Need for resource efficient walling material

Nivit Kumar Yadav
Senior Programme Manager
Centre for Science and Environment
Walling material sector in India

• It is said, India is far lagging behind in infrastructure development and around 70% of India is still to be constructed;

• The “Housing for All” scheme of Indian government will require roughly 11 crore (35000 houses per day) new homes by 2022;
- 2 trillion USD

• An estimate shows that the building floor space will quadruple from 14 to 64 billion sq. meter by 2047.
Growth in Building Construction

- Residential floor space area (billion m²) in 2012: 13.4 billion m²
- Commercial floor space (billion m²) in 2012: 0.75 billion m²
- Residential floor space area (billion m²) in 2047: 53.6 billion m²
- Commercial floor space (billion m²) in 2047: 9.6 billion m²
Brick demand

* Market of brick industry – 200 billion bricks @ Rs. 4 = 800 billion Indian rupees
2nd largest industrial consumer of coal

- Steel: 20% (47 TPA)
- Bricks: 15% (35 TPA)
- Cement: 125 TPA
- Others: 53% (125 TPA)

Total: 236 tonnes per annum (TPA)
Environmental impacts

- Residential (40%)
- Industry (15%)
- Open burning (24%)
- Transport (21%)
- Other industry
- Brick kilns (40%)

Images show examples of environmental impacts from industrial activities.
Market of bricks

Contribution in Indian GDP

- Services: 69%
- Construction: 10%
- Industries: 17%
- Agriculture: 14%

Thus it becomes important to closely monitor and transform the growth of the sector in right direction – need for resource efficient walling materials
## Market of bricks

<table>
<thead>
<tr>
<th>Type of brick</th>
<th>Annual consumption (2014/15)</th>
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</thead>
<tbody>
<tr>
<td>Solid burnt clay bricks</td>
<td>243 billion bricks/year</td>
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<tr>
<td>Hollow and perforated burnt clay bricks</td>
<td>0.2 billion bricks/year</td>
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<tr>
<td>Pulverised fuel-ash lime/cement bricks</td>
<td>11.7 billion bricks/year</td>
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<tr>
<td>Autoclaved aerated concrete blocks</td>
<td>4.4 billion bricks/year</td>
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<tr>
<td>Concrete blocks</td>
<td>15 billion bricks/year</td>
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<td><strong>Total</strong></td>
<td><strong>274 billion bricks/year</strong></td>
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</table>
Geographical distribution of the brick manufacturing industry in India
Clay brick to resource efficient brick

- Clay and stabilised soil products
- Building lime and gypsum products
- Cement matrix products
  - AAC/CLC
Various masonry product based on BIS classification
# Comparative Assessment Of Different Walling Materials

<table>
<thead>
<tr>
<th></th>
<th>Mined raw material (kg/m³)</th>
<th>Primary Energy for Manufacturing (MJ/m³)</th>
<th>CO₂ emission for manufacturing (T CO₂/m³)</th>
<th>Thermal Conductivity (W/m-K)</th>
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<tbody>
<tr>
<td>Solid fired clay bricks (FCBTK)</td>
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<tr>
<td>Hollow fired-clay blocks</td>
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<tr>
<td>AAC Block</td>
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<tr>
<td>Cement Concrete Block</td>
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<tr>
<td>FaL-G Brick</td>
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<tr>
<td>Monolithic Concrete Wall</td>
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<tr>
<td>Compressed stabilized clay Block</td>
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**Comparative Assessment**

– Fal-G, AAC blocks, hollow clay fired blocks and compressed stabilized earth block better than others – can be called resource efficient

– Monolithic concrete wall – worst on resource efficiency parameters amongst the options considered

– Solid fired clay brick and concrete block needs improvements to make them resource efficient
FLYASH BRICKS
Flyash generation and utilization
Flyash availability in the country
Road Blocks to achieve

• No policy for demand side push for ash utilisation in bricks, road construction etc.

• Logistics cost - Ash transport costs

• Limited demand - in remote locations with several power plants

• Quality issues of ash bricks - perception on strength, color etc.

• Lack of level playing field: Clay and fly ash brick

• BIS standard does not mandate use - minimum level of fly ash that can be used in construction material not defined.
CSE’s Recommendations

TO INCREASE DEMAND

• **Mandate usage of fly ash bricks in Top 53 urban centres** (population > 1 million) by amending byelaws. Policy must be made consistent among various government departments. This can lead up to 80 mt fly ash usage annually.

• To establish **Fly ash mission** to promote use of fly ash – raising finances, setting up plants, securing raw materials sourcing, selling finished products alleviating quality concerns etc.

• **Level playing field:** Red clay brick sector dominates 80% of the brick market in India. (enjoy tax breaks etc.) To compete, fly ash brick makers must be provided tax relaxations, simplified procedures for establishment and operations.

• **Public disclosure of data:** User agencies like the road construction bodies, etc. should publish detailed data on fly ash usage.

• **Skill building**- of brick manufacturers and road construction agencies
• The production and use of solid clay bricks in all municipalities, large and mid-sized cities in coastal areas were banned beginning in 2000.

• As a result, the production of solid clay bricks reduced from around 620 billion in 1995 to around 400 billion bricks in 2010 (production of other types of bricks increased from 100 billion in 1995 to 400 billion in 2010).

• Shanghai: first Chinese city to attempt fly ash utilisation. Shortage of construction materials drove the choice of fly ash. Since 1997 the city has been using fly ash to construct foundation slab for tall buildings.
Why capacity building programme?

• Environmental management

• Process for ensuring quality of bricks

• Mechanization

• Operation and maintenance
Thank you