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# INDIA

Challenges, Considerations, and  
Opportunities for Canadian pellet producers



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# EXECUTIVE SUMMARY

To reduce greenhouse gas emissions and improve air quality, the Government of India (GOI) mandated biomass co-firing in coal plants. Their ambitious targets include transitioning to 5% co-firing by Oct 2022 and 7% co-firing by Oct 2023. The government estimates that this action could save 38 million tonnes of carbon dioxide emissions.

However, to achieve these goals, approximately 96,000 tonnes per day of biomass pellets would be needed; current capacity is around 7,000 tonnes per day. Annually, this would require upwards of 35 million tonnes per year of biomass pellets.

Based on WPAC's explorations, observations and limited discussions, it concludes the following:

- **Exporting pellets from Canada to India isn't feasible**
  - While the Indian government and Indian coal power companies would welcome foreign investment and expertise, it is not feasible, at least in the short term, for Canada to export wood pellets to India. This is due to the extremely low-price expectations of Indian coal power producers coupled with vast distances and high shipping costs from Canada.
- **There is significant opportunity to capitalize on domestic biomass**
  - There is a huge, largely untapped opportunity to mobilize a local biomass pellet industry in India based on agricultural residues as feedstock. This would include construction of large-scale pellet plants fed by agriculture residues collected from millions of small farms.
- **Coal power companies appear unmotivated**
  - Coal power companies are being asked by GOI to enter long term supply contracts; however, they do not presently appear to have the interest or expertise about how to mobilize a large-scale biomass pellet feedstock supply. Indian coal power companies may be willing to consider joint ventures.
- **Local connections will be required**
  - Local partners to help navigate customs and language is critical for any market expansion into India.
- **Carbon capture, utilization, and storage key in early stages**
  - Carbon capture, utilization, and storage (CCUS) represents a significant long-term opportunity; and will be key to achieving India's greenhouse gas targets and energy needs.

Based on these observations, WPAC offers the following recommendations to its members:

## 1. Meet with the Canadian High Commission in India

- Interested potential investors or project developers should discuss the opportunity with representatives of the trade commissioner office in the Canadian High Commission to India in Delhi.

## 2. Map the opportunity

- A key step would be to map the location of coal power plants in relation to biomass feedstock supply and to determine the optimum location and size of biomass pellet plants.

## 3. Visit India

- This is a large enough opportunity that it is worth a trip to India to investigate further.

# BACKGROUND

## HEALTH AND CLIMATE CRISES

According to a [report](#) by the International Energy Agency (IEA), air pollution has emerged as one of India's gravest social and environmental problems in recent years. At the same time, the country is experiencing signs of a warming climate with potentially devastating effects in the long term.

Energy-related fuel combustion is at the heart of both crises. It is a main source of three major air pollutants, NO<sub>x</sub>, SO<sub>2</sub> and PM<sub>2.5</sub>, and the largest contributor to India's CO<sub>2</sub> emissions. In many locations, concentrations of particulate matter persistently exceed recommended national and international standards with severe implications for public health.

In addition, stubble burning in Punjab and Haryana states, part of the farm belt that borders the capital, New Delhi, accounts for 30% to 40% of air pollution in October and November, according to air-quality monitoring agency SAFAR.

In 2019 alone, India experienced an estimated 1.2 million air pollution-related premature deaths. At the same time, India's growing economy is driving CO<sub>2</sub> emissions, which increased by more than 55% in the last decade and are expected to rise by 50% by 2040.



## AMBITIOUS GHG REDUCTION STRATEGIES

India is the 3rd largest emitter of CO<sub>2</sub> in the world after China and the US, with estimated annual emissions of about 2.6 gigatonnes per annum (gtpa). The Government of India has committed to reducing CO<sub>2</sub> emissions by 50% by 2050 and reaching net zero by 2070.

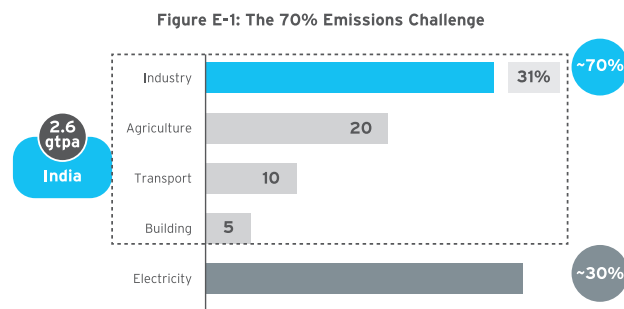


Image Credit: Government of India: Carbon Capture, Utilization and Storage (CCUS) Policy Framework and its Deployment Mechanism in India

To achieve these goals, the GOI has mandated biomass co-firing in coal plants. Currently, India burns approximately 670 million tonnes of coal annually for power generation. The GOI has directed coal companies to move to 5% co-firing by Oct 2022 and 7% co-firing by Oct 2023. The government estimates that this action could save 38 million tonnes of carbon dioxide emissions, improve air quality, and mitigate climate impacts.

In addition, the GOI initiated the National Policy for Management of Crop Residues, the National Green Tribunal Act, and the Straw Management System to restrict agricultural burning and make use of crop waste.



### LITTLE PROGRESS DESPITE MANDATES

India has about 180 thermal power plants with a collective capacity of 198,734 MW. As of 2021, only 8 power plants had co-fired biomass pellets; by October 2022, this had increased to 39. However, the amount of biomass co-fired is still lagging. As of date, 83,066 MT of biomass has been co-fired at these plants for a combined capacity of 55,390 MW. Of the 39 power plants, NTPC was the best performer. NTPC (formerly known as National Thermal Power Corporation Limited), is an Indian power company owned by the Government of India.

The GOI held a meeting in New Delhi on October 3, 2022, to review progress of biomass co-firing in thermal power plants. The meeting was co-chaired by Union Minister for Environment, Forest



& Climate Change, Shri Bhupender Yadav and Union Minister for Power, New & Renewable Energy, Shri R. K. Singh. Attendees included senior officials from the state governments of Haryana, Punjab and Uttar Pradesh, other government bodies and heads of all power utilities in the NCR region.

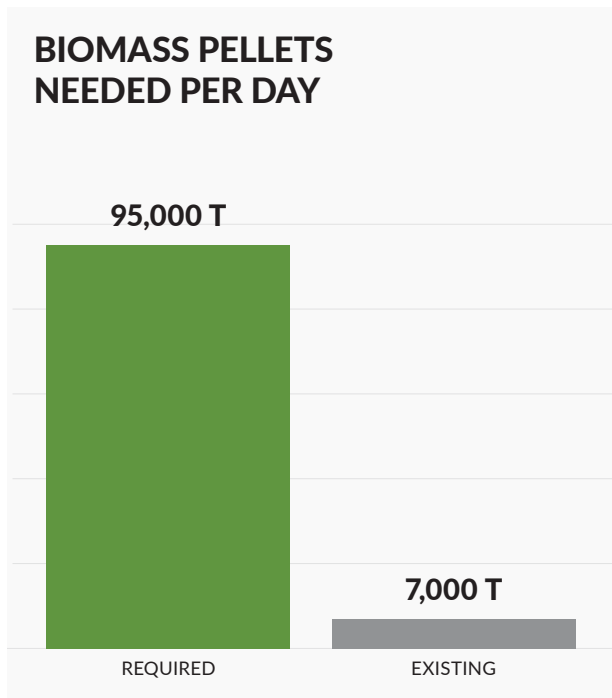
### KEY OUTCOMES OF THE MEETING

- Strong emphasis on the need to **accelerate procurement and use of biomass pellets** in thermal power plants.
- Warning that the GOI **will impose fines on plants if they failed to co-fire enough biomass**.
- Potential to **reduce coal** supply in those thermal power plants that do not comply with the Ministry of Power's policy on biomass co-firing.
- Reinforced that the **health and safety of the citizens was topmost priority**, and no one has the right to put innocent lives in danger.
- Directed **all thermal power plants in NCR region to install biomass pellet manufacturing plants** (torrefied / non-torrefied) in their premises, including the private power companies.
- Providing **financial incentives from the Central Pollution Control Board to set up pellet manufacturing plants** as well as torrefaction plants in the NCR region.
  - In case of pelletization plant, a maximum amount of Rs 14 lakhs per tonne plant production capacity per hour (CA \$22,000), shall be given as one-time financial support by CPCB, subject to a total financial support of Rs 70 lakhs per proposal (CA \$114,000).
  - In case of torrefaction plant, a maximum amount of Rs. 28 lakhs per tonne plant production capacity per hour (\$44,000 CAD), shall be given as one-time financial support by CPCB, subject to a total financial support of Rs. 1.4 crore per proposal (CA \$228,000).
- Identified that the **lack of biomass pellets of agricultural residues is a key obstacle** to fulfilling the GOI's direction to co-fire biomass with coal in thermal power plants.

**BIOMASS IN ABUNDANCE,  
BUT PELLETS SCARCE**

The GOI has established the National Mission on use of Biomass in coal-based thermal power plants, also called SAMARTH (Sustainable Agrarian Mission on use of Agro-residue in Thermal Power Plants).

SAMARTH estimates 95,000 to 96,000 tonnes per day of biomass pellets are needed while existing capacity is around 7,000 tonnes per day. Annually, the demand could reach 35 million tonnes per year of biomass pellets.



Agricultural biomass holds potential for coal power plants and would reduce crop burning. However, pellets made from agriculture residues tend to have higher ash content along with varying levels of other elements such as chlorine or silica. These can create problems such as corrosion, fouling, and slagging in boilers. One way to mitigate these issues is to blend with wood pellets to keep undesirable components in acceptable concentrations.

Given the opportunity to provide India with wood pellets, trade commissioner Kapil Malhotra from the Canadian High Commission in India approached WPAC in July 2022 regarding the potential



opportunity to export wood pellets from Canada to India. The WPAC board of directors approved and directed Gordon Murray to investigate this opportunity.

**STARTING POINT:  
TRADE MISSION TO INDIA**

Forestry Innovation Investment is a Crown agency of the BC Government that is focused on expanding opportunities for BC forest products and ensuring BC’s forest sector continues to grow and prosper. One role of FII is to expand global markets by creating more opportunities in existing and new markets—especially in high-potential Asian countries like China, Japan, South Korea, India, and Vietnam.

During the week of January 16, 2023, FII led a forest sector mission to India, primarily focussed on solid wood products. WPAC, which has a strong relationship with FII, saw this as an opportunity to join the mission to learn more about wood pellet opportunities in India.

# TRADE MISSION OBSERVATIONS

## INFORMATION SOURCES

The information in this report was sourced from internet searches, the FII mission briefing package, conversations with trade commissioners Kapil Malhotra and Saroj Mishra at the Canadian High Commission to Delhi, and from meetings with industry participants including:

- Sarabjit Singh, Director, Lehra Fuel Tech PVT LTD, a manufacturer of a full range of biomass production equipment including briquette and pellet presses, hammer mills, dryers, chippers, hoppers, silos and more.
- Rohit Dev, an entrepreneur with an interest in aggregating biomass fuels and providing logistics support.
- Sukhdeep Singh Rana, Managing Director and Sudhir Aggarwal, Director of Business Development, Nugreen Energy Private Limited, a pellet manufacturer with an interest and experience in torrefaction and in experimenting with other innovative bio-based solid fuels.
- Dr. Jatinder Singh Chandok, General Manager of International Business Development, Alok Kumar Asthana, Additional General Manager, International Business, and Sangeeth Suresh, Executive, International Business, NTPC Limited, an Indian government-owned business and India's largest power utility that operates coal power plants.
- Ashis Basu, Chief Executive Officer and Manoj Kumar Singh, Chief Financial Officer, GMR Energy Limited. GMR Energy is a part of GMR Group, which is one of the largest diversified Infrastructure Conglomerates in India. With an operating capacity of over 4400 MW, it has a balanced fuel mix of coal, gas, heavy oil, wind, and solar energy.
- Vinod Kumar Dobriyal, Principal Consultant, CSC e-Governance Services India Limited, a government organization responsible for a network of citizen service points connecting

local population with government departments, business establishments, banks, insurance companies and educational institutions, thus enabling the Government's mandate of a socially, financially, and digitally inclusive society.

Mr. Dobriyal's primary interest was to provide introductions and arrange meetings with senior government officials.

## GEO-POLITICAL CONTEXT

### Fastest Growing Economy

- The Indian economy is one of the largest and fastest growing in the world. The majority of GDP is from services, especially information technology.
- India is expected to reduce reliance on Russia and to increasingly develop defence synergies with Australia, Japan, and the US.
- Public debt is expected to remain around the equivalent of 62% of GDP in 2023-27, but most of it will be held locally, and debt servicing will not be a cause for concern.
- GDP growth of 6% is estimated over the next two years. Growth is expected to average 5.1% per year for the period 2022-50. The country's economic progress is premised on a shift up the value chain in IT, manufacturing, business, and information services.
- Consumer price inflation will decelerate to 5.2% in 2023, from an estimated 6.9% in 2022, as global commodity prices abate, and slower rupee depreciation eases imported inflation.
- Fertility rates have dropped below two (the replacement level) since 2021 for all states but five in India. Continued growth in the working-age population over 2022-50 will support India's economic expansion.
- Divergence in economic fortunes within the country will result in strong pressure for Indians from poorer states to move into more prosperous areas.

- The gap in productivity between the agriculture sector and high-growth industries such as information technology (IT) is vast.
- As its economy expands, India will become an increasingly important diplomatic, military, and economic power.

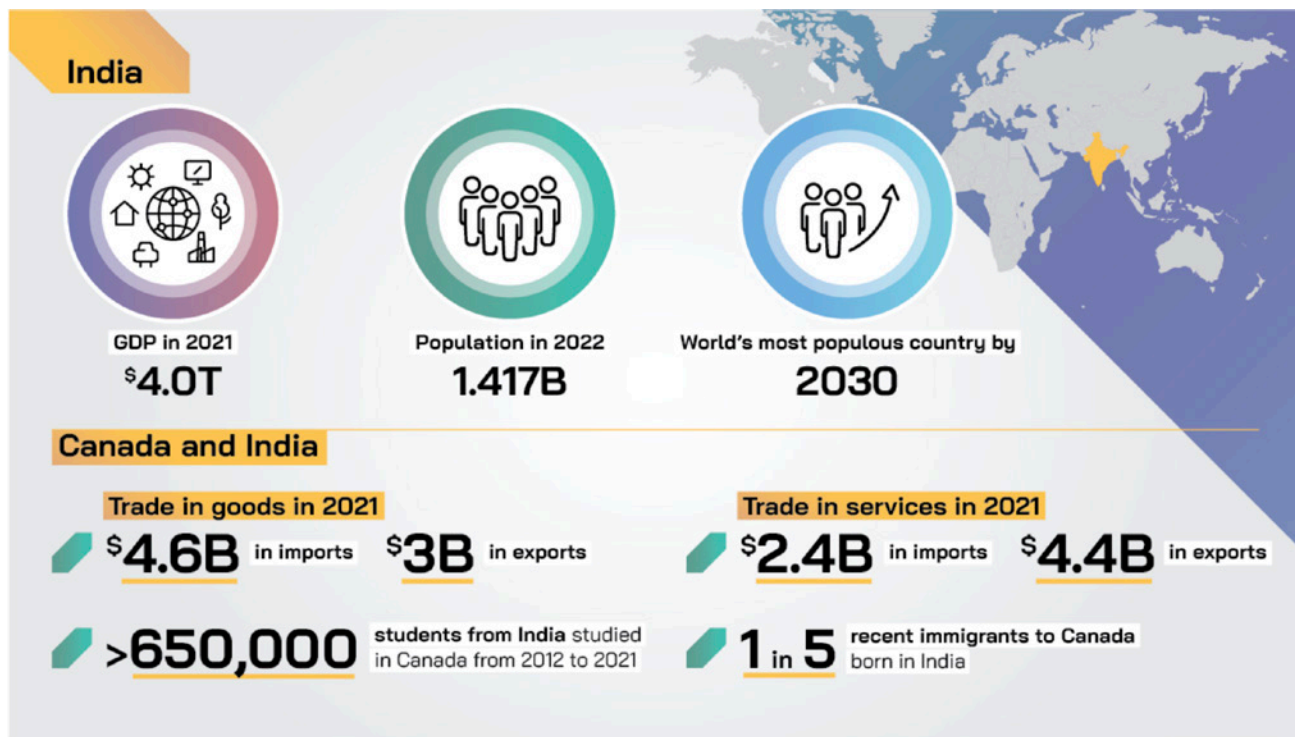
**Political Stability**

- The coalition government led by the Bharatiya Janata Party (BJP) will serve out its full term until 2024. The deep-seated influence of Prime Minister Modi, his high approval rating, and the lack of an effective national political opposition limit risks to political stability.
- The government will maintain a focus on infrastructure development (within limited fiscal space), while backing liberalisation and privatisation to support economic growth.

- India is expected to focus on sealing more bilateral trade agreements with trade partners such as Australia, the Gulf Co-operation Council countries, and the UK in 2023; a trade pact with the EU is likely later in 2023-27.
- Border disputes between India and China remain tense. India and China each continue to maintain around 60,000 troops and advanced weaponry along the border, which raises the risk of military clashes in 2023-27, although a full-blown conflict is not expected.
- Relations between India and Pakistan will remain strained. However, a military conflict is unlikely given nuclear arsenals of both nations.
- The government will announce a new foreign trade policy in March 2023. It is expected that tariff and non-tariff barriers will remain in place.

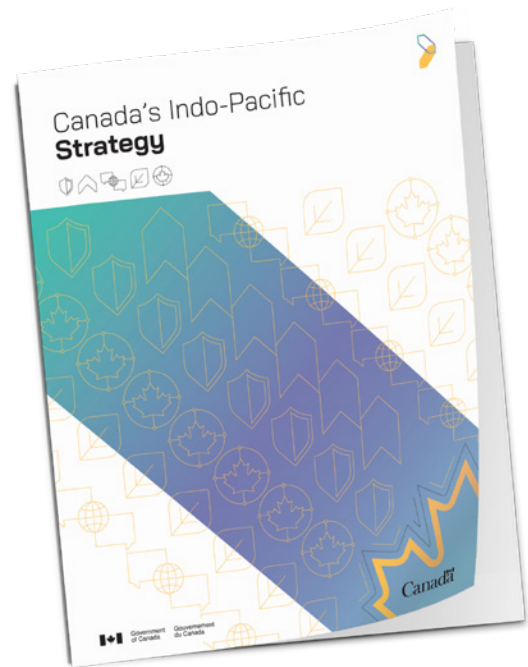
**International relations focused on trade**

- India has maintained a neutral stance on the Russia-Ukraine war, but Mr Modi raised concerns about the Russian invasion during a dialogue with Russia’s president, Vladimir Putin, in September 2022.



### An important trade partner for Canada

- The Government of Canada (GOC) recently released an **Indo-Pacific Strategy**. It recognizes India as a critical partner based on a shared tradition of democracy and pluralism, a common commitment to a rules-based international system and multilateralism, mutual interest in expanding our commercial relationship, and extensive and growing people-to-people connections.
- Canada has committed to growing economic ties with India, including through deeper trade and investment, as well as cooperating on building resilient supply chains.
- Canada is seeking to expand Indian market access through a Comprehensive Economic Partnership Trade Agreement (EPTA) and plans to create a Canada-India desk within the Trade Commissioner Service to promote implementation of the EPTA for businesses and investors looking to enter the Indian market, or for those partnering with Indian businesses.
- The GOC also seeks to accelerate cooperation in the fight against climate change, in protecting the environment, and in deploying green technologies and has committed to send enhanced Team Canada trade missions in priority sectors of mutual interest, such as renewable energy and clean technology.





# TRADE MISSION FINDINGS

## LIMITED PELLET INDUSTRY IN INDIA

SAMARTH estimates 70-80 existing pellet manufacturers, producing 7,000 tonnes per day or 2.5 million tonnes per year, while 35 million tonnes per year are needed for biomass co-firing alone. The average Indian pellet plant produces just 30,000 – 35,000 tonnes per year, an extraordinarily small scale by international standards where industrial plants are commonly at least ten times larger. It's clear that the existing biomass Indian pellet industry is incapable of meeting the demand from coal power plants.

## UNREALISTIC PRICE EXPECTATIONS

It's clear that Indian pellet suppliers favour selling their product to industries such as textile, food processing, metal-based or in the open market for the highest price they can obtain. Many of these industries, especially in the Delhi-National Capital Region are under pressure to switch to cleaner fuels.

These pellet suppliers can sell pellets at -Rs 12,000-13,000 per tonne (CA \$195-\$215), instead of supplying it to coal thermal power plants at the offered price of Rs 8,000-9,000 per tonne (CA \$130-\$145).

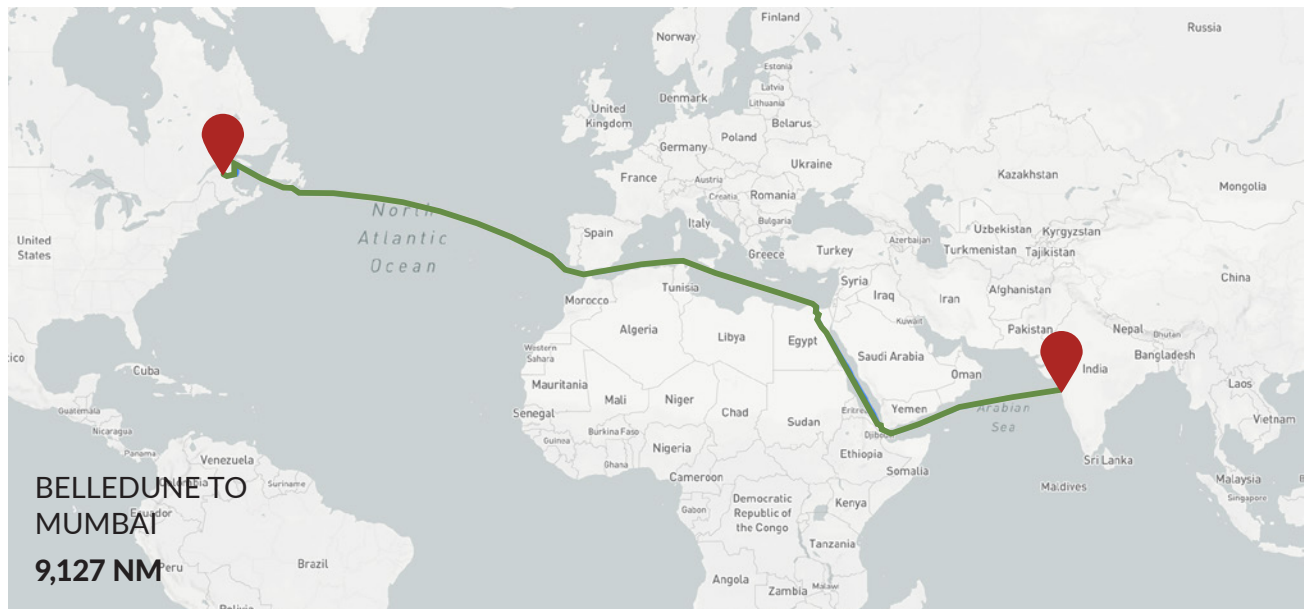
India is known to be a hugely price sensitive market and given the Indian coal power pellet price expectation of around CA \$130-\$145, it is unlikely that Canadian wood pellets could come anywhere close to competing in India, despite the performance advantages of pellets made from wood compared to agricultural residues. Indeed, with agriculture pellets being diluted by 90% or more coal, adverse properties of agriculture biomass will likely be minimized during combustion.

## LOGISTICS ARE SIGNIFICANT IMPEDIMENT

For Canadian producers, the logistics are a serious obstacle for market entry. Pellets would have to cover nearly 15,600 nautical miles (NM) from Vancouver to Mumbai, starting with the voyage to the Panama Canal, across the Atlantic to Strait of Gibraltar onto the Mediterranean Sea to the Suez Canal, and then to the Red Sea and Arabian Sea to Mumbai.

The voyage from Canada's east coast is only slightly better at 9,127 NM, traveling from Belledune or Halifax through the St. Lawrence River to the Atlantic Ocean to the Strait of Gibraltar to the Mediterranean Sea and onto the Suez Canal, then





the Red and Arabian Seas to Mumbai. The journey from Quebec is also feasible for producers in that province or from Ontario, where pellets could be railed to a Quebec port such as Quebec City.

Once in India, the journey for the pellets continues. India is the world's third largest country. Upon entry into the country, the pellets would have to be transloaded, then shipped long distances by rail to power plants scattered throughout the country's interior.

### LOCAL FEEDSTOCK IS LIMITED

Currently, crop residues in India are primarily used as bedding material for animals, livestock feed, soil mulching, bio-gas generation, bio-manure/compost, thatching for rural homes, mushroom cultivation, biomass energy production, fuel for domestic and industrial use, etc. Gross agriculture residues total 560 million tonnes per year of which 260 million tonnes are surplus. The top residues by quantity are sugar cane bagasse 41%, rice straw and husks 25%, wheat straw 23%, corn stover 7%, and cotton stalks 4%.

The state of Uttar Pradesh (north India) produces nearly a quarter of India's total agro-residue. Punjab (north India), West Bengal (east India), Madhya Pradesh (central India), Maharashtra (west-central India) and Bihar (east India) are the other top agro-residue producing states.

Biomass residues are seasonal. Although India can produce multiple crop cycles annually, residues are generally only available for around three quarters of the year.

### COMPLICATED DOMESTIC SUPPLY CHAIN

Nearly 67% of India's farmland is held by marginal farmers with holdings below one hectare, against less than 1% in large holdings of 10 hectares and above. The average farm is estimated at 1.15 hectare.

While the cropped area in India is estimated at 193.76 million hectares, nine states account for 78% – Andhra Pradesh, Karnataka, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Punjab, and West Bengal.

Presently biomass collection is mostly unorganized. There appears to be many opportunities for project developers to locate large scale biomass pellet plants within agricultural regions and close to coal power plants. Developers would need to find Indian partners who understand local customs and can communicate in local language with farmers to organize systematic collection of agriculture residues. There are an estimated 100 to 150 million farms in India.

## INDIA BY THE NUMBERS

SIZE OF THE AVERAGE FARM

**1.15** Hectares

ESTIMATED CROPPED AREA IN INDIA

**193.76** Million Hectares

ESTIMATED NUMBER OF FARMS

**100–150** Million

NUMBER OF MAJOR LANGUAGES

**122**

The country itself has 122 major languages, with about 60% able to speak Hindi and 10% able to speak English.

Nevertheless, there is a huge, largely untapped opportunity to mobilize a local biomass pellet industry in India based on agricultural residues as feedstock. This would include construction of large-scale pellet plants fed by agriculture residues collected from millions of small farms.

### EARLY DAYS FOR CARBON CAPTURE, UTILIZATION, AND STORAGE (CCUS)

CCUS has a role to play in enabling clean and green baseload power and ensuring the sustenance and non-stranding of coal and lignite-based thermal power plants. The National Institution for



Transforming India (NITI) is a public policy think tank of the Government of India. In November 2022, NITI released a comprehensive report, [Carbon Capture, Utilization and Storage \(CCUS\) Policy Framework and its Deployment Mechanism in India](#).

The report recognizes that CCUS has an important and critical role to play for India to reach its goal of cutting CO<sub>2</sub> emissions in half by 2050 and to accomplish net-zero by 2070. It concludes that CCUS is required for both industry and the power sector.

However, for the power sector in particular, the report notes that India relies on coal for meeting over 70% of its electricity needs. Even if India can meet its renewables target of 500 GW installed capacity by 2030, there would still be a need to meet baseload power demand from fossil fuels (most likely coal) or other dispatchable sources, given the intermittency and non-dispatchable nature of solar and wind power.

## KEY FINDINGS FROM THE REPORT:

- Even with RE growth, coal-based power will continue to meet more than 50% of electricity demand. As the power sector is the largest emitter of CO<sub>2</sub>, **CCUS in the power sector is essential for meaningful decarbonization** and ensuring energy security in India.
- The report sets out key CCUS actions (interventions) that must be taken in various CO<sub>2</sub> intensive sectors – i.e power, steel, cement, oil and gas, hydrogen, and coal gasification.
- The theoretical **CO<sub>2</sub> Storage Capacity in India is 395-614 gigatonnes.**
- The key to a successful CCUS implementation in India is to **enact a policy framework that supports the creation of sustainable and viable markets for CCUS projects.** The private sector is unlikely to invest in CCUS unless there are sufficient incentives or unless it can benefit from the sale of CO<sub>2</sub> or gain credits for emissions avoided under carbon pricing regimes.
- The report concludes that a **cash and tax credit-based policy is more likely to incentivize CCUS adoption in India**, by establishing markets for carbon-based products and offsetting carbon capture costs through financial instruments and future taxes and growth.
- India recognizes the need to promote CCUS adoption and implementation in India with a multi-pronged approach to incentivizing:
  - (1) Technology transfer of commercially proven CCUS technologies
  - (2) Promoting R&D in novel technologies, particularly in CO<sub>2</sub> utilization
  - (3) Encouraging private sector participation in implementing CCUS demo projects

## STRONG SYNERGIES ON RESEARCH & DEVELOPMENT

The Biomass and Bioenergy Research Group (BBRG) is a world-class research group, based at the University of British Columbia. The Group conducts



advanced research and develops innovative solutions to meet the needs of the emerging bio-based businesses in Canada and around the world.

Currently, BBRG's engineers and scientists are focused on turning raw biomass into industrial feedstock that would meet the requirements of industry. The main technical activities of the group consist of evaluating the physical and chemical properties in relation to biomass size reduction, drying, pelletization, and best practices for safe handling and storage of biomaterials.

For the past five years, BBRG has been researching the mobilization of agricultural feedstocks, focussing on supply chain logistics, resource assessment and analysis, physical and chemical characterization of biomass, densification (that include drying, size reduction, and pelletization), best practices for storage and handling of raw biomass and ready to deploy feedstock, and life cycle analysis and cost benefit analysis.

Both NPTC Limited and GMR Energy expressed interest in connecting with BBRG.

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# CONCLUSIONS

The information in this report is based on a very short visit to India. WPAC met with only two of fifty companies operating coal power plants in India. Much of the information in this report was obtained from conversations with trade commissioners and internet searches.

Nevertheless, we can conclude the following:

- It is not feasible, in at least in the short term, for Canada to export wood pellets to India. This is due to the extremely low-price expectations of Indian coal power producers coupled with vast distances and high shipping costs from Canada.
- There is a huge, largely untapped opportunity to mobilize a local biomass pellet industry in India based on agricultural residues as feedstock. This would include construction of large-scale pellet plants fed by agriculture residues collected from millions of small farms.
- The Indian government and Indian coal power companies would welcome foreign investment and expertise.
- It would be essential to have local partners to help navigate customs and language.
- India also needs to deploy carbon capture, utilization, and storage on a massive scale. This is another significant opportunity to pursue.

Overall, the trade mission to India and meetings were informative and highlight some important next steps for WPAC and interested members:

1. Interested potential investors or project developers should discuss the opportunity with representatives of the trade commissioner office in the Canadian High Commission to India in Delhi.
2. Developers will need to meet with a greater sample of coal power companies.
3. Coal power companies are being asked by GOI to enter long term supply contracts. These companies may be willing to consider joint ventures. They do not presently appear to have the interest or expertise about how to mobilize a large-scale biomass pellet feedstock supply.
4. A key step would be to map the location of coal power plants in relation to biomass feedstock supply and to determine the optimum location and size of biomass pellet plants.
5. This is a large enough opportunity that it is worth a trip to India to investigate further.



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