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Scaling-up Technology Innovation for Greening the Construction Sector

India has a rich tradition and history of implementing environmentally responsible strategies for buildings and construction. The building and construction sector in India are energy intensive, resource depleting and is one of the prominent emitters of greenhouse gases. The pertinent raw materials used in this sector include building materials such as sand, cement, bricks, steel to list a few. Several efforts have been undertaken recently by the Indian government to promote the use of sustainable raw materials in the construction sector. One of the prominent interventions has been a ban on the production of red bricks using conventional technologies and conversion to zig-zag or vertical methods of brick making issued through a 2018 notification by the Ministry of Environment, Forests and Climate Change (MoEF&CC), GoI. Following this, the Bihar state government has made it mandatory for public sector undertakings to procure fly-ash bricks for construction purposes. Other interventions by the Indian government includes reduced rates of GST on fly-ash bricks from 12% to 5% as decided in a GST Council meeting held on November 2017. The ramifications of these notifications are vast and mentioned as under:

- **Promoting circular approaches by recognising the potential importance of wastes as a raw material in the construction sector** through reducing environmental footprint and replacing virgin resources with secondary materials. This is the first step towards obtaining resource efficiency in production processes.
- **Promoting the use of fly-ash bricks** which reduces emissions significantly and prevents the erosion of top-soil required for agricultural purposes. It is also identified as one of the effective measures to aid transition towards a green economy thereby emphasising on sustainable development and promoting environmental wellbeing.
- **Engineering the strategic shift towards green economy** by considering the varied prerequisites in transitioning to a green economy and emphasizing on financing aspects. This requires continuous engagement with well informed investors and entrepreneurs who identify the potential of value addition of such initiatives.
- **Developing the business case of clean technologies** by identifying the potential business opportunities in the construction sector which is critical for its sustenance and continuous development. It is also pertinent keeping in mind the Indian government's stance towards resource efficiency, circular economy and sustainable development.
- **Creating strategies for development of small and medium scale enterprises (SMEs)** for competitive positioning.
- **Promoting awareness on clean technologies** in the construction sector among varied stakeholders to bolster efforts in the right direction.

As compared to traditional fired clay bricks, the fly-ash brick technology is a clean and eco-friendly technology which entails high compressive strength, low water absorption and can be moulded into uniform shapes and sizes. According to an analysis conducted by Development Alternatives, the envisaged benefits from manufacturing 3 billion fly-ash bricks annually in Bihar are as follows:

- ✓ Conservation of fertile soil: *8.4 million tons of fertile soil saved per year*
- ✓ Increased utilisation of fly ash: *4.5 million tons of fly-ash utilized per year*
- ✓ Carbon mitigation: *2.02 million tons of CO_2 mitigated per year*
- ✓ Conservation of coal: *0.63 million tons of coal saved per year*

Fly-ash bricks: A case study of Bihar

Bihar is one of the fastest growing states in India. Since 2011-12, the growth rate of Gross State Domestic Product (GSDP) of Bihar has been witnessing a rising trend, growing by a CAGR of 12.3% (compared to a national average CAGR of 5.92%). In fact, the GSDP of Bihar is one of the highest among all Indian states. The following trends are noticeable in the state of Bihar:

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- **Rising importance of the construction sector**: Amongst many sectors in Bihar, the construction sector is also one of the significant sectors in the state as it constitutes 9% share in the GSDP and is a major source of employment in the state considering the nature of work involved.

- **Increasing the importance of fly ash utilisation**: There is an increasing trend of fly-ash usage in various value-added products such as geo-polymers, bricks, cement, ceramics and road construction. Particularly in the state of Bihar, an enhanced utilization of fly-ash in brick making is noticeable.

- **Policy thrust to transit to cleaner technologies in brick making**: In March 2018, the MoEF&CC released a notification for adoption of cleaner technologies for brick making processes. Following this notification, the Bihar State Pollution Control Board (BSPCB) has made it mandatory for all existing brick kilns to adopt cleaner technologies for brick making. Accordingly, there is an increased shift from conventional red brick kilns to cleaner technologies, by either adopting fly ash brick making processes or implementing zig-zag /vertical methods of brick making.

- **Business case for fly-ash bricks:** The state of Bihar has a total installed thermal power capacity of 4.77 GW. Combined, these 4 thermal power plants produced 7.38 million tons of fly ash in 2017-18 which is expected to increase to 22.57 million tons by 2020-21. However, only 42.78% (3.16 MT) of the total fly ash generated in the state has been utilised so far. Generation of fly ash, a waste from the thermal industry adds additional responsibility on the thermal power plants over its handling and final disposal. Given the low utilization level of fly ash in Bihar, there is enough scope for manufacturing fly ash bricks and gain market share in the overall brick industry in the state. Hence efforts need to be channelized in creating a market by addressing the existing gaps in demand and supply.

Investment for Impact in the fly-ash brick sector of Bihar

At present, there is enough fly ash available in Bihar to produce about 7 billion bricks per year. This has led to the development of several fly-ash brick making units in the state. Persistent research efforts by Development Alternatives in this sector has revealed that a large number of these existing fly ash enterprises are either non-functional or have shut down due to lack of market demand and adequate financial support. Fly ash brick makers face several barriers including lack of market demand, negative mindset regarding fly ash bricks, lack of fiscal incentives, problems associated with fly ash sourcing and inadequate mechanisms for compliance to existing regulations.

TGY 2019 seeks to bring together policy makers, research institutions, civil society, fly-ash associations, public sector undertakings (PSUs), financial institutions and international organisations to provide a hands-on experience for comprehending the potential advantages of fly-ash bricks vis-à-vis other clean technologies in the construction sector of Bihar. Additionally, it seeks to decipher the financing opportunities available to enterprises in transitioning to a green economy.

Specific answers will be sought for the following questions:

- How to incentivize uptake of fly-ash bricks enterprises?
- What role can financial institutions play in supporting fly-ash enterprises?
- How can the usage of fly-ash bricks be increased for the affordable housing segment?
- How can multi-stakeholder efforts create market for fly-ash bricks?
- How can these efforts be scaled up to the national and global levels?