Difficulties of applying CDM methodologies in the building sector: overview of previous activities/efforts made and lessons learnt

BEEP PROJECT
ULAANBAATAR 2013
United Nations Framework Convention on Climate Change (UNFCCC)

- Ultimate objective of stabilizing global greenhouse gas concentrations in the atmosphere

- Industrialized countries (Annex I countries) *aim to restore* GHG emissions below 1990 levels

- Support capacity building in, and facilitate technology transfer to developing countries to mitigate, and to adapt to climate change
Kyoto: Planned impact

GHG Emissions for Annex B countries

1990: Base Year

First Commitment Period:

2008

2012

AVG: 1990-5.2%

GHG Emissions or "BUSINESS AS USUAL (BaU)"

Graph shows the planned impact of GHG emissions over time for countries participating in the Kyoto Protocol, with a focus on the First Commitment Period from 2008 to 2012, and the average decrease of 5.2% from 1990 to the current year.
CDM Projects in Building sector

- There has been a specific buildings focused CDM Small Scale Methodology AMS II.E available since 2005
- But only around 0.5% of CDM projects are for buildings
- Only India Kolkata Sheraton hotel project has CERs issued - under 2000 CERs/year for 2006-2008, not cost effective
- Even successful lighting and SWH CDM projects are rare
“Baseline Monitoring Study Report – Final Draft”

“CDM Baseline Study for Thermo Technical Rehabilitation of Pre-Cast Panel Buildings in Ulaanbaatar”

“Baseline Monitoring Study Report – Final Draft”

Frank Pool (New Zealand)

With assistance of Tsogt A. (Mongolia),
Narantsatsral Ch. (Mongolia),
Munkhbayar B. (Mongolia)
Why Panel Buildings Were Chosen:

- Around 500 pre-cast panel buildings in Ulaanbaatar
- Major replication potential, incl. in other countries
- High ratio for energy savings, At least 50% energy / GHG savings expected
  - higher U value
- Panel bldgs standard designs with limited variations
  - 5, 9, 12 store
- Panel buildings will continue to be used for decades
CDM Baseline Monitoring Study Results -Thermo-
Technical Rehabilitation of Pre-cast Panel Buildings in UB

2009-2010 Mongolian winter to examine the actual thermal characteristics and actual heating:

<table>
<thead>
<tr>
<th>Location-District</th>
<th>1. building 8, 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating from CHP No 4, so no heat shortage</td>
<td></td>
</tr>
<tr>
<td>2 nine-storey buildings = 792 apartments</td>
<td></td>
</tr>
<tr>
<td>2 Sukh Associations involved</td>
<td></td>
</tr>
<tr>
<td>Replicable to 2 same clusters.</td>
<td></td>
</tr>
<tr>
<td>Lower rehabilitation cost</td>
<td></td>
</tr>
</tbody>
</table>
District-1, building 9
District-1, building 8
CDM Baseline Monitoring Study Results - Thermo-Technical Rehabilitation of Precast Panel Buildings in UB

- **Location:** District-10. building connected to substation 13
  - 5-storey (building 40 with 58 apartments)
  - 9-storey panel building (building 14 with 144 apartments)
  - comprising 1014 apartments across 14 buildings in the whole cluster
- **3 Sukh Associations involved**
- **Most of PP Buildings 5, 9 story building**
District-10, 9 story building
District-10, 5 story building
examine the actual thermal characteristics and actual heating energy supply

- Commissioned structural and condition reviews of the four applicable panel buildings.
- Installed and calibrated heat meters and done measurement:
  - Purchase a new 100 mm heat meter to monitor the space heating supply to District 1’s buildings 8 and 9
  - Buy new 40 mm heat meters and reuse some existing heat meters to measure the heat supply to the individual heating system risers in the 5-storey (building 40) and a 9-storey panel building (building 14)
examine the actual thermal characteristics and actual heating energy supply

- Ventilation rates were measured by Blower door.
- Measured heat transfer coefficient of walls and windows
- Measured inside air temperatures and humidity.
- Made infra photos to check heat loss.
Measuring inside air temperatures and humidity
Monitoring Air Tightness
Measuring heat transfer coefficient
Infra photo
## CONTENTS

A. General description of the small scale project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / crediting period

D. Environmental impacts

E. Stakeholders’ comments
Draft CDM PDD for District 1

Annex 1: Contact information on participants in the proposed small scale project activity
Annex 2: Information regarding public funding
Annex 3: Baseline information
Annex 4: Monitoring Information
Draft CDM PDD for District 1

- Facade view will improved.
- Heat loss will decrease.
- Increase the price of buildings.
- Will save around 70 percent heat. actual 50 percent.
Before insulation. GIZ project
After insulation. GIZ project
## Heat loss and payment calculation insulated building by GIZ project

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Heat load kW</th>
<th>Energy consumption kWh/year</th>
<th>square</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insulated building 8</td>
<td>69.5</td>
<td>200160</td>
<td>1080</td>
</tr>
<tr>
<td>2</td>
<td>Noinsulared building 19</td>
<td>116.6</td>
<td>335808</td>
<td>1080</td>
</tr>
</tbody>
</table>

### Payment for Heating

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>By square</th>
<th>By heat meter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unit price ฿/m²</td>
<td>Sum ฿/8 months</td>
</tr>
<tr>
<td>1</td>
<td>Insulated building 8</td>
<td>304</td>
<td>2626560</td>
</tr>
<tr>
<td>2</td>
<td>Noinsulared building 19</td>
<td>304</td>
<td>2626560</td>
</tr>
</tbody>
</table>
The following technologies/measures will be deployed in the project:

- Fitting EPS (Expanded Polystyrene) wall insulation to the outside of the external pre-cast concrete walls, roofs, changing windows. U value should meet existing building code.
- Reducing uncontrolled ventilation.
- Changing the current single vertical pipe series heating radiator pipe work to a horizontal two pipe parallel hot water supply and return system serving the radiators of each individual apartment.
- Install for all heating risers balancing valves.
The following technologies/measures will be deployed in the project:

- Install for each radiators thermostat valves.
- Install for each apartment heat meters.
- Changing apartment space heat billing from an area based heat tariff to a measured actual heat supply based heating tariff
Single Pipe Heat Radiators
The crediting period will start on 15 September 2012 and apply for 7 years (renewable).

<table>
<thead>
<tr>
<th>Years</th>
<th>Annual estimation of emission reductions in tonnes of CO$_2$e</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 September 2012 – 15 May 2013</td>
<td>12,988</td>
</tr>
<tr>
<td>15 September 2013 – 15 May 2014</td>
<td>12,988</td>
</tr>
<tr>
<td>15 September 2014 – 15 May 2015</td>
<td>12,988</td>
</tr>
<tr>
<td>15 September 2015 – 15 May 2016</td>
<td>12,988</td>
</tr>
<tr>
<td>15 September 2016 – 15 May 2017</td>
<td>12,988</td>
</tr>
<tr>
<td>15 September 2017 – 15 May 2018</td>
<td>12,988</td>
</tr>
<tr>
<td>15 September 2018 – 15 May 2019</td>
<td>12,988</td>
</tr>
<tr>
<td><strong>Total estimated reductions</strong> (tonnes of CO$_2$e)</td>
<td><strong>90,916</strong></td>
</tr>
<tr>
<td><strong>Total number of crediting years</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>
Difficulties encountered

- All precast panel building apartments privatized. Owners interested to implement this project. But no financial sources
- Insulation work is high cost.
- Heat price for apartment is lower
- Construction season in short.
PROJECT IDEA NOTE (PIN)
Energy Efficiency Building

• OBJECTIVE OF THE PROJECT:

To reduce air pollution caused by coal and wood burning in the informal dwellings in Ulaanbaatar city and other population centers.

These houses are poorly insulated, resulting in large heating losses. The objective of the project is to replace existing dwellings with well-insulated houses, and thus reducing energy costs and reducing greenhouse emissions.
PROJECT IDEA NOTE (PIN)
Energy Efficiency Building

• PROJECT DESCRIPTION AND PROPOSED ACTIVITIES:

Replacement of 7000 existing houses with super-insulated buildings, thus reducing coal costs. The super insulated airtight houses that will be built use domestically available materials like Polysterene Foam Board insulated Light Weight Concrete, Rockwool insulated Timber Framed Houses, Structural Insulated Panels and etc. A 35m² house in the ger district requires about 7.4 tons of coal per year for heating in the baseline, and a 65m² house requires about 11.5 tons of coal/year. By introducing super-insulated buildings, the annual consumption will be reduced to 3.1 respectively 5.3 tons of coal per year.
<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Superinsulated Houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1000</td>
</tr>
<tr>
<td>Year 2</td>
<td>1000</td>
</tr>
<tr>
<td>Year 3</td>
<td>1000</td>
</tr>
<tr>
<td>Year 4</td>
<td>1000</td>
</tr>
<tr>
<td>Year 5</td>
<td>1000</td>
</tr>
<tr>
<td>Year 6</td>
<td>1000</td>
</tr>
<tr>
<td>Year 7</td>
<td>1000</td>
</tr>
</tbody>
</table>
**PROJECT IDEA NOTE (PIN)**

Energy Efficiency Building

Schedule of emission reductions:

<table>
<thead>
<tr>
<th>Year</th>
<th>Houses under construction</th>
<th>Total finished houses at start of year</th>
<th>tCO2 emission reductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>1000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>1000</td>
<td>1000</td>
<td>7,850</td>
</tr>
<tr>
<td>2013</td>
<td>1000</td>
<td>2000</td>
<td>15,700</td>
</tr>
<tr>
<td>2014</td>
<td>1000</td>
<td>3000</td>
<td>23,550</td>
</tr>
<tr>
<td>2015</td>
<td>1000</td>
<td>4000</td>
<td>31,400</td>
</tr>
<tr>
<td>2016</td>
<td>1000</td>
<td>5000</td>
<td>39,250</td>
</tr>
<tr>
<td>2017</td>
<td>1000</td>
<td>6000</td>
<td>47,100</td>
</tr>
<tr>
<td>2018</td>
<td>0</td>
<td>7000</td>
<td>54,950</td>
</tr>
<tr>
<td>2019 and later</td>
<td>0</td>
<td>7000</td>
<td>54,950</td>
</tr>
</tbody>
</table>
Suggestion for further projects

- Improvement heating supply system with heat only boilers: /examples: Yarmag-63, heat load (233.4/134.8)kW, Shar khad-79 schools/
  - Insulation. /wall, roof, ploor, basement, changing windows /
  - Changing heating system. /installing thermostat and balancing valves, heat meters…etc/
  - Install domestic hot water system.
  - Renewing district heating network.
  - Renewing heat only boilers. /boilers, pumps …etc/
  - Automatization
## Potential projects

- Improvement heating supply system with district heating. /UB, Darkhan citys/:  
  - Insulation.  
  - Changing heating system. /instaling thermostat and balancing valves, heat meters…etc/  
  - Install domestic hot water system.  
  - Renewing district heating network.  
  - Renewing heating substations. /heat exchangers, pumps, heat meters…etc/  
  - Automatization
Heating substation with plated heat exchangers

Standard product
- ordering number
- without changes
- series production

Configuration (CPS)
- one common platform
- pre-configurable modules
- series production

Customized
- special design
- stand/nonstand components
- custom-made production
pumps
Various regulators

<table>
<thead>
<tr>
<th>Temperature regulator</th>
<th>Pressure, зарцuurалт тохируулах хаалт</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armatur</td>
<td>Арматур</td>
</tr>
<tr>
<td>Diameter 15-200</td>
<td>Diameter 15-200</td>
</tr>
<tr>
<td>Temperature: max 150°C</td>
<td>Temperature: MAX150°C</td>
</tr>
<tr>
<td>Pressure: PN 10/16/25/40</td>
<td>Pressure: PN 10/16/25/40</td>
</tr>
</tbody>
</table>

Monitoring screen
Heating equipment
Heat recovery from ventilation

- Air to air heat exchangers
Thank you

Ministry of construction and urban development, UNDP

“BEEP” Project

31 January 2013

Ulaanbaatar