



Report and Recommendation of the President to the Board of Directors

Project Number: 45273-001
April 2012

Proposed Loans People's Republic of Bangladesh: Financing Brick Kiln Efficiency Improvement Project

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 16 April 2012)

Currency Unit	–	taka (Tk)
Tk1.00	=	\$0.0121
\$1.00	=	Tk82.48

ABBREVIATIONS

ACFID	–	Agricultural Credit and Financial Inclusion Department
ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
BBMOA	–	Bangladesh Brick Manufacturing Owners Association
BFID	–	Bank and Financial Institutions Division
CO ₂	–	carbon dioxide
DOE	–	Department of Environment
ESMS	–	environmental and social management system
FCK	–	fixed chimney kiln
FIRR	–	financial internal rate of return
HHK	–	hybrid Hoffman kiln
MOEF	–	Ministry of Environment and Forests
MOF	–	Ministry of Finance
OCR	–	ordinary capital resources
PAM	–	project administration manual
PFI	–	participating financial intermediary
quad	–	1015 British thermal units (BTU) or 1.055 × 10 ¹⁸ joules
TA	–	technical assistance
tCO ₂	–	tons of carbon dioxide
VSBK	–	vertical shaft brick kiln

NOTES

In this report, "\$" refers to US dollars.

Vice-President	X. Zhao, Operations 1
Director General	S. H. Rahman, South Asia Department (SARD)
Directors	B. Carrasco, Public Management, Financial Sector and Trade Division, SARD Y. Zhai, Energy Division, SARD
Team leaders	A. Huang, Finance Specialist, SARD P. Wijayatunga, Senior Energy Specialist, SARD
Team members	F. Begum, Senior Social Development Officer (Gender), Bangladesh Resident Mission, SARD P. Gutierrez, Associate Project Analyst P. Marro, Principal Financial Sector Specialist, SARD M. Panis, Senior Operations Assistant, SARD Z. M.M. Rahman, Senior Financial Sector Officer, Bangladesh Resident Mission, SARD J. Romero-Torres, Financial Sector Specialist, SARD J. Versantvoort, Senior Counsel, Office of the General Counsel L. Zhang, Energy Specialist, SARD
Peer reviewers	P. Perera, Senior Energy Specialist, East Asia Energy Division Q. Zhang, Principal Financial Sector Specialist, Office of Regional Economic Integration

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PROJECT AT A GLANCE

1. Project Name: Financing Brick Kiln Efficiency Improvement Project		2. Project Number: 45273-001	
3. Country: Bangladesh		4. Department/Division: South Asia Department/Public Management, Financial Sector, and Trade Division	
5. Sector Classification:			
Sectors	Primary	Subthemes	
Finance	√	Small and Medium-Sized Enterprise Finance and Leasing	
Energy		Energy Efficiency and Conservation	
6. Thematic Classification:			
Themes	Primary	Subthemes	
Economic growth		Promoting economic efficiency and enabling business environment	
Environmental sustainability	√	Eco-efficiency	
Private sector development		Private sector investment	
6a. Climate Change Impact		6b. Gender Mainstreaming	
Adaptation	Low	Gender equity theme (GEN)	
Mitigation	High	Effective gender mainstreaming (EGM)	
		Some gender benefits (SGB)	√
		No gender elements (NGE)	
7. Targeting Classification:		8. Location Impact:	
General Intervention	Targeted Intervention		
	Geographic dimensions of inclusive growth	Millennium development goals	Income poverty at household level
√			
9. Project Risk Categorization: Complex			
10. Safeguards Categorization:			
Environment		FI	
Involuntary Resettlement		FI	
Indigenous People		FI	
11. ADB Financing:			
Sovereign/Nonsovereign	Modality	Source	Amount (\$ Million)
Sovereign	Project loan	Asian Development Fund	20.0
Sovereign	Project loan	Ordinary capital resources	30.0
Total			50.0
12. Cofinancing: No Cofinancing available.			
13. Counterpart Financing: Counterpart financing will be provided as follows: (i) a minimum of 30% of the total cost of a subproject in the form of sub-borrowers' equity and (ii) a minimum of 20% of the total subproject cost from participating financial intermediaries (PFIs)' own funds. ADB will finance up to 50% of the total cost of a subproject.			
14. Aid Effectiveness: <div style="text-align: center; padding-top: 10px;">No Aid Effectiveness available.</div>			

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on proposed loans to the People's Republic of Bangladesh for the Financing Brick Kiln Efficiency Improvement Project.

2. The brick manufacturing process is energy intensive and is a major source of greenhouse gas emissions and fine particulate pollution in Bangladesh. The proposed project intends to establish a credit facility of \$50 million equivalent in local currency at Bangladesh Bank (central bank) for relending to participating financial intermediaries (PFIs) for the purpose of constructing more energy-efficient and environmentally superior brick kilns. The credit facility has two components: (i) to upgrade existing polluting brick kilns to a transitional design to preserve sector welfare while immediately reducing pollution, and (ii) to promote the most advanced brick kiln pilots to demonstrate their operational and commercial viabilities in Bangladesh. The combined efforts will help build more energy-efficient brick manufacturing capacities in Bangladesh to transform the sector to a modern and efficient industry.¹

II. THE PROJECT

A. Rationale

3. Promoting energy efficiency and conservation is a part of Bangladesh's National Strategy for Accelerated Poverty Reduction II 2009–2011. From 1990 to 2011, Bangladesh's real gross domestic product grew consistently at around 5% per annum.² During the same period, the population grew from 109 million to 159 million. As a result, the country's primary energy consumption rose from 0.25 quad (10¹⁵ British thermal units) in 1990 to 0.87 quad in 2008.³ With increased consumption of carbon-based fuels, the country's carbon dioxide (CO₂) emissions per capita doubled from 40 tons in 1990 to 80 tons in 2008.⁴ High energy intensity from growing inefficient industrial operations is a major contributor to greenhouse gas emissions and fine particulate pollution in Bangladesh. Brickfields are among the largest industrial polluters.

4. Brick-making contributes to about 1% of gross domestic product.⁵ However, due to the lack of relevant policy and legislations, the brick sector is poorly regulated. Instead of a small number of highly efficient modern brickfields, a large number of unqualified small businesses operate on the back of outmoded technologies, severe industrial pollution, and poor labor standards. With the current rate of economic growth, the brick sector continues to expand at about 8% per annum,⁶ and burn about 6.0 million tons of coal and emit about 9.8 million tons of carbon dioxide (CO₂).⁷ In the capital city of Dhaka, the brick sector contributed most to the fine particulate pollution during the operating season (from November to April). There are additional land-use change emissions from (i) deforestation by burning firewood (as a cheaper replacement to coal), (ii) loss of farmlands and other natural habitats (to construct brick kilns),

¹ The design and monitoring framework is in Appendix 1.

² Asian Development Bank (ADB). 2011. *Key Indicators for Asia and the Pacific 2011*. Manila.

³ US Energy Information Administration. 2012. <http://www.eia.gov/countries/country-data.cfm?fips=BG&trk=m#tpe>.

⁴ Boden, Tom, Gregg Marland and Bob Andres. *National CO₂ Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2008*. Carbon Dioxide Information Analysis Center. Oak Ridge National Laboratory. Oak Ridge. <http://cdiac.ornl.gov/ftp/trends/emissions/ban.dat>

⁵ The World Bank. 2011. *Introducing Energy-efficient Clean Technologies in the Brick Sector of Bangladesh*. Washington, DC.

⁶ Annual growth rate of the construction sector has ranged from 8.1% to 8.9% from early 1990s to 2010.

⁷ S. Ferdausi, S. Vaideeswaran, and S. Akbar. 2008. *Greening Brick Making Industries in Bangladesh*. Dhaka: The World Bank. http://www.baq2008.org/system/files/sw38_Ferdausi+presentation.pdf.

and (iii) loss of vegetations from extracting fertile top-soils for brick making.

5. There are six basic types of brick kiln in Bangladesh: (i) bull's trench kiln, (ii) fixed chimney kiln (FCK), (iii) improved zigzag kiln, (iv) vertical shaft brick kiln (VSBK), (v) Hoffman kiln, and (vi) tunnel kiln. From (i) to (vi), bull's trench kiln is the least energy-efficient and most polluting, and tunnel kiln is the most energy-efficient and the least polluting. In addition, there are modified (or improved) zigzag kiln⁸ and hybrid Hoffman kiln (HHK), which are based on traditional designs but are more energy-efficient. FCKs can be upgraded to improved zigzag kilns because of the similar technical designs. Currently, 92% of the 4,880 brickfields in Bangladesh are using the highly polluting FCK design. Improved zigzag kilns, VSBKs, HHKs, and tunnel kilns are rare because of the general lack of awareness of these technologies and the inadequate market funding support.

6. To improve environmental conditions, Ministry of Environment and Forests (MOEF) issued a directive on 15 July 2010, requiring that (i) no annual FCK licenses be renewed after September 2012; (ii) environmental clearance favor more energy-efficient improved zigzag kilns, VSBKs and HHKs; and (iii) all FCKs cease to exist from September 2013.⁹

7. The project is designed as a financial intermediary loan to complement the Government of Bangladesh directive (para. 6) by catalyzing domestic capital and providing targeted finance to build energy-efficient brick kiln replacement capacity, thereby enabling the eventual phase-out of FCKs. The proposed credit facility will establish two revolving funds of (i) up to 25 years of \$30 million equivalent local currency from ordinary capital resources (OCR) of the Asian Development Bank (ADB) for upgrading FCKs to improved zigzag kilns and (ii) up to 32 years of \$20 million equivalent local currency from ADB's Special Funds resources for constructing more advanced VSBKs, HHKs, and tunnel kilns.¹⁰

8. ADB's support is catalytic. It will support the government's effort to adjust to more environmentally friendly production techniques and, through the dissemination of commercially viable technologies and close monitoring of safeguard policies, ensure a smooth and orderly transformation of the brick sector. ADB has undertaken extensive stakeholder consultation including relevant government agencies, brick manufacturing association members, brickfield workers (including female workers), and potential investors in the course of project preparation to ensure design viability.

9. The project will be supported by a capacity development technical assistance (TA) (under processing)¹¹ that addresses the brick sector development constraints in policy and regulatory formulation, technology awareness-raising, technical and business support, research and development, and emerging alternative livelihood needs. The TA is designed to coordinate with development partners and complement the lending assistance to effectively support a more comprehensive and environmentally sustainable brick sector development program.

⁸ The existing zigzag kiln is not standardized and energy efficiency improvement is uneven. The World Bank is developing improved zigzag kiln technical standard with energy efficiency improvement greater than 30%.

⁹ Government Directive to Phase Out Fixed Chimney Kilns (accessible from the list of linked documents in Appendix 2).

¹⁰ Because the improved zigzag kiln is only a transitional and intermediary technology, at a future point when the government phases out support for such a technology, the project steering committee will determine how to utilize the revolving credit facility to exclusively support other more efficient brick kilns.

¹¹ The ADB Clean Energy Working Group has provided in-principle approval of the \$750,000 funding allocation (draft Capacity Development Technical Assistance Concept Paper is accessible from the list of linked documents in Appendix 2).

10. The demand for ADB funds is strong. Due to the government's strong commitment to uphold its directive to phase out FCKs (para. 6), Bangladesh Brick Manufacturing Owners Association (BBMOA) members are compelled to upgrade their FCKs to improved zigzag kilns.¹² Although there is a general lack of awareness of more advanced VSBK, HHK, and tunnel kiln technologies in Bangladesh, the local market for energy-efficient brick kilns is developing, as evidenced by the increasing number of HHK pipeline projects. The TA will also provide technical workshops and media campaigns to disseminate the successful pilot projects' technical and commercial viabilities and create continuous demand for ADB funds.¹³

11. The project aligns with ADB's country partnership strategy for Bangladesh, 2011–2015 by supporting the environmentally sustainable development.¹⁴ The country partnership strategy is programmed to support more inclusive and greener economic growth by deepening financial markets and boosting energy efficiency, with a significant emphasis on climate change mitigation and adaptation. The project also aligns with ADB's Financial Sector Operational Plan by competitively mobilizing domestic finance for the target sector development.¹⁵ The project supports environmentally sustainable growth, which is one of the three strategic agendas of ADB's Strategy 2020.¹⁶ As a financial intermediary loan, the project also supports private sector development by providing sustainable growth potential for brick manufacturers and, hence, development of small and medium-sized enterprises.

12. The project design has been closely coordinated with the related brick sector initiatives. The project complements the industrial energy efficiency finance program of ADB's Private Sector Operations Department.¹⁷ The joint ADB direct funding support harmonizes with the TA projects and carbon finance scheme from the World Bank and United Nations Development Programme and other initiatives from Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ International Services).

B. Impact and Outcome

13. The impact will be improved environmental conditions in Bangladesh. The outcome will be the replacement of polluting FCKs with more energy-efficient kilns in Bangladesh's brick sector.

C. Output

14. The outputs are (i) a designated credit facility, by catalyzing domestic resources, to

¹² BBMOA represents a majority of FCK owners. BBMOA submitted an official letter to ADB to reaffirm its members' desire to access ADB project funds to upgrade FCKs to improved zigzag kilns. Bangladesh Brick Manufacturing Owners Association Confirmation Letter (accessible from the list of linked documents in Appendix 2).

¹³ Prior to the approval of the proposed capacity development TA, additional funds will be provided by ADB through the following TA: ADB. 2011. *Technical Assistance to the People's Republic of Bangladesh for Support for Climate Change Mitigation and Renewable Energy Development*. Manila (TA 7826-BAN).

¹⁴ ADB. 2011. *Country Partnership Strategy Bangladesh 2011–2015*. Manila.

¹⁵ ADB. 2011. *Financial Sector Operational Plan*. Manila.

¹⁶ ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila.

¹⁷ ADB. 2011. *Report and Recommendation of the President to the Board of Directors: Proposed Loan Facility and Technical Assistance to the Industrial and Infrastructure Development Finance Company and Other Financial Institutions for the Industrial Energy Efficiency Finance Program in Bangladesh*. Manila (Loan 7349-BAN). Unlike the proposed Private Sector Operations Department transaction, the objective of which is general industrial energy efficiency across seven industry sectors (and only \$6 million allocated for constructing HHKs), the project focuses exclusively on the comprehensive development of Bangladesh's brick sector. The project will also increase the awareness of the transformational push included under the proposed TA and complement the Loan 7349-BAN.

finance upgrade to and construction of more energy-efficient brick kilns; and (ii) mitigated adverse working and social welfare conditions in ADB-funded brick kilns.

D. Investment and Financing Plans

15. The project is estimated to cost \$100 million (Table 1).¹⁸

Table 1: Project Investment Plan
(\$ million)

Item	Amount
A. Debt Cost	
1. FCK upgrade funded by ADB OCR	30.00
2. Construction of VSBKs, HHKs, and tunnel kilns funded by ADF (SDR equivalent)	20.00
3. Supplementary commercial bank finance	20.00
B. Equity Cost	
1. Sub-borrowers' own equity	30.00
Total	100.00

ADB = Asian Development Bank, ADF = Asian Development Fund, FCK = fixed chimney kiln, HHK = hybrid Hoffman kiln, OCR = ordinary capital resources, SDR = special drawing right, VSBK = vertical shaft brick kiln.
Source: Asian Development Bank estimates.

16. The total financing plan is \$100 million (Table 2). The government has requested a loan of \$30 million from ADB's OCR and a loan of \$20 million from ADB's Special Funds resources to help finance the project. The OCR loan will have a 25-year term, including a grace period of 5 years, an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility, a commitment charge of 0.15%, and such other terms and conditions set forth in the draft loan agreement. The Asian Development Fund (ADF) loan has a fixed 32-year maturity including a grace period of 8 years, a 1.0% interest charge during the grace period and 1.5% during the amortization period, and equal amortization.

Table 2: Financing Plan

Source	Amount (\$ million)	Share of Total (%)
ADB ordinary capital resources	30.00	30
ADB Asian Development Fund	20.00	20
Sub-borrowers (equity)	30.00	30
Participating financial intermediaries	20.00	20
Total	100.00	100

ADB = Asian Development Bank.
Source: Asian Development Bank estimates.

17. ADB will finance up to 50% of the total subproject cost. The sub-borrowers will contribute at least 30% of the total subproject cost in the form of equity. PFIs will contribute the remaining (at least) 20% of the total subproject cost from other funds at their disposal. The credit facility will comprise two revolving funds, administered by Bangladesh Bank's Agricultural Credit and Financial Inclusion Department (ACFID), for up to 25 years and 32 years, matching the maturities (and amounts) of the respective ADB OCR and Special Funds sources. Bangladesh Bank's relending terms to PFIs will be designed flexibly to adjust to the changing market

¹⁸ The average upgrade cost from FCK to improved zigzag kiln is estimated at an average of \$40,000, but could vary from \$16,000 to \$70,000 depending on the level of mechanical automation. ADB surveys indicate that average loan amount from creditworthy FCK clients who want certain level of technological upgrade could go as high as \$300,000.

conditions and meet PFIs' demand for funds. To increase the financial viability of the project, ADB will propose harnessing the greenhouse gas emission reductions resulting from the project by selling the certified carbon credits under the clean development mechanism of the United Nations Framework Convention on Climate Change.

E. Implementation Arrangements

18. The Bank and Financial Institutions Division (BFID), acting through the Ministry of Finance (MOF), will be the executing agency. Bangladesh Bank will be the implementing agency. BFID will establish a project steering committee, consisting of senior officials from Bangladesh Bank, BFID, Department of Environment (DOE), Finance Division of the MOF, MOEF, Ministry of Industries, and other relevant agencies, chaired by the secretary of BFID. The credit facility will be administered by Bangladesh Bank's ACFID, where the project management unit will be established because of its experience in managing the \$4 million equivalent HHK credit facility.¹⁹ DOE will be a part of the project implementation arrangement to provide relevant (brick and environment) technical support, including verifying brick kiln technical design and monitoring environmental benefits (e.g., CO₂ emission reduction), to Bangladesh Bank. The implementation arrangements are summarized in Table 3 and are described in the project administration manual (PAM).²⁰

Table 3: Implementation Arrangements

Aspects	Arrangements		
Implementation period	June 2012–June 2015		
Estimated completion date	June 2015		
Management			
(i) Oversight body	Project steering committee: Bangladesh Bank, BFID, MOF, DOE, Finance Division of the MOF, MOEF, Ministry of Industries, and other relevant agencies, chaired by the secretary of BFID.		
(ii) Executing agency	BFID		
(iii) Key implementing agency	Bangladesh Bank		
(iv) Implementation unit	ACFID: 40 staff		
Procurement	Private or commercial practices acceptable to ADB	(at least) 5 contracts ^a	\$17.0 million
		(at least) 20 contracts ^a	\$3.0 million
		(at least) 200 contracts ^b	\$30.0 million
Disbursement	The loan proceeds will be disbursed in accordance with the <i>Loan Disbursement Handbook</i> (2007, as amended from time to time) of the ADB and detailed arrangements agreed upon between the government and ADB.		

ACFID = Agricultural Credit and Financial Inclusion Department, ADB = Asian Development Bank, BFID = Bank and Financial Institutions Division, DOE = Department of Environment, MOEF = Ministry of Environment and Forests, MOF = Ministry of Finance.

^a (i) 5 hybrid Hoffman kilns and tunnel kilns by assuming a maximum average cost of \$6.8 million, and (ii) 20 vertical shaft brick kilns by assuming a maximum cost of \$300,000, of which ADB will finance 50% of the total costs.

^b Assuming maximum upgrade cost from fixed chimney kiln to improved zigzag kiln is \$300,000 of which ADB will finance about 50% of the total project cost.

Source: Asian Development Bank.

19. Bangladesh Bank will sign an administration agreement with BFID for access to the ADB funds at the original ADF and OCR loan terms. Bangladesh Bank will be responsible for the

¹⁹ Performance of the \$4 million HHK credit facility is discussed in the Sector Assessment (Summary): Brick (accessible from the list of linked documents in Appendix 2). The lessons learned are factored into the design of the project.

²⁰ Project Administration Manual (accessible from the list of linked documents in Appendix 2).

repayments of the ADB loans. BFID will be responsible for managing the associated foreign exchange risk and maturity risk. Bangladesh Bank will establish two imprest accounts for the ADF and OCR funds and subsequently two local currency accounts, corresponding to the ADF and OCR imprest accounts, for relending to PFIs.

20. Bangladesh Bank's relending terms to PFIs (i) include interest rates that reflect Bangladesh Bank's cost of funds and the prevailing market conditions, and a repayment period of 5 years, inclusive of a grace period of at least 6 months; and (ii) permit early repayment without penalty. Selection of PFIs and disbursement to PFIs and sub-borrowers will be guided by Bangladesh Bank's internal procedures and ADB's eligibility criteria and disbursement guidelines.²¹ PFIs' onlending terms to sub-borrowers will be determined by the same market conditions to ensure sub-borrowers' demand for funds without discouraging domestic resource mobilization or causing market distortions.

21. ADB Procurement Guidelines (2010, as amended from time to time) will apply to the extent relevant to subproject procurement. The procurement will be undertaken by the sub-borrowers in accordance with established private sector or commercial practices acceptable to ADB. A draft procurement manual will be prepared and submitted to ADB for approval to satisfy ADB that procurement procedures applied to sub-borrowers are appropriate. This includes reasonable prices being paid, procurement from eligible source countries, and fair canvassing when selecting suppliers. The procurement processes will be monitored by Bangladesh Bank's ACFID, assisted by the proposed capacity development TA consultant (to verify whether the ongoing procedure is acceptable to ADB). ACFID will review PFIs' procurement reports and disqualify any PFI that does not comply with the procedures approved by ADB.

III. DUE DILIGENCE

A. Technical

Table 4: Type of Brick Kilns

Types of Kiln	Bull's Trench	Fixed Chimney	Improved Zigzag	Vertical Shaft Brick	Hybrid Hoffman	Tunnel
Pollution level	very high	high	medium	medium low	low	low
Emissions ^a (mg/m ³)	>1,000	>1,000	500–800	78–187	20.3	<50
CO ₂ Emissions ^b	631	582	440	291	315	291
Coal consumption ^b	260	240	180–200	100–120	120–130	100–120
Total market share	...	92.2%	3.1%	0.0%	0.2%	0.0%
Investment (\$)	35,000	70,000	80,000	250,000	2,000,000	4,000,000
O&M cost (\$/Year)	75,000	150,000	160,000	190,000	500,000	900,000
Labor per day	150	150	150	75	80	45
Brick production ^c	2,000,000	3,000,000	3,000,000	4,000,000	15,000,000	30,000,000
Brick quality (psi)	<2,500	<2,500	<2,500	4,260	4,500–6,000	4,500–6,000
Brick price (Tk.)	5.0	5.5–6.0	5.5–6.0	6.0	7.0–7.5	7.5

... = not available, CO₂ = carbon dioxide, mg/m³ = milligram per cubic meter, O&M = operation and maintenance, psi = pounds per square inch.

Note: The specific brick production volume determines the kiln size. The figures only provide a highly generalized overview of the different types of brick kilns and are not representative of any specific kilns.

^a Refers to fine particulate pollution emissions per 100,000 bricks produced.

^b Refers to tons per million bricks produced.

^c Per year.

Source: Asian Development Bank estimates.

²¹ Initially proposed PFIs include commercial banks of Agrani Bank, Janata Bank, Rupali Bank, Sonali Bank, and nonbank financial institutions of Infrastructure Development Company Limited.

22. Table 4 summarizes the technical and commercial viabilities of various brick manufacturing technologies. In terms of coal consumption per million bricks produced, VSBKs, HHKs, and tunnel kilns are the most energy-efficient, using about 100–130 tons of coal. This is more efficient than for FCKs (240 tons) and improved zigzag kilns (180–200 tons). For fine particulate pollution per 100,000 bricks produced, HHKs and tunnel kilns (less than 50 milligrams per cubic meter [mg/m^3]) are better than VSBKs (78–187 mg/m^3), and significantly better than improved zigzag kilns (more than 500 mg/m^3) and FCKs (more than 1,000 mg/m^3). CO_2 emissions for manufacturing 1 million bricks from VSBKs and tunnel kilns (291 tons of CO_2 [tCO_2]) are lower than from HHKs (315 tCO_2), which is lower than from improved zigzag kilns (440 tCO_2) and FCKs (582 tCO_2). HHKs and tunnel kilns produce the best-quality bricks, measured by the level of pressure resistance of more than 4,500 pounds per square inch (psi) (up to 6,000 psi); improved zigzag kilns and VSBKs cannot produce bricks of similar quality.

23. In summary, tunnel kiln is the best available technology for producing the highest quality bricks with the lowest environmental impact. HHK is the second best option. VSBK is environmentally friendly but has a lower commercial viability because of the lower brick quality and the smaller production volume. Improved zigzag kiln is more energy-efficient than FCK, but inferior in all technical aspects compared to VSBK, HHK, and tunnel kiln.²²

B. Economic and Financial

24. The project's economic benefits include the positive externalities produced by the more energy-efficient brick kilns from (i) coal cost savings, (ii) quantified health benefits from improved environmental condition, (iii) clay cost savings from moving towards perforated and hollow bricks, (iv) income generated from returning phased-out FCK sites to agricultural use, (v) improved revenue, and (vi) potential carbon credit. The economic internal rate of return is calculated at 38.5% without factoring in the potential carbon credit benefits. By factoring the carbon credit benefits, the overall economic internal rate of return is 85.3%.²³ Sensitivity analysis for 10% increase in capital cost and 10% reduction in incremental benefits would still result to acceptable project economic internal rate of return and economic net present value.

25. The financial analysis indicates favorable financial internal rates of return (FIRRs) on an average-sized improved zigzag kiln, VSBK, HHK, and tunnel kiln over a project life cycle of 10 years. The calculation is based on 70:30 debt–equity ratio. The cost of debt is 11% per year (pro rata ADB's funding cost of 9% per annum and market relending cost of 16% per annum) and cost of equity is estimated at 15%. The project FIRR for an average improved zigzag kiln is 34.0%, for a VSBK it is 33.6%, for an HHK it is 37.5%, and for a tunnel kiln it is 35.1%.²⁴ The payback periods are 3.7 years for an average improved zigzag kiln, 6.1 years for a VSBK, 5.6 years for an HHK, and 5.4 years for a tunnel kiln. Although the upgrade to an improved zigzag kiln has a high investment return, ADB OCR fund is restricted to existing FCK owners and no construction of greenfield improved zigzag kilns will be financed. All project FIRRs compare favorably to the weighted average cost of capital of 12.2%.

²² The design standards of FCKs will be developed by the World Bank, and work is ongoing. Verification of the technology design standard, including VSBK, HHK, and tunnel kiln, will be provided by DOE, through the support from proposed capacity development TA, to meet the international best practices.

²³ Financial and Economic Analyses (accessible from the list of linked documents in Appendix 2).

²⁴ The project FIRR does not factor in the financing cost and is higher than the equity FIRR that factors in the financing cost.

C. Governance

26. PFIs shall submit quarterly reports to Bangladesh Bank ACFID on ADB's fund utilization, including detailed subloan information: types of technology funded (with certification from DOE), subloan amounts, tenors, interest rates, repayment terms, amortization schedules, repayment records, and compliance records (e.g., with PFI participation agreement and ADB eligibility criteria). In turn, ACFID will amalgamate the collected information and provide ADB with a quarterly report on the overall performance of the credit facility. Bangladesh Bank will ensure that all PFIs comply with the applicable national laws and regulations and will apply the ADB prohibited investment activities list to all subprojects that are financed by ADB. The ADB Anticorruption Policy (1998, as amended to date) has been explained to and discussed with the government and Bangladesh Bank, and will be explained to PFIs to ensure compliance at sub-borrower level. The specific policy requirements and supplementary measures are described in the PAM (footnote 20).

D. Poverty and Social

27. About 750,000 people work in the brick sector in Bangladesh. On average, about 150 workers are employed at each FCK, about 10%–20% of whom are women and sometimes illegal child laborers. The work is seasonal, occurring during the 6 months of dry season from November to April. Working conditions are harsh. Because of the low level of mechanical automation, workers endure a high level of manual labor and occupational hazards. Workers' living conditions are also poor. Living near the polluting kilns aggravates already worsening personal health.

28. Under the participation agreements with Bangladesh Bank, all PFIs will undertake not to finance any brickfield that violates the core labor standards. A gender action plan will safeguard the well-being of female workers in ADB-funded brickfields.²⁵ The capital investments required to fund energy-efficient brick kilns will also improve their mechanical automations and reduce occupational hazards. The increased skill sets to operate more advanced HHKs and tunnel kilns could lead to improved labor productivity and higher wage.

29. The phase-out of FCKs will however result in the loss of livelihood for some FCK owners and workers. To minimize such a negative social impact, the project supports the upgrade of FCKs to an intermediate technology of improved zigzag kilns as a transitional measure to modernize the brick sector in Bangladesh. The proposed capacity development TA will help finance the retraining of the affected businesspersons and workers to improve their chances of securing alternative livelihoods (footnote 11).

E. Safeguards

30. According to ADB's Safeguard Policy Statement (2009), the project is classified as FI (financial intermediary) for environment, involuntary resettlement, and indigenous peoples. Safeguards-related eligibility criteria will eliminate any subproject that is classified as category A for environment or that involves resettlement or affects indigenous peoples.²⁶ Furthermore, subprojects cannot involve in any activity on the prohibited investment activities list indicated in the Safeguard Policy Statement. An environmental and social management system (ESMS)

²⁵ See gender action plan in PAM (accessible from the list of linked documents in Appendix 2).

²⁶ A safeguard categorization practice will be established at the Bangladesh Bank and PFI level in accordance with ADB's Safeguard Policy Statement. Any lack of capacity will be supplemented initially by ongoing TA (footnote 13) and subsequently the proposed capacity development TA when it is approved.

arrangement consistent with the Safeguard Policy Statement was developed to guide the project implementation.²⁷ PFIs will monitor sub-borrowers' compliances to the developed ESMS and submit annual environmental and social performance reports to Bangladesh Bank, which will submit a compiled report to ADB.

31. An assessment of the capacities of Bangladesh Bank and a potential PFI to manage the environmental and social issues was conducted as a part of the project due diligence. The result shows that potential PFIs may have to strengthen their capacities to monitor sub-borrowers' compliance to the ADB ESMS requirements. The proposed capacity development TA will support Bangladesh Bank and PFIs to manage and implement the developed ESMS arrangement.

F. Risks and Mitigating Measures

32. The project design is based on strong government commitment to enforce the phase-out of the polluting FCKs. The technical design specification for improved zigzag kiln is being finalized. ADB plans to provide capacity building to Bangladesh Bank and PFIs to monitor and manage sub-borrowers' compliance with required ESMS, core labor standards, gender action plan, and procurement practices acceptable to ADB. This will also ease ADB's reputational risk working in the brick sector that has to improve its compliance record on basic safeguard standards. More detailed risk and mitigating measures are provided in the risk assessment and risk management plan.²⁸

Table 5: Summary of Risks and Mitigating Measures

Risks	Mitigating Measures
Government's inability to uphold its directive to phase out the existing fixed chimney kilns (FCKs).	ADB has obtained strong government commitment to maintain its policy direction. The government has committed not to repeal, suspend or substantially amend the relevant government directive (para. 6) without ADB approval.
Lack of standard design specifications in improved zigzag kiln, VSBK, HHK, and tunnel kiln in Bangladesh.	The World Bank is developing the technical (design) standard for improved zigzag kiln. A subproject for upgrading to improved zigzag kiln is eligible for financing only after DOE has approved and published such general design standard and certified that the proposed subproject meets the published design standard. If DOE is unable to approve and publish general design standards for VSBK, HHK, or tunnel kiln, these types of subprojects are eligible for financing only after DOE has certified that the subproject design meets international best practices.
Lack of participating financial intermediaries (PFIs)' compliance with required environmental and social management system, core labor standards, gender action plan, and procurement practices acceptable to ADB, raising potential ADB reputational risk.	All PFIs must sign a participation agreement with Bangladesh Bank to meet the stated compliance requirements. Through the proposed capacity development TA, ADB will support Bangladesh Bank's regular monitoring of compliance conditions at PFIs and sub-borrowers. In addition, PFIs' compliance systems will need to be in place, and

²⁷ Financial Intermediary: Environmental and Social Management System Arrangement (accessible from the list of linked documents in Appendix 2).

²⁸ Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

Risks	Mitigating Measures
	satisfactory to ADB, before first disbursement. Furthermore, ADB will design commercial incentives, such as carbon credit, to reward sub-borrowers who demonstrated satisfactory compliance records. Finally, the project is designed to finance creditworthy, larger, model brickfields that could demonstrate exemplary compliances in environmental, social, labor, and gender standards, thereby minimizing ADB's reputational risk.

Source: Asian Development Bank.

IV. ASSURANCES AND CONDITIONS

33. The government has assured ADB that implementation of the project shall conform to all applicable ADB policies including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in detail in the PAM and loan documents.

34. The government has agreed with ADB on certain covenants for the project, which are set forth in the loan agreements and project agreement. As a condition to effectiveness, the government and Bangladesh Bank must execute an administration agreement pursuant to which Bangladesh Bank will implement the project by approving and monitoring subprojects and making the ADB financing available to PFIs.

V. RECOMMENDATION

35. I am satisfied that the proposed loans would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve

- (i) the loan of \$30,000,000 to the People's Republic of Bangladesh for the Financing Brick Kiln Efficiency Improvement Project from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 25 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board; and
- (ii) the loan in various currencies equivalent to SDR12,972.000 to the People's Republic of Bangladesh for the Financing Brick Kiln Efficiency Improvement Project from ADB's Special Funds resources with an interest charge at the rate of 1.0% per annum during the grace period and 1.5% per annum thereafter; for a term of 32 years, including a grace period of 8 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and project agreements presented to the Board.

Haruhiko Kuroda
President

16 April 2012

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
Impact Improved environmental conditions in Bangladesh.	10% reduction in annual greenhouse gas emission from the brick sector from 2018. (2010 baseline: Carbon dioxide [CO ₂]: 9.8 million tons) ^a 20% reduction in fine particulate pollution from the brick sector from 2018. (2010 baseline: Suspended particulate matter emission load: 17.1 kilogram per 10,000 brick produced) ^a	National Communications Report on Inventory of Greenhouse Gas Emissions voluntarily submitted to the United Nations Framework Convention on Climate Change, studies conducted by other organizations such as the United Nations Development Programme and the World Bank. Suspended particulate matter, use Isokinetic collection (e.g., United States Environmental Protection Agency method-17) for brick kilns.	Assumptions No drastic increase of other industrial and overall pollution level.
Outcome Replacement of polluting fixed chimney kilns (FCKs) with more energy-efficient kilns in Bangladesh's brick sector.	Approved financing of at least 200 FCK upgrades to improved zigzag kilns by December 2015. Approved financing of at least 20 vertical shaft brick kilns (VSBKs) and 5 hybrid Hoffman kilns (HHKs) and/or tunnel kilns by December 2015. Reduction of FCKs by 50% by December 2015. (2011 baseline: 4,490 FCKs)	(For all indicators) Survey and statistics from Bangladesh Brick Manufacturing Owners Association. Government statistics, e.g. from the Ministry Environment and Forests and/or Ministry of Industries.	Assumptions The government continues to enforce the phase-out of FCKs. Risks Lack of design standards in Bangladesh to upgrade FCKs to improved zigzag kilns and construct VSBKs, HHKs, and tunnel kilns. Low technical and commercial viabilities from VSBK, HHK, and tunnel kiln pilot projects.

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks						
Outputs 1. Designated credit facility, by catalyzing domestic resources, to finance upgrade to and construction of more energy-efficient brick kilns. 2. Mitigated adverse working and social welfare conditions in ADB-funded brick kilns.	Credit facility made fully operational by December 2012. Brick sector finance volume is at least \$100 million by December 2015. (2011 baseline data: \$3 million) 100% compliance (by Participating financial intermediaries [PFIs]) with core labor standards and gender mainstreaming in all the kilns financed by the project by December 2015. (2011 baseline data: 70%)	Bangladesh Bank Agricultural Credit and Financial Inclusion Department (ACFID) report and development partners reports (e.g. the World Bank and United Nations Development Programme). Bangladesh Bank's participation agreements with PFIs (incorporating the compliance requirements), Bangladesh Bank review reports, capacity development technical assistance consultant reports, and periodic labor inspections by Ministry of Labour and Employment.	Assumption The Asian Development Bank (ADB) project is able to leverage additional funds. No drastic change in Bangladesh's economy and ongoing credit crunch will ease from 2013. Risk PFIs are not interested in channeling the funds because of the lack of incentives (e.g. cumbersome procedures, small fund size, and unattractive interest margin). Lack of local capacities to support the construction, maintenance, and operation of the advance brick kilns.						
Activities with Milestones		Inputs							
Designated credit facility, by catalyzing domestic resources, to finance upgrade to and construction of more energy-efficient brick kilns. (Continuous, from third quarter of 2012)		Loan ADB: \$50,000,000							
1.1 ADB provides \$50 million to Bangladesh Bank through Ministry of Finance. Bangladesh Bank establishes a \$50 million equivalent revolving credit facility in local currency at its ACFID for onlending to PFIs to construct more energy-efficient brick kilns.		<table><tr><th>Item</th><th>Amount (\$ million)</th></tr><tr><td>Ordinary capital resources</td><td>30.0</td></tr><tr><td>Asian Development Fund</td><td>20.0</td></tr></table>		Item	Amount (\$ million)	Ordinary capital resources	30.0	Asian Development Fund	20.0
Item	Amount (\$ million)								
Ordinary capital resources	30.0								
Asian Development Fund	20.0								
1.2 Bangladesh Bank designates ACFID as the project management unit.									
1.3 Bangladesh Bank determines disbursements to PFIs based on its internal procedures and the agreed eligibility criteria (with ADB). Bangladesh Bank determines (i) the relending terms to PFIs, and (ii) PFIs' onlending terms based on market conditions.		PFIs: \$20,000,000							
1.4 PFIs shall submit quarterly reports to ACFID on the funds utilization including detailed subloan information: type of technology funded (the technology to be certified by department of environment [DOE]), subloan amount, tenor, interest rate, repayment terms, amortization schedules, repayment records, and compliance records		<table><tr><th>Item</th><th>Amount (\$ million)</th></tr><tr><td>Loan</td><td>20.0</td></tr></table>		Item	Amount (\$ million)	Loan	20.0		
Item	Amount (\$ million)								
Loan	20.0								
		Sub-borrowers (Equity): 30,000,000							
		<table><tr><th>Item</th><th>Amount (\$ million)</th></tr></table>		Item	Amount (\$ million)				
Item	Amount (\$ million)								

Activities with Milestones	Inputs
(e.g. with PFI participation agreement and ADB eligibility criteria).	Equity 30.0
<p>1.5 ACFID will collate the collected information and provide ADB with a quarterly report on the overall performance of the credit facility.</p> <p>1.6 DOE provides relevant (brick and environment) technical support, including verification of brick technical design and monitoring of environmental benefits (e.g. CO₂ emission reduction) to Bangladesh Bank.</p> <p>Mitigated adverse working and social welfare conditions in ADB-funded brick kilns. (Continuous, from third quarter of 2012)</p> <p>2.1 ADB incorporates relevant environmental and social management system (ESMS) requirements, gender action plan, and core labor standards in ADB's loan and project agreements.</p> <p>2.2 Bangladesh Bank incorporates relevant ESMS requirements, gender action plan, and core labor standards in its participation agreements with PFIs for compliance at sub-borrower level.</p> <p>2.3 Bangladesh Bank and PFIs monitor the compliance of stated social safeguard measures at PFIs and sub-borrowers respectively.</p>	

^a The World Bank Energy Sector Management Assistance Program South Asia. 2011. *Introducing Energy-Efficient Clean Technologies in the Brick Sector of Bangladesh*. Report No. 601550BD. June.
Source: Asian Development Bank.

LIST OF LINKED DOCUMENTS

<http://www.adb.org/Documents/RRPs/?id=45273-001-3>

1. Loan Agreements (Ordinary Operations)
2. Loan Agreements (Special Operations)
3. Project Agreement
4. Sector Assessment (Summary): Brick
5. Project Administration Manual
6. Contribution to the ADB Results Framework
7. Development Coordination
8. Financial and Economic Analyses
9. Country Economic Indicators
10. Summary Poverty Reduction and Social Strategy
11. Financial Intermediary: Environmental and Social Management System Arrangement
12. Risk Assessment and Risk Management Plan

Supplementary Documents

13. Fund Flow (Chart)
14. Assessment of Capacity to Comply with Safeguard Requirements
15. Draft Capacity Development Technical Assistance Concept Paper
16. Government Directive to Phase Out Fixed Chimney Kilns (translated version)
17. Bangladesh Bank's Current Hybrid Hoffman Kiln Credit Facility Letter
18. Sample Participation Agreement between Bangladesh Bank and Participating Financial Intermediaries
19. Bangladesh Brick Manufacturing Owners Association Confirmation Letter
20. Britic Client List for Immediate Financing for HHKs and Tunnel Kilns