

Catalyzing Emissions Reduction in Brick Manufacturing in Bangladesh

Objective

Pilot a practical strategy to reduce the emissions and improve working conditions among brick manufacturers in Bangladesh

Problem statement

Bricks are an essential building material in Bangladesh. With its steady economic growth and young population, 25 billion bricks were manufactured and sold in Bangladesh in 2015. This market is projected to triple within the next decade. Unfortunately, 85% of these bricks are manufactured using inefficient coal fired brick kilns that generate enormous quantities of black carbon, carbon dioxide, and small particulate matter (PM_{2.5}). The annual global radiative forcing generated by the black carbon and greenhouse gases emitted by brick kilns in South Asia is equivalent to the radiative forcing emanating from the entire US passenger car fleet.¹

Prior efforts to reduce emissions from brick kilns have focused primarily on constructing expensive tunnel kilns with designs similar to kilns in high income countries.² These modern kilns generate lower emission per brick produced, but the bricks made in these kilns cost 40% more per brick than bricks made in traditional kilns.³ At this premium price bricks manufactured in these expensive kilns capture <15% of the market.^{4,5} Consequently, the large majority of bricks are still manufactured in small, less efficient kilns. Transport costs also favor small traditional kilns. Bricks are inexpensive to manufacture, but heavy and so expensive to transport, especially on poorly maintained roads in South Asia. Thus, the market for bricks is dominated by small kilns that manufacture bricks near buyers.

Traditional kilns are profitable businesses. They require 90-95% less capital to establish than a modern kilns. Initial investments are recouped within two years and the annual return on investment is 80%.³ Although government-sponsored schemes are available for upgrading to modern kilns, most current brick manufacturers lack sufficient collateral to borrow for such investments, and have little motivation to move beyond their successful business model.

Brick kiln workers are most commonly seasonal migrants from more impoverished rural areas in Bangladesh who are contracted through middlemen. The workers are paid the bulk of their salary in advance, and are then committed to work the entire brick kiln season. Because kiln workers are usually illiterate, they are unable to understand or contest the labor overseers accounting of their production, debt and earnings.⁶ These labor contracting middlemen retain a disproportionate percentage of the kiln owners labor costs. This bonded labor model, where laborers do not have the option of leaving if they find working conditions too egregious, is widely viewed as exploitative.⁶⁻⁸ Child labor has been frequently documented.^{6,9,10}

Our proposal

We propose to work with current brick kiln owners and offer a suite of progressive interventions that simultaneously reduce both emissions and coal costs. These will include various steps to improve combustion efficiency including mixing coal dust with the clay, approaches to better match coal feeding with available oxygen and altering the chimney and brick layout to optimize airflow. Intervention kilns will employ a workforce that is trained and recruited through a trusted labor intermediary that forswears bonded labor and provides regular monthly pay of at least the minimum wage. We will offer loans for the kiln upgrades that would be repaid from improved profits generated by reduced costs. We will cultivate relationships with kiln owners so after they experience success with one upgrade, we can motivate them to invest in further upgrades that progressively reduce emissions.

As the kiln upgrades roll out over a larger geographic area, a separate assessment organization (icddr,b) will conduct unannounced assessments to evaluate if the upgrades are in place and procedures being followed. They will assess the impact on emissions by measuring the ratio of carbon monoxide to carbon dioxide in the exhaust gas while simultaneously capturing video of the coal feeding process over a 24 hour period.

We envision funding the brick manufacturing sector transformation through three sources. First, we are seeking catalytic philanthropic funding to support the initial phase of piloting the interventions in fewer than 10 kilns in Bangladesh. This will allow us to measure the effects of the intervention and provide model sites for kiln owners, the government and other stakeholders to observe. The second line of funding will come from social impact investors who will provide capital to BRAC Bank who will then make loans to brick kiln owners for upgrading their kilns. Kiln owners will repay these loans with interest. Third, we will seek global climate mitigation funding based on the documented reduction in black carbon. We will use the climate mitigation funds to ensure sufficient oversight so that implementations meet efficiency and climate objectives as well as underwriting the ongoing process of sector transformation.

This sector transformation project complements ongoing Government of Bangladesh efforts to support the development of modern high-efficiency kilns, by providing a pathway for continuous quality improvement among the remarkably successful small kilns owners who dominate the market. In the intermediate term, we anticipate the demand for bricks to remain strong, but by progressively improving the manufacturing process this project will reduce overall emissions.

We envision three project phases. In phase I (2 years) we will conduct a demonstration project in up to 10 kilns. This will reassure the Bangladesh Department of the Environment, the Bangladesh Brick Manufacture Owners Association and other stakeholders of the business and environmental performance of these upgrades. In Phase II (1 year) we will expand the intervention to an additional 30-45 kilns. In Phase III we would progressively scale, initially to 200 to 300 nearby kilns and in the subsequent years nationally through funding secured from global climate donors. We are currently seeking \$4.6 million to support Phase I and II.

Appendix

Organizations

We have assembled a consortium of institutions with the skills and capacity to transform the brick manufacturing sector (Figure 1). Stanford University, a leading research university that is committed to addressing the great environmental problems of our time, will coordinate and oversee the project. Stanford Professor Stephen Luby who lived in Bangladesh for eight years and has been conducting research in Bangladesh for 16 years, will oversee the project. Greentech Knowledge Solutions, based in Delhi, is the technical leader in South Asia on working with current brick producers to improve manufacturing so that it is more energy-efficient and less polluting. BRAC delivers a range of technically sophisticated programs to improve health, education and economic prospects in 40,000 communities across Bangladesh. They are skilled at managing national level programs. They have experience in construction, banking, business development and loan recovery. icddr,b is an international research organization based in Bangladesh that has broad experience conducting research aimed to improve the health of the people of Bangladesh.

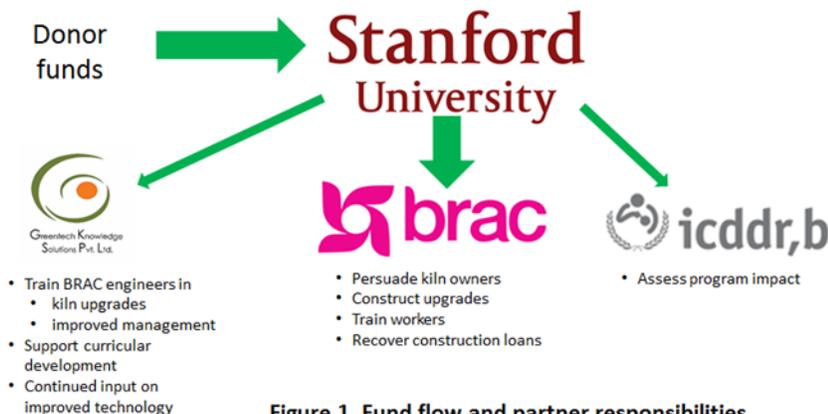


Figure 1. Fund flow and partner responsibilities

References

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