Affordable Housing

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What we are building: a business initiative with social impacts

- Our definition of Affordable Housing: “Housing for people who do not have access by usual financial ways to decent housing”
  - Emerging countries: 4 billion people (‘Base of the pyramid’)
  - Developed countries: 150 million people without decent house conditions

- Our objective: building new markets for LafargeHolcim and improving housing conditions

- A dedicated team at corporate level and local projects run by the local country teams (Marketing and/or Commercial teams).
THE AFFORDABLE HOUSING PROGRAM OF LAFARGEHOLCIM

25 COUNTRIES WITH PROJECTS LAUNCHED OR IN DEVELOPMENT
Affordable Housing with LafargeHolcim in numbers

25 countries involved

Over 400,000 people impacted in 2015

More than 15,000 housing loans distributed through our microfinance partners in 2015

New business activity which contributed additional USD 15m EBITDA to LafargeHolcim results
Affordable housing: 4 initiatives

**MICROFINANCE**
- *Customer need:* Individual home builder’s access to finance
- *Our solution,* based on our cement bags retailers network:
  - Providing access to credits & technical assistance
  (catalogues of house designs, bill of quantities, ...)

**EARTH & CEMENT**
- *Customer need:* alternative to burnt clay bricks
- *Our solution:* Mix of cement and soil to produce **non burnt clay bricks,** keeping aesthetic and thermal inertia of earth construction

**DISTRIBUTION IN SMALL QUANTITIES**
- *Customer need:* Access to cement & RMX in informal settlements (congested areas) and remote/rural areas.
- *Our solution:* Distribution of cement and bagged concrete in small quantities, as well as one-stop shop solutions.

**MASS AFFORDABLE HOUSING**
- *Customer need:* Quality & speed of delivery of large scale projects
- *Our solution:* LafargeHolcim works with developers to improve quality & speed of construction
A Complete Housing Solution for Individual Home Builders

Access to financing through microfinance institutions (MFIs)
- For home extensions & renovation
- For new homes, built bit-by-bit
  - Largest network of MFIs, supported by partners

Technical assistance
- Catalogs
- Site visits, plans & budgets
- Tablet App
- Trained masons
- IHBs Hotline

Access to Retailers
- Pick-up of materials
- Availability of products & prices checked
- Trained to basic construction technical assistance

Construction solutions
- Modular houses for bit-by-bit construction
- Concrete blocks offer
- Roofing solutions

Complete Housing Solution
Over 1,600 houses built every month with our offer

Building the ecosystem: Housing Microfinance Academy

- In partnership with IFC/World Bank
- Objective: training microfinance banks on how to create a housing microcredit product & work with LafargeHolcim
- Countries covered in 1 year: Kenya, India, Brazil, Nigeria
INFORMAL SETTLEMENTS (1/2)

Example in India (Lafarge India)

**Needs in self-built neighborhoods**

- 100 million urban Indians live in self-built neighborhoods
- Many small contractors are building individual, low-rise houses
- Key aspects of the demand make ready-mix concrete an attractive solution
  - Quality (perceived) and time are highly valued,
  - Accessibility and transport are often challenging

**Our program across India**

- Delivery (on rickshaws) of 15 liters bag of fresh concrete, using special mix design
- Extension to 10 new cities in 2015
... in informal settlements  (2/2)

Example in India (Shivaji Nagar, Mumbai)

Delivery of bagged mortar, bags being reusable

Project of 3 houses built in parallel, allowing for 20% savings for the owners. Our bagged concrete allowed to streamline construction.

Example of project targeted by dedicated sales team
Mass Affordable Housing

Addressing the needs for mass Housing in emerging countries

Context

Governments, NGOs & social housing developers are looking for new construction solutions to achieve the following:

• Build Social Housing projects faster
• Improve the quality & perception of such projects (aesthetic, durability)

LafargeHolcim approach

Identification & testing of construction systems to optimize cost, speed, quality and durability

• Research Center in France & regional Construction Development Labs

Facilitate implementation of such projects

• LafargeHolcim Construction Specialists in countries
• Ready-mix business line

Examples

Collaboration with NGO Gawad Kalinga in the Philippines

For Ogun State Property Investment Corporation in Nigeria
Building carcasses in Nigeria

Example in Nigeria

**DAY 01**
Installation of vertical rebar and wall formwork.

**DAY 02**
Installation of deck formwork and better slab B.R.C.

**DAY 03**
Installation of M & E, top slab B.R.C and dropframe. Formwork alignment.

**DAY 04**
Concreting process begins.

Wall formwork can be removed after a minimum concrete compressive strength of 2 N/mm² is achieved.

Deck formwork can be removed after a minimum concrete compressive strength of 10 N/mm² is achieved.
What we offer: Construction of Concrete Structure (or Carcass) on a mass scale

**Housing Services**

- **Quality**

- **Cost & Time**

- **Safety**
  - Control over site activities – no endangered life, no loss of time. Enforcement of safety standards.

- **Integrity**

**Lafarge Advantage**

- Aluminum formwork
- Concrete
- Labor & Management

= CARCASS
Earth & Cement solutions

A construction opportunity in emerging countries

Needs for new solutions

- 2 to 3 billion people live in earth-based homes
- Individual houses are mainly built of mud brick or burnt clay brick
- Environmental issues:
  - Increasing deforestation due partially to the use of wood for clay bricks burning
  - Low resistance to monsoons, requesting owners to rebuild houses every year

Our offer: Stabilized soil bricks – a dry mix of earth, sand and cement compressed to a brick

Advantages

- Use of local materials (earth – sand)
- On-site and easy fabrication
- Standardized form
- Durability of the product against shock, rain and insects.
LafargeHolcim’s solution of Soil Stabilized Bricks

Size: 29cm x 14cm x 9cm
How to produce SSB in 4 steps

1. **Soil extraction**
   - Using local soil deposit, widely available in order to minimize logistic cost

2. **Sieving**
   - Earth sieving to optimize the grading curve and maximize synergies earth/cement during compression

3. **Mixing & compacting**
   - Strict manufacturing protocol, to ensure optimum quality

4. **Curing - strength 1st**
   - Wet and dry curing for two weeks to enable synergy between cement/sand and earth

Quality control required at all production stages
Our expertise in mix design

SSB strength depends on the mix of water, cement, earth & sand

In our Research Center, we developed easy to use formula ...

...as well as techniques & tools used on site

Achieving the best mix design has positive impacts both on the durability and the cost of the construction project
## Comparison of construction materials

<table>
<thead>
<tr>
<th>Property</th>
<th>SSB</th>
<th>Burnt clay bricks</th>
<th>Concrete blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>29 x 14 x 9</td>
<td>22 x 11 x 7.5</td>
<td>42 x 20 x 15 to 50 x 25 x 20</td>
</tr>
<tr>
<td>Weight</td>
<td>7.5 Kgs</td>
<td>3.5 Kgs</td>
<td>12 Kgs</td>
</tr>
<tr>
<td>Compressive strength</td>
<td>Up to 7.4 MPa</td>
<td>Avg. Strength 6.3 MPa</td>
<td>Approx. 15 MPa</td>
</tr>
<tr>
<td>Water absorption</td>
<td>10%</td>
<td>14%</td>
<td>Up to 5%</td>
</tr>
<tr>
<td>Bricks per m² of wall</td>
<td>30</td>
<td>50 (single layer) 100 (double layer)</td>
<td>8 to 10</td>
</tr>
<tr>
<td>CO₂ emission / m³ building material</td>
<td>112 kg</td>
<td>681 kg</td>
<td>279 kg</td>
</tr>
<tr>
<td>Cost / m² (Base 100 = Burnt clay bricks)</td>
<td>80 to 90</td>
<td>100 (double layer)</td>
<td>150</td>
</tr>
</tbody>
</table>

*For each country, we carry out a comparative study of the construction cost for a 1 m² wall, with the most used techniques*
Different solutions for different scales

- Manual press: 100 bricks/day
- Semi-automatic press: 2,000 bricks/day
- Stationery press: 10,000 bricks/day
8 countries with Durabric on the market

**Tanzania**
- Partnership with "SSB integrator"

**Cameroon**
- First bricks produced
- Pipeline of 1k houses

**Uganda/Rwanda**
- First house built, local partner

**Malawi**
- > 2 m bricks already produced (~320 houses)

**Nigeria**
- First bricks produced with local partner

**Indonesia**
- First house with Durabric

**Madagascar**
- Partnership with "SSB integrator"

**Total oil station**

**Thomas Health Center**

**Illovo project**

**Teachers college**

A first for the country!
Launching a company with CDC Group dedicated to selling Durabric as part of a complete construction solution in Africa

<table>
<thead>
<tr>
<th>More automated Production solutions to increase availability of high quality bricks</th>
<th>A Complete Building Solution</th>
<th>Dedicated Prescription &amp; Project Assistance resources</th>
<th>Building a Network of affiliated producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Plant dedicated to SSB production, operated by LafargeHolcim</td>
<td>✓ Wall solutions with our SSB offers, ✓ Roofing solutions: micro-concrete tiles, ✓ Flooring solutions (earth&amp;cement), ✓ Door &amp; window frames, ✓ Lighting equipment (indoor &amp; outdoor)</td>
<td>2 prescriber targeting  • Corporations (employee estates)  • International NGO projects  • Government projects</td>
<td>Leveraging on partners resources &amp; networks to set up affiliated producers</td>
</tr>
<tr>
<td>✓ On site production solutions operated by contractors</td>
<td></td>
<td></td>
<td>✓ Licensing model, targeting precasters or entrepreneurs interested to produce SSB, complying on quality and leveraging Durabric Brand</td>
</tr>
</tbody>
</table>

On December 18, 2015, LafargeHolcim and CDC Group (DFID) announced a project of joint venture to accelerate & replicate this scheme
Leveraging a unique network of partners

<table>
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<th>Global and regional partners</th>
<th>Local partners</th>
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<td>Development finance institutions, UN agencies and inclusive business platforms</td>
<td>Partnerships with over 40 local micro-finance institutions (MFIs)</td>
</tr>
</tbody>
</table>

- Global and regional partners: Inter-American Development Bank (IDB), International Finance Corporation (IFC), CDC Group, UN-Habitat, The Practitioner Hub, World Urban Campaign

- Local partners: Tsip, SDB, Attawfiq, Société Générale, Rurral Bankers Association of the Philippines, MFinance, BancABC
Contacts – Corporate Affordable Housing team

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