OVERVIEW

ROADMAP FOR SUSTAINABLE AND ENERGY EFFICIENT BRICK PRODUCTION IN BANGLADESH

WHAT IS THE PROBLEM?

THE ISSUES IN BRIEF

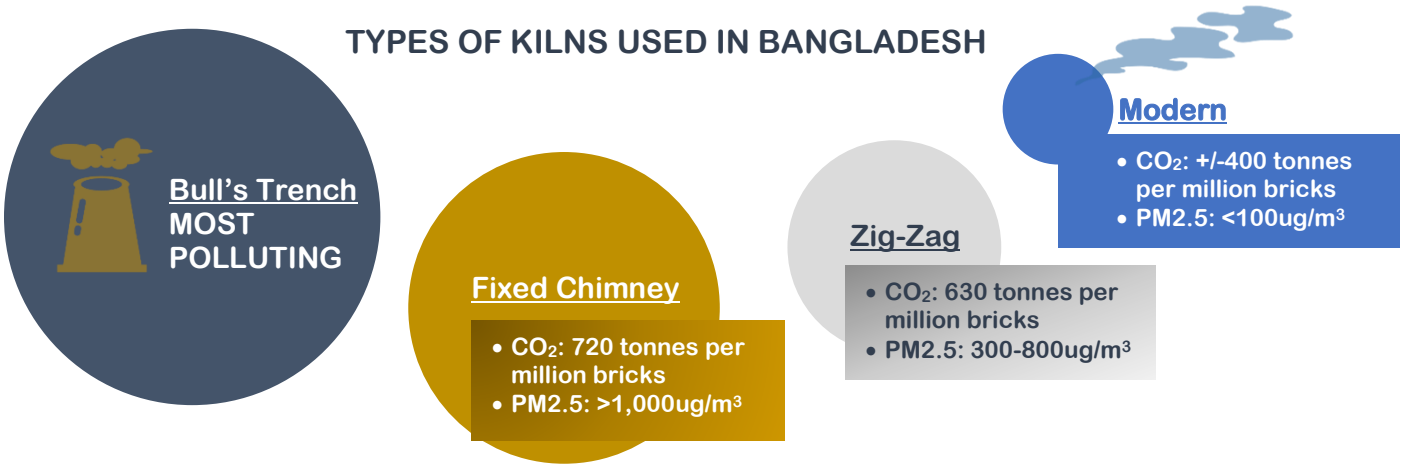
Bricks are an indispensable resource for Bangladesh's rapid infrastructure development. One of the reasons for this is that there is a lack of naturally occurring stone in the deltaic region.

Making bricks by heating clay blocks in coal fired kilns is widespread. However, due to the use of inefficient, traditional firing technology, brick production in Bangladesh is a major emitter of carbon dioxide, and the country's largest source of air pollution.

The typical production process also sources valuable clay topsoil from agricultural land, contributing to its depletion. Brick production is expected to continue growing at about 5% per year, serving as an essential component Bangladesh's booming construction industry.

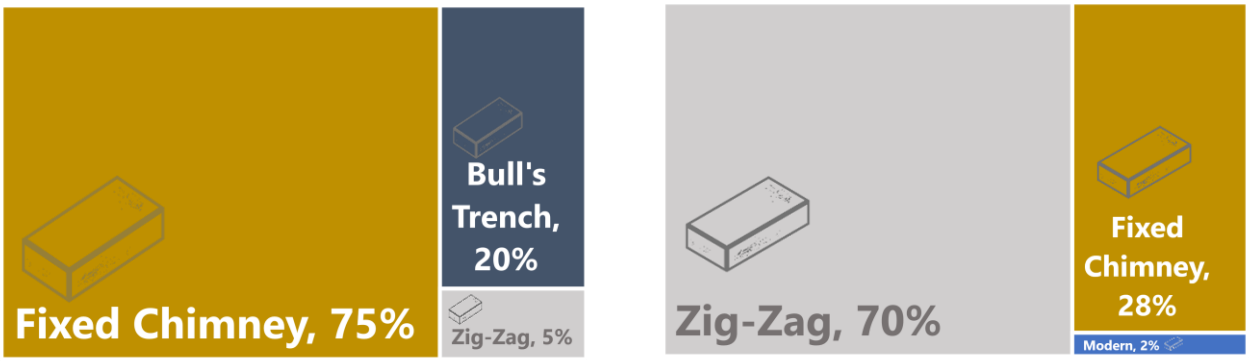
CARBON DIOXIDE (CO_2) AND AIR POLLUTION FROM BRICK KILNS

Currently (in 2019) 91% of bricks produced in Bangladesh are made using highly polluting traditional firing technology. While government regulations from 2006 to today have successfully driven traditional kiln owners to implement reforms to reduce emissions, the emission reductions have not yet dropped to levels that are desirable for human health and the environment. The following graphic shows the different kiln types and their corresponding CO_2 and air pollution (i.e., particulate matter, or PM2.5 for short) emissions.

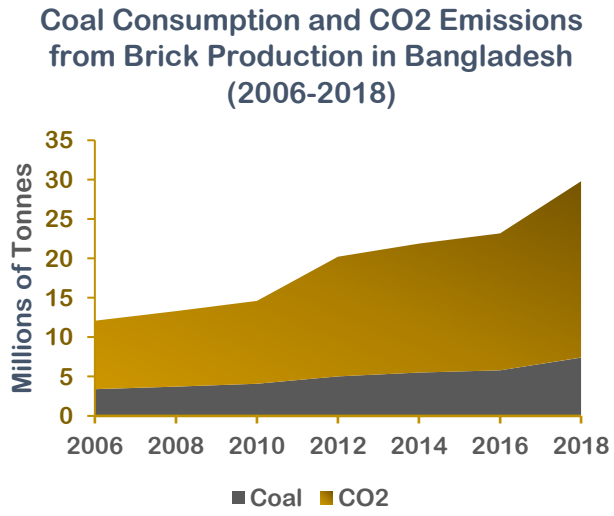


MARKET SHARE OF DIFFERENT TRADITIONAL TECHNOLOGIES

Government of Bangladesh environmental policies have shifted brick production toward less polluting types of kilns:



However, CO_2 and PM2.5 emissions have not reached desirable levels:



In 2018, average daily PM2.5 concentrations surpassed healthy levels during the winter months when brick production occurs, and routinely reached levels considered hazardous for human health. Historical PM2.5 trends were equally high.

The 2018 World Bank report *Enhancing Opportunities for Clean and Resilient Growth in Urban Bangladesh* stated:

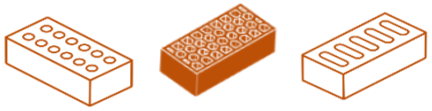
"Based on data from 11 continuous air quality monitoring stations in eight urban areas, the urban population-weighted annual PM2.5 concentration is estimated at 80ug/m^3 for 2013-2015, more than five times the Bangladeshi standard and **eight times the World Health Organization (WHO) guideline**. The source apportionment undertaken by the Department of Environment identifies vehicles and **brick kilns** among the key sources."

In addition to these challenges, Fixed Chimney and Zig-Zag kilns have multiple undesirable features in comparison to more modern kilns, such as:

- **Depletion of valuable topsoil on agricultural land**
- **Inability to produce more environmentally friendly hollow bricks**
- **Lack of potential for economies of scale**
- **Lack of labor regulations**

WHAT ARE THE ALTERNATIVES?

ENERGY EFFICIENT KILNS



Examples of different types of hollow, or perforated, bricks

The two types of modern kilns with the most potential in Bangladesh are Hybrid Hoffman and Tunnel kilns. These two types currently make up only 9% of the market share of brick production. While both these kilns require the use of coal (due to a shortage of natural gas in Bangladesh) they use less coal than traditional kilns and, when designed and operated by skilled technicians, release much less CO_2 and PM2.5. They also do not require the use of agricultural topsoil and can produce bricks using renewable raw materials, such as sand, river dredge, and riverbank soil. Furthermore, energy efficient kilns operate year-round and have a higher production capacity than traditional kilns. Since one Hybrid Hoffman kiln can replace five traditional kilns, and one Tunnel kiln can replace 8-10 traditional kilns, transitioning to energy efficient kilns would occupy less land (thus freeing it up for agricultural production) and would be easier to regulate.

Another advantage of energy efficient kilns is that they have the capability of producing hollow, or perforated bricks, which have 25% less mass, require less energy during firing, and have good insulation properties. In both China and Vietnam, energy efficient kilns make up 70-75% of brick production, while the remainder of the market demand is met with non-fired bricks.

NON-FIRED BRICKS

Non-fired bricks are the most environmentally friendly option as they do not require the burning of coal. Bangladesh's Housing and Building Research Institute is a leader in design and marketing of non-fired bricks using locally available, renewable raw materials, including fly ash, stones, gravel, sand, riverbank soil and river dredge. The most important components of expanding the market for non-fired bricks are the availability of raw materials, design methods, and marketing. Currently in Bangladesh, two types of non-fired bricks have the most potential for growth. These are Compressed Concrete Blocks and Aerated Autoclaved Concrete Blocks. For Compressed Concrete Blocks, production capacity has limitations due low availability of stone—it is estimated that they will not be able to occupy more than 25% of the total brick supply. However, with significant investments in production and market potential for other types of non-fired bricks, including Aerated Autoclaved Concrete Blocks, non-fired bricks may be able to supply up to 50% of the future demand for bricks.

In addition to investment capital for new kilns, major investments will be required to build technical capacity for an effective technology transition.

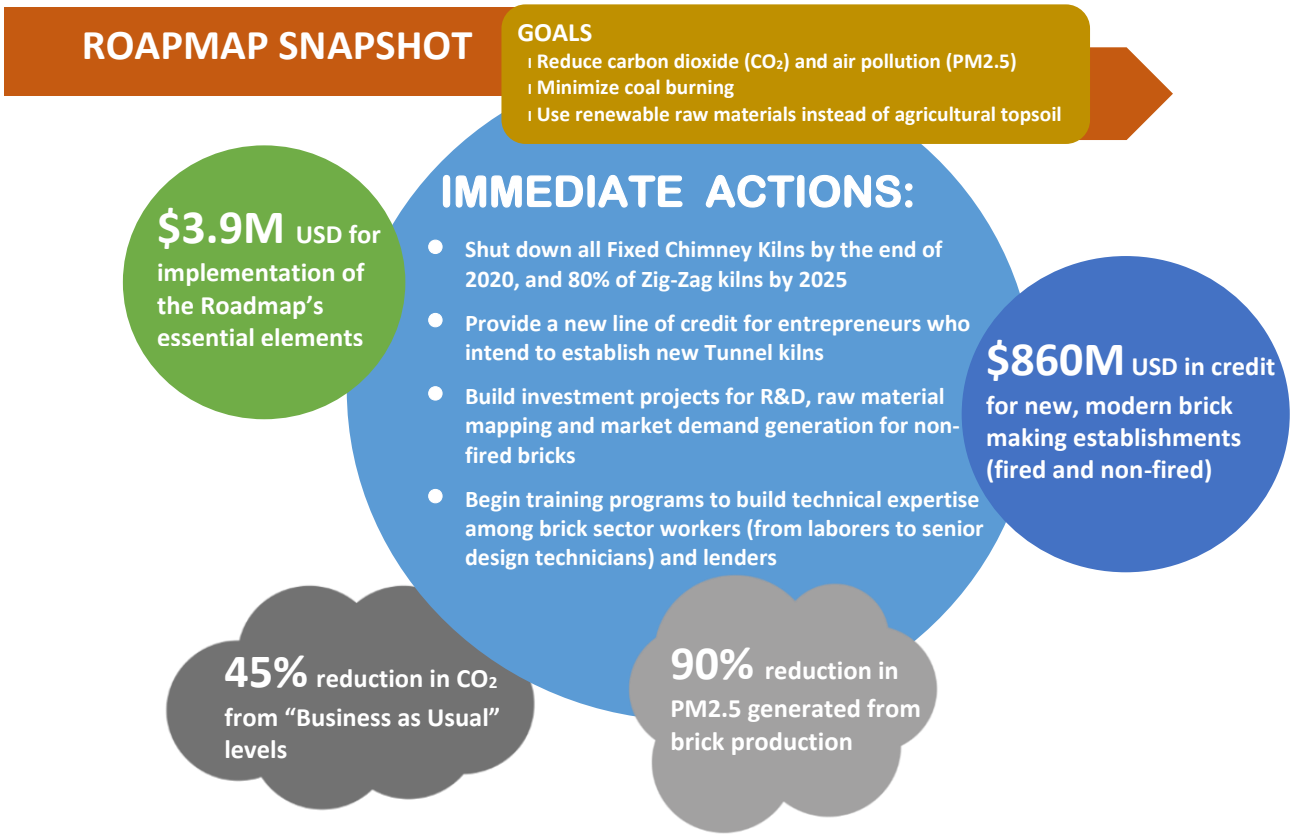
This is necessary among kiln design technicians, brick workers and credit lenders.

Significant investment in raw material mapping and research into design and production options for non-fired bricks will be critical.

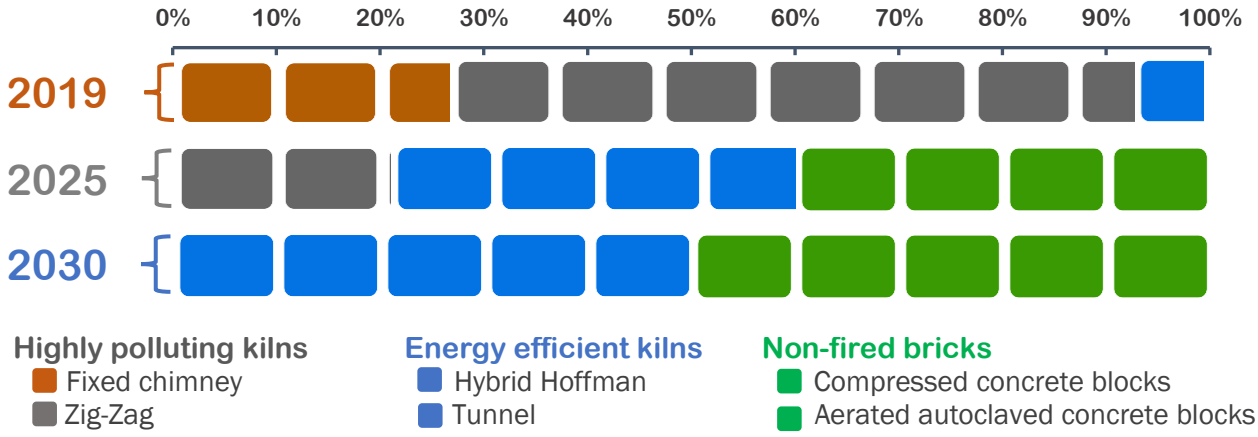
TECHNOLOGY TRANSITION PATHWAY

THE ROADMAP

The global Climate and Clean Air Coalition developed a Roadmap to guide the Bangladesh brick production sector's transition to sustainable and efficient technology adoption. Implementation of the Roadmap will require carrying out a set of immediate and urgent actions. A top-level snapshot of the Roadmap, with estimated costs, is as follows:



TECHNOLOGY TRANSITION TIMELINE →



Strategic Objective 1: Strengthen the Policy Environment

- Declare brick production an INDUSTRY to streamline licensing and oversight
- Collect geocodes for all brick kilns to better track and enforce licensing requirements
- Amend the Brick Manufacturing and Establishment Act 2013 to 1) clarify rules for raw material sourcing and transport, 2) adjust guidelines for coal quality monitoring, and 3) institute incentives for clean technology
- Update National Building Code to encourage use of sustainable, non-polluting building materials
- Extend regulations across the value chain to incentivize environmentally friendly production

Strategic Objective 2: Enhance Energy and Resource Efficiency

- By 2030, phase out traditional brick kilns that burn coal inefficiently and rely on clay topsoil
- Develop standards for non-fired brick products to facilitate their market entry and growth
- Conduct a national mapping of raw materials for fired and non-fired bricks
- Promote and incentivize more environmentally friendly hollow bricks
- Invest in research and development on new raw materials that can replace clay

Strategic Objective 3: Facilitate Access to Finance and Incentives

- Invest in financing the development of a range of non-fired brick technologies
- Establish credit channels (for +/-$350 million USD) to fund the establishment of new, energy efficient auto brick kilns, thus increasing their market share
- Provide seed funding to traditional brick kiln owners for livelihood alternatives
- Create financial incentives (e.g., preferential tax and/or interest rate options) for clean production

Strategic Objective 4: Capacity and Institutional Framework

- Launch a national brickmaking training center
- Increase public awareness of energy efficient and non-fired bricks, including technology and production options
- Establish a raw material testing laboratory to ensure the availability of appropriate, investment grade materials for the sector