

Mid-Term Review

Bangladesh Green Brick Project IKEBMI

(Increasing Kiln Efficiency in the Brick Making Industry)

**United Nations Development Programme (UNDP)
Global Environment Facility (GEF)**

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Acronyms, Abbreviations, and Other Definitions

ADB – Asian Development Bank

ATLAS– UNDP financial management system

AWP – annual work plan: plan with budget prepared annually for UNDP projects.

BABMA - Bangladesh Auto-Brick Makers Association: an association 30 to 35 HHK and tunnel kiln owners.

Banolata: a project demo located in Natore that is operational, but no longer working with the project

BBMOA - Bangladesh Brick Making Owners Association: an association of traditional kiln owners purportedly numbering 6,000, of which 1,200 to 1,500 have paid dues at any one time

Brick Center: a sustainable entity the project plans to set up to serve the energy and environment related needs of Bangladesh’s brick sector

BMI – brick making industry: in this case, refers to Bangladesh’s brick making industry

BTK – bull trench kiln: an earlier and polluting brick kiln type. Since 2002, BTKs cannot receive environmental clearance in Bangladesh.

BUET – Bangladesh University of Engineering and Technology

CASE: World Bank environment-related project in Bangladesh. Project has a major component dedicated to cleaner brick production. The component focuses on developing and promoting small-scale kiln technologies.

CBN: project demo that has been commissioned but is not operational

CDR- combined delivery report: official UNDP report showing project expenditures

CEA - Clean Energy Associates: one of two key project partners

CO – UNDP country office

Cox’s Bazaar: a seaside town in Bangladesh known for its wide and long sandy beach

Demo – demonstration: In this document, “demo” refers to one of the demonstrations undertaken as a part of the project being evaluated.

DEx – directly executed project: UNDP term for projects implemented directly by UNDP rather than by a government partner

DoE – Department of Environment: Department under Bangladesh’s Ministry of Environment and Forests. The Department is responsible for enforcing environmental legislation and at present is the key government entity involved in Bangladesh’s brick sector.

Eco 2: project demo that was commissioned but is no longer operating

Eco 3 and Eco 4: two adjacent project demo kilns that were under construction, but with construction stopping midway. Equipment has arrived and is onsite.

EE – energy efficient or energy efficiency

EEK- energy efficient kiln

EE kiln – energy efficient kiln

FCK – fixed chimney kiln: Brick kiln type with 120 foot chimney that disperses pollutants over wider area than BTK. Bangladesh’s brick policy in 2002 called for replacement of BTKs with FCKs and this occurred on a wide scale over the ensuing few years.

FIs - financial institutions: In Bangladesh, refers to government-owned financial institutions, whereas private sector financial institutions in the loan business are referred to as banks.

GDP – Gross Domestic Product

GEF – Global Environment Facility

GGCA – Global Gender Climate Alliance: an organization that partnered with the project in providing gender training to brick kiln owners. It also supported training and other benefits for female workers at PDF B demo Universal.

GHG – greenhouse gas

GoB – Government of Bangladesh

hartal – general strike often held for political reasons. *Hartals* were frequent in 2013 in Bangladesh impeding business and project progress.

HHK - hybrid Hoffman kiln: an energy efficient kiln technology that uses heat from the kiln exhaust to dry the bricks. It is hybrid because, using coal as a fuel, the coal or part of the coal is placed in the bricks prior to firing.

HK – Hoffman kiln: an energy efficient kiln technology that uses heat from the kiln exhaust to dry the bricks. Often fueled with natural gas.

IDCOL – Infrastructure Development Company Limited: a government-owned financial institution in Bangladesh

IDLC – Industrial Development Leasing Company: a government-owned financial institution in Bangladesh

IKEBMI – Increasing Kiln Efficiency in the Brick Making Industry: the project being evaluated in this document. It focuses on increasing energy efficiency in Bangladesh’s brick sector.

improved zig-zag: Also known as “mini-HHK” this is a new small-scale energy efficient, low emission kiln design developed by XI for the World Bank CASE project. A demonstration is expected soon.

LOA – letter of agreement: In this report, it refers to the letters signed with project partners CEA and XI regarding payment for implementing the project.

Makrail: project demo that has been stalled waiting for loan approval for almost two years

M&E: monitoring and evaluation

mini-tunnel: This is a new small-scale energy efficient, low emission kiln design developed by XI for the World Bank CASE project and modeled after larger scale tunnel kilns. A demonstration is expected eventually.

MoEF – Ministry of Environment and Forests: Government of Bangladesh ministry responsible for the environment and forests, including legislation regarding these

MoI – Ministry of Industry

MTR – midterm review: an evaluation of a project taking place midway through its lifetime

NDC – project demo that has recently received financing and is moving forward

NEx – nationally executed project: UNDP term for projects implemented by a government partner in the country of execution

O&M – operations and maintenance

PDF B – project development funds B: A preparatory phase for GEF projects, which includes funding for project preparation.

PM – project manager: Leads the PMU of the project under review.

PMU - project management unit

prodoc – project document

PSC – project steering committee

PSI – pounds per square inch: can refer to the strength of bricks

RMB: Chinese currency, Chinese yuan

Scale-up Funds: funds of US1 million received by the project from UNDP Headquarters TRAC funding to set up Brick Center and expand efforts of project.

SMEs – small and medium-sized enterprises

SSL: A project demo that has been commissioned but is no longer operating

suo moto – “on its own motion”: used when a government agency acts based on its own authority rather than referring to other agencies

TA – technical assistance: a term for international development support entailing soft services as opposed to hardware

TAC – Technical Advisory Committee: a committee designated in the project document of the project under review to provide technical guidance to the project

taka – Bangladeshi currency, also known as BDT

Tianjin MIEC – Tianjin Machinery Import Export Company: a major Chinese import and export company with office in Dhaka. The company partners with project partners CEA and XI and is closely involved in the project, serving as the importer for most of the demos.

TRAC funds – Target for Resource Assignment from the Core funds: a type of UNDP funds allocated by UNDP Headquarters

tunnel kiln: highly automated brick kiln type. Investment is much higher than for HHKs; and employment is less.

UNDP – United Nations Development Programme

UNFCCC- United Nations Framework Convention on Climate Change

Universal: project’s PDF B demo. Also known as “Eco 1.”

VAT – value added tax

VSBK – vertical shaft brick kiln: a small-scale energy efficient brick technology. While one or two demos have been set up in Bangladesh, brick makers are hesitant to accept this technology as the bricks are not red enough to suit market preferences.

XI – Xian Institute: A Chinese design institute specializing in building materials. One of two key project partners.

zig-zag: Brick kiln type being promoted in Bangladesh as cleaner alternative to FCK. With the new Brick Act of 2013, most traditional brick makers in Bangladesh are looking at transitioning

from FCK to zig-zag. Yet, there is no standard design and stakeholders indicate most zig-zags do not meet Government emission requirements.

Executive Summary

Overview: The project brought the concept of energy efficient bricks to Bangladesh, stimulated substantial replication of the HHK technology, and indirectly promoted bank financing and policy support of cleaner brick technologies. Yet, only one of 15 demos targeted by the full-scale project is operational, three others have stopped operation, and two are in the pipeline. Demos were overemphasized in implementation to the neglect of other aspects of project design. Going forward, the project, via a PMU-driven process, should address these other aspects in the areas of technology assessment, policy, certification and technical support, and capacity and awareness building. Activities should be tailored to meet very specific needs identified in the MTR. Existing and pipeline demos (representing six different owners) should also be supported to the extent possible by the project partners and PMU without additional outlays of GEF funding. No new demos should be pursued. Brick Center establishment, as a means of achieving sustainable support, should be pursued in parallel with recommended project activities, which can be conducted under the Brick Center (either formally or informally) to build its brand and capabilities.

Bangladesh Brick Industry Background

- Majority of country's brick sector is traditional, small-scale kilns numbering 6,000 to 10,000. Operation is seasonal (dry season of about six months per year). Sector employs between one and two million people, a large portion of which are destitute migrants.
- While currently in a slump, the brick sector over the past few decades has grown at a significant clip to keep up with growth in the building and infrastructure sectors, which have averaged five percent growth annually.
- Sector considered one of the top sources of air pollution in the country and a primary cause of deforestation. Depletion of topsoil resources by the industry is also of concern.
- Prior to 2001, dominant brick kiln technology was BTK. Policy (2002) resulted in mass transition to FCK technology, which has higher chimney to disperse pollutants. Recent policy (2013) requires shift to from FCK to lower emission technologies including zig-zag (most popular option, a small-scale technology), VSBK (small-scale, has been piloted, but not accepted by Bangladesh brick makers), HHK (mid-scale technology supported by the project), or tunnel (highly automated mid or large scale technology).
- Key players in the brick industry include: traditional brick makers and their association, investors in HHKs and tunnel kilns and their association (generally a different demographic than traditional brick makers), government regulators (MoEF's DoE is regulator of air quality and main GoB player at present), service and equipment providers to HHKs and tunnel kilns, masons providing conversion to zig-zag services to traditional brick makers, debt providers to HHK and tunnel kilns, and international donors.

Project Background

- *Increasing Kiln Efficiency in the Bangladesh Brick Making Industry* (IKEBMI) is a UNDP-GEF project designed with duration of five years and GEF funding of USD3 million. Its purpose is to reduce energy consumption of and GHG emissions from Bangladesh's brick sector.
- Project concept met with strong enthusiasm due to very negative impacts (particular in air quality) of brick kilns in Bangladesh
- Project objective is to remove barriers that have so far inhibited adoption of cleaner and more efficient brick kiln technologies in Bangladesh.
- Project has six targeted outcomes each associated with one component: (1) Energy Efficient Kiln (EEK) Technology support program targets understanding of technology options (GEF budget of US450,519, CEA/XI responsible); (2) EEK Demo Program targets critical mass of demos to provide detailed information on EEKs (GEF budget of US1,107,680, CEA/XI responsible); (3) EEK Capacity Development Program targets improved capacity to manage and operate EEKs and EE practices (GEF budget of US564,546, CEA/XI responsible); (4) Communication and Awareness Program targets awareness of EEKs and EE practices (GEF budget of US75,000; PMU responsible); (5) EEK Finance Support Program targets availability of financing for EEK adoption (GEF budget of US255,906, CEA/XI responsible); (6) Policy Development and Institutional Support Program targets promulgation and compliance with policies to encourage EEKs and EE brick making practices (GEF budget of US161,996, CEA/XI responsible).
- To date, project has focused most of its efforts on introducing one technology, the HHK.
- Project also has components for: (7) Monitoring and Evaluation Program (GEF budget of US139,310, PMU responsible) and (8) Project Management (GEF budget of US245,043, PMU responsible.)
- Initial concept developed in late 2003 by UNDP and partners CEA and XI. PDF B approved in late 2004, implemented from June 2005 to March 2007 with GEF funding of US348,000. Main achievement was demo plant – Bangladesh's first coal-fired HHK –with 50,000 brick per day capacity. Capital costs financed by Chinese investors. Plant located on rented land.
- Late in submission process, GEF funding of full project was reduced from US5 million to US3 million. Changes were made in the prodoc's outcome budget, but not to any of its activities in the text. Almost 3 years after PDF B completion, prodoc signed in April 2010. Original close date (still in effect) is March 2015. LOAs with CEA and XI (which together were to be allocated 97 percent of activity-based funding) were signed in August 2010. PMU was set up in Dec. 2010. Inception workshop held in March 2011.
- In January 2013, project awarded US1 million in UNDP TRAC funds for "Scale-up" plan focused on establishing Brick Center. Brick Center was initially targeted to be set up by end of 2013 and "Scale-up" funding to be spent by end of 2014. Delays in Brick Center work have been due to changes in management at UNDP and a desire to consult stakeholders more widely on the plan.

- In 2013, there was significant political unrest in Bangladesh. For 156 work days, strikes (*hartels*) made it difficult to go to work and stalled travel to the field. The *hartels* were a significant factor in delaying progress in 2013, but the situation improved greatly in 2014.
- CEA/XI and PMU are the main organizations involved in day-to-day implementation. UNDP, as GEF Implementing Agency, provides guidance and back-stopping as needed. Project Board is responsible for oversight and major decision-making. The TAC, formed more recently, is responsible for providing technical advice to the project.
- LOAs assign broad responsibility to CEA and XI for five of the project's six activity-based components, but do not specify costing on a level more specific than the outcome level. In the first year, UNDP/CEA did not scrutinize delivery. Delivery was checked starting in the second year, but the costing proposed by CEA/XI was still not scrutinized.
- CEA has an office and permanent staff in Dhaka, though according to stakeholders only one engineer capable of supervising construction. XI has less of a presence, with one marketing person shared with Tianjin MIEC and an engineer, who does not speak English and spends several months per year in Bangladesh. XI indicates plans to base a full-time engineer in Dhaka going forward.
- PMU was initially staffed by four persons (PM who leads the office, Monitoring Officer, Communications Officer, and Finance and Admin. Assistant). In Oct. 2013, a Development Planning Officer was added. The PM has recently changed, with the new PM, who has strong business background, hired to drive launch of the Brick Center.
- CEA/XI are both members of the project board and (via the LOAs) contracted partner, a dual role that concerns some stakeholders.

MTR Purpose and Methodology

- Purpose of MTR is to (1) provide transparency and accountability for funds spent, (2) identify lessons learned from project shortcomings, and (3) make recommendations for course correction and the way forward.
- This MTR also took specifics of IKEBMI into consideration in planning its approach. These specifics are: (1) project difficulties with the demos (only one operational); (2) question of appropriateness of HHK technology (given that HHKs are not doing well financially, are too investment intensive for most traditional brick makers, and employ less people); (3) occurrence of substantial private sector development of HHKs outside the project (raising the question of whether the project was needed or in fact stimulated the activity); and (4) remaining funds (US\$1.3 million including UNDP TRAC funds) and gaps not addressed.
- Methodology is highly interview intensive. Following document review in October 2014, mission of 2.5 weeks conducted from Oct. 13 to 28, 2014. Over 40 interviews, including those with demo entrepreneurs, HHK entrepreneurs outside of the project, service providers, traditional brick makers, financial institutions, other donors/donor projects, government, project partners, UNDP, and PMU, were conducted.

Project Overall: Relevance and Positive Impacts

- High level of enthusiasm for project's overall theme is testimony of its relevance for Bangladesh. Alignment with national priorities is strong, as Government has concern about lack of viable options for lowering emissions from brick sector. As designed, project is strongly aligned with UNDP comparative advantage. A trend borne out by project is that UNDP introduces new concepts and technologies and then other donors pick these up with larger investments. Yet, UNDP comparative advantage in capacity building and other "soft" activity areas has not been leveraged due to overemphasis of project on its demos.
- An estimated minimum of 24 HHKs developed in Bangladesh outside the project are thought to be operational, with a total of 52 or more non-project HHKs including those in the pipeline. While attribution is difficult, analysis suggests at least half have some sort of link to the project. Some of these entrepreneurs began by consulting the project partners, others worked with service providers influenced by the project, and others heard about HHKs through the media (likely via the project's media campaign). Data suggests an uptick in cumulative HHKs in the country starting in 2010, when the full-scale project was launched.
- Interviews did not reveal a strong direct impact by the project on policy, but reasoning suggests at minimum, a strong indirect impact. Stakeholders point out that the new 2013 Brick Act specifically mentions HHKs, something that were not known to Bangladesh before the project. A policy-maker who believed the project had no impact on policy, related that he came to know about HHKs through a site visit. Yet, the site, while not a project demo, was one known to be influenced by the project in its early days.
- Impact on the media was substantial with 49 news stories and 20 electronic media stories published. A project media campaign on kilns in Cox's Bazaar led directly to the Bangladesh Supreme Court Ruling prohibiting kilns in ecologically sensitive areas of Cox's Bazaar.
- Probable indirect impact of the project on the banks and financial institutions is suggested by the aforementioned impact on replication. Many of the replication HHKs obtained debt financing from banks or financial institutions.
- Other donor involvement in bricks was likely stimulated by the project. While IKEBMI began PDF work in 2005 and its full-scale project in 2010, the World Bank first purchased HHK carbon credits in 2011 and initiated CASE project work on kiln technologies in 2012. ADB initiated low-interest loan facility for energy efficient kilns in 2012.

Project Overall: Negative Findings and Concerns

- Status of the demos is one of the most concerning aspects of the project. Only one full-scale project demo is in operation. Three commissioned demos are stalled. One pipeline demo has stalled while under construction, with equipment already on site. Two other demos are in the pipeline. One has just received its bank loan and is moving forward. The other has been stalled in getting its bank loan approved for almost two years now.
- Out of five demo entrepreneurs with whom we spoke, three expressed substantial dissatisfaction and upset with the way the project partners had handled implementation.

While MTR work reveals that major challenges are facing profitability in the HHK industry in general, findings also suggest issues with partner implementation have caused problems for entrepreneurs.

- At the same time the project partners were providing GEF-funded “soft support” to the demos for free, they were selling equipment and “turnkey solutions” to the demo entrepreneurs. Some stakeholders see this as problematic, while others see it as necessary in ensuring quality or addressing a new sector. There appears to be a lack of clarity of which services were provided by the UNDP-GEF project and which were part of turnkey, for-profit contracts entrepreneurs signed with the project partners.
- Support from the project partners was often not very timely and delays have hurt the entrepreneurs. The delays may have been due to lack of qualified staffing on the ground long-term in Bangladesh. In contrast, entrepreneurs working with another HHK service provider found response time to be very timely and satisfactory.
- Partner-provided cost estimates for the HHK projects were too low resulting in loans that were too small and unexpected needs for additional capital after investment decisions had been made. Sources indicate this has been a major problem for some entrepreneurs and that the cost-underestimate is for local construction, rather than equipment, which was quoted by the project partners at a relatively high price.
- Project partners may possibly have failed to adjust the HHK technology to the situation of Bangladesh, particularly its wet and humid climate. This may be related to the cost underestimates for civil works. Stakeholders point to kilns that are too small and drying facilities that are too limited to achieve promised capacities.
- Yet, the MTR revealed that most HHK owners and the industry as a whole are facing general challenges related to the introduction of a new technology.
 - The drying issue in Bangladesh’s wet climate is an ongoing challenge. Some service providers have introduced external heating (at least when raining) and claim they still achieve good energy efficiency. Project partners state this method is highly energy consumptive and polluting.
 - Market preferences, low brick prices, and lack of profitability hinder development of HHKs. The Bangladesh market prefers red bricks, so that 100% of the coal cannot be put in the HHK bricks as is done in China. The real estate market in Bangladesh has been depressed, driving down demand and prices. Some HHK owners are struggling to compete with traditional kiln makers who undercut them on price.
 - The skill level of workers, especially firemen, results in less efficient operations and higher costs. It has been difficult for Bangladeshi firemen to reach the skill level of their Chinese counterparts.
 - Low quality of available coal (imported from India) and lack of reliable electricity (which requires the purchase of costly generators) are challenges to HHKs.

- HHK owners believe policy support is too limited. Eligibility for eco-industry low interest loans is desired, as is a level playing field with traditional brick owners in VAT policy.
- Politically-related strikes in 2013 impacted the market and hindered the progress of HHK owners.
- Some stakeholders allude to HHK investors or potential investors diverting bank loan funds from HHKs to other purposes. The MTR, however, did not reveal firm evidence of this.
- Costing indicated by CEA/XI in their annual work plans was accepted at face value. All that was checked is whether they completed the work. A more effective approach might: (1) check that all the unit pricing adds up (so that project can be completed for the amount promised); (2) check that unit prices are reasonable as compared to market rates; and (3) define the specific work to be included in each item. Findings suggest costing of some activities was inflated and that project partners have thus been overpaid for their work to date.
- Over-focus on the demos is an important shortcoming of the project that should be rectified in the post-MTR phase. This over-focus on the demos has left many areas of true intent of the project unaddressed, although 76 percent of the partner-allocated funding has been disbursed.
- Selection of the HHK for the predominant focus of the project raises the questions: (1) Should the project have focused on only a single technology or on multiple technologies? (2) Was the HHK an appropriate technology on which to focus? The project document justifies HHK selection based on energy efficiency only, but does not consider potential adoption rates, high level of up-front investment required, or lower employment as compared to traditional kilns.

Outcome-Level Analysis

- Technology Support Program: Progress towards Outcome 1 (“understanding of technology options”) has been weak. Instead of focusing on developing a technical understanding of the various EE kiln options, activities instead focused on technical support of individual demos.
- Demo Support Program: Outcome 2 (“detailed information on EE kiln operations”) has been partially met, though, due to limited full-scale project operational demos, it is the PDF B demo that has provided the most information. Given the number of non-project HHKs operating in the country now, the project should reach out to these as potential partners in demonstrating HHK results in Bangladesh.
- Capacity Development Program: Outcome 3 (“improved capacity to manage EEKs”) was partially met in that the demos (and replications) have developed persons knowledgeable about running HHKs. Yet, more training is needed. The project did not develop any training modules nor did it train persons outside the demo HHKs.
- Communications Program: Outcome 4 (“enhanced awareness”) has been largely met in terms of increased public awareness of green brick technologies. Going forward, more focused awareness building is needed to address specific targets, particularly in the policy area.

- Finance Support Program: Substantial results with regard to Outcome 5 (“availability of financial support...of EEKs”) have been seen. This is in some cases a direct result of the project (loans to project demos) and in others an indirect result (loans to replications). Yet, because this component focused mostly on assisting individual demos achieve loans, needed training of the banks and financial institutions in EE kilns is lacking.
- Policy Development Program: The project itself did not make much direct progress toward Outcome 6, “promulgation of and compliance with favorable policies,” though it may have indirectly contributed to progress made. Very limited activities include brief comments on the draft Brick Act and a report on land degradation issues. CEA, as an individual private sector organization, may not have strong credibility for policy recommendations. UNDP via the PMU may be the more appropriate party to work on such things.

Expenditure Analysis

- As of Nov. 30, 2014, GEF funds are 83% spent with US\$13,961 remaining. UNDP Scale-up funds are 20% spent with US\$803,622 remaining. Total remaining funds are US\$1.3 million. Of GEF funds allocated to CEA/XI components, 76% has been spent.
- While a component-by-component analysis showing proportion of prodoc allocated funds spent suggests no outcomes have been ignored, in reality the project overemphasized spending on Outcome 2, the demos. Demo-based activities dominated most of CEA/XI’s components, even though the intention of the project document was for broader activities.
- Activity level expenditure analysis suggests low cost-effectiveness of some items. Efforts to estimate unit expenditures raise questions about value delivered for the price. Further, analysis reveals a lack of planning for overall delivery. For example, installation and commissioning support by XI is estimated to be priced at US\$113,476 per demo. Yet, 15 times this value (assuming 15 demos are the target) or US\$1.7 million exceeds XI’s total LOA value.
- Results of co-financing are quite positive. Realized co-financing of US\$9 million nears prodoc targeted financial sector co-financing of US\$10.85 million.
- Due to the US\$1 million in UNDP Scale-up funds, other (non-demo) project co-financing has exceeded targets. In addition, inputs from GGCA and the Dutch Fund, while small, bring the new dimensions of gender and green economy to the project.
- Project management costs to date have been slightly higher than the GEF target of 10% maximum, but not egregiously so. Out of the US\$2.442 million in GEF funds spent to date, US\$307,630 or 12.5 percent have been project management costs. At present, project management costs are being paid from the UNDP Scale-up funds. The intention is to eventually split project management costs between the two funding sources.

Sustainability, Design, Implementation, M&E, and Gender/Poverty

- Sustainability of project results remains precarious due to difficulties HHK installations are having in surviving. Replication and the developing of enthusiastic service providers and entrepreneur proponents for the HHK sector are a positive force. In the “way forward,”

ensuring sustainability of HHKs (if indeed follow up work shows the HHK effort worth sustaining) and other technologies supported will be important. Critical tools in ensuring sustainability will be targeted activities addressing specific policy, training, and technical problems. The Brick Center initiative, calling for a permanent institution, is a very positive effort in terms of ensuring project sustainability.

- Design issues include: (a) the structure of the relationship between UNDP and the project partners, (b) technology choice and focus on a single technology, (c) over-focus on the demos, and (d) dual role of project partners in delivering project services and earning a profit from equipment sales.
- Key implementation issues include delays and handling of institutional set-up. The largest delay was the three years between conclusion of PDF B activities and prodoc signing. In the future, UNDP may wish to institute greater accountability of staff in pushing pipeline projects forward. Brick Center start up has also been delayed due to management changes at UNDP and a decision to consult stakeholders after funds were received.
- Stakeholders suggest institutional set-up problems might have been ameliorated in implementation had the LOAs been more specific and the TAC set up earlier. In the author's view, a major problem was that Xian/CEA wrote their own AWP's and determined their own prices within those AWP's, with no one really checking if those prices made sense.
- Day-to-day monitoring of the project has been strong, though overall big-picture monitoring has been weak. Work of the Monitoring Officer has been quite meticulous. One problem the author perceives is that monitoring by the PMU is often reduced to a matter of indicators and deliverables as in the project results framework. The PMU should also have a process for looking at whether outcomes are being achieved and progress is being made toward the project objective – the big picture. This broader sort of monitoring should be an important role of the PMU as a whole, led by the PM. In the future, this higher level of monitoring responsibility should be clearly articulated for the PMU.
- In the case of demos, the PMU should be monitoring these carefully by frequent site visits and be in frequent communication with demo owners, who should be made aware what it is that the project is offering them for free and why they should support the PMU in its monitoring. This kind of monitoring has been absent in the project to date.
- On the gender side, by cooperating with Global Gender and Climate Alliance (GGCA), the project brought gender awareness training into the project in an innovative way. It held a workshop for traditional brick makers on gender issues and also provided training and other support for women at the PDF B demo, Universal.
- The pro-poor concerns related to HHKs' lower employment overall and lower proportion of destitute migrants in staff are controversial. Some point to the egregious working conditions at traditional kilns and note that it is tunnel kilns that really reduce employment. Preliminary results suggest employment (in person-days of work) per brick may be about 2.5 times higher in traditional kilns than HHKs. Additional work is needed to verify this estimate. Some stakeholders favor short-term losses in employment to develop a cleaner brick industry with

higher quality employment. Others point out that if the transition is slow the dislocation will not be that great.

Way Forward

- Given that many specific needs remain in the brick sector and correlate with the original intended scope of the project, an extension of one year (until March 31, 2016) is recommended. Extension should be contingent on the development of a detailed calendar-bound action plan, with strong certainty of timely delivery. The action plan should exhibit that the project will have strong achievements before closure in the areas in which there are still gaps in addressing project outcomes and in which stakeholders have expressed needs.
- The focus going forward should be on “soft” activities that support a broader audience than the demos alone; and no new demos should be pursued. Rational includes: (1) The project has already spent most of its funds on the demos and has neglected non-demo activities. (2) Non-project HHKs have proliferated and can provide information on HHK operations that was originally intended to be gotten from the demos. (3) Needs articulated by stakeholders during the MTR are focused on “soft activities.” (4) Remaining funds are limited and “soft activities” tend to represent a lower investment but have high potential for cost effectiveness if implemented well.
- All subsequent “soft activities” should be managed by the PMU rather than the project partners; and remaining project (GEF) funds should be allocated to the PMU’s annual work plan. Implementation has shown that the project partners are more focused on the “hard activities” of establishing demos and less suitable for conducting broad-based “soft activities,” such as capacity building workshops.
- The project partners should fulfill their obligation of assisting the three pipeline demos (NDC, Makrail, and Eco3/Eco4) and provide any assistance possible to the stopped demos (Eco2, CBN, and SSL) to get them operating again. A new LOA between UNDP and the partners that offers no additional payment beyond that which has already been made may be signed. Alternatively, a refund of overpayment may be considered with subsequent search for new service provider to resolve ongoing issues. The PMU, as it evolves into a Brick Center, should seek to assist the demos as possible through information provision and liaison work.
- Outcome 1 - Understanding of Technology Options: During the MTR, it was found that there is no clear “winner” and that not enough information is available at this point to discard any one of the “green” kiln technologies designated by the government. One of the first matters of business for the project action plan going forward could be a study of existing HHKs (especially the non-project ones) to understand the economic and policy issues they are facing, as well as to obtain a data set on their energy and emissions performance. In addition to supporting HHKs (if proved viable), the project may move to a multi-technology strategy, also supporting the development of smaller-scale technologies, which may reach a larger portion of brick makers. Local (low-cost) production of HHKs might also be considered for support, as might work in alternative shapes and materials for bricks.

- In terms of fit with other donors, the project, in identifying work with small-scale technologies, should aim to complement rather than duplicate the World Bank CASE project's current efforts, which focus on: (1) converted zig-zag (Vietnamese technology proven in Vietnam, with initial demo in Bangladesh by University of Hanoi- 7 demos total targeted), (2) improved zig-zag (new theoretical design by XI, also called "mini-HHK", demo expected soon - 7 in total targeted), and (3) mini-tunnel (new theoretical design by XI, demo expected eventually – 5 in total targeted). The project may also find ways to complement ADB work, which is providing concessionary loans to zig-zag, VSBK, HHK, and tunnel technologies.
- Going forward, in pursuit of "soft activities," the project should expand its network of partners to include BABMA, BBMOA, individual replication HHKs, HHK service providers, other design institutes and equipment manufacturers from China (and other countries as relevant), financial sector stakeholders, relevant government officials, and other donors.
- Policy needs: The project could contribute to policy makers' efforts by providing more solid information on areas of interest to them, such as emission results of various technologies or data on clay resources. The project could also hold focused workshops on policy areas it hopes to have an impact in, such as brick standards or kiln certification. HHK owners desire policy support in: (1) recognition as an industry, (2) qualification for preferential low interest loans, (3) achievement of treatment on VAT equal to that accorded to traditional kilns, and (4) brick standards and certification of factories. Traditional kiln owners desire an approved standardized zig-zag design and assurance of long-term policy stability.
- Certification and other technical support: Certification to run an HHK, certification of HHK suppliers, and certified zig-zag design are needs suggested. Other kinds of technical support raised include a lab for measuring emissions and brick strength quality, as well as for testing coal and clay. Research on coal and clay is also needed.
- Financial sector and financing: While entrepreneurs should remain the focus, financial institutions desire technical sessions about efficient kiln technologies for their working level people. One financial institution suggested cooperation with UNDP in holding workshops on EE kiln technologies for the institution's brick making clients. Another financial concept raised multiple times is the clustering of groups of traditional brick makers to come up with the capital needed to finance an HHK. While many suggested this arrangement will present great challenges, brick makers suggest interest may exist if the HHKs are proven profitable.
- Capacity building and awareness: Training and continued awareness building are considered two key areas in which the project can make needed contributions going forward. While the project trained people at individual demos, there is a need more broadly in the sector for training of personnel and in particular firemen for HHKs. A need is also seen for more focused awareness building, such as on specific policy issues and on specific technologies. BABMA HHK owners have suggested that BBMOA kiln owners be invited to visit their HHKs, with UNDP serving as a link. BBMOA asked for information and capacity building on how to conserve topsoil and use other (non-clay) materials. One intriguing area for

awareness building that has not yet received much attention from IKEBMI or other donor brick projects is on the market side. Stakeholders mentioned that buyers do not yet fully understand the merits of auto-bricks and reject bricks that are not red enough in color (such as VSBK bricks and HHK bricks manufactured with 100% of coal put in the bricks). In addition, the government can be encouraged to support the purchase of auto-bricks through procurement rules.

- Brick Center: The Brick Center idea received welcome from many stakeholders. While it is hoped that the project can come up with a strong action plan for the next 15 months (assuming an extension is pursued), not all of the problems of Bangladesh's brick sector can be solved on this timescale. UNDP may wish to pursue Chinese Government support for the Center, as well as continue conversations with other donors, particularly the World Bank and ADB. The author believes much of the Brick Center's scope will coincide with the "way forward" recommendations outlined above. Thus, these project activities may be conducted under the Brick Center (either formally or informally) to build its brand and capabilities.

PART I. PRELIMINARIES: BACKGROUND AND MTR METHODOLOGY

1. Project and Industry Background

Increasing Kiln Efficiency in the Bangladesh Brick Making Industry (IKEBMI) is a UNDP-GEF project designed with duration of five years and GEF funding of USD3 million. Its purpose is to reduce energy consumption of and greenhouse gas (GHG) emissions from Bangladesh's brick sector. The project document was signed in April 2010; and the original project close date (still in effect) is March 2015. Due to the extremely serious local air pollution created by brick kilns in Bangladesh, the idea of a "win-win" project that both improves local air quality and reduces energy consumption/GHG emissions elicits strong enthusiasm from many living in the country or familiar with the situation there.

1.1 Background on Bangladesh's Brick Making Sector

Background on Bangladesh's brick making sector is given below. The industry, its environmental impacts, kiln technologies in use, and key players are covered in turn. Given the emphasis this review will put on "the way forward" for the project, the author has chosen to include in this background section the current situation rather than the situation at project start. Comparison to changes from the situation at project start, however, are important to this review and are covered in subsequent sections, especially Section 3 ("Project Overall: Relevance and Positive Impacts").

The industry: Bangladesh's brick making sector plays a significant role in the nation's economy. It is believed to account for about one percent of GDP and employ (mostly on a seasonal basis) between one to two million people. Estimates of the total number of brick-making operations range from 6,000 to over 10,000. Kilns documented by the Department of Environment (DoE) numbered 6,791 in September 2014. Most of these are small-scale seasonal businesses ("traditional kilns"), operating from six to eight months a year and active mainly from November to April. A socio-economic survey of traditional kilns commissioned by the IKEBMI project found the average output level of surveyed kilns to be around three million bricks per season and average employment to be around 190 persons, 75 percent of whom are migrants (*Socio-Economic Baseline Study*, IKEBMI Project, 2012). While currently in a slump, the brick market over the past few decades is said to have grown at a significant clip to keep up with growth of the building and infrastructure sectors, which have averaged around five percent growth annually. Despite the current slump, long-term growth in the brick sector is expected to be strong, driven by increasing urbanization, infrastructure projects, and increasing use of bricks in rural areas.

Environmental impacts of the industry: Brick-making is considered one of the most critical sources of air pollution in the Bangladesh, as well as a major threat to forests and topsoil. Those who live in Dhaka are familiar with the deterioration of air quality that occurs once the traditional kilns start up in November. The Project's *Socio-Economic Baseline Study* found that villagers living near to traditional kilns feel strongly that there is an association between the brick kilns and human health. They also indicate that agriculture – via soil fertility and animal health – is impacted by kiln pollutants. Impacts on urban air quality have been documented in a study by Begum et al, which found that nearly 40 percent of fine particulate emissions in Dhaka during the brick-making season can be attributed to brick kilns (Begum, 2010). Brick-making is also considered a primary cause of deforestation in Bangladesh. While regulation has had some impact such that fuel wood use in brick-making is no longer “out in the open,” sources consulted during the mid-term review (MTR) indicate that use of wood in traditional kilns is still quite common in many locations. Finally, use of high quality topsoil as raw material for bricks is a substantial environmental concern, which has led the government to prohibit previously profitable brick exports to India.

Technologies and Policy Drivers: Exhibit 1-1 summarizes the brick kiln technologies used in Bangladesh at present time. Currently, the majority of bricks in Bangladesh are made in traditional, small-scale kilns. Changes in kiln type, driven by government policy at two critical junctures, has resulted in some improvements in air quality, but results are still considered below par. Prior to 2001, the dominant kiln technology in Bangladesh was the bull trench kiln (BTK). Given the highly negative impact on local air quality, national policy issued in 2002 required conversion to fixed chimney kiln (FCK). Conversion entailed addition of a 120 foot chimney to disperse pollutants over a wider area than achieved by the BTK's 30 foot chimneys. Wide-scale conversion occurred over a period of a few years, though non-compliance is still an issue, with BTKs remaining in some areas.

Given continued air quality concerns, the Government issued new regulations in 2013 outlawing FCKs and requiring conversion to zig-zag kilns, hybrid Hoffman kilns (HHKs), tunnel kilns, VSBKs, and other energy efficient technologies. The BTK, FCK, zig-zag kiln, and VSBK are small-scale (e.g. producing in the range of three million bricks per season), while HHK and tunnel are mid and larger scale (e.g. targeted production of 15 million bricks per year or more) and require a much larger up-front investment. Hoffman kilns (HKs), which are fueled by natural gas, were introduced into Bangladesh in the 1980s (World Bank, 2011). These are very efficient, but, due to resource concerns, new natural-gas fired kilns are not allowed in Bangladesh. HHKs were first introduced to the nation via the IKEBMI project with its PDF B phase demo (2006) and are the main technology on which the project has focused to date. Tunnel kilns have appeared more recently in the country.

In addition to IKEBMI's work in introducing medium-scale energy efficient kiln technology (HHKs), efforts by other parties have been underway to introduce more efficient small-scale technologies. In 2010, the vertical shaft brick kiln (VSBK), which has a scale similar to traditional kilns, but is much less polluting, was piloted in Bangladesh. Yet, the technology has been unable to stimulate replication. Over the past few years, the World Bank has been supporting introduction of low-emission technologies for small-scale kilns. These include (a) a Vietnamese technology for converting FCK to zig-zag, which has already been piloted in Bangladesh, as well as two newly developed designs prepared by Xian Institute, (b) "improved zig-zag" (said to be a "mini-HHK" technology), and (c) "mini-tunnel." These last two technologies are unproven, but expected to be piloted soon.

Exhibit 1-1: Brick Kiln Technologies in Bangladesh (as of October, 2014)

Kiln Technology	Scale and characteristics	Status	Number in Bangladesh (DoE data, Sept. 2014)
BTK (bull trench kiln)	Small-scale, two 30-ft chimneys. Most polluting of all listed technologies.	Outlawed in 2002 (environmental clearance will not be given)	Unknown, but some exist despite regulations
FCK (fixed chimney kiln)	Small-scale, one 120 ft chimney. Highly polluting, but emissions more dispersed than BTK's.	Outlawed in 2013 (environmental clearance will not be given)	3,515
Zig-zag	Small-scale. Can be less polluting than FCK, but no standard design, so many still do not meet government standards. World Bank introducing low-emissions Vietnamese model for conversion of FCK to zig-zag.	Substantial conversion from FCKs in 2014. Vietnamese model piloted.	2,965
VSBK (vertical shaft brick kiln)	Small-scale. Very good energy efficiency and emissions results.	Pilot introduced in 2010, but not accepted by local brick makers.	A few
"Improved zig-zag" and "mini-tunnel"	Theoretical new designs for small-scale kilns introduced by World Bank via Xian Institute consultancy.	Pilots expected – technologies not yet proven.	0
Hoffman Kiln (HK)	Medium-scale. Uses natural gas. Very good energy efficiency and emissions results.	Introduced in 1980s, but new ones are prohibited due to concerns about natural gas resources.	Unknown
Hybrid Hoffman Kiln (HHK)	Medium-scale. Very good energy efficiency and emissions results.	Introduced by UNDP-GEF IKEBMI project in 2006.	63
Tunnel Kiln	Medium/large-scale. Very good energy efficiency and	Recently introduced.	40

	emissions results.		
TOTAL			6,791

Players in Bangladesh’s Brick-Making Industry: An overview of key players in Bangladesh’s brick-making industry may be divided into traditional small-scale brick makers, investors in mid and large-scale brick kilns, industry associations, government regulators, service and equipment providers, debt providers to the industry (private banks and government financial institutions), and international donors. Exhibit 1-2 lists the key players or player types and offers some background on each.

Traditional brick makers and their association: Traditional brick makers in Bangladesh generally have seasonal, small-scale kilns – either FCKs or recent conversions to zig-zag. Their kilns are most often located on rented land and workers (many of whom are migrants) most often acquired through middle men. Those kiln owners met during the MTR mission often mentioned their fathers or even grandfathers having been involved in the brick-making industry. They believe their educational levels and lack of the right personal networks make it difficult for them to get bank loans for larger-scale operations, such as HHKs. Outsiders often portray traditional brick makers as politically connected persons (“muscle men”); and banks have some concern that they would use political influence to avoid paying back loans.

The official association for traditional brick makers is the Bangladesh Brick Manufacturers Owners Association (BBMOA). BBMOA indicates that it has 6,000 members, of which 1,200 to 1,500 are current on dues at any one time. As a group, BBMOA indicates that, in addition to difficulties obtaining loans, the profitability of HHK technology is not yet proven and thus they’d not be willing to invest in HHKs anyway. At the same time, mission findings indicate some members of this group are pursuing loans for HHKs. In general, BBMOA members are concerned about the lack of stability of government policy in terms of which kiln technologies are allowed and the lack of standard design for zig-zag kiln, the most popular of the allowed technologies.

Investors in HHKs and tunnel kilns: The MTR mission found that HHK and tunnel investors are in a large part a different group from traditional brick makers. HHK investors are often well educated persons who have success in other industries and are looking to expand into a high potential area, or an area that may contribute to economic activity in their hometown. Investors include, for example, those with experience or assets in the dairy industry, the paper industry, the financial services industry, and the military. At the same time, the mission also identified some investors in HHKs who do have traditional brick kiln experience (e.g. five to ten years), which, while it may not have been for multiple generations and may be part of a diversified portfolio of investments, is preferred by financial institutions. The top service provider to the HHK industry also indicates that clients are a mix of those from the traditional brick industry and those without

brick experience. Typical up-front investment for an HHK (including land purchase) may be around US2 million, as compared to perhaps US50,000 for an FCK to zig-zag conversion. Tunnel kiln investors identified tend to be large industrial groups (investment levels are typically around US6 to 8 million), often in the building or infrastructure industries and wishing to vertically integrate into bricks. Recently, HHK investors (along with some tunnel kiln investors) have set up an association, the Bangladesh Auto Brick Manufacturers' Association (BABMA), which indicates it has 30 to 35 members. In the face of stiff price competition from low-cost traditional brick makers, they have an interest in pushing for policy and financial incentives favoring environmentally-sound brick production. They claim to have already achieved a tax holiday for new HHKs.

Government regulators: The main Government of Bangladesh regulator of the brick industry is the Department of Environment (DoE), which is part of the Ministry of Environment and Forests (MoEF). The Ministry of Industry is not involved, since the sector is not recognized as a formal industry, though some proponents hope that it will become one and thus qualify for certain benefits. Kilns are required to register with the DoE and comply with MoEF kiln policy. Regulators feel challenged in that the brick industry lacks a clearly viable solution to achieve improved air quality. While the industry is now converting from FCK to zig-zag on a large scale, a regulator explained to the MTR mission that most zig-zags don't meet environmental standards. At the same time, HHKs are too costly for most brick makers; and other more small-scale technologies are not fully proven or accepted in Bangladesh. Regulators would like to move to an emissions-based (rather than technology based) approach in their policy, but lack the capacity to monitor emissions on a wide scale.

Service and equipment providers: Various masons (local and Indian) are helping traditional kiln owners convert their FCKs to zig-zag. For HHKs (which received more focus during the MTR mission), an estimated five or six service and/or equipment providers have emerged. Most of the main equipment is Chinese, whereas service providers include both Chinese-led and local-led organizations. The service provider that has developed the most HHKs in Bangladesh is the Chinese-led Xian Shunfeng (20 to 25 HHKs developed), which is also an equipment manufacturer. The IKEBMI project partners, the Xian Institute (XI, a Chinese design institute) and Clean Energy Alternatives (CEA, a locally-led and US-registered firm), cooperate with the Tianjin Machinery Import and Export Corporation (a Chinese company) to provide turnkey HHK solutions to customers who receive some free services from the IKEBMI project and then, in turn, become its demos. Most of the HHK providers are now entering the tunnel kiln business as well.

Debt providers: While traditional brick makers generally obtain financing in informal ways, such as from local people, HHK and tunnel owners finance their projects via loans from private sector banks or government financial institutions. While the majority of HHKs in the country appear to be financed by private sector banks, some state-owned financial institutions have taken a strong

interest in the sector, are educating themselves about it, and are beginning to make loans in the sector.

Donors: In addition to UNDP’s involvement through the IKEBMI project, which began in 2005 with the launch of project preparatory activities, the World Bank and Asian Development Bank (ADB) are now also actively involved in the brick sector. As one part of its CASE project, the World Bank is supporting consultancies to develop small-scale energy efficient and low emissions brick kiln technologies for Bangladesh. (These include the Vietnamese FCK to zig-zag conversion, Xian Institute’s newly designed “improved zig-zag”, and Xian Institute’s newly designed “mini tunnel”). ADB has developed a US\$50 million loan facility to provide low interest loans for zig-zag, HHK, tunnel, and VSBKs in Bangladesh.

**Exhibit 1-2: Background on Various Types of Players in Bangladesh’s Brick Industry
(as of October 2014)**

Player/Type of Player	Background on Player
Traditional Brick Makers	Run small-scale kilns, usually for around six months per year (dry season), with perhaps 3 million bricks per season and 190 workers. Many are converting now from FCK to zig-zag; investment may be around US\$50,000. Most would have difficulties obtaining bank loan for larger scale kiln technology and many are skeptical of profitability of these technologies, anyway.
Investors in HHKs and Tunnel Kilns	For HHKs, a different group than traditional brick makers, generally with higher education and stronger network in financial sector. Most are entrepreneurs with success in other sectors. Some have experience in the brick sector, but many do not. Scale of investment (for HHK) is around US\$2 million and production 15 million bricks per year. For tunnel kilns, investors tend to be large companies hoping to vertically integrate or expand activities into a relevant area. Scale of investment is around US\$6 to 8 million.
BBMOA	Association of traditional kiln makers: 6,000 members of which 1,200 to 1,500 have paid dues at any one time. Concerned about instability of policy (in terms of which kiln types allowed) and lack of standard design for zig-zag kilns.
BABMA	Association for “auto-brick makers”(HHK and tunnel): 30 to 35 members. Interested in promoting policies and financial incentives favorable to cleaner production of bricks.
DoE, MoEF	DoE implements rules regulating the brick industry. Currently requires certain kiln types, but hopes to move to emissions-based regulations. Concerned about lack of viable kiln options at present. MoEF is the ministry overseeing DoE and is responsible for issuing regulations.
Ministry of Industry (MoI)	MoI not currently involved with brick industry as it is not recognized as a formal industry. Advocates hope someday to obtain formal recognition and associated benefits.
Service providers – traditional kilns	Service providers include Indian and local masons that are helping to convert FCKs to zig-zag kilns.
Service and equipment	Five, six or more service providers to HHK and tunnel kiln industry

providers –HHKs and tunnel kilns	in Bangladesh. Xian Shunfeng top provider of HHKs (20 to 25 built to date). Most equipment is Chinese, though German and Korean also mentioned. Project partners XI and CEA cooperating with Tianjin Machinery Import and Export Company to provide turnkey solutions (as well as free UNDP project services) to IKEBMI project demos.
Banks and Financial Institutions	Private sector banks have provided most of the HHK and tunnel kiln loans in Bangladesh, though some government-owned financial institutions are also interested and active in the sector.
Donors	In addition to UNDP's IKEBMI project (preparation of which began in 2005), the World Bank's CASE project, begun in 2010, has significant "green brick" component for developing small-scale low-emission technologies. ADB more recently launched a US\$50 million low-interest loan facility for zig-zag, HHK, tunnel, and VSBKs.

1.2 Summary of Project Design

Project Goal: IKEBMI's project goal is reduction of greenhouse gas emissions (GHGs) from Bangladesh's brick making industry, with the expectation that local air quality will also improve. In UNDP-GEF project design, the goal may be considered a target that will be met by the combined contribution of this project and others, beyond the duration of the project.

Project Objective: IKEBMI's project objective is removal of barriers that so far have inhibited adoption of cleaner and more efficient kiln technologies and molding techniques by brick makers in Bangladesh. These barriers are to be removed in a concerted dissemination program essential to reducing GHGs and local air pollution. In UNDP-GEF project design, the objective may be considered a target that will be met largely by the project alone, though perhaps at a point in time beyond project close.

Project Outcomes: Each of IKEBMI's six activity-based components has an associated outcome. Outcomes in UNDP-GEF project design are targets that are generally meant to be met by the project alone and achieved by project close. Below is an overview of each of the project's six activity-based components as designed, including: targeted outcome, original scope of activity as indicated in the project document, expenditures (as of Oct. 20, 2014), and responsible parties. These components are divided into distinct thematic areas as follows: Component 1 – technical assessments, Component 2 – project demos, Component 3 – capacity building, Component 4 – communications and awareness raising, Component 5 – financing, and Component 6 – policy. Expenditure information for Component 7 (monitoring and evaluation), Component 8 (program management), and Component 10 (UNDP TRAC funds, to date used to support project management and "Brick Center" efforts) are also included below.

Component 1: Energy Efficient Kiln (EEK) Technology Support Program ->

Targeted Outcome: Thorough understanding and appreciation of technology options and their environmental impacts by brick makers, government, and other stakeholders.

Activities delineated in ProDoc: Assessment of other energy conservation and EEK technology options, clay resource assessment (looking at country overall), assessment of performance of *all* brick makers in country, identification of energy performance improvements in brick industry, energy reporting of brick makers in Bangladesh, development of local brick making engineering and consultancy service industry.

Expenditures/Budget: To date, GEF expenditures of \$392,506 (87%) out of targeted \$450,519

Responsible Parties: Clean Energy Associations (CEA) and Xian Institute (XI)

Component 2: Energy Efficient Kiln (EEK) Demonstration Program ->

Targeted Outcome: Establishment of a critical mass of demonstration projects that will provide detailed information of EEK operations, energy savings, and environmental impact to interested brick makers.

Activities delineated in ProDoc: Workshop to promote demos/identify brick makers to host. Feasibility analysis as needed. Meeting of demo implementation requirements (confirmation of availability and quality of clay resources and availability of labor and materials; financing assistance). Establishment of baseline data for demo sites. Design of demos. TA for financing demos. Installation and operation of demos. Evaluation and dissemination of demo results.

Expenditures/Budget: To date, GEF expenditures of \$796,440 (72%) out of targeted \$1,107,680

Responsible Parties: CEA and XI

Component 3: Energy Efficient Kiln (EEK) Managerial and Capacity Development Program->

Targeted Outcome: Improved local vocational, technical, and managerial capacity to manage and sustain operations of EEKs and EE practices in Bangladesh

Activities delineated in ProDoc: Training and certification program for EEK production personnel. Evaluation of capacity of local engineering firms. Assessment of viability of local manufacturing of EEKs and associated equipment. Feasibility study on standardization of EEK equipment. Training course for local engineering firms to design, build, and maintain EEKs. Training course for brick maker's association. TA on project proposal preparation.

Expenditures/Budget: To date, GEF expenditures of \$410,148 (73%) out of targeted \$564,546.

Responsible Parties: CEA and XI

Component 4: Communication and Awareness Program->

Targeted Outcome: Enhanced awareness of the public and other stakeholders on EEKs, EE brick making practices and methodologies, and energy efficient bricks production.

Activities delineated in ProDoc: Establishment of Brick Making Industry Information Center. Promotion and advocacy of energy efficiency in brick making industry. Integrated brick making industry information exchange service. Brick making industry energy awards program.
Expenditures/Budget: To date, GEF expenditures of \$140,240 (187%) out of targeted \$75,000.
Responsible Parties: Project Management Unit (PMU)

Component 5: Energy Efficiency Kiln (EEK) Finance Support Program ->

Targeted Outcome: Availability of financial and institutional support to encourage SME adoption of EEKs.

Activities delineated in ProDoc: Action plan for financing brick making industry SMEs. Techno-economic feasibility evaluation of brick-making SMEs. Capacity building for banks regarding brick-making industry. Promotion of business links between brick SMEs and banks. Training courses on project financing for the brick making industry.

Expenditures/Budget: To date, GEF expenditures of \$257,242 (101%) out of targeted \$255,906
Responsible Parties: CEA/XI

Component 6: Policy Development and Institutional Support Program ->

Targeted Outcome: Promulgation of, and compliance to, favorable policies and regulations that encourage adoption of EEKs and energy efficient brick making practices and methodologies. (Including brick making emission standards, coal usage policies, and standardization of brick properties and qualities.)

Activities delineated in ProDoc: Improvement of Government of Bangladesh awareness through campaigns and lobbying. Formulation of policies and implementing rules. Campaigns to adopt project's proposed policies and implementing rules. Three national enforcement workshops. Formulation and implementation of strategies to minimize land degradation from brick making. Review of brick making industry energy efficiency policy. Capacity building for brick making association on compliance.

Expenditures/Budget: To date, GEF expenditures of \$89,934 (56%) out of targeted \$161,996
Responsible Parties: CEA/XI

Component 7: Monitoring and Evaluation Program

Expenditure/Budget: To date, GEF expenditures \$99,477 (71%) out of targeted \$139,310
Responsible Party: PMU

Component 8: Project Management

Expenditure/Budget: To date, GEF expenditures of \$307,530 (126%) out of targeted \$245,043
Responsible Party: PMU

Component 10: UNDP TRAC Fund Scale-Up

Expenditures/Budget: To date, UNDP TRAC expenditures of \$165,351 (17%) out of targeted \$1 million

1.3 Project History and Timeline

Major phases of the project and associated delays are discussed below. These phases include the PDF B Phase, the project start-up phase, and the phase after receipt of US\$1 million in UNDP scale-up funds. A summary of the project timeline is shown in Exhibit 1-3 below.

PDF B Phase: An initial short concept paper for the project was developed by UNDP and partners Clean Energy Associates (CEA) and Xian Institute (XI) in December 2003, out of which an application for project preparatory funds (“PDF B”) was developed. A PDF B grant was approved in December 2004. PDF B operations were carried out from June 2005 to March 2007, with GEF funding of USD348,000. During this time, the main achievement was a Hybrid Hoffman Kiln (HHK) demonstration plant with capacity of 50,000 bricks per day. HHKs are much more energy efficient and less polluting than the vast majority of kilns in Bangladesh, but also have much greater up-front costs. Capital costs of the PDF B demo were financed by Chinese investors that have business relationships with project partners CEA and XI. The exact identity of the investors has not been revealed. Land is rented rather than purchased. The PDF B demo (“Universal,” or “Eco 1”) has played an important role in attracting additional investors to the HHK sector in Bangladesh. While natural gas-fired HKs had been previously built by the private sector in Bangladesh, new ones are no longer allowed; and Universal was the first coal-fired HHK in the country. The main other output of the PDF B phase was the project document, which proposed the establishment of 15 more HHK demos.

Project Startup and Associated Delays: Substantial delays occurred in the start-up of the project. Most significantly, while PDF B activities were concluded in March 2007, the final version of the project document was not signed until April 2010, about three years later. Reasons for this great delay are not clear, though one stakeholder (from the project partners) suggested UNDP was not proactive in pushing the document through the GEF process, where it had been hung up on the issue of project management costs being 17 percent instead of the maximum allowed ten percent. UNDP letters of agreement (LOA) with CEA and XI, which together were to be allocated USD2.5 million out of total GEF project funds of USD3.0 million, were signed about four months after signing of the project document. The PMU was set up about four months after the signing of the LOAs. The inception workshop was then held about three months later, in March 2011, or almost a year after project document signing.

Some events during the approval and start-up period may have negatively influenced the subsequent course of the project. Stakeholders explain that the proposed GEF grant was reduced

from US\$5 million to US\$3 million late in the application process. One stakeholder (from the project partners) indicated that corresponding changes in the prodoc had to be made in less than 24 hours and that, due to time limitations, the decision was made by those involved in the revisions (CEA and the international consultant drafting the project document) to change the amounts allotted to each outcome in the budget, but not to alter the text description of project activities in any way. When the LOAs were prepared, issues related to the reduced budget vis-à-vis the full agenda of prodoc activities were raised. The LOAs reference the activities and outputs described in the text of the project document, as well as the prodoc budget. CEA indicates they signed their LOA, but with caveats, due to the issue of unrevised activities in the prodoc being referred to. Another stakeholder reported that, in part related to the budget reductions, a lot of changes from the originally targeted activities were made in the inception report. That stakeholder believes the proposed changes were major enough that they should have been put before UNDP headquarters and the GEF.

**Exhibit 1-3: IKEBMI (“Bangladesh Green Brick”) Project Timeline –
Major Milestones and Project Close Date**

Note: Major delays indicated by ellipses.

PDF B approved	PDF B implemented	ProDoc Signed	Signing of LOAs with Project Partners	PMU established	Inception Workshop
Dec. 2004	June 2005 – March 2007	April 2010	August 2010	Dec. 2010	March 31, 2011
<i>Current project close date:</i> March 2015					
<i>Recommendation for extension:</i> Revised close date of Dec. 2015 or March 2016 (contingent on action plan with clear calendar for activities and high level of confidence that calendar can be adhered to). Recommendation based on (a) significant room for additional project contributions/filling in the gaps during the next 12 to 15 months and (b) consideration of time lost due to country situation in 2013.					

Award, Positive Review, and Receipt by Project of UNDP “Scale-Up” Funds: From late 2011 to early 2013, the project was perceived positively as evidenced by three different events. One stakeholder explains that in 2011, with four demos up and operating, the impression of the project was much more positive than that given at the time of the MTR. (Major concerns evident at the time of the MTR will be discussed in Section 4 of this report.) As for the first positive event, at the end of 2011, there was a broad evaluation of all UNDP projects in the country and IKEBMI was chosen as one of the top ten that had been executed in the past five or six years. As for the second positive event, in 2012, the project submitted to UNDP Headquarters a proposal prepared by the responsible UNDP Program Officer for “scale-up” funds and, in January 2013, received USD1 million in “TRAC” funding. The project proposal was the only one out of US\$38 million worth of applications to receive the full amount proposed. One key aspect of the proposal was to set up a “Brick Center.” Such a center had been referenced in Component 4 of the prodoc as a “Brick Information Center,” but in the end, funds allocated to this component (carried out by

the PMU) had been too limited to set up the Center. As for the third positive event, in 2013, the project received an outstanding achievement award from the UNDP Country Office.

Delays in Brick Center Set-up: The additional US\$1 million in funding (received in early 2013) was to be spent by end of 2014 and has since garnered an extension until end of 2015. While efforts to set up the Brick Center were in high gear at the time of the MTR mission (October 2014), various delays had previously caused this effort to lose over a year of time. Initially, the plan was to set up the Brick Center by the end of 2013. By July 2013, the PMU had prepared a revised annual work plan for the Center. Stakeholders attribute delays to: (1) substantial management changes in the UNDP Country Office (especially in key persons involved with the project), (2) a desire of the country office to consult stakeholders more widely on the plan for the Brick Center, and (3) issues from the Country Office in determining who will lead the effort. Some stakeholders suggest that broad stakeholder consultation on the nature of the Brick Center after the receipt of funds may not be appropriate, as funds should be spent as indicated in the proposal. As for leadership, the Country Office (CO) has put the Assistant Country Director leading the policy cluster in charge of the Brick Center effort, though the project itself is under the purview of the CO's cluster responsible for climate change and environment. The first formal group consultation with stakeholders was held in April 2014. Bilateral consultations with other donors had been held in December 2013. Further consultations were held in May 2014, after which a draft document was circulated to stakeholders. A second major group consultation was held in October 2014.

Country Situation in 2013: In 2013 there was significant unrest in Bangladesh. For 156 work days (about 60 percent of total work days), there were strikes (*hartals*) organized by the opposition party. Because of associated violence, people were advised to avoid going out and often worked from home. Things in the field were also stalled – it was difficult to travel. The *hartals* were a significant factor in delaying project progress in 2013, but the situation improved greatly in 2014.

1.4 Project Institutional Set-up

CEA/XI and the PMU are the main organizations involved in day-to-day project implementation. UNDP, as the GEF Implementing Agency, provides guidance and back-stopping as needed. The project also has a Project Board, which is responsible for oversight and major decision making. The Technical Advisory Committee, formed more recently, is responsible for providing technical advice to the project.

The project is designed such that five of the six activity-based components (which represent US\$2.54 million or 85 percent of the total project budget of US\$3.0 million) are to be handled by

project partners CEA/XI and one (Component 4: Communications) is to be handled by the PMU. The PMU is further to handle monitoring and evaluation (M&E) and project management. The PMU's share of the project budget (meant to cover Component 4-Communications, M&E, and project management) is US\$459,353 or 15 percent, though recently an additional US\$196,378 from the one million in UNDP provided scale-up funds has been used to support PMU project management and activities, including coordination of Brick Center start-up initiatives

CEA/XI LOAs and payment: On August 1, 2010, UNDP signed LOAs with both CEA and XI that were to terminate on June 1, 2014. The LOAs call for an advance to be provided to CEA/XI at the beginning of each year and for final annual payment to be based on completion of activities in the year's annual work plan. While the LOA includes broad output targets for each outcome, it does not specify costing on a level more specific than the outcome level. In practice, the procedure followed has been that CEA/XI submitted annual work plans that were not scrutinized by UNDP or the PMU on the basis of budget per specific deliverable. After 2010 (when full payment was made), delivery of specific items promised in the CEA/XI-prepared annual work plans was checked and the amount of the second annual payment made contingent on that. Still, despite this increased scrutiny, the original costing per item proposed by CEA/XI was accepted without question. Two payments were provided in each of 2010, 2011, 2012, and 2013, though none was made in 2014.

CEA/XI presence and staffing in Dhaka: CEA has an office and permanent staff based in Dhaka, while XI has less of a presence. One marketing person who was initially based in Dhaka and employed by the Tianjin Machinery Import Export Corporation (a business partner of CEA/XI) and speaks very good English, now represents both his initial employer and XI, with salary reportedly paid by both. A key technical individual from XI (who does not speak English) spends several months a year in Dhaka, travelling back and forth to China. With increased responsibilities from the World Bank CASE project, XI during the MTR mission (Oct. 2014), indicated plans to place an engineer full-time in Dhaka. (The engineer also does not speak English.) According to sources, CEA had just one engineering person involved in the project, though a number of team members with other backgrounds also appear to have been involved.

PMU Staffing: The PMU was initially staffed by four persons and, in October 2013, increased staffing to five. The original four positions are: Project Manager (responsible for overall implementation and management), Monitoring and Evaluation Officer, Communications Officer (responsible for Component 4), and Finance and Administrative Assistant. The fifth position is Development Planning Officer. Originally hired to work on the Brick Center, this officer has been working on other aspects of the project due to delays in Brick Center implementation. Three of the four original staff remain, but the original Project Manager left at the beginning of September 2014 and a new Project Manager came onboard shortly thereafter. The new Project Manager has a strong business background and was hired primarily to drive launch of the Brick

Center, though is also committed to overseeing management of the project overall. Other staff members have very strong backgrounds in development work, though none have highly technical backgrounds or prior knowledge of the brick industry. The PMU was initially housed in the office of CEA, but more recently has moved to an office in the same building with UNDP.

Project Board and PSC: While the project document calls for both a Project Steering Committee and, under it, a Project Board, in practice the Project Board has been overseeing the project, while the PSC (led by the Ministry of Environment and Forests) has met just once (in February, 2014). The Project Board had met seven times by the time of the MTR (Oct. 2014). The main attendees at Project Board meetings have been from UNDP, CEA, PMU, and BBMOA (Bangladesh Brick Making Owners Association). XI representatives attended two meetings. During the MTR, some stakeholders pointed out the challenge of CEA's and XI's dual role as both contracted partner (via the LOAs) and decision-making partner (via membership in the Project Board). They suggest that, in order to ensure proper oversight, organizations contracted to carry out such a large portion of the project should not also have decision-making power over the project.

TAC: The project document calls for a Technical Advisory Committee (TAC) to provide technical advice on emissions monitoring and issues related to the technology used. The first TAC meeting was not held until May 2014 (about four years into the life of the project). A number of stakeholders mentioned that the PMU did not have the capabilities to review technical content of CEA/XI deliverables, so that the TAC was important for this reason and should have been established earlier. At the first TAC meeting, government officials involved expressed surprise that the Committee had not been organized earlier. A second TAC meeting was held in July 2014.

UNDP: UNDP, via its Bangladesh Country Office and Bangkok-based Regional Technical Advisor, has been actively involved in guidance and backstopping of the project. This work has benefited from involvement at the Deputy Country Director level of the CO. It has also benefited from the proactive support of the program officer who worked to secure the US1 million in scale-up financing, as well as partnerships in gender and green economy, for the project. One challenge, however, has been staff turnover. From the time of the PDF to the MTR, four different UNDP program officers have been responsible for the project, three during the lifetime of the full-scale project. Another general challenge expressed by stakeholders is that UNDP program officers are often pulled away from their main role of providing high-level guidance to projects by the need to support day-to-day detail work of the various PMUs whose projects they oversee.

2. MTR Purpose and Methodology

This section covers: (1) the general purpose and content of the MTR, based on general evaluation guidance from the UNDP and the GEF; (2) special considerations of this MTR given the specific situation and needs of the IKEBMI project at the time of the MTR; and (3) methodology used in the MTR for gathering and analyzing information.

2.1 General Purpose and Content of MTR

The main general purpose of the MTR is two-fold. The first purpose is to provide transparency and accountability for funds spent, identifying both project achievements and project shortcomings. The second purpose is to identify lessons learned from project shortcomings and to make recommendations for course correction so that targeted outcomes can be achieved by project close, with strong potential to achieve project objective in the near-term. While the MTR checks for completion of activities and outputs (covered in Section 5), the main focus of analysis is at the outcome and objective levels. That is, the MTR aims to determine whether the project is on track to making the meaningful impacts targeted. Specific aspects reviewed include relevance of the project and its activities, efficacy (impact/results), efficiency (cost effective use of funds), and sustainability of results.

2.2 Project-Specific Considerations of the MTR

In addition to addressing the general purposes common to the MTRs of all UNDP-GEF projects, MTR design should take into consideration the special situation of the project being reviewed. The key points below provide context for the approach of this MTR. The MTR consultant is thankful to UNDP and the project team for highlighting these issues in the early days of the MTR so that they could be properly investigated during the mission.

Project difficulties with the demos: While IKEBMI was initially quite positively received in terms of its concept and PDF B demo results, there were serious concerns about its performance at the time of the MTR mission, about 4.5 years after project document signing. This concern was first and foremost based on the poor performance of the project demo work. As the MTR consultant eventually learned, only one of the 15 demos targeted by the full-scale project was operating at the time of the MTR mission. In addition, some demo investors were expressing strong dissatisfaction with project implementation. Yet, 83 percent of GEF project funds had already been spent.

Appropriateness of HHK technology: Questions had also arisen as to whether the HHK technology to which almost all project funds to date had been directed is appropriate for Bangladesh. Existing demos were struggling financially and often technically. Traditional brick

makers argued the technology required too much investment for them, so that most investors in project demos come from outside the brick industry. They asked UNDP to provide support to technologies more appropriate to them. Some persons noted that the HHK technology provides substantially less employment (in person-days per brick) than traditional brick making, which is of concern particularly since traditional brick making employs some of the nation's poorest people. While the HHK technology provides strong reductions in energy use, GHG emissions, and local air pollution, potential adoption levels are of concern. If it is only able to achieve very low penetration into the brick sector, a more easily adopted technology with lower degree of energy savings per brick may in fact have the potential to achieve greater overall savings sector-wide.

Private sector activity in HHKs: At the same time as the project's own demo efforts were floundering, the project uncovered the surprising result of substantial non-project activity in the HHK sector (over 50 kilns, with perhaps at least half in operation). Whether this activity could be attributed to the project became an important line of inquiry. Was the project an irrelevant effort while the private sector itself drove adoption? Or, did the project, despite its own problems, stimulate this private sector activity?

Remaining funds, gaps not addressed, and needs highlighted: While 83 percent of GEF funds have been spent, given the UNDP TRAC funding award, a substantial US 1.32 million (of GEF and TRAC monies combined) remains (as of Nov. 30, 2014). Needs of the brick industry are being highlighted both by regulators and the industry itself. On the industry side, both traditional brick makers and new, auto-brick makers (i.e. investors in HHKs and tunnel kilns) have expressed needs potentially addressable by the project. Further, many gaps in delivery of the project to date (as discussed in Section 5) are obvious and correspond to ongoing needs in the brick sector.

In light of the above context and guidance from the UNDP Country Office and Regional Technical Advisor, the MTR consultant put special efforts during the mission on the following key areas: (1) identifying positive results of the project (and in particular, working to understand whether positive results in replication, policy, and finance could be attributed to the project), (2) understanding shortcomings of the project and lessons implied, and (3) defining a way forward based on needs of the sector and gaps in project delivery so far.

2.3 MTR Methodology

The methodology adopted for the MTR was highly interview intensive. Following extensive document review in early October 2014, a mission of about 2.5 weeks was conducted from October 13 to 28, 2014. In addition to interviews with those directly implementing or overseeing implementation of the project, a strong effort was made to speak to demo entrepreneurs,

entrepreneurs with HHKs developed outside of the project, entities providing services to the HHK sector, traditional brick makers, financial institutions, government officials, and donors/donor projects in the brick sector. In total, over 40 interviews were conducted. During this period, MTR work benefitted from strong support of the UNDP CO and PMU, particularly IKEBMI's Monitoring Officer, who facilitated the majority of face-to-face interviews. Exhibit 1-4 below lists the stakeholders interviewed, as well as site visits.

Other methodological issues involve interview content and analysis of information gathered. Interview questions were designed to cover a combination of general MTR content (described in 2.1) and desired content specific to the situation of the IKEBMI project (described in 2.2). Whenever possible, the MTR consultant drafted up rough meetings notes from interviews in the evenings or few days following each interview. After all interview notes were done and a preliminary report of findings submitted to UNDP, the MTR consultant prepared a revised outline for the MTR report. Based on this outline, findings from each interview were divided by topic. Findings across interviews were then aggregated by topic and an assessment of each topic conducted in preparation for drafting of the corresponding section of the report.

Exhibit 1-4: MTR Stakeholder Meetings/ Interviews and Site Visits
Over 40 interviews conducted.

UNDP and PMU	
UNDP responsible program officer (current – 2 meetings)	PMU – Project Manager (current)
UNDP responsible program officer (previous via Skype)	PMU – Project Manager (previous)
UNDP leadership – Assistant Resident Rep. (2 meetings)	PMU – Monitoring Officer
UNDP leadership – Res. Rep. and Deputy Res. Rep.	PMU- Business Development Officer
UNDP senior advisor – involved in project from the start	PMU – Finance and Admin Assistant
	PMU – Group Meeting
Project Partners (also, jointly act as providers of HHK turnkey services)	
Tianjin Machinery and Xian Institute Res. Rep.	Clean Energy Associates - President
Xian Institute (Sr. Engineer and Engineer)	
Project Demo Owners and Managers	
Banolata (operational) - owner	Eco 2,3, and 4 (stopped)-advisor /former investor
CBN (commissioned but not operating) - owner	Eco 2 (stopped) - factory manager
Makrail (pipeline – not yet financed) - owner	NDC (pipeline – just got financing) - Chairman
PDF B demo (“Universal”) - factory manager	
Other (Non-project) Providers of HHK Turnkey Services	
Xian Shunfeng (2 meetings)	Brictec
Owners of Non-project HHKs	
Comprehensive (operational) - owner	Kapita and Autokap (operational) - owner
Advance Tech Ltd (operational) - owner	
Other Donors or Donor Projects	
World Bank Bangladesh Country Office	World Bank CASE Project PMU (in DoE)
Government Organizations	
Department of Environment (DoE), Ministry of Environment and Forests (MoEF)	
Associations and Traditional Brickmakers	
BBMOA (traditional brick makers association)	Group of three traditional brick makers

BABMA (auto-brick makers association)*	
Project Consultants and Industry Experts	
Consultant who prepared HHK replication study	Brick Expert at Bangl. Univ. Eng. and Technology
Financial Sector	
IDCOL	IDLC
Workers at PDF B demo	
Male contract loading workers (3 interviews)	Female permanent workers (2 interviews)
Site Visits to Project Demos in Dhamrai and Nearby Zig-Zag kiln	
PDF B demo (“Universal” or “Eco 1”) - operational	Eco 3 and Eco 4 – stopped mid-construction
Eco 2 – commissioned but production stopped	Zig-zag kiln

*Combined with interview of HHK owner (AdvanceTech) - met two officers of Association

PART II: BIG PICTURE – OVERALL IMPRESSION OF PROJECT, ITS IMPACT, AND MAJOR ISSUES

3. Project Overall: Positive Impacts and Relevance

Despite the shortcomings that have been alluded to and will be further examined in the next section, the Bangladesh Green Brick Project, on a broad level, has had substantial positive impacts and is also highly relevant. That is, while the project struggled to make its demos viable to the neglect of broader activities, it created very strong interest and activity in the “green brick sector.” To put it colloquially, the project created “buzz” about green bricks. Indeed, it really brought the concept of “green bricks” to Bangladesh and made people come to know the HHK technology in particular. Impacts are seen in: the substantial number of HHKs developed outside of the project, upgraded brick policy, involvement and interest of financial institutions in the sector, and development of other service providers in the sector. Attribution of these developments to project impact, however, is challenging. Were these developments merely parallel efforts that coincidentally occurred and were more successful as the project fumbled along? Or, despite its fumbling, did the project really create impact that led to these more successful efforts? The MTR consultant’s general conclusion is that the project did indeed contribute to these wider and more positive impacts, some directly and some indirectly.

Stakeholders spoke during the mission about the project’s high level of relevance and the change it had achieved, especially during its early period, in people’s perception. Before the project, most of the relevant parties in Bangladesh had not heard of HHKs and energy efficient technologies for bricks, but now both policy makers and many in the industry are aware of these. One stakeholder noted how, reflecting its relevance and appeal, the project was featured at a side event at Rio+20, held in June 2012. Another pointed out how the mindset changes achieved by the project had had a big impact and that now stakeholders (especially other donors) are “all over this issue.” A government stakeholder referenced the project as “pioneering.” A donor stakeholder noted how the project had a very successful preparatory phase, so that a lot of interest in HHKs was generated in 2007-2009. He noted that journalists were attracted and interest was created among entrepreneurs, including several that started HHKs with the help of other (non-project) technology providers. A stakeholder that provides services to the industry was very emphatic that the UNDP project had a major influence in spreading HHKs in Bangladesh.

This section first provides a review of project relevance. It then provides evidence and additional reasoning for the project role in or impact on each of: (1) non-project HHKs

(replication), (2) other aspects of brick-making industry (turnkey service providers, traditional brick makers, and services provided by project to interested entrepreneurs), (3) policy, (4) the media, (5) the financial sector, and (6) other donors.



Exhibit 3-1: Universal, PDF-B Demo Hybrid Hoffman Kiln (HHK) – kiln unloading; visit gave impression of well-run operation and employees satisfied with the opportunity. (MTR mission, Oct. 2014, photo by Shamim Iftekhar)



Exhibit 3-2: Universal - PDF-B Demo Hybrid Hoffman Kiln (HHK) – brick formation line (MTR mission, Oct. 2014, photo by Mr. Shamim Iftakhar, IKEBMI Communications Officer)

3.1 Relevance

Suitability to situation in Bangladesh: The MTR consultant was struck by the high level of enthusiasm and interest among stakeholders for this project’s overall theme of introducing more energy efficient and less polluting brick technologies to Bangladesh. This strong interest is testimony to the project’s high level of relevance for Bangladesh. Persons living in Bangladesh, particularly Dhaka, find the overall theme of the project very relevant as they are aware and concerned about the health hazard presented by brick kilns in the country. Government regulators, traditional brick makers, persons in the financial sector, and persons in the donor community all expressed strong interest in the project and in cleaner brick production in Bangladesh. Concerns about relevance do emerge at the level of technology selection. (In other words, is the technology on which the project has focused to date appropriate to Bangladesh?) This topic will be covered in more detail in Sections 4 and 9.

Alignment with national priorities: Project alignment with national priorities is also strong at the broad level. As introduced in Section 1, Bangladesh’s MoEF has issued environment-related regulations to the brick industry; and these are implemented by its Department of Environment

(DoE). During the MTR mission, DoE expressed strong concern about the lack of viable options for achieving lower emissions across the nation's brick sector.

Alignment with UNDP comparative advantage : The project as designed is strongly aligned with UNDP's comparative advantage, though implementation to date has not fully leveraged that advantage. In the donor sector, a repeated trend and strength of UNDP projects is that UNDP introduces new ideas or technologies with a relatively small amount of technical assistance (TA) funding and these ideas or technologies are later taken up, perhaps with a higher level of financing, by other donors, such as the World Bank or ADB. The entry of the World Bank and the ADB into the Bangladesh "green brick" area following dissemination of the concept by the IKEBMI project follows this pattern. Another typical strength of UNDP projects is their ability to have substantial impacts via "soft", low-cost activities, such as capacity building and policy support. As will be discussed later in this document, the project to date has focused heavily on the demos and neglected broader activities in such areas, although these were originally an integral part of project design.

Innovation and need for project: The project has received notice from many as the first donor project in the Bangladesh brick sector – an area widely recognized for its negative impact on air quality. In addition to addressing a new area, the project is considered innovative in its approach of working closely with the private sector. Whether the project was truly needed (and thus relevant) or energy efficient brick technologies would have come to Bangladesh anyway is a point of some contention. Yet, subsequent sub-sections provide evidence that the project did have a strong impact in replication and other aspects of moving energy efficient brick efforts in the country forward.

3.2 Replication

As mentioned, Universal, the PDF B demonstration established in 2006, was the first coal-fired HHK in Bangladesh. Though many gas-fired HKs had been built previously, policy no longer allows new ones to be built. Other coal-fired HHKs began to appear in the years after Universal, even before full project implementation. In November 2013, the project-commissioned a study on HHKs that included a replication survey (Chisty, 2013). The survey found a total of 52 non-project HHKs (some operating and some in the pipeline). The author of the study emphasized that he may not have found them all. Registration information provided by the Department of Environment (which licenses brick kilns) indicates that by September 2014, there were 63 HHKs (including both project and non-project ones). Of the 52 found by the consultant in November 2013, 24 were determined to be operational, though there were also 12 of the other 28 that had unknown status.

Determining causality as to how these investors first heard about HHKs and why they decided to go ahead and invest is challenging. This author's conclusion, however, is that at least half of the non-project HHKs and probably more experienced significant impact either directly or indirectly from the project and thus may be termed "replications." Exhibit 3-3 below shows data on the status of the non-project HHKs found by Chisty in his 2013 study, which also provides information on how investors first learned about HHKs and other potential links with the project. The study's survey included a specific question on "first information source of HHKs." Seven out of 29 answering the question (and 6 out of 19 that are operational and answered the question) indicated that UNDP was their first information source. Yet, a meeting with the Mr. Chisty yielded further insights as to why he believes the number impacted by the project may be greater. There is a phenomenon that a few of those who first interacted with HHKs through the project went on to become consultants or service providers. Based on this line of reasoning, the estimate in Exhibit 3-3 of those impacted by the project is widened to include those who had retained Brictec (also known as Planning Partners), a service provider who clearly developed his HHK expertise via interactions with the project. And, given the very large number of media reports achieved by the project, those first hearing about HHKs through the media are also counted as being influenced by the project. These estimates bring the proportion of non-project HHKs (both operational and overall) answering the question that were somehow significantly impacted by the UNDP project close to 50 percent. The true figure is likely larger, as there may be many other second-hand links besides Brictec that are not known to the reviewer.

Exhibit 3-3: Status of Non-Project HHKs and Role of the Project in their Existence
Results imply substantial role of project in replication.

Status of non-project HHK	Number HHKs	Stated UNDP as first info source	Others influenced by UNDP*	Total UNDP influenced	Service Provider
In operation (Nov. 2013)	24	6 out of 19 (32%) answering question	+2 Brictec +1 media	9 of 19 (49%)	Shunfeng 9/15 Planning Ptns 2/15 BRITIC 2/15
In test run (Nov. 2013)	2	0 out of 1 answering question	--	0 of 1	Shunfeng 1/1
Construction (Nov. 2013)	11	0 out of 9 answering question	+3 Brictec +1 media	4 of 9	Shunfeng 2/5 Planning Ptns 3/5
Planning (Nov. 2013)	3	1 out of 2 answering question	--	1 or 2	NA
Unknown (Nov. 2013)	12	None responded	--	---	NA
Total (Chisty, Nov. 2013)	52	7 out of 29 (24%) answering question	7 out of 29 answering question	14 of 29 (48%)	Shunfeng 12/21 Planning Ptns 5/21
DoE Total (Sept. 2014)	63	NA	NA	NA	NA

Sources: PMU-commissioned Chisty study (Nov. 2013), DoE Kiln Registration Data (Sept. 2014)

*Note: For "others influenced by UNDP", all HHKs served by provider Brictec (also known as Planning Partners), which was heavily influenced by the project, are included. Further, given the very strong media campaign of the project, all those stating the media as their first source of information on HHKs are included in the group of "others influenced by UNDP."

Exhibit 3-4 below illustrates the geographic distribution of non-project HHKs identified in the Nov. 2013 PMU-commissioned study. Like the project demos, most are located in the Dhaka area, though most of the nation's six other divisions have at least one. One positive trend noted during the MTR mission is news of a number of HHKs being planned outside Dhaka Division.

Exhibit 3-4: Geographic Distribution of Non-Project HHKs identified in Nov. 2013

Dhaka	Chittagong	Khulna	Rajshahi	Barisal	Sylhet	Rangpur
43	4	1	1	2	---	1

Sources: PMU-commissioned Chisty study (Nov. 2013)

Further leading to confidence in the conclusion of the project's role in the significant number of non-project HHKs is information gathered through the interview process about some of the very early non-project HHKs. For example, the owner of Kapita (established in 2010), while he had earlier been exposed to gas-fired HKs, spoke to the project (via CEA) about coal-fired HHKs and discussed the possibility of becoming a project demo. He eventually decided to go with another service provider. Since then, in addition to building a second HHK plant, he has advised others on developing HHKs, though the MTR consultant does not know the names of these other companies so was not able to include them in the count of UNDP-project-influenced HHKs. Another early example is Diamond, constructed in 2007. Diamond's owner first consulted with the UNDP project (via CEA) about becoming a demo before deciding to go with another service provider. Also illustrating the sort of second-hand impacts of the project seen in replication, one policy maker from Department of Energy (DoE), after indicating the project had had no impact on policy, told the MTR consultant he first learned about HHKs from a site visit to Diamond. HHKs, in turn, were eventually specified as one of the allowable brick kiln types in the 2013 Brick Act. Selected anecdotes offered by stakeholders regarding attribution of HHK replications are given in Exhibit 3-5. On the whole, while there are a few contradictions, these comments suggest a substantial role of the UNDP project in replication.

Exhibit 3-5: Selected Stakeholder Comments Regarding Influences on HHK Replication

Anecdotes and Comments Related to Project Impact on Replication
<p>-“Learned about HHKs from UNDP project. The housing sector is taking those bricks, so there is good demand. Plan to do an HHK and have applied for an ADB-subsidized loan. Have not converted to zig-zag because want to do HHK.” – traditional brick maker</p> <p>-“Diamond Autobricks purchased its machinery from project partners CEA/XI/Tianjin. After sometime, it turns out the project partners could not provide the engineers from China as promised. So, the owner went to China and found an engineer. Construction began in 2007. Capacity was much lower than targeted, so a second HHK has been built.” – service provider A</p> <p>-“Diamond was not parallel – it came one year after the PDF B demo. Kapita also came after. Both were involved with the PDF B Demo, Universal.” –PMU team member</p> <p>-“UNDP project did full design for Kapita. They came to the project for discussions at least ten times. Eventually worked with another supplier to build it.” – service provider B</p> <p>-“Kapita learned about HKs from Rex Autobricks, a gas-fired project, not from UNDP project.” – service provider C and entrepreneur (in separate conversations)</p> <p>-“Am in the construction business and heard about HHKs through travels to China.” –HHK owner (His</p>

service provider, however, was heavily influenced by the UNDP project.)
 -“Given that Shunfeng [top service provider to replications] was in Bangladesh about ten years [before full project started], why did replication have to wait until 2010 to take off?” - consultant who believes project played important role in replication

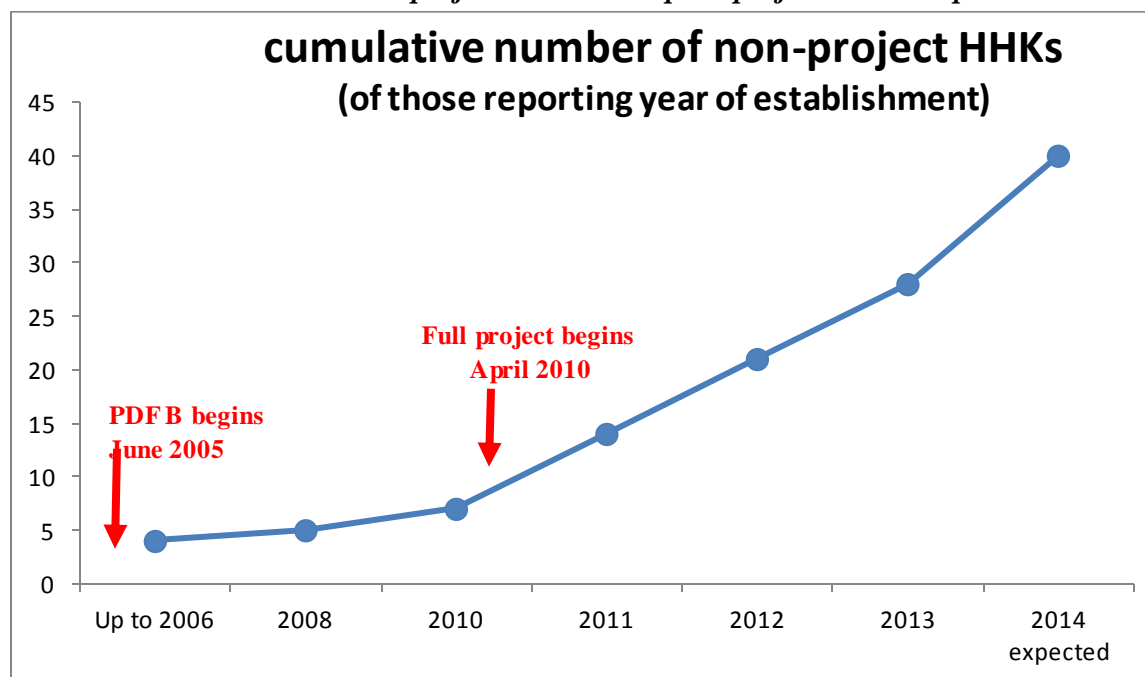
Exhibit 3-6 shows stakeholder comments relating to the quality of replication plants. Views on whether these plants are well designed and whether they are doing well or are even operational are mixed and contradictory. Deeper examination of the challenges facing HHKs is provided in Section 4.

Exhibit 3-6: Selected Stakeholder Comments Regarding Quality of Replication Plants

Anecdotes and Comments on Quality of Replication Plants (including proportion of capacity reached)
<p>-“Advance Tech HHK is in Bogra, an island in the south part of Bangladesh. The plant was built quickly – in six months. It has achieved production of 50,000 bricks per day out of a capacity of 60,000. A second kiln is being planned to expand the capacity by 60,000.” –HHK owner</p> <p>-“Project at Tangail [Dhaka Division] with capacity of 100,000 bricks per day is running at 75,000.” – service provider A</p> <p>-“[Replication plant] was operating at only 20% capacity. Buys natural gas for external heat and transports it at night [because it’s not allowed]....Due to pollution from external heat, DoE issued letter asking them to shut down... Most of the ‘operating’ replications in the project study are not really operating...All of the top service provider’s HHKs are in trouble. With external firing, energy efficiency is low....Villagers shut down the [replication] plant due to smoke from the external firing...Believe most of Shunfeng’s ‘replications’ are not really operating.” – service provider B</p> <p>-“Xian Shunfeng has done 20 to 25 HHKs and most are still operational. It has three more in the pipeline.” – service provider C</p>

Other evidence implying project replication rather than coincidental establishment of so many HHKs outside of the project is the timeline for non-project demo establishment. Chisty (author of the project-commissioned Nov. 2013 report on HHKs) collected information on date of establishment of non-project HHKs. He then plotted the cumulative number of HHKs against time and argues that the uptick correlates quite well with the project timeline, strongly suggesting, though of course not proving, causality. Exhibit 3-7 shows the timeline of non-project HHK establishment based on the data he collected.

Exhibit 3-7: Timeline of non-project HHK Establishment
Correlation with project timeline implies project role in replication.



Source: Project-commissioned study by Hashim Chisty, November 2013.

3.3 Other Evidence of Positive Impact on the Brick-making Industry

Stakeholder interviews revealed a range of other types of evidence that the project is playing a strong role in the generation of non-project HHKs seen in Bangladesh and that these therefore may be termed “replications.”

Statement by top provider of HHKs: While interviews revealed a lot of negative feelings about the project (particularly among those involved in the demos), an individual involved in the industry since 2001 and working for the number one turnkey provider of HHKs in Bangladesh attributed the popularization of HHKs in the country to the project: “The UNDP Project and its work with Xian Institute had a major influence in spreading HHKs in Bangladesh. Before that, HHKs were not popular in the country. There were not many projects. The UNDP project introduced the word ‘HHK’ to the industry.” These words, coming from one of the persons that has had the most central position in Bangladesh’s HHK industry for the longest time, adds a lot of credence to the idea that the project had a major impact via building awareness of HHKs.

Introduction of future service providers to HHKs: As mentioned, interviews revealed that at least a few persons active in this industry and now advising or providing services to HHK entrepreneurs were strongly influenced by the project earlier in their careers. One such person is the founder of Brictec Bangladesh, a leading turnkey HHK provider that has completed two HHK facilities and has three more in the pipeline. The completed projects are operating at a

respectable 70 to 80 percent capacity daily. The individual's career trajectory includes the following:

- Worked at Diamond Autobricks (Diamond is a project that started with UNDP/CEA and then went to China to find its own Chinese engineers when CEA could not deliver service in a timely fashion. Diamond began its work in the interim between the PDF-B phase and the start of the full-scale project.)
- Worked at SSL (UNDP project demo)
- Worked at Banolata (UNDP project demo)
- Consultant to CBN (Interestingly, this individual began constructing the HHK at CBN, but the job was later taken away and completed by CEA, after which CBN became a project "demo.")
- Founded Brictec Bangladesh

Raised awareness of traditional brick makers: Board members of BBMOA, the association of traditional brick makers, told the author during the mission that they first learned about HHKs from the UNDP project via a site visit to Universal (PDF-B demo). While BBMOA's official position is that HHKs are too capital intensive for traditional brick makers who cannot get the access to loans that non-traditional investors have been able to get, there do appear to be a small group of traditional brick makers that are pursuing HHKs. For example, the MTR mission later learned that one of the BBMOA board members with whom it had spoken had applied for an ADB loan to establish an HHK. At the same time, the MTR mission found that some regular members of BBMOA have little knowledge of HHKs. This suggests that substantial work remains to be done to get the word out to the association's 6,000 members regarding energy efficient options for the brick making industry.

Market recognition of quality of HHK bricks: While much work is still needed in educating the market, input from stakeholders during the MTR mission suggest that the market is beginning to recognize the high quality of HHK bricks. As the project has played a role in spreading the technology, this secondary impact, which could, in turn, magnify replication trends, may also be attributed partially to the project. The owner of one of the project demos (with a plant far away from Dhaka) indicated that the market recognizes the special quality of its bricks. The entrepreneur is planning expansion. Another demo owner stated that he expects no problem in marketing the HHK bricks and that there are lots of customers. He explained that the housing sector prefers "auto bricks." He further explained that, while retail customers do not like it that HHK bricks are heavier, real estate developers, highway builders, and government all like the solid bricks and hollow bricks available from auto brick makers.

Information provided to interested entrepreneurs: The sheer number of entrepreneurs to which the project provided information on HHKs in a one-on-one format also implies the project

may have had strong impact beyond the demos. Records indicate a total of 182 interested entrepreneurs received such information support via consultations at either the PMU or CEA.

3.4 Evidence of Impact on Policy

Interviews did not reveal strong direct impact on policy, but reasoning suggests at minimum, a strong indirect impact exists. The author spoke with two different Department of Energy (DoE) officials regarding whether the project had had an impact on the new Brick Making Act issued in 2013. One told us that the UNDP project had been consulted about the draft policy, suggesting possible partial influence. The other told us the UNDP project could not have had an impact, since they (DoE) just came to know about the project recently. This official, however, is the one that came to know about HHKs via a visit to Diamond Autobricks, which, as mentioned, was in turn influenced by the project. The new Brick Act outlaws the predominant FCK kiln technology in Bangladesh and offers a number of options including zig-zag (a small scale technology), HHK (medium scale), and tunnel (medium to large scale). A number of stakeholders point out that, without the project, policy makers might not have been aware enough or felt comfortable enough to include technologies such as HHK in the new Brick Act. At minimum, the project may be credited with introducing the HHK concept, albeit indirectly in some cases, into the awareness of Bangladesh's policy makers. At maximum, the overall concept of "green brick" (energy efficient, lower emission) technologies in the mindset of policymakers may have been generated by the project, as it was the first to create "buzz" about green brick technologies in general.

Exhibit 3-8 provides selected comments from stakeholders regarding the links between the project and policy. Most of this evidence is supportive of an impact of the project on the Brick Making Act issued in 2013. In addition, the project team notes a very clear connection between project communication activities and the 2012 ruling of the Supreme Court of Bangladesh banning brick kilns in eleven ecologically critical areas.

Exhibit 3-8: Comments from Stakeholders Regarding Project Impact on Policy

Brick Maker Comments
"Believe project [and other donor projects] had an impact on the government act. Otherwise, why would the Act mention technologies like HHK and Zig Zag? So, likely a link." –traditional brick maker
Comments of Government Officials
"Learned about HHKs via Diamond project. HHK is a good technology. Before was concerned HHK not within the law because requires too much land. Went to Diamond and was really surprised. The owner is now looking to do an additional project...Don't know anything about the policy contributions [of the project]. Have not even visited the demo site – how could [project] have influenced us?"– DoE official (note: Diamond influenced by UNDP project, suggesting indirect project influence on official) "Definitely we consulted UNDP---[UNDP Project] took part in the process [for formulating the new Brick Act]....An eye opener for the Department/Government to see the new technology." – DoE official
Project Team and UNDP Comments
"[Different person from] DoE attended inception workshop. Project met frequently with DoE and sent them documents." – Project staff member A

“[DoE official] was Project Board member for over three years. Project had workshops that talked about policy – talked about financial barriers, soil issues, alternative approaches. And, the new law talks about soil issues. The two (project and policy) were in parallel. There is no concrete evidence [of impact]. Still, we can claim [impact] because all of these discussions that went on.” – Project staff member B

“[Project] got article in the *Daily Star* about brick makers [regarding] protected area in danger because of brick kilns...In 1 to 2 weeks, high court... issued a *suo-moto*...The Brick Act this time was one of the fastest passing laws in the country. Without the project may have taken 20 years to pass. Law specifically mentions HHKs because of project.” – Project staff member C

“Believe that without project, the Act would not have happened. They were targeting an emissions level, but needed alternative [technology] options. Seeing and believing technologies available in the market influenced policy makers. If there were no options, will not have the Act.” – UNDP staff member

3.5 Evidence of Impact on Media

Component 4, the communications effort handled by the PMU, resulted in extensive media coverage of green bricks and brick environmental issues. Direct impact on the media (and thus awareness of those exposed to the media) is clear. In a specific example, a project media campaign on kilns in Cox’s Bazaar led directly to the Bangladesh Supreme Court Ruling prohibiting kilns in ecologically sensitive areas of Cox’s Bazaar. More broadly, over the course of the PMU’s media efforts, 49 news stories were published in print media and 20 in electronic media. This is considered a relatively high level of coverage for a UNDP-GEF Bangladesh project and represents significant impact on the media.

3.6 Probable Indirect Impact on Banks and Financial Institutions

While project activities for Component 5 (Energy Efficient Kiln Finance Support Program) were disappointing, evidence suggests that the project has indirectly led to greater awareness and interest by banks and financial institutions in energy efficient brick technologies. Project activities are disappointing in that broader efforts to build the capacity of financial institutions and banks were neglected in favor of specific financing support for the demos. And, of the demo entrepreneurs with whom we spoke, a greater number indicated they had received no help from the project in financing than those that did. Many, it seems, already had their own relationships with the banks and did not need or seek help. Yet, the two financial institutions we met with, IDCOL and IDLC, have people educated, conversant, and pro-active with regard to green brick projects. IDCOL over the past year has had strong internal efforts to understand the brick sector and is considering one HHK project, though is more interested in tunnel kilns. IDLC has financed two HHKs and is interested in cooperating with UNDP in raising the knowledge level of its brick sector clients. They have suggested the project and IDLC hold a joint seminar with IDLC brick clients regarding green brick technologies.

This interest and involvement on the part of financial institutions is unlikely to have been the situation in Bangladesh prior to the project. The author concludes that, while the project did not

directly build awareness of the banks, through stimulating replication and the involvement of other donors in the sector (especially ADB and World Bank), the project indirectly led to raised awareness in the financial sector. As one stakeholder pointed out, prior to the project no bank in Bangladesh had funded an HHK. At the same time, the MTR mission found that there was financial institution involvement in gas-fired HKs prior to the project.

Further evidence of indirect impact on the financial sector is found in Chisty's Nov. 2013 work on HHK replication. Of 26 non-project HHK owners answering a survey question on financing, 23 indicated bank or financial institution loans that together total about US\$39 million. While absence of broad capacity building of financial institutions mostly rules out direct project impact, our findings regarding project impact on replication itself suggest the project has indirectly impacted the banking sector via the resulting loans. Exhibit 3-9 provides a listing of these non-project HHK loans, organized by financial institution.

Exhibit 3-9: Non-project HHK Loans

Suggests indirect project impact on financial sector, given project role in HHK replication.

No.	Bank or Financial Institution	No. of Projects	Amount loaned (USD)
1	Agrani Bank	1	1.16 million USD
2	Bank Asia	1	1.70 million USD
3	Basic Bank	2	2.68 million USD
4	City Bank	1	839,000 USD
5	Eastern Bank	1	1.10 million USD
6	IDCOL	1	1.70 million USD
7	Islami Bank	2	1.48 million USD
8	Janata Bank	1	839,000 USD
9	Krishi Bank	1	839,000 USD
10	National Bank	1	839,000 USD
11	One Bank, Ltd.	2	2.69 million USD
12	Prime Bank	3	3.59 million USD
13	Shahjalal Bank	1	1.34 million USD
14	SIBL	1	1.16 million USD
15	Sonali Bank	1	839,000 USD
16	UCBL	3	3.52 million USD
	TOTAL	23	38.90 million USD

Source: Hisham Chisty, project-commissioned report, Nov. 2013.

Note: Results are from a total of 26 HHK owners responding to questions on financing of their ventures.

3.7 Other Donor Involvement in Bricks

A last area in which the UNDP-GEF Bangladesh Green Brick Project appears to have had direct impact is in activating other key donors, namely the World Bank and ADB, to enter the green brick area. Compared to the UNDP-GEF Project, for which PDF-B work was initiated in 2005 and for which full-scale project work was initiated in 2010, other donor activities started later

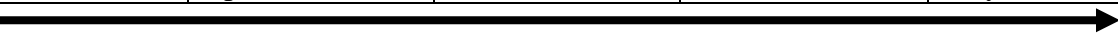
(see Exhibit 3-10). The World Bank CASE Project, for example, began in 2010. About US\$5 million of the CASE project's total budget (other areas besides bricks are covered as well) focuses on bricks. World Bank personnel told the MTR consultant that CASE after review of the UNDP project decided to focus on smaller-scale kiln technologies, since the UNDP project is covering the mid-scale HHK technology. So, clearly, the World Bank project carefully reviewed the UNDP project activities. Further, a team member of the World Bank involved in its Bangladesh brick work was involved in the PDF B phase of the IKEBMI project when previously employed at UNDP (2004-2007).

In a separate initiative, the World Bank purchased carbon credits, beginning in 2011, from two bundles of five HHKs each. Of the first bundle of five, all five HHKs are either project demos or non-project HHKs clearly influenced by the project. This first bundle was arranged by CEA, one of the project partners, and registered with the UNFCCC in 2011.

The Asian Development Bank, in an initiative approved in May 2012 is providing US\$50 million in green brick financing for Bangladesh. This will be made available to entrepreneurs in the form of low-interest loan support, consisting of US\$30 million for small-scale kilns (zig-zag) and US\$20 million for medium and large size kilns (HHKs and tunnel kilns), as well as VSBKs (also small-scale). It is unlikely the ADB project would have been able to generate significant interest in HHK investments on a reasonable timescale had it not be for the demonstration and popularization of HHKs achieved via the UNDP project. Yet, while start-up has been slow, at least two HHKs have already been approved in ADB's pipeline, both of which will have turnkey solutions provided by Xian Shunfeng, the number one HHK service provider in the country.

Exhibit 3-10: Timeline of Donor Involvement in Green Bricks in Bangladesh
Timeline implies UNDP-GEF project stimulated or facilitated other donor activity

UNDP-GEF IKEBMI PDF-B launch	UNDP-GEF IKEBMI Full-scale project launch	World Bank CASE project begins with estimated US\$5 million green brick component for small-scale kiln technologies	World Bank CASE purchases carbon credits for first bundle of 5 Bangladeshi HHKs	ADB low- interest loan facility launched: US\$30 million for zig- zag and US\$20 million for HHK, tunnel, and VSBK
June 2005	April 2010	2010	2011	May 2012



Discussion of UNDP role going forward vis-à-vis green brick activity of other donors is included in Section 8 ("The Way Forward").

3.8 Changes from the Baseline: Summary of Changes to Date and Opportunities Going Forward

Bringing together some of the above findings, as well as other targeted impacts of the project, in a single chart is useful in highlighting the true extent of the project's impact. Exhibit 3-11 attempts to do this by showing changes to the baseline achieved at the time of the MTR (October 2014) and indicating the MTR consultant's assessment of whether these changes were in whole or part due to the project. By adding a column for "end of project" and perhaps one for "five years after project close", the chart could also be used as a big-picture planning tool to identify what needs to be achieved post-MTR and before project close.

The most notable changes from the baseline in 2005 are that: (1) Bangladesh has gone from zero to about 26 operational HHKs (largely due to the project). (2) The number of service providers in the green brick sector has increased (in part due to the project) from one or two to five or six, though not much progress has been made in domesticating manufacturing. (3) A new policy requiring use of cleaner kiln technologies has been issued, in part due to project. (4) Green bricks, previously unknown to the media, have received numerous mentions in the media due to the project. (5) Some, but not all, traditional brick makers are now aware of various green brick technologies, in large part due to the project. (6) An estimated 21 private sector banks and financial institutions have made loans to HHKs, whereas previously none had. This is believed to be an indirect impact of the project, though loans had been made previously to HKs. (7) Involvement of major donors has increased from one (UNDP) to three, at least in part due to the project. An area targeted by the project but in which less progress has been made is brick making techniques, such as molding and hollow bricks. While the new brick act requires 50 percent of bricks to be hollow, in practice there is little activity in this area. The market is not receptive and sourcing of required materials is considered a barrier.

Exhibit 3-11: Changes from the Baseline
Overall, changes from baseline suggest substantial impact of project.

Item	At start of PDF B (June 2005)	At start of project (April 2010)	At time of MTR mission (Oct. 2014)	Due to project?
Number of coal-fired HHKs operational	0	4 operational (estimated)	26 operational (estimated)	Over half due in some part to project influence
Other EE brick practices (molding, hollow bricks, etc.)	limited	Limited	limited, but policy requires 50% hollow bricks	Possibly
Status of service providers and	1 or 2 service providers in	Unknown	5 or 6 service providers in	At least partly

manufacturers	HHK market		HHK market	
Brick making policy	2001 policy amendment requiring BTK conversion to FCK	2001 policy amendment requiring BTK conversion to FCK	2013 policy amendment requiring FCK conversion to zig-zag, VSBK, HHK, or tunnel	In part due to project's introduction of alternative technologies
Green bricks in media	None known	None known	49 news stories in print media, 20 in online media	Yes
Awareness of brick makers	Did not know about EE brick technologies	Most did not know about EE brick technologies	Many but not all know about EE brick technologies	Yes, in large part
FIs/banks making loans to HHKs	None (but some HK loans)	2 or 3 estimated	21 (estimated)	Indirectly due to project
Involvement of other donors	UNDP only	UNDP and World Bank	UNDP, World Bank, ADB	Yes, at least partly

Note: Figures are rough estimates, mostly based on findings of Nov. 2013 project commissioned study by Chisty combined with information on project demos.

Going forward, the project has substantial opportunities to generate additional changes from the baseline. While the way forward will be discussed in more detail in Section 8, some preliminary thoughts on potential further changes to the baseline are discussed here. First, HHKs are currently in a precarious situation as both profitability and technical viability in Bangladesh are in question. If the project is able to satisfactorily address these issues through a detailed study of current HHKs and resolution of certain issues facing the sector, the change from the baseline in terms of HHK numbers could be much greater by, say, five years post-project close. The project may also be able to generate positive changes from the baseline in the number of small-scale truly energy efficient kilns through providing support in capacity building and certified design. (Currently, there are concerns that the majority of zig-zag conversions are not meeting government emissions standards and are not that energy efficient.) With more targeted policy work, the project may be able to generate changes from the baseline with new preferential policies for green brick enterprises, such as classification of these enterprises as eco-industries qualified for low-interest loans, or with standards for bricks that favor them. The project also has an opportunity to fill gaps in its work to date by promoting and building capacity in non-kiln energy efficient practices, such as molding and hollow bricks. Finally, stronger awareness work on energy efficient kilns and practices for the industry has the potential to create broader awareness across the full membership of BBMOA.

4. Project Overall: Negative Findings and Concerns



Exhibit 4-1: *Left*: Full-scale project demo - Eco 2. Production stopped by owner due to low capacity. *Right*: Full-scale project demo -Eco 3. Construction stopped due to Eco 2 problems (Oct. 2014, photos by Mr. Shamim Iftekhar).

While positive impacts, as described in the foregoing section, have been substantial, the project has also experienced serious shortcomings. As an example and preview of this section's discussion, during the mission, the MTR consultant visited the site of Eco2, a commissioned demo that has stopped operation, and the site of Eco3 and Eco4, two adjacent kilns, also designated as project demos, for which construction was stopped mid-stream. Photos are shown in Exhibits 4-1 and 4-2. Eventually, it was determined that only one of the full-scale project's demos (of 15 targeted in project design) was operational at the time of the MTR mission. Discussions revealed a number of problems in partner implementation of the demos. At the same time, interviews showed that many HHK owners (both demo and non-demo) are facing difficulties in achieving and maintaining profitability. Another apparent shortcoming of the project has been lack of oversight of costing of activities of the project partners and of tying these to overall targeted deliverables, both to ensure reasonable costing and to ensure that money was being spent at a pace that could ensure full delivery. Over-focus on the demos and neglect of project activities targeting a broader audience of beneficiaries is also a major concern. Finally, many stakeholders have raised the concern of whether the HHK technology is appropriate to Bangladesh or at least whether it has made sense for the project to put almost its full focus on this one technology.



Exhibit 4-2: Equipment for full-scale project demos Eco3 and Eco4. Stored under shed and rusting reportedly due to owner dissatisfaction with Eco 2 operation and cash flow problems there. Construction for both Eco3 and Eco4 was stopped midstream (Oct. 2014, photo by Mr. Shamim Iftekhar, IKEBMI Communications Officer).

The serious problems with the project demos raise the question of whether problems with implementation arrangements and delivery specific to the project are the main underlying issue or whether the general difficulties in introducing a new technology are the main explanation. This section will examine both explanations. It acknowledges and assesses the major challenges to introducing HHKs, a new technology, into Bangladesh. At the same time, given the many problems and complaints regarding partner implementation of the demos, these are also examined in detail. In order to gain some perspective on the overall importance of the two types of explanations, it is useful to review and compare the status of non-project HHKs with demo HHKs. While the MTR could not do this on a comprehensive scale (and indeed suggests this as a next step for the project), interviews reveal that greater success has probably been achieved by non-project HHK owners and their turnkey providers. That is, while most are struggling, a substantial number of non-project HHKs appear to be operational and having a better relationship with their turnkey service provider. In particular, while only one of the full-scale project's targeted 15 demos was operational at the time of the MTR, the top turnkey service provider to the HHK industry appears to have achieved a much more significant number of operational clients (possibly up to 20, though this needs to be confirmed). In addition, the service provider's clients with whom we spoke were very positive about the services provided. This contrasted with the predominantly dissatisfied attitude of project demo entrepreneurs with their service provider, who are the project partners CEA and XI. One reason for the contrast is that the project partners had weak capacity on the ground. In addition, multiple sources suggest that the project partners had substantially underestimated costs to investors, which left them quite upset once the true costs were known. The underestimates led to shortages of working capital once

projects became operational, so that the entrepreneurs faced a problematic and unexpected crunch once commissioned.

General comments on the project offered by stakeholders further convey the view that it is the project itself that has problems, rather than all being explained by general challenges to technology adoption, though the latter must be acknowledged as well. Exhibit 4-3 shows some of these general comments. Subsequent text of this section will include stakeholder input on more specific issues.

Exhibit 4-3: Selected Stakeholder Comments on General Concerns about the Project

-“Don’t see any interventions of the project - don’t really see it doing anything. There is no training. There is none of the mutual trust needed. There is serious resistance from BBMOA as the HHK cost is 15 times that of traditional kilns. There was serious opposition to the transformation. Before launching the project, people gave a very rosy picture of profits and environmental benefits. When the PDF B was implemented [things seemed okay]. When the full project came, everything has gone awry....[The project partners] didn’t do anything – they haven’t brought the things they were supposed to.”-HHK investor

-“The major value of the project is in creating awareness that the technology exists and is profitable. But subsequent impact was negative as lack of successful implementation led to a reduction of confidence in the technology. Are you [UNDP] happy with the performance after 6.5 years?...Given the challenge of the startup experience with many HHKs, the enthusiasm of investors has diminished to a great extent. Don’t see much enthusiasm now. The more alarming side is that confidence of the entrepreneurs has been diminished. It’s not only UNDP, but ADB has a problem – US\$50 million loan facility but no loans. Only two have been approved and none disbursed. Something is wrong with the technology...On the positive side, the project created initial positive momentum. The tragedy is that the momentum was not sustained.” –financial institution stakeholder

-“[Project partners] spoiled the opportunity of this project. Yet, UNDP also did not give it enough priority.” –HHK investor

-“UNDP saw it as a very interesting project, but day to day there were problems....Day to day what was happening worried me a lot. Worried about how much we were committing to the factories as PMU did not have much resources. Most of the money was allocated to CEA and XI.”- UNDP stakeholder

The main content of this section is laid out as follows: The section begins with a review of the status of the project demos, an important topic which should be out in the open, but was not entirely clear in initial interactions with the project. The text then moves to a demo-by-demo presentation of the various explanations for demo problems that have been given, particularly by the demos themselves and by the project partners CEA and XI. This part also includes some background information on each of the demos. Next, an issue-by-issue, topical analysis is presented of possible shortcomings in partner implementation that have led to demo problems. It is followed by an assessment of general problems facing introduction of the HHK technology in Bangladesh, which some suggest as an alternative or at least softening explanation to partner implementation shortcomings. The discussion next addresses issues of costing of partner activities and ensuring payments are tied to overall project deliverables. This is followed by a discussion of the project’s over-focus to date on the demos, resulting in the neglect of broader project activities targeted in the original project design. Last, the section introduces the issue of

technology selection and the question of whether almost complete focus on HHKs (as has been the trend of the project to date) makes sense for Bangladesh. This issue is examined further in Section 8 (“The Way Forward”).

4.1 Status of Demos

Initially, one challenging aspect of the MTR was getting down to the bottom of the demo numbers. How many demos had been achieved, after all? Challenges included figuring out which commissioned demos were really operating and which demos in the pipeline were really moving forward. The results of findings are disappointing. While the full-scale project targets 15 demos (not including the PDF-B demo), only one was operating at the time of the MTR. Three others had been commissioned but were not operational. As for demos “in the pipeline,” two had stopped construction, one is moving forward just having obtained financing, and one has been stalled for over a year with its loan application stuck in a financial institution. Exhibits 4-4 and 4-5 show the status of commissioned and pipeline project demos.

Exhibit 4-4: Full-Scale Project “Operating” Demos

All commissioned, but only one operating

Suggest counting CBN as one demo, so table represents 4 commissioned demos

Name	Location	Capacity bricks per day	Kilns	Status	Reason/Notes
1. Banolata	Natore	50,000	1	operating	owner no longer allowing CEA/XI access to site
2. Eco 2	Dhaka – next to PDF B demo	50,000	1	operation stopped	owner frustrated with under-capacity operation
3. CBN	Dhaka – in key traditional kiln area	100,000	1 (CEA counts as 2 demos)	operation stopped	owner ran out of operating capital; bank loan too small
4. SSL	Dhaka	50,000	1	operation stopped	Not profitable/far under capacity; land sold for profit

Exhibit 4-5: Pipeline Demos

One looks promising; others stalled;

suggest counting each company as one demo rather than two, so table represents two or three pipeline demos, rather than six

Name	Location	Capacity bricks per day	Kilns	Status	Reason/Notes
1. Eco 3 and Eco 4	Dhaka – near Eco2 and PDF B	100,000	2 (CEA counts as 2)	Construction stopped	Not happy with Eco 2 production level

			demos)		
2. NDC	Magura (Khulna Divison)	100,000	2 (CEA counts as 2 demos)	Just got loan	Seems satisfied with progress
3. Makrail	Faridpur (Dhaka Division)	100,00	2 (CEA counts as two demos)	Waiting 2 years for IDCOL loan	XI not willing to sign performance bond required by IDCOL

Aside from the aforementioned issues, there were additional disappointments: Demos are more heavily focused in the Dhaka area than intended. And, even in the Dhaka area, it's clear the greatest effort has been to "hit the numbers" rather than to achieve a demonstration effect. For example, commissioned demo Eco 2 is located right next door to the PDF B demo Universal (also known as "Eco 1"). And, Eco 3 and 4 (pipeline demos) are located a few kilometers away and are next door to each other. Finally, all three Eco demos are owned by the same party. It seems that no clear definition of project demo was ever agreed upon, though in the consultant's view, at minimum allowing a maximum of one demo per owner or per contiguous location to "count" seems reasonable for a project hoping to achieve a demonstration effect, while three nearby kilns owned by the same owner counting as three independent demos does not. Further, the MTR consultant found that in one case a single large kiln (CBN) was being counted as two demos. Interestingly, this kiln was not even initiated by the UNDP-GEF project partners, but instead taken over from another turnkey service provider when construction was underway. In the absence of a pre-existing agreement on the definition of a demonstration, the MTR consultant believes that at minimum, the count for CBN's one kiln should be reduced from two demos to one. The MTR consultant further recommends the three pipeline enterprises be counted as two or three demos total rather than six, despite each having two adjacent kilns.

4.2 Demo-by-Demo: Additional Background and Explanation of Problems

This subsection provides additional background on each of the demos and also explores the explanations of problems on a demo-by-demo basis. It focuses mostly on feedback from the demo entrepreneurs and project partners, though includes input from others when relevant. The subsection following this one also explores problems with the demos but does this on a cross-cutting, issue-by-issue basis. The goal of this demo-by-demo section will be to give the reader a full view of the demo storyline and initial introduction to some of the issue areas, while that of the following section will be to probe the significance of various types of partner implementation issues in depth.

Summary of feedback from demo entrepreneurs and project partners : Perhaps one of the most concerning findings of the project is that a number of the demo entrepreneurs spoken with

are quite angry with the project partners and/or indicate they did not receive the support expected. As we heard different versions of events from the entrepreneurs than we heard from the project partners, it became clear that not everything everyone said could be accurate. Triangulating and looking for congruence between what multiple parties said leaves one with a few key conclusions. First, there had been serious problems in the project partners substantially underestimating costs to the entrepreneurs, resulting in serious problems with both operations (e.g. not enough drying capacity built due to the low estimates) and then operating capital down the road (more money spent on capital expenses than expected). Further, project partners' responsiveness to urgent needs of entrepreneurs was quite weak, causing delays and costing the entrepreneurs money. Because the issues involved are contentious, we provide feedback from the entrepreneurs on an anonymous basis in Exhibit 4-6 below. For fairness, we also provide the responses that CEA and XI have offered to this feedback. In general, given the challenges in achieving profitability in this sector, some degree of dissatisfaction is likely. Yet, the more positive responses received regarding the top HHK service provider implies the problems are not entirely due to industry challenges.

Exhibit 4-6: Entrepreneur and CEA/XI Statements on the Problems

Conclusion: Stories differ, but underestimates of costs and lack of timeliness in service provider response time appear to be consistent problems

What entrepreneur says	What CEA/Xian Institute says
Entrepreneur 1: CEA/XI under-quoted price by far to draw us in; response time terrible – caused us to lose money; double charged [for UNDP-GEF supported services]; did not design drier well. Forced us to sign equipment contract with them.	CEA/XI on Entrepreneur 1: Problem is fireman's skill level; entrepreneur did not pay us last several months for Chinese fireman; we are willing to talk to them. Drier adjusted because Bangladeshi firemen weak. Plant manager stealing from owner by buying inferior quality coal.
Entrepreneur 2: [CEA/XI] are really representative of an equipment supplier. They required use of Tianjin's equipment. Kiln and drier design too small. Other providers have long ago solved these [technical] problems. No one shows up when service requested.	CEA/XI on Entrepreneur 2: Diverted money to other investment purposes. CEA construction supervisor spent 3-4 months at site.
Entrepreneur 3: Main problem is not enough working capital. Yes, CEA also not timely/ cost us money as a result. Construction supervisor never stayed overnight. Yes, [CEA] underestimated costs. I did not know UNDP provided money to CEA so that free services could be provided to me. Received no support from CEA in liaising with banks.	CEA/XI on Entrepreneur 3: NA (MTR consultant did not discuss this demo with CEA/XI).
Entrepreneur 4: Situation is killing us – have lost millions of taka on salaries. CEA says "4 days" and no word for months. May be willing to go with other supplier if they can sign financial institution's required guarantee. CEA's project	CEA/XI on Entrepreneur 4: Entrepreneur has refused to get equipment from someone else, so waiting for 2 years for bank loan because of guarantee issue. XI prevaricating, but has just agreed to sign performance bond. (XI said later

profile faulty – had some mistakes.	will not agree to this.)
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More background on demos, with additional stakeholder feedback on their problems:

Below, additional input from stakeholders on demos is provided on a demo-by-demo basis. General background on each demo is presented first, followed by discussion of the problems.

Banolata (only operational demo of full-scale project): Banolata is located a good distance from Dhaka and thus helps the project achieve some geographic diversity. The investor's main business is dairy and food products involving dairy. He was born and educated in Natore and has a soft spot in his heart for the place, where he had previously invested in a flour mill. A friend told him about the UNDP HHK opportunity. He gathered information on the soil of Natore and learned it is good for brick making. The investor was comfortable in his current business, so was mainly looking for the opportunity to do something good for Natore.

The investor and his management are extremely upset about the level of support provided by the project partners, from whom they also procured equipment. They feel the key problem with the project demos is that they have not been supported properly. They suggest: "If the demos had been supported properly, there would be a lot more investors [in HHKs], but when investors visit 'sick projects,' you can't attract them." They also point out that the PDF B demo (Universal), which is used to convince others to invest, is not a demonstration of financial viability: It did not have a bank loan, benefited from equipment donated by Tianjin Machinery Import Export Company, and is based on leased rather than purchased land. They further indicate that they were not given a choice of supplier if they wished to receive the UNDP project benefits, though the project partners deny this.

Banolata initially had problems with drying and was only achieving around 18,000 brick per day out of its designed capacity of 50,000. The Banolata team expressed great frustration in the time it took XI to solve this problem by expansion of the driers. Communication appears to have been a significant problem. The XI engineer visiting the site does not speak English. While frequent interpretation support is said to have been provided by telephone, the Banolata team felt its drier problems were not solved until the engineer was accompanied to the site by an interpreter (who, in all the confusion, the owner mistook for a more knowledgeable engineer). At that time, it was decided that the drier capacity should be expanded. CEA/XI indicate that the plant was also having problems due to use of low quality coal and lack of skill of the fireman.

Now, the project is achieving around 40,000 out of its designed capacity of 50,000 bricks per day. Third parties suggest the enterprise is doing well and that its bricks are in strong demand (with some even sold in Dhaka) due to their good quality. One stakeholder indicates the project is achieving an energy intensity of 13.5 tons of coal per 100,000 bricks, which is considered quite good. The investor, however, indicates finances are still problematic and says a major problem that has caused him financial loss is that CEA/XI underestimated the costs of establishment. He

believes expansion will enable the operation to become financially viable so that he can service the demo's bank loan. The investor obtained the bank loan without any support from CEA due to his preexisting bank relationships and indicates the CEA-provided feasibility study was not used by the bank, which prepared its own. Banolata has shifted to another, local service provider and no longer allows CEA/XI onsite. This has created problems for the project partners in fulfilling their obligations to the project in assessing energy consumption of the demos. The project is a part of the first bundle of five HHKs receiving payment for carbon credits from the World Bank, as organized by CEA. It's not clear how much income this will bring, though one stakeholder noted that a few years ago Universal received US\$15,000 to 20,000 for that one year.

CBN (commissioned demo that has stopped operation): CBN has a single kiln with designed capacity of 100,000 bricks per day, meant when in full operation to be double fired (with firing occurring at two different positions in the kiln simultaneously). The kiln has 38 doors and 16 drier channels. The plant is built on about 4.15 acres of land. Total costs for both machinery and construction were about US\$3.8 million. CBN is located in the area of Dhaka with the densest population of traditional brick kilns. Therefore, were it under operation and operating profitably, it could have a great demonstration effect in terms of reaching traditional brick makers. The owner of CBN has ten years of "traditional" brick making experience and still maintains his traditional kiln (an FCK). He also has an electronics business and an appliance distribution business.

CBN's path to becoming a project demo is a bit circuitous. The owner initially began pursuing a partially below ground kiln with a first service provider. Concerned about flooding, he then abandoned that project and moved to a second service provider who began building the current 100,000 bricks per day capacity HHK kiln and associated driers. Midstream, the owner switched to his third service provider – CEA – and became a project demo. Yet, CBN's owner was not very aware of the role of UNDP in the project, nor of the special benefits he was to receive as a project demo. He initially asked if UNDP was the party supporting the carbon credits, which he would be receiving if in operation. (The World Bank is that party.) CBN did not receive assistance from CEA in obtaining its loan, which was secured prior to CEA's involvement in the project.

CBN was commissioned and operational, but eventually had to shut down due to lack of working capital. One source indicates that the plant ran for only three months, though the owner indicates (if noted correctly by the reviewer) operation continued for about two years. Both indicate that it operated at about half capacity (50,000 bricks per day) and under single firing only, probably due to the working capital problem. CBN's owner emphasizes that his main problem is lack of working capital, due in part to the bank providing less than requested. Investment in the partially underground kiln, which was eventually abandoned, probably contributed to the current cash

flow problem. CBN did find that CEA delays and lack of proactive service caused them some loss, but the main issue is really the lack of working capital.

The owner presented a strong argument that the ADB concessional loans or other such support should be available to projects like his rather than new projects only. He points out that some new investors applying for the ADB loans, that are not really brick makers, may just divert the money to other investments, whereas he is serious about making HHK bricks and will be ready to do so immediately after capital is received. He further notes that his location in the densest traditional kiln area of Dhaka makes resuscitation of his operations important to HHK industry image as a whole.

SSL (commissioned but no longer operational): The MTR mission did not have the opportunity to meet with SSL representatives and gathered most input on this demo from the project partners, as well as a few other parties. The project, which has a designed capacity of 50,000 bricks per day, was sold once and has recently been sold for the second time. The original owners were able to recoup their investment, as the land had increased in value and is said to have been sold for 300 to 350 percent of its original cost. The first buyers were a group of retired army officers who hired some local people to run the plant for some time. The newest owners may not have an intention of resuscitating the plant, though not much information was available on this.

According to CEA and XI, there were two main problems with the demo when under its original ownership. The first is that the clay sample provided to XI by the investors was not representative of the raw materials that were eventually to be used in brick making. Instead, the sample provided was high quality topsoil or clay bought on the market. CEA/XI helped resolve the production problems by recommending the soil be mixed with sand. After this experience, XI made site visits to all new demo sites to ensure the clay samples were obtained correctly. The second issue, according to CEA is that there were conflicts between the two managers, one appointed by each of the two original owners.

Another issue is that there are now cracks in the kiln due to settling of the ground. According to CEA, the investors indicated they had had an outside organization test the soil. Yet, CEA/XI later found this not to be true – the land was filled with sand and sold as solid ground. CEA, however, indicates the kiln cracks are not a serious problem.

Eco (Eco 2 - commissioned, but production stopped; Eco 3 and Eco 4 - under construction with construction stopped): Eco 2 was bought already constructed from its original owner in 2011 by an investor (and partners) introduced by a UNDP advisor. The main investor was keen to develop several HHKs at once, so also invested in green field projects Eco 3 and Eco 4. Construction for these two kilns was delayed substantially due to difficulties encountered in the search for appropriate land. The designed capacity of each of the three kilns is 50,000 bricks per

day. Eco 2 is located adjacent to Universal, the PDF B demo, which is also sometimes called Eco 1. Eco 3 and 4 are nearby (perhaps 5 km away) and are located adjacent to each other.

Different explanations are offered by different stakeholders for the stoppage of production at Eco 2 (which occurred in May or June 2014) and of construction at Eco 3 and Eco 4 (where the MTR mission found the already procured equipment rusting unused under a shed). According to some stakeholders, the investors are upset that Eco 2 production was substantially under promised capacity. At the time production was stopped, production was about 25,000 bricks per day. According to these stakeholders, the kiln (built with 18 doors) is too small to support the capacity of 50,000 bricks per day promised by the project partners. One stakeholder indicates the investors plan to expand the kiln at Eco 2 to 24 to 26 doors to be able to meet targeted capacity and also plan to restart production soon.

A few other explanations were offered for project stoppage. One of the additional explanations offered is that the economy in 2013 in Bangladesh was very bad. As a result, Eco 2 suffered very high receivables that year, creating a working capital problem, which is also part of the reason for stoppage of construction of Eco 3 and Eco 4. The other additional explanation is that the investors became interested in other investment opportunities and diverted the remaining funds to those purposes. This last explanation offers one a less optimistic view regarding the potential of resuscitating these projects.

NDC (pipeline demo, recently had bank loan approved): NDC is planning construction of two kilns of capacity 50,000 bricks per day each, so 100,000 bricks per day total. The location of the project is Magura (Khulna Division) in southeastern Bangladesh, about 170 km from Dhaka. The company's board has a number of persons experienced in business, though not in the brick industry. While not on the board himself, a driving force between the project is a 90-plus year old gentleman known for building the first paper mill in Bangladesh. The chairman of the board is a retired army colonel. The project spent a good deal of time securing approvals, something they did on their own without CEA assistance, given their business experience. It appears that over a year was spent in this process before applying for a bank loan. The NDC stakeholders with whom the author spoke, however, feel the biggest delay was obtaining the bank loan, which took over a year. They did not receive assistance from CEA in liaising with the banks, as they already had their own banking relationships. The NDC stakeholders had no complaints about the timeliness of CEA/XI's services. Machinery for the project will all be obtained through XI, aside from a generator to be obtained from the UK and some items to be obtained domestically. Total value of imported equipment will be US\$800,000.

Makrail (pipeline demo, stalled due to problems obtaining loan): The Makrail project is planned for Faradpur District, located 160 km from the city of Dhaka and part of Dhaka Division. Two kilns of 50,000 bricks per day (or 100,000 per day total) are planned. The location is the

managing director's ancestral home; and he believes they have a good market there. They are new to the brick sector. The project began 3.5 years ago. Of this time, almost two years has been spent trying to get financing – they were ready for construction 1.5 years ago.

CEA has supported financing efforts, though the investor believes responsiveness has been far too low. CEA first recommended one bank at which Makrail had to open an account. When this loan didn't work out, CEA recommended IDCOL, for which Makrail had to meet many new requirements. IDCOL believed the project as originally designed for 50,000 bricks per day was not profitable, so it was decided to expand the capacity to two kilns totaling 100,000 bricks per day capacity. According to a Makrail stakeholder, CEA preparation of the new profile that was required took months rather than weeks, as would be expected. The main reason the project is stuck now is that IDCOL is asking for stronger guarantees from the equipment supplier, which is XI. IDCOL found the original supplier agreement very "flimsy." For a long time, XI has been unwilling to provide the stronger guarantee required. The MTR mission heard from a CEA stakeholder that XI is likely to finally move forward with it. Yet, the stakeholder stated that the "performance bond" IDCOL is requiring is not typical for investments of this scale and will increase costs to the entrepreneur. XI themselves told the mission that they will not move forward with the guarantee, as they believe the agreement holds them responsible for production targets, which really depend on the quality of management. Meantime, the investor has been waiting months for further action from CEA, which was earlier promised to happen in "four days." Another explanation that has been offered as an underlying reason for the delays is that IDCOL's advisor does not like HHK technology. Indeed, IDCOL told the MTR mission that they prefer to finance tunnel kilns, but will consider HHKs.

4.3 Key Issues with Project Partner Implementation of the Demos

Sifting through the various complaints regarding the demos and related evidence, four key issues with regard to partner implementation of the demos emerge. First is that, at the same time the project partners CEA and XI were providing GEF-funded "soft support" to the demos for free, they were selling equipment and "turnkey solutions" to the demo entrepreneurs. Second, support from the project partners was often not very timely and delays may have hurt the entrepreneurs. The delays may have been due to lack of qualified staffing on the ground long-term in Bangladesh. Third, partner-provided cost estimates for the HHK projects may have been too low resulting in loans that were too small and unexpected needs for additional capital after investment decisions had been made. Finally, the project partners may possibly have failed to adjust the HHK technology to the situation of Bangladesh, particularly its wet and humid climate. Each of these key issues is addressed in turn below, based on input from the many interviews conducted during the MTR mission.

4.3.1 Soft Support from UNDP Combined with Selling of Equipment

At the same time the project partners were tasked with providing GEF-funded “soft support” for free to the demos, they were signing for-profit equipment and/or turnkey contracts with most of the demo entrepreneurs. The dual role of the project partners as both UNDP-GEF project implementers and turnkey providers of HHKs is something that some stakeholders see as problematic, while others see it as necessary. The free support paid for by funds of the UNDP-GEF project includes services such as factory design, supervision of construction on the trouble shooting level (service providers come when there are issues), clay resources study, feasibility study for bank loan application, training of staff, etc. Turnkey support includes the complete sets of imported equipment and other related work, such as commissioning. Justification offered for this dual role of the project partners has been that only in this way can they really guarantee the services -- by insuring top-quality equipment, such as rust-free, long-life ball-bearings. Or, another justification offered is that the industry is relatively new in Bangladesh, so that initially, at least, there may have been limited options of service providers. Those that see the dual roles of the partners as problematic ask, for example, whether the enticement of free services offered by the project will be used by them to gain market advantage as an equipment supplier. Lack of clarity of the demo owners about what was to be provided as a part of the project for free and what was to be provided based on the turnkey contract they paid for raises concerns about this dual role of the project partners. Also raising concern is that at least one of the demo entrepreneurs seemed extremely unclear about UNDP’s role in the project.

Stakeholder input offered varying views as to whether CEA/Xian Institute heavily pushed their equipment on the demos. Some demo investors say they were offered no choice if they wanted to receive the UNDP-GEF support, while others said they were given a choice. According to the representative of Tianjin Machinery Import and Export Company, who also represents XI, XI offers the demo investors a number of choices of machinery. If the investors go with the XI preferred machinery, then XI offers a stronger guarantee. XI does not have an export license and for that reason the Tianjin company handles the export of equipment, for which it charges 2.0 to 2.5 percent of equipment costs. XI charges an additional 3.0 to 5.0 percent for selecting the equipment, installing it, and providing the first year of maintenance. Selected comments from stakeholders regarding the CEA/XI role in selling equipment are given in Exhibit 4-7.

Exhibit 4-7: Stakeholder Comments Regarding CEA/XI Role in Selling Equipment

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| <ul style="list-style-type: none">-“The only objective of CEA/XI is to sell their machinery... We were given no choice of equipment supplier – told we had to go with XI.” (Demo entrepreneur)-“What [CEA] does is different than [Shunfeng]. They are turnkey including bank loan, whereas Shunfeng just supplies equipment.” (Non-project HHK owner)-“CEA provides a low cost for services, but has a huge write up in the machinery price as compared to us. We have no write up on the machinery price. CEA’s machinery cost [for a 100,000 brick per day plant] is thus US300,000 more than ours.” (HHK service provider)-“As we did not get our machines from XI, when [the Tianjin/XI rep] came, all he did was say |
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our machines are not good.” (Demo entrepreneur)

-“They required use of Tianjin equipment. We were not given a choice of supplier.” (Demo investor)

-“They are using the XI name, but this is really about Tianjin wanting to make more money....This is suppliers and CEA working together....Suppliers should be separated from implementers. How can you have checks and balances?....They want to make money from the machines.” (Non-project HHK owner)

-“Have decided to buy our equipment through XI. UNDP has a very good idea about XI. They have proven themselves through other projects....So, we didn’t look right or left...” (Pipeline demo investor)

-“Chose XI to supply the equipment. While they never pushed us, they said it was the best option. We chose them in good faith. Did not compare other suppliers in detail, but [did some research]. We know the brick machine would be a little cheaper [if sourced elsewhere].” (Pipeline demo investor)

-“Investors can buy the equipment somewhere else, but then XI will not give a guarantee on it...XI holds a tender in China to get the best price and provides a one year performance guarantee... We need to select the equipment to ensure quality, low electricity consumption, simple to repair, long-lasting parts (as it would take a long time to order parts from China), and resistance to dampness (given the climate in Bangladesh).” (Tianjin/XI representative)

“The problem with CEA is that they always push/propose XI equipment. Otherwise their reports are helpful.” (Stakeholder from financial institution)

While views vary, a substantial number of stakeholders expressed concern about the dual role of the project partners. As such, a lesson learned may be to apply caution in future projects potentially facing similar situations. The responsibility of the project partner to provide options when available must be clearly laid out to all involved, as should be the distinction between project-supported and for-profit services provided by the partner.

In terms of distinction between project-supported and for-profit services provided by the partners and whether the claimed UNDP services were really delivered, the main conclusions are that the distinction between the two was not always laid out clearly to demo entrepreneurs and that a lot of confusion exists. Some claim that the project partners were “double-charging” – that is, getting paid by UNDP for services that they also charged the entrepreneurs for – and did not always deliver to the entrepreneurs what they claimed to UNDP they had delivered. Mission findings did not incontrovertibly prove these claims. The more accurate claim may be that the project partners offered a turnkey package and did not clearly explain which services were a benefit of the UNDP-GEF project and which services the entrepreneurs were specifically paying for through purchase of the turnkey package. For example, one stakeholder noted that CEA/XI provides a “turnkey” solution that includes bank financing, while Shunfeng does not. Yet, support provided by CEA/XI in liaising with the banks was charged to the UNDP-GEF project and should not have been considered part of the CEA-XI turnkey packaged paid for by entrepreneurs. Selected comments of stakeholders on these issues are given in Exhibit 4-8.

Exhibit 4-8: Issue of Double-Charging or Lack of Delivery of UNDP Services

-“Know of cases in which CEA/XI took money [from demo investors] for services supposed to be paid for by the project.” (person that was associated with UNDP/PMU)

-“Had to employ engineer during construction...Had to pay for XI’s transportation and accommodation...All the tests were done by ourselves including the testing of local clay...Did not receive free training – paid for Chinese fireman to train staff...Did not receive assistance with the banks – did not need it...Techno-economic feasibility study received but not used – bank did their own.” (Demo investor)

-“Did not provide any money to CEA – just transportation.” (Demo entrepreneur who had bought equipment elsewhere, but received construction guidance supervision from CEA.)

-“No one knows about this project – that someone is getting paid for the project...No clay study...no feasibility study...no support in construction supervision. [The demo] paid for its own construction supervisor. The only role with [the project partners] was in the purchase of their equipment...UNDP program officer should be copied on communications between CEA/XI and entrepreneur, but instead UNDP not kept informed. Entrepreneur doesn’t know the relationship between the project and the company.” (Demo investor)

-“We discussed [with demo investors] which services are provided for free under the UNDP project. Design, construction supervision and training in firing are free. Building the kiln is not covered, so there is a separate contract.” (XI representative)

4.3.2 Lack of Responsive Service

Another issue with project partner implementation is lack of responsive service, including problems of delays, lack of skilled staff on-the-ground in Bangladesh, and lack of English language skills. Delays in service and low responsiveness appear to have hurt some entrepreneurs financially and are probably the strongest complaint cutting across demos. Delays often appear to have been caused by lack of qualified staff on-the-ground in Bangladesh. For example, the author heard several times that XI engineers were often not in-country/ not available, though XI representatives also related how they often visited sites within less than 24 hours of a problem being reported. Clients of Xian Shunfeng (the top supplier of HHK turnkey solutions in Bangladesh) were more satisfied and impressed with Shunfeng’s responsiveness. One interviewee, who had dealt with both suppliers, told us that he could call Shunfeng’s managing director at 2 am and have someone from their company onsite early the next day, while XI response may take months. As mentioned earlier, language has also been an issue for XI. They often send an engineer who does not speak English to project sites. While it has been said that interpretation is provided through frequent phone support, demo investors do not seem satisfied with this solution. Even UNDP itself has found XI unresponsive to its communications.

Exhibit 4-9 provides selected stakeholder comments on project partner responsiveness issues, as well as a few comments on the responsiveness of Shunfeng, Bangladesh’s top HHK provider. These comments offer an impression that the problem is serious and in large part due to lack of skilled people on the ground, particularly as Shunfeng, which has more of an in-country team, garners more positive feedback.

Exhibit 4-9: Stakeholder Input on Project Partner Responsiveness Issues

(includes comparison to Shunfeng responsiveness)

Stakeholder Comments on Project Partner Responsiveness
<p>-“Ignored our pleas for help on the drier issue [which caused us to be way under capacity]. We finally threatened to hold a press conference. Then XI sent a specialist from China to solve the problem...CEA has no local manpower. They are good at writing.”(Demo investor)</p> <p>-“Diamond bought all the machinery from CEA/XI, who assured all the support would come, but the engineers were not coming from China as promised. So, they [Diamond] went ahead and hired their own engineers from China.” (An HHK service provider)</p> <p>-“CEA never stayed overnight at the site [for construction supervision]. Regarding design and construction supervision services, we didn’t <i>receive</i> the service, we had to <i>push</i> for it...There is only one technical staff member at CEA. He was coming when we had problems, but got sick and was no longer available...The construction supervision provided was ‘guidance supervision’ and not detailed/total supervision...One reason we were late commissioning is that we had to wait for the CEA engineer to fit us into his schedule. You’d think it might be 2 or 3 days, but sometimes we waited 15 days.” (Demo investor)</p> <p>-“XI has never tried to establish an office in Dhaka...Their representative is really the representative of their main supplier...Even if asking for maintenance of machines – no response...because XI has no office here...Whenever we ask XI for service, no one turns up. Now have taken responsibility ourselves and are working with local providers...They [XI] can’t deliver. During the last four years, Xian hasn’t sent a single person speaking English.” (Demo investor)</p> <p>-“Early impression that their responsiveness was weak...You need passion and commitment to do this work...What happened to the zig-zag demos they were supposed to do? What other evidence do we need?” (Non-project HHK owner)</p> <p>-“They don’t prepare anything professionally – just patch work...There were a lot of errors in their work...CEA performance is the problem. They don’t have the set up for this kind of industry. Cannot even provide the project profile properly...CEA is delaying us...Heard from another party that UNDP paid the money already to CEA, so they do not have incentive. What they said would be provided in 4 days doesn’t happen in 2 months...Where is the accountability?” (Demo investor)</p> <p>-“Problem with XI is that they have no local staff.” (Service provider)</p> <p>-“Explanation [of their lack of proactiveness] may be that they (CEA/XI) got busy with other projects (World Bank, ADB) and were not capable of handling all this.” (UNDP staff member)</p> <p>-“The longest the XI engineer has spent in Bangladesh in one year is eight months. Last year it was less. Now planning to station an engineer year-round in Dhaka.” (XI representative)</p> <p>-“XI plans to send two people on permanent basis for the World Bank project, but [these] can also support the UNDP project.” (XI representative)</p> <p>-“Had no hindrance from CEA/XI. The big delay has been procedural in getting the bank loan.” (HHK investor)</p>
Comparison to Shunfeng Responsiveness
<p>-“Shunfeng has two full-time Chinese engineers. They went home for the holidays, but when I had a problem he sent one back to help in just two days...There were problems with our HHK due to the different local environment, but the difference [between Shunfeng] and CEA is that Shuneng will fix the problems. They provide two years service with machines, but if you have a problem as your friend they will fix it for life.”(Shunfeng client)</p> <p>-“If you call [Shunfeng] at 2 am, an engineer will come shortly. [XI] seems to never respond...Shunfeng has people in Bangladesh.” (HHK manager)</p>

4.3.3 Cost Underestimates

A number of sources indicate that the CEA/XI cost estimates given to entrepreneurs were too low. The negative impacts they attribute to these cost underestimates are loans that are too small, facilities that are under-scale, and working capital problems. Some knowledgeable in the industry indicate that the cost underestimates were for the local costs, especially civil construction, whereas the partners sell their equipment at quite a high price. As a result of trying to meet the low estimates, XI may have designed the drying capacity to a scale smaller than was needed in a wet climate like Bangladesh's. One source suggested the problem was that CEA/XI were using very dated numbers and never updated them, while another believed the low estimates were intentional.

Comments from demo stakeholders, including demo entrepreneurs and HHK service providers, are given in Exhibit 4-10. The comments imply that cost underestimates had quite serious negative impacts on the demos.

Exhibit 4-10: Stakeholder Input on Cost Underestimates Suggest Serious Negative Impact

Comments on Demo Cost Underestimates
<p>-“The initial investment we were told was US\$1 million to be financed 50% out of pocket and 50% bank loan. The eventual cost was US\$2 million so US\$1.5 million [75%] came out of pocket. For financing, had initially estimated 70 million taka capital investment and added 30 million working capital to that for total of 100 million taka investment. Requested half (or 50 million taka) from bank and bank approved 45 million taka loan. Because the driers were too small, running at 35% capacity at first, could not service the debt, so bank loan increased...It took XI 1.5 years to solve the drier problem....[Project partners] misguided us....We made it clear plant was not to be an ‘experiment’...Sold inferior quality machines at a high price.” (Demo investor)</p> <p>-“Saw one of the UNDP feasibility studies – the ‘project profile.’ The cost data being used was very old, perhaps even from 2001. What was 1.5 million USD in 2001 is now 3.0 million USD. Prices have gone up a lot in Bangladesh.” (Non-demo HHK investor)</p> <p>-“A common problem among [project partner] plants was the budget estimates. Diamond, SSL, and Banolata to some extent had the same problem – no working capital. The estimate was way below the true budget. They [investors] had to end up spending two times the amount....The machinery cost is two times the cost of other companies! Maybe [the project partners’ estimate is around] US\$550,000 for the machines and they estimate only US\$250,000 for the construction – that is not enough for the whole project...They told the CBN entrepreneur he needed only USD\$100,000 for civil works.” (HHK service provider)</p> <p>-“They tell the investors they need less money than they really do...But it is when they tell them they need [the low estimate] that they get bank financing. They may tell them construction will only cost a certain amount and it ends up costing a lot more.” (Non-demo HHK investor)</p> <p>-“For an HHK of 50,000 bricks per day capacity, the real cost, not including land is not less than 10 to 11 crore taka [US\$1.3 million]. Main components of cost are the imported machines, the local machines, the civil construction, and power supply...UNDP project is quoting low cost, but they can’t support successful project that way....Equipment price is not low. It’s things like the drying chamber [civil construction] that are quoted too low. Need a bigger drier. But due to low cost quote, the UNDP project is doing very small driers...Not an issue of equipment cost, but more a case of CEA underestimating costs for local construction....Another issue is kiln design. In Bangladesh, 18 doors are not enough.” Believes XI does good job in design, but designing smaller scale than needed to accommodate low CEA budget</p>

estimates. (HHK service provider)

-“Estimates are based on equipment, materials, labor, and land. So, entrepreneur can see if any of the areas, such as labor, are underestimated.” (XI representative)

4.3.4 Possible Failure to Adjust Technology to the Situation in Bangladesh

A number of sources suggested the CEA/XI team failed to adjust their kiln and drier plans to the situation in Bangladesh. This situation includes a very wet climate, low skill level of kiln firemen as compared to China, larger brick size than in China, and a strong market preference for reddish colored bricks. Some say that the project partners lagged behind others in the industry that have long ago figured out and are using techniques such as longer driers and more driers, larger kilns, and external firing as needed in the rainy season to address the local situation. At the same time, as noted in the discussion of cost underestimates, some suggest that “under-design” of drying facilities and kilns was driven by the budget underestimates, rather than by lack of understanding of how to adjust to the local situation. Also, there appears to be great controversy over whether external heat for drying is acceptable and achieves good energy efficiency/ low emissions or instead negates the energy and emissions benefits of HHKs. More discussion on general technology challenges to HHKs in Bangladesh will be included in the next sub-segment of this section. Here, Exhibit 4-11 provides selected comments from stakeholders focused on the topic of whether the project partners failed to adjust the HHK technology to the situation of Bangladesh.

Exhibit 4-11 Stakeholder Input on Possible Failure of Project Partners to Adjust Technology to Situation of Bangladesh

-“Problem UNDP demos are having is the need to adjust to Bangladesh’s coal and wet weather. [Shunfeng] has tried to address these. UNDP [CEA] came to visit our project and didn’t like the external heat – told us we were doing it wrong. I didn’t like that...If we had better coal would not need the outside heat. As a result of poor coal quality, we are not adding coal to the clay.”(non-project HHK owner)

-“Our major problem was drying capacity too low – eventually added another drying chamber...Another demo [not ours] had a crack in its kiln. This is the result of poor design. We decided to include a base/platform even though XI didn’t recommend it. In the three years from 2007, XI should have become aware of the environment in Bangladesh.” (demo investor)

-“The main problem with SLL is the (1) drying and (2) kiln design...Designed capacity is 50,000 bricks per day ...output was [only] 20,000 to 25,000....Chinese brick size is smaller and materials are different. (Clay softer and with more moisture in Bangladesh.) The problem is that CEA/XI did “copy and paste” of Chinese design. SSL operated 6-8 months. They were upset, saying, ‘How can we make money with 20,000 bricks per day?’...[One of our best plants] uses external heat only when it’s raining. If you have enough space for storage, you don’t need external heat, but storage is an added expense.” (HHK service provider)

-“If external firing can make the HHK work (for a reasonable cost), then why not?” (industry expert)

-“18 doors [for the kiln] are typical in China, but it’s not enough for Bangladesh. In future projects the kilns will have 22 doors, because of our experience.” (CEA representative)

-“The project design of Universal has been proven wrong. In our environment, 18 door project should not have been done. Doesn’t have enough space for cooling. The projects with other services providers are

more well designed. Most have 26 doors kilns and 12 drying channels...These other providers have fixed the problem long ago...They all get their designs from XI too, but the design they get from XI is better and takes into account the situation in Bangladesh...Our kiln is 18 doors; we have heard that 24 to 26 door kilns are getting better quality bricks.” (demo investor)

“Kiln has 18 doors. Owner expects 50,000 bricks per day [indicated design capacity], but with 18 door kiln can only get 25,000 to 30,000 per day.” (demo manager)

“As for the construction, they didn’t take the climate into consideration. For Universal, they took the Chinese rules and built a 50,000 brick per day plant with only 18 doors in the kiln – that is not possible [in Bangladesh]!... We expect the best from UNDP.”(non-project HHK investor)

“Problem in not reaching designed capacity is due to lack of skill of Bangladeshi fireman.” (XI rep)

“Projects must be customized for Bangladesh: Chinese bricks not the same size as Bangladeshi bricks. Chinese clay is not the same as Bangladeshi clay. China’s weather is not the same. Labor capabilities in the two countries are different. Chinese customers are different.” (HHK service provider)

4.4 Difficulties in Introducing the New Technology

While there are serious concerns about how the demos were implemented, technology and other factors have made the adoption of HHKs in Bangladesh challenging. The MTR consultant interviewed three HHK entrepreneurs that used service providers other than the project partners. None seemed as upset with their service provider as did some of the demo entrepreneurs. At the same time, one of the three was very upset with how challenging it is to make money in the industry and sees a great need for government policy support. The other two also conceded difficulties in achieving profitability, though were more optimistic that solutions are possible, particularly with policy support. One even noted that while his factory is having trouble, it is not an issue with the service provider. Overall, the author concludes that implementation shortcomings of the project partners, as described in 4.3, are real and had a negative impact on project results. Yet, at the same time, overall issues facing the industry are serious, compounding the problems associated with partner shortcomings, and require strong attention.

Stakeholders spoke to us about the overall challenges of introducing a new technology. One non-project HHK entrepreneur noted that “This is an industry in which you have to have stamina to sustain.” Another stakeholder told us that it took China ten years to go from FCKs to HHKs. He further noted that it would be a good result if even just five of the 25 or so operational HHKs in Bangladesh survived. Highlighting the challenges of transforming the brick industry in general to cleaner technologies, another stakeholder mentioned a regional brick workshop held in India in February or March 2011. The main focus of the workshop was the Indian experience. While the event was supposed to last from 9 am to 1 pm, it ended up lasting until 8 pm, as the Indian entrepreneurs had so many complaints.

Through stakeholder interviews, a number of key industry-wide factors impeding the successful adoption of HHKs have been identified. These include technical challenges in drying the bricks in Bangladesh’s wet climate. Market issues (low brick prices) and lack of profitability are also a

major challenge. Other issues are skill of the local work force (especially firemen), low quality of coal and electricity shortages, political instability, and concerns of some entrepreneurs shifting loans targeted for HHKs to other uses. These issues are explored in more detail below.

4.4.1 Drying/Climate Issues

One challenging problem has been the drying issue. Some stakeholders suggest the project partners did not do enough to adapt their technology to Bangladesh's wet climate (as discussed in 4.3). At the same time, it should be acknowledged that drying has been a challenge to all HHK entrepreneurs and service providers. And, it is not clear whether the best solution has yet been achieved.

With the rainy season and year round operation of these kilns, drying the bricks requires more heat than in China. One stakeholder explained that in China they even have to add water to the clay, while they would not need to do that in Bangladesh. Other providers appear to have adopted external heating (in addition to waste heat from the kiln) to solve the drying problem, though aim to do this on a limited basis and only during the rainy season. CEA/XI indicates this approach is not good and negates the eco-friendly and energy efficient aspects of HHKs. They claim that some plants using external drying with coal have big smoke chimneys and have been shut down either by local people or the government. Others, they say, surreptitiously bring in natural gas at night, as its use in brick factories is not allowed. They believe the best solution to the drying problem is extending the length of each of the drying channels from 45 m to 70 m. Shunfeng, however, states that even with external drying as needed, their Bangladesh-based plants are achieving on average 15 tons of coal per 100,000 bricks, which is a comparatively good figure. They suggest that if the drying is done properly, less coal will need to be used in the firing. In general, it appears that earlier plants by non-project service providers needed more external drying, while newer ones need less, such as only when it rains. One service provider explained that if there is storage for the clay, no external firing is needed, but storage adds to capital expenses. There are clearly some issues/disagreements with regard to the best approach to drying that require further clarification and fact finding.

4.4.2 Market and Profitability Issues

Market preferences, low brick prices, and lack of profitability of HHKs are also serious problems hindering the success of the industry. According to interviewees, customers in Bangladesh don't like bricks that are fired with coal in them. In the HHKs in China, 100 percent of the coal is put in the bricks and none needs to be added to the kiln. XI indicates this is the most energy efficient way to operate the kiln. Yet, one entrepreneur showed us bricks that had been fired with coal in them and others that had been fired without coal in them or with less coal in them. The color of the latter (no coal or less coal) is much more reddish and is preferred by the market in Bangladesh. This suggests either a need for campaigns to build market awareness (e.g. the bricks

fired with lots of coal in them are supposed to be very strong) or greater attention to market preferences in designing processes at Bangladesh-based HHKs.

Profitability is so far quite a challenge for the HHK sector in Bangladesh. Brick prices are very low due to competition from traditional manufacturers and a slump in the real estate industry. One source indicated market prices are half of that in neighboring areas of India. (Brick exports from Bangladesh to India are now forbidden.) High interest rates on bank loans (16 to 17 percent) also make profitability difficult to achieve in the face of competition from traditional brick makers, who do not have bank loans.

Entrepreneurs varied somewhat in their positions on these issues. Some believe selling the “auto-bricks” is not a problem because they are high quality and in demand and that the major problems of HHKs lie in issues such as working capital and too high of interest rates on bank loans. Others, however, find the price competition from traditional brick makers to be too fierce and/or operational costs simply higher than expected, so that profitability is out of reach. Selected stakeholder comments on these topics are provided in Exhibit 4-12.

Exhibit 4-12: Stakeholder Comments on the Brick Market and Profitability

The Market's Preferences
<p>-“There is no problem with marketing the bricks. If we can get production up to [70% capacity] will be very profitable. There are lots of customers. The housing sector prefers auto bricks. Hollow brick production is achievable through auto bricks and the cost is lower. There is a trend toward green bricks.” (demo investor with brick sector experience)</p> <p>-“Stopped putting coal in the bricks, as quality of brick not good with coal in it.” (Non-project HHK owner)</p> <p>-“The quality of our bricks is really good – 7,000 to 9,000 PSI as compared to <3,000 PSI from traditional brick makers. As a result, Government prefers our bricks....Our brick chips are as strong as stone, but lighter, and garner a higher price than traditional brick makers’ chips.” (Non-project HHK owner)</p> <p>-“In 2007/2008 people not aware of advantage of auto-bricks – so we faced problem selling.” (PDF B demo staff member)</p> <p>-“In Bangladesh brick market you need red color bricks to sell them, so can’t put too much coal in them. Are planning to put up to 50% of coal in bricks, but not 100% like in China.” (HHK service provider)</p>
Overall Market Situation, Market Prices, and Competition
<p>-“Currently the brick market is very low....If the brick price is good, could recover our investment. The price of bricks in India is 16 taka, but only 8 taka in Bangladesh. Why? Their [traditional kiln owners’] costs are very low. They use wood and not coal and do not need a bank loan. Their investment costs are just about USD100,000 – ours were US3 million.” (Non-project HHK owner)</p> <p>-“The market was very down in 2013 and our receivables became huge. Still no serious movement in the economy – 86 Billion taka lying unutilized in the banks. The whole real estate sector is suffering... Created a big negative impact on entire brick sector. Real estate developers the main clients of HHKs. This year no brick demand. With receivables, negative impact on working capital.” (Demo investor)</p> <p>-“Auto bricks can sell for a 1 to 1.5 taka premium, but traditional brick makers [influencing the market] are able by word of mouth to say they are not good.” (Financial institution stakeholder)</p> <p>-“Profitability looks good...All traditional brick makers will be shut down..New bridge near our plant will provide strong demand.” (pipeline demo entrepreneur)</p> <p>-“Government has decided to make brick industry cleaner. Hard to say if one will be profitable at a</p>

certain time. Past 3 or 4 years construction sector slow because economy weak...But construction industry prefers auto bricks...And a huge amount of bricks will be required for construction of major bridge. Auto bricks preferred for road construction due to high PSI...We have the ability to sustain a few years if there are [market] issues.” (pipeline demo entrepreneur)

-“Real estate market in a slump, so developers not building, reducing the demand for bricks.” (Non-project HHK owner)

-“The market is saturated now with supply greater than demand. Three years ago India was importing 70 million bricks from Bangladesh but [exports] not [allowed] anymore.” (Traditional brick maker)

HHK costs and profits

-“HHKs are profitable if total design and after sales service ensured.” (HHK service provider)

-“All technology has some issues, but these could be solved if the profitability is there. Personally, feel that the HHK has been a failure [in Bangladesh, because not profitable].” (Industry expert)

-“When starting the project understood the production costs of HHK to be 3 or 4 taka per brick, but the actual cost turned out to be 7.5 taka...Coal, generator (because electricity supply not stable), and high bank interest charges drive up the costs....Main problem is costs and not the technology.” (non-project HHK owner)

-“Profits are 1 taka per brick...Profitability tied to two things: (1) capacity utilization and (2) market issues.” (non-project HHK owner)

-“Rex (gas-fired HK) was profitable. Some HHKs are profitable.” (HHK service provider)

4.4.3 Skill of Local Workers, Especially Firemen

A third problem area is the skill level of local people working at the HHKs, particularly the firemen. According to CEA/XI, a real challenge is that the local firemen have not been able to reach the skill level of Chinese ones and this reduces the energy efficiency of the kilns and the ability to put 100 percent coal in the bricks (rather than in the top of the kiln). The need for training matches with input from several other stakeholders, pinpointing training as an important need. At the same time, others believe that the market in Bangladesh will not accept bricks fired with 100 percent of coal used inside the bricks (due to less attractive coloring). So this could be partly a market issue rather than one fully attributable to the Bangladeshi firemen.

In the mission’s discussions with CEA and XI, both pointed to lack of skill of the firemen as the number one issue facing Bangladesh’s HHKs. They do not believe technology is the problem. They attributed the fireman problem partly to lack of training, but also to educational level (on average, lower than in China), and work ethic (not willing to work swing shift). Kilns, they note, should be run for 24 hours per day. Yet, they indicate Bangladesh’s kilns may be run for 8 to 10 hours per day only.

Non-project HHK owners also spoke of challenges with firemen not being as good as they’d hoped, though these stakeholders included it as one of a number of issues facing the industry rather than the primary one. One financial institution mentioned a preference for tunnel kilns as these are more automated and do not require skilled firemen as do HHKs. Several persons mentioned the problem of skilled firemen jumping from one employer to another. The method

being used to train Bangladeshi firemen is to bring in a Chinese fireman to the HHK. Shunfeng appears to keep a fireman on staff who is “loaned out” to HHKs that need guidance. XI at one point also provided a fireman to one of the demos. These firemen speak neither English nor Bangladeshi, but communicate by showing how they do the work.

4.4.4 Coal Quality and Electricity

Yet another problem area is coal quality and electricity issues. One non-project HHK entrepreneur raised coal quality as his primary problem, and the author also heard about sub-standard coal causing problems at one of the demos. Most of the coal used is low quality coal from India, though one non-project entrepreneur indicated he is sourcing high quality coal from Bangladesh. Because electricity in many locations is not dependable, the plants need to buy a generator, which is also a substantial factor in increasing costs.

A few stakeholders offered more in-depth explanation of the coal issue. Asked whether the local fireman doesn't have the skill to put a lot of coal in the bricks, one stakeholder explained that the problem is not due to the fireman but to the quality of coal – it creates bubbles in the bricks. The non-project HHK entrepreneur who states coal quality as his number one issue notes that the coal Bangladesh receives from India is very low quality, with no specifications. International regulations require exported coal to be less than one percent sulfur, while the Indian coal they are getting is over 4 percent sulfur. High sulfur coal, he notes, does not burn properly. The Indian coal has a calorific value of 2,700, while what they need is really 5,000. Yet another issue is that the coal traders will try to trick small buyers on quantity if they are not knowledgeable. Yet, the entrepreneur has no other option of sources. For example, one cannot buy from Indonesia in such small quantities as they need. This stakeholder is now looking into fuel alternatives such as compressed biomass pellets.

4.4.5 Limited Policy Support

Overall, the HHK owners of non-project demos with whom we spoke all believe more policy support is needed. This may be in the form of recognizing brick-making as an industry and as an eco-industry thus eligible for lower interest bank loans. Brick standards would also be a way to strengthen the competitiveness of HHKs. And, HHK owners feel the VAT policy is unfair to HHK owners. They indicate traditional brick makers can pay a set amount annually for the VAT, while HHK owners must pay VAT based on number of bricks produced. More discussion of policy issues is included in Section 8 (“The Way Forward”). It is raised here, however, as one of the major areas that make it difficult for HHKs in general to thrive.

4.4.6 Political Issues

In concert with and perhaps adding to macroeconomic issues, such as the depressed real estate market, political issues have also had a negative impact on HHKs in general. The issue of political problems negatively impacting business was raised by one of the demo owners as well as by CEA, XI, and UNDP. As mentioned earlier, for 156 work days in 2013 in Dhaka, there were strikes. This stalled work in the field as it was difficult to travel, as well as adversely affecting the market.

4.4.7 Staying Power of Investors/ Potential Misuse of Bank Funds

A number of stakeholders alluded to HHK investors or potential investors diverting bank loan funds for HHKs to other purposes. Yet, the MTR consultant did not find firm evidence of this phenomenon. It was also mentioned numerous times that a significant level of corruption is involved in bank loans as (1) bribes are required to receive loans and (2) funds requested may be inflated so as to divert to other purposes. One stalled demo in particular was pointed out as having diverted money to other purposes. Yet, it was found that this demo had already purchased all its equipment, which had arrived on site. This leads the author to believe that fund diversion was not a primary initial driver of pursuing the demo loan, but that in fact unprofitable operation and disappointing results had been the most important factor in abandonment of the venture.

4.5 Implementation Issues Relating to Costing of Activities and Delivery

In terms of oversight of the project partners, one of the most serious gaps is that no one, to the reviewer's knowledge, mapped out all the activities expected to be done under the LOAs and determined unit costing, so that funds could be expected to cover all the work. Instead, costing indicated by CEA/XI in their annual work plans was accepted at face value and all that was checked is whether they completed the work. A more effective approach might: (1) check that all the unit pricing adds up (so that the project can be completed for the amount promised), (2) check that unit prices are reasonable as compared to market rates, and (3) define the specific work to be included in each item. For example, what does "construction supervision" entail with regard to the project? And, considering this, does the amount charged per demo make sense?

In a big picture sort of way (see Exhibit 4-13), the idea that too much was charged for the work done is obvious, as only four demos (out of 15 targeted) have been commissioned (and only one was operational at the time of the MTR mission), but 76 percent of the partners' payments per the LOAs has been disbursed. At the same time, project partners argue that they made many,

many site visits for projects that did not come to fruition (perhaps to up to 30 sites) and that, indeed, 76 percent of the work has been done.

Exhibit 4-13: Amount and Proportion of LOA Amount Disbursed to Xian/CEA

CEA/Xian Paid to date	Amount Remaining in LOAs	Share of work done?
\$1.942 million (76%) (out of \$2.541 million)	\$598,376 (24%)	Seems much less than 76% (Only 4 out of targeted 15 demos commissioned and only 1 operating. Even if focus had been purely on demos, achievement of 11 demos would be needed to represent 73% of target.)

Digging into the numbers for individual types of activities and calculating unit costs can also be helpful. Activity-based analyses of this sort suggest that indeed the project partners have been overpaid for the work done per the LOAs. That is, even if the LOAs did not indicate unit prices, they did indicate the whole package was to be completed for a certain amount. Thus, appropriateness of amount charged to date might be estimated by checking part of total work done. For insights on this, the MTR consultant looked at two standard items in the annual work plans and disbursement listings: clay studies and construction supervision (also termed “installation and operation”).

Payments for clay studies appear to be erratic, though we did learn from XI that sometimes the clay samples are sent back to China for lab work, while at other times visual inspection at the site can be enough to determine clay properties. XI indicated that the maximum cost of a clay study in China (if all tests need to be done) is 12,000 RMB or about USD2,000. Exhibit 4-14 below shows findings from reviewing disbursements as compared to progress indicators. In 2011, two clay studies were completed and the project partners were paid US29,482 for that. In 2012, three clay studies were completed with the project partners being paid US29,482. And in 2013, four clay studies were completed with payment of US19,482 (which makes one wonder if the “1” in US19,482 is a typo and should have been a “2”). Clearly, the unit pricing is erratic, but giving the benefit of the doubt and assuming some clay studies are more expensive than others, what is the average unit cost of the clay studies? This comes to US8,716, which seems high based on a maximum lab cost of US2,000 (and realizing that some clay does not even need to go to the lab in China, or even leave the site for that matter).

Construction supervision (see Exhibit 4-14) shows similarly erratic pricing, though this may be partly explained by the timing of commissioning. Yet, computing an average unit price for construction supervision gives a value of US113,476. One challenge in assessing this figure is knowing the criteria for the work done. Entrepreneurs indicate the work was “come as needed” and that no overnight visits were involved. In contrast, CEA indicates a case where its engineer stayed for months on site. Using the average unit cost to date to compute the total cost of 15 such construction supervision services (based on total deliverable of 15 demos) yields a total of US1.7

million (=15xUS113,476). While this activity is allocated to XI alone, the total of US1.7 million is more than the total amount of XI's LOA without even considering any of the other activities it was supposed to complete according to the LOA. This example provides strong evidence that the annual work plans "overcharged" for services on a unit basis, so that it would be impossible to complete all demos (and even less so all outputs promised) for the budget agreed upon.

Exhibit 4-14: Examples of Implied Unit Costing and Evidence of Overpayment

Year	Clay Studies (activity 1.2)			Construction Supervision (activity 2.7)		
	Paid	Number	Implied Unit Cost	Paid	Number	Implied Unit Cost
2011	29,482	2	\$8,716	160,697	0	\$113,476
2012	29,482	3	Note: x15= US130,743	193,253	1	Note: x15 = US1.7million, more than XI's total LOA
2013	19,482	4		99,952	2+2*(1/2)	

Note: 2013 includes ½ credit for Eco 3 and Eco 4, for which construction was stopped midstream, thus the total "credit" for these is 2*1/2 = 1.

More information on project expenditures by component and by activity is provided in Section 6.

4.6 Over-focus on the Demos

Over-focus on the demos is an important shortcoming of the project that should be rectified in the post-MTR phase. This over-focus on the demos (beyond the weak results in achieving only one operational demo out of 15 targeted) have left many areas of the true intent of the project unaddressed, although 76 percent of the partner-allocated funding has been disbursed. Section 5, which focuses on an outcome-by-outcome analysis of project results, will offer more details on the gap between types of activities implied by the project document as compared to types of activities actually implemented. Yet, the topic of over-focus on the demos is first presented here because of its importance in the big picture of major issues facing the project. One key finding of the outcome-by-outcome analysis of Section 5 is that, while only Component 2 in the project document is clearly focused on serving the demos, most of the other CEA/XI components were adjusted to entail demo services rather than wider activities, such as training for banks or a nation-wide clay assessment, as originally intended. This finding is presented in more succinct form in Exhibit 4-15.

Exhibit 4-15: Strong Focus on Demos in Implementation of Four out of Five Partner Components – Not the Impression Given in the Project Document

Component (responsibility)	Description of Focus in Implementation
1. Technical support (studies) (CEA/XI)	<i>Demo Focus:</i> Clay studies for specific demos, energy evaluation of demos, etc. (one brief report comparing brick technologies)
2. Demos (CEA/XI)	<i>Demo Focus, as Expected:</i> Demos
3. Capacity Building (CEA/XI)	<i>Demo Focus:</i> All training was given to specific individual demos; also provided list of

	engineering firms to individual demos
4. Communications (PMU)	<i>PMU Component – Broad Focus:</i> Workshops, campaigns, outreach to the press, videos
5. Banks/Financial Institutions (CEA/XI)	<i>Demo Focus:</i> Reported 1 to 1 meetings with banks/FIs only; a number of entrepreneurs report no bank assistance
6. Policy (CEA/XI)	<i>Little work done</i>

Given the over-focus on the demos to date, much less attention has been given to the wider community of brick makers than expected. While this may partly be an issue of the appropriateness of technology selection, it is also a result of lack of outreach beyond the handful of demo investors. The MTR mission learned from BBMOA that their main interaction with the project to date had been a site visit to Universal (the PDF B demo). They also attended a gender workshop, a joint workshop held by ADB and UNDP, and the two recent stakeholder meetings regarding the Brick Center. In addition, they have been involved in project board meetings. Yet, they do not feel that project activities have benefited their constituents in any substantial way. As one BBMOA officer (and traditional brick maker) put it: “We have spoken many points, but all the funding for the project has gone to the consultants.”

Discussions with CEA offer a partial explanation for this trend. According to them, only 24 hours before the project document was due to be submitted to the GEF, they were asked to reduce the budget from USD5 million to USD3 million. Others also confirm this budget reduction issue, though not the extremely short timescale on which it was required to be done. CEA indicates that there was no time to change the activities in the project document, so that only the budget was changed. Inspection of the project document budget shows that budget line items are on an outcome basis only, so the changes did not indicate that any activities would be cut or, if so, which ones.

Interestingly, many of the outstanding needs for work going forward that were identified during the MTR are the broader, non-demo areas meant to be covered by the project but neglected in implementation that was too heavily skewed towards the demos. For example, there is still a lack of clarity in comparing the various brick technologies available (including their emissions and energy consumption), a need for training, need for policy support, and need for brick standards.

4.7 Technology Selection (in Retrospect)

A number of stakeholders raised concern for the selection of HHKs as the kiln technology on which the project has put its overwhelming focus. The issues are introduced here and discussed further in Section 8 (“The Way Forward”). There are two main angles to the question of technology selection: First, should the project have focused on only a single technology or on multiple technologies? Second, was the HHK an appropriate technology to focus on?

As for the first question, the project document may be interpreted to cover a wider focus than HHKs alone. It refers frequently to energy efficient kilns and energy efficient brick-making practices in general. With recent efforts to set up the Brick Center, the project is now moving towards a more inclusive approach with regard to technologies rather than focus on HHKs alone.

As for whether the HHK was an appropriate technology to focus on, many stakeholders suggest that it was not, while others offer counterarguments to their criticisms. One of the key complaints is that the investment scale at around US2 million is too large for traditional brick makers, who may invest on the order US100,000 in a new kiln and generally don't have the ability to get large loans from the banks. As one BBMOA officer and traditional kiln owner put it, "The project is designed for only five percent of the industry. The last four years you are working only for HHKs and not for us. You only see large investors. This is a small scale industry. We can develop small industry technology – there are lots of small things we can do!" If HHKs can only achieve a very small penetration of total production, say 5 percent, it is certainly valid to ask whether another technology, even with lesser energy savings per brick, could have a larger overall impact. Project partners, however, suggest that if one "looks at any technical transformation, the early adopters are not the people who are already in the industry... Bangladesh's garment industry was not built by tailors." Another HHK service provider points out his belief that the HHK is the right level of technology for Bangladesh as it is more labor intensive and requires less capital investment than tunnel.

Another key issue regarding the selection of HHKs is the question of whether they can be economically successful in Bangladesh. As will be discussed in Section 8, more information is needed to assess potential profitability of HHKs. Many stakeholders, however, are pessimistic on their prospects. One industry expert pointed out to the MTR mission his view that "HHK and tunnel can't compete on price with traditional brick making. In some cases, the investors have invested [mostly] their own equity and can handle a couple of years of losses to make things work. Yet, most of the HHK investors can't handle a few years of losses since they have to service their loans... At the end of the day, need to make money. Machine made bricks are not special enough to command a 25 percent premium to make them profitable. People will pay a little bit more but not that much." He suggests the breakeven point for HHK bricks is 8.0 taka per brick, so that a sale price of 8.5 taka would be needed for profitability. Yet, the current sale price is more like 7.5 taka. He adds that another advantage is that traditional brick makers use very low value land that is submerged during the monsoon season, while HHK owners must purchase or rent high value high-ground land. Yet, some other stakeholders see good prospects for HHKs in the long run, once the real estate market recovers and once a more supportive policy environment is solidified.

Another possible issue is employment. Some stakeholders point out that employment at HHKs due to the machine production of bricks is much less than at traditional kilns. Also, employees

may be somewhat different in nature, with traditional kilns employing large numbers of destitute migrants and HHKs employing more persons who live locally, so that a transition to HHKs might hurt “the poorest of the poor.” Initial calculations suggest that the “employment per brick” at HHKs is less than half that at traditional kilns. Yet, the industry expert referenced above was not as concerned about this issue. He noted that there is nothing special in terms of the HHK kiln that requires the bricks be machine made. He explained that the key added functionality of machine formed bricks is that the machine is needed for hollow bricks, but that hollow bricks don’t really have a market in Bangladesh. Some other stakeholders offered the view that in certain cases technology advancement needs to occur even if there is some employment dislocation, and dislocation may be minimized or even eliminated if the transformation is gradual. One stakeholder pointed to the experience of Bangladesh’s salt industry in which the small players were producing salt without iodine, which affected the health of the population. In the end, the smaller (and presumably more labor intensive) players went out of business, but this might be judged an overall positive thing given the wide public health implications.

In terms of the technology selection issue, a shortcoming of the project is that not enough work was done up front to determine the best technologies and the best scope (multiple technologies or one technology) on which the project should focus. The PDF B should have put more effort in this direction, but instead it appears technology selection was assumed even at the PDF B stage. One small report comparing technologies was prepared at the start of the full-scale project, but it appears to have been a minor activity. As some stakeholders point out, the project document in its discussion of technology selection focuses mainly on which technology has the lowest energy consumption but does not consider other key factors such as: (1) potential breadth of adoption, (2) whether up-front investment level is feasible for local investors, (3) cost competitiveness with traditional brick makers, and (4) employment.

PART III: OUTCOME LEVEL ANALYSIS

5. Outcome Level Analysis

This section reviews project results at the outcome level, asking the question of what progress has been made toward intended outcomes and what course correction may be needed. The project is designed so that there is one main outcome for each activity-oriented component. Below, each component and its corresponding outcome are addressed in turn. In each of these sub-sections, a table for the corresponding component-outcome pair compares intended activities as delineated in the project document (repeated from sub-section 1.2) to activities realized in implementation. Results shown in these tables substantiate the conclusion stated earlier (in sub-section 4.6) that the project to date has over-focused on the demos and neglected broader activities intended in the project's design. Following the table in each section, text discusses overall progress toward the component's intended outcome. In many cases, it is found that outstanding needs articulated by stakeholders during the mission correspond to original project design, showing the continuing relevance of that design.

5.1 Component 1: Technology Support Program

A comparison of Component 1's intended activities to realized activities is given in Exhibit 5-1.

Exhibit 5-1: Component 1 Designed versus Implemented Activities

Component 1: Energy Efficient Kiln (EEK) Technology Support Program -> Targeted Outcome: Thorough understanding and appreciation of technology options and their environmental impacts by brick makers, government, and other stakeholders	
Activities Delineated in ProDoc	Activities Implemented to Date
Assessment of other energy conservation and EEK technology options, clay resource assessment (looking at country overall), assessment of performance of <i>all</i> brick makers in country, identification of energy performance improvements in brick industry, energy reporting of brick makers in Bangladesh, development of local brick making engineering and consultancy service industry.	21 page report comparing brick making technologies, clay resource assessment at 11 specific HHK demo or potential demo sites, assessment of energy performance of three HHK demos, and a report on drier design and change of exhaust fan.
Overall Assessment of Delineated versus Realized Activities	
Project as implemented focused activities in this component mainly on the demos, whereas this component in the project document targeted technical understanding for the nation's brick making industry more broadly, as well capacity building of local engineering firms.	
Responsible Party	Expenditures as of October 20, 2014
CEA and XI	\$392,506 (87%) out of targeted \$450,519

Progress towards this component's outcome (Outcome 1) has been weak. Instead of focusing on developing a technical understanding of the various energy efficient kiln options, activities instead focused on technical support of individual demos. Assessment of energy use of the demos has been limited (due to limited operational demos). Yet, the indirect result of the project in terms of replication means that there are many more HHK kilns than previously, which could serve for a more extensive energy and emissions assessment of HHKs in coming months.

During the mission, interviews confirmed that there is still a great need in terms of assessment of the technology options for green bricks. Various groups favor various options, but there is a lack of real data to back them up. For example, some persons believe that the HHKs are not appropriate to Bangladesh as they have not yet become very profitable and have had some technical (e.g. drier) problems. Others indicate that traditional brick owners with smaller scale kilns are still burning wood in their kilns on a wide scale and that most of the zig-zag conversions will not have very good environmental performance. Yet, Bangladesh-based data on the real situation for both of these technologies is unavailable. The Government also lacks the information they need on energy efficient brick technologies. One official told us that zig-zag, while the most popular conversion option, has simply not been proven and that typical conversions are probably far from meeting the Government's air quality standards. Provision of more hard evidence on the performance of various technologies (both economic, energy, and environmental), then, is strongly needed and something the project could appropriately do in its last year to 15 months, if it is extended. There is a strong need to reach out beyond the very limited pool of project demos to the larger HHK community and gather data on economic, energy, and emissions performance. At the same time, more information is needed on the performance of various small-scale conversion options, such as zig-zag.

Further, in terms of technical assessment, some stakeholders suggest there are general technical needs of HHK owners and others that have not been met. For example, there is a need for information on clay mixing process and what kind of clay makes good bricks. No report was provided on that, they indicate, though some research and mapping work was intended by the project document. There is also a need for information on coal and the mixing process.

5.2 Component 2: Demo Program

A comparison of Component 2's intended activities to realized activities is given in Exhibit 5-2.

Exhibit 5-2: Component 2 Designed versus Implemented Activities

Component 2: Energy Efficient Kiln (EEK) Demonstration Program -> Targeted Outcome: Establishment of a critical mass of demonstration projects that will provide detailed information of EEK operations, energy savings, and environmental impact to interested brick makers	
Activities Delineated in ProDoc	Activities Implemented to Date
Workshop to promote demos/identify brick makers to host. Feasibility analysis as needed. Meeting of demo implementation requirements (confirmation of availability and quality of clay resources and availability of labor and materials; financing assistance). Establishment of baseline data for demo sites. Design of demos. TA for financing demos. Installation and operation of demos. Evaluation and dissemination of demo results.	One-on-one meetings (instead of workshop) with potential investors. Feasibility analyses merged with Component 5 techno-economic analyses (11 completed). Description of how demos will be implemented (clay studies and financing assistance originally delineated as part of this component were instead counted towards Components 1 and 5, respectively). Baseline data for sites (12 completed). Designs (12 completed). Loan applications (13 completed). Construction supervision as needed (when help requested by demo owners) provided to 4 demos that were commissioned; partial support to 2 demos at which construction stopped midway. Reports on demos (4 completed).
Overall Assessment of Delineated versus Realized Activities	
Implemented activities for this component correspond more closely to those delineated than is the case for most other components. However, some activities delineated (such as those related to clay quality and bank financing for the demos) were used to “receive credit” for work done on other components, which were originally defined more broadly than to address the demos alone).	
Responsible Party	Expenditures as of October 20, 2014
CEA and XI	\$796,440 (72%) out of targeted \$1,107,680

Outcome 2 has been partially met, though it is the PDF B demo (Universal) that has provided the most information. Because of the very limited number of demos operational from the full-scale project (only one at the time of the MTR mission), the ability to provide detailed information on performance is lacking. Yet, there are a number of non-project HHKs operating in the country now; and it is recommended the project reach out to these as potential partners in demonstrating HHK results in Bangladesh.

5.3 Component 3: Capacity Development Program

A comparison of Component 3’s intended activities to realized activities is given in Exhibit 5-3.

Exhibit 5-3: Component 3 Designed versus Implemented Activities

Component 3: Energy Efficient Kiln Managerial and Capacity Development Program-> Targeted Outcome: Improved local vocational, technical, and managerial capacity to manage and sustain operations of EEKs and EE practices in Bangladesh	
Activities Delineated in ProDoc	Activities Implemented to Date
Training and certification program for EEK production personnel. Evaluation of capacity of local engineering firms. Assessment of viability of local manufacturing of EEKs and	Training of project demo personnel on site or at Universal. One training document provided in English only. List

associated equipment. Feasibility study on standardization of EEK equipment. Training course for local engineering firms to design, build, and maintain EEKs. Training course for brick maker's association. TA on project proposal preparation.	of local engineering service firms provided to each demo. Feasibility study of standards. Meetings with entrepreneurs to plan demos.
Overall Assessment of Delineated versus Realized Activities	
Project as implemented focused training mainly on demos rather than the broader audience intended and did not design formal training program as intended. Local engineering firms and brick makers association were not trained as intended.	
Responsible Party	Expenditures as of October 20, 2014
CEA and XI	\$410,148 (73%) out of targeted \$564,546

Outcome 3 was partially met in that the demos have developed some personnel knowledgeable about running HHKs. While the number of demos is limited, the replication effect has resulted in many more persons having HHK related capacity than existed prior to the project. From stakeholder conversations, however, it was learned that capacity development of staff in energy efficient kilns is still lacking. More training is needed for the HHK firemen, in particular.

The exact extent of training provide directly by the project is unclear. One demo entrepreneur indicated that 8 to 10 of his people were trained at Universal for about two weeks. A pipeline demo investor stated his understanding that CEA/XI will provide someone at *their* factory for six months to train their people. CEA/XI have indicated that 370 personnel were trained through the project, though a UNDP/PMU stakeholder expressed doubt about this. The original target was 700 persons. The PMU in its responsibility to monitor the project asked to be present at the trainings, but was not given the opportunity. Stakeholders complain that there was no formal training – not even one significant training module designed. One training document was prepared, though it is available in English only. One stakeholder explained that “it’s not just telling someone what to do [as they did], but has to be a training process. Trainees have to have something in their hands. We requested a training manual.” The stakeholder further pointed out that there has been no training of any local architect or construction people; and the HHK design has not been shared. The project document indicates Component 3 will include “guidance to strengthen local engineering firms,” (output 3.3) but the output submitted for this item was merely a survey of such firms.

5.4 Component 4: Communications Program

A comparison of Component 4’s intended activities to realized activities is given in Exhibit 5-4.

Exhibit 5-4: Component 4 Designed versus Implemented Activities

Component 4: Communication and Awareness Program->	
Targeted Outcome: Enhanced awareness of the public and other stakeholders on EEKs, EE brick making practices and methodologies and energy efficient bricks production	
Activities Delineated in ProDoc	Activities Implemented to Date
Establishment of Brick Making Industry Information Center. Promotion and advocacy of energy efficiency in brick making industry. Integrated brick making industry information exchange service. Brick making industry energy awards program.	Numerous workshops, media, and advocacy campaigns completed. Initiation of efforts to establish Brick Center. Preparation of brochures and audio-visual materials.
Overall Assessment of Delineated versus Realized Activities	
Intended promotion and advocacy work widely pursued. Lack of funds stalled Brick Center progress until 2013, after which delays continued, but, by time of MTR (Oct. 2013), Brick Center efforts were strongly underway.	
Responsible Party	Expenditures as of October 20, 2014
PMU	\$140,240 (187%) out of targeted \$75,000

The Communication Program largely met Outcome 4's target of making the public aware of the concept of "green bricks" and the environmental problems with traditional kilns. It also brought the "green brick" business opportunity to the attention of interested entrepreneurs. The program rebranded the project as the "Green Brick Project" to better facilitate promotion as compared to the original name of "IKEBMI Project." Due to lack of funds, the Communications Program did not initially set up a Brick Information Center, as delineated in the project document, but now with the UNDP-provided "Scale up Funds," efforts are underway to set up a Brick Center with broader functionality.

The awareness program to date has focused on a broad level. Some stakeholders have suggested that, in next steps, the awareness program become more focused to achieve more specific targets, and, in particular, specific policy changes. One stakeholder suggested these more focused result might be achieved by workshops that center on a few related items. To date, the Communications Program has faced the challenge that there have not been that many results from other parts of the project for dissemination. Once there is more hard information available from Component 1 (in areas such as technology assessment), communications work may be better able to focus efforts to achieve such targeted results as some stakeholders are recommending.

5.5 Component 5: Finance Support Program

A comparison of Component 5's intended activities to realized activities is given in Exhibit 5-5.

Exhibit 5-5: Component 5 Designed versus Implemented Activities

Component 5: Energy Efficiency Kiln (EEK) Finance Support Program -> Targeted Outcome: Availability of financial and institutional support to encourage SME adoption of EEKs	
Activities Delineated in ProDoc	Activities Implemented to Date
Action plan for financing brick making industry SMEs. Techno-economic feasibility evaluation of brick-making SMEs. Capacity building for banks regarding brick-making industry. Promotion of business links between brick SMEs and banks. Training courses on project financing for the brick making industry.	14 page action plan (including 6 pages of background). One-on-one meetings with financial institutions and entrepreneurs. One or two joint workshops with other brick-related efforts. Techno-economic feasibility studies for project demos.
Overall Assessment of Delineated versus Realized Activities	
As implemented, most activities focused on obtaining financing for the demos, though some entrepreneurs already had strong bank relationships and did not need this support. Broader capacity building and training of financial sector with regard to brick industry was mostly absent.	
Responsible Party	Expenditures as of October 20, 2014
CEA/XI	\$257,242 (101%) out of targeted \$255,906

Substantial results with regard to Outcome 5 have been seen in terms of increased support of banks and financial institutions for energy efficient kiln technology. This is in some cases a direct result of the project (loans to project demos) and in others an indirect result (loans to replications).

At the same time, because this component of the project has to date focused more on assisting individual demos achieve loans, needs of the banks and financial institutions in training in energy efficient kilns is lacking. Some financial sector stakeholders expressed an interest in more education of this sort. One also suggested collaboration between the institution and the UNDP-GEF project in educating the former's brick sector clients in energy efficient kiln opportunities. Financial institutions we met are also interested in building their knowledge base with regard to green bricks and said they would appreciate workshops targeted at the financial sector.

The MTR mission did not receive any positive input from stakeholders on the project's direct contribution to increasing bank support for the green brick sector, though indirect impact (as discussed in Section 3) was acknowledged. As indicated previously in this report, more demos than not claim to already have had banking relationships and to therefore not have used CEA support in this area. Some also indicate the techno-economic feasibility study prepared by CEA was not used by their bank, though others indicate it was.

5.6 Component 6: Policy Development Program

A comparison of Component 6's intended activities to realized activities is given in Exhibit 5-6.

Exhibit 5-6: Component 6 Designed versus Implemented Activities

Component 6: Policy Development and Institutional Support Program -> Targeted Outcome: Promulgation of, and compliance to, favorable policies and regulations that encourage adoption of EEKs and energy efficient brick making practices and methodologies. (Including brick making emission standards, coal usage policies, and standardization of brick properties and qualities.)	
Activities Delineated in ProDoc	Activities Implemented to Date
Improvement of Government of Bangladesh awareness through campaigns and lobbying. Formulation of policies and implementing rules. Campaigns to adopt project's proposed policies and implementing rules. Three national enforcement workshops. Formulation and implementation of strategies to minimize land degradation from brick making. Review of brick making industry energy efficiency policy. Capacity building for brick making association on compliance.	Report describing brick standard. Provided comments on draft government brick emissions policy. Report on land degradation issues.
Overall Assessment of Delineated versus Realized Activities	
Did not conduct campaigns, lobbying, and workshops targeted. Very limited activities in the form of a few reports not disseminated, aside from comments on Government draft policy which was shared with policy makers.	
Responsible Party	Expenditures as of October 20, 2014
CEA and XI	\$89,934 (56%) out of targeted \$161,996

The project itself did not make much direct progress toward Outcome 6, though it may have indirectly contributed to progress made. The revised Brick Act issued in 2013 is very good progress in terms of policies to encourage more energy efficient brick making. As discussed, it was in part influenced by the project. Yet, the project did not directly do much policy work at all, despite the design of a full component focused on this. Very limited activities include brief comments on the draft Brick Act and a report on land degradation issues. One stakeholder pointed out that CEA, as an individual private sector organization, may not have much credibility in terms of policy recommendations. UNDP via the PMU may be the more appropriate party to work on such things. A stakeholder from the Bangladesh Auto-Brick Makers Association (BABMA) similarly suggested that the Association's work would be greatly strengthened by partnering with UNDP in policy advocacy. Another stakeholder suggested that policy advocacy is really not one of CEA's strengths.

The author learned from stakeholders in the HHK sector that they still have very strong needs for policy support. While BABMA indicates it achieved a five-year tax holiday for new HHKs (with no assistance from the project), they are anxious to get more policy support in areas such as a level playing field with traditional brick makers in the VAT tax, opportunities for low-interest eco-industry loans, etc. Brick standards are also thought to be an area that would support the development of the energy efficient brick industry.

Traditional brick makers also feel challenged in that policy is unstable. One, in getting a loan for zig-zag conversion, asked his banker, “Can you guarantee me zig-zag won’t be outlawed for a number of years?”

PART IV: EXPENDITURES, SUSTAINABILITY, AND OTHER ASPECTS OF PROJECT

6. Expenditure Analysis

This section utilizes project expenditures and comparisons to targeted expenditures to assess cost efficiency, compliance with project design, leverage of GEF funds via co-financing, and balance between different parts of the project. Sub-section 6.1 presents overall GEF expenditures by year and by component, showing the fund flow over time, the balance between components, and funds remaining. Sub-section 6.2 presents, by component, available activity-level expenditures as means of understanding where large amounts of funds have been spent and of getting a picture of cost efficiency. Sub-section 6.3 presents data on co-financing, which has been substantial. Last, sub-section 6.4 looks at project management costs as a proportion of total costs and also reviews the breakdown of these costs.

6.1 Overall GEF Expenditures and Outcome-Wise Comparison

A summary of GEF funds and UNDP Scale-up Funds spent, allocated, and remaining is given in Exhibit 6-1. It shows that while 83 percent of GEF funds have been spent, only 20 percent of the scale-up funds have been spent. Thus, a substantial US1.3 million (of combined GEF and Scale-up funds combined) is left as of Nov. 30, 2014.

Exhibit 6-1: GEF Funds and Scale-Up Funds – amount spent and amount remaining (USD)
as of Nov. 30, 2014

Source	Spent	Allocated	% Spent	Amount Remaining
GEF funds	2,486,139	3,000,000	83%	513,861
Scale-up funds	196,378	1,000,000	20%	803,622
Total funds	2,682,517	4,000,000	67%	1,317,483

Exhibit 6-2 offers a year-wise and outcome-wise break down of expenditures to date, as well as a comparison of percentage of prodoc allocations spent for each outcome. Total annual expenditures show a ramp-up in 2011 and 2012 and a drop-off in 2013, probably due to greater scrutiny of payments by UNDP resulting from concerns about delivery. In 2014, the drop-off was even greater, due to no payments being made to CEA and XI, again resulting from concerns about delivery.

Exhibit 6-2: Outcome-Wise Expenditures
in USD and as per UNDP Atlas as of Nov. 30, 2014

	2010	2011	2012	2013	2014	Total	ProDoc	%Pro Doc
1. Tech Assess	50,000	113,719	95,289	83,498	30	342,537	450,519	76%
2. Demos	150,000	244,677	255,198	134,878		784,752	1,107,680	71%
3. Capacity Bldg	100,000	131,765	98,019	80,364		410,148	564,546	73%
4. Communications		34,309	70,916	28,229	6,787	140,241	75,000	187%
5. Financing		82,281	74,920	26,830		184,031	255,906	72%
6. Policy	154,152	17,475	48,279	927		220,833	161,996	136%
7. Monitoring	1,380	28,287	32,757	19,109	17,915	99,448	139,310	71%
8. Project Mngt.	16,007	107,600	84,507	82,553	16,963	307,630	245,043	126%
9. Cost Sharing†			-11,408	9,126		-2,282	NA	NA
10. Scale-up funds				8,447	187,931	196,378	NA*	NA
Gains or Losses			-863	-335		-1,199	NA	NA
Total	471,539	760,113	747,614	474,626	229,626	2,682,517	3,000,000*	83%**

†Cost sharing indicates sharing of costs in cross project activities, such as a cross-project evaluation that occurred.

*Scale up funds are included in “total expenditures” (columns 2-6) but not in the total of budget allocated in the prodoc (column 7).

**Scale up funds are also not included in “% of ProDoc” allocation spent (column 8). So 83% is arrived at by subtracting scale-up funds spent to date from the total spent to date and dividing by US3 million. (That is, [2,683,517 – 196,378]/3,000,000 = 83%.)

Generally, in analyses such as these at the time of mid-term review, it is instructive to look at percentage of the project document-indicated budget spent for each outcome. Comparison of percentage of target spent among outcomes can show which outcomes have been neglected to date and which ones emphasized or over-emphasized. In the case of IKEBMI expenditures, however, the MTR consultant found that this kind of analysis is less useful, because the nature of many activities has been changed from the original intention of the project document. Stepping back from the numbers and considering the findings of the Section 5 tables comparing intended and actual activities, a general conclusion that Outcome 2 (“Demo Program”) has received the bulk of spending going to CEA/XI is implied. Gaps in activities originally targeted by the project document suggest under-spending in technology assessments (Outcome 1), capacity building (Outcome 3), educating the financial sector (Outcome 4), and policy (Outcome 6), even if the percentage of targeted funds spent do not convey this.

Further suggesting a cloudy picture in the outcome-by-outcome expenditures are discrepancies between outcome-wise expenditures recorded in UNDP’s ATLAS system and those indicated by the CEA/XI invoices paid. Exhibit 6-3, provided by the PMU, shows these gaps for the components for which CEA and XI are responsible.

**Exhibit 6-3: Comparative Disbursement according to ATLAS and as per Invoice
for CEA/XI Components, as of Nov. 30, 2014, in USD**

Activity	Disbursement as per Invoice (A)	Disbursement as per ATLAS (B)	Target as per ProDoc (C)	Balance as per Invoice (C-A)	Balance as per ATLAS (C- B)	Difference Btwn Invoice payment and ATLAS (A-B)
1	392,506.50	342,506.79	450,519.00	58,012.50	108,012.21	49,999.71
2	792,439.65	784,752.15	1,107,680.00	315,240.35	322,927.85	7,687.50
3	410,147.81	410,148.13	564,546.00	154,398.19	154,397.87	(0.32)
5	257,242.00	184,030.50	255,906.00	(1,336.00)	71,875.50	73,211.50
6	89,933.50	220,833.00	161,996.00	72,062.50	(58,837.00)	(130,899.50)
Total	1,942,269.46	1,942,270.57	2,540,647.00	598,377.54	598,376.43	(1.11)

The major issue with regard to overall expenditures of GEF money is that 76 percent of the funds allocated to CEA/XI components have been spent, while only four demos of the full-scale project (out of a targeted 15) are commissioned and only one is currently operational. CEA/XI were allocated 97.2 percent of activity-based component funding in the project document. Aside from their components, only US\$75,000 was allocated for the Communications Component (Component 4), which is being implemented by the PMU. These issues of limited overall delivery in terms of demos and of overemphasis on the demos to the neglect of other priorities have been explored in more depth in Section 4. Among stakeholders that are aware of the situation, most feel the project partners have been overpaid. Yet, the partners express that they have done 76 percent of the work. They mention doing the work for the start-up of 40 to 50 plants and also that there is a lag of up to three years in the time it can take factories to become operational. They express commitment to achieve the target of 15 demo factories in the full-scale project with no increase in allocated amount.

6.2 Activity-Level Expenditures by Outcome and Cost Efficiency

This sub-section attempts to provide an activity based analysis of expenditures for each of the project's six activity-based components. Complications arise in this process, because payments to CEA and XI (who were allocated 97 percent of funds targeted for activity-based components) in 2010 were not broken down by activity. Thus, the approach used is to look at payments for activities in 2011 – 2013 (no payments were made in 2014) and corresponding outputs in those years to come up with a unit price per output where relevant. This approach was introduced in sub-section 4.5 (see Exhibit 4-14) for the activities of clay resource studies and construction management. A general conclusion from that analysis and the one that follows is that unit amounts paid for many deliverables seem quite high in terms of what was delivered. In addition, big ticket items, particularly construction supervision (also referred to as “installation and commissioning”), show that payment for full delivery (based on unit charges to date) would exceed total project document allocations to the partners. Both of these conclusions suggest overpayment of the project partners for work done to date.

Outcome 1 (Technology Support Program) activity-wise expenditure analysis: Exhibit 6-4 below shows the activity-wise expenditure analysis for Outcome 1. When possible, it shows estimated unit expenditures for the deliverables associated with each activity. As payments were not broken down by activity and simply made on a bulk basis on 2010, only payments and deliverables for 2011-2013 are used in the analysis. While a deeper dive may need to be taken to verify amount of effort involved with the deliverables of this component, the author's initial impression is that payments per unit deliverable are extremely high for the effort expended in many of Outcome 1's activities. An example is the cost of US\$78,547 for one energy monitoring report. According to the author's understanding, this report covers four project demos and reports their energy use per volume of bricks produced. The work likely involved obtaining data from each of the four demos, and computing energy consumption per 100,000 bricks. For the clay studies, as mentioned in sub-section 4.5, the MTR mission learned that the maximum cost of lab work in China is US\$2,000 per clay study, but that not all samples need to be sent to China and some samples do not even need to leave the site. Thus the unit amount of US\$8,716 per clay study seems high. The cost of US\$62,329 per report evaluating the operating and managerial performance of the demos (4 demos covered) also seems high given that the reports are not very detailed.

Exhibit 6-4 Activity-wise Expenditure Analysis for Outcome 1 – Technology Support Program

Activity	Progress (2011 – 2013 progress)	Total 2011-2013 Expenditure	Calculated Unit Expenditure (if relevant)
1.1 Assessment of Technology Options	21 page report (0 reports)	NA because 2010 only	NA
1.2 Clay Resource Assessment	11 demo clay assessments (9 assessments)	\$78,447	\$8,716 per demo clay assessment
1.3 Evaluation of operating performance of kilns	2 eval reports (1 eval report)	\$62,329	\$62,329 per eval report
1.4 Identification of energy potential improvements in BMI	3 managerial/operational studies (2 studies)	\$48,446	\$24,223 per managerial and operational study
1.5 Energy reporting program for BMI	2 energy monitoring reports (1 report)	\$78,547.5	\$78,547 per energy monitoring report
1.6 Development of local engineering and consulting service industry for BMI	13 lists of local eng'g companies near demo sites (11 lists)	\$24,737	\$2,249 per list of engineering companies near demo site
TOTAL of \$392,507 (87%) disbursed out of \$450,519 allocated in prod. oc.			

Outcome 2 (Demo Program) activity-wise expenditure analysis: Exhibit 6-5 below shows the activity-wise expenditure analysis for Outcome 2. When possible, it shows estimated unit expenditures for the deliverables associated with each activity. The largest expenditure by far for

the 2011 to 2013 period is for the installation and commissioning of the demos (also known as “construction supervision”), which comes out to an estimated unit pricing of US\$113,476 per demo. Interestingly, some stakeholders indicate that XI’s price of equipment sold to demo entrepreneurs is extremely high. One in particular indicated CEA/XI’s service price is low (perhaps corresponding to much of this being paid for by the project), but equipment price very high. One interpretation is that subsidization of service costs by the project gave CEA/XI a market advantage and they were able to overcharge for equipment, thus offering a similar total package price to other providers. Since the equipment is paid for by the entrepreneurs, the US\$113,476 per demo installation/commissioning paid for with UNDP-GEF project monies must all correspond to input of labor. As there was only one XI engineer and one CEA engineer involved via intermittent site visits, this amount seems quite high.

Exhibit 6-5 Activity-wise Expenditure Analysis for Outcome 2 – Demo Program

Activity	Progress (2011 – 2013 progress)	Total 2011-2013 Expenditure	Calculated Unit Expenditure (if relevant)
2.1 Promotion of EE technology and demo projects	182 entrepreneurs in database; 133 met with (144 and 95)	\$37,498	NA because multiple output types
2.2 Feasibility analyses of selected demo sites <i>merged with</i> 5.2 Techno-economic feasibility evals for BMI SME financing	11 feasibility studies (9 studies)	\$27,950 (for 2.2) + \$27,171 (for 5.2)	\$6,125 per feasibility study
2.3 Demo project implementation requirements	13 report on demo requirements (11 reports)	\$24,000	\$2,182 per report on demo requirements
2.4 Baseline data for demo establishment	12 baseline studies (10 studies)	\$31,457	\$3,146 per baseline study
2.5 Design of demo projects	12 design packages (10 designs)	\$26,782	\$2,678 per design package
2.6 Tech. Assistance for Financing of demos	13 reports on TA (11 reports on TA)	\$31,563	\$2,869† per TA provided
2.7 Installation and operation of demos	4* demos installed (3 demos installed + 2 in progress)	\$453,903	\$113,476 per demo installed**
2.8 Demo results eval and dissemination	2 eval reports (1 eval report)	\$12,978	\$12,978 per eval report
TOTAL of \$792,440 (72%) disbursed out of \$1,107,680 allocated in prodoc.			

†Many entrepreneurs handled bank liaison on their own. The number of entrepreneurs assisted in this regard is thus questionable.

*In contrast to monitoring reports, CBN, which has one kiln, is here counted as only one demo

**To compute unit price, total expenditure is divided by 4, giving credit for three completed demos and estimating a third for the two demos for which construction was not completed.

Outcome 3 (Capacity Development Program) activity-wise expenditure analysis: Exhibit 6-6 below shows the activity-wise expenditure analysis for Outcome 3. When possible, it shows

estimated unit expenditures for the deliverables associated with each activity. For many of these activities, input level seems quite low based on documentation submitted. Unit price for the kiln/equipment standardization study (at US\$51,038) is quite high. As the work regarding local engineering firms in the end was transformed into compilation of simple lists of local firms near demos, expenditures in this area also seem high (combined expenditure in 2011-2013 for activities 3.2 and 3.3 of US\$116,521 purportedly covering 11 potential demo sites), though the amount of work involved is not clear. Actual input for training of demo staff is also unclear. One entrepreneur reported that eight to ten of his people trained at Universal for 2 weeks (unit cost of US\$21,109), though the project partners claim they sent a Chinese fireman for a month or more to each demo (again, unit cost of US\$21,109 as compared to salary of Chinese fireman of US\$850/month as indicated per CEA).

Exhibit 6-6 Activity-wise Expenditure Analysis for Outcome 3 – Capacity Dev. Program

Activity	Progress (2011 – 2013 progress)	Total 2011-2013 Expenditure	Calculated Unit Expenditure (if relevant)
3.1 Capacity building for kiln production personnel <i>merged with</i> 3.5 Training course on design, feasibility, eval, construction, and O&M of EE kilns	Claim of 370* persons trained (184 trained)	\$57,653 (for 3.1) + \$26,783 (for 3.5)	\$21,109 (or more) per demo
3.2 Assessment of capabilities of BMI maintenance service providers	List/survey of local engineering support around 13 demos (list for 11 demos)	\$24,388	\$2,217 per list of local engineering support
3.3 Guidance to strengthen local engineering companies to service demo sites	13 surveys/lists (11 reports)	\$92,133	\$8,376 per list/survey on local engineering support
3.4 Feasibility study on standardization of kilns and equipment	2 studies on standardization (1 study)	\$51,038	\$51,038 per study on standardization
3.6 Technical assistance in planning of HHK projects	Planning meetings with 18 entrepreneurs (meetings with 14 entrepreneurs)	\$62,140	\$4,439 per entrepreneur with whom planning meetings were held
TOTAL of \$410,148 (73%) disbursed out of \$564,546 allocated in prodoc.			

Outcome 4 (Communication and Advocacy Program) activity-wise expenditure analysis:

Exhibit 6-7 below shows the activity-wise expenditure analysis for Outcome 4. Less information was available on activity-wise expenditure breakdowns for these activities. Specific expenditures for the Brick Center (Activity 4.1), taken out of the UNDP Scale-up Funds, are unknown to the author, as these are merged with other expenditures from the fund that are supporting the PMU (project management costs). Other than the Brick Center, the main expenditures for Outcome 4 fall under 4.2, the promotion and advocacy program. While the author did not obtain a detailed

list of sub-activities, the overall impression in terms of funds spent (US\$140,240) is positive, given the strong press coverage achieved (49 news stories in print media and 20 in online media).

Exhibit 6-7 Activity-wise Expenditure Analysis for Outcome 4 – Communication Program

Activity	Progress	2010 – 2014 expenditures	unit cost
4.1 BMI Info Center establishment	3 stakeholder workshops, business plan, bilateral meetings	NA	NA
4.2 Promotion and Advocacy Program	Numerous workshops, 4 regional awareness campaigns, videos, and promotional materials; strong results in terms of press coverage	140,240	NA (multiple types of activities included)
4.3 BMI information service	None – will presumably be part of Brick Center	NA	NA
4.4 BMI energy awareness and awards program	NA	NA	NA
TOTAL of \$140,240 (187%) out of \$75,000 targeted in prodoc			

Outcome 5 (Finance Support Program) activity-wise expenditure analysis: Exhibit 6-8 below shows the activity-wise expenditure analysis for Outcome 5. When possible, it shows estimated unit expenditures for the deliverables associated with each activity. The overall impression given is that the cost effectiveness of Component 5, on which US\$257,242 has been spent, has been quite low, with double counting of activities to some extent. For example, activity 2.6 is focused on TA to assist the demos in getting financing. Yet, it is unclear whether the work for 5.3 and 5.5 was really differentiated from this. It seems CEA's main activity with regard to financial institutions has been to help demo HHK entrepreneurs get loans. This work it did for some entrepreneurs, but in our experience a good portion already had banking relationships and did not seek this liaison support. Or, CBN, another commissioned demo, got its financing before CEA/XI got involved with them. Activity 5.5, in particular, is concerning. The referenced report itself is probably not the main output, whereas "increased access to financing" is. Yet, it is difficult to assess inputs and thereby assess cost effectiveness of the US\$67,376 spent on this work.

Exhibit 6-8 Activity-wise Expenditure Analysis for Outcome 5 – Finance Support Program

Activity	Progress (2011 – 2013 progress)	Total 2011-2013 Expenditure	Calculated Unit Expenditure (if relevant)
5.1 Action plan for financing BMI SMEs	Action plan prepared in 2010	----	NA – all work was in 2010
5.2 Techno-economic feasibility evals for BMI SME financing	<i>See Outcome 2, activity 2.2</i>	\$27,171 (<i>see 2.2 of Outcome 2</i>)	<i>merged with 2.2 (see Outcome 2)</i>
5.3 Capacity building for banks/ financial institutions	11 financial institutions met with (<i>7 met with</i>)	\$89,010	\$12,718 per financial institution

			engaged in discussions
5.4 Promotion of business links	Report on business linkages	---	NA – all work was in 2010
5.5 Increasing of access to financing sources	2 reports on increased access to financing (2 reports)	\$67,376	\$33,388 per report on increased access to financing
TOTAL of \$257,242 (101%) disbursed out of \$255,906 allocated in prodoc.			

Outcome 6 (Policy Development Program) activity-wise expenditure analysis: Exhibit 6-9 below shows the activity-wise expenditure analysis for Outcome 6. When possible, it shows estimated unit expenditures for the deliverables associated with each activity. Stakeholders suggest low cost effectiveness of the funds spent on Outcome 6. In general, some items were drafted, but not disseminated. The workshop held in 6.1 is said to be a joint workshop held with another organization.

Exhibit 6-9 Activity-wise Expenditure Analysis for Outcome 6 – Policy Dev. Program

Activity	Progress (2011 – 2013 progress)	Total 2011-2013 Expenditure	Calculated Unit Expenditure (if relevant)
6.1 Improvement of GoB awareness	1 activity (1 activity)	17,473	US17,473 per activity
6.2 Formulation of policies and implementing regulations	drafted implementing rules/regs (drafted IRRs)	11,380	US11,380 for IRRs
6.3 Policy support activities (at demo sites)	Brick quality standards drafted (brick standards)	11,380	US11,380 for draft brick quality standards
6.4 Capacity building for regulation and enforcement	No progress	11,145	Unknown – no work done
6.5 Formulation and implementation of strategies to minimize land degradation for BMI	Strategies prepared	----	All work was in 2010
6.6 Review of BMI EE policy	No progress	1,391	Unknown, work done unclear
6.7 Capacity building of BMI in compliance with emission standards	One report completed	---	All work was in 2010
TOTAL of \$89,934 (56%) disbursed out of \$161,996 allocated in prodoc.			

6.3 Co-Financing

Co-financing of the project demos is shown in Exhibit 6-10. Results of co-financing are quite positive with realized co-financing of US9 million nearing targeted private sector/financial sector co-financing of US10.85 million. If demo investor NDC, which has now received a bank loan,

realizes its plans, total co-financing of the demos will rise to US\$12.6 million. In addition to this co-financing, the project is believed to have stimulated a number of other non-project HHKs, which have similar levels of financing, further implying project success in mobilizing co-financing.

Exhibit 6-10: Co-Financing of the Project Demos

Year of Investment	Name of HHK demo Kiln	Debt Finance (in Tk.)	Sourcing Bank	Equity (in Tk.)	Total (in Tk.)
2010	SSL Ceramic Bricks Ltd.	45,375,000	Bank A is a Ltd.	24,433,000	69,808,000
2010	Banalata Refractory Ltd.	65,000,000	Sonali Bank Ltd.	35,000,000	100,000,000
2011	HAAIR Bricks Ltd.	32,449,000	Basic Bank Ltd.	17,467,000	49,916,000
2012	ECO-III&IV Bricks Ltd.	137,002,000	Basic Bank Ltd.	73,770,000	210,772,000
2012	CBN I & II Bricks Ltd.	99,500,000	National Bank Ltd; & Bangladesh Bank	200,000,000	299,500,000
2010-2012	Total (In Taka)	379,326,000.00	---	350,670,000.00	729,996,000.00
2010-2012	Total (in USD)	\$4.68 M	---	\$4.33 M	\$9.01 M
2014 (expected)	NDC Bricks (in USD)	\$800,000	Janata Bank	\$2.8 M	\$3.6 M
Total realized and expected	---	\$5.48 M	---	\$7.13 M	\$12.61M

Due to the US\$1 million in Scale-up funds received from UNDP, other (non-demo) project co-financing has exceeded targets. In addition to the UNDP funds, there were small inputs from GGCA and the Dutch Fund. While small, stakeholders see these funds as positive, bringing the new dimensions of gender and green economy to the project.

Exhibit 6-11: Other (non-Demo) Project Co-financing

Year	Sources	Purpose	Amount (USD)
2011	GGCA (Global Gender and Climate Alliance)	Gender Intervention	30,000
2012	GGCA (Global Gender and Climate Alliance)	Gender Intervention	30,000
2012	Dutch Fund	Green Economy	30,000
2013	UNDP TRAC Fund	Scale up (Brick+)	1,000,000
Total			1,090,000

6.4 Project Management Costs

Project management costs to date have been slightly higher than the GEF target of 10 percent maximum, but not egregiously so. Out of the USD2.442 million in GEF funds spent to date, USD307,630 or 12.5 percent have been project management costs. For the time being, project management costs are being paid from the UNDP Scale-up Funds and the intention is to eventually split project management costs between the two funding sources (GEF and UNDP Scale-up funds). As project management costs financed by the Scale-up funds are recorded under

“Component 10” (the Scale-up fund component), it is difficult to compute the grand total spent to date and compare to the grand total of funds available.

The MTR consultant received a break-down of project management expenditures for the period 2010-2013. For that period, the total expenditures were US\$279,964, of which the two top categories of expenditure were US\$117,982 on salaries and US\$26,578 for common services (probably building services, such as security). All other line items were under US\$20,000.

7. Other Topics: Sustainability, Design, Implementation, M&E, and Gender/Poverty

This section brings together a number of other topics that are important aspects of project review. Due to the content of this report and the nature of the project, many of these topics have been covered in a horizontal fashion throughout other sections of the report. When this is the case, this section will serve to summarize and remind the reader of findings detailed elsewhere in the document.

7.1 Sustainability

Sustainability of project results to date remains precarious due to the difficulties that HHK installations are having in surviving. On the other hand, replication and the developing of enthusiastic service providers and entrepreneur proponents for the HHK sector are a positive force in pushing for sustainability. As the project charts out the “way forward,” ensuring sustainability of HHKs (if indeed follow up work shows the HHK effort worth sustaining) and other technologies supported will be important. Critical tools in ensuring sustainability will be targeted activities addressing specific policy, training, and technical problems. The Brick Center initiative is a very positive effort in terms of ensuring project sustainability, as the concept calls for a permanent center to serve the industry in achieving more energy efficient, less polluting production.

7.2 Design

A number of project design issues have been discussed or implied in previous sections of this report. Primary among these has been: (a) the structure of the relationship between UNDP and the project partners, (b) technology choice and focus on a single technology, (c) over-focus on the demos, and (d) dual role of project partners in delivering project services and earning a profit from equipment sales. As for the design of the relationship between UNDP and the project partners, stakeholders suggest that a tighter structure and more specific LOAs would have been useful. One stakeholder explains that project design failed to develop a risk based performance

structure to hold the project partners responsible. That is, if they do not deliver, what remedies are there? Or, if the demos cannot be achieved, what is the alternative to achieve delivery? Stakeholders from the UNDP/PMU side felt that the structure of the relationship did not allow enough oversight of the project partners, particularly given that the project partners were also members of the Project Board. As has been discussed elsewhere in this report, in future such relationships, deliverables for payment need to be designed and budgeted with much more active involvement from the PMU or UNDP.

The issue of technology choice and focus on a single technology have also been discussed elsewhere in this document. The project document concludes HHKs are the best choice for Bangladesh based on their energy efficiency, but does not consider ability of brick makers in financing the large up-front investment costs. Nor does it consider the reduced employment in moving from traditional kilns to HHKs.

As for over-focus on the demos, while this is largely an implementation issue, steps taken during project design in the future could perhaps prevent this trend of “demo work taking over the project.” When it is intended that activities are independent of the demos, the project document may state so clearly. In general, more clarification is needed to draw the line between what a project will do for demos and what the demo investors need to pay out of pocket for.

Last, regarding the dual role of the project partners as project implementers and sellers of equipment, future projects may wish to design very clear guidelines for such situations. For example, there should be clear documentation provided to entrepreneurs so that they understand what is available for free from the project. Further, there should be an agreement with partners that, when other acceptable equipment providers are available in the market, entrepreneurs be given a clear, unbiased choice.

7.3 Implementation

Much of the discussion in this report has already referenced problems in implementation. Key areas include delays in delivery and the institutional set-up, which calls for the project partners to be allocated 97 percent of funds for activity-based components. A related issue is the direct implementation structure chosen for this project.

Delays: Delays referenced in Sub-section 1.3, particularly before launch of the full project, were substantial. In the future, UNDP may wish to take actions to avoid such delays. The largest delay was the three years between completion of PDF B activities in March 2007 and the signing of the project document in April 2010. While the author does not know the reason for this delay and wonders if perhaps there was some well-reasoned hesitation to move forward with the project, in general, UNDP may wish to take preventive measures against such long delays. For example,

one program officer could be assigned each pipeline project with accountability for being proactive in moving it forward. Management then could be responsible for assuring every pipeline project falls under the purview of a program officer.

The delay in moving forward with Brick Center work is another key delay of the project with lesson learned. This delay, as discussed earlier, was due to management changes in the CO as well as a decision by the CO to solicit stakeholder feedback after the proposal had been submitted and Scale-up funds received. While turnover in management is inevitable and does commonly lead to delays, the delay in Brick Center work suggests action be taken so that turnover does not lead to unacceptable delays in projects. While work seems to be picking up on the Brick Center, one stakeholder noted that it still does not seem very timely. He mentioned attending a workshop six months ago regarding the Center, but that he had received no subsequent communication since. He tried to contact the person in charge by phone, but did not get a response. He suggests that UNDP thus creates a feeling of remoteness and of telling the sector what to do rather than really consulting stakeholders.

Institutional Set-up: Issues with institutional set-up have been discussed elsewhere in this document. While the problem faced with the project partners was partly a project design problem, the author believes that more could have been done in implementation to address the design flaws. The project is organized as what UNDP calls DEx (direct execution by UNDP) rather than the more typical NEx (national execution by a government agency). While one stakeholder suggests DEx is the problem, another suggests it has benefits if implemented well. In general, DEx can be faster than NEx, but may be “less careful.” This stakeholder does not believe DEx is a mistake. He suggests that if the LOA had been more specific and the TAC had been set up with adequate capacity, implementation could have been more effective. The LOA, he notes, didn’t have specific deliverables. In the author’s view, a major problem was that Xian/CEA wrote their own annual work plans (AWPs) and determined their own prices within those AWP, with no one really checking if those prices made sense.

7.4 Monitoring and Evaluation

Day-to-day monitoring of the project has been quite strong, though overall big-picture monitoring has been weak. The project designed monitoring and evaluation into implementation. There is a monitoring and evaluation officer in the PMU. Stakeholders have indicated his work is quite meticulous in terms of tracking indicators and deliverables and providing the required monitoring documents. The author also found these materials quite detailed and useful in preparing the MTR. One of the problems with the monitoring and evaluation appears to be that the PMU did not feel empowered to act on the problems they saw. They were aware of the deliverables being quite weak. Eventually, this message was conveyed to the CO, which began to withhold some of the payments to CEA/XI.

One problem the author perceives is that monitoring by the PMU is often reduced to a matter of indicators and deliverables as in the project results framework. It is only when an MTR or terminal evaluation are conducted that someone is retained to look seriously at whether outcomes are being achieved and progress is being made toward the project objective – the big picture. Yet, this broader sort of monitoring should be an important role of the PMU as a whole, led by the head of the PMU, the project manager. From consultations with the PMU, the author gets the impression they have been aware both with problems of the demos and problems in the other components of shifting most activities to be demo-related. Yet, the PMU was not reviewing CEA/XI's annual work plan or planning longer-term to see that the costing in the plan fit with achievement of all of the project's deliverables. Instead, the PMU simply tacked its work plan onto CEA/XI's. Further, the PMU did not feel empowered to maintain frequent contact with demo entrepreneurs as they were not offering service to them. One stakeholder suggests the PMU was not proactive enough. Originally, the PMU had a vehicle, but did not use it for site visits to the demos.

The lesson learned from this experience may be that a higher level of monitoring responsibility should be clearly articulated for the PMU. Indicators in the project monitoring matrix are, of course, important. Yet, at the same time, the PMU as a whole, led by the Project Manager, needs to periodically reflect on whether progress is being made towards outcomes. In the case of demo projects, the PMU should be monitoring these carefully by frequent site visits and be in frequent communication with demo owners, who should be made to understand what it is that the project is offering them for free and why they should support the PMU in its monitoring. This lack of frequent site visits to and communication with the demos is perhaps the greatest shortcoming of project monitoring.

The project is also designed to have an MTR and terminal evaluation. The MTR was initiated relatively late in the cycle of the project, with an initial MTR conducted in December 2013 – February 2014, over three years after project document signing of this five year project. The initial MTR, conducted by an international and domestic consultant, was deemed unsatisfactory by UNDP as it only focused on the problems of the project, neglecting both achievements and recommendations for course correction and a way forward. The second MTR, initiated in October 2014, has been conducted by an international consultant working alone, but with strong support from the PMU (especially the Monitoring Officer) and UNDP during the mission. In order to remain unbiased, it was decided that the second international consultant would not review the first MTR prior to drafting this report.

7.5 Gender and Poverty

Gender and poverty issues are also important to this project. Women work in the brick kiln industry; and the workers in the industry are also some of the nation's poorest. On the gender side, by cooperating with Global Gender and Climate Alliance (GGCA), the project brought gender awareness training into the project in an innovative way. It held a workshop for traditional brick makers on gender issues and also provided training and other support for women at the PDF B demo, Universal. While some of the female workers trained indicated the training did not have a great impact on them, they appreciated other aspects of this work, such as showers and medical check-ups provided. While HHK demos appear to have lower overall employment per unit brick, they tend to have a higher proportion of women, who are hired to run the brick making line.

Elsewhere in this report, the pro-poor related issues of HHKs' lower employment overall and lower proportion of destitute migrants in overall staffing are discussed. Proponents of HHKs point to the egregious working conditions at traditional kilns, mentioning how some brick makers are even known to lock up women and children to make sure they don't run away. They also point out that tunnel kilns, due to their high level of automation, have less employment, while HHKs still have significant employment.

The MTR mission interviewed both male and female workers at Universal, the PDF B demo. The level of satisfaction with the job seemed quite high. Most did not have previous experience in traditional kilns, but one interviewee that did noted his current conditions are much better. The interviewees do not have a lot of problems with injuries. The male loaders at Universal include both locals (30%) and migrants (70%), whereas almost all of the women working the brick line are locals. The two women workers we interviewed told us they would have no interest in working for a traditional brick field and do seem as though they are better off than women who work at such jobs.

More work might be done to compare employment rates at traditional brick kilns to those at HHKs. One of the Universal managers offered a simple comparison: At Universal, 100 people work to produce 35,000 bricks per day. For traditional bricks, it would take about 250 people to make the same amount (30 to 35,000 bricks per day) at a well-run kiln, but it would also take 250 people at an average kiln to produce 20 to 25,000 bricks per day. So, by this comparison, we can see that on a per brick basis, the traditional kiln employs at least 2.5 times as many people to produce a certain amount of bricks as the HHK.

Stakeholders were divided on whether UNDP should favor traditional kilns given their higher employment. Some emphasize that the HHKs provide quality year round employment, even if less of it. Also, most HHKs are not using in their sourcing of employees a middle man, which

tends to be a source of problems for traditional kiln workers. Similarly, another stakeholder was not convinced by the argument that traditional kilns should be kept open to maintain labor opportunities. He notes that countries want to increase productivity and living standards and also that the traditional kiln jobs really have a negative impact on workers. He suggests there will be short-term losses, but with more efforts, better opportunities for people. Other stakeholders point out that the transition to HHKs and other cleaner brick making technologies will be gradual, so with less dislocation occurring than might at first be worried about.

PART V: RECOMMENDATIONS AND RATINGS

8. Way Forward

This section will offer recommendations for the way forward for IKEBMI. Despite challenges, the MTR consultant sees very strong potential for the project going forward. One of the striking aspects of the MTR mission is that stakeholders presented so many clear needs and that many of these are in line with the original project design. As an example, one non-project HHK owner summarized four areas in which the project can help the HHK industry going forward: (a) assist HHK and other auto-brick manufacturers in impacting policy, (b) promote HHKs to other brick makers (namely BBMOA – help connect auto-brick makers with interested BBMOA members), (c) get lower interest rates for HHKs (that are certified), and (d) educate bank engineers about the technology.

Summary: The sub-sections below discuss key elements of the recommended way forward. The author strongly feels that an extension of the project could be highly beneficial to address unmet needs. At the same time, it is important that the project shift gears from its current mode which seems to be putting sole focus of additional spending on establishment of the Brick Center. To merit extension of the UNDP-GEF project, the author believes that sole focus of additional spending on setting up the Brick Center over the next 12 to 15 months is not enough. This work should be complemented with very targeted activities to address other gaps in project delivery to date. Yet, experience suggests project partners CEA and XI, whose work has focused on demo establishment, are not the right organizations to fill those gaps. Instead, a PMU-led effort is recommended.

The major focus of this work and of spending should be “soft activities,” with only limited attention to (and little or possibly no additional spending for) the demos. As for the demos, given replications that have occurred, the recommendations is that new ones are not initiated, but that CEA/XI is asked to complete work with the two promising pipeline demos (NDC and Makrail) and assist commissioned but stalled demos in coming back into operation. The project should not yet abandon the HHK technology, but instead make use of the many replications to conduct an unbiased study on their performance and financial issues. The project could, meantime, also extend its scope to small-scale technologies and support dissemination of standardized designs for these. In this regard, the project should look closely at what the World Bank CASE project is doing in small-scale technologies to assure efforts are complementary and not duplications. As for other “soft activities,” the project should seek to address ongoing needs articulated by stakeholders in the areas of policy, financial institutions and financing, certification and technical support, and capacity and awareness building. The set-up of the Brick Center, of course, will also be part of the way forward and all the aforementioned areas of work can be conducted as part of

the Brick Center's first year to 15 months of activities, assuming the Center is formally launched in time. Or, alternatively, the activities can be "informally" ascribed to the Brick Center to help build its brand while set-up activities are underway.

More details on the aforementioned recommendations are covered in the sub-sections below.

8.1 Extension Contingent on Clear Action Plan

During the MTR mission, it became clear that, while a lot of developments have occurred in the Bangladesh "green brick" field since project launch, there are still many specific needs in the brick sector that correlate with the scope of activity originally targeted by the project. Further, with the experience and position built to date, the project seems well-placed to address these needs. Thus, it is recommended that the project be considered for an extension of up to one year, until March 31, 2016 (or three-quarters of a year, up to December 31, 2015). Extension should be contingent on the development of a detailed calendar-bound action plan, with strong certainty of timely delivery. The action plan should exhibit that the project will have strong achievements before closure in the areas in which there are still gaps in addressing project outcomes and in which stakeholders have expressed needs.

At the time of the MTR, the author got an impression that the project was stalled, aside from actions being taken on the Brick Center, which had also been much delayed, and the progress of one pipeline demo, which had just received a bank loan. To shift into action mode, the project needs clear assignment of responsibility and planning of how to spend the remaining US\$1.3 million in funds (of which, as of November 30, 2014, US\$514,861 are GEF funds and US\$803,622 are UNDP TRAC funds). The reviewer suggests that the portion of remaining funds that will not be allocated to Brick Center endowment be allocated for specific soft activities to fill in the gaps described below, combined with continued support of project management from the PMU. These activities may be conducted by the Brick Center, but a clear distinction should be made between funds allocated towards the activities and those allocated toward Brick Center endowment.

8.2 Major Focus on "Soft Activities" with only Limited Attention to Demos

It is recommended that no new demos be pursued and that the focus going forward be on "soft" activities that support a broader audience than the demos alone. The rationale for this includes the following: (1) The project has already spent most of its funds on the demos and has neglected non-demo activities that were intended to be funded as well. (2) At the same time that the project demos have had many problems so that only one full-scale project demo is operational, non-

project HHKs have proliferated and can provide information on HHK operations that was originally intended to be gotten from the demos. (3) Stakeholder needs that we heard from both brick entrepreneurs and policy makers are focused on “soft activities.” (4) Remaining funds are limited and “soft activities” tend to represent a lower investment but have high potential cost effectiveness if implemented well.

8.3 Relationship with Project Partners and Demo Work Going Forward

Going forward, it is recommended that all subsequent “soft activities” be managed by the PMU rather than the project partners and that all remaining project (GEF) funds be allocated to the PMU’s annual work plan. Implementation has shown that the project partners are more focused on the “hard activities” of establishing demos and less suitable for conducting broad-based “soft activities,” such as capacity building workshops.

While no new demos should be pursued, the project partners should fulfill their obligation of assisting the three pipeline demos (especially NDC and Makrail, but also Eco2/Eco3, for which construction is stalled), as well as providing any assistance possible to the commissioned but non-operating demos to get them operating again (Eco2, CBN, and SSL). This relationship may be pursued through a new LOA between UNDP and the partners that offers no additional payment beyond that which has already been made. (The partners have already been provided with 76 percent of the funds originally targeted for them to achieve 15 demos and substantial non-demo activity.) Or, alternatively, a refund of overpayment may be considered with subsequent search for new service provider to resolve ongoing issues. The reviewer understands from CEA/XI that they are committed to seeing the demos through and transforming the industry so that this latter scenario seems less likely. On the other hand, a stakeholder from XI indicated to the reviewer that they would not agree to extend the work with no further payment. In terms of other service providers, there will unlikely be enough money in the project to compensate them unless some of the overpayments to CEA/XI are returned, as the recommendation is to use remaining project monies for “soft,” non-demo activities.

The PMU, as it evolves into a Brick Center, should also seek to assist the demos as possible. It can do this through its role of information provision and liaison work, linking entrepreneurs as needed to service providers and financiers in the sector. It can also, in this role, make sure these entrepreneurs have reports and information about issues others in the sector have faced.

In terms of what the entrepreneurs of existing and pipeline demos need, the reader may wish to refer back to sub-section 4.2 to assess those needs. Exhibit 8-1 offers a summary of some of the needs identified during stakeholder consultations. While the recommendation is that the project do what it can to help the existing demos, the focus of the project going forward should be on broader capacity building and support. As one very knowledgeable stakeholder put it: “If you do

anything for them [the commissioned demos], that will be a bonus, but generally the [commissioned] demos will have to work out their own problems.”

Exhibit 8-1: Needs of Existing and Pipeline Demos

Demo	Status	Need
1. Banolata	operational	Planning to expand with investment of US\$500,000. Did not mention it, but may be interested in low-interest ADB financing.
2. CBN	Commissioned, not operating	Stalled due to working capital. Interested in either (a) financial partners or (b) bank financing. Interested in ADB low interest loans, but understands ADB is only financing new projects. Points out his HHK is in the densest area of traditional kilns so is an important demo. Asks ADB and other potential donor supporters to consider this point.
3. Eco2	Commissioned, not operating	Need not entirely clear, but owner may wish to expand size of kiln and driers to get closer to designed capacity. Experienced receivables problem in 2013.
4. SSL	Commissioned, not operating	Third owners have purchased the land this plant is on and word is they plan to do something else with the land. The project however may wish to reach out to them and discuss possibility of resuscitating the HHK.
5. Eco 3,4	Construction stalled	Need not entirely clear, but as with Eco2, owner may be looking for way to get closer to designed capacity of 50,000 bricks per day per kiln.
6. NDC	Just received bank loan	NDC did not articulate any specific needs, but information support from the Brick Center/PMU may be helpful to ensure project has best chances of success.
7. Makrail	Waiting for financing	Stalled due to IDCOL not approving loan. IDCOL is requesting stronger guarantee from supplier which XI will not offer. Makrail may need help in finding another supplier, another bank, or negotiating an acceptable agreement between IDCOL and XI.

8.4 Technology Selection and Component 1 – Appreciation of Technology Options

There has been substantial discussion recently on which green brick technology is appropriate to Bangladesh and on which technology the project should focus. During the MTR, it was found that there is no clear “winner” and that not enough information is available at this point to discard any one of the “green” technologies designated by the government. HHKs are still considered to have superior energy and emissions results to zig-zag (the most popular small-scale alternative), but HHK owners are having many problems achieving profitability and ensuring the technology is working well. And, the investment required for HHKs is more than most traditional brick makers can get access to. At the same time, standard zig-zag kilns are believed by some in the Department of Environment to exceed emission standards by far. The World Bank is focusing on smaller scale technologies in the brick component of its CASE project, but so far only a few demos are on the ground. Of the three designs being pursued by CASE, only one appears to have real-world experience (a zig-zag model from Vietnam). The other two, “new zig-zag” (or “mini-HHK”) and “mini-tunnel”, both designs provided by the Xian Institute, are understood to be theoretical but untested designs.

Thus, while many question HHKs' appropriateness to Bangladesh, it seems part of the project mandate going forward should be to collect real data and information on this technology. One of the first matters of business for the project action plan going forward could be a study of existing HHKs (especially the non-project ones) to understand the economic and policy issues they are facing, as well as to obtain a data set on their energy and emissions performance. Other issues such as employment (which is less for HHKs than traditional kilns – by one estimate HHK employment is less than half in person-days per brick) should be researched as well. Such a study may also model overall impacts of employment on HHK adoption given different adoption rates. For example, if HHKs were only adopted at a rate that compensated for annual growth in brick consumption, employment dislocation may not be experienced. During the MTR, it was found that there are many opinions on such matters (technical, economic, and social), but that real data is lacked. One stakeholder suggests it will be important to find a non-biased person to carry out such assessments, as many in Bangladesh involved in this sector already have strong opinions on preferred technology. If findings of such work suggest full-scale abandonment of HHKs, the project may wish to move to focus only on smaller-scale technologies. Information collected to date in the MTR, however, suggests the more likely scenario is for the project to move to a multi-technology strategy encompassing both mid-scale and small-scale brick kiln technologies. Focusing on mid-scale technologies alone seems to touch on too small a portion of the industry (and its energy-environment problems) for the short-term, but could be important in the industry's medium to long-term evolution.

Similarly, for smaller scale technologies, the project may wish to carry out energy and environment assessments of mainstream zig-zags as well as compliance of traditional brick makers. One stakeholder mentioned at first that it would not make sense to work on zig-zag given the CASE project, but at the same time noted there may be room for the project to compare the performance of various zig-zag options. Thus, the project may also wish to work with the World Bank in assessing (or disseminating assessment) of the new models promoted through the CASE project. Developing completely new small-scale energy-efficient kiln alternatives may be an option for the Brick Center going forward (such as through an innovation fund), though a brand-new proven, operational model is unlikely to be achieved in the life of the UNDP-GEF project. At the same time, proven technologies not pursued by the CASE project may be something the UNDP project could pursue in the short-term. One such technology is VSBK. The CASE project initially was planning to pursue this technology (and prior to that the World Bank had piloted a VSBK in Bangladesh), but the consultant chosen to do so for CASE backed out, likely because there appears to be a low acceptance level among traditional Bangladeshi brick makers. In sum, stakeholders feel a real need for a cleaner, more energy efficient small-scale brick technology for Bangladesh, but none that can both perform and achieve acceptance has yet been identified with certainty. While the process may take some time, involvement in identifying or developing such a technology would have real merit for the project's Brick Center.

Another area to consider is localization of production of HHK equipment in order to lower investment costs. Some stakeholders, such as XI, were positive on this idea. XI, in fact, told the mission it is pursuing some joint production opportunities with the localization objective in mind. One DoE official, not feeling very happy with the air quality performance of zig-zags, feels the government would support such localization efforts. Others felt that, given the technical difficulties facing HHKs, the time will not yet be ripe to pursue localization of equipment production until technical problems are resolved.

And, lastly, other technical areas related to energy efficiency in brick making are brick shapes (e.g. hollow bricks) and alternative materials for bricks. The Brick Center may do work in these areas. Awareness raising in the market, however, will be as important as technical work undertaken.

8.5 Fit of UNDP among Other Donors

As for fit of the UNDP project among other donors, the main consideration should be the World Bank's CASE project and ADB's concessional loan program for energy-efficient brick kilns in Bangladesh. ADB's program supports HHKs, tunnel, zig-zag, and VSBKs with low-interest loans. While UNDP work is unlikely to duplicate ADB work, there may be complementary ways in which UNDP could work with the ADB project in identifying promising HHK candidates or, in particular, building awareness to bring VSBK candidate investors to the table. The greater concern for overlap and potential for complementarity is with the World Bank's CASE Project work. As mentioned, this work is now focusing on developing and disseminating three small-scale kiln technologies that are new to Bangladesh: (1) converted zig-zag (Vietnamese technology proven in Vietnam, with initial demo in Bangladesh by University of Hanoi- 7 demos total targeted), (2) improved zig-zag (new theoretical design by XI, also called "mini-HHK", demo expected soon - 7 in total targeted), and (3) mini-tunnel (new theoretical design by XI, demo expected eventually – 5 in total targeted). While on the one hand, the project does not want to duplicate Bank work, small-scale kiln technology is an urgent area of need, so that the project may wish to work with the Bank in disseminating a standard design or results more generally. Or, there may be other small-scale kiln technology options that the project wishes to pursue. The CASE project is also planning to demonstrate the addressing of social and environmental issues by providing grants to selected entrepreneurs for 1 million taka each to incentivize them to provide shelter and address other health and safety issues.

8.6 Partners

Going forward in its pursuit of "soft activities," the project should to expand the network of organizations and companies with which it cooperates. Key organizations to consider are

BABMA (the auto-brick makers association) and BBMOA. Partners may also include the individual replication HHKs, which could play an active and positive role in testing HHK energy consumption and disseminating information on HHKs/facilitating site visits. Further potential partners are the small group of service providers in the HHK industry. These players should be invited to project workshops, give presentations, and possibly carry out certain activities such as training or preparation of training manuals. They may include individuals working at service providers such as Shunfeng and Brictec. While CEA and XI may continue to be involved, the project may also seek to involve other wall and building design institutes in China that have been active in HHKs in China over the years. Also, equipment suppliers from China and other countries may be engaged in activities. Interestingly, one financial sector stakeholder mentioned his organization went to China with the purpose of convincing top Chinese suppliers with the most industry experience to come and set up shop in Bangladesh. Their thinking is that the top suppliers, with their vast experience, may have better equipment than others.

8.7 Policy Needs and Component 6

MTR consultations revealed that policy needs are substantial. First, policy makers, while having recently issued the new Brick Act, seem to feel a bit stuck. Mainstream zig-zag doesn't meet their emission standards, yet HHK appears too expensive for most investors. The project could contribute to policy makers' efforts by providing more solid information on areas of interest to them, such as emission results of various technologies or data on clay resources. The project could also hold focused workshops on policy areas it hopes to have an impact in, such as brick standards or kiln certification.

For policy-related results to be pursued, the project may work closely with the two brick associations including both Bangladesh Auto-Brick Makers Association (BABMA, which represents HHK owners' interests) and Bangladesh Brick Making Owners Association (BBMOA, which represents traditional brick maker interests). At the same time, it is important to realize that tensions may exist between the interests of the two organizations. One BABMA representative suggested that the UNDP-GEF project and Brick Center can help serve as a bridge between the two associations. He stated that the auto-brick makers would be willing to host visits from BBMOA members, so the latter could learn more about green brick facilities, and that the project/Brick Center could facilitate this.

During the MTR, BABMA officers clearly articulated several areas of policy interest. While they indicate having already achieved a tax holiday for new HHKs, they report this is not giving them the benefit they need, given profitability issues. Policy areas in which these HHK owners hope further work can be done include: (1) recognition as an industry (by Ministry of Industry), (2) qualification for preferential low interest loans (e.g. eco-industry loans at 7-9 percent interest rather than the normal 16 percent), (3) achievement of equal treatment on VAT to that accorded

traditional kilns (they report traditional brick makers can pay a fixed price VAT annually of around 200,000 taka, whereas auto-brick makers have to pay by the brick), and (4) brick standards and certification of factories.

BBMOA members have also articulated policy needs. First, they emphasize their need for a stable/long-term policy. That is, if they convert to zig-zag, will it too be outlawed in a few years? In addition, they are very anxious that an approved standardized design for zig-zag be made available. At present there is none, which also presents them with high risk. How can they comply if there is no strict definition of what zig-zag is?

8.8 Certification and Other Technical Support

As mentioned above, stakeholders also see a need for certification, as well as technical support. One DoE stakeholder mentioned that certification could not come from the Government, so may be vested in an outside body. An industry stakeholder suggested there be a 20 to 30-day HHK training to gain certification and that certification be required for operation. BBMOA, as mentioned, hopes for a standard, certified design for zig-zag. Other stakeholder talked about the certification of HHK suppliers. One noted that, if he were an entrepreneur, one of his first priorities would be in getting a list of certified suppliers so as to know which ones have quality equipment he can depend on.

Stakeholders mentioned several other kinds of technical support the project could provide. For example, traditional brick maker requests include a lab with a model of the equipment needed for measuring emissions and brick strength quality. And, an HHK investor also pointed out the need for being able to get a report on brick quality on short notice. (At present, BUET does this, but it takes five days.) He also mentioned the need for a research investigation on both coal and clay. Other stakeholders similarly mentioned the need to be able to test clay and coal in country without sending to China.

8.9 Financial Sector and Financing – Component 5

While banks and financial institutions have become more involved in the sector by virtue of the increasing number of projects, they still lack information. From our discussions, we learned that they have an interest in being educated on the sector in group format. One stakeholder suggested a two step process consisting of (1) awareness building for high-level bank management and (2) technical sessions for working level people on how the technologies work. Technical presentations by domestic experts will be of the most interest, he indicated, while entrepreneurs sharing experience and information on regulation of the sector are also interesting to them. Another financial institution the mission met with talked about the possibility of a partnership between the project and the institution. The stakeholder asked whether the project could provide

training/information on green brick technology to the financial institution's brick maker clients who are considering shifting to zig-zag or HHK. This may be an attractive way to cooperate with the financial sector, as their clients are likely already screened as credit-worthy and capable of obtaining loans.

A few other areas of support for financial institutions were mentioned, though most agreed that it is the entrepreneurs that need the most support. One financial stakeholder mentioned the need for an unbiased third party to evaluate technologies.

Another financing-related concept that came up repeatedly was the idea of joint investment of traditional brick makers in HHKs, due to their lower individual investment capacity. While many said this will not work, the mission's meeting with traditional brick makers suggests that profitability of HHKs is still their major concern. Transport to market from a larger brick factory, according to some, is also a concern. A pilot of joint investment of traditional brick makers in an HHK (perhaps with support of a financial institution if possible) may be of interest, though would, of course, present many challenges.

8.10 Capacity Building and Awareness – Components 3 and 4

Training and continued awareness building are considered two key areas in which the project can make needed contributions going forward. While the project trained people at individual demos, there is a need more broadly in the sector for training of personnel and in particular firemen for HHKs. The skill of firemen was mentioned many times during the MTR as a top problem facing HHK owners. A handbook in Bengali for firemen is also desirable. In this regard, the project may wish to look into cooperation with other service providers to the industry beyond the original project partners (who did provide an English-only pamphlet). At the same time, the current project partners told the MTR mission they are gearing up to expand training and have applied for a grant from the Chinese Government to do so. Some stakeholders have suggested there may be common areas for training (such as firing) across technologies so that one training course could serve different types of brick makers. More information is needed on this aspect, but if synergies exist across technologies, they could be exploited in the design of training activities. For the training, stakeholders emphasize the importance of designing dedicated training modules and preparing training materials, rather than just showing persons "how to do it," as has been the main mode of training to date in the project.

While much awareness of the green brick sector has been built through the project, a need is seen for more focused awareness building, such as on specific policy issues and on specific technologies. Also, while awareness building has reached key players, such as BBMOA officers, the mission found that some non-officer members seemed less aware about HHKs. For continued awareness building on HHKs, as mentioned, BABMA HHK owners have suggested that

BBMOA kiln owners be invited to visit their HHKs, with UNDP serving as a link. Also, as results with smaller-scale technologies accumulate from the World Bank project, or, if the UNDP-GEF project also has results in this realm, the project can serve as a conduit for disseminating small-scale technology results.

Other technical areas for capacity building were also mentioned during consultations. For example, BBMOA asked for information and capacity building on how to conserve topsoil and use other (non-clay) materials. They have heard from the government about this, but don't know how to do it.

One intriguing area for awareness building that has not yet received much attention from IKEBMI or other donor brick projects is on the market side. Stakeholders mentioned that buyers do not yet fully understand the merits of auto-bricks. In addition, the government can support the purchase of auto-bricks through procurement rules. The local government engineering departments were mentioned in this regard as the organizations responsible for sourcing bricks for making roads and highways. Further, as has been discussed, some of the key challenges in producing more energy efficient bricks have been market resistance. The Bangladesh market does not accept HHK bricks in which 100 percent of the coal has been put in the bricks, though bricks made with a portion of the coal going in the bricks and a portion going in holes in the top of the kiln may be accepted. While putting 100 percent of the coal in the bricks reduces the redness of the brick's color, such bricks, which are said to be very strong, may be appropriate for uses in which the bricks do not show. More market education, then, would be beneficial in this area. Similar color-type challenges are facing bricks coming out of VSBK's, which are not very red, so that market education work may also help with the promotion of the highly efficient small-scale VSBK technology.

8.11 Brick Center

The Brick Center that UNDP is envisioning supporting with the UNDP TRAC funds awarded to the project is an idea that received welcome from many stakeholders consulted during the MTR mission. While it is hoped that the project can come up with a strong action plan for the next 15 months (assuming an extension is pursued), not all of the problems of Bangladesh's brick sector can be solved on this timescale. Thus, a sustainable institution will be a real benefit. While the ADB and World Bank currently have activities in the sector, it is not clear whether either will continue brick work beyond their current initiatives. (Neither to our knowledge have specific plans to do so at this time.) Regarding establishment of the Brick Center, one donor stakeholder mentioned experience in the brick making sector with how difficult it is to find quality consultants. He suggested it may be difficult to find the right human resources to staff the Brick Center. On the other hand, if the Brick Center is conceived more as an information source and

venue for linking interested individuals together, it may be more important for the staff to have strengths in information dissemination and liaison work.

UNDP has mentioned pursuing outside donors to enhance the endowment for the Brick Center. Given the substantial involvement of Chinese interests in this sector, one avenue may be Chinese bi-lateral funding. UNDP China has been emphasizing South-South cooperation in recent years and also currently has a green brick project. It began its green brick work some years back with a strong brick component in its successful UNDP-GEF Township and Village Enterprises Energy Efficiency Project. While the World Bank has not yet determined whether its country priorities in coming years will include bricks (its next five year plan is currently in the development stage), they are the donor whose interests and activities (via the CASE project) most closely align with UNDP's in its path forward with IKEBMI. Thus, they may also be one of the most interesting donors to pursue for co-financing of the Brick Center. They did earlier support a brick information center via CEA, but the funding was quite limited – USD60,000 after taxes. The materials were eventually handed over to the Department of Energy for dissemination. ADB, given its US\$50 million loan commitment to the sector, would also be a relevant donor to involve in the Center.

As for functions of the Brick Center, the author believes many of these will coincide with the “way forward for the project” recommendations outlined above. Stakeholders made several specific recommendations with regard to the Center, some of the most popular of which were certification and training. BBMOA representatives expressed specific interest in a certified zig-zag design. Asked about fee-based services, they suggested that equipment or services if offered at prices affordable by them will be of interest. One idea mentioned by UNDP stakeholders is that of “one-stop shop” for licensing, given that current brick makers have to go to five or six different places to update their licenses.

9. Project Ratings

Progress towards results: MS (moderately satisfactory)

Implementation and adaptive management: MS (moderately satisfactory)

Sustainability: ML (moderately likely)

Determining project ratings for this project is challenging, as it has both great strengths and serious shortcomings. Yet, despite the middling ratings given, the reviewer has high hopes that course correction with a clear calendar-driven plan of action will lead to strong results in the final 15 months of the project, should it be extended.

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