among investors and lead to a slowdown in funding. It is crucial to look beyond political fault lines to ensure the future of sustainable climate tech.

That being said, from a strategic finance-to-research collaboration and private sector investment perspective, the current landscape demonstrates both intent and capacity for scaling up bilateral engagement in climate technology. It would be interesting to see Ottawa's initiatives, hopefully on a positive note, notably since Canadian Prime Minister Mark Carney stepped down as Chair of Brookfield Asset Management only in January.[9] With such large-scale investments in Indian Climate Tech and a new Canadian government leaning towards mending diplomatic and economic ties with New Delhi, bilateral engagement in energy investments could see a positive shift in the near future.

Canadian minister of environment and climate change Steven Guilbeault and India's minister of environment, forest and climate change Bhupender Yadav signing a memorandum of understanding (MoU) on the sidelines of the Stockholm+50 meeting in June 2022.
Source: Environment Canada X

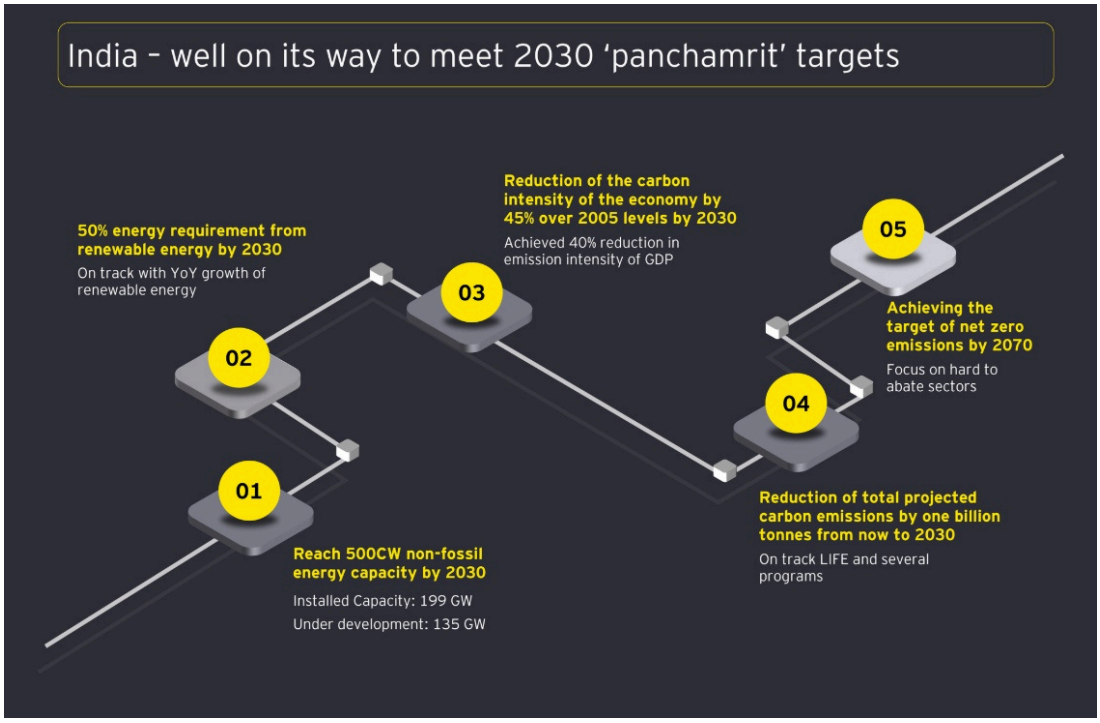
India's Needs and Canada's Strengths in Climate Technology

India's need for climate-resilient agriculture is pressing, with climate change already impacting crop yields, water availability, and food security.[10] Solutions like precision irrigation, satellite-based weather prediction, and smart farming technologies are crucial. Meanwhile, urban areas require adaptive infrastructure to cope with increasing heat waves, floods, and air pollution, prompting interest in energy-efficient buildings, smart grids, and nature-based solutions.[11] Additionally, energy transition remains central, where India could benefit from support for decarbonizing industries, scaling up renewable energy infrastructure, and adopting technologies such as energy storage and green hydrogen.

As one of the fastest-growing economies with serious vulnerabilities to climate change, India represents both a major front in the global fight against climate change and a rapidly expanding market for green technologies. India's market development is running in parallel with rising climate needs, particularly in sectors such as agriculture, energy, and urban infrastructure. India's green tech market is expected to grow significantly, from USD 837.2 Million in 2024 to USD 8,603.2 Million by 2033, with a CAGR of 27.36%[12], driven by government mandates such as achieving net-zero emissions by 2070.[13] India aspires to expand the following markets, which can be an attractive investment opportunity for Canadian investors:

- **Green Hydrogen:** With initiatives such as the National Green Hydrogen Mission, India aims to position itself as a leading producer of green hydrogen. By 2030, India aspires to produce at least 5 million metric tonnes per year and add 125 GW of renewable energy capacity.[14]

- **Renewables Market:** In the 26th COP Summit, Indian PM Narendra Modi highlighted five 'nectar elements' of India's climate action plan - Panchamrit. Under this plan, India aspires to have 500 GW of Non-Fossil Fuel capacity by 2030, with 50% of its energy coming from renewables.[15]



Source: EY India, How India's Sustainable Development Goals are powering its growth while striving for net zero, 2023

India's National Green Hydrogen Mission, launched by the Government of India in January 2023, is an initiative aimed at making India a global hub for the production, use, and export of green hydrogen. The mission aligns with India's broader climate and energy goals, including achieving energy independence by 2047 and net-zero emissions by 2070.

With a grand outlay of INR 19,744 crore, the Mission focuses on scaling up India's green hydrogen production capacity to at least 5 million metric tonnes (MMT) per annum by 2030, supported by around 125 GW of renewable energy capacity. This is expected to generate over INR 8 lakh crore in investments, create over 6 lakh jobs, and reduce fossil fuel imports worth over INR 1 lakh crore. It also aims to reduce nearly 50 MMT of annual greenhouse gas emissions by the end of the decade.

The Mission includes several key components: the Strategic Interventions for Green Hydrogen Transition (SIGHT) programme will provide financial incentives for domestic electrolyzer manufacturing and green hydrogen production; pilot projects in sectors like steel, shipping and mobility will demonstrate use-cases; and the development of green hydrogen hubs will integrate production and consumption geographically.

Other enabling measures include a well-rounded policy and regulatory framework, incentives for demand creation in hard-to-abate sectors, infrastructure development, skill-building initiatives, and R&D support through a dedicated public-private partnership mechanism.
The National Green Hydrogen Mission is expected to position India at the forefront of the global clean energy transition. By focusing on both supply and demand, it aims to build a robust domestic green hydrogen ecosystem while also tapping into emerging international markets. As one of the most ambitious hydrogen strategies globally, the Mission signals India's intent to lead in the development of future-ready, low-carbon energy solutions.

These needs present a significant opportunity for international partnerships, particularly with countries like Canada, which have advanced climate technology ecosystems. The Canadian government has also doubled its international climate finance from CAD 2.65 billion (2015–2021) to CAD 5.3 billion (2021-2026),[16] where it will focus on supporting climate action in developing countries. Canada is home to many climate tech companies and has particular strengths in carbon capture and storage (CCS), clean hydrogen, AI-powered energy efficiency, and smart infrastructure.

Canada's climate ventures could benefit from greater international collaboration and market access, particularly in rapidly growing markets like India. Canadian Pension Funds are one of the few large-scale investors in the Indian renewable energies/climate tech space. The Canadian Pension Plan Investment Board (CPPIB) recently invested USD 114 Mn in ReNew Power, a leading Indian renewable energy developer.[17] A diversification of such investments in the thriving Indian climate tech sector could mean sizeable returns for pension holders and also help India achieve its energy goals.

Canadian Climate Tech Companies that featured in The Global Cleantech 100, 2025

- Cyclic Materials: Extraction of Rare Earth Elements from spent products to be used in magnets
- Enersion: Innovative heat pump technology that delivers both cooling and heating by offsetting grid electricity and natural gas
- e-Zinc: A recyclable a zinc-based energy storage solution that lasts longer and is more sustainable than lithium-based batteries
- Ionomr: Has produced a membrane that lowers both the economic and environmental cost of electrolysis, paving the way for hydrogen
- Mangrove Lithium: Skips the extraction and refining process for Lithium and converts impure rock extracts into lithium hydroxide at the mine sit
- Pani: Uses AI-powered platform monitors to sensor data in water treatment and desalination plants
- pH7 Technologies: Extracts platinum group metals, such as rhodium, iridium and palladium, from catalytic converters and solar panels instead of mining
- Summit Nanotech: Extracts lithium by conserving freshwater resources, creating zero solid waste and requires 26 times less land
- Svante: Makes filters and modular machines that capture CO_2 emissions at industrial sites. The captured carbon is either stored underground or recycled into products like polymers or solvents

Source: MaRS, 9 Canadian startups feature on the Global Cleantech 100 in 2025

India is also expanding its solar capabilities. In 2024, India's solar capacity reached a total 94.17 GW, increasing by 24.5 GW, almost double its growth in 2023.[18] In addition to installing 18.5 GW of utility-scale solar projects in Tamil Nadu, Rajasthan and Gujarat, the PM Surya Ghar: Muft Bijli Yojana also helped 7 lakh homes install rooftop solar systems within ten months. India is now the fourth nation worldwide with over 100 GW of installed solar capacity and aims to produce 160 GW of solar modules and 120 GW of cells by 2030, which would make it a key player in the global solar supply chain. In April 2025, the National Solar Energy Federation of India and SolarPower Europe signed an MoU[19] to unlock EU-India cooperation on solar manufacturing and build more supply chains.

For Canada, India offers real-world testing for scaling technology in diverse and challenging environments, while for India, Canadian innovation can provide key inputs to development efforts. Indian advances in low-cost solar manufacturing and tech deployment models could also offer reciprocal learning opportunities for Canadian firms. This indicates that the India-Canada climate tech relationship could be mutually beneficial.

Ultimately, bridging India's climate tech demand with Canadian innovation capabilities offers a strategic way forward. Both countries stand to benefit — India by gaining access to cutting-edge technology and expertise, and Canada by expanding the global reach of its climate ventures. The scale, urgency, and market opportunity inherent in India's green transition make it a suitable partner for Canada's global energy efforts.

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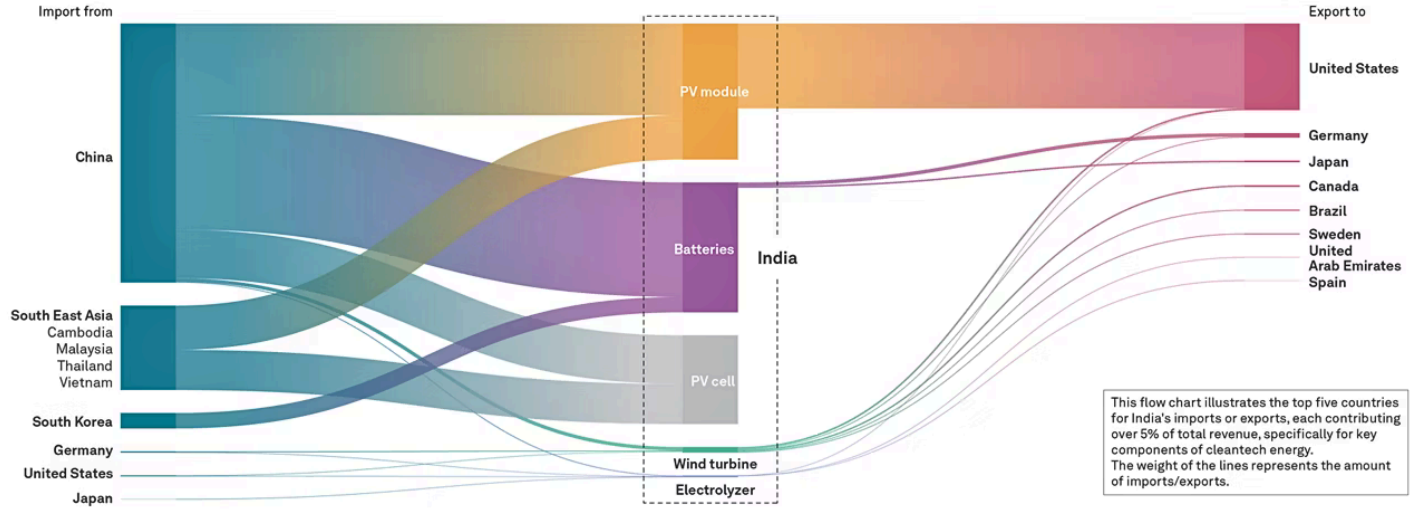
Flow chart of India imports and exports of key clean energy technology components in 2023



As of Aug. 1, 2024.
Wind turbine imports and exports includes nacelles, blades, towers, and other associated parts.
Batteries imports and exports are lithium-ion batteries which include all applications.
Source: S&P Global Commodity Insights.

Sectoral Focus: Climate Tech Applications and Cooperation Potential

Agriculture and Food Security

Problems: Climate Variability, Water Stress, and Yield Instability

India's agricultural sector is deeply affected by climate change, facing an increase in extreme weather events, including droughts, floods, unseasonal rains, and heatwaves. These impacts reduce crop yields, affect food security, and threaten the livelihoods of rural communities. In extensive field and simulation studies[20] carried out by the Government of India, it was discovered that without proper adaptation of mitigation strategies:

- Rainfed rice yields would reduce by 20% in 2050 and by 47% in 2080;
- Irrigated rice yields were projected to reduce by 3.5% in 2050 and by 5% in 2080;
- There could be a reduction in wheat yield by 19.3% in 2050 and 40% in 2080.

With only 50% of agricultural land being irrigated, water stress is also a growing concern. India faces diverse climate risks, including 42% of its land being susceptible to drought, and a projected tripling of the rate of groundwater depletion by the 2080s due to rising temperatures.[21] These vulnerabilities are exacerbated by India's dependence on smallholder farming, where farmers usually lack access to adequate forecasting tools and adaptive technologies.

Technologies: Precision Agriculture, Satellite-based Planning, and Smart Irrigation

- Precision Agriculture and Soil Monitoring: Innovations in remote sensing, Geographic Information Systems (GIS), and AI-powered farm analytics continuously track crop conditions, soil health, and climate trends. Internet of Things (IoT) enabled soil sensors can provide real-time data on moisture and nutrient levels, helping farmers optimize irrigation and fertilizer application.[22] The National Innovations on Climate Resilient Agriculture (NICRA), a network project of the Indian Council of Agricultural Research (ICAR), is piloting interventions in 651[23] predominantly agricultural districts, with plans to address weather anomalies and recommend region-specific climate-resilient crops, varieties, and management practices.

- Satellite-based Planning: In addition to using precision agriculture to identify ideal land sites for farming, AI-based analytics—combined with satellite imagery—can be utilized to enhance crop yield and quality. An example of this is the Agrometeorological Advisory Services (AAS), run by the India Meteorological Department (IMD).[24] This provides regional weather forecasts, helping farmers mitigate risks related to weather variations.

- Smart Irrigation: In an effort to introduce smart irrigation systems, such as automated drip and sprinkler technologies, the Government of India launched its flagship "Per Drop More Crop" initiative, which provides financial assistance to farmers for installing micro-irrigation systems, including rain guns, drip irrigation, and sprinkler irrigation.[25] These solutions are critical in tackling growing water scarcity in agriculture.

Recommendations for Bilateral Cooperation

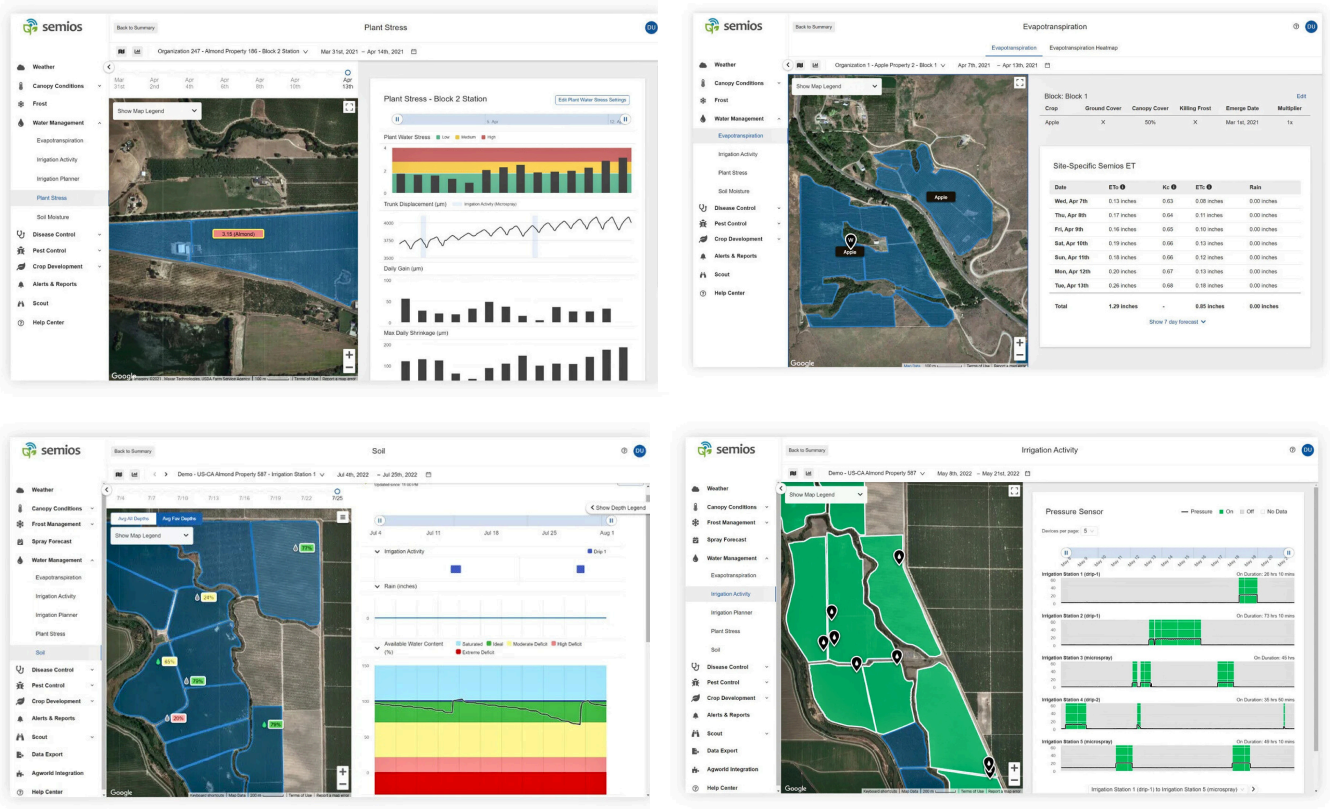
While India has introduced numerous schemes and initiatives, it lacks a sustained influx of investment and technological expertise in smart agriculture. Canadian firms and research institutions, however, are at the forefront of AI-powered farm management, advanced drone-assisted monitoring, and smart irrigation systems.[26]

Considering this, there is clear potential for:

- Field-testing Canadian precision agriculture solutions in Indian agro-climatic zones to improve input efficiency and reduce crop vulnerability via joint research & pilots.
- Disseminating Canadian expertise in satellite-based forecasting and big data analytics through training programmes, state-level partnerships, and knowledge sharing.
- Co-developing low-cost technologies suited for India's smallholder farmers by applying Canadian R&D expertise to India's large-scale market.

Given India's ambitions in climate-resilient agriculture and Canada's proven capabilities in agri-innovation, bilateral cooperation in this sector can generate impactful solutions that also serve broader climate adaptation goals.

Snapshot of Semios's (Canadian Company) water management solution. *Source: Semios Website*



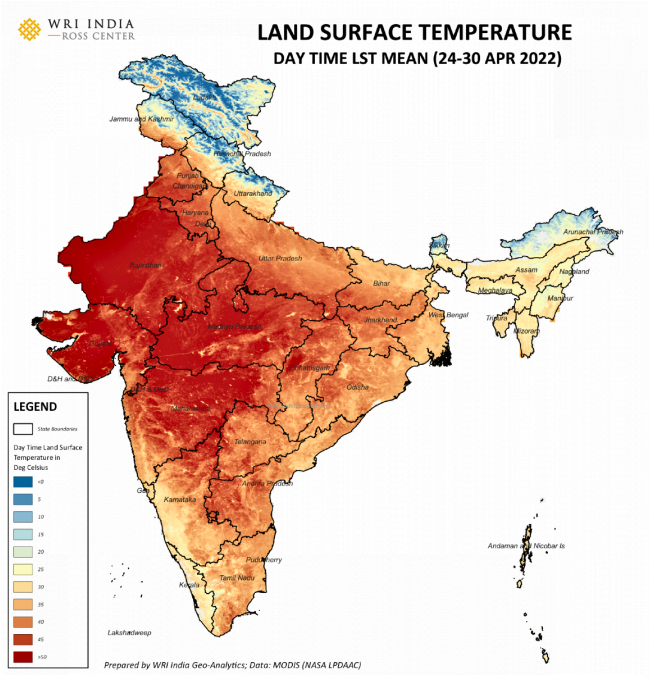
Urban Planning and Infrastructure

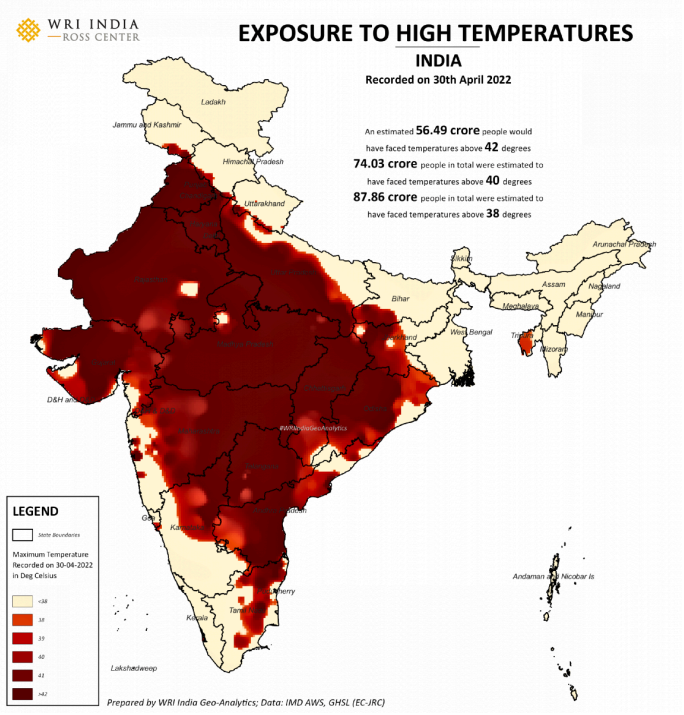
Problem: Heatwaves, Flooding, Poor Mobility, High Emissions

India's rapid urbanization has resulted in significant climate-related challenges. Factors such as population density in urban areas, declining green cover, and lifestyle elements, including additional cooling requirements and vehicular emissions, have contributed to the 'heat-island' effect in places like Delhi. Large, bare, open concrete spaces combined with densely polluted air which traps heat has led to the creation of heat 'hotspots'.[27]

Another deeply felt impact of climate change is the occurrence of excessive urban flooding, particularly in metropolitan cities. A dimension of unpredictability is now added to annual rainfall patterns, where rising temperatures due to climate change bring forth unseasonal and excessive rain. Additionally, densely populated cities with poorly planned drainage systems and inadequate infrastructure often experience regular flooding. Delhi has been using the same drainage plans as were established in 1976. Mumbai, along with its outdated drainage system, has 70% (impermeable) concretized area, leading to greater runoff and subsequent waterlogging.[28]

Urban areas in India are overwhelmed with heavy economic activity, built on the foundation of plans devised for a time when the population was less than a third of what it is today. Excessive vehicular emissions lead to thick polluted air around cities, trapping heat and creating heat hotspots, which ultimately affect rainfall and cause flooding on the streets. Cities are caught in a vicious cycle, and effective mitigation strategies are a pressing need to recover from the impacts of climate change.





Technologies: Smart Grids, Climate-Adaptive Infrastructure, Digital Twins

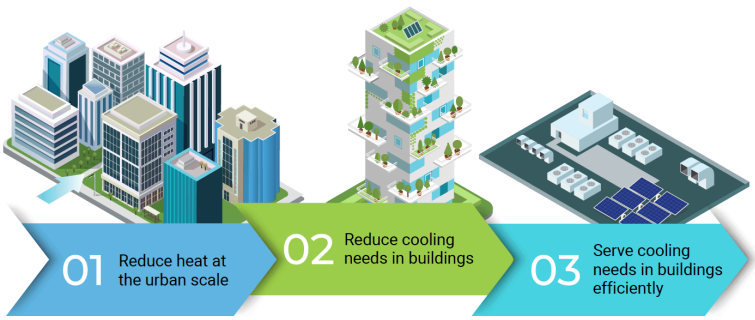
- Smart Grids and Energy-efficient Buildings: Establishing smart grids can optimize electricity distribution, reduce losses, and integrate renewable energy sources, enhancing energy efficiency in urban areas. India, under its National Smart Grid Mission,[29] and Canada, with its Green Infrastructure Smart Grid Program,[30] are two such initiatives in both countries to deploy smart grid systems for clean growth. Energy-efficient building designs, incorporating passive cooling techniques (heavy insulation) and use of sustainable materials and efficient lighting, can mitigate the urban heat island effect and reduce energy consumption.[31]
- Climate-resilient Infrastructure: Developing infrastructure that is resilient to climate impacts is crucial in urban centers. This includes constructing flood-resilient buildings with elevated foundations, utilizing permeable pavements to manage stormwater, and integrating green spaces to absorb excess rainfall.[32]Such measures can significantly reduce the vulnerability of urban areas to sudden changes in the weather.
- Digital Twins and Urban AI Tools for Planning: A digital twin virtualizes models of cities, allowing planners to simulate and analyze the impacts of scenarios such as extreme weather events or infrastructure changes.[33] Using AI tools, this technology enables data-driven decision-making, providing real-time insights to facilitate efficient improvements in city infrastructure.

Recommendations for Bilateral Cooperation

To enhance climate resilience in their urban centers, India and Canada can collaborate on several fronts:

- Establishing partnerships between Indian and Canadian cities/states/provinces to facilitate the exchange of best practices in urban planning, climate adaptation, and sustainable infrastructure development.
- Collaborative pilot projects focusing on implementing established and successful initiatives on smart grids, constructing climate-resilient infrastructure, and deploying digital twin technologies, which can serve as models for viable solutions in both countries.
- Balancing funding mechanisms, such as India's Smart Cities Mission[34] and Canada's Green Infrastructure Program,[35] can support the development and deployment of innovative urban solutions. Collaborative funding can also attract private sector investment and foster public-private partnerships.

By combining Canada's technological expertise with India's dynamic urban landscape, both countries can co-develop and implement solutions that address the pressing challenges of urban climate resilience.



Three core steps for developing a whole system approach to urban cooling, proposed by "Beating The Heat: A Sustainable Cooling Handbook for Cities" by UNEP Cool Coalition

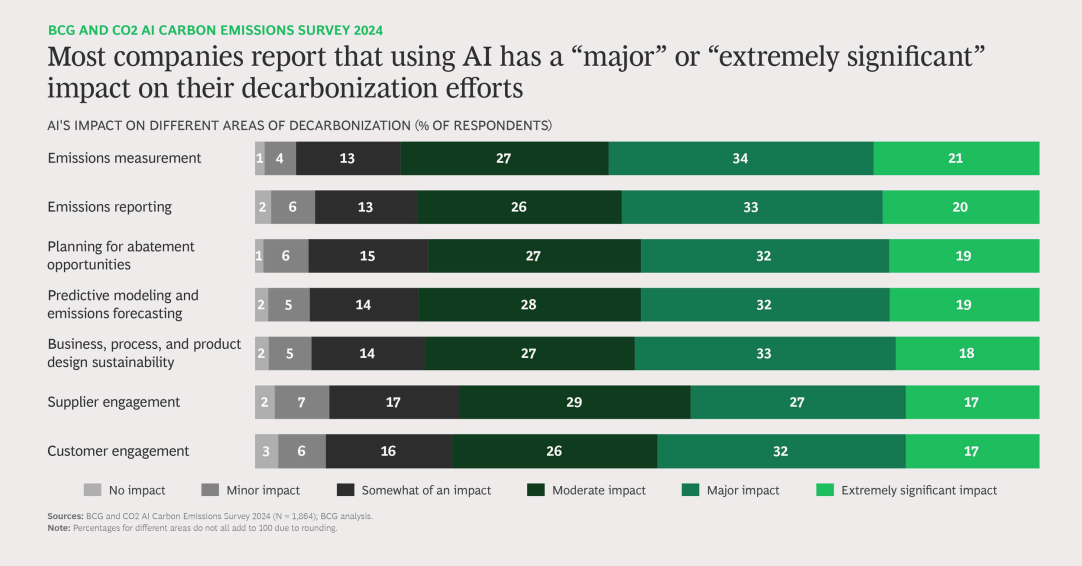
Energy and Industry

Problem: Emission intensity and fossil fuel lock-in

India's industrial and energy sectors remain heavily reliant on fossil fuels, contributing significantly to emissions and climate vulnerability. While India is committed to achieving net-zero emissions by 2070, it faces the dual challenge of maintaining economic growth while transitioning to cleaner energy sources, particularly in reducing its dependence on coal production.[36] Emission intensity, limited energy access in rural pockets, and fossil fuel lock-in are central concerns[37] that require both technological and financial solutions. While India has displayed a 7.93% reduction[38] in Greenhouse gas (GHG) emissions from 2019 to 2020 in a bid to achieve its Net-Zero goals by 2070, a lack of better alternatives makes it lean more towards using fossil fuels as an energy source for the foreseeable future.

Technologies

- Carbon Capture and Storage (CCS): India has shown growing interest in CCS technologies to decarbonize sectors such as steel and cement, aiming to reduce CO_2 emissions to near zero.[39]However, India faces issues such as a lack of a strategic roadmap to store and utilize CCSs, and an inability to expand due to high operational costs and the absence of strong policy and financial incentives to support large-scale deployment.
- Hydrogen Energy: The National Green Hydrogen Mission is seen as a critical pathway for India's clean energy transition. India has launched pilot projects and hydrogen hubs under this scheme. However, the demand market for hydrogen is still very weak, and a lack of a policy framework and low manufacturing capacities in reaching the target of 200 GW by 2030 could make it difficult for India's hydrogen ambitions to achieve fruition by 2030.[40]
- Efficiently utilizing AI to achieve goals: As is the case with many new developments, AI-based grid optimization and battery storage technologies are key enablers in achieving clean goals. A recent report notes that climate leaders are increasingly deploying AI for grid flexibility, emissions monitoring, and predictive maintenance to enhance bottom-line outcomes.[41] Canada's advanced work in AI-powered energy analytics and smart grid solutions provides a blueprint for bilateral innovation, particularly in developing solutions tailored to India's unique grid dynamics.



Recommendations for Bilateral Cooperation

In the energy and industry sector, there is significant potential for joint R&D, co-financed pilot projects, and policy coordination. Public-private partnerships could be formed to bring together Indian energy conglomerates and Canadian clean tech firms, inspired by investment patterns similar to those of Brookfield.

- Importing Canadian Liquified Natural Gas (LNG) could possibly reduce emissions in India by 62%[42] as compared to its conventional reliance on coal, in turn allowing Canada to benefit by establishing itself as an energy supplier to a significant player in the Indo-Pacific. Export projects have now come into effect, with an LNG Plant at Kitimat on Canada's west coast having recently sent out the first cargo to Asian markets on 1st July 2025.[43]
- Establishing a dedicated India-Canada Clean Tech Fund to scale high-impact projects in renewables, green hydrogen, and CCS, utilising Canadian success story blueprints to strengthen the renewable energy industry in India.
- Attracting Canadian investments in partnerships focused on production, storage, and transport solutions of green Hydrogen.
- Expanding AI-driven collaboration in energy efficiency and smart grid management, building on Canada's proven use cases and India's implementation scale.

A general view of LNG Canada's liquified natural gas facility in Kitimat, British Columbia, Canada November 19, 2024. REUTERS/Jennifer Gauthier/File Photo

Challenges and Gaps in the Current Cooperation Landscape

Although India continues to attract investments from Canada in its renewable energy ventures and agro-tech initiatives, the pair faces numerous challenges in solidifying bilateral cooperation on a larger scale, particularly in sustaining partnerships.

A few such challenges are:

- While India and Canada have signed Memoranda of Understanding (MoUs) to strengthen cooperation on environmental protection and climate action, the implementation of these agreements has been limited, with few concrete joint initiatives or dedicated working groups focused on climate technology.
- Collaborations between Indian and Canadian research institutions, such as the Canada-India Research and Development (R&D) program, aim to foster the joint development of innovative products. However, these efforts often lack coordination, leading to fragmented initiatives without a cohesive strategy for climate technology deployment.
- India's climate tech startups face significant funding challenges, particularly at the growth stage. Despite a growing number of startups in the sector, access to necessary capital remains a bottleneck, hindering the scalability of solutions and limiting potential collaboration with Canadian counterparts.
- India has emphasized the need for unrestricted access to green technology and climate finance, criticizing unilateral measures by developed nations that hinder climate action in developing countries. Such disparities in trade policies and regulatory standards create barriers to the effective transfer of technology between India and Canada.
- Despite Canada's strengths in green skills training and India's emerging workforce in renewable energy, there has been minimal cooperation in vocational training or mutual recognition of green credentials. This gap represents a missed opportunity to develop a skilled workforce that supports climate technology initiatives.

In June 2025, India and Canada agreed to resume free trade agreement (FTA) negotiations and restore diplomatic ties, starting with the return of High Commissioners. The talks, paused since September 2023, aim to advance the Early Progress Trade Agreement (EPTA) and eventually conclude a Comprehensive Economic Partnership Agreement (CEPA). Both nations emphasized collaboration in areas like clean energy, digital transformation, and food security.

Conclusion

The India-Canada relationship in climate technology cooperation displays both significant promise and missed cooperation potential. While both nations are climate-forward and possess complementary capabilities, their collaboration has not developed beyond its present latent stage. Moving from dialogue to action will require structural changes, political commitment, and ecosystem-level engagement. Both countries would benefit from a dedicated bilateral relationship focused on climate innovation, such as a task force or innovation ecosystem, that co-develops and scales climate technologies. This can provide movement to stagnated conversations, ensure policy alignment, and facilitate matchmaking between innovators, financiers, and regulators across both geographies. As is the case with all sides of the Indo-Canadian relationship, trust-building is critical. Diplomatic strains have undermined confidence and disrupted momentum in multiple areas. Climate cooperation must be centered on a sustainable, long-term, people-centric agenda. Reviving business-led channels can ensure progress even during moments of high-level political friction.

Another area of focus is the smooth flow of finances to Indian clean-tech firms, which need better access to Canadian capital, and Canadian innovators need clearer pathways into India's fast-moving market. Canada's leadership in green training programs and India's youth-heavy demographic present a win-win opportunity. Utilizing the potential of our people-to-people ties, developing joint curricula, certification frameworks, and exchange programs can help create the human capital pool necessary for a climate-smart economy.

In conclusion, India and Canada have a unique window to redefine their bilateral climate partnership, not just as two countries exchanging technology, but as leaders of a sustainable future. Leveraging their respective strengths through stable frameworks and shared goals can unlock viable solutions for climate mitigation, resilience, and equitable growth across the Indo-Pacific region.

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