



**Global Environmental Facility**

**United Nations Development Programme**

**Ministry of Environment, Forest and Climate Change  
Government of India**

**The Energy and Resources Institute**

**UNDP/GEF Project: Energy Efficiency Improvements in the  
Indian Brick Industry (PIMS 3465)**

**Terminal Evaluation Report**

Draft 3.0

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## Acknowledgements

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The TE Team is very grateful to all those who have stayed in the background but also contributed much to the success of the TE process.

The Team wishes everyone success in all their endeavors.

## Executive Summary

This Terminal Evaluation report is for the evaluation of the **Energy Efficiency Improvements in the Indian Brick Industry Project** (PIMS 3465). The Project was funded by the Global Environmental Facility (GEF) and implemented through the United Nations Development Programme (UNDP) with the Ministry of Environment, Forest and Climate Change (MOEFCC) as the Executing Agency through the Energy and Resources Institute (TERI).

As a background, the India EE Brick Project or also referred to herein as the Project, had its initial conceptualization in 2001-2002 which was originally proposed for a five-year full-scale project (FSP) for GEF grant of US\$ 5.06 million focusing on the large-scale training of brick manufacturers and brick industry workmen in undertaking energy-efficiency improvements in the brick making. The proposal did not result to a GEF-funded project. Then later, it was developed as a Medium Scale Project (MSP) for submission to UNDP/GEF in 2007 with some modifications and after some series of reviews and updating was endorsed by the CEO in March 2008 and approved by GEF in June 2009.

### • Project Summary

The following describes in summary the India Brick Project when it was endorsed by the CEO (including the status of funds and committed co-financing at the revised completion date of December 2016):

**Table 1: Project Summary Table**

Project Title:	<b>Energy Efficiency Improvements in the Indian Brick Industry</b>			
GEF Project ID:	2844 (GEF PMIS ID)		<i>at endorsement (US\$)</i>	<i>at completion (US\$)</i>
UNDP Project ID:	3465 (UNDP PIMS ID) 00057405 (Atlas ID)	GEF financing:	696,448	696,448
Country:	India	IA/EA own:	145,000 (TERI in kind)	74,988 * (TERI in kind up to Dec 2011)
Region:	Asia Pacific	Government:		
Focal Area:	Climate Change	Other:	1,999,000	1,966,065* (Brick kiln units)
FA Objectives, (OP/SP):	OP-5	Total co-financing:	1,999,000	1,966,065
Executing Agency:	MOEFCC through The Energy and Resources Institute (TERI)	Total Project Cost:	2,695,448	2,694,448
Other Partners involved:		ProDoc Signature (date project began):		May 2008
		(Operational) Closing Date:	Proposed: April 2012	Actual: Dec 2016

\*Corresponding to inputs and resources provided as valued at local costs and converted at the conversion rate: 1 USD = INR 50.7 for 2009-12 period and INR 67.70 for 2015-16 period

- **Brief Project Description**

The project was designed with the goal to reduce energy consumption, and restrict GHG emissions by creating appropriate infrastructure for sustained adoption of new and improved technologies for production and use of resource efficient bricks (REB) in India.

The objectives of the project is to make India's five<sup>1</sup> major brick producing clusters more energy efficient by:

- Demonstrating REB technologies and develop technology models (supply side)
- Building awareness and develop sustainable markets for REBs among various stakeholders such as builders, architects, individual end-users (demand side)
- Influencing government organizations, financial institutions and policy and decision makers

The Project's envisaged outcomes are:

- (i) Enhancing public sector awareness on resource-efficient products.
- (ii) Access to finance for brick kiln entrepreneurs
- (iii) Improved knowledge on technology, including marketing
- (iv) Availability of resource efficient technology models in 5 clusters through Local Resource Centers
- (v) Improved capacity of brick kiln entrepreneurs

The Project's intended environmental impact in terms of GHG CO<sub>2</sub> emission reduction through savings in energy consumption by planned 12 brick kiln units in 5 major clusters is:

- 47,128 t CO<sub>2</sub> (over project implementation 4 years) and
- 187,840 t CO<sub>2</sub> over 15 years.

- **Project Implementation**

The original project duration was for an implementation period of four (4) years from 2009 to 2013. However, the Project remained stagnant during January 2012 to August 2015 as affected by the audit findings (2011 Audit Report) regarding financial issues on manpower costs charged by TERI to be higher than allocations provided in the ProDoc. [*References:* Field Report (2011); Project MTR Report (October 2012, UNDP letter to TERI requesting TERI to refund or reprogram the corresponding variance putting the project on hold; TERI's response letter to refund the amount and foreclose the project.)]

After a long series of discussions and meetings, the issues were resolved for the project to continue to be implemented by reprogramming the attainment of the expected outcomes. The LFA was reviewed and a list of tasks was identified which will reasonably address the outcomes originally envisaged. It was decided that the project balance amount of 217,903 USD will be spent through UNDP Country Office support. The Project was decided to follow the revised closing date of December 31, 2016 on an

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<sup>1</sup> Later the project decided to focus on only in one cluster viz. north region

extended basis which was justified to allow the project to complete almost 50% of the activities which remained incomplete as of 2014.

Project implementation can be divided into three (3) phases:

- 2009-2011: Project implemented by TERI as Responsible Party as originally planned in the ProDoc
- 2012-2014: Almost stagnant with practically no work after MTR: Project activities were almost stagnant with practically no operation after the project was placed on hold and the MTR has confirmed the status of the project and has led to identification of an action plan to complete the project.
- 2015-2016: Program outcomes revised with 2 AWP, which got signed in August 2015, under Country office support mode consisting of (a) the TERI Component (without additional funds) and (b) the UNDP Component (utilizing the remaining project fund balance).

The 2015/2016 extension was envisioned and approved to achieve the following in line with the project objectives and thus bringing the project outputs/outcomes nearer to the original goal, though in a scaled-down scope and towards closing the project:

- Lead to notification of revised Indian Standards for REBs by the Bureau of Indian Standards. (TERI)
  - Sensitizing financing institutions to lend loans for REB manufacturing units (MoEFCC)
  - Preparation of “Investment Guide” as reference document for FIs (TERI)
  - Completion of Market assessment and potential study (Greentech)
  - Handbook “Construction using REBs” for architects, engineers, builders, government officials (TERI)
  - Completion of installation of 3 new REB producing units and preparation of investment plans for 25 REB units and provision of technical assistance to these units (Punjab State Council for Science and Technology)
  - Completion of project story on REBs in India and UNDP-GEF project role and an audio-visual on REBs in India (ADCS)
  - Resource Audit of REB producing units and conventional solid burnt bricks (TERI)
  - Terminal Evaluation (UNDP)
  - Eco-labeling of REBs which is not a part of project design (MoEFCC).
- 
- **Context and Purpose of the Terminal Evaluation**

This Terminal Evaluation (TE) is part of the requirements of the evaluation process under the UNDP Guidelines for Conducting Terminal Evaluation for all GEF-funded projects. The evaluation included a mixed methodology of document review, interviews, and observations from project site visits, and information verification. As an important part of the TE, the evaluation effort used the criteria of relevance, effectiveness, efficiency, sustainability, and impact, as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects.

The scope of the activities of the TE includes the following:

- Evaluation of the project achievements against the original LFA and the approved project completion works through AWP 2015 & 2016
- Assessment of:
  - physical work progress
  - operational status of project activities
  - replication potential
  - sustainability
- Identification of issues, constraints and lessons learnt
- Recommendations on strategies to move project forward and recommendations for follow-up effort by the Government of India, UNDP and other key partners.

The TE Mission was conducted in New Delhi, India with field visits to the project sites in Sonipat and Chandigarh, Punjab for the period January 30 – February 5, 2017. The TE Team conducted interviews with selected government counterparts, private entrepreneurs and stakeholders.

The parameters for evaluating the project with the aforesaid implementation history and challenges could be taken in two perspectives: *firstly*, on the basis of the original commitments using the ProDoc log frame wherein the project is taken largely with a national scope consisting of five clusters of brick kiln producers. *Secondly*, on the basis of a reprogrammed implementation mode where UNDP stepped in to actively support the completion of the project with the help of the identified agencies doing specific tasks in line with the achievement of the project outcomes. It was though on a scaled down level (which was also recommended in the MTR) considering remaining project funds of an MSP project and timetable as described above. The first instance of evaluation was already done in the MTR which has led to the current UNDP-assisted implementation mode. The Terminal Evaluation, therefore, has to view the evaluation on the reprogrammed arrangement as the project continued to be implemented and brought to closure under an updated set of targets and timeframe.

#### • Evaluation Rating Table

**Table 2** provides a summary of ratings of the terminal evaluation of the India EE Brick Project:

**Table 2: Terminal Evaluation Ratings\***

<b>Evaluation Ratings:</b>			
<b>1. Monitoring and Evaluation</b>	<b>Rating</b>	<b>2. IA&amp; EA Execution</b>	<b>Rating</b>
M&E design at entry	S	Quality of UNDP Implementation – Implementing Agency (IA)	MS
M&E Plan Implementation	MU	Quality of Execution - Executing Agency (EA)	MS
Overall quality of M&E	MU	Overall quality of Implementation / Execution	MS
<b>3. Assessment of Outcomes</b>	<b>Rating</b>	<b>4. Sustainability</b>	<b>Rating</b>
Relevance	R	Financial resources:	MS
Effectiveness	MS	Socio-economic:	MS
Efficiency	MU	Institutional framework and governance:	MU
Overall Project Outcome Rating	MS	Environmental :	MS

		Overall likelihood of sustainability:	MS
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\* As stated in the TE TOR, all criteria marked with (\*) were rated using the prescribed rating scales.

### Assessment Rating considering Original ProDoc Log Frame consisting of Five Clusters

In the context of the original project log frame which was designed for the project to have involved five clusters, the TE Team views that the overall rating in project implementation to be *Marginally Unsatisfactory (MU)* because the project had significant shortcomings in the delivery of results according to prescribed timeframe and scope.

The TE Team is in the opinion that there is no need to provide details on this assessment approach as it was already covered in the Mid-Term Review (MTR). The Team proposes to rather focus the end-of-project assessment on the reprogrammed implementation and project completion targets as discussed below.

### Summary of Accomplishment Ratings based on Reprogrammed Implementation

Based on the above, the project results under the AWP 2015/2016 terms of reference are rated as:

- **Relevant** - The project is suited to local and national development priorities and organizational policies, including changes over time and it is in line with the GEF Operational Programs or the strategic priorities under which the project was funded.
- **Moderately Unsatisfactory (MU) in terms of Efficiency** - The project had significant shortcomings in the delivery of results according to prescribed timeframe and scope though the project operated within the budgeted resources available under the MSP category in spite of some financial issues encountered and resolved. Details of this assessment can be seen in **Table 7** on actual (as of EOP Dec 2016) vis-à-vis the AWP 2015/2016 reprogrammed completion works to meet the original Log Frame objectives.
- **Moderately Satisfactory (MS) in terms of Effectiveness** - There were moderate shortcomings on the extent to which an objective has been achieved or how likely it is to be achieved.

### Overall Rating: Marginally Satisfactory

The overall rating of the achievement of project results based on the reprogrammed implementation is **Marginally Satisfactory (MS)**. This is based on the following major outputs which the Project has achieved for the last two years (2015-2016) in pursuit of the expected outcomes.

1. Facilitation to 9 existing nine plants, 3 New REBs commissioned, 3 likely in 2017
2. Resource Audit of 6 brick manufacturing units
3. Market linkage support to 12 REB units
4. ~40 workshops/seminars/meeting (~2700 Persons participated)
5. 5 model project reports templates for availing of loans from financial institutions
6. REB Investment guide prepared
7. Market assessment for REBs: Present Production and Future Markets"

8. 33 (instead of planned 25) bankable investment plans to establish new REB units
9. Two audio-visual & process story documenting project findings, learning, etc.
10. Project operational website (<http://www.resourceefficientbricks.org/>)
11. Inclusion of REBs in schedule of rates by PWD, Government of Punjab
12. Revision of REB codes under Bureau of Indian Standards [In progress]
13. Preparation of promotional material and organization of awareness creation, training-capacity building workshops

## Summary of conclusions, recommendations and lessons

### Conclusions:

- India Brick EE Project has been financially and operationally closed on December 31, 2016, as extended through 2015 & 2016 AWP
- The Project was able to overcome the problems and challenges (2011 to 2014 due to some financial/audit issues) which was compensated by the 2015/2016 completion works.
- Ambitious targets for an MSP; Completion works concentrated in Punjab state by PSCST in North Cluster (instead of 5 clusters) within the allocated budgets to meet project objectives
- Performance Ratings:
  - Overall project results (based in the adjusted 2015/2016 work programs):  
**Moderately Satisfactory (MS)**
    - Relevance: Still very appropriate given changed circumstances and market characteristics
    - Sustainability: Likely to deliver desired benefits for the coming 10-20 years after its completion
    - Replicability: Big potential for replication as demonstrated in Punjab in mechanization, training and viability; to cover other regions
  - Synergistic approach proved to be very necessary in sustainable REB making and application due to very wide scope and number of stakeholders
  - More government support and fund mobilization critical to realize REB economic and sustainable development and environmental potential

### Recommendations:

- Fast track inclusion of REB in public sector procurement guidelines and expedite adoption of relevant REB BIS standards also in other states
- Enact relevant REB-favourable national policies and mobilize REB program funding support to sustain the project's breakthroughs and momentum as gathered in terms of REB technology application, fuel and material savings, environmental benefits and institutional strengthening



- Designate (a) program lead ministry/agency who could continue integrating the overarching REB objectives and sub-programs more effectively at national level for policy and (b) regional resource centres for implementation at state level as modelled in Punjab
- Take advantage of south-south/triangular cooperation for REB technology application to accelerate mechanization and standardization
- Utilize remaining funds (~USD 20-25 thousand USD) for finalizing the sustainability plan (or an exit/post-project strategy) in realizing REB scaling-up and for disseminating project results and action plan and seek support in GEF 7 or GCF or national funding for 'REB Mission'
- Comparative study showcasing efficacy of the REBs of the building that uses REBs compared to other the conventional/traditional building material (hand moulded and compact press moulded or Hollow concrete blocks
- Comprehensive and holistic cost-benefit cost benefit or life cycle cost analysis of REBs vis-a-vis traditional hand moulded brick
- Develop future programs to enhance scale and widen horizon of scope

**Lessons:**

- There needs to be clear monitoring guidelines for charge out rate band allowed as against that mentioned in the ProDoc.
- There is need to have independent professional inputs while developing project document in order to evolve a strong and realistic LFA.
  - In this case project development process had been very long (almost 7 years); though fortunately all major stakeholders viz. TERI, MoEF and UNDP remained committed to project development despite such long development period.
  - Also, though LogFrame and baseline and incremental analysis was included in the approved ProDoc, as also mentioned in MTR, it was very generic and not very closely tailored to the project's specific context and desired outcomes. Though an updated LFA was prepared by the PFU/PMU but was never implemented, as by the time the updated LFA was ready for consideration in December 2011, project had effectively ceased operations over the still unresolved issue of TERI staff charge out rates higher (2-4 time) than that specified in the ProDoc.
- There is need to clearly develop and mention base line scenario in ProDoc for example for number of bank loan for REBs in base year 2008 which has resulted in quantifiably verifying the project impact during the course of execution. In order to avoid such confusion in measuring the project achievements there is need to have very clear and quantifiable benchmark in such a manner that will help track and monitor efficacy of the project.

## Acronyms and Abbreviations

Acronym	Meaning
AIBTMF	All India Bricks and Tiles Manufacturers' Federation
APR	Annual Project Report
ADCS	Academic and Development Communication Services
AWP	Annual Work Plan
BIS	Bureau of Indian Standards
BOP	Best Operating Practices
BTK	Bull's Trench Kilns
CEO	Chief Executive Officer
CO <sub>2</sub>	Carbon dioxide
CPCB	Central Pollution Control Board
CPWD	Central Public Works Department
DPR	Detailed Project Report
EA	Executing Agency
EOP	End of project
FALG	Fly Ash Lime Gypsum brick
FI	Financial Institution
FSP	Full scale project
GCV	Gross Calorific Value
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Green House Gases
GKSPL	Greentech Solutions Pvt Ltd
IA	Implementing Agency
INP	Int Nirmata Parishad
IR	Inception Report
LRC	Local Resource Centre
M&E	Monitoring & Evaluation
MES	Military Engineering Services
MJ	Mega Joule
MoEFCC	Ministry of Environment, Forests and Climate Change
MSME	Ministry of Micro, Small and Medium Enterprises
MoU	Memorandum of Understanding
MTR	Mid-Term Review
MoUD	Ministry of urban Development
MSP	Medium Size Project
NCR	National Capital Region
NPD	National Project Director
NSIC	National Small Industries Corporation Ltd
OP	Operation Program
PC	Project Coordinator
PDF	Project Development Facility
PFC	Project Facilitation Cell
PIR	Project Implementation Review
PWD	Public Works Department
PSCST	Punjab State Council for Science and Technology
REB	Resource efficient brick
R&D	Research & Development
RCU	Regional Coordinating Unit
SC	Steering Committee

SDC	Swiss Development and Cooperation
SIDBI	Small Industries Development Bank of India
SISI	Small Industries Services Institute
SME	Small and Medium Enterprises
SPM	Suspended Particulate Matter
SSI	Small Scale Industries
TE	Terminal evaluation
TERI	The Energy and Resources Institute
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
UP	Uttar Pradesh
USD	US Dollar
VSB	Vertical Shaft Brick Kiln

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# UNDP/GEF Project: Energy Efficiency Improvements in the Indian Brick Industry (PIMS 3465)

## Terminal Evaluation Report

### 1. Introduction

This Terminal Evaluation (TE) Report is part of the requirements of the evaluation process under the UNDP Guidelines for Conducting Terminal Evaluation for GEF-funded projects. The project being evaluated is the **Energy Efficiency Improvements in the Indian Brick Industry Project** (PIMS 3465) or the India EE Brick Project or also referred to herein as the Project, funded by the Global Environmental Facility (GEF) and implemented through the United Nations Development Programme (UNDP) with the Ministry of Environment, Forest and Climate Change (MOEFCC) as the Executing Agency through the Energy and Resources Institute (TERI).

The TE Mission was conducted in New Delhi, India with field visits to the project sites in Sonipat and Chandigarh, Punjab for the period January 30 – February 5, 2017.

#### 1.1. Purpose of the evaluation

This Terminal Evaluation is in compliance with the UNDP and GEF M&E policies and procedures for all full and medium-sized UNDP-supported, GEF-financed projects which are required to undergo a terminal evaluation upon completion of implementation.

#### 1.2. Scope & Methodology

The evaluation included a mixed methodology of document review, interviews, and observations from project site visits, and information verification. As an important part of the TE, the evaluation effort used the criteria of relevance, effectiveness, efficiency, sustainability, and impact, as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects.

The scope of the activities of the TE includes the following:

- Evaluation of the project achievements against the original LFA and the project completion works through AWP 2015 & 2016
- Assessment of:
  - physical work progress
  - operational status of project activities
  - replication potential
  - sustainability
- Identification of issues, constraints and lessons learnt

- Recommendations on strategies to move project forward and recommendations for follow-up effort by the Government of India, UNDP and other key partners.

The TOR for the conduct of the Terminal Evaluation is shown in **Annex A** (with its own annexes removed) but the relevant TOR annexes that are to be included in this TE report are seen attached as the TE Report annexes. The overall TE Mission schedule, persons interviewed and sites visited are shown in the Mission Schedule or itinerary as **Annex C**.

The Terminal Evaluation Team (TE Team) conducted interviews with selected government counterparts, private entrepreneurs and stakeholders. The List of Persons met/interviewed is shown in **Annex D**. The TE Team conducted field missions to various project stakeholder locations and project field sites viz. in Sonipat and Chandigarh, Punjab with descriptions and photographs in **Annex G**. The evaluation referred to reports and documents provided by UNDP and the project management team, as listed in **Annex E**. A matrix of questions covering each of these criteria was used as guidance and is included as **Annex F** of this TE Report.

In assessing the outputs and outcomes, the evaluation referred to the Project Logical Framework that indicates success indicators and targets as shown in **Annex B1** as attached also to the TE TOR. While there was no change in the intended outcomes, the project's activities and outputs were reprogrammed in 2015-2016 after an almost two years of no operation and were undertaken through the approved AWP 2015 and AWP 2016 to complete the project, as summarized in **Annex B3**.

### 1.3. Structure of the terminal evaluation report

The TE Report includes the following:

- Assessment of the actual project approach vis-à-vis project design/formulation
- Assessment of project implementation in terms of management, partnership, M&E, financing and execution by the implementing agency (UNDP) and executing agency (MOEFCC/TERI)
- Assessment of project results in terms of relevance, effectiveness, efficiency, ownership, mainstreaming, sustainability, and impact
- Conclusions, recommendations and lessons.

## 2. Project description and development context

The construction sector contributes about 10% of India's GDP and is growing at the rate of 9% per annum. The Indian brick industry is the second largest in the world (next to China) and is also a major source of local air pollution and topsoil erosion. Brick production in India takes place in small units, using manual labor and traditional firing techniques. Large demand for bricks has resulted in mushrooming of brick kiln clusters at the outskirts of major towns and cities.

As stated in the ProDoc, at the current rate of production in 2009, the brick industry consumes about 350 million tons of fertile topsoil every year, approximately equal to 34,000 hectares of prime agricultural land. By using perforated, hollow clay bricks 30% of clay per brick. The sector consumes 24 million tons of coal along with huge quantity of biomass fuels. The brick clusters are major sources of local air pollution (SPM, SO<sub>2</sub>, fugitive emissions, etc.) affecting local population, agriculture and vegetation. The total CO<sub>2</sub> emission from the brick industry is estimated at 41.6 million tons accounting for 4.5% of total GHG emissions from India.

The Project key information is summarized below:

Project Title:	<b>Energy Efficiency Improvements in the Indian Brick Industry</b>			
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The Project's intended environmental impact in terms of GHG CO<sub>2</sub> emission reduction through savings in energy consumption by planned 12 brick kiln units in 5 major clusters is:

- 47,128 t CO<sub>2</sub> (over project implementation 4 years) and
- 187,840 t CO<sub>2</sub> over 15 years.

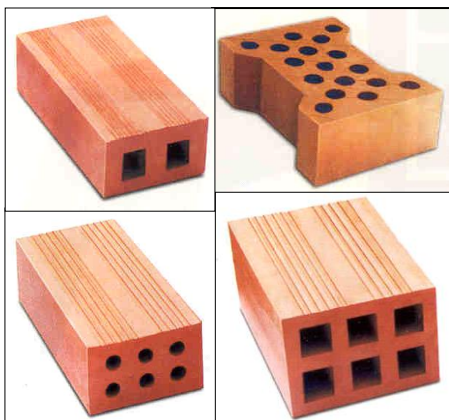
## 2.1. Project Development Background, Start, Duration and Implementation History

In review, the brick project had its initial conceptualization in 2001-2002 when the Punjab State Council for Science and Technology (PSCST) in cooperation with TERI, developed the project proposal for a five-year full-scale project (FSP) and proposed for GEF grant of US\$ 5.06 million



focusing on the large-scale training of brick manufacturers and brick industry workmen in undertaking energy-efficiency improvements in the brick firing process and in the demonstration of four different technological options (pre-dominantly efficient brick kilns) through 20 demonstration projects. The proposal did not result to a GEF-funded project.

In 2005, project development was revived through a PDF-A grant which resulted to a proposal for a GEF medium sized project (MSP) with a GEF grant of US\$ 696,448 was prepared. The focus was on promotion and production of resource-efficient bricks (perforated, hollow and fly ash bricks) in 5



brick-making clusters with an aim to reduce clay and fuel use in brick production. Project development and approval took 3 years (2005-2008) marked by the GEF CEO endorsement in April 2008. The project inception workshop was held in November 2009. The project commenced as planned to be a GEF Medium-Sized Project (MSP) in 2009.

The original project duration was for an implementation period of four (4) years from 2009 to 2013. However, the Project remained stagnant during 2012-2014 as affected by the audit findings (2011 Audit Report) regarding financial issues on manpower costs charged by TERI to be higher than allocations provided in the ProDoc. [References: Field Report (2011), Project MTR Report (October 2012, UNDP letter to TERI requesting TERI to refund or reprogram the corresponding variance putting the project on hold, TERI's response letter to refund the amount and foreclose the project.]

After a long series of discussions and meetings, the issues were resolved for the project to continue to be implemented by reprogramming the attainment of the expected outcomes. The LFA was reviewed and a list of tasks was identified which will reasonably address the outcomes envisaged for the whole project to bring the project implementation to a close. It was decided that the project balance amount of 217,903 USD will be spent through UNDP country office support. The Project was decided to follow the revised closing date of December 31, 2016 on an extended basis which was justified to allow the project to complete almost 50% of the activities which remained incomplete as of 2014. This 2015/2016 extension was envisioned and approved to achieve the following:

- Lead to notification of revised Indian Standards for REBs by the Bureau of Indian Standards. (TERI)
- Sensitizing financing institutions to lend loans for REB manufacturing units (MoEFCC)
- Preparation of "Investment Guide" as reference document for FIs (TERI)
- Completion of Market assessment and potential study (Greentech)
- Handbook "Construction using REBs" for architects, engineers, builders, government officials (TERI)
- Completion of installation of 3 new REB producing units and preparation of investment plans for 25 REB units and provision of technical assistance to these units (Punjab State Council for Science and Technology)
- Completion of project story on REBs in India and UNDP-GEF project role and an audio-visual on REBs in India (ADCS)
- Resource Audit of REB producing units and conventional solid burnt bricks (TERI)
- Terminal Evaluation (UNDP)
- Eco-labeling of REBs which is not a part of project design (MoEFCC).

In addition to ongoing activities being completed by TERI, the following are the major project completion tasks and the agencies to do the tasks through a project extension request that was approved:

<b>Project Completion Tasks</b>	<b>Agency assigned to do the task*</b>
Market assessment for Resource Efficient Bricks (REBs): Present production and future markets	GKSPL
Setting up of 3 Resource Efficient Brick [REB] units and preparation of investment plans for 25 REB units	Punjab State Council for Science and Technology
Resource Audit of REB producing units and conventional solid burnt bricks	TERI
Finalize the “ Investment guide on REBs” describing (i) composition, characteristics, construction aspects of REBs, (ii) benefits of REBs vs. normal brick (ii) investment on REBs and (iv) vendors  Identify national and regional financial institutions and conduct workshop for FIs	TERI
Project documentation (process story book and audio-visual)	ADCS
Terminal Evaluation	Ongoing

\* All these agencies were selected through Request for Proposal as per UNDP procurement process.

As such, with TERI having agreed to refund excess charges and to carry out set of activities that were incomplete but still relevant to the project, the assigned tasks to TERI were to be done through the approved Annual Work Plan (AWP) 2015 Part 1 as part of project completion. In parallel, AWP 2015 Part 2 which was directly supervised and supported by UNDP, in cooperation with the PSCST, consisted of three new brick units to be installed from fund balance for 2015 - 2016 through the AWP 2015/2016 to complete the project’s desired 12 units and 25 investment plans. A summary of the various planned activities under AWP 2015 Part 1 & 2 is seen in **Annex B3, Table B3**.

Thus, the Project implementation can be divided into 3 phases:

- I. 2009-2011: Project implemented by TERI as Responsible Party
- II. 2012-2014: Project activities were almost stagnant with practically no operation after the project was placed on hold and the MTR has confirmed the status of the project and has led to identification of an action plan to complete the project.
- III. 2015-2016: Project outcomes revised through the AWP 2015 and AWP 2016 under the a UNDP Country Office support implementation mode consisting of (a) the TERI Component (without additional funds) and (b) the UNDP Component (utilizing the remaining project fund balance).

It is important to note at this juncture, that the parameters for evaluating the project with the aforesaid implementation history and challenges could be taken in two perspectives: *firstly*, on the basis of the original commitments using the ProDoc log frame wherein the project is taken largely with a national scope consisting of five clusters of brick kiln producers. *Secondly*, on the basis of a reprogrammed implementation mode where UNDP stepped in to actively support the completion of the project with the help of the identified agencies doing specific tasks in line with the achievement of the project outcomes. It was though on a scaled down level (which was also recommended in the MTR) considering remaining project funds of an MSP project as described above. The first instance of evaluation was already done in the MTR which has led to the second UNDP-assisted implementation mode. The Terminal Evaluation, therefore, has to view the evaluation on the reprogrammed arrangement as the project continued to be implemented and brought to closure under a new set of targets and timeframe.

## **2.2. Problems that the Project Sought to Address**

Major threats to the Indian brick industry are the use of obsolete technologies and use of solid bricks with traditional practices. When the project was justified the following were identified as major problems that the project sought to address:

- Limited information on resource efficient technologies
- Lack of resource efficient model brick kiln units at cluster levels
- Non-availability of trained manpower
- Limited access to finance
- Unexplored market for alternate building products
- Old specifications and codes for building materials
- Non-availability of institutional mechanism

At the time of project design, there were several opportunities to improve resource efficiencies and promote production of resource efficient bricks such as perforated bricks, hollow blocks and fly ash bricks. But this would require significant changes and upgrading in existing set-up of brick making processes for which solutions are not yet available. It required use of machinery such as brick extruders.

### ***Barriers***

In review, as worded in the ProDoc, the barriers responsible for the slow growth of the Indian brick sector are related mostly to the need for technology upgrade which is summarized in the following major barriers identified in the Indian brick sector:

1. *Policy barrier* - The existing codes and specifications for building materials are based on traditional brick making and do not meet modern practices and technologies. With the availability of new building materials, these codes and specifications need to be reviewed and modified for large scale production and end-use.
2. *Financial barrier* - There is lack of awareness and knowledge among brick kiln entrepreneurs to prepare project reports/documents for seeking loan from financial institutions/ banks. The credit worthiness of brick kiln entrepreneurs by banks is also not very favorable. At present,

there is no tailor-made financial instrument available to brick kiln entrepreneurs for investing on technology upgrading. Higher transaction costs are envisaged by individual brick kiln entrepreneurs for developing markets for resource-efficient bricks. These financial barriers are responsible for brick kiln entrepreneurs not to invest on technology upgrading and its related activities.

3. *Business skills related barrier* - Majority of the brick kiln entrepreneurs use traditional method of green brick production, brick firing and marketing. They also lack capacities and modern practices on marketing, business opportunities and kiln management. There is also lack of trained manpower to cope with new technology changes.
4. *Technology barrier* - The availability of technology know-how for resource-efficient bricks is limited as very few technology providers are available in the country. With the brick kiln operations in India are generally carried out in small scale, the access to know-how by individual brick kiln entrepreneurs is limited.
5. *Awareness barrier* - Present level of awareness of entrepreneurs and end-users on modern technologies (machineries) and building products is low. The benefits on production of resource-efficient bricks such as energy savings, reduction in top soil consumption and air pollution are also not well known to the brick kiln entrepreneurs. The end-users such as builders, architects, etc. also lack information on benefits insulation properties, saving in mortar during construction, etc.) of using resource-efficient bricks in building construction.

#### *Project situation during implementation*

According to the national level study conducted by TERI during 2013-15, the following briefly describe the situation of the country's brick manufacturing during the project implementation:

- a. The brick manufacturing industry, being grass-roots based located around the big cities and municipalities where the demand for this building material is existing though in highly disaggregated manner is considered in the micro, small, and medium enterprises (MSME) sector in India.
- b. Around 190,000 – 280,000 brick kilns exist in the country, producing 220 to 280 billion bricks annually using 29-35 million tons of coal and 12 to 16 million tons of biomass for fuel.<sup>2</sup>
- c. The industry consumes around 400-500 million square meters of top soil.
- d. Uttar Pradesh is the largest producer of clay-fired bricks producing around 58 billion clay-fired bricks (about 26% of total country production) using 8 million tons of coal and 2 million tons of biomass
- e. In Punjab, just like in other states, almost all the clay-fired brick production are solid bricks because users and builders still are biased towards using them because of traditional perception of strength, beauty and availability. REBs are not known generally.
- f. At the project design, interactions with the leading brick kiln entrepreneurs and association in Punjab have indicated interest in producing REBs because with the availability and knowledge of benefits of REBs, the market for REBs will increase.

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<sup>2</sup> The TE Team noted different values of the statistics cited in different drafts of the report on "Market Assessment for Resource Efficient Bricks (REBs): Present Production and Future Market". Greentech Knowledge Solutions Pvt., Ltd. The latest update was dated January 2017.

### **2.3. Immediate and Development Objectives of the Project**

The project was designed with the goal of reducing energy consumption, and reducing GHG emissions by creating appropriate infrastructure for sustained adoption of new and improved technologies for production and use of resource efficient bricks (REBs) in India by making brick producing units more energy efficient and resource efficient. Identified five major brick producing clusters (viz. National Capital Region, Punjab, East Uttar Pradesh, Maharashtra and Karnataka) were targeted during the project development and approval stage to be the demonstration areas and as entry points for the countrywide program being envisaged. Five Local Resource Centers (LRCs) were planned to play a key role in setting up the demonstration projects, dissemination activities and providing technical support and trouble shooting of the brick units.

The project is in line with the overall objective of Operational Program 5 (OP5) which is “Removal of Barriers to Energy Efficiency and Energy Conservation” in the climate change focal area. OP5 promotes energy efficiency by removing barriers to large-scale application, implementation and dissemination of cost-effective, energy efficient technologies and practices that will result in the reduction of greenhouse gas emissions.

Specifically, the objective of the proposed medium size project is to make India’s five major brick producing clusters more energy efficient by promoting production and use of resource-efficient bricks, and improving overall efficiency in brick making. This conforms to the strategic objective “Promoting industrial energy efficiency” of OP5.

The objectives of the project is to make India’s five<sup>3</sup> major brick producing clusters more energy efficient by:

- Demonstrating REB technologies and develop technology models (supply side)
- Building awareness and develop sustainable markets for REBs among various stakeholders such as builders, architects, individual end-users (demand side)
- Influencing government organizations, financial institutions and policy and decision makers

UNDP-GEF’s intervention through this Brick Project aims to address the problems and barriers and assist India’s selected five major brick producing clusters.

The Project’s envisaged outcomes are:

1. Enhancing public sector awareness on resource-efficient products.
2. Access to finance for brick kiln entrepreneurs
3. Improved knowledge on technology, including marketing
4. Availability of resource efficient technology models in 5 clusters through Local Resource Centers
5. Improved capacity of brick kiln entrepreneurs

### **2.4. Baseline Projects and Indicators**

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<sup>3</sup> Later the project decided to focus on only in one cluster viz. north region

There is neither list nor description of the baseline projects in the approved ProDoc to provide the status of relevant projects at the start-up stage for which the project can build upon with the incremental activities and outputs that the Project will come up with the financial support of GEF and UNDP. This should have helped in defining the committed counterpart resources that will be provided by partners under the co-financing provisions.

The Project Document also did not elaborate completely the design in terms of baseline problem definition, the incremental analysis, and indicators at base line. Therefore, it was observed that the implementation was somehow affected by the unclear and not-fully-supported project objectives formulation and target setting.

This observation was also reported during the MTR. A proposal was submitted to modify the Log Frame of the project in view of changing situations and the limited resources of this project as an MSP project. A proposal to revise the Log Frame was submitted in September 2011 (before the MTR) in order to update the information and targets therein. **Annex B.2** presents the comparison of the proposed modified log frame with the original. However, the proposed Log Frame modification was not approved by the PSC because it is still not definitive and not fully quantifiable.

## 2.5. Main stakeholders

The project was started to be implemented through national implementation modality (NIM) with the Government of India (GOI) through the Ministry of Environment, Forests and Climate Change (then Ministry of Environment and Forests) assuming overall responsibility for the achievement of project results as the Implementing Partner (IP). The IP signs the annual work Plan (AWP) with UNDP. A National Project Director (NPD) was designated for overall management, including achievement to project results, and for the use of the UNDP/GEF funds for all the project activities to produce the desired outputs.

The Energy and Resources Institute (TERI) acted as the Responsible Party as designated by the GOI to be involved in the day-to-day implementation of project activities and in providing guidance and directions for the project.

The other stakeholders involved in the project include the following with their respective roles:

- *Brick kiln entrepreneurs* - provide their facilities (infrastructure such as kiln and manpower) up to 12 demonstration brick kiln units identified in 5 different brick clusters in India; invest about 30% of the total investments required for technology upgrading; take loans from banks for balance share of investments required on technology upgrading; provide access to their units for carrying out monitoring and evaluation of technologies implemented in their units and participate in training programs which would help in building their skills and capacities.
- *Brick industry associations* - provide support to LRCs during project implementation in organizing various training programs and awareness seminars.

- *Technology suppliers*- finalize the specifications required for various machineries and provide the necessary equipment and machineries per specification. .
- *Local Resource Centres*- play a key role in setting up of demonstration projects which will be equipped with necessary instrumentation to carry out monitoring as well as training; develop DPRs and assist in seeking loan from banks; carry out training programs, awareness generation activities and market promotion and serve as “resource centers” for carrying forward dissemination activities and providing technical support and troubleshooting for new units.
- *Financial institutions and banks* – provide access to loans for investing on technology upgrading during the demonstration stage and set up a trend for other units in the cluster for approaching the banks to invest in their units.
- *End-users* – participate in seminars and interaction that would help them in sensitizing themselves to capacitate them in developing and enhancing the market for resource-efficient bricks.
- *Policy makers* –participate in interaction in policy making especially with those involved in developing specifications and codes for building materials.

## 2.6. Expected Results

The Project’s expected project outcomes and their respective targets that would result to the project goal and objectives include the following:

- Outcome 1: Enhanced public sector awareness on resource efficient products

1.1: Public construction contracts

1.2: Policy advocacy

*Target:* Usage of resource-efficient bricks by new public department building contracts increased by 20% by end of project.

- Outcome 2: Access to finance for brick kiln entrepreneurs

2.1: Identification of national and regional financial institutions (FIs)

2.2: DPR preparation for 12 demonstration projects

2.3: Development of resource efficient brick production project profiles

2.4: Arranging finance for the demonstration projects

*Target:* No. of loans from local banks/ financial institutions for technology upgradation tripled by end of project

- Outcome 3: Improved knowledge on technology, including marketing

3.1: Market research and strategies for market development

3.2: Sensitizing and educating end-users

*Target:* Market share of resource-efficient bricks doubled by end of project

- *Outcome 4:* Availability of resource efficient technology models in 5 clusters through Local Resource Centers

4.1: Identification of brick kiln units and signing MoUs

4.2: Technology sourcing

4.3: Facilitating commissioning of demonstration projects

4.4: Monitoring and evaluation of projects

*Target:* All 12 Units established by end of year 1.

Outcome 5: Improved capacity of brick kiln entrepreneurs

5.1: Development of training module for energy efficiency improvements

5.2: Organization of training programs

5.3: Exposure visits/ Study tours within India

5.4: Conducting awareness seminars

5.5: Development of promotional materials and web site

*Target:* At least 5 Brick kiln entrepreneurs in each cluster invest in technology up grading by end of project



### 3. Findings

#### 3.1. Project Design / Formulation

##### 3.1.1. Analysis of LFA/Results Framework (Project logic /strategy; Indicators)

The Project Logical Framework is shown in **Annex B1** as attached to the Terminal Evaluation TOR (December 2016) which was used as the reference for the indicators, baseline and targets and the project logic/strategy as originally conceived and approved by UNDP/GEF.

However, in the course of implementation, the TE Team was informed that there were initiatives to update the project Log Frame in which a revised Log Frame was proposed in September 2011 in view of the scaled-down implementation to only one brick cluster instead of the original 5 clusters. The proposed Log Frame revisions are shown in **Annex B2** for information regarding the project management intention to update the Log Frame in view of the prevailing circumstances.

In related comments and observations cited in the Mid-Term Review (MTR) Report with the MTR mission conducted in February – March 2012 (MTR report finalized in October 2012), the project design “had a very ambitious target of direct emissions reduction of 187,840 tons of CO<sub>2</sub> in five major brick making clusters in India over 15 years, comprising the savings in energy consumption by the 12 demonstration units that were to be installed by the project and that were to be fully operational by the end of year 1.” The MTR further concluded that “the project is well short of meeting its targets as per the original LFA, and there is now no likelihood that the project could meet the targets set in the original LFA. The project is left with around 1/3rd of the budget and 1/3rd of the time, thus it is important at this stage to prioritize actions and it would be appropriate to revise the LFA. The PFC has already submitted a revised LFA to UNDP.”

However, the revised Log Frame with the proposed adjusted and reduced targets were not adopted by the Project Steering Committee (PSC) as UNDP pointed out that a Log Frame with completely changed set of targets for each of the five outcomes which remained unquantifiable, was not acceptable. After almost two years of suspended operation, mainly due to the long time taken in resolving the financial issue of overcharging in manpower costs, the project resumed its implementation through the approved Annual Work Plan 2015 which defined the completion work based on the original Log Frame including activities and outputs that are needed to optimize the achievement of the objective with the remaining funds. The completion tasks were divided into two parts:

However, the activities needed to be extended further for another year through the approval of the AWP 2016 since the desired outputs were not yet achieved in 2015. The Project was decided to have the final extension up to December 31, 2016 for its closure.

##### 3.1.2. Assumptions and Risks

The assumptions that would influence the success of the project included the following:

- Government policies conducive to modernization of Indian brick industry

- Increasing expectation for adaptation of new product
- Government agencies promoting new resource efficient product in construction sector
- Adaptation of new product by Architects and builders specially around mega cities

During the project design the following served as the risk log of the project:

	Risk Type	Description	Likelihood	consequence	Risk Level
1	Technical	Adoption of technology by brick clusters	Low	High	Moderate
2	Commercial	Adaptation of new product by architects and builders especially around mega cities	Low	High	Moderate
3	Commercial	Small scale industry and financial institutions/banks support and provide timely co-financing in various clusters	Low	High	Moderate

### 3.1.3.Lessons from other relevant projects (e.g. same focal area) incorporated into project design

During the project preparation stage, there was no experience or finding in past or ongoing project cited in energy efficiency in brick making that could be adopted in terms of lessons learned. Thus, the Project is unique as far India is concerned. However, there were ongoing efforts in perforated and hollow brick making in the context of resource efficient (related to top soil and water conservation). Nevertheless, the project was justified on the basis of several opportunities in the Indian brick industry to improve the energy efficiency both in the production REBs and their application in buildings and residences.

### 3.1.4.Planned stakeholder participation

- At the outset, the Key Stakeholders of the project have been identified to consist of the following:
- End-users such as builders, architects and government departments such as MES (Military Engineering Services), CPWD (Central Public Works Department), State PWD, etc.
- Government organizations such as BIS (Bureau of Indian Standards) and BEE (Bureau of Energy Efficiency) for inclusion of the technical specifications of

REBs in their standards

- Other government organizations such as HUDCO, CGCRI, MSME-DI, BMTPC, CPCB, state PCB
- Brick kiln entrepreneurs for technology adoption
- Banks and financial institutions for providing loans to brick kiln units for technology adoption

Based on reports, the TE Team recognizes the active participation of the various stakeholders listed above with particular mention about the participation of the brick kiln manufacturers in hosting and shouldering the cost of the demonstration projects. The GoI through the MOEFCC has been very effective in mobilizing support and participation in the activities and providing inputs from the stakeholders.

#### 3.1.5.Replication approach

The replication approach of the project is anchored on two main strategies: Successful demonstration of the REB production technology (Outcome 4) and increasing the market for REBs (Outcomes 1 & 3). In assessing the project achievement on this important project key result area, the TE team gathered relevant project outputs/activities that will contribute to the project outcome on replication of the project in terms of:

- a. The Project helped nine (9) existing REB unit (which became operational during the project conceptualization and delayed actual project start) in overcoming the initial teething troubles in streamlining the REB production on commissioning through provision of much needed technical assistance and handholding
- b. The project helped in commissioning three (3) new REB units right from identifying project developer, preparing DPR and getting it commissioned with the help of LRC
- c. The additional three (3) new REB projects are in advanced stage of commissioning till the end of project duration (December 2016) and are likely to get commissioned in 2017

#### 3.1.6.UNDP comparative advantage

UNDP's intervention in addressing the above barriers and assist India's the brick producers through the aforesaid project activities is highly advantageous. The brick industry encompasses several sectors both public and private and overarching development objectives and covers multiple programs that need to be synchronized and synergized in achieving the Project goal and objectives. UNDP has the long-term commitment in developing these sectors and in following the relevant UNDAF and CAP that UNDP administers for India. Therefore, UNDP is in a vantage position and has multi-point development approach to help India through the Project to reduce energy consumption, and reduce GHG emissions by creating appropriate infrastructure for sustained adoption of new and improved technologies for production and use of REBs in India.

### 3.1.7. Linkages between the India EE Brick Project and other interventions within the sector

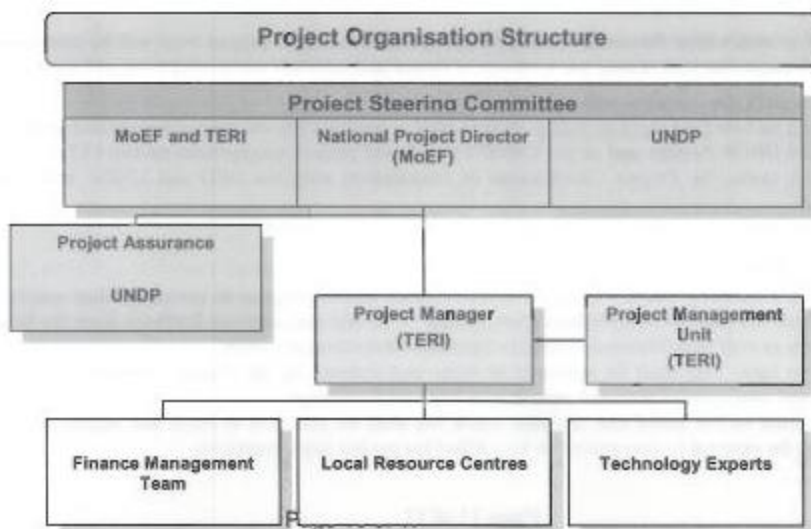
In the course of project development and implementation, there were projects and programs that were ongoing with the common objective of improving the productivity and efficiency of brick kilns in India. The project worked hand and hand with these projects or interventions that may not necessarily be focused in REB production yet. These initiatives include:

- a. Ongoing development in other agencies and institutes on firing techniques and chimney designs in the country, including those in but not limited to: Central Building Research Institute, Punjab State Council for Science and Technology and Aligarh Muslim University;
- b. Government programs and regulations on awareness of pollution control and energy conservation in brick manufacture;
- c. Bilateral projects such as the one supported by the Swiss Agency for Development and Cooperation on capacity building for brick firemen;
- d. Brick making projects being implemented by TERI and other partners
- e. On-going activities in standards development for the brick industry;
- f. Research and demonstration work in various institutes and clusters which are also the local resource centers of the project;
- g. Ongoing initiatives in other UNDP-GEF-supported projects in other countries, such as in Bangladesh, Vietnam and China.

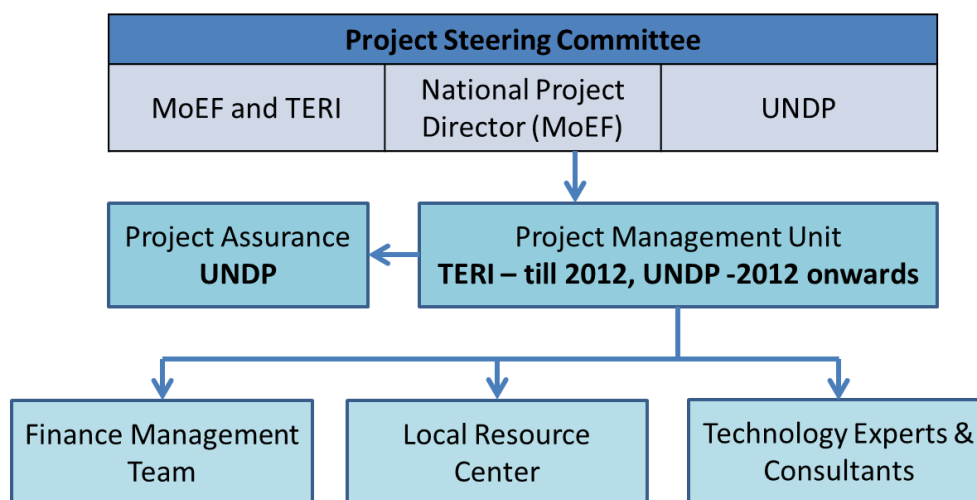
### 3.1.8. Management arrangements

The Project was implemented in the Nationally Implemented Modality (NIM) with the Ministry of Environment, Forests and Climate Change (MOEFCC, formerly Ministry of Environment and Forests) as the Implementing Partner representing the Government of India which assumes the overall responsibility of achieving the expected project results. MOEFCC has officially approved the Annual Work Plans (AWPs) since inception up to 2016 in accordance with the UNDP and GEF rules and regulations. MOEFCC has designated the senior officials of MOEFCC as the National Project Director (NDP) for the Project with the Joint Secretary-International Cooperation (Mr. Bishwanath Sinha as the incumbent NPD during the TE mission. The NPD has been responsible for the overall management, including achievement of expected and planned results, and for the application of the UNDP/GEF funds in pursuit of the Project's goals, objectives, outputs and activities based on approved AWPs.

The Energy and Resource Institute (TERI) was designated as the Responsible Party with the overall responsibility for the implementation of all project activities since inception in 2009. As per ProDoc, TERI is in charge of coordinating and facilitating the project activities in all the five (5) identified brick making clusters and in providing guidance and directions for project implementation. However, in 2014, the arrangement was modified after almost two years of inactivity in implementation when the project was on hold (during 2012-2014) due to some financial issues related to charging of fees. The modified management arrangement starting December 2014 included UNDP Country Office in the implementation in terms of providing direct support in project management and directions in carrying out the completion works for the project towards closure in December 31, 2016. The modified management arrangement also included the Punjab Council for Science and Technology (PSCST) in the Management Team within the specific tasks assigned also to UNDP CO and TERI (for its ongoing activities) as defined in the approved AWP 2015/2016.



**Proposed NIM Structure (2009-2012) in the ProDoc**



**UNDP-Assisted Implementation (2012-2016)**

**Figure 1: Project Management Structures**

The Project Steering Committee (PSC) has performed its tasks in reviewing the progress and in providing direction and guidelines in implementing the project. Among its function included: ensuring that project goals and objectives are achieved within the agreed timeframe, reviewing progress and recommending strategic approaches, reviewing project expenditures against outputs as planned and approving work plans in close coordination with the UNDP which remains as the final authority and responsibility being the implementing agency of GEF.

The members of the PSC during project implementation are the following:

- Joint Secretary (CC) & PD, MoEF (now renamed MoEFCC) (Chairman)
- Director, CC Division, MoEF (now renamed MoEFCC) (member)
- A representative of IC Division, MoEF (now renamed MoEFCC) (member)
- A representative of UNDP (member)
- A representative of TERI (member)
- A representative of HUDCO (member)
- A representative from Swiss Agency for Development and Cooperation (member)

The Project Management Unit (PMU) headed by the Project Manager was organized under TERI's supervision and is assisted by the support teams, namely, Financial Management Unit (within the PMU with the function being exercised by TERI as Responsible Party of MoEF during the first part of the project implementation) and Local Resource Centers (LRCs). At the later part of implementation in the two years toward project closure beginning 2015 onwards, the project shifted to the direct implementation modality (DIM) where UNDP took over the project management and played the role of PMU based on the approved AWP 2015/2016.

The MOEFCC has entered into an agreement with UNDP CO for providing support services in the form of procurement of goods and services and later in 2014, the involvement of UNDP CO in direct support in the implementation of some selected project completion tasks covered by AWP 2015/2016; for both components viz. (a) the TERI Component (without additional funds) and (b) the UNDP Component (utilizing the remaining project fund balance).

### **3.2. Project Implementation**

#### **3.2.1. Adaptive management (changes to the project design and project outputs during implementation)**

In the course of project implementation, the Project experienced a number of challenges and problems which were not foreseen in the design of the project. The following were the measures taken by the Project in adapting to changing situations:

- a. In 2012, the Project had its MTR for which the Project Log Frame was recommended to be revised in view of limited resources and need to focus in one or two clusters only instead of five. However, the proposed log frame was not adopted by the PSC and UNDP because of still unquantified indicators/targets.
- b. In 2012-2014, the implementation was stalled for almost two years due to the financial issues encountered related to higher-than-budgeted staff manpower cost charging prompting UNDP to request TERI as Responsible Party to refund the corresponding value or reprogram activities in order to keep the project on track and accomplish selected project completion tasks that will significantly contribute to the achievement of project goal and objectives. The PSC in close consultation with UNDP CO India approved the AWP 2015/2016 with the purpose of completing the project in December 2016 on an extended timeframe of implementation.

- c. Since project was delayed and the REB units being planned for implementation got commissioned by the time the project formally got kick-started by end of 2009 (as mentioned in the MTR also), there UNDP considered them as needed technical hand holding support to these units to streamline production by overcoming initial teething troubles in adopting new technology. UNDP therefore insisted to implemented additional at least three entirely new greenfield REB projects during the extended project period and at least 25 detailed REB project's bankable investment plans for new identified potential REB units and included them in the AWP 2015/2016 tasks along with resource audit of six brick making units; two each of perforated, hollow bricks and traditional hand-made bricks.

### 3.2.2.Partnership arrangements (with relevant stakeholders involved in the country/region)

The Project has relied significantly on partnerships especially with limited resources as a Medium-Size Project (MSP). Among the notable partnerships entered into by the project and their major contributions in the achievement of project goal and objectives during the project completion phase are with the following:

**a. Punjab State Council for Science and Technology (PSCST)**

- Awareness in stakeholders through workshops and outreach material
- Facilitated interaction between brick industry and equipment providers International Conference
- REB manufacturing technologies demonstrated in 4 industries which manufactured brick of conventional size with perforation (10% to 30%)
- Preparation of Investment Plans for 25 REB units
- Setting up of 3 new REB Units

**b. Greentech Solutions Pvt Ltd (GSKPL)**

- Market assessment for Resource Efficient Bricks: Present Production and Future Markets

**c. Academic and Development Communication Services (ADCS)**

- An audio-visual "Bricking a Greener India" (8 minutes and 30 seconds in length) to create awareness and promote the use of REBs
- A process story "Bricking a Greener India" is under preparation (final draft ready)

**d. The Energy and Resources Institute (TERI)**

- Five model project reports as templates for availing of loans from financial institutions
- Resource audit of 6 brick manufacturing units (2 brick producing units each of perforated bricks, hollow blocks and conventional hand-made solid bricks)
- Preparation of a case study highlighting benefits of using REBs in building construction for architects and builders
- Handbook on construction using REB (clay product)

- Developed and operationalized project website (<http://www.resourceefficientbricks.org/>)
- Preparation of promotional material and organization of awareness creation, training-capacity building workshops

### 3.2.3.Feedback from M&E activities used for adaptive management

The project monitoring and evaluation (M&E) followed the established UNDP and GEF procedures and the M&E Plan as embodied in the approved ProDoc and confirmed in the Project Inception Workshop in November 2009.

The annual reports that were submitted included primarily the Annual Project Report (APR) which serves as the internal report for the project and the Project Implementation Review (PIR) which serves as the common report for UNDP and GEF. Using the Project Log Frame and its indicative baseline and annual targets, the project progress for the year is reviewed by the PSC from which achievements/results and implementation serve as basis for preparation and approval of the next year's AWP as part of the adaptive management process. From results of TE Team's interviews with PMU, the PIR is a very relevant and effective M&E tool for tracking performance per agreed targets and in adapting to changing situation which still keeping the end objective in mind.

The major M&E activity that provided significant adaptive management interventions was the Mid-Term Review (MTR) where in its report submitted in October 2012, has recommended: revision of the Project Log Frame, active support to REB in South India, uptake of REBs and modification of existing BIS standards, setting clear guidelines in the selection of demonstration/replication units, focus assistance in improving energy efficiency of extruders and dryers, strengthening and prioritizing support for South and North India clusters for improving project impact, enhancing government ownership of the REB program, and improving operations and budget management in line with UNDP/GEF guidelines.

However, after the MTR process and its finding and recommendations on the high staff-rate charged by TERI had several negative implications on the project implementation which was due to high staff charge out rates and the time allocation of persons managing the PFU and providing technical support in terms of number of person-weeks of inputs. This observation confirmed the audit findings for the period. The available person-weeks and funds budget have been drastically reduced over those that were originally planned for, thus limiting what could be provided for the other service contracts. The issues took long to resolve and caused the project to stall for almost two years until they were finally resolved and actual adaptive management can be decided and implemented via the AWP 2015/2016. TERI presented their comments and explanations through a series of communications and meetings that were summarized and annexed to the MTR report (October 2012) which led to the resolution of the issues. In 2015, the decision was for UNDP to continue the implementation under a direct implementation modality (DIM) arrangement in order to complete the project activities and achieve project goals and objectives.



## 3.2.4. Project Finance

In summary, the project budget and expenses as of December 31, 2016 at the planned closure of the project is shown below:

**Table 3: Summary of Project Finance**

	Budget at Endorsement (Million US\$)	Expenses at Completion (Million US\$)	% spent /realized as of EOP
GEF Financing	696,448	672,854	96.61%
<i>Remaining GEF fund</i>		<i>23,594</i>	
Co-financing	1,999,000	1,966,065	98.35%
Total	2,695,448	2,662,808	98.79%

*GEF Trust Funds*

As of closing date, there is a remaining fund balance of USD 23,594. The summary of annual budget versus expenditures per Outcome is shown in **Table 5** in the following page.

*Project Co-Financing*

The extent of co-financing realized by the project is valued at USD 1,966,065 as compared to the indicative values during the project approval at USD 1,999,000. The details of the actual co-financing realized are shown below:

**Table 4: Summary of Project Co-Financing**

Co-financing Realized	Estimated Values	
	INR	USD*
• <b>Period 2009-2011</b> (Source: TERI)		
1. Investments in brick kiln units on mechanization	57,954,000	1,143,077
2. Expenses by brick kiln entrepreneurs towards increased knowledge on REBs	479,038	9,448
3. Project implementation expenses by TERI	3,801,891	74,988
<i>Sub-total</i>	<i>62,234,929</i>	<i>1,227,513</i>
• <b>Period 2015-2016</b> (Source: PSCST)		
4. Three (3) new brick kilns	50,000,000	738,552
TOTAL	112,234,929	<b>1,966,065</b>

\* Corresponding to inputs and resources provided as valued in local costs and converted at the conversion rate of USD 50.70 for period 2009-2011 and USD 67.70 for 2015-2016. Further details are seen in Table 6.

**Table 5: Summary of GEF Funds Project Annual Budget versus Expenditures per Outcome (in US \$)**

	2009	2010	2011	2012	2013	2014	2015	2016	Totals
<b>Budgeted (per AWP)</b>									
Outcome 1	117,020	12,459	12459				15,000	15,000	
Outcome 2	0	19,450	19450				16,000	16,000	
Outcome 3	0	34,600	29400				35,000	18,633	
Outcome 4	0	105,250	77750				45,000	47,854	
Outcome 5	0	11,150	12550				65,000	20,565	
Outcome 6	0	28,220	54220				30,000	18,005	
Project Management	0	0							
Communication, M&E, Audit	0	6,530	6,530				11,903		
<b>Total Annual Planned Disbursement</b>	117,020	217,659	212,359	0	0	0	217,903	136,057	696,448*
<b>Actual annual Expenditures (per AWP)</b>	118,605	195,361	124,625	39,954	0	0	81,846	112,543	672,934
<i>% Expended vs. Planned disbursement</i>	101.35%	89.76%	58.69%	0.00%	0.00%	0.00%	37.56%	82.72%	96.62%
<i>Cumulative expenditures</i>	118,605	313,966	438,591	478,545	478,545	478,545	560,391	672,933	672,934
Balance as of December 31, 2016								23,514	23,514

\* This total budget of the project as per Prodoc

**Table 6: Summary of Co-financing Committed versus Actually Realized (in US \$)**

Co-financing (type/source)	UNDP own financing (US\$)		Government of India ( US\$)		Partner Agency ( US\$)		Total (US\$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants	0	0	0	0	0	0	0	0
Loans/Concessions	0	0	0	0	0	0	0	0
Equity investment (Existing 9 brick kilns in 2009 - 2012)	0	0	0	0	1,854,000	1,143,077	1,854,000	1,143,077
In-kind support	0	0	0	0	145,000 (TERI in kind)	74,988* (till Dec 2011)	145,000	74,988
Other investments (3 New Brick kiln entrepreneurs in 2015-2016)	0	0	0	0	0	738,552**	0	738,552
Totals	0	0	0	0	1,999,000	1,071,405	1,999,000	1,071,405

\* Corresponding to inputs and resources at local costs through TERI amounting to an estimated INR 3,801,891 and converted at 1 USD=INR 50.7 (for period 2009-2012) for 9 existing brick kiln which were assisted by the project to improve REB production

\*\* Corresponding to inputs and resources at local costs through PSCST amounting to an estimated INR 50,000,000 and converted at 1 USD=INR 67.70 (2015-16) for 3 new REB kiln units assisted by the project.

### 3.2.5. Monitoring and evaluation

#### *Design at entry and inception (\*)*

The TE Team finds the Project M&E as designed at the endorsement stage and at inception to be robust and according to time-tested procedures and standards of GEE and UNDP.

**\*Rating: (S) Satisfactory**

#### *During implementation (\*)*

If the monitoring of the project implementation according to the M&E Plan has been sufficient and effective, the financial issues on the staff manpower cost should have been detected and adaptive management should have been exercised to mitigate the potential effects of prolonged implementation delays. The TE Team finds that the project M&E system and its implementation as having several areas for improvement in the management of resources allocated for the project. At the project level, the monitoring of the co-financing inputs expected from key partners should have been fully established and consistently enforced as designed and approved in order for it to significantly contribute as an effective tool for tracking their commitment and participation as expected to achieve planned project goals.

**\*Rating: (MU) Moderately Unsatisfactory**

#### *Overall assessment (\*)*

In this regard, the project had severe shortcomings in the regular monitoring and evaluation to keep the project implementation on track and on time.

**\*Rating: (MU) Moderately Unsatisfactory**

### 3.2.6. Implementation and Execution

#### *Implementing Agency (UNDP) execution (\*)*

UNDP had to intervene in the project implementation when the project experienced implementation and execution problems caused by the long resolution of overcharging issues by the Responsible Party. It had to exercise direct adaptive management by assuming the responsibility of implementing the project through a shift of implementation modality from NIM to UNDP-assisted modality in order to resume implementation and complete the project towards its goals and objectives.

**\*Rating: (MS) Moderately Satisfactory**

#### *Executing Agency execution (\*)*

However, the execution of the project could have been improved if adaptive management and more rational decision making had been resorted to earlier on after the financial audit and MTR have been done and their findings and recommendations received and validated in 2012. These fall under the responsibility of the Implementing Partner and the Responsible Party, which is more on the latter under the NIM arrangement. The strategic decisions took much longer that it should normally take within the purview of the PSC responsibility as chaired by the Implementing Partner with the decision making process fully assisted and executed on a day-to-day basis by the Responsible Party. Nevertheless, from the overall project standpoint, the expected outcomes have been satisfied in view of the successful completion of the remaining tasks through the combined co-operation among TERI, MOEFCC and UNDP India Country Office based on the targets and timelines agreed in the AWP 2015/2016 to bring the project to a closure.

**\*Rating: (MS) Moderately Satisfactory**

*Overall project Implementation/execution (\*)*

**\*Rating: (MS) Moderately Satisfactory**

### 3.3. Project Results

#### 3.3.1. Overall results (attainment of objectives) (\*)

The overall project achievement vis-à-vis the ProDoc expected project results (if five clusters were covered) in terms of GHG CO<sub>2</sub> emission reduction is summarized below:

	GHG emission reductions (tCO <sub>2</sub> ) cumulative	
	<u>Project period (2010-15)</u>	<u>15 years post project</u>
<b>ProDoc Target</b>	47,128	187,840
<b>Project Achievement</b>		
9 units during 2009-2012 (Source: GKSPL)	10,171*	30,513
3 new Units installed in 2016 (Source: PSCST)	Nil	13,275
<b>Total</b>	<b>10,171</b>	<b>43,788</b>
<b>% Achieved</b>	<b>21%</b>	<b>23%</b>

\* . In the estimation procedure, to be more conservative, the CO<sub>2</sub> reduction contribution that is attributable to the project was placed at 20% of the total potential CO<sub>2</sub> reduction of the 9 kiln units since they are already existing and the project's TA was only in terms of facilitation and support in streamlining the kiln production operation as they adopt to new REB production technology

### **Assessment rating considering original ProDoc Log Frame consisting of Five Clusters**

In the context of the original project log frame which was designed for the project to have involved five clusters, the TE Team views that the overall rating, to be *Marginally Unsatisfactory (MU)*.

The TE Team is in the opinion that there is no need to provide details on this assessment approach and rather focus the assessment on the approved reprogrammed implementation as discussed below.

### **Assessment Rating based on the Reprogrammed Activities and Completion Tasks**

However, the Project activities and outputs have to be reprogrammed as decided by the PSC and as also recommended by the MTR (2012). Hence, the Project has to concentrate into only one cluster, i.e., mainly focusing in the Punjab cluster, because of project resource limitations and intention of project completion for a long extended project implementation.

Therefore, considering the need to make adjustments in the original targets vis-à-vis what could be practically achieved with the remaining project funds after the MTR and after being under a suspended operation situation for almost two years up to 2014, the Project Steering Committee after several deliberations has decided to close the project by doing the completion works to at least bring the project accomplishments closer to the main goal of the project – *To reduce energy consumption, restrict GHG emissions by creating appropriate infrastructure for sustained adoption of technologies for production and use of REBs in India*. As stated above, it has been accepted that the project can only support only one cluster (focusing in Punjab State with the PSCST, which is a strong advocate of the REBs, acting as the Local Resource Center. Therefore, instead of five (5) clusters as envisaged in the original project objectives, the Project has to be completed by focusing in the North Cluster in Punjab considering the prevailing circumstances that the project has experienced.

The PSC, in close consultation with the UNDP CO India has supported the two-year project completion works by virtue of the approved AWP 2015/2016 which lined up all the necessary tasks that need to be accomplished and set the project closure in December 31, 2016. **Table B3 - 1: Target and Actual Achievement of ProDoc Log Frame Outcomes and Ratings in Annex B3** which presents the assessment, analysis and ratings of performance based on how the AWP 2015/2016 plans and outputs met the original Project Log Frame Expected Outcomes, by significantly attaining the desired results in an accelerated phase with the resources and scope of an MSP Project. Against this backdrop, the result of the analysis using the key evaluation criteria in the TE TOR on relevance, efficiency and effectiveness, is summarized in **Table 7** below:

**Table 7: Assessment Ratings on Actual (as of EOP Dec 2016) vs. AWP 2015/2016  
Reprogrammed Completion works to meet Original Log Frame Objectives**

Outcomes	<u>Target and Actual Achievement vs. ProDoc Log Frame Outcomes</u> <b>EOP Dec 2012 Target</b> • [Actual Achievement EOP Dec 2016]	Assessment Ratings on Actual (as of EOP Dec 2016) vs. AWP 2015/2016 Completion works		
		Relevance	Efficiency	Effectiveness
Objective	Year 5: reduction of 59,920 tCO <sub>2</sub> • [Estimated 43,788 tCO <sub>2</sub> of GHG emission reduction]	2	3	4
Outcome 1: Enhancing public sector awareness	<u>Public construction contracts</u> • [REBs included in procurement schedule in Punjab PWD] • [Revision of BIS is in advance stage]	2	3	3
	<u>Public Advocacy</u> • [Increased awareness in the industry, brick producers and public as feedback in seminars and workshops conducted, and project assessment reports]	2	3	4
	Year 4: Increase usage of REBs by 20% • [150% increase in sale of perforated bricks and 200% in hollow bricks from baseline] • [Producing 106.3 million bricks annually]	2	4	4
	<i>Outcome 1 Summary of Ratings</i>	2 <sup>@</sup>	3 (MU)	4(MS)
Outcome 2: Access to finance for brick kiln entrepreneurs	<u>Identification of national &amp; regional financial institutions</u> • [National and regional meeting with FIs planned in 2017 Q1]	2	3	3
	<u>DPR preparation for 12 demonstration projects</u> • [33 (instead of planned 25) bankable investment plans to establish REB units]	2	4	4
	<u>Development of resource efficient brick production project profiles</u> • [5 model project reports templates for availing loans from financial institutions] • [Resource Audits of 6 brick manufacturing units: 2 each of perforated bricks, hollow blocks and conventional hand-made solid bricks]	2	3	4
	<u>Arranging finance for the demonstration projects (12 REB units in 5 different clusters.</u> • [Market linkage support to 9 REB kiln units] • [Financial support arranged for 3 newly commissioned units and additional 3 units to be commissioned in 2017]	2	3	3
	<i>Outcome 2 Summary of Ratings</i>	2 (R)	3 (MU)	3 (MU)
Outcome 3: improved knowledge on	<u>Market research and strategies for market development</u> • [25 Feasibility reports prepared for new	2	3	3

Outcomes	<b>Target and Actual Achievement vs. ProDoc Log</b> <b>Frame Outcomes</b> <b>EOP Dec 2012 Target</b> • [Actual Achievement EOP Dec 2016]	Assessment Ratings on Actual (as of EOP Dec 2016) vs. AWP 2015/2016 Completion works		
		Relevance	Efficiency	Effectiveness
technology marketing	interested REB entrepreneurs] • [REB Investment guide prepared] • [Market assessment study “REBs: Present Production and Future Markets”] <b>Sensitizing and educating end-users</b> • [Conduct of seminars and workshops clearly highlighting REB benefits]	2	4	4
<i>Outcome 3 Summary of Ratings</i>		<i>2 (R)</i>	<i>4 (MS)</i>	<i>4 (MS)</i>
Outcome 4: Availability of resource efficient technology models in 5 regions through Local Resource Centers.	<b>Identification of brick kiln units and signing MoUs</b> • [3 New REB Units commissioned viz. Hisar (Haryana), Solan (Himachal Pradesh) and Amritsar (Punjab)] • [3 more units likely in 2017]	2	3	4
	<b>Technology sourcing</b> • [Provided linkage with suppliers and technical advice]	2	4	4
	<b>Facilitating commissioning of demonstration projects</b> • [Technical handholding and facilitation support provided to 9 REB units]	2	4	4
	<b>Monitoring and evaluation of projects</b> • [Submitted M&E reports as required]	2	3	3
<i>Outcome 4 Summary of Ratings</i>		<i>2 (R)</i>	<i>4 (MS)</i>	<i>4 (MS)</i>
Outcome 5: Improved capacity of brick kiln entrepreneurs	<b>Development of training module for energy efficiency improvements</b> • [Developed modules which were used in the trainings]	2	3	4
	<b>Organization of training programs (2 programs /yr per cluster. Total 40 programs &amp; 2000 beneficiaries)</b> • ~40 workshops, seminars, meeting	2	3	4
	<b>Exposure visits/ Study tours within India</b> • Completed study tours and visits	2	4	3
	<b>Conducting awareness seminars (5 programs; 500 entrepreneurs)</b> • More than 1000 engineers, 1,600 brick entrepreneurs, 200 architects/builders, 150 government officials, and machinery suppliers & other stakeholders trained.	2	4	4
	<b>Development of promotional materials and web site</b> • Two audio-visuales: “Bricking a Greener India” (one 8 min & one short 30 seconds ) and Documentation of project information, findings, learning, etc. in the form of process story/resource book	2	4	4



Outcomes	<b>Target and Actual Achievement vs. ProDoc Log Frame Outcomes</b>	<b>Assessment Ratings on Actual (as of EOP Dec 2016) vs. AWP 2015/2016 Completion works</b>		
	<b>EOP Dec 2012 Target</b> • [Actual Achievement EOP Dec 2016]	<b>Relevance</b>	<b>Efficiency</b>	<b>Effectiveness</b>
	• Project has operational website ( <a href="http://www.resourceefficientbricks.org/">http://www.resourceefficientbricks.org/</a> )			
	<i>Outcome 5 Summary of Ratings</i>	<i>2 (R)</i>	<i>3 (MU)</i>	<i>4 (MS)</i>
	<b>Per Criteria Rating</b>	<b>2 (R)</b>	<b>3 (MU)</b>	<b>4 (MS)</b>
	<b>OVERALL PROJECT RATING</b>	<b>4 (MS)</b>		

### Summary of Accomplishment Ratings based on Reprogrammed Implementation

Based on the above, the project results under the AWP 2015/2016 terms of reference are rated as:

- **Relevant** - The project is suited to local and national development priorities and organizational policies, including changes over time and it is in line with the GEF Operational Programs or the strategic priorities under which the project was funded.
- **Moderately Unsatisfactory (MU) in terms of Efficiency** - The project had significant shortcomings in the delivery of results according to prescribed timeframe and scope though the project operated within the budgeted resources available under the MSP category in spite of some financial issues encountered and resolve. Details of this assessment can be seen in **Table 7** above on actual (as of EOP Dec 2016) vis-à-vis the AWP 2015/2016 reprogrammed completion works to meet the original Log Frame objectives.
- **Moderately Satisfactory (MS) in terms of Effectiveness** - There were moderate shortcomings on the extent to which an objective has been achieved or how likely it is to be achieve.
- **Overall Rating: Marginally Satisfactory**

The overall rating of the achievement of project results based on the reprogrammed implementation is **Marginally Satisfactory (MS)**. This is based on the following major outputs which the Project has achieved for the last two years (2015-2016) in pursuit of the expected outcomes. These are briefly elaborated in the following paragraphs:

1. Facilitation to 9 existing nine plants, 3 New REBs commissioned, 3 likely in 2017
2. Resource Audit of 6 brick manufacturing units
3. Market linkage support to 12 REB units
4. ~40 workshops/seminars/meeting (~2700 Persons participated)
5. 5 model project reports templates for availing of loans from financial institutions
6. REB Investment guide prepared

7. Market assessment for REBs: Present Production and Future Markets”
8. 33 (instead of planned 25) bankable investment plans to establish new REB units
9. Two audio-visual & process story documenting project findings, learning, etc.
10. Project operational website (<http://www.resourceefficientbricks.org/>)
11. Inclusion of REBs in schedule of rates by PWD, Government of Punjab
12. Revision of REB codes under Bureau of Indian Standards (in progress)
13. Preparation of promotional material and organization of awareness creation, training-capacity building workshops

## Elaboration of the Major Project Accomplishments

1. **Facilitation to 9 existing plants, 3 New REBs commissioned, 3 likely to be commissioned in early 2017**

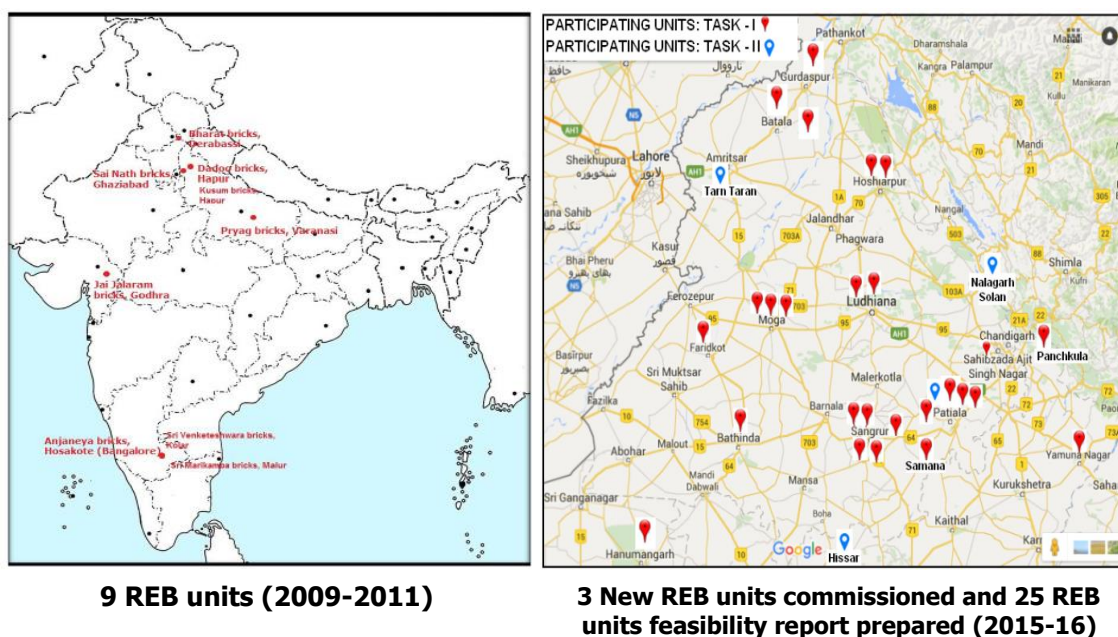


Figure 2: Distribution of REB units under project

### a. Nine (9) Existing REB units

The project was designed to have 12 REB-making demonstration plants as the vehicles for pursuing the objectives of the Project. There were nine (9) REB units that were included in the facilitation works provided by the Project since they have been in existence when the Project started to be implemented. As observed by the MTR, eight (8) of the “demonstration” plants had the necessary machinery (extruders) for producing REBs and at least four units were commercially producing REBs before the start of the project.

In general, access to financing is not a concern for the 12 REB units being supported by the project as what was observed also by the MTR Team (2012). The barriers regarding access to finance as identified in the ProDoc has remained as not appearing to be significant because any entrepreneur including brick makers can avail of financing based on their own credit

capacity and standing. Accordingly, there was no finance-related barrier which needs to be addressed by the Project in its completion works.

Hence, the Project focused on providing direct technical assistance and “holding them by the hand” in their shift to more modern and sustainable techniques in producing REBs. At the early part of project implementation, there was generally no increase in perforated brick and/or hollow block production during 2011 compared to 2010. By 2016 at project closure, production in the 5 out of 9 REBs significantly increased in the range of 149% to 7,330% increase versus the 2010 level.

**Table 8: Nine (9) REB Manufacturing Units Supported by the Project (2009-2011)**

Brick Manufacturing Unit	Product	Fuel used	Production (2010) tons/ year	Production (2011) tons/ year	Estimated Production (2015/16) tons/ year	% Increase 2016 vs. 2010 level
1. Jay Jalaram Bricks, Gujarat	Perforated Brick	Mainly coal	10,314	8,100	8,100	0%
2. Bharat Bricks, Punjab	Perforated Brick	Mainly coal	4,760	8,855	11,870	149%
3. Prayag Bricks, UP	Perforated Brick & Hollow Block	Mainly coal	2,339	2,622	7,254	210%
4. Kusum Bricks, UP	Perforated Brick & Hollow Block	Mainly coal	7,370	6,030	-	NA
5. Dadoo Bricks, UP	Perforated Brick & Hollow Block	Mainly coal	0	8,375	7,332	-12%
6. Sai Bricks, UP	Perforated Brick	Mainly coal	26,800	16,000	1,466	-95%
7. Aanjaneya Bricks, Karnataka	Hollow Block	Biomass	1,875	0	10,800	476%
8. Marikamba Bricks, Karnataka	Hollow Block	Biomass	242.5	0	2,700	1,013%
9. Lakshmi Venkateswara, Karnataka	Hollow Block	Biomass	15	0	1,114	7,330%
			53,716	49,981	50,636	-2%
<b>Percent increase in Production</b>						

Source: MTR October 2012 for Production 2010 and 2011. The TE Team (2017) gathered production data for 2015/2016.

It will be noted that the increases in production from 2010 to 2016 for the 9 brick kilns supported by the project varied with too large a bandwidth. In five units growth of the order of 150% to 7,730% can be observed but in others it has also observed to be declined. This may be

due to the individual operating and market conditions of each brick kiln. Those with higher increases in REB production for the period are those that have responded well to the project's technical assistance and hand holding. But in general, the growth in overall REB production of the 9 brick kilns was seen as a declining trend. It is also noted that these 9 brick kilns have already existed when the Project started. Nevertheless, the 9 demo brick units served very largely in the promotion and experience sharing for the other brick makers thereby influencing a major increase in the overall REB production.

*b. Three (3) newly commissioned REB units*

Additionally, the Project has directly assisted three (3) more brick makers to produce REBs, thus hitting the targeted number of REB units before the project ended. The assistance provided by the project is in terms of identifying the project site, technology, developing bankable investment plan, facilitating finances and technical support during implementation and commissioning of the plant, in the light of experience in the first 9 existing brick kilns supported. The production level and fuel used by each new REB unit is seen below.

**Table 9: Additional newly Commissioned REB Manufacturing Units Supported by the Project**

<b>Additional REB Units, Location</b>	<b>Date Commissioned</b>	<b>Product</b>	<b>Fuel used</b>	<b>Production Capacity, Tons/yr.(Production since commissioning)</b>
1. Sonipat (Haryana)	November 2016	Perforated brick	Coal & biomass	24,400 (148.2)
2. Solan (Himachal Pradesh)	Plant ready to be commissioned by 31 March 2017	Perforated Brick	Coal	18,000 (151.0)
3. Amritsar (Punjab)	November 2016	Perforated Brick	Coal	27,000 (114.5)
Total				79,400 (413.8)

*c. Three (3) Likely to be commissioned in 2017*

The Project has also supported and facilitated the realization of the following additional three (3) new REB units that will likely be commissioned after the Project has ended, i.e., within 2017:

**Table 10: Additional Likely to be Commissioned REB Manufacturing Units in 2017 Supported by the Project**

Brick Manufacturing Unit, Location	Investment in Lac Rs. (US\$)	Product	Fuel used	Production Capacity (2017) tons/year
1. Lucknow (Uttar Pradesh)	305.00 (US\$ 464,667)	Perforated bricks/hollow blocks	Coal	27,000
2. Hissar (Haryana)	201.31 (US\$ 306,035)	Perforated bricks	Coal	21,000
3. Ludhiana (Punjab)	237.61 (US\$ 361,219)	Perforated bricks	Coal	30,000
Total	743.92 (US\$ 1,130,931)			78,000

The project has provided technical assistance and facilitated and arranged the financial support for these units.

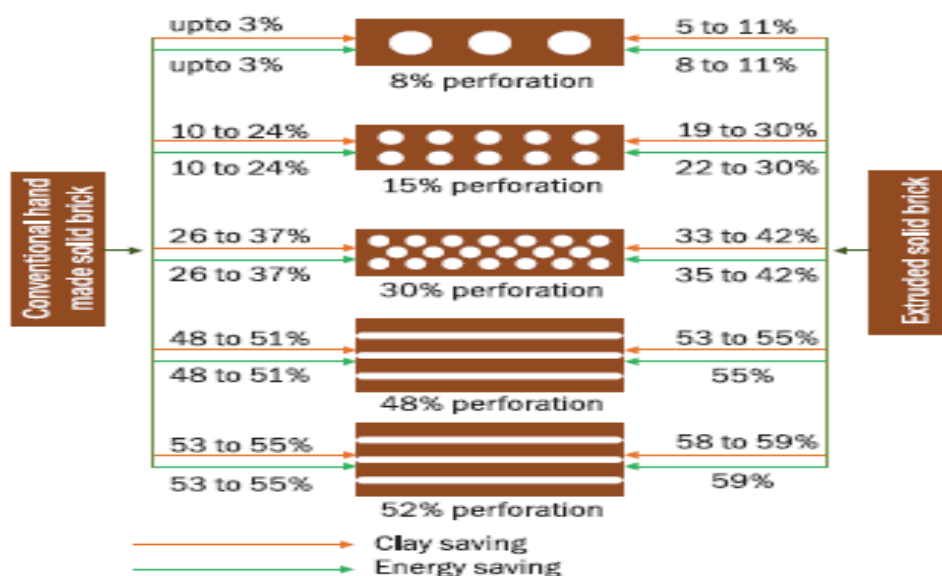
## **2. Resource Audit of 6 brick manufacturing units**

REBs consisting of perforated and hollow bricks consume less energy in production (coal and biomass) as well as resources (top soil and water). Because of lighter weight and good insulating characteristics, REBs require less cement and steel when already being used in building construction and less energy consumption in buildings and houses for being weather-friendly in terms of reduced cooling load during summer and preservation of heat during winter.

Resource audits of 6 brick manufacturing units were conducted for 2 each of the following:

- Perforated bricks,
- Hollow blocks and
- Conventional hand-made solid bricks.

Below is the graphical illustration of the clay saving and energy saving validated by the Project in producing REBs across different percentages of perforation or voids when compared to hand-made solid brick and extruded solid brick.



Source: TERI

**Figure 3: Clay Saving and Energy Saving for REBs across different Percentages of Perforation**

For instance, REBs with 30% perforation, the clay saving and energy saving are same at 26-37% when compared to conventional hand made solid brick. On the other hand, for the same perforation level, clay saving is at 33 – 42% and energy saving is 35 – 42% when compared to extruded solid brick.

### 3. Market linkage support to 12 REB units

Because of the salient benefits of REBs, there is the need to transform the market towards REBs which is the primary objective of the EE Brick project. The project has done very significant interactions with leading brick kiln entrepreneurs, brick makers association and pertinent government agencies in building the market for REBs especially in recognizing its entry into the building standards and specifications through the Bureau of Indian Standards (BIS). The project has established market linkage for the 12 REB units that it has supported through various information and promotional activities which is envisaged to expand as replication projects in other states and brick producing clusters in the future. In Punjab, where this MSP project has concentrated the developmental work in a scaled-down scope into one cluster instead of five clusters, the PSCST has hand held the entrepreneurs by providing valuable technical assistance and said market development linkages which could serve as model for the replication of REB production and marketing into other clusters.

### 4. ~40 workshops/seminars/meeting conducted (~2700 Persons participated)

During the course of project implementation large number of (around 40) workshops, seminars, and meetings have been organized during which more than 1,000 engineers, 1,600 brick entrepreneurs, 200 architects/builders, 150 government officials, and machinery suppliers and other stakeholders have been trained. These included awareness workshops for government officials, architects, potential REB manufacturers, training programs for masons, interaction workshops for various stakeholders etc.

#### **5. *Five (5) model project reports templates for availing of loans from financial institutions***

In order to help potential REB manufacturer to come forward and go for REB production in future and access the finance for setting up the project, the project has developed five (5) model detailed project reports (DPR) template for different capacities and different regions. These are as follows:

- Model DPR for 100 lakh REBs per day capacity (North India)
- Model DPR for 100 lakh REBs per day capacity with drier (North India)
- Model DPR for 25,000 bricks per day capacity (South India)
- Model DPR for 75,000 bricks per day (South India)
- Model DPR for less than 50 Lakhs bricks capacity (North India)

#### **6. *REB Investment guide prepared***

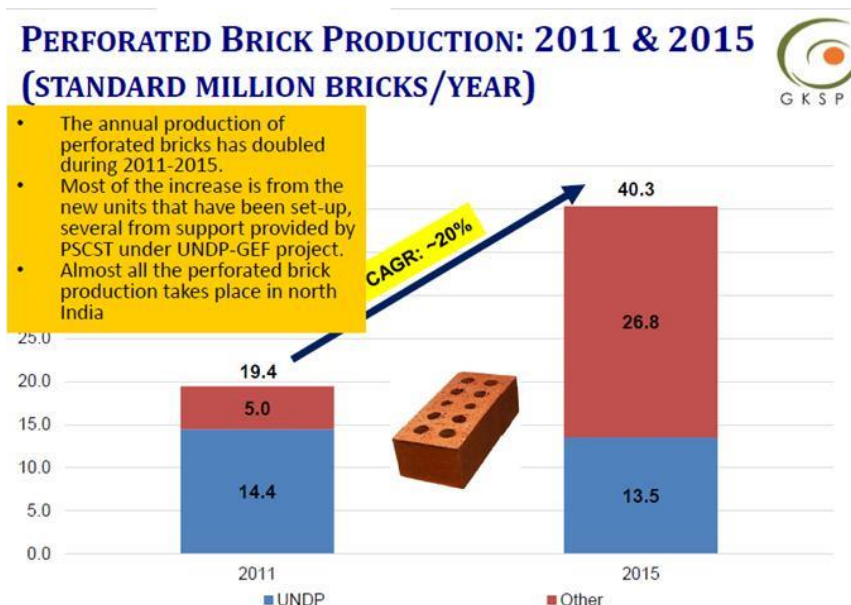
The project has developed a comprehensive investment guide for REB production units to help the brick kiln entrepreneurs and financial institutes in taking informed decisions and result in an increase in the quantum of financing to this sector. The guide gives a brief background of the sector and the importance and need for going into REB manufacturing because of its advantages with regards to resource efficiency, economic benefits, as well as environmental benefits. The guide also describes the REB technology and potential vendors for helping them to implement it. The techno-financial analysis presented in the investment guide clearly highlights that investments in REB producing units is attractive for both, brick kiln entrepreneurs as well as financial institutes.

#### **7. *Market assessment for REBs: Present Production and Future Markets***

A detailed market assessment study was assigned to undertaken under the project with the aim of:

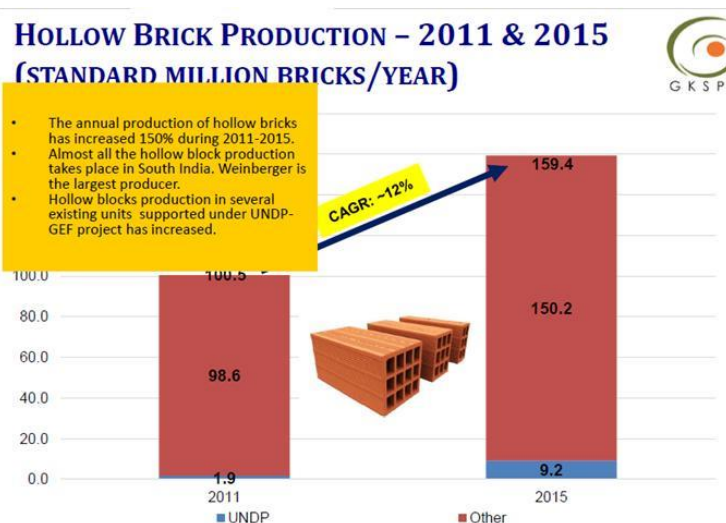
- Assessing the status of production capacity and market for burnt clay REBs
- Identifying key drivers and barriers in the growth of market for burnt clay REBs
- Projecting future demand for bricks and market potential for burnt clay REBs under different scenarios
- Suggesting policy and other measures needed to develop the market for burnt clay REBs.

The study observed that the annual production of perforated bricks has doubled during 2011-2015. Most of the increase was from the new units that have been set-up, several from support provided by PSCST under UNDP-GEF project almost all perforated brick production taking place in north India. (See **Figure 4**).



**Figure 4: Increase in Production of Perforated Bricks**

During the same (2011-2015) period the annual production of hollow bricks has increased by 150% and almost all the hollow block production taking place in South India. (See **Figure**

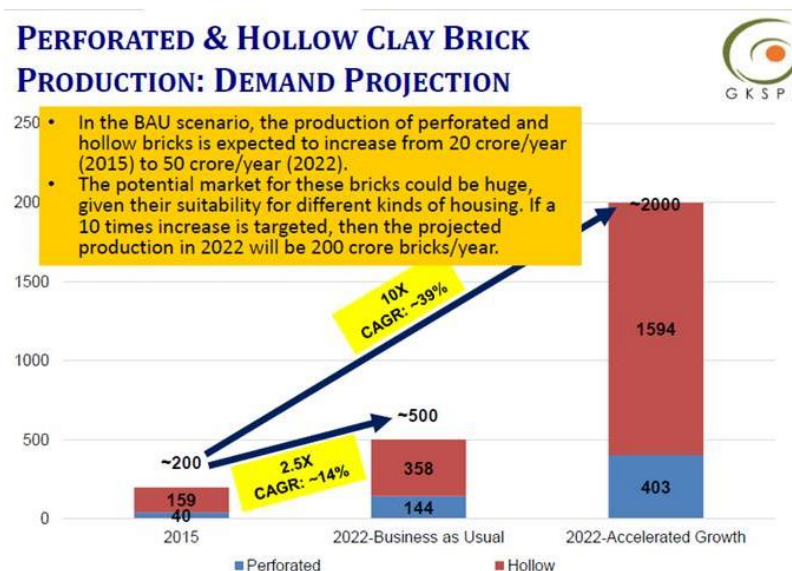


**Figure 5: Increase in Production of Hollow Bricks**

5) Though the Weinberger is the largest producer of hollow bricks, several other existing hollow blocks production units were provided technical support and facilitation support under UNDPGEF project helping them to overcome initial teething problems and thereby helping them to increase their production.



The study also tried to assess the future demand for REBs in the Indian market. According to the study under the BAU scenario, the production of perforated and hollow bricks is expected to increase from 20 crore/year (2015) to 50 crore/year (2022) (See **Figure 6**). The potential market for these bricks could be even huge, given their suitability for different kinds of housing and thus with a 10 times increase target, the projected production in 2022 would be 200 crore bricks/year.



**Figure 6: Production of Perforated and Hollow Bricks vs. Demand<sup>32</sup> (instead of planned 25) bankable investment plans to establish REB units**

Under the Project, preparation of 26 investment plans for REB units under Task-1 and 3 bankable detailed project reports (DPR) under Task-2 has been achieved through the facilitation support to the REB entrepreneurs by LRC. The DPR inclusive of investment plan for all 26 units under Task-1 and 6 units under Task-2 has been prepared for working out cost-benefit analysis of the unit after adopting REB manufacturing technology or a total of 32 investment plans. Out of 26 units studied under Task-1, 23 units have opted to produce lay perforated bricks (with perforations more than 20%) whereas remaining 3 opted to adopt fly ash brick technology.

#### **8. Two audio-visual & process story documenting project findings, learning, etc.**

In order to document the entire story of project implementation as well as capturing major outcomes and valuable learnings of the project, a comprehensive document in the print form was prepared under the Project in order to help retain the project memory for future interventions.

In order to help disseminate the project findings, and key message to create mass awareness two audio-visuals were prepared: "Bricking a Greener India" (one 8-minute AVP giving detailed information) and one short 30 seconds AVP (clipping for promoting on television media).

At the time of TE, the final draft of the same was shared which was planned to be produced within weeks' time after getting go ahead approval for its printing and production, respectively.

### 9. Project operational website

The project has an operational website, which provides quite useful information on the project and provides access to the technical reports, papers, and test results. The website can be assessed through the link <http://www.resourceefficientbricks.org/>.

It gives brief updates of project presenting its goal, objectives, vision and approach. Various sections/pages of the website provide case studies, directory, useful resources as well as updates and information of relevant events, announcements and quick links for downloads. It is a good learning and knowledge sharing platform.

## Screenshot of Project Website



### 3.3.2. Country ownership

The extent of country-level coordination in support of country ownership for the Project implementation appears not very well-founded since the project has to shift the mode of implementation from NIM to UNDP-supported modality. This organizational change was

resorted so as the project would continue implementation and complete the project after being on hold for almost two years. This situation has affected very much the efficiency and effectiveness of project implementation in order to pursue the project's objectives and goal in the prescribed timeline. If the support systems were functioning properly, e.g. monitoring and evaluation, the deviation from agreed budgets for charging manpower costs should have been detected and resolved promptly. However, on the aspect of relevant policies and programs as indicator of country ownership of the brick making improvement program, the Government of India has maintained its drivenness towards central policies and regulations that support production and utilization of REBs in commercial and residential buildings.

### 3.3.3. Mainstreaming

The project has been involved in promoting REBs with the end objective of mainstreaming their production and utilization in the country's building sector. For example, to increase market for REBs, it was required to look at both purchases by public sector and private sector. For Public sector units (PSUs) to purchase REBs, it was essential that REBs are included in the procurement schedule. REBs inclusion in Indian Standards was helpful for the PSU to consider its inclusion in procurement of materials. The project worked with different PSUs and the governmental agencies. For instance, the Public Works Department of the Government of Punjab was the first to include REBs in procurement schedule. This can be stated as most significant achievement of the project. In all, to increase market, workshops were conducted by project partners for the target groups included architects, REB producers, machinery manufacturers, REB users, government officials, etc. as guided by market assessment for REBs to provide insights into REB market and influence the mainstreaming of REBs.

### 3.3.4. Sustainability:

#### Summary of Ratings:

Financial resources (\*) – (MS) Marginally Satisfactory

Socio-economic (\*) – (MS) Marginally Satisfactory

Institutional framework and governance (\*) – (MU) Marginally Unsatisfactory

Environmental (–) - (MS) Marginally Satisfactory

Overall likelihood (–) - (MS) Marginally Satisfactory

The following findings of the TE are in support of the above sustainability assessment:

- Project has been successful, though to limited scale when compared to the entire LFA targets for 5 regions, but made breakthroughs in North Region in the following:
  - in policy (a) by the inclusion of REBs in procurement guideline in one State (Punjab) and (b) the advance stage in formally including REB in BIS

- in providing TA which is needed by REB manufacturers to make REB sustainable.
- Resource audit reports of REB production units indicate significant energy saving coupled with corresponding GHG emission reduction.
- Project has also developed various project development templates for seeking finance or loan for setting up REB units in 33 locations in terms of bankable investment plans.
- Among planned 5 LRCs by the project, only LRC-North (PSCST) is committed to continue to provide support to REB makers even after end of project.
- It is shown by PSCST that key factor for REB sustainability is the ability of LRCs to continue providing TA, advice, networking and other support services to brick makers after end of project

### 3.3.5. Impact

The Project's overall impact is summarized as:

- 150% increase in sale of perforated bricks and 200% in hollow bricks from baseline
- Producing 106.3 million bricks annually
- Estimated 43,788 tCO<sub>2</sub> of GHG emission reduction cumulative over 15 years project period

The intended impact was to achieve project GHG emission reductions of 47,128 tonnes of CO<sub>2</sub> over project implementation lifetime of four years and a target of 187,840 tonnes of CO<sub>2</sub> reductions over 15 years, as specified in the ProDoc, comprising the savings in energy consumption by planned 12 demonstration units in five major brick making clusters in India. However, as mentioned earlier, the project decided to focus on only one (northern) region as per recommendation during mid-term review and also revised its target to install 3 new REB units in addition to 9 existing units for which facilitation support was provided (20% of GHG emission reductions were accounted for these as recommended in MTR). In the estimation procedure, to be more conservative, the CO<sub>2</sub> reduction contribution that is attributable to the project was placed at 20% of the total potential CO<sub>2</sub> reduction of the 9 kiln units since they are already existing and the project's TA was only in terms of facilitation and support in streamlining the kiln production operation as they adopt to new REB production technology. It is noted in this TE Report that TERI has reiterated their objection to this methodology as they indicated previously in their response to the MTR Report in October 2012..

The Project has provided market linkage support to nine (9) REB units which has resulted increased production of REBs (out of nine five have shown drastic increase in the range of 150% to 7330% but other have declined or exited as mentioned earlier) and in the last five years with average production of 106.3 million bricks annually. This is estimated to have resulted in significant energy saving during production that translates to approximately 10,171 tCO<sub>2</sub> of reduction in GHG emission during the project period which accounts for 21% of targeted 46,128 tCO<sub>2</sub> during the period of 2010-2015. The estimated GHG saving

from these 9 units and 3 new units commissioned during the final year of project period over 15 years project period translates to 43,788 tCO<sub>2</sub> i.e. 23% of targeted reduction of 187,840 tCO<sub>2</sub>.

## 4. Conclusions, Recommendations & Lessons

### 4.1 Conclusions:

- India Brick EE Project has been financially and operationally closed on December 31, 2016, as extended through 2015 & 2016 AWP
- The Project was able to overcome the problems and challenges (2011 to 2014 due to some financial/audit issues) which was compensated by the 2015/2016 completion works.
- Ambitious targets for an MSP; Completion works concentrated in Punjab state by PSCST in North Cluster (instead of 5 clusters) within the allocated budgets to meet project objectives
- Performance Ratings:
  - Overall project results (based in the reprogrammed/adjusted 2015/2016 work programs): **Moderately Satisfactory (MS)**
    - Relevance: Still very appropriate given changed circumstances and market characteristics
    - Sustainability: Likely to deliver desired benefits for the coming 10-20 years after its completion
    - Replicability: Big potential for replication as demonstrated in Punjab in mechanization, training and viability; to cover other regions
  - Synergistic approach proved to be very necessary in sustainable REB making and application due to very wide scope and number of stakeholders
  - More government support and fund mobilization critical to realize REB economic and sustainable development and environmental potential

### 4.2 Recommendations:

- *Fast track inclusion of REB in public sector procurement guidelines and expedite adoption of relevant REB BIS standards also in other states*

Project has achieved success in including REBs in procurement schedule/guidelines of PWD in state of Punjab due to the team effort of the project key stakeholders. However, real success and significant real visible impact would happen only if this happens on much larger scale not only in all PWDs in Punjab but also in other states as well as in other public sector procurement schedules. There is need to enhance efforts in this direction in future and ensure REB gets

included in procurement schedules of large number of PWDs and other public sector agencies across the country.

- *Enact relevant REB-favourable national policies and mobilize REB program funding support to sustain the project's breakthroughs and momentum as gathered in terms of REB technology application, fuel and material savings, environmental benefits and institutional strengthening*

In order to achieve project goal of promoting energy efficiency to reduce GHG emissions through promotion of REBs (perforated bricks and hollow blocks) there is need to expedite follow-up with Chairman of CED-30 committee of Bureau of Indian Standard (BIS) to complete incomplete task of inclusion of REBs in relevant standards like BIS code related to REB viz. IS 2222 : 1991 (Specifications for burnt clay perforated building bricks), IS 3952 : 2013 – Specifications for burnt clay hollow bricks and blocks for walls and partitions.

This will help a lot in large scale promotion of REBs considering very high relevance of project in view of Government of India's ambitious mission to provide home for all its population by 2022 resulting in huge demand for REBs which can significantly reduce energy demand for meeting bricks demand and help reduce high volume of HG emissions associated with its production.

- *Designate (a) program lead ministry/agency who could continue integrating the overarching REB objectives and sub-programs more effectively at national level for policy and (b) regional resource centres for implementation at state level as modelled in Punjab*

The brick manufacturing sector does not come under purview of any particular ministry or department and does not come under the conventional industry norms too and mostly considered as an unorganized, basically grass-root industry. However, it has impact and linkages with several sectors like labour (being labour intensive employing huge unskilled, semi-skilled manpower), energy (being cumulatively second largest sector consuming coal after power plant though in disperse manner) and rural development (as it is mostly located in rural or peri-urban areas) and environment (due to cumulative vast pollution in a dispersed manner). Therefore, for having a holistic approach and rapid results-oriented development of this sector, particularly due to its increased importance with what was envisaged to be experiencing massive growth in the coming years with the government's mission of "House for All by 2022", the brick sector needs a lead agency to own and develop the program. Therefore, considering the past experience, the fact that it is one of the biggest polluting sectors and the need for a pragmatic resource conservation program, the MoEFCC appears to be the natural choice for the lead role in brick making and utilization sub-sector.

- *Take advantage of south-south/triangular cooperation for REB technology application to accelerate mechanization and standardization*

There is a lot of co-operation and synergism opportunities to enhance knowledge-experience sharing, benefits from complimentary expertise, insights, accelerate pace of technology upgradation, scaling up in this sector with other developing countries in Asia as well as Africa. Therefore, there is need to plan and implement bilateral or multi-lateral programs for technology and knowledge transfer and sharing among key countries and stakeholders in future for achieving rapid and fruitful development of the sector with unified approach and leveraging

from capacity and knowledge insights of individual country(ies) which could be orchestrated by UNDP or other developmental agencies.

- *Utilize remaining funds (~USD 20-25 thousand USD) for finalizing the sustainability plan (or an exit/post-project strategy) in realizing REB scaling-up and for disseminating project results and action plan and seek support in GEF 7 or GCF or national funding for 'REB Mission'*

Project has achieved reasonably good success in creating awareness about need and importance of promoting REBs in the country. Project also moderately succeeded in demonstrating the REB producing technology and units as well as in quantifying its benefits.

Successful inclusion of REBs in procurement schedule in Punjab and market potential studies of REBs done calls for not losing momentum gained in promoting REBs and so there is need to evolve series of actions in order to capitalize on success and momentum gained for scaling up REBs across India in near future.

- *Comparative study showcasing efficacy of the REBs of the building that uses REBs compared to other the conventional/traditional building material (hand moulded and compact press moulded or Hollow concrete blocks*

On the REB production side, REBs are made from the same raw material (clay), same technology (moulding, drying and firing in kilns) and same fuel (coal or biomass/agro residues), so what makes it resource efficient is reduction in material (hollow), reduction in energy consumption (fuel) due to less material being used, better quality due to more uniform heating/firing etc. Also it is being made almost by same people and there is not too much skill difference across brick manufacturing types. On the REB utilization side, use of REBs reduces energy consumption of the building due to its higher insulating properties or lower "U" value etc. The qualitative advantages and disadvantages need to be quantified, documented, explained and showcased to all stakeholders, viz., users, builders, architects and policy makers, etc. to guide decision making. Thus, a comparative cost/benefit and investment analysis on using REBs versus other brick types need to be completed and results disseminated among interested parties.

- *Comprehensive and holistic cost-benefit cost benefit or life cycle cost analysis of REBs vis-a-vis traditional hand moulded brick*

Another advantage of REB production compared to others is that it requires 1 acre instead of 4 acres thereby freeing valuable 3 acre land which can be used for variety of livelihood activities or at least rented. Also faster drying of REBs due to hollow nature reduces drying time and so drying or in case of shed drying required shed area and further since it reduces inventory area further reduces area requirements. There are several other intangible benefits of switching to REBs which needs to be assessed and highlighted

- *Develop future programs to enhance scale and widen horizon of scope*

Develop FSP with a higher version of effort to scale up adoption of REB Technology in the country. This will have higher level of efforts in large scale promotion across India rather than focusing on R&D etc as in the present MSP which has been proved here. Similarly develop MSP for "Shifting from earth to non-earth material" for brick making as construction material with

the main focus on saving the top soil, main focus on adoption of innovative technology for saving the valuable soil and focus is on demonstration of cluster based approach on how to pool resources for common cause. Also small component of the project can be on marketability or marketing of the brick specially REBs.

#### **4.3 Lessons:**

- There needs to be clear monitoring guidelines for charge out rate band allowed as against that mentioned in the PrDoc.
- There is need to have independent professional inputs, while developing project document in order to evolve a strong and realistic LFA.
- In this case project development process had been very long (almost 7 years); though fortunately all major stakeholders viz. TERI, MoEF and UNDP remained committed to project development despite such long development period.
- Also though LogFrame and baseline and incremental analysis was included in the approved ProDoc, as also mentioned in MTR, it was very generic and not very closely tailored to the project's specific context and desired outcomes. Though an updated LFA was prepared by the PFU/PMU but was never implemented, as by the time the updated LFA was ready for consideration in December 2011, project had effectively ceased operations over the still unresolved issue of TERI staff charge out rates higher (2-4 time) than that specified in the ProDoc.
- There is need to clearly develop and mention base line scenario in ProDoc for example for number of bank loan for REBs in base year 2008 which has resulted in quantifiably verifying the project impact during the course of execution. In order to avoid such confusion in measuring the project achievements there is need to have very clear and quantifiable benchmark in such a manner that will help track and monitor efficacy of the project.



## **Annexes**

**Annex A:** Terms of Reference for the Terminal Evaluation of the India Brick Project

**Annex B:** Project Log Frames and Reprogramming

Annex B1: Original Project Logical Framework of the Energy Efficiency Improvements in the Indian Brick Industry (PIMS 3465)– as provided with the TE TOR December 2016

Annex B2: Comparison of the Baseline and Target Values between the original and Proposed Modified (Sept 2011) Log Frames

Annex B3: List of Planned Activities under Project AWP 2015/16 Part 1 & 2 to complete Committed Outcome/Outputs under original Log Frame and corresponding Ratings as of Dec 31, 2017 EOP

**Annex C:** Itinerary of the TE Mission

**Annex D:** List of persons interviewed

**Annex E:** List of documents reviewed

**Annex F:** Evaluation Question Matrix

**Annex G:** Pictures of REB manufacturing operations

**Annex H:** Evaluation Consultant Agreement Form

**Annex I:** Report Clearance Form

**Annex J:** TE Audit Trail

**Annex K:** GEF Focal Area Terminal Tracking Tool (*Annexed in a separate file*)

## Annex A: Terms of Reference for the Terminal Evaluation of the India Brick Project

# TERMINAL EVALUATION TERMS OF REFERENCE –INTERNATIONAL CONSULTANT



## INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of the *Energy Efficiency Improvements in the Indian Brick Industry* (PIMS 3465)

The essentials of the project to be evaluated are as follows:

## PROJECT SUMMARY TABLE

Project Title:	<b>Energy Efficiency Improvements in the Indian Brick Industry</b>			
GEF Project ID:	2844 (GEF PMIS ID)		<u>at endorsement</u> (Million US\$)	<u>at completion</u> (Million US\$)
UNDP Project ID:	3465 (UNDP PIMS ID) 00057405 (Atlas ID)	GEF financing:	696,448	696,448
Country:	India	IA/EA own:		144,000 (TERI in kind)
Region:	Asia Pacific	Government:		
Focal Area:	Climate Change	Other:	1,999,000	1,854,000 (Brick kiln units)
FA Objectives, (OP/SP):	OP-5	Total co-financing:	1,999,000	1,998,000
Executing Agency:	MOEF THROUGH The Energy and Resources Institute (TERI)	Total Project Cost:	2,695,448	2,694,448
Other Partners involved:		ProDoc Signature (date project began):		June 2009
		(Operational) Closing Date:	Proposed: Dec 2012	Actual: Dec 2016

## OBJECTIVE AND SCOPE

The project was designed with the goal to reduce energy consumption, and restrict GHG emissions by creating appropriate infrastructure for sustained adoption of new and improved technologies for production and use of resource efficient bricks in India.

The objectives of the project are:

- To demonstrate REB technologies and develop technology models (supply side)
- To build awareness and develop sustainable markets for REBs among various stakeholders such as builders, architects, individual end-users (demand side)

- To influence government organizations, financial institutions and policy and decision makers

Project's envisaged outcomes are:

- (i) Enhancing public sector awareness on resource-efficient products.
- (ii) Access to finance for brick kiln entrepreneurs
- (iii) Improved knowledge on technology, including marketing
- (iv) Availability of resource efficient technology models in 5 clusters through Local Resource Centres
- (v) Improved capacity of brick kiln entrepreneurs

### **Component 1: Enhancing public sector awareness on resource-efficient products**

Presently, the awareness level of specifications and codes amongst relevant public agencies at State and Central Government such as Central Public Works Department (CPWD), state public works departments, Military Engineering Services (MES), etc. is very low. For example, most of them are not aware that the energy efficient burnt clay hollow brick (for walls and partition), meets the building code. In fact this brick type not only fully complies with the specifications, it also contributes to improved structural stability and better looks. Furthermore, lack of awareness about specifications and codes among government agencies has led to non-inclusion of resource efficient and energy efficient products in their bill of materials to be used in public construction contra

#### *(2015) (i) Public construction contracts*

Inclusion of energy-efficient bricks in public construction contracts will be a focus under this component. This will improve confidence level of builders and end-users resulting in a wider use of these products. It will have direct impact on the market and stimulate production of resource efficient bricks.

#### *(ii) Policy advocacy*

PFC would make a special effort to obtain the support of state and local governments in the promotion of resource efficient bricks. Various state and central Government agencies (e.g. CPWD, PWD, MES, BIS, etc.) will be invited to workshops at the national level conducted by LRCs, which would help in enhancing their knowledge and understanding on resource efficient bricks. It is planned to conduct at least three "National level meetings" to which all stakeholders, including policy makers, will be invited.

### **Component 2: Access to finance for brick kiln entrepreneurs**

One of the important activities during project implementation would be to establish access to funds from various financial institutions for demonstration units and assist financial institutions in developing tailor-made financial packages for the brick industry. The activity would address the barrier being faced by the brick manufacturers in accessing loans from financial institutions

#### *(2015) (i) Identification of national and regional financial institutions (FIs)*

The project has interacted with various financial institutions and banks e.g. Small Industries Development Bank of India (SIDBI) to share knowledge on the Indian brick sector and the proposed interventions under the UNDP-GEF project, which would help in transformation of the Indian brick sector. The response from SIDBI is positive.

In the initial phase of the project, PFC and LRCs will interact extensively with various financial institutions and local banks, which would help in enhancing understanding of FIs on the brick sector and the project

objectives. The interactions will assist the project in identifying the interested national and regional financial institutions for providing finance to brick making units.

*(ii) DPR preparation for 12 demonstration projects*

Individual brick kiln entrepreneurs lack the capacity to prepare detailed project reports for project implementation and for approaching banks for loans. The LRCs would prepare detailed project reports (DPRs) for the new projects (12 no.) with the guidance of PFC. It would also prepare user-friendly guidelines and model DPRs which would help other brick kiln units to prepare DPRs on their own.

*(iii) Development of resource efficient brick production project profiles*

The experience gained during the planning and implementation of the demonstration will be collated and detailed project profiles relevant for a particular cluster/ region will be prepared.

*(iv) Arranging finance for the demonstration projects*

The project will be setting up 12 (twelve) resource efficient brick kiln units in 5 (five) different clusters. PFC and LRCs would prepare DPRs for approaching the banks. It would also facilitate interaction between individual entrepreneurs and banks for provision of loans based on DPRs and fulfillment of bank's criteria in providing loans. These activities would also help in developing suitable financial package for brick industry.

**Component 3: Improved knowledge on technology, including marketing**

While other components have mainly focused on strengthening the supply of resource-efficient bricks, Component 3 focuses on creating markets for such products

*(i) Market research and strategies for market development*

A marketing professional will help each LRC in studying market and demands for the resource efficient bricks in the cluster. The marketing professionals will interact with demonstration units, LRC and end-users and would develop the strategies for market development. He will also provide assistance to the demonstration units in marketing of the resource efficient bricks. LRC would also facilitate testing of resource efficient bricks (e.g. compressive strengths of bricks). These results will be used to provide comprehensive product details to the end-users so that they can make an informed choice.

*(ii) Sensitizing and educating end-users*

LRCs and PFC would sensitize and educate end-users such as builders, architects, masons and house builders regarding the advantages of resource efficient bricks. Posters will be exhibited and brochures will be distributed during various interactive meets (training programs and awareness programs). LRC would also distribute these promotional materials to various end-users during one-to-one meetings and also through post & email. The posters and brochures will also be distributed to various government and non-governmental agencies for display and distribution specifically during national and international exhibitions on building materials and construction.

**Component 4: Availability of resource efficient technology models in 5 clusters through Local Resource Centers**

The project has short-listed five brick making clusters in India. The parameters chosen for short-listing of these clusters are:

- Major brick production centers located close to high growth centers
- Higher demands for bricks due to vibrant construction activities
- Availability of forward looking entrepreneurs willing to adopt technology modernization.
- Covering different geographical locations

The project would set up 12 (twelve) demonstration projects in 5 (five) different brick kiln clusters regions, and thereby allowing new/ existing entrepreneurs to take up production of resource-efficient products. The clusters identified for setting up demonstration units and the types of interventions proposed are given below:

S No	Cluster	State/ Region	Number of demonstration units	Proposed interventions
1	Ghaziabad/Gurgaon	NCR	2	Perforated bricks
2	Ludhiana	Punjab	2	Perforated bricks/ Flyash-Clay bricks
3	Varanasi	East Uttar Pradesh	2	Perforated bricks/ Hollow blocks
4	Pune	Maharashtra	3	Perforated bricks/ Hollow blocks

(2015) *(i) Identification of brick kiln units and signing MoUs*

The project, during the PDF-A phase interacted with individual brick kiln entrepreneurs in all the five clusters. Letters from individual brick kiln entrepreneurs interested in adoption of technologies for production of resource efficient bricks are given. The project also interacted with brick industry association at national level national (All India Bricks and Tiles Manufacturers' Federation – AIBTMF) as well as at regional levels (e.g. Int Nirmata Parishad – INP, Varanasi). The letters of cooperation from brick industry associations at national and regional level are given. During implementation, the project will shortlist the brick kiln units, based on a well defined 'selection criteria' for up-gradation of technology. The next step would be finalization of MoUs with each of the brick kiln units. The project will work closely with the local industry associations during this phase, so as to ensure the involvement of the entire brick industry in the cluster in the demonstration projects

(ii) Technology sourcing

During the PDF-A phase, interactions with a number of technology suppliers involved in supplying machineries to brick industry have been initiated. These interactions had helped in developing project profiles by matching available equipment specifications with the needs of the industry, such as, production capacity, investments capacity of the entrepreneurs, quality and reliability of the machinery. During implementation phase, the project would extensively interact with technology/ machinery suppliers and prepare a list of potential technology suppliers to be made available to the project developers. The project through the PFC & LRCs will facilitate sourcing of plant and machinery for individual demonstration units.

*(iii) Facilitating commissioning of demonstration projects*

The Project Facilitation Cell (PFC) would facilitate the implementation of the project through the local resource centers (LRCs) identified in the short-listed clusters. It would also coordinate with local offices of SISI/ NSIC for synergizing various activities planned under project implementation. During the PDF-A stage, detailed discussions were organized with the Ministry of Micro, Small and Medium Enterprises (MSME) and the concerned officials of the ministry have assured cooperation in the proposed project

through the involvement of SISI/ NSIC branches in the selected clusters. LRC would facilitate adoption of technologies for production of resource efficient bricks by individual brick kiln units in the short-listed clusters. This would require effective coordination between all the stakeholders such as entrepreneur, technology supplier, financial institutions, local brick industry associations etc.

During the commissioning of demonstration projects in the cluster, LRC would assist in the commissioning on a regular basis. It would also interact with the technology supplier and the technical experts in troubleshooting operations wherever required and ensure smooth functioning of the resource efficient brick kiln unit.

*(iv) Monitoring and evaluation of projects*

PFC will prepare a comprehensive monitoring and evaluation framework for the monitoring of individual brick kiln units. It would help the LRC in carrying out the evaluation by experts in the field. For each brick kiln unit, a baseline report and a post-commissioning report will be prepared. These reports would cover performance evaluation of energy consumption, environmental emissions and resource efficiency (e.g. reduction in soil consumption level) along with other operational parameters (production, breakage, production costs and sale of bricks). LRC would also help individual brick kiln units in preparation of suitable formats to document various operating parameters and carrying out energy & environmental monitoring of the plants of the plants, which would help in the evaluation process.

**Component 5: Improved capacity of brick kiln entrepreneurs**

Component 5 will focus on 'capacity development in the private sector', addressing the needs of local brick industry and institutions such as brick kiln associati

*(2015) (i) Development of training module for energy efficiency improvements*

The LRCs and PFC would assess the specific needs of the brick sector and develop suitable training modules for conducting training programs in different clusters. The training program would cover 'Best Operating Practices' (BOP) on brick firing, green brick making and financial management. Suitable modifications in the training modules will be incorporated based on the feedback received from the participants.

*(ii) Organization of training programs*

It is proposed to conduct 2 training programs per year per cluster. The total programs planned are 40 and estimated numbers of beneficiaries are 2000 brick kiln units. The LRC along with technical experts will be organizing these training programs jointly with local brick manufacturers associations. These training programs would help in adopting BOP in individual brick kiln units and are expected to result in energy savings of 5–10%. LRC would obtain feedback from each training programs that would help PFC in continuously upgrading the contents and the overall quality of the training programmes.

*(iii) Exposure visits/ Study tours within India*

The project would undertake exposure visit/ study tour for members of PFC and LRCs and short-listed group of entrepreneurs for in-depth understanding on the technological options available.

*(iv) Conducting awareness seminars*

LRC would conduct a total of 5 (five) regional level awareness seminars during the execution of the project. These awareness seminars would bring together the brick kiln entrepreneurs (around 500), construction sector experts and the technology suppliers to a common platform to share their

experiences and requirements. Awareness seminars will be accompanied by organization of technical exhibition to exhibit resource-efficient brick making processes and machineries as well as resource efficient brick products. This is expected to help in developing business for the technology supplier as well as avenues for the demonstration units in finding market for their bri

(2015) (v) *Development of promotional materials and web site*

PFC would develop promotional materials such as website, brochures and posters to promote resource efficient bricks. PFC would develop a website with inputs from LRCs. The website would provide information on alternate products available in different regions, list of brick kiln units who produce alternate bricks, quality of these products (e.g. compressive strength of perforated bricks, hollow blocks and fly ash bricks) and technology suppliers. The website will also provide linkages with other relevant websites. PFC will maintain the website and update information regularly. The project will prepare brochure which will be distributed to all relevant stakeholders. The brochure would provide information pertaining to resource efficient technologies, resource efficient bricks, their physical parameters (dimensions and compressive strengths), usage and availability in the market.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects.

The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

## EVALUATION APPROACH AND METHOD

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An overall approach and method<sup>4</sup> for conducting project terminal evaluations of UNDP supported GEF financed projects have developed over time. The evaluation should include a mixed methodology of document review, interviews, and observations from project site visits, at minimum, and the evaluators should make an effort to triangulate information. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact**, as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects. The international consultant will be the team leader and coordinate the evaluation process to ensure quality of the report and its timely submission. The national consultant will provide supportive roles both in terms of professional back up, translation etc. The evaluation team is expected to become well versed as to the project objectives, historical developments, institutional and management mechanisms, activities and status of accomplishments. Information will be gathered through document review, group and individual interviews and site visits.

A set of questions covering each of these criteria have been drafted and are included with this TOR. The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the GEF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The evaluator is

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<sup>4</sup> For additional information on methods, see the [Handbook on Planning, Monitoring and Evaluating for Development Results](#), Chapter 7, pg. 163

expected to conduct a field mission to various project stakeholder locations viz. Delhi, Bangalore, Chandigarh, Varanasi, etc., including the following project field sites viz. Amritsar-Jalandhar, Chandigarh, Malur, etc. Interviews will be held with the following organizations and individuals at a minimum but not limited to:

- Relevant personnel at UNDP Country Office in New Delhi, India and Program Officer in-charge of the Project
- National Project Director (NPD)
- National Project Coordinator (NPC)
- Project Management Unit (PMU)
- Local Resource Centers (LRCs)
- Relevant project stakeholders like brick industry association, brick kiln entrepreneurs, financial institutions, technology suppliers etc.

The evaluator will review all relevant sources of information, such as the project document, mid-term review (MTR) report, project reports – including Annual APR/PIR, project budget revisions, midterm review, progress reports, GEF focal area tracking tools, project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. A list of documents that the project team will provide to the evaluator for review is included in the Terms of Reference.

## EVALUATION CRITERIA & RATINGS

An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework, which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at a minimum cover the criteria of: **relevance, effectiveness, efficiency, sustainability and impact**. Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The obligatory rating scales are included in the TOR.

Evaluation Ratings:			
1. Monitoring and Evaluation	rating	2. IA& EA Execution	rating
M&E design at entry		Quality of UNDP Implementation – Implementing Agency (IA)	
M&E Plan Implementation		Quality of Execution - Executing Agency (EA)	
Overall quality of M&E		Overall quality of Implementation / Execution	
3. Assessment of Outcomes	rating	4. Sustainability	rating
Relevance		Financial resources:	
Effectiveness		Socio-political:	
Efficiency		Institutional framework and governance:	
Overall Project Outcome Rating		Environmental :	
		Overall likelihood of sustainability:	



## PROJECT FINANCE / COFINANCE

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The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator(s) will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

Co-financing (type/source)	UNDP own financing (mill. US\$)		Government (mill. US\$)		Partner Agency (mill. US\$)		Total (mill. US\$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants								
Loans/Concessions								
• In-kind support								
• Other								
Totals								

## MAINSTREAMING

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UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programs. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender. The evaluation will examine this project's contribution to the United Nations Development Assistance Framework (UNDAF).

## IMPACT

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The evaluator will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.<sup>5</sup>

## CONCLUSIONS, RECOMMENDATIONS & LESSONS

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The evaluation report must include a chapter providing a set of **conclusions, recommendations** and **lessons**. Conclusions should build on findings and be based in evidence. Recommendations should be prioritized, specific, relevant, and targeted, with suggested implementers of the recommendations. Lessons should have wider applicability to other initiatives across the region, the area of intervention, and for the future.

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<sup>5</sup> A useful tool for gauging progress to impact is the Review of Outcomes to Impacts (ROtI) method developed by the GEF Evaluation Office: [ROtI Handbook 2009](#)

## IMPLEMENTATION ARRANGEMENTS

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The principal responsibility for managing this evaluation resides with the UNDP CO in (New Delhi, India). The UNDP CO will contract the evaluators and ensure the timely provision of per diems and travel arrangements within the country for the evaluation team. The Project Team will be responsible for liaising with the Evaluators team to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

Throughout the period of evaluation, the evaluation team will liaise closely with the Programme Officer/ Adviser/Project Manager, the concerned agencies of the Government, any members of the international team of experts under the project and the counterpart staff assigned to the project. The team can raise or discuss any issue or topic it deems necessary to fulfill its task, the team, however, is not authorized to make any commitments to any part on behalf of UNDP/GEF or the Government.

### ***Logistics***

The evaluation team will conduct a mission visit to New Delhi and selected project sites, to meet with relevant project stakeholders. This visit will also include meetings with the officials of UNDP, the Implementing Partner, stakeholders from other institutions and ministries related to the project.

After the initial briefing by UNDP CO, the review team will meet with the National Project Director (NPD), National Project Coordinator (NPC) and the GEF Operational Focal Point as required.

## EVALUATION TIMEFRAME

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The total duration of the evaluation will be 25 working days according to the following plan:

Activity	Timing	Completion Date
<b>Preparation</b>	2 days	8 Dec 2016
<b>Evaluation Mission</b>	6 days	12-17 December 2016
<b>Draft Evaluation Report</b>	12 days	30 December 2016
<b>Final Report</b>	5 days	25 January 2017

## EVALUATION DELIVERABLES

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The evaluation team is expected to deliver the following:

Deliverable	Content	Timing	Responsibilities
<b>Inception Report</b>	Evaluator provides clarifications on timing and method	No later than 2 weeks before the evaluation mission.	Evaluator submits to UNDP CO
<b>Presentation</b>	Initial Findings	End of evaluation mission	To project management, UNDP CO

<b>Draft Final Report</b>	Full report, (per annexed template) with annexes	Within 2 weeks of the evaluation mission	Sent to CO, reviewed by RTA, PCU, GEF OFPs
<b>Final Report*</b>	Revised report	Within 1 week of receiving UNDP comments on draft	Sent to CO for uploading to UNDP ERC.

\*When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report. See Annex I for an audit trail template.

## TEAM COMPOSITION

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The evaluation team will be composed of 2 consultants (*1 international /1 national evaluators*). The international consultant will be designated as the Team Leader and will be responsible for finalizing the report. The consultants shall have prior experience in evaluating similar projects. Experience with GEF financed projects is an advantage. The evaluators selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

The International Consultant (Team Leader) must present the following qualifications and professional background:

### Education:

Post Graduate Degree in Science / Engineering.

### Years of experience

- Professional background in project evaluations of renewable energy, energy efficiency and climate change mitigation projects is essential. Experience in evaluating projects on small scale industries, energy efficiency, specifically in the brick or construction sector is desirable. A minimum of 15 years of relevant experience in monitoring and evaluating donor driven projects (preferably GEF, World Bank, or UN);

### Competencies:

- Highly knowledgeable of participatory monitoring, review and evaluation processes, and experience in review and evaluation of technical assistance projects with major donor agencies;
- Familiar with energy efficiency policies / conditions in India and abroad through management and / or implementation or through consultancies in review and evaluation of donor funded projects.
- Understanding of CO<sub>2</sub> emission reduction calculations (including IPCC, GEF procedure), especially from the energy audit and implementation of its recommendations, that contribute to global benefits;
- Familiar with GEF rules, regulations and project reviews and evaluations;
- Demonstrated ability to assess complex situations, succinctly, distil critical issues, and draw forward-looking conclusions and recommendations;

- Ability and experience to lead multi disciplinary and national teams, and deliver quality reports within the given time.
- Writing and communication will be in English, and he/she must have excellent communication skills in English. The consultant must bring his/her own computer/ laptop and related equipment.

The evaluation team shall conduct debriefing for the UNDP Country Office, NPD, NPC, Project Management Unit and UNDP BRH, in India towards the end of the evaluation mission. The international consultant shall lead presentation of the draft review findings, creating the recommendations, and shall lead the drafting and finalization of the terminal evaluation.

**Note: Candidates meeting minimum qualification and experience as stated above will get 70% marks, additional marks will be awarded for additional expertise.**

### EVALUATOR ETHICS

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Evaluation consultants will be held to the highest ethical standards and are required to sign a Code of Conduct (Annex E) upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the

### PAYMENT MODALITIES AND SPECIFICATIONS

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%	Milestone
10%	Following submission and approval of the TE inception report
30%	Following submission and approval of the 1ST draft terminal evaluation report
60%	Following submission and approval (UNDP-CO and UNDP RTA) of the final terminal evaluation report and GHG Tracking Tool

### EVALUATION CRITERIA

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#### Cumulative analysis

The award of the contract shall be made to the individual consultant whose offer has been evaluated and determined as:

- Responsive.

Having received the highest score out of a pre-determined set of weighted technical and financial criteria specific to the solicitation.

Only candidates obtaining a minimum of 49 points (70% of the total technical points) would be considered for the Financial Evaluation.

- Technical Criteria weight - 70%;

- Financial Criteria weight - 30%.

**Evaluation Criteria:**

- Qualification of the Consultant: 20 Marks;
- Relevant work Experience: 30 Marks;
- Proposed Work Plan for undertaking the task: 15 Marks;
- Time Line for completion of the Task: 5 Marks.

**Annexes to the TOR *(not included here)***

- Annex 1: Offeror's Letter to UNDP Confirming Interest and Availability for the Individual Contractor Assignment
- Annex 2: General Terms and Conditions for ICs (in separate document)
- Annex 3: P-11 form for ICs (in separate document)

Above documents can be found 'Forms and Documentation for Individual Contractor' column in career section. Please find link below:

<http://www.in.undp.org/content/india/en/home/operations/careers/>

**Documents to be submitted by Consultants**

- Offeror's Letter to UNDP Confirming Interest and Availability for the Individual Contractor Assignment
- Updated and signed P-11 form for ICs
- Proposed work methodology with timeline
- Updated CV with contact details of three references.

Please note following components have to be covered while giving financial proposal:

- Per day consultancy fee;
- Rates for one flight ticket for Home Station-New Delhi-Home station, please note it has to be economy class only.

NOTE: UNDP will reimburse or pay for all local travel, accommodation and food costs during the mission as per actuals.

**Notes:**

- Any kind of miscellaneous charges i.e. internet, phone etc. would not be reimbursed;
- Individuals working with institutions may also apply, contract would be issued in the name of institution for the specific services of individual;
- Please note proposals without financial proposal will not be considered;

- CV, Financial proposal and proposed work plan can be clubbed in one file for uploading;
- The consultants must bring his/her own computing equipment

## ANNEX B: PROJECT LOG FRAMES

**ANNEX B1: ORIGINAL ENERGY EFFICIENCY IMPROVEMENTS IN THE INDIAN BRICK INDUSTRY (PIMS 3465) PROJECT LOGICAL FRAMEWORK – AS PROVIDED WITH THE TE TOR DECEMBER 2016 AND ALSO ANNEXED TO THE PRODOC**

Project Strategy	Objectively verifiable indicators				
<b>Goal</b>	To reduce energy consumption, and restrict GHG emissions by creating appropriate infrastructure for sustained adoption of new and improved technologies for production and use of resource efficient bricks in India				
	<b>Indicator</b> (quantified and time-bound)	<b>Baseline</b>	<b>Target</b>	<b>Sources of verification</b>	<b>Risks and Assumptions</b>
<b>Objective</b> To make India's five major brick producing clusters more energy efficient	Reduction of 187,840 tons of CO <sub>2</sub> in five major brick making clusters in India over 15 years Savings in energy consumption by the demonstration units.	Production of resource-efficient bricks will not increase resulting in continuation of high CO <sub>2</sub> generation and high energy consumption in the sector (42 million tons of CO <sub>2</sub> per annum)	Year 1: reduction of 10,099 tCO <sub>2</sub> Year 5: reduction of 59,920 tCO <sub>2</sub> Year 10: reduction of 123,880 tCO <sub>2</sub> Year 15: reduction of 187,840 tCO <sub>2</sub>	Project reports and files	Government agencies promoting new resource efficient product in construction sector
<b>Outcome 1:</b> Enhancing public sector awareness on resource-efficient products	Usage of resource-efficient bricks by new public department building contracts increased by 20% by end of project.	No increase in usage of EE bricks in public buildings.	Year 2: increase by 3% Year 3: increase by 10% Year 4: increase by 20%	Contract documents of the public departments with inclusion of resource-efficient bricks specifications	Government policies conducive to modernization of Indian brick industry
<b>Outcome 2:</b> Access to finance for brick kiln entrepreneurs	# of loans from local banks/ financial institutions for technology upgradation tripled by end of project.	# of loans will not increase	Year 3: # of loans doubled compared to baseline year 2008. Year 4: # of loans tripled compared to baseline year 2008	Bank records and Industry association records	Bank lending policies are conducive to brick industry
<b>Outcome 3:</b> Improved knowledge on technology, including marketing	Resource-efficient bricks sold in the market and used for construction.	Market share of resource-efficient bricks remains low	Market share of resource-efficient bricks doubled by end of project	Market surveys and relevant reports and enquiries of entrepreneurs and end-users.	Small scale industry supporting the entire initiative in various clusters

<b>Outcome 4:</b> Availability of resource-efficient technology models in 5 clusters through Local Resource Centers	12 EE brick kilns units established in 5 clusters by end of project	No EE brick kiln units established	Year 1: All 12 Units established by end of year 1.	Records of demonstration units on production and sale of resource-efficient bricks.	Adaptation of new product by Architects and builders specially around mega cities
<b>Outcome 5:</b> Improved capacity of brick kiln entrepreneurs	At least 5 Brick kiln entrepreneurs in each cluster invest in technology upgradation by end of project	No such investment will take place	Year 2: 1 entrepreneur in each cluster invests Year 4: 5 entrepreneurs in each cluster invests	Market surveys reports	Government policies conducive to modernization of Indian brick industry



**Annex B2: Comparison of the Baseline and Target Values between the original and Proposed Modified (Sept 2011) Log Frames<sup>6</sup>**

Project Strategy	Indicator	Baseline Comparison		Target Comparison		
		Original Log Frame (July 2007)	Proposed Log Frame Modification (Sept 2011)	Original Log Frame (July 2007)	Proposed Log Frame Modification (Sept 2011)	
<b>Objective</b> To make India's five major brick producing clusters more energy efficient	Reduction of 187,840 tons of CO <sub>2</sub> in five major brick making clusters in India over 15 years Savings in energy consumption by the demonstration units.	Production of resource-efficient bricks will not increase resulting in continuation of high CO <sub>2</sub> generation and high energy consumption in the sector (42 million tons of CO <sub>2</sub> per annum)	(Same)	Year 1: reduction of 10,099 tCO <sub>2</sub>  Year 5: reduction of 59,920 tCO <sub>2</sub> Year 10: reduction of 123,880 tCO <sub>2</sub> Year 15: reduction of 187,840 tCO <sub>2</sub>	Year 1: reduction of 0 Year 2: reduction of 8,000 tCO <sub>2</sub> Year 3: reduction of 10,000 tCO <sub>2</sub> Year 4: reduction of 13,310 tCO <sub>2</sub>	
<b>Outcome 1:</b> Enhancing public sector awareness on resource-efficient products	Usage of resource-efficient bricks by new public department building contracts increased by 20% by end of project.	No increase in usage of EE bricks in public buildings.	REBs are not used in constructions by the government departments.	Year 2: increase by 3% Year 3: increase by 10% Year 4: increase by 20%	Government departments started using REBs for construction.	
<b>Outcome 2:</b> Access to finance for brick kiln entrepreneurs	# of loans from local banks/ financial institutions for technology upgradation tripled by end of project.	# of loans will not increase	Banks are not willing to provide financial assistance to brick sector.	Year 3: # of loans doubled compared to baseline year 2008. Year 4: # of loans tripled compared to baseline year	Acceptance of brick sector by bank as a potential customer for providing financial assistance.	

<sup>6</sup> Note that the Proposed Modified (Sept 2011) Log Frame was not adopted by the PSC.

Project Strategy	Indicator	Baseline Comparison		Target Comparison		
		Original Log Frame (July 2007)	Proposed Log Frame Modification (Sept 2011)	Original Log Frame (July 2007)	Proposed Log Frame Modification (Sept 2011)	
				2008		
<b>Outcome 3:</b> Improved knowledge on technology, including marketing	Resource-efficient bricks sold in the market and used for construction.	Market share of resource-efficient bricks remains low	(Same)	Market share of resource-efficient bricks doubled by end of project	100 million REBs consumed in the market during the project period.	
<b>Outcome 4:</b> Availability of resource-efficient technology models in 5 clusters through Local Resource Centres	12 EE brick kiln units established in 5 clusters by end of project	No EE brick kiln units established	No REB producing brick kiln units	Year 1: All 12 Units established by end of year 1.	12 operating project units established during the project duration	
<b>Outcome 5:</b> Improved capacity of brick kiln entrepreneurs	At least 5 Brick kiln entrepreneurs in each cluster invest in technology upgradation by end of project	No such investment will take place	Brick kiln entrepreneurs do not have capacity to adopt REB technologies	Year 2: 1 entrepreneur in each cluster invests Year 4: 5 entrepreneurs in each cluster invests	Brick kiln entrepreneurs started producing REBs in their brick kiln units	

**Annex B3: List of Planned Activities under Project AWP 2015/16 Part 1 & 2 to complete Committed Outcome/Outputs under original Log Frame and corresponding Ratings as of Dec 31, 2017 EOP**

**Table B3 -1: Target and Actual Achievement of ProDoc Log Frame Outcomes and Ratings**

Outcomes	Implementation of Planned Activities by TERI and UNDP/PSCST ( <i>Planned Completion Dates</i> )		Target and Actual Achievement of ProDoc Log Frame Outcomes EOP Dec 2012 Target • [Actual Achievement EOP Dec 2016]	Assessment Ratings Actual (as of EOP Dec 2016) vs. Original Log Frame Targets per UNDP/GEF Criteria and Rating Standard <sup>7</sup>		
	AWP 2015 P–rt 1 – TERI	AWP 2015 Part 2 – UNDP/PSCST		Relevance <sup>8</sup>	Efficiency <sup>9</sup>	Effectiveness <sup>10</sup>
Objective	Reduce energy consumption and restrict GHG emissions		<p><b>Year 5: reduction of 59,920 tCO<sub>2</sub></b></p> <ul style="list-style-type: none"> <li>[Estimated <b>43,788</b> tCO<sub>2</sub> of GHG emission reduction]</li> </ul> <p>10,171 tCO<sub>2</sub> (21% of target of 46,128 tCO<sub>2</sub>) during project period of 2010-2015 and 43,788 tCO<sub>2</sub> (23% of target of 187,840 tCO<sub>2</sub>) GHG saving over 15 years post project period. <i>Reference: GKSPL and PSCST study reports</i></p>	2	3	4
Outcome 1: Enhancing public sector awareness	1.1 Follow-up with BIS for revision of existing standards on Perforated Bricks ( <b>Dec 2015</b> )	1.1 Prepared and submitted REB specification to include in BIS standards ( <b>Dec 2015</b> )	<p><b>Public construction contracts</b></p> <ul style="list-style-type: none"> <li>[REBs included in procurement schedule in Punjab PWD]</li> <li>[Revision of BIS is in advance stage]</li> </ul> <p><b>Public Advocacy</b></p> <ul style="list-style-type: none"> <li>[Increased awareness in the industry, brick producers and public as feedback in seminars and workshops conducted, and project assessment reports]</li> </ul> <p><b>Year 4: Increase usage of REBs by 20%</b></p>	2	3	3
	1.2 Interactions with government departments for inclusion of REBs	1.2: Procurement guidelines prepared for inclusion of REBs as part of the		2	3	4
				2	4	4

<sup>7</sup> Please refer to Table B3-2 below for Rating Standards

<sup>8</sup> **Relevance:** The extent to which the activity is suited to local and national development priorities and organizational policies, including changes over time or the extent to which the project is in line with the GEF Operational Programs or the strategic priorities under which the project was funded.

<sup>9</sup> **Efficiency:** The extent to which results have been delivered with the least costly resources possible; also called cost effectiveness or efficacy with respect to agreed timeframe also.

<sup>10</sup> **Effectiveness:** The extent to which an objective has been achieved or how likely it is to be achieved

Outcomes	Implementation of Planned Activities by TERI and UNDP/PSCST ( <i>Planned Completion Dates</i> )		Target and Actual Achievement of ProDoc Log Frame Outcomes EOP Dec 2012 Target • [Actual Achievement EOP Dec 2016]	Assessment Ratings Actual (as of EOP Dec 2016) vs. Original Log Frame Targets per UNDP/GEF Criteria and Rating Standard <sup>7</sup>		
	AWP 2015 P-rt 1 - TERI	AWP 2015 Part 2 – UNDP/PSCST		Relevance <sup>8</sup>	Efficiency <sup>9</sup>	Effectiveness <sup>10</sup>
	in their bill of materials / procurement guidelines ( <i>Dec 2015</i> )	procurement by public departments ( <i>Dec 2015</i> )	<ul style="list-style-type: none"> <li>[150% increase in sale of perforated bricks and 200% in hollow bricks from baseline]</li> <li>[Producing 106.3 million bricks annually]</li> </ul> <i>Reference: Market Assessment study by GKSPL</i>			
			<i>Outcome 1 Summary of Rati<sup>®</sup></i>	<i>2 (R)</i>	<i>3 (MU)</i>	<i>4 (MS)</i>
Outcome 2: Access to finance for brick kiln entrepreneurs		2.1 Finalize “investment guide on REBs” describing (i) composition, characteristics, specifications, construction aspects of REBs, benefits of REB vs. normal bricks, (iii) investments on REB and (iv) vendors ( <i>July 2015</i> ).	<u>Identification of national &amp; regional financial institutions</u> <ul style="list-style-type: none"> <li>[National and regional meeting with FIs planned in 2017 Q1]</li> </ul> <u>DPR preparation for 12 demonstration projects</u> <ul style="list-style-type: none"> <li>[33 (instead of planned 25) bankable investment plans to establish REB units]</li> </ul> <u>Development of resource efficient brick production project profiles</u> <ul style="list-style-type: none"> <li>[5 model project reports templates for availing loans from financial institutions]</li> <li>[Resource Audits of 6 brick manufacturing units: 2 each of perforated bricks, hollow blocks and conventional hand-made solid bricks]</li> </ul>	2	3	3
		2.2 Identify national and regional financial institutions and conduct one workshop for FIs ( <i>Aug 2015</i> )	<u>Arranging finance for the demonstration projects (12 REB units in 5 different clusters.</u> <ul style="list-style-type: none"> <li>[Market linkage support to 9 REB kiln units]</li> <li>[Financial support arranged for 3 newly commissioned units and additional 3 units to be commissioned in 2017]</li> </ul>	2	3	3
			<i>Outcome 2 Summary of R<sup>®</sup>ngs</i>	<i>2 (R)</i>	<i>3 (MU)</i>	<i>3 (MU)</i>
Outcome 3: improved knowledge on technology	3.1 preparation of a case study highlighting benefits of using	3.1 Develop a report based on actual results of resource audits of	<u>Market research and strategies for market development</u> <ul style="list-style-type: none"> <li>[25 Feasibility reports prepared for new interested REB entrepreneurs]</li> </ul>	2	3	3

Outcomes	Implementation of Planned Activities by TERI and UNDP/PSCST (Planned Completion Dates)		Target and Actual Achievement of ProDoc Log Frame Outcomes EOP Dec 2012 Target • [Actual Achievement EOP Dec 2016]	Assessment Ratings Actual (as of EOP Dec 2016) vs. Original Log Frame Targets per UNDP/GEF Criteria and Rating Standard <sup>7</sup>		
	AWP 2015 P–rt 1 - TERI	AWP 2015 Part 2 – UNDP/PSCST		Relevance <sup>8</sup>	Efficiency <sup>9</sup>	Effectiveness <sup>10</sup>
marketing	REBs in building construction for architects and builders ready to print and hosted on websites. (Oct 2015)	REB producing units (primary soil and energy) vis-à-vis normal bricks (at list 9 project units and 9 non-project units) Oct 2015)	<ul style="list-style-type: none"><li>[REB Investment guide prepared]</li><li>[Market assessment study “REBs: Present Production and Future Markets”]</li></ul> Sensitizing and educating end-users <ul style="list-style-type: none"><li>[Conduct of seminars and workshops clearly highlighting REB benefits]</li></ul>	2	4	4
	3.2 Finalization of draft handbook on construction using REBs (Oct 2015)					
	3.3 Prepare capacity assessment report on present construction practices for masons (Nov 2015)	3.2 Assess annual production of REBs (including the ones TERI provided assistance. Under the project) and prepare a synthesis report on “market Assessment of REBs production and demand in India <sup>11</sup> (Oct 2015)				
	3.4 Create awareness with architects for promotion of REBs(Dec 2015)					
			Outcome 3 Summary o®atings	2 (R)	4 (MS)	4 (MS)
Outcome 4: Availability of resource efficient	4.1 Preparation of reports consisting of technical assessment of the	4.1 support establishing 3 REB units.(Nov 2015)	Identification of brick kiln units and signing MoUs <ul style="list-style-type: none"><li>[3 New REB Units commissioned viz. Hisar (Haryana), Solan (Himachal Pradesh) and</li></ul>	2	3	4

<sup>11</sup> Five original clusters and five other additional clusters may be covered.

Outcomes	Implementation of Planned Activities by TERI and UNDP/PSCST (Planned Completion Dates)		Target and Actual Achievement of ProDoc Log Frame Outcomes EOP Dec 2012 Target • [Actual Achievement EOP Dec 2016]	Assessment Ratings Actual (as of EOP Dec 2016) vs. Original Log Frame Targets per UNDP/GEF Criteria and Rating Standard <sup>7</sup>		
	AWP 2015 P-rt 1 - TERI	AWP 2015 Part 2 – UNDP/PSCST		Relevance <sup>8</sup>	Efficiency <sup>9</sup>	Effectiveness <sup>10</sup>
technology models in 5 regions through Local Resource Centers.	operating extruders to identify constraints and develop corrective actions (Nov 2015)		Amritsar (Punjab)] • [3 more units likely in 2017] Technology sourcing • [Provided linkage with suppliers and technical advice] Facilitating commissioning of demonstration projects	2	4	4
	4.2 Preparing the list of existing and potential entrepreneurs of REB manufacturing units in Karnataka and Tamil Nadu (Nov 2015)		• [Technical handholding and facilitation support provided to 9 REB units] Monitoring and evaluation of projects • [Submitted M&E reports as required]	2	3	3
			Outcome 4 Summary of Ratings	2 (R)	4 (MS)	4 (MS)
Outcome 5: Improved capacity of brick kiln entrepreneurs	5.1 Preparation of REB promotional material (Brochure). Hosted on website and also on print (Aug 2015)	5.1 Prepare investment plans for 25 REB units (Aug 2015)	Development of training module for energy efficiency improvements • [Developed modules which were used in the trainings] Organization of training programs (2 programs /yr. per cluster. Total 40 programs & 2000 beneficiaries) • ~40 workshops, seminars, meeting	2	3	4
	5.2 Payment to vendors for completion of outstanding payments (June 2015)	5.2 Develop promotional material and documentation of the project and conducting a national level	Exposure visits/ Study tours within India • Completed study tours and visits Conducting awareness seminars (5 programs; 500 entrepreneurs) • More than 1000 engineers, 1,600 brick entrepreneurs, 200 architects/builders, 150 government officials, and machinery	2	4	3
				2	4	4

Outcomes	Implementation of Planned Activities by TERI and UNDP/PSCST (Planned Completion Dates)		Target and Actual Achievement of ProDoc Log Frame Outcomes EOP Dec 2012 Target • [Actual Achievement EOP Dec 2016]	Assessment Ratings Actual (as of EOP Dec 2016) vs. Original Log Frame Targets per UNDP/GEF Criteria and Rating Standard <sup>7</sup>		
	AWP 2015 P-rt 1 - TERI	AWP 2015 Part 2 – UNDP/PSCST		Relevance <sup>8</sup>	Efficiency <sup>9</sup>	Effectiveness <sup>10</sup>
		workshop on REBs (Dec 15)	suppliers & other stakeholders trained. Development of promotional materials and web site • Two audio-visuels: “Bricking a Greener India” (one 8 min & one short 30 seconds ) and Documentation of project information, findings, learning, etc. in the form of process story/resource book • Project has operational website ( <a href="http://www.resourceefficientbricks.org/">http://www.resourceefficientbricks.org/</a> )	2	4	4
			Outcome 5 Summary of Ratings	2 (R)	3 (MU)	4 (MS)
				2 (R)	3 (MU)	4 (MS)
			OVERALL PROJECT RATING	4 (MS)		

Table B3-2: UNDP – GEF Evaluation Criteria and Rating Standards

Rating Scales		
<b>Ratings for Outcomes, Effectiveness, Efficiency, M&amp;E, I&amp;E Execution</b>  <b>6: Highly Satisfactory (HS):</b> The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency  <b>5: Satisfactory (S):</b> There were only minor shortcomings  <b>4: Moderately Satisfactory (MS):</b> there were moderate shortcomings  <b>3: Moderately Unsatisfactory (MU):</b> the project had significant shortcomings  <b>2: Unsatisfactory (U):</b> there were major shortcomings in the	<b>Sustainability ratings:</b>  <b>4. Likely (L):</b> negligible risks to sustainability  <b>3. Moderately Likely (ML):</b> moderate risks  <b>2. Moderately Unlikely (MU):</b> significant risks  <b>1. Unlikely (U):</b> severe risks	<b>Relevance ratings:</b>  <b>2. Relevant (R)</b>  <b>1. Not relevant (NR)</b>  <b>Impact Ratings:</b>  <b>3. Significant (S)</b>  <b>2. Minimal (M)</b>  <b>1. Negligible (N)</b>

achievement of project objectives in terms of relevance, effectiveness, or efficiency		
<b>1: Highly Unsatisfactory (HU):</b> The project had severe shortcomings		



## Annex C: Itinerary of the TE Mission

DATE/TIME	Meeting with	Contact Person	Phone, e-mail	Address	Relevance to the project
Arrival					
<b>30 Jan (Monday) 0900 to 1100</b>	UNDP – kick off meeting	Dr SN Srinivas	9818844798 sn.srinivas@undp.org	55 Lodhi Estate, New Delhi 110003	Briefing by UNDP
<b>1100 to 1200</b>	Telephonic discussions with past RTA, Dr Butchaiah Gadde	Mr. Ramakrishna Bhatta to organize telephonic or skype call	9990569223 <a href="mailto:Ramakrishna.bhatta@undp.org">Ramakrishna.bhatta@undp.org</a>		
<b>1200 to 1300</b>	NPD [Mr Ravishankar Prasad]	Dr Nayanika Singh	9810254814 nayanika.singh@undp.org	MoEFCC, Indira Paryavaran Bhavan, Jor Bagh Road, New Delhi - 110 003	National Project Director at the MoEFCC
<b>1400 to 1800</b>	Visit TERI	Mr. Sachin Kumar,	9899284734 sachink@teri.res.in	TERI, Darbari Seth Block, India Habitat Center Complex, Lodhi Road, Delhi, 110003	Responsible Party
<i>30 Jan halt in Delhi</i>					
<b>31 Jan (Tuesday) Travel 0830 to 1030</b>	Travel by car to Sonipat [unit has temporarily closed operations in winter]	TE consultants]			
<b>1030 to 1230 followed by lunch</b>	Visit Sonipat unit	Mr. Pritpal Singh	98141 04784 prtipal.pscst@gmail.com	M/s. Jain BKO, Uklana Mandi, Hisar	Received technical assistance by PSCST to set up REB unit
<b>1500 to 1800</b>	Travel by car to Chandigarh	TE consultants			
<i>31 Jan stay in Chandigarh</i>					
<b>01 Feb (Wednesday) 1000 to 1300</b>	Meeting with PSCST	Mr. Pritpal Singh	98141 04784 prtipal.pscst@gmail.com	Punjab State Council for Science & Technology, MGSIPA Complex, Sector 26, Chandigarh -160019	Partner agency
<b>1430 to 1930</b>	Travel from Chandigarh to Delhi	TE consultants			
<i>1 Feb stay in Delhi</i>					
<b>02 Feb (Thursday) 0930 to 1300</b>	Meeting GKSPL	Dr. Samir Maithal	09811392256 sameer@gkspl.in	Pocket 3, Sector 12 Dwarka, Dwarka, Delhi, 110075	Prepared market development study for project
<b>1430 to 1530</b>	Meeting ADCS	Mr. Eashwar KP	9500067559 eashwar@adcs.in	369, Metro view apartments, Sector 13, Dwarka, New Delhi	Audio-visual, project story
<i>Stay for one night (02 Feb) in Delhi</i>					
<b>03 Feb (Friday) 1030 to 1130</b>	Debriefing on draft findings of TE at UNDP New Delhi office	Mr. Ramakrishna Bhatta	9990569223	55 Lodhi Estate, New Delhi 110003	UNDP. Ms. Marina Walter (DCD), Dr Preeti Soni (ACD), Dr S N Srinivas, Mr. Saba Kalam, Danish

## TE Report: Indian EE Brick Project

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DATE/TIME	Meeting with	Contact Person	Phone, e-mail	Address	Relevance to the project
1530 to 1630	Debriefing on draft findings of TE by Rogelio and Dr Mande to NPD and GEF OFP	Dr Nayanika Singh	9810254814 <a href="mailto:Nayanika.singh@nic.in">Nayanika.singh@nic.in</a>	Indira Paryavaran Bhawan, Jor Bhagh, New Delhi	GEF OFP
<b>04 Feb 2017:</b> Evening Flight to .....					

**Contact Details:** Dr SN Srinivas – 9818844798, Mr. Ramakrishna Bhatta – 9990569223, Ms. Meena Negi – 011-4653 2338

## Annex D: List of Persons Interviewed

Name	Position/Office	Contact Details
Dr SN Srinivas	Programme Analyst (Energy for Development) United Nations Development Programme 55, Lodhi Estate, New Delhi – 110003	Tel: +91-11-46532251 Mobile: +91 9818844798 E-mail: sn.srinivas@undp.org
Mr B Ramakrishna Bhatta	United Nations Development Programme 55, Lodhi Estate, New Delhi – 110003	Tel: +91 11-2996 0593 Mobile: +91 9990569223 E-mail: <a href="mailto:ramakrishna.bhatta@undp.org">ramakrishna.bhatta@undp.org</a>
Dr Butchaiah Gadde	Project Manager United Nations Development Programme 21, Munsudong (Diplomatic Compound) Pyongyang, DPR Korea	Tel: +850-2-381-7772/3/4/5 Mobile: (+850) 191 250 0373 Email: <a href="mailto:butchaiah.gadde@undp.org">butchaiah.gadde@undp.org</a>
Mr. Bishwanath Sinha	Joint Secretary – International Cooperation  Ministry of Environment, Forest and Climate Change (MoEFCC)	Phone: +91 11 24695274
Dr Nayanika Singh	Ministry of Environment, Forest and Climate Change (MoEFCC)	Mobile: +91 9810254814 Email: <a href="mailto:Nayanika.singh@nic.in">Nayanika.singh@nic.in</a>
Mr Sachin Kumar	Fellow Industrial Energy Efficiency Division TERI (The Energy & Resources Institute) Darbari Seth Block, Habitat Place Lodhi Road, New Delhi 110 003	Ph: +91-11-24682100/41504900 Mobile: +91 9899284734 Email: <a href="mailto:sachink@teri.res.in">sachink@teri.res.in</a>
Mr N Vasudevan	Seior Fellow Industrial Energy Efficiency Division TERI (The Energy & Resources Institute) Darbari Seth Block, Habitat Place Lodhi Road, New Delhi 110 003	Ph: +91-11-24682100/41504900
Mr. Pritpal Singh	Senior Engineer, Punjab State Council for Science & Technology (PSCST), MGSIPA Complex, Sector 26, Chandigarh -160019	Mobile: +91 98141 04784 Email: <a href="mailto:pritpal.pscst@gmail.com">pritpal.pscst@gmail.com</a>
Dr Samir Maithal	Director Greentech Knowledge Solutions Pvt. Ltd. (GKSPL) 342, Abhiyan Apartments,  Plot 15, Sector 12, Dwarka, New Delhi - 110078	Ph: +91 11 45535574 Mobile: +91 9811392256 Email: <a href="mailto:sameer@gkspl.in">sameer@gkspl.in</a>
Mr K P Eashwar	Managing Director ADCS (Academic and Development Communication Services) 17/12 Venkittarathinam Nagar Extn	Mobile: +91 - 95000 67559 E-mail: <a href="mailto:eashwar@adcs.in">eashwar@adcs.in</a> , <a href="mailto:eashwar.adcs@gmail.com">eashwar.adcs@gmail.com</a>

	Secon– Street Adyar, Chennai - –00 020	
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## Annex E: List of Documents Reviewed

	Particulars
Project Document	Signed by: Yannick Glemarec UNDP-GEF Executive Coordinator Date: 5 July 2007
Inception Workshop Report	November 18, 2009
Mid-term review (MTR) report of project	Frank Pool & Dr Sameer Maithel; 21 October 2012
Project Fact sheets	Various topics
Annual Work and Financial Plans	2013, 2014, 2015, 2016
Annual Project Report/ Project Implementation Review (APR/PIR) till 2016	2013, 2014, 2015, 2016 (draft)
Minutes of Project Technical Committee/Project Steering Committee meetings	PSC #1 (Aug 21, 2009); PSC #2 (March 23, 2010); PSC #3 (July 5, 2010); PSC #4 (January 6, 2011); PSC # (September 22, 2011)
Quarterly Reports	2009, 2010, 2011, 2012, 2013, 2014
Annual financial audit reports	2015 Part 1&2, 2016
Back to office reports of UNDP staff (if any)	Field visit reports summary Project Extension Request (
Study reports/Conference proceedings/government guidelines, etc.	Several instances
Baseline reports, consultancy inputs for implementation, post commissioning measurement studies, etc.	PIF preparation and LFA
GEF Monitoring & Evaluation Policy	TOR
GEF Focal Area tracking tools at baseline, midterm, and terminal points of the project	At endorsement and MTR
Knowledge products	Various packages
UNDP Development Assistance Framework (UNDAF)	With TOR
UNDP Country Programme Document (CPD)	With TOR
UNDP Country Programme Action Plan (CPAP)	With TOR
GEF focal area strategic program objectives	With TOR
Other publications prepared under the Project	Various packages
Other publications prepared by partners outside project	Design Manuals Fact sheets on different firing technologies Ecolabeling
Several reference materials and data sheets	Provided by PMU

## Annex F: Evaluation Question Matrix

**Terminal Evaluation of  
UNDP/GEF Project-- *Energy Efficiency Improvements in the Indian Brick Industry (PIMS 3465)***

Evaluative Criteria	Questions	Indicators	Sources <sup>12</sup>	Methodology <sup>13</sup>
Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels?				
<ul style="list-style-type: none"> <li>Is the project relevant to National priorities and commitment under international conventions?</li> </ul>	<ul style="list-style-type: none"> <li>Is the project country-driven?</li> </ul>	<ul style="list-style-type: none"> <li>Participation of the stakeholders and beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>PIR, Field reports and UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>Does the project adequately take into account the national realities, both in terms of institutional and policy framework in its design and its implementation?</li> </ul>	<ul style="list-style-type: none"> <li>Government programs and laws and regulations passed</li> </ul>	<ul style="list-style-type: none"> <li>Copies of policy pronouncements</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>How effective is the project in terms of supporting and facilitating needs of the <u>building sector through efficient production of resource-efficient bricks?</u></li> </ul>	<ul style="list-style-type: none"> <li>Participation of the stakeholders and beneficiaries</li> <li>relevant impacts on efficiency improvement</li> </ul>	<ul style="list-style-type: none"> <li>PIR, Field reports and UNDP CO assessments</li> <li>Energy audits reports on the selected brick kilns</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> <li>Field visits and inspections</li> </ul>
	<ul style="list-style-type: none"> <li>What was the level of stakeholder participation in project design and ownership in project implementation?</li> </ul>	<ul style="list-style-type: none"> <li>Satisfaction of the stakeholders and beneficiaries</li> </ul>	<ul style="list-style-type: none"> <li>PIR, Field reports and UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>

<sup>12</sup> Various sources, but not limited to project document, project reports, national policies & strategies, key project partners & stakeholders, needs assessment studies, data collected throughout monitoring and evaluation, data reported in project annual & quarterly reports etc.

<sup>13</sup> Various methodologies, but not limited to Data analysis, Documents analysis, Interviews with project team, Interviews with relevant stakeholders etc.

<ul style="list-style-type: none"> <li>Is the project internally coherent in its design?</li> </ul>	<ul style="list-style-type: none"> <li>Are there logical linkages between expected results of the project (log frame) and the project design (in terms of project components, choice of partners, structure, delivery mechanism, scope, budget, use of resources etc.)?</li> </ul>	<ul style="list-style-type: none"> <li>Number/degree of changes in the log frame and targets</li> </ul>	<ul style="list-style-type: none"> <li>MTR report</li> <li>UNDP CO assessments</li> <li>PMU Reports</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>Even after one extension, does the project achieve its expected outcomes</li> </ul>	<ul style="list-style-type: none"> <li>Performance improvement and deliveries as a result of extensions</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU report</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>Did the project made satisfactory accomplishment in achieving project outputs vis-à-vis the targets and related delivery of inputs and activities?</li> </ul>	<ul style="list-style-type: none"> <li>Achievement of targets</li> <li>Explanation on non-achievement</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU report</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
<ul style="list-style-type: none"> <li>Does the project provide relevant lessons and experiences for other similar projects in the future?</li> </ul>	<ul style="list-style-type: none"> <li>Has the experience of the project provided relevant lessons for other future projects targeted at similar objectives?</li> </ul>	<ul style="list-style-type: none"> <li>lessons learned reported</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU report</li> <li>UNDP CO</li> <li>Lessons learned reports</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
<b>Effectiveness: The extent to which an objective has been achieved or how likely it is to be achieved?</b>				
<ul style="list-style-type: none"> <li>Does the project been effective in achieving the expected outcomes and objectives?</li> </ul>	<ul style="list-style-type: none"> <li>Whether the performance measurement indicators and targets used in the project monitoring system are accomplished and able to achieve desired project outcomes within 31<sup>st</sup> December 2015?</li> </ul>	<ul style="list-style-type: none"> <li>Achievement of targets under each outcomes – to be rated</li> </ul>	<ul style="list-style-type: none"> <li>Project Framework (log frame) in the GEF-Approved project document (or Annex B) and subsequent revisions approved by UNDP/GEF</li> <li>PIR</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> <li>Completion of data and analysis in the Annex C: Evaluation of achievements based on the log frame targets or any revision thereof</li> </ul>

<ul style="list-style-type: none"> <li>How is risk and risk mitigation being managed?</li> </ul>	<ul style="list-style-type: none"> <li>How well are risks, assumptions and impact drivers being managed?</li> </ul>	<ul style="list-style-type: none"> <li>Risks identified and managed</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU reports</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>What was the quality of risk mitigation strategies developed? Were these sufficient?</li> </ul>	<ul style="list-style-type: none"> <li>Quality assessment</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU reports</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>Are there clear strategies for risk mitigation related with long-term sustainability of the project?</li> </ul>	<ul style="list-style-type: none"> <li>Risk mitigation done</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU reports</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
<ul style="list-style-type: none"> <li>Consideration of recommendations and reporting of information</li> </ul>	<ul style="list-style-type: none"> <li>Did the project consider Midterm Review recommendations conducted on time and reflected in the subsequent project activities</li> <li>Reporting of the petroleum fuels and the power reduction in each of the model units from implementing eco- tech options and the corresponding carbon emission reductions.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with agreed MTR recommendations</li> <li>Fuel saving achieved</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU reports</li> <li>Field reports</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
<ul style="list-style-type: none"> <li>What lessons can be drawn regarding effectiveness for other similar projects in the future?</li> </ul>	<ul style="list-style-type: none"> <li>What lessons have been learned from the project regarding achievement of outcomes?</li> </ul>	<ul style="list-style-type: none"> <li>Lessons learned reported</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU reports</li> <li>Field reports</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>What changes could have been made (if any) to the project design in order to improve the achievement of the project's expected results?</li> </ul>	<ul style="list-style-type: none"> <li>Nature of changes in indicators and targets</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
<b>Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards and delivered results with the least costly resources possible?</b>				



<ul style="list-style-type: none"> <li>Was project support provided in an efficient way?</li> </ul>	<ul style="list-style-type: none"> <li>How does the project management systems, including progress reporting, administrative and financial systems and monitoring and evaluation system were operating as effective management tools, aid in effective implementation and provide sufficient basis for evaluating performance and decision making?</li> </ul>	<ul style="list-style-type: none"> <li>Problems identified and addressed</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>How effective was the adaptive management practiced under the project and lessons learnt?</li> </ul>	<ul style="list-style-type: none"> <li>Adaptive management actions reported and results</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>Did the project logical framework and work plans and any changes made to them used as management tools during implementation?</li> </ul>	<ul style="list-style-type: none"> <li>Satisfaction by the PMU and co-operating agencies in using the Log Frame as management tool</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>Utilization of resources (including human and financial) towards producing the outputs and adjustments made to the project strategies and scope.</li> </ul>	<ul style="list-style-type: none"> <li>Resource inventory and utilization indices</li> <li>Extent of adjustments done and results</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> <li>Field reports</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>Details of co-funding provided (Ministry of Urban Development, GoI and Financing Units) and its impact on the activities (Refer to Table in section 6. Project Finance / Co-Finance).</li> </ul>	<ul style="list-style-type: none"> <li>Ratio of co-financing actually realized vs. committed values</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>How does the APR/PIR process helped in monitoring and evaluating the project implementation and achievement of results?</li> </ul>	<ul style="list-style-type: none"> <li>Satisfaction of the PMU and UNNP CO in using it as management M&amp;E tool</li> </ul>	<ul style="list-style-type: none"> <li>Assessment reports of PIRs</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>

<ul style="list-style-type: none"> <li>How efficient are partnership arrangements for the project?</li> </ul>	<ul style="list-style-type: none"> <li>Appropriateness of the institutional arrangement and whether there was adequate commitment to the project?</li> </ul>	<ul style="list-style-type: none"> <li>Level of partnership developed vs. committed level</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	<ul style="list-style-type: none"> <li>Document analysis and interviews</li> </ul>
	<ul style="list-style-type: none"> <li>Was there an effective collaboration between institutions responsible for implementing the project?</li> </ul>	<ul style="list-style-type: none"> <li>Level of collaboration achieved</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>Is technical assistance and support received from project partners and stakeholders appropriate, adequate and timely specifically for project PMU?</li> </ul>	<ul style="list-style-type: none"> <li>Level of satisfaction by PMU</li> </ul>	<ul style="list-style-type: none"> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
<b>Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results?</b>				
<ul style="list-style-type: none"> <li>Will the project be sustainable on its conclusion and stimulate replications and its potential?</li> </ul>	<ul style="list-style-type: none"> <li>How effective is the project in terms of strengthening the capacity of <u>building sector</u> professionals</li> </ul>	<ul style="list-style-type: none"> <li>Satisfaction level of professionals accessing project results</li> </ul>	<ul style="list-style-type: none"> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>Was an exit strategy prepared and implemented by the project? What is the "Expected situation at the end of the Project"</li> </ul>	<ul style="list-style-type: none"> <li>Coy of Exit Strategy</li> </ul>	<ul style="list-style-type: none"> <li>Exit strategy report</li> <li>UNDP Assessment</li> </ul>	Document analysis and interviews
	<ul style="list-style-type: none"> <li>Appropriateness of the institutional arrangement and whether there was adequate commitment to the project.</li> </ul>	<ul style="list-style-type: none"> <li>Level of commitment through results realized</li> </ul>	<ul style="list-style-type: none"> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	Document analysis and interviews
<b>Impact: Are there indications that the project has contributed to, or enabled progress towards maximizing environmental benefits?</b>				

<ul style="list-style-type: none"> <li>What was the project impact under different components?</li> </ul>	<p>To what extent has the project contributed to the following?:</p> <ul style="list-style-type: none"> <li>(a) Institutional Arrangements Strengthened</li> <li>(b) Effective Information Dissemination Program Developed</li> <li>(c) Stakeholders capacity enhanced</li> </ul>	<ul style="list-style-type: none"> <li>Institutional Arrangements Strengthened</li> <li>Information programs developed</li> </ul>	<p>Annex C: Evaluation of achievements based on the log frame targets or any revision thereof</p>	<p>Document analysis and interviews</p>
<ul style="list-style-type: none"> <li>What are the indirect benefits that can be attributed to the project?</li> </ul>	<ul style="list-style-type: none"> <li>Were there spinoffs created by the project, if any, as a result of the various workshops held nationwide, toolkits, case studies developed?</li> </ul>	<ul style="list-style-type: none"> <li>Spin-offs created</li> </ul>	<ul style="list-style-type: none"> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	<p>Document analysis and interviews</p>
<ul style="list-style-type: none"> <li>Impacts due to information dissemination under the project</li> </ul>	<ul style="list-style-type: none"> <li>To what extent did the dissemination activities facilitate the progress towards project impacts?</li> </ul>	<ul style="list-style-type: none"> <li>Level of dissemination of results achieved</li> </ul>	<ul style="list-style-type: none"> <li>PIR</li> <li>PMU Reports</li> <li>UNDP CO assessments</li> </ul>	<p>Document analysis and interviews</p>

Annex G: Pictures of REB manufacturing operations

**Resource efficient green brick production**



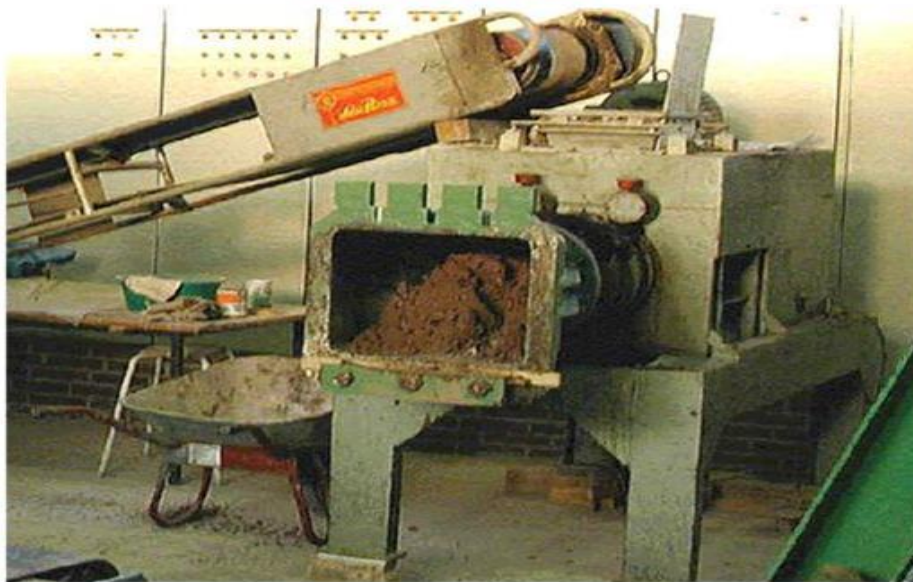
**Set-up for mixing and grinding clay**



## Clay mixer



## Extruder

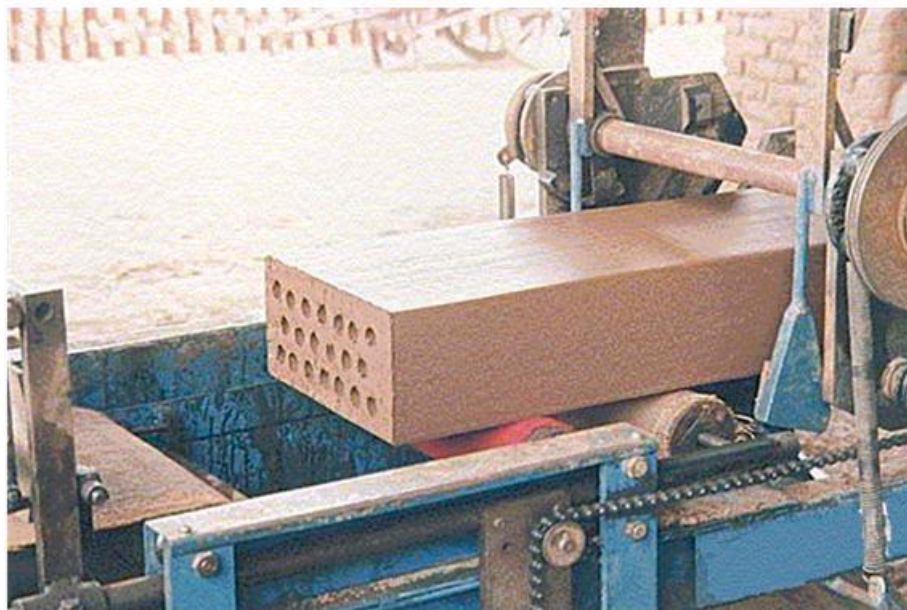




## **Drying of Resource efficient bricks**



## **Wire-cutting mechanism**



## **Wire cutting & drying of resource efficient green bricks**



Annex H: Evaluation Consultant Agreement Form

**Evaluation Consultant Agreement Form – International Consultant**

Terminal Evaluation of  
UNDP/GEF Project-- *Energy Efficiency Improvements in the Indian Brick Industry (PIMS 3465)*

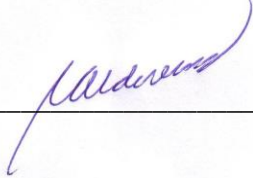
Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Rogelio Z. Aldover

Name of Consultancy Organization (where relevant): Independent Consultant

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at *Manila, Philippines* on *January 30, 2017*

Signature: 

**Evaluation Consultant Agreement Form – International Consultant**

Terminal Evaluation of  
UNDP/GEF Project-- *Energy Efficiency Improvements in the Indian Brick Industry (PIMS 3465)*

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Sanjay Mande

Name of Consultancy Organization (where relevant): \_\_\_\_\_

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at *New Delhi, India* on *January 30, 2017*

Signature: 



**Annex I: Evaluation Report Clearance Form**

**Terminal Evaluation of  
UNDP/GEF Project-- *Energy Efficiency Improvements in the Indian Brick Industry* (PIMS 3465)**

*(to be completed by CO and UNDP GEF Technical Adviser based in the region and included in the final document)*

Evaluation Report Reviewed and Cleared by

UNDP Country Office

Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

UNDP GEF RTA

Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Annex J: TE Audit Trail (Annexed in a separate file)**

To the comments received on **(date)** from the Terminal Evaluation of UNDP/GEF *Project-- the Energy Efficiency Improvements in the Indian Brick Industry* (PIMS 3465)

*The following comments were provided in track changes to the draft Terminal Evaluation report; they are referenced by institution ("Author" column) and track change comment number ("#" column):*

Author	#	Para No./ comment location	Comment/Feedback on the draft TE report	TE team response and actions taken

**Annex L: GEF Focal Area Terminal Tracking Tool (*Annexed in a separate file*)**