



Fly ash:: Potential to Reduce Clay Extraction

Fly ash: Generation and Utilisation Scenario India

- **Ash is the second largest waste stream**
 - ~1bt ash already dumped in ash ponds
 - ~180 mt ash generated every year from coal-based power
 - 55 % utilisation, less than 10% in bricks
- **Ash Generation will increase to ~300mt by 2021-22**

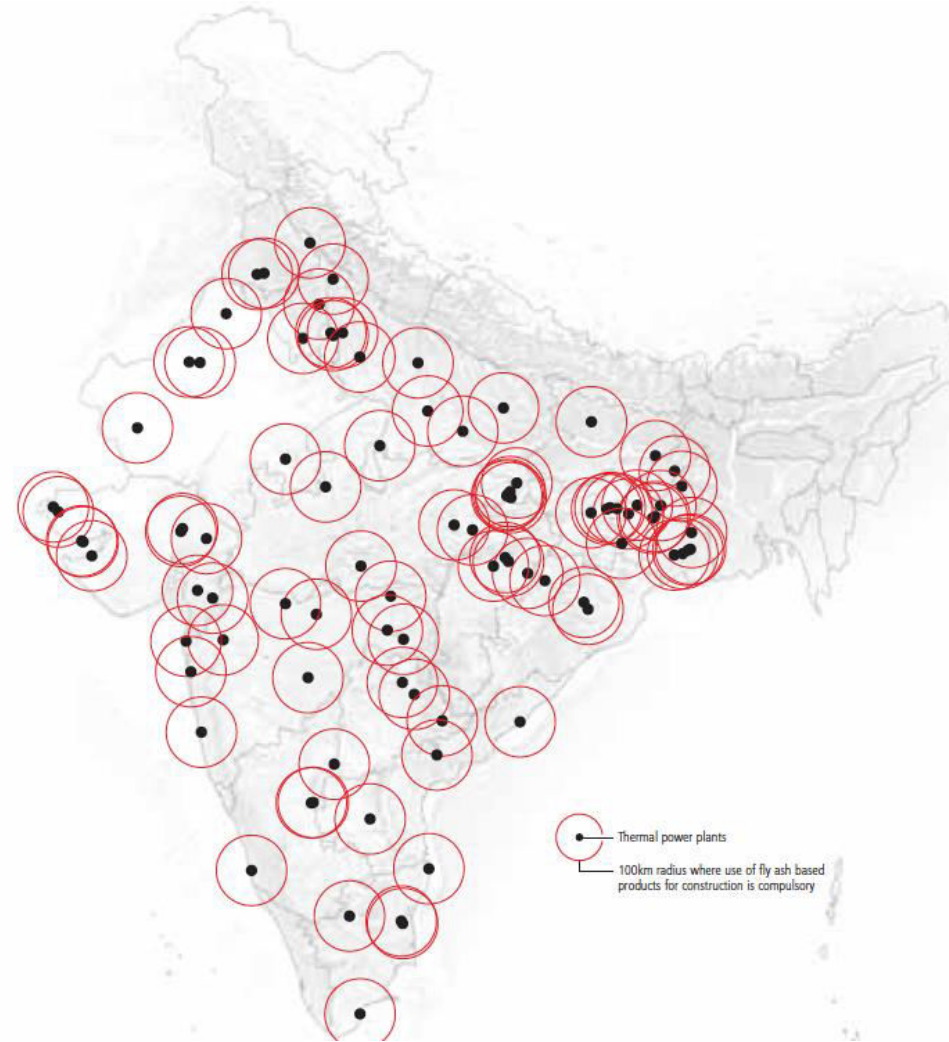
Year	Ash Generation in mt	Ash Utilization in mt	Cement	Bricks	Roads, embankments	Reclamation	Mine filling	Agriculture	Others
2012-13	163	100	41	9.9	16.9	11.8	10	2.5	7.4
2013-14	172	99	39	12	15	11	11	2.8	7
2014-15	184	103	43	12	13	11	13	1.9	6.8



Fly ash: regulations – not been achievable

Decades of effort by Government to drive 100 % ash utilisation target

- **Fly ash notification, 1999 set 100 % ash utilisation target by 2009**
 - Introduced demand and supply side measures
Example- construction projects around 100 kms radius of power plants should use only fly ash bricks
- **law was modified in 2009, mandating 100 percent ash utilisation by 2019**



Fly ash: regulations

(Draft) Notification, 2015

- Construction activities happening 500 km (310 miles) around power plants should use only fly ash bricks/cement
- Power plants to bear the cost of transport of ash up to 100 km for use in construction, roads etc. For government projects, industry has to bear the cost up-to 500 kms

Why the violation and what is the Fly ash utilisation potential

- **Cement – largest use (39.17 mt in 2013-14):**
 - Cement industry produced 251 mt cement in 2012-13; 65% of it was pozzolana cement – reasonable success; World pozzolana cement production only 18 percent (2008).
- **Brick making– little usage (12.23 mt in 2013-14),**
 - **Huge potential exists-** India consumes ~**200 billion bricks which can use 200 mt of ash annually** (1kg fly ash/ brick).
- **Roads & embankments– little use (4.98 mt in 2013-14):**
 - China used 58.8 mt ash (total roads built: 1,30,000 kms of roads in 2011-12);
 - India used very little- only 5.53 mt ash (total roads build 1,73,907 kms of roads)

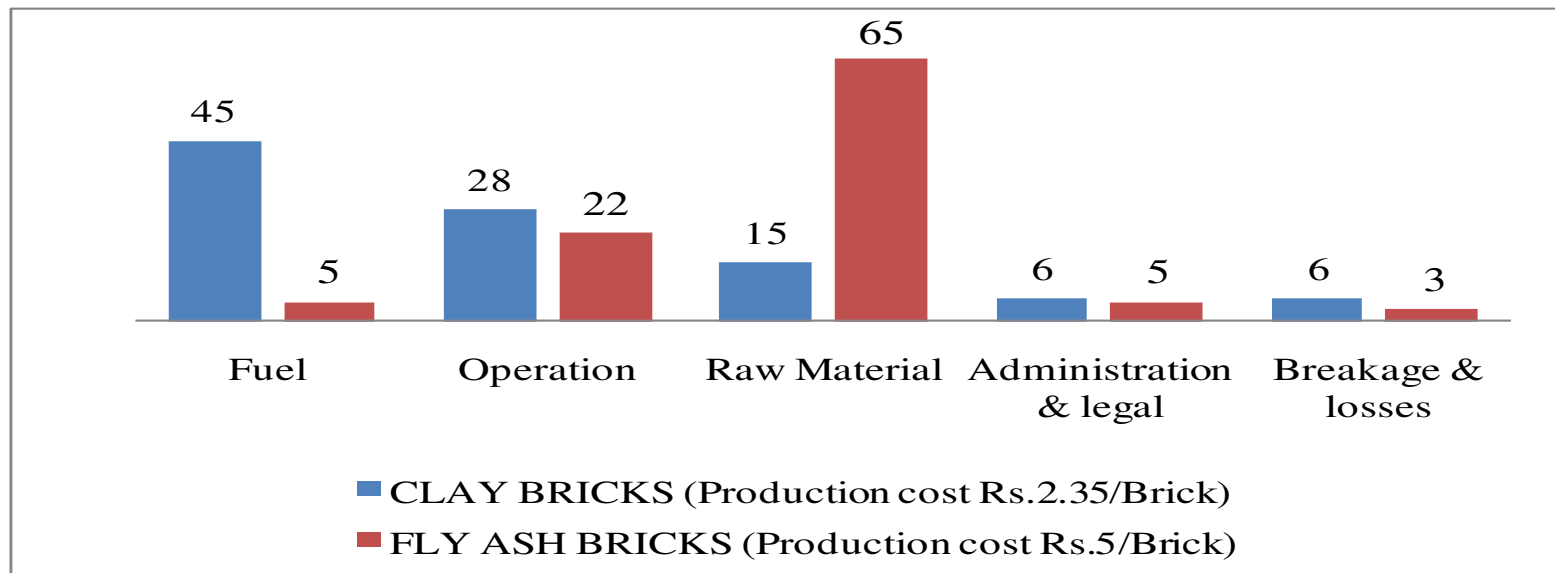
Demand Side

Fly ash brick: Availability

- **Availability –**
 - uneven and inadequate supply (the industry produces only around 17 per cent of the total demand for bricks.)
 - Architects and builders complain that fly-ash bricks are not readily available
 - Small scale builders: market choice;
 - Large scale builders: in case decides to use fly ash bricks, they often demand “earnest money” from fly ash-based brick manufacturers to ensure reliable supply, an onerous requirement for small companies.

Fly ash brick: Cost

- Brick cost contribute less than 5 percent of total cost of house
- Fly ash brick production cost varies from Rs 2 to Rs 5/brick with raw material a big component of total costs; therefore, lower ash costs will make fly ash bricks more competitive.
- In certain areas Fly ash bricks are cheaper (for eg. in parts of Maharashtra and Tamil Nadu) than clay bricks but in most regions they are more expensive.



Quality

- Fly ash brick manufacturers typically don't apply for accreditations to avoid costs - only two manufacturers have been given BIS certification for fly ash lime- gypsum (FAL-g) brick production, according to the website.
- Sub-standard quality:
 - due to companies not following BIS specifications or using lower amount of binder to cut costs;
 - lack of technical skills also plays a role as manufacturers don't know the right mix of raw materials to be used given the variations in fly ash, clay etc.

Perception

- **Myths**
 - inferior product in terms of strength, insulation etc.
 - This view is compounded by the fact that it is made from “waste” material and has an unappealing grey colour.
- Fly ash brick is however a good competitor of clay brick

	Clay Brick	Fly ash brick
Weight	heavier	lighter
Compressive strength in kg/sq.cm	35	100
Thermal conductivity in W/sq.m-C	1.25 - 1.35	0.90 - 1.05
Water absorption	20-25%	6-12%

Supply Side

Fly ash availability

- **Raw material availability:** major cost of fly ash brick making.
 - Even though it is mandatory for power plants to distribute 20 per cent of dry fly ash free, brick industry is forced to purchase it from traders.
 - difficulty in navigating power plant bureaucracy
 - guaranty to pick up a minimum amount of ash or incur penalty and pay earnest money, which can be a financial strain.
 - Large scale users like cement plants are much better placed to meet all of these requirements and may get priority in collecting ash.
 - In NCR area ash costs Rs 6,000 per 20-ton truck for a 50 Km distance. (CSE survey)

Level Playing field

- **Competition:** forced to compete with clay brick industry, a dominant incumbent that is politically powerful. Government policies failed to engage with the clay brick industry and convince them to shift to fly ash. Instead, a new set of entrepreneurs were encouraged to get into fly ash brick business.
- **Ease of establishment/operations:** difficult for fly ash brick manufacturers
- **Taxation/profitability:** Clay brick makers pay a total of only 9 percent tax; fly ash industry pays over 21 percent. tax
 - excise duty of 12.36 percent,
 - value added tax (VAT) 5 percent and
 - local body tax (LBT) 4 percent

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 upto 80 mt fly ash usage annually
- The Ministry should direct the municipalities in these urban centres to amend the building bye laws so **ONLY** fly ash bricks can be used for construction.

China: Banned Clay bricks in urban agglomerations

- 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.

Fly ash: Challenge

Country	Ash generation in mt (2012)	Ash utilisation in mt (2012)	Utilisation %
China	440	293.92	66.8
India	145.42	85.07	58.5
United States	98.8	47.12	47.7
South Africa	36.2	2.42	6.7
Australia	12.79	2.4	19
Japan	12	11.6	96.7

Source: US Energy Information Administration, American Coal Ash Association, Asian Coal Ash Association, World Bank, Electricity Supply Commission (Eskom) South Africa, Ash Development Association of Australia, Central Electrical Authority-India

China has been very successful in utilising ash – in a span of seven years China has utilised over 2bt of ash.

CSE's recommendation

- 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 (currently pays ~21.36%), 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

CSE's Recommendations

TO INCREASE SUPPLY

- **Logistic cost – prime detrimental factor. Welcomed the government move to encourage power plants transport of ash upto 100 km**
- **Ash transport upto 100 km is feasible, will not increase the cost of generation significantly:** According to CSE estimates transport of fly ash up to 100 km by road costs around 4 paisa per KWh. Current ash disposal costs of around 3 paisa/KWh. (Profits made by power plants 50 paise/unit)