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Building local climate knowledge

Challenges of transition to low carbon technologies in brick manufacturing in Bangladesh

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The context

- Brick manufacturing sector is an important economic activity of the country.
- Has long been recognised in academic and policy domain for damaging impacts on environment; threat to human health, agricultural productivity and cause global warming.
- Despite taking various policy attempts for a transition towards low-carbon technologies since 1989, no tangible success has been achieved so far.
- 95% of brick kilns still employ polluting technologies (World Bank, 2011, p 14; Darain et al. 2016).

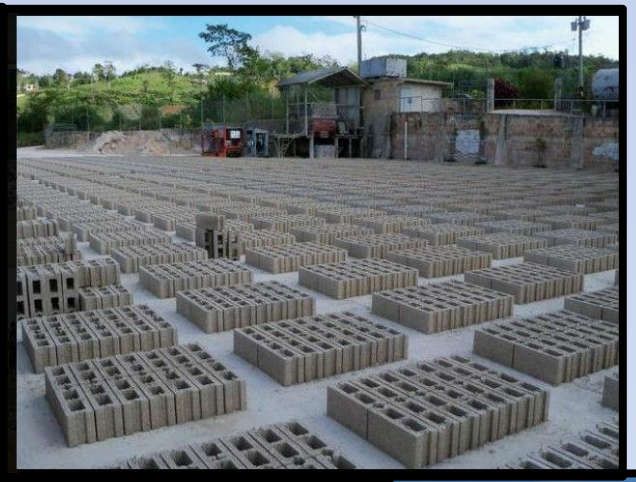
The context

- Contributes 1% in country's GDP and employs more than a million people (KPP, nd, p 1; WB, 2011, p. 8).
- Grown at an average of 5.6% a year between 1995 and 2005 (WB, 2011, p. 8).
- Entirely run by the private sector and dominated by small-scale brick kilns.
- Not recognized as industry in Bangladesh as they mostly operate in small-scale in rented land without having substantial fixed-assets; produce and provide employment only for six months in dry season (November to April). This restricts them from accessing industrial financing facilities.

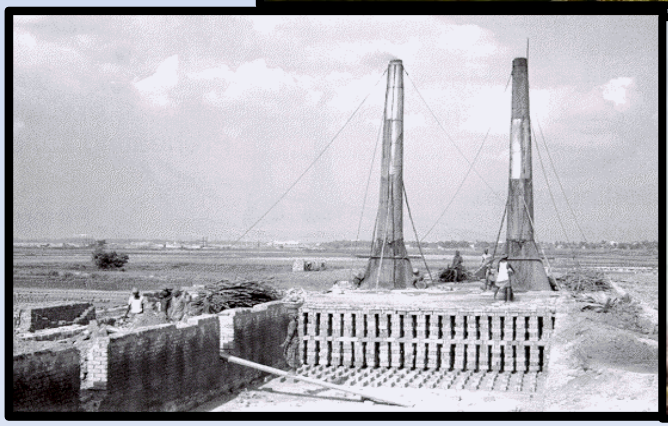
The context

- Use energy-inefficient and high-emitting conventional technologies. Coal and firewood are the main fuel to fire bricks.
- Contributes to global warming as it annually consumes 4.78 million tonnes of coal and emits 11.59 million tonnes of CO2 (ADB, 2016, p. 6).
- Is a major source of coarse and fine particulate matter (PM) fractions in Dhaka causing an estimated 2,200 to 4,000 premature deaths and 0.2 to 0.5 million asthma attacks per year (Guttikunda and Khaliquzzaman 2014, p. 103).
- Causes extraction of fertile top-soils from agricultural lands to be used as the sole raw material of bricks. To manufacture 17 billion bricks, around 45 million tonnes of fertile soils are used every year, which is equivalent to 2600 hectares of agricultural land (Bharadwaj and Bhattacharjee, 2015, p 1).

Hybrid Hoffman Kiln



Sand Cement Blocks



Bull's Trench Kiln

Fixed Chimney Kiln

Zigzag Kiln

Sources: Different free access websites

Key research question

- What are the challenges of transition to low carbon development in the brick manufacturing sector of Bangladesh?

Limited academic research attempts to identify why the brick manufacturing transition has so far failed. Studies basically focused on the impacts of the polluting technologies and technical and financial feasibility of few modern fired-brick manufacturing technologies, ignoring alternatives like non-fired-brick technologies. But without identifying social-political barriers and the challenges of the system holistically, it is unrealistic identifying the way forward to facilitate and expedite the transition.

Methods

- The study uses the strategic niche management (SNM) approach as its theoretical framework to analyse the challenges in transition process from a holistic perspective incorporating different social, economic, technological and institutional dimensions.
- This approach is appropriate as it emphasises on systematic analysis of policies and social practices that support innovation and socio-technological changes towards sustainable socio-technical regimes; going beyond technological invention.
- The research uses case study approach through KII (7; semi-structured) selected from the relevant government and NGOs and private sector working on low-carbon brick technologies in Bangladesh
- Both academic and 'grey' literature are also used as secondary sources of data.

Specific sub-questions

From the theoretical perspective of SNM, the research question is explored based on five specific sub-questions:

1. What protective space is there for supporting the low carbon brick technologies to evolve and compete with the existing socio-technical regime?
2. How experience and learning are reflected in the development of low carbon brick technologies?
3. What role does the actor network play in low carbon brick technology development?
4. What role expectations play in low carbon brick technology development and how far visions corresponds to those expectations?
5. How learnings are adopted in the institutions and contributed to low carbon brick technology development?

Key findings

Table 1: Policies, laws, and regulations in brick sector of Bangladesh

Year	Policies, laws, regu.	Govt. res	Attributes	Observations
1989	The Brick Burning (Regulation) Act of 1989	DoE, MoEF	-First brick-making related law -partially banned the use of firewood -introduced licensing	-Use of firewood largely discontinued, except in remote areas
1992	Revision of the Brick Burning (Regulation) Act of 1989	DoE, MoEF	-fully banned the use of firewood -gave licensing authority to the DC -introduced both fine and jail for law breaker	-seniority of enforcer of the regulation and severity of penalty increased
2001	Revision of the Brick Burning (Reg.) Act of 1989	DoE, MoEF	-Amendment of 1989 Act -Put restriction on location of kilns	-Location criteria not possible to implement in reality. -location requirements have not been enforced.
2002	Brick Burning rules	DoE, MoEF	-First attempt to change technology -made the use of 120-ft chimneys compulsory.	-successfully enforced, especially near urban areas -BTKs upgraded to FCK -some continue to operate illegally
2007	GOB Notification	DoE, MoEF	-No environmental clearance certificates unless shifted to alternative fuel and improved technologies by 2010.	-not implemented -no activity to facilitate the switch
2010	GOB Notification	DoE, MoEF	-FCK operation banned from 2013	-Activities undertaken under GOB's CASE project with WB support
2013	Brick Making & Kiln Establishment (Control) Act 2013	DoE, MoEF	-Defined HHK, Zigzag, Vertical shaft, Tunnel and similar other technologies as modern brick kiln technology - recognized concrete compressed (non-fired) bricks -exempted license to concrete compressed encourage bricks -made use of 50% hollow brick mandatory -banned the use of top soil of agricultural land -restricted use of coal	-The modern kiln technologies mentioned are not equally applicable -loophole remained in banning the use of top soils -Mentioned only about concrete compressed brick blocks as non-fired options -Did not give adequate focus on non-fired bricks as a whole
2015	7thFYP 2016-2020	HBRI, MHPW	-substitute conventional bricks with brick alternatives by 2020 to stop extraction of top soils of agri land.	-No significant progress in research -not fully compatible with the Brick Act 2013
2015	Landuse Act	MoL	-banned use all agricultural land for industrial purpose, including the brick kilns	-Act not passed yet

Is there any protective space to support the LC brick technologies?

The findings show that there is lack of adequate protective spaces for the LC technologies to evolve. Policies, R&D and financing mechanism largely failed to provide that protective space.

- The policies and regulations on bricks went through changes frequently with an expectation to encourage a shift towards low-carbon technologies. However, changes in regulations were not strictly enforced in reality.
- The regulation on the location of kilns is also widely claimed as impractical to comply with.
- Specifying few technologies as 'modern kilns' in 2013 Act also restricts the development of other LC technologies.
- The target of replacing fired-bricks with non-fired bricks by 2020, made in 7thFYP is not supported by any corresponding law to implement it, or any phase-out plan for the fired-bricks to help non-fired bricks evolve in a protective space.
- Different public and private financing available since 2015 for creating protective space for LC non-fired technologies are highly inadequate to achieve the expectation.

Do experience and learning are reflected in the development of LC brick technologies?

While few of the learnings could be interpreted into action to give protection to the LC technologies, many of the learnings could not create any impact because they are uncoordinated and not widely disseminated and recognised.

- HBRI is engaged in pilot experiments to increase awareness for its social acceptance and promoting debates to facilitate the process of policy making. However, it has some institutional limitations in R&D which prevents it from widely generating learnings for niche building.
- The 2013 Act is identified as going through a process of explorative experiments; the technologies prescribed in the Act are not comparable to each other in terms of economic and technical feasibility; irrational restriction of locations.
- DoE initiated to revise the Act, making the clauses on location of kilns more flexible, and allowing any advanced low-carbon technology. However, the proposed revision of the Act has not got approval by the cabinet division (*as of June 2017*).

What role does the actor network play in LC brick technology development?

The actor networks (like the producers, users/ non-users, regulators) are found as fragmented, not organised and matured enough to strongly contribute in LC tech development by rising expectations and creating demands through exchange of knowledge and interactions.

- Bangladesh Brick Manufacturers and Owners Association (BBMOA) who basically works for protecting the business interest of fired-brick manufacturers, provide important critical feedbacks to policies protecting the development of LC brick technologies.
- There is a formal actor network, created by a joint pilot project between a NGO and HBRI, to promote the niche technology of non-fired bricks, which includes representatives of brick producers (fired and non-fired) and consumers from both public and private sectors, authorities of environmental protection, green financiers, and environmental activists. It has potentials but at an initial stage.
- There are other actors like media and environmental activists who are non-users of the regime technology but affected by the environmental impacts caused by it. Play a strong catalytic role in creating demands.

How does the target and means of achieving that target contributed in the transition process?

While the expectation is to shift the brick-making technologies towards low-carbon brick options, there lacks any clear vision on which steps to be taken to achieve that expectation. The expectation also remains weak as the process of LC niche development goes through continuous explorative and pilot experiments and learning mainly at regulatory level, based on a loose interaction between different actor networks.

- Repeated revisions and changes in policy and regulations itself is an indication of unstable vision. The 1989 Act on brick making went through a series of changes. The revision process of the latest 2013 Act was also started within two years of its enactment.
- The visions for achieving the expectation also have some contradictions in it. Some coordination gaps are identified among ministries with regards to policies on using top-soils of agricultural lands in brick manufacturing.

None of the relevant government ministries, including HBRI who has a major responsibility in facilitating the shift towards non-fired brick technology, believe that it is possible to achieve the 2020 target.

How learnings are adopted in the institutions and contributed to the LC technology development?

Previous discussions have shown that the policies and practices interacted with each other to create the institutional environment for supporting LC brick technologies are mostly dysfunctional.

- A major challenge at institutional level is lack of technical capacity at local level to measure and monitor pollutions from bricks kilns and assess the technological efficiency, which discourage the kiln owners to invest in LC technologies.
- Inadequate emphasis on engaging different actors in R&D to generate learnings for developing niche is also a major institutional limitation.
- Another institutional disincentive for the growth of LC technologies is that the cost of compliance or converting to LC brick technologies is significantly higher than by bribing the local authority to evade laws or even paying the fines, which are rarely imposed.

Recommendations to overcome the challenges

Recommendations

- An inclusive policy development process through active involvement of kiln owners, consumers, environmental activists, policy makers and any other relevant actors should be in place to ensure inclusion of the lessons generated through experiments and learning in policies. Ensuring such comprehensive process will verify applicability of a policy, avoid rise of any adversarial relationship between actors and will increase trust, cooperation and a common understanding about the expectations and visions.
- Clarity and consistency on visions are also essential for achieving expectations and development of a niche.
- Creating an enabling situation for the actor networks to share lessons and reflection of those lessons in policy instruments can contribute to enforcement of the regulation and ensure policy certainty avoiding frequent changes and contradictions in policy.
- A protective space should be created for the niche technology to evolve through providing different incentives, technical and financial capacity development support to the brick kilns in phase-out and transition process. A special attention should be given in this regard to small kiln owners as they have lesser capacity yet play an important role in infrastructure development for the poor consumers living in remote communities.

Cont…

Recommendations

- Creating market for the LC bricks through consumption of those bricks in government constructions can also play an important role in the protection of niche. This will raise awareness and trust among the private consumers as well.
- Giving new license contradicting with expectation and visions should be stopped as otherwise, the kiln owners will be at risk of losing their investment.
- Special emphasis should be given on building technical and institutional capacity of the regulatory institutions like DoE and DC office for appropriate monitoring and enforcement of the policies and regulations. Institutional capacity of the research organizations like HBRI should also be increased by adding an extension department to it so that it can disseminate and apply its research outcome in real-life setting. Without strengthening of HBRI, it is very unlikely for the institute to be able to perform its responsibility to materialise the 2020 target.
- More focus should be given on R&D and assessment of economic, technical, social, political and environmental feasibility of any technology, before incorporating it into policy planning.

Thanks!

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