Fast & Affordable Housing:
Learnings in Design, Development and Delivery

Sumitesh Das
Chief (Global Research Programmes)
Research and Development Division, Tata Steel Limited
sumitesh.das@tatasteel.com
What drives Innovation

• Innovations do not happen in a vacuum.
• There is a need, a goal, a target or an objective.
• The target should emotionally touch the innovator.
• Think“ much beyond their present reach”.
• Eco-system that helps to Connect. Proliferate. Diffuse.
• Fertile eco-systems help innovations to tip.
• Re-innovate.
The Housing Need

• Housing is a personal and a social need.
• A house gives identity and brings a change.
• Shortage of quality housing
  • ~ 24 to 26.5 million (various sources)

• Population increase. Persistent Problem.
# Issues and Barriers In Delivery

<table>
<thead>
<tr>
<th>Issues/Barriers</th>
<th>1961-71 Third and fourth plan</th>
<th>71-81 Fifth and sixth plan</th>
<th>81-91 Sixth and seventh plan</th>
<th>91-2001 Eight and ninth plan</th>
<th>2001-11 Tenth and Eleventh plan</th>
<th>Total marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing finance and affordability</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>85</td>
</tr>
<tr>
<td>Institutional and policy framework</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>Availability of land for housing</td>
<td>10</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>Advancement and availability of building materials</td>
<td>15</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Speedier technology and housing system</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>20</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>Supply of skilled and unskilled labor</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>20</td>
<td>65</td>
</tr>
</tbody>
</table>

*Mass-Industrialized Housing to Combat Consistent Housing Shortage in Developing Countries: Towards an Appropriate System for India - Ar. Uttam K. Roy, Dr. Madhumita Roy, Prof. Subir Saha; XXXVI IAHS World Congress on Housing, National Housing Programmes –New Visions, November 03-07, Kolkata, India, Year ?)*
Challenges to meet the Housing Need

• **Time**
  – Need for speedier technology
  – Flexible Housing System addressing land issues

• **Cost**
  – Affordable
  – Value for money and long lasting
  – Availability of financing systems

• **Sustainability**
  – Green technologies
  – Easier supply chain
  – Easy availability
  – Acceptability
Speedy Construction Technologies

- Framed structures
- Easy to manufacture
- Easy to Transport
- Open and customisable
- Local manpower skill sets
- No power tools
Flexible Housing System addressing land issues

- G+ structures
- Steel Rods, Concrete and Bricks.
- Quality and Time.

<table>
<thead>
<tr>
<th>Component</th>
<th>What does it seek to replace*</th>
<th>Enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Auto Aerated Bricks and Blocks (Rs. 60 for a 300x 300x 100 mm block)</td>
<td>Fired Clay Bricks (Rs. 5~9) Production (FY09): 140 billion. 100,000 plants</td>
<td>• Policy needed • Training and Demonstration Units • Replacement behaviour • Acceptability • Training of “brick” makers</td>
</tr>
<tr>
<td>2. AeroCon Bricks and Blocks</td>
<td>• Uses 400 mT of good quality soil every year. • Uses 24 mT of coal. • Pollution.</td>
<td></td>
</tr>
<tr>
<td>3. Sandwich Puf Panels (Rs. 1500 per sq. m)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*www.flyashbricksinfo.com
# Affordability

<table>
<thead>
<tr>
<th>Monthly Household Income</th>
<th>Income Pyramid</th>
<th>Market Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; Rs. 5000</td>
<td>33%, (22.4 mil)</td>
<td>ULTRA LOW SEGMENT</td>
</tr>
<tr>
<td>Rs. 5000-10,000</td>
<td>31% (21.1 mil)</td>
<td>Price of unit &lt; Rs. 3 lacs</td>
</tr>
<tr>
<td>Rs. 10,000-20,000</td>
<td>21% (15 mil)</td>
<td>Potential Demand ~ 21 mil</td>
</tr>
<tr>
<td>Rs. 20,000-30,000</td>
<td>5% (3.4 mil)</td>
<td>Market size ~ Rs. 1,300,000 crores</td>
</tr>
<tr>
<td>Rs. 30,000-40,000</td>
<td>5% (3.4 mil)</td>
<td>LOW SEGMENT</td>
</tr>
<tr>
<td>Rs. 40,000-80,000</td>
<td>4% (2.7 mil)</td>
<td>Price of unit: Rs. 3~10 lacs</td>
</tr>
<tr>
<td>&gt; Rs. 80,000</td>
<td>1% (0.7 mil)</td>
<td>Potential Demand ~ 21 mil</td>
</tr>
</tbody>
</table>

**PREMIUM SEGMENT**
- Price of unit > Rs. 25 lacs
- Potential Demand ~ 2 mil
- Market size ~ Rs. 500,000 crores

**MIDDLE SEGMENT**
- Price of unit: Rs. 10~25 lacs
- Potential Demand ~ 5 mil
- Market size ~ Rs. 900,000 crores

Customer Segmentation and Market Potential *(Adapted from Monitor (2009))"
Affordability and Speedy Technologies

• Frame structure solutions and Pre-fab solutions meet the higher band of the LOW INCOME SEGMENT

• Product and Process INNOVATIONS are needed to reach the lower bands of the LOW and ULTRA LOW INCOME SEGMENTS

• Can we look at alternate technologies, particularly brewing in our research laboratories.

• Criterion: “Green” and “sustainable”
Green materials

<table>
<thead>
<tr>
<th>Product</th>
<th>Prototype</th>
<th>Pilot</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coir CSNL Board</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arhar Stalk Cement Board</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bio based sandwich composites</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Castor oil based Polyol foams*</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
</tbody>
</table>

** This list is not exhaustive

- Waiting for Innovators to take to Pilot and Commercial scales
- Long gestation periods, sometimes 5+ years. Unattractive
- Supply chains and raw material availability
- Creating awareness of technologies
- Policy to encourage multi level entrepreneurs needed
- Design for G+ structures
# Commercial Options for Wall Claddings

<table>
<thead>
<tr>
<th>Board Material</th>
<th>Strength</th>
<th>Advantage</th>
<th>Disadvantage</th>
<th>Price (Rs/Sq-m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coir Board</td>
<td>H</td>
<td>Strong &amp; Aesthetic</td>
<td>Costly</td>
<td>1250</td>
</tr>
<tr>
<td>Bamboo Mat Board</td>
<td>H</td>
<td>Strong &amp; Aesthetic</td>
<td>Costly</td>
<td>1000</td>
</tr>
<tr>
<td>Fibre Cement Board</td>
<td>H</td>
<td>Strong</td>
<td>Costly</td>
<td>600</td>
</tr>
<tr>
<td>Bison Board</td>
<td>H</td>
<td>Strong</td>
<td>Heavy</td>
<td>330</td>
</tr>
<tr>
<td>Dragon Board (MgO Board)</td>
<td>H</td>
<td>Strong</td>
<td>Chinese import</td>
<td>250</td>
</tr>
<tr>
<td>Calcium Silicate Board</td>
<td>M</td>
<td>Easy to handle</td>
<td>Low strength</td>
<td>330</td>
</tr>
<tr>
<td>Gypsum Board</td>
<td>L</td>
<td>Lighter</td>
<td>Absorbs Water</td>
<td>215</td>
</tr>
</tbody>
</table>
30 pilots pan India to see if the concepts work
Others are beginning their journey

Plan: 60 units – houses, community centres etc.

And few more ....
Building the Eco-system (1)

- India is vast. One size does not fit all.

- Develop 10 Regional Champions & Collaborations
  - Fund Entrepreneurs for scale up. Freedom to Fail
  - Research Labs to be incentivised for scale-up technologies
  - Tax rebates / holidays for early adapters
  - Organisations can also play entrepreneurs

- Successful entrepreneurs and business luminaries to monitor progress
Building the Eco-system (2)

- Innovation awards for implementing solutions
- Training programs for building professionals in the formal and informal sector on the new methods of construction, alternate methods
- Combine technologies e.g. Solar, wind, water harvesting
Then the **Trilemma** can be solved

**Fast**

**Affordable**

**Sustainable** Housing Solutions for INDIA
Thank you
Back UP Slides
Distribution of house types

Figures are in millions

- Kuchha: 87
- Semi Pucca: 106
- Pucca: 55
Material Usage in Indian construction

Source: census data 2001
**Katcha structures**

**Katcha structure**: A structure which had walls and roof made of non-pucca materials was regarded as a katcha structure. Katcha structures could be of the following two types:

(a) ‘Unserviceable katcha’ which included all structures with thatched walls and thatched roof i.e. walls made of grass, leaves, reeds etc. and roof of a similar material. 10 million population lives in these types.

(b) ‘Serviceable katcha’ which included all katcha structures other than unserviceable katcha structures.

**Occupants:**

- Daily wage earners
- Land labourers
- Susceptible to influence
- Monthly income Rs. 1200 to 1800
- All working hands
- Greater societal bond & dependency
- Mostly tribal areas and C class cities
- No toilets. Traditional clay made Chulha

Size of house varies from 150-200 Sq Ft
Semi-pucca structures

Semi-pucca structure: A structure which could not be classified as a pucca or a katcha structure as per definition was a semi-pucca structure. Such a structure had either the walls or the roof, but not both, made of pucca materials.

Occupants:
- Change oriented
- Calculative & Risk takers
- Land owners and have side businesses
- Most educated up to higher secondary
- May or may not have toilets and smokeless Gas burners

Size of house varies from 180-250 Sq Ft
Pucca Structures

Pucca structure: A pucca structure was one whose walls and roofs were made of “pucca materials”.

Occupants:
- Rich farmers, irrigated land
- Traders in villages
- Lower inclination towards accepting change
- Risk averse
- Monthly income > Rs. 8000
- Mostly found in villages near the A class cities, reflection of city structures
- House contains, toilets and bathroom.
- Has smoke less and traditional chulha.
- Has provision of heating water using wood, in the backyard

Size of house varies from 200-350 Sq Ft

* Excludes land cost
Low cost Housing & Affordable Housing

Low cost housing is used to describe dwelling where the total housing costs are affordable to the group of people within the “low income” bracket.

Affordable housing is a term used to describe dwelling units whose total housing costs are deemed "affordable" to those that have a low income.
Low cost Housing Projects: Examples

<table>
<thead>
<tr>
<th>Developer</th>
<th>Project</th>
<th>Location</th>
<th>Unit type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shapoorji Pallonji</td>
<td>Shukho brishti</td>
<td>New Town, Rajarhat, Kolkata</td>
<td>1BHK (320 sq. ft) and 2BHK (480 sq. ft)</td>
<td>Rs 3.85-6.35 lakh</td>
</tr>
<tr>
<td>Santosh Associates</td>
<td>Om Shanti Nagar-2</td>
<td>Batwa, Ahmedabad</td>
<td>1BHK (350 sq. ft) and 2BHK (450 sq. ft)</td>
<td>Rs 3.5-6.5 lakh</td>
</tr>
<tr>
<td>Sterling Developers</td>
<td>Janadhar</td>
<td>Atibele, near Electronic City, Bangalore</td>
<td>1BHK and 2BHK (area not decided yet)</td>
<td>Starting from Rs 4 lakh</td>
</tr>
<tr>
<td>Matheran Realty Co.</td>
<td>Tanaji Malusare City (TMC)</td>
<td>Karjat, Maharashtra</td>
<td>1 room kitchen (225 sq. ft), 1BHK (300 sq. ft) and 2BHK (375 sq. ft)</td>
<td>Rs 3-7 lakh</td>
</tr>
</tbody>
</table>