AAETI

Anil Agarwal Environment Training Institute

Overview of Brick Kiln Sector in the country

AAETI

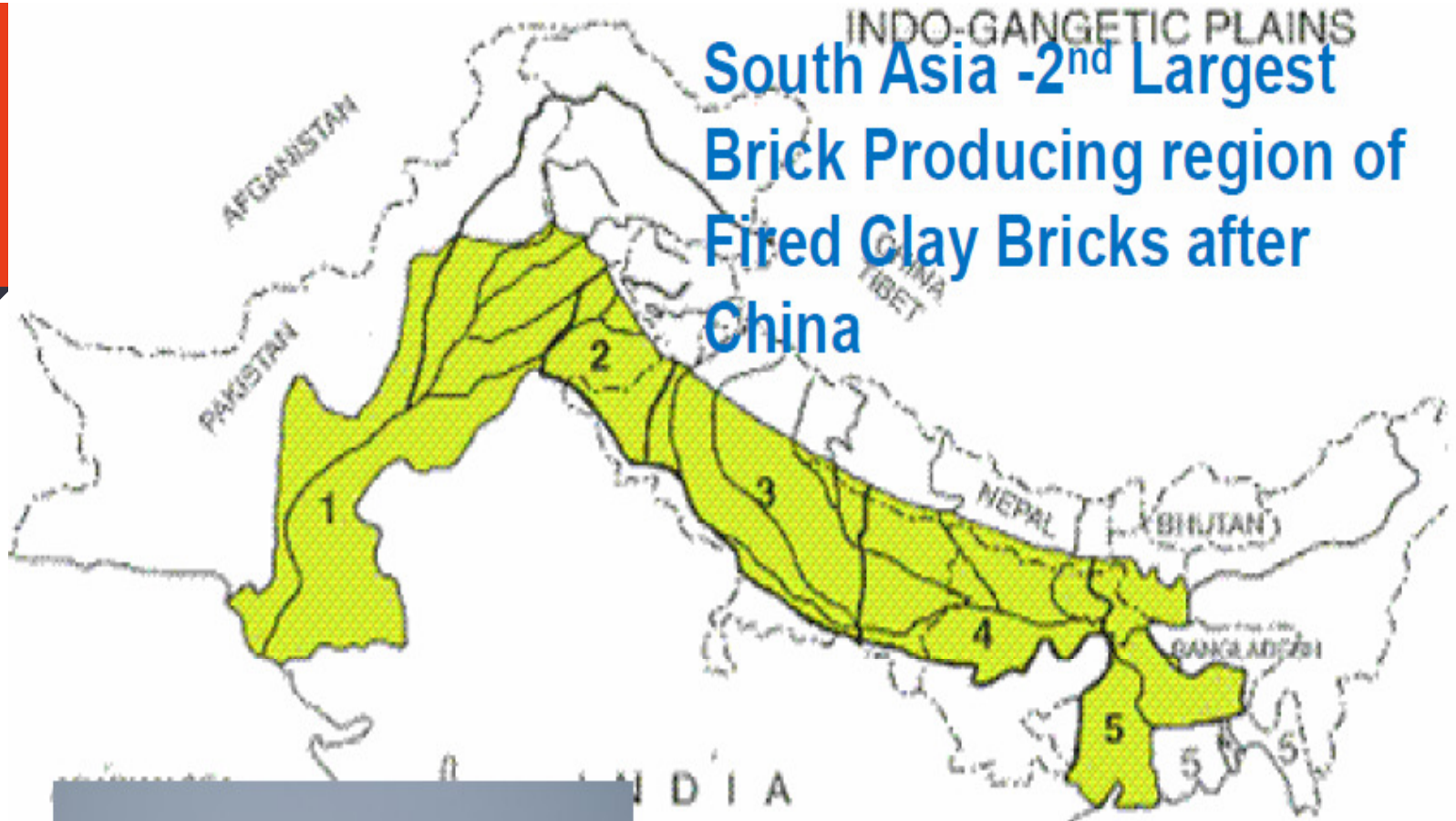
Global brick production: 1.5 trillion bricks/annum

Country	Production %	No. Billion P.A.
China	66.67%	1,000
India	13.33%	200
Pakistan	3.00%	45
Vietnam	1.67%	25
Bangladesh	1.13%	17
Nepal	0.40%	6
Rest of Asia	0.47%	7
Total Asia	**86.67%**	**1,300**
USA	0.53%	8
UK	0.37%	4
Australia	0.13%	2
Rest of World	12.40%	186
Total Rest of World	**13.33%**	**200**
Total World Production	100.00%	1,500

CSE

AAETI

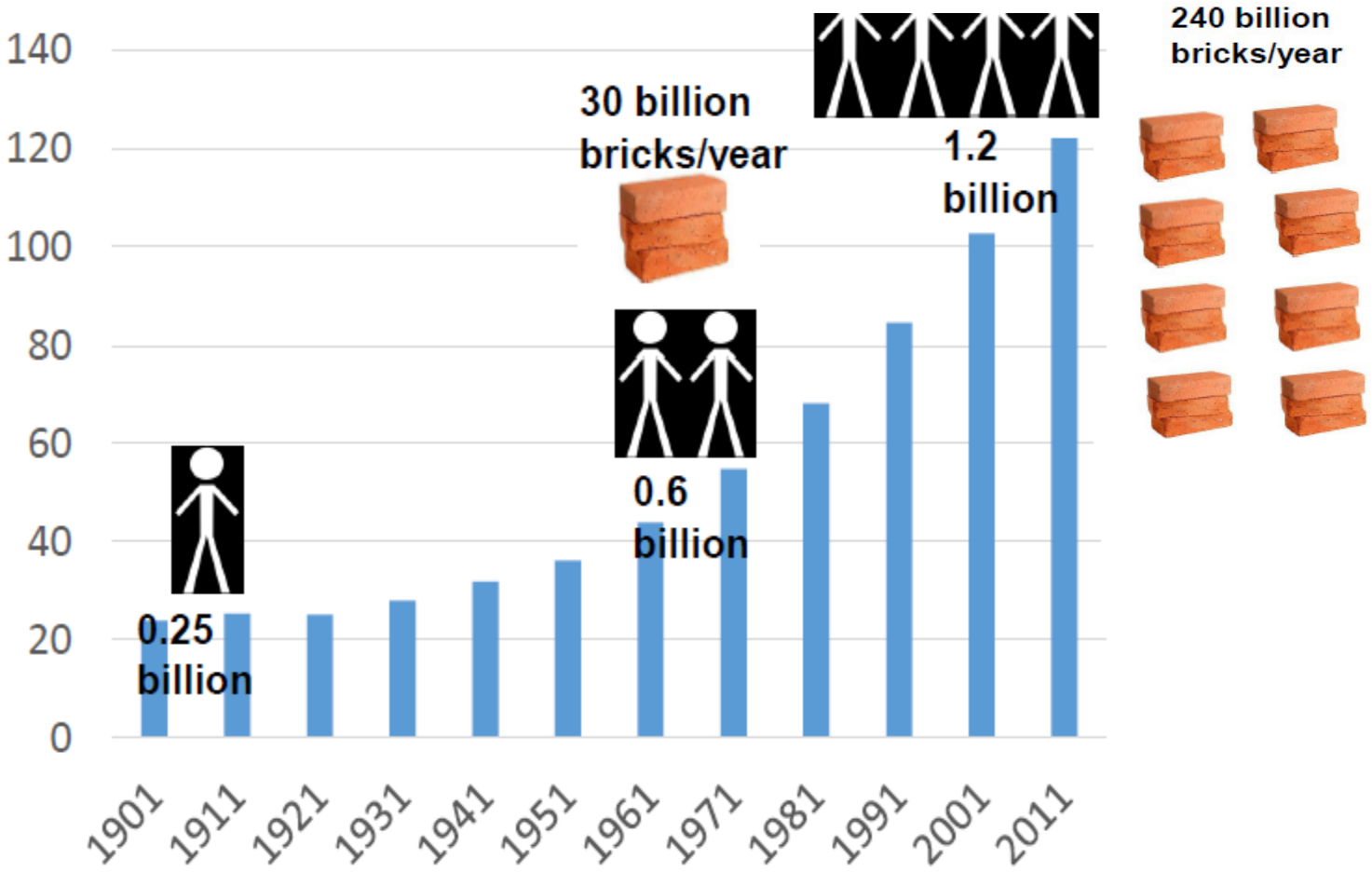
South Asia -2nd Largest Brick Producing region of Fired Clay Bricks after China



- South Asia Annual Production 250-300 billion bricks/year
- Coal Consumption ~50 million tons/year
- 60-70,000 FCBTKs in the Indo-Gangetic Plains

AAETI

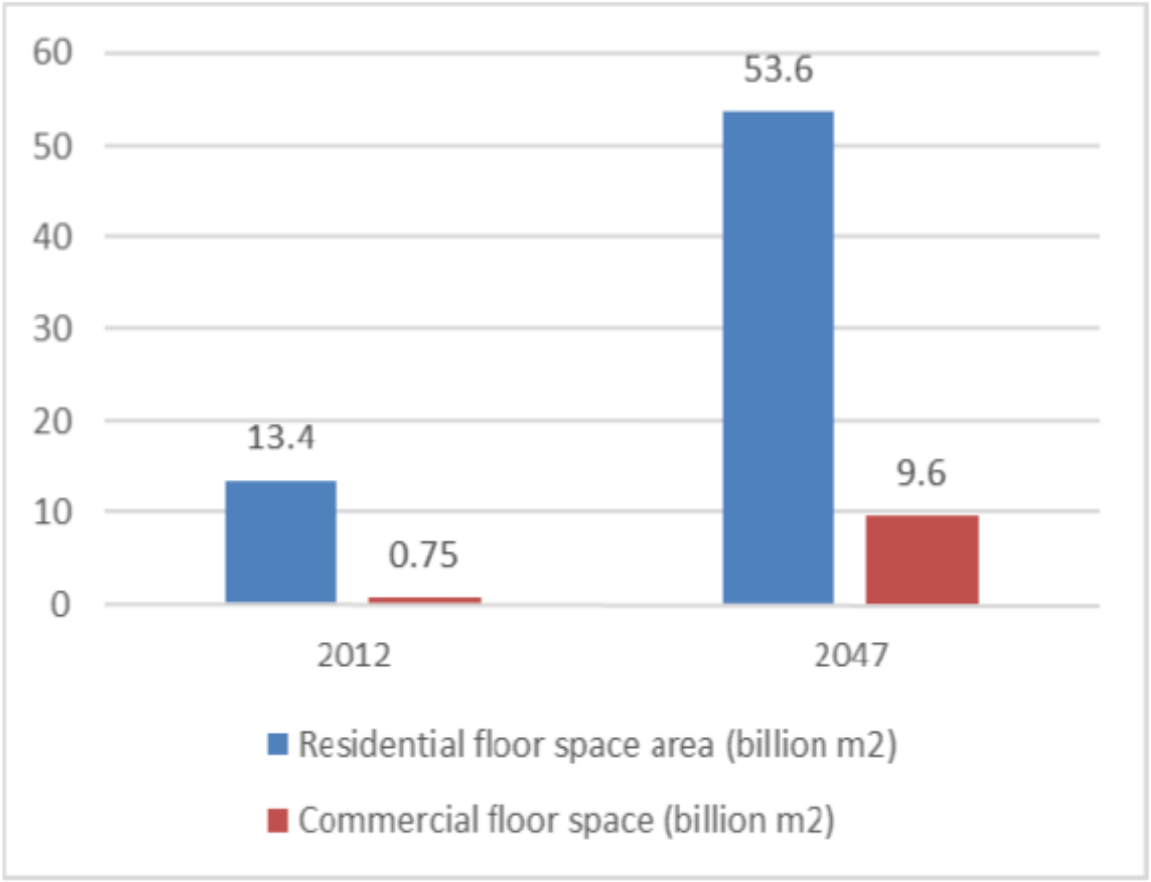
8 times increase in production in last 40 years (India)



AAETI

Brick demand likely to increase by 3-4 times by 2047

Between 2012 to 2047, building stock in India to increase by ~500%.



CSE

AAETI

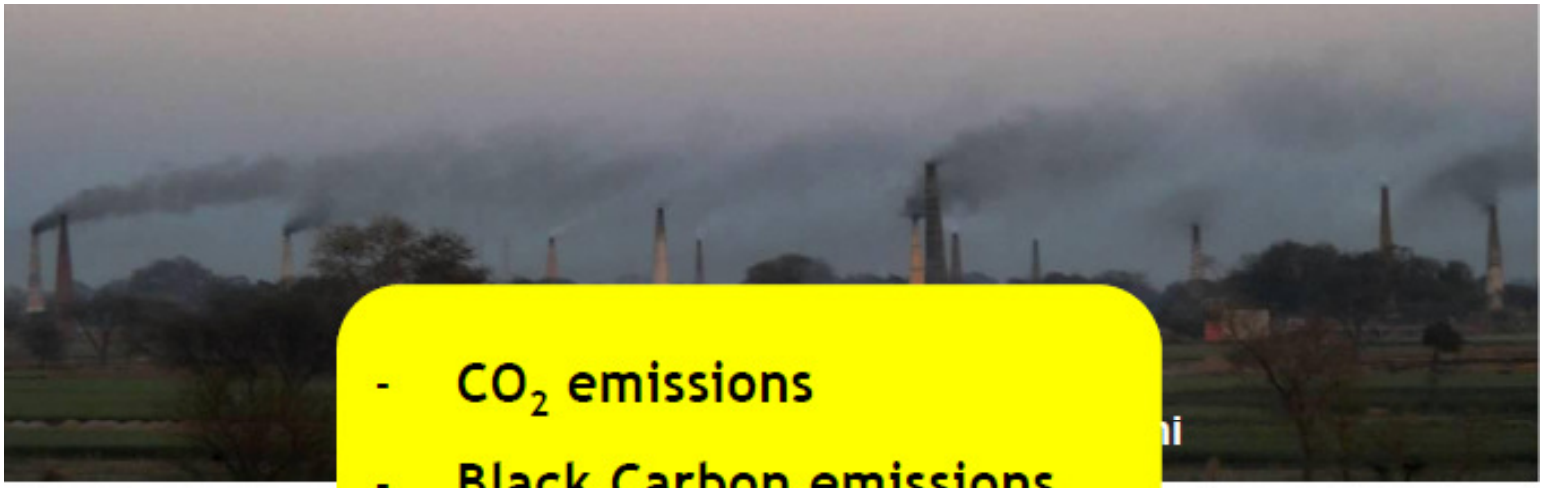
‘Under-construction’ agenda

- Massive “Under-Construction” agenda for countries of the south.
- 70 percent of India is yet to be built.
- Homes, offices and factories require large quantities of building material.
- Cheapest building material so far has been – BRICKS!
- Standard practice
  - - Dig clay/mud from the field
  - - Mould them into bricks
  - - Fire them in inefficient furnaces using different fuel source
- Kilns operate from China to Peru, burning anything cheap.

CSE

AAETI

Concern about rising pollution

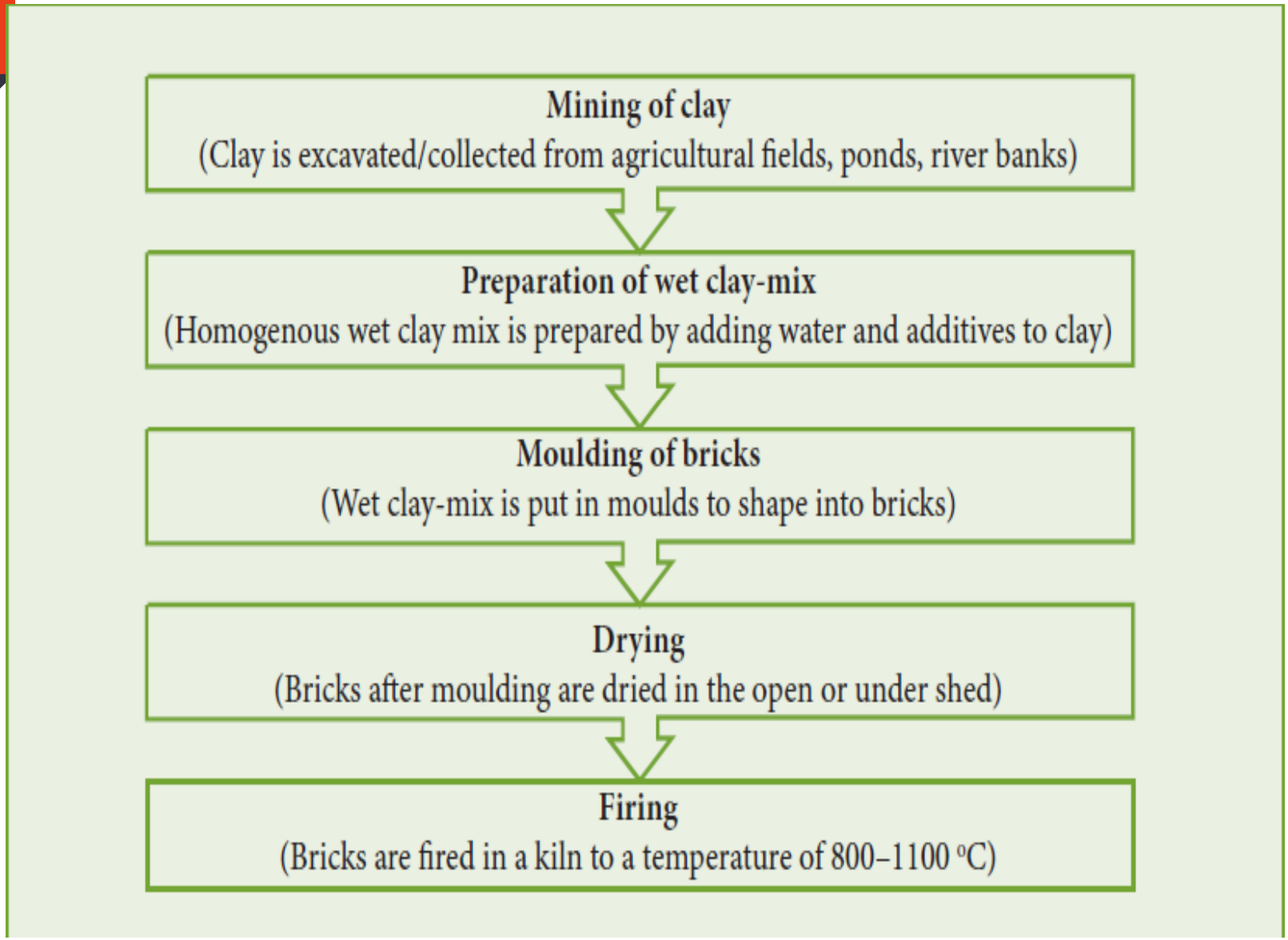


- CO_2 emissions
- Black Carbon emissions
- PM10, PM 2.5, CO, SOx,..

CSE

AAETI

Brick making process



CSE

AAETI

Resource intensive sector

- **Major fuel**: Coal, firewood, heavy oil
- Coal Consumption by Asian Brick Kilns - 110 million tonnes/ year
- Highest consumer – China (50 million tonnes/year)
- Kilns have huge variation in efficiency
- Coal consumption varies between 11-70 tonnes coal per 100,000 bricks.
- Clay consumption:
  - China: 1 billion m^3
  - India: 350 million tonnes
  - Bangladesh: 45 million tonnes

CSE

AAETI

Brick sector in India

- **Second largest producer – India** (200 billion bricks/year).
- 65% of these made by burning fertile alluvial Indo-Gangetic plains.

FCBTK	6500 (N), 17000 (E), 400 (C) 7500 (W) and 1000 (S)
Zigzag	15 (E)
High Draft	50 (N), 2000 (E)
Hoffman	500 (S)

- Huge environmental cost associated with this BM:
  - Black carbon emissions
  - Local air pollution
  - Loss of fertile top soil
- Black carbon emissions: as high as 9% of the India's annual black carbon emission total.

CSE

AAETI

Brick sector in India: Labor issues

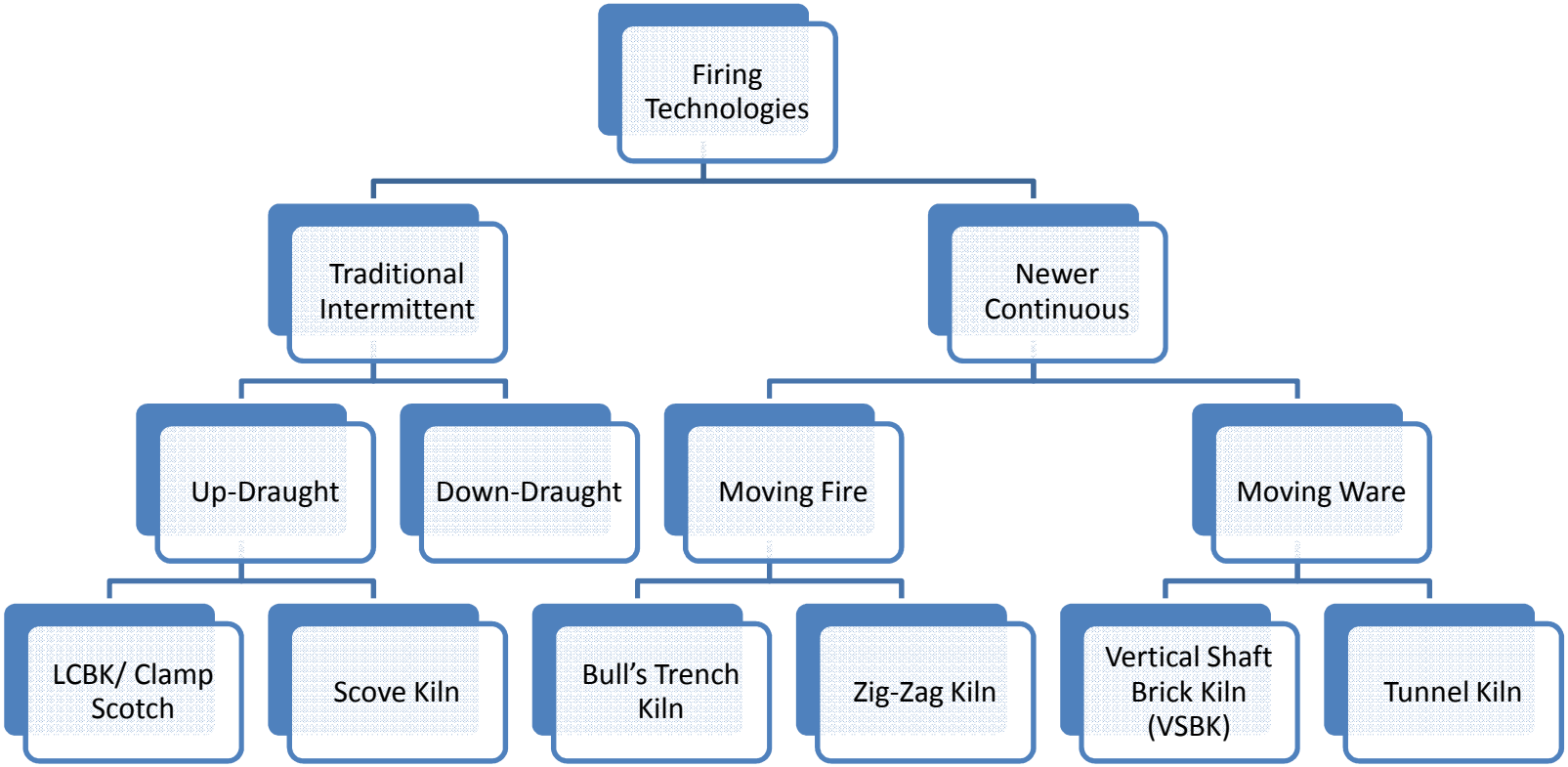
• Employs 10 million laborers: unacceptable working conditions

- Migratory workers
- Seasonal employment
- Wages on the basis of number of bricks produced
- Occupational hazards – no PPE
- Child labor
- Non-implementation of Factories Act provision

CSE

AAETI

Technology: Varied & Outdated



CSE

AAETI

Technology vs workforce

Country	Type of Kiln	No. of Kiln	No. of Bricks Produced (in billion/year)	No. of People employed	No. of Bricks produced per employee
China	Hoffman Kiln & Tunnel Kiln	80,000	1,000	5 million	200,000
India	FCBTKs, Clamp	>100,000	200	10 million	20,000
Pakistan	Clamps & MCBTKs	12,000	45	9 million	5,000
Vietnam	Tunnel & VSBKs	10,000	25	-	
Bangladesh	FCBTKs, zigzag	8,000	17	1 million	17,000
Nepal	Clamps & BTKs	700	6	140,000	42,857

CSE

AAETI

Technology: Varied & Outdated!

- Clamp technology is equally polluting but without the initial setting up cost (due to no fixed structure).

- That also makes regulation enforcement difficult for these moveable kiln.

- Zigzag kilns are better than FCBTK.

- Air travels in a zigzag path resulting in the reduction of pollutants and black carbon, and is more energy efficient.

- PM emissions: **FCBTK – 250 to 1250 mg/Nm3**
  Zigzag - Less than 250 mg/Nm3

CSE

AAETI

Energy efficient technology

- Vertical Shaft Brick Kiln is even a better technology.

- Tunnel Kiln is much more expensive to set up but requires less man power compared to FCBTK & Zigzag.

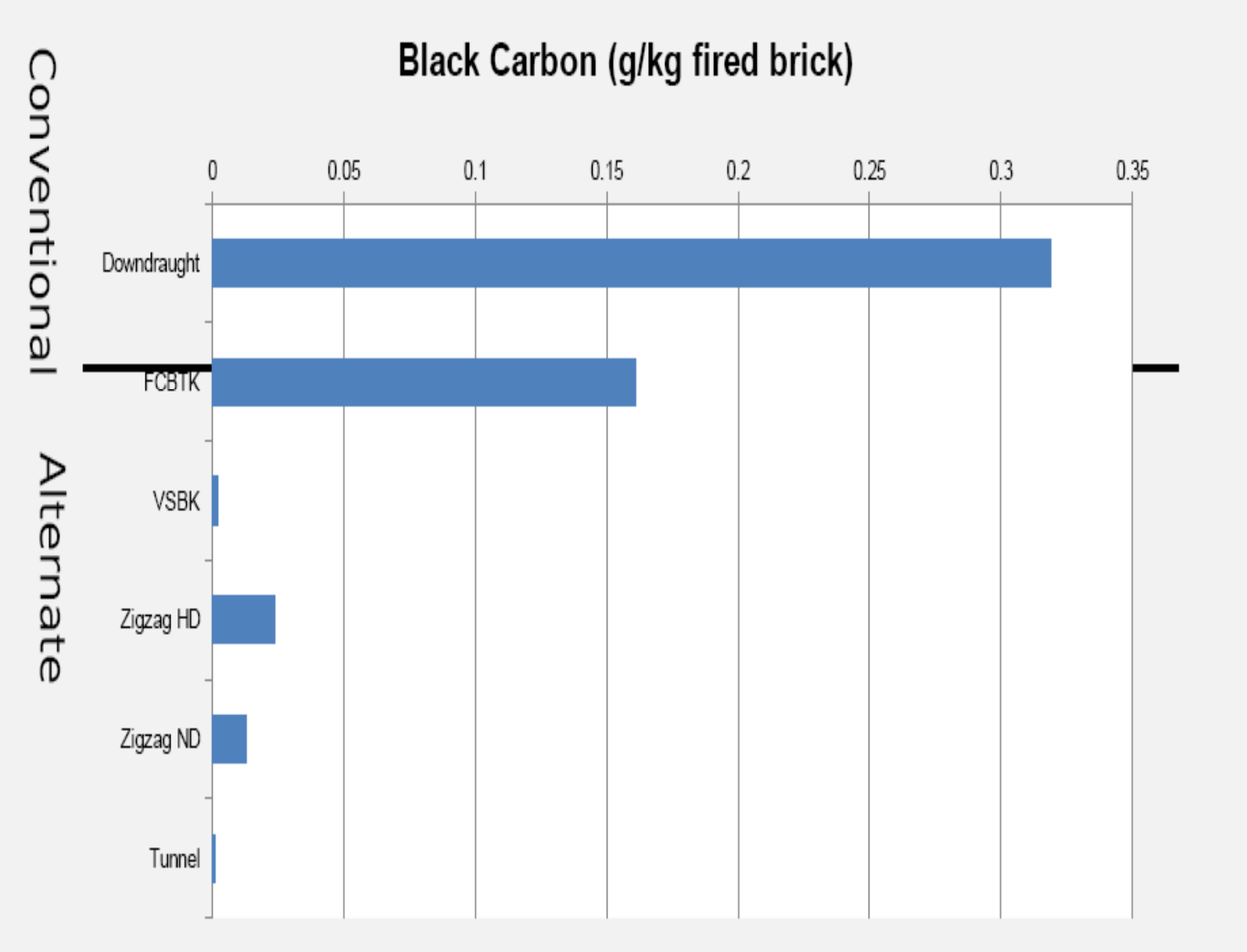
- Best technology available so far for large scale production for brick production in industrialized country.

- The advantages of using Tunnel Kiln are:
  - It can fire a wide variety of products.
  - Good control over the firing process.
  - Ease of mechanization, thus reducing the labor requirement.
  - Has large production volume.

CSE

AAETI

Technology comparison



AAETI

Environmental impacts

Emission

- Particulate matter
- SO_X, NO_X
- GHG
- Black carbon
- Toxics emission

Clay mining

- Unregulated mining
- Land degradation

CSE

AAETI

Class exercise

AAETI

Emission Standards in different countries

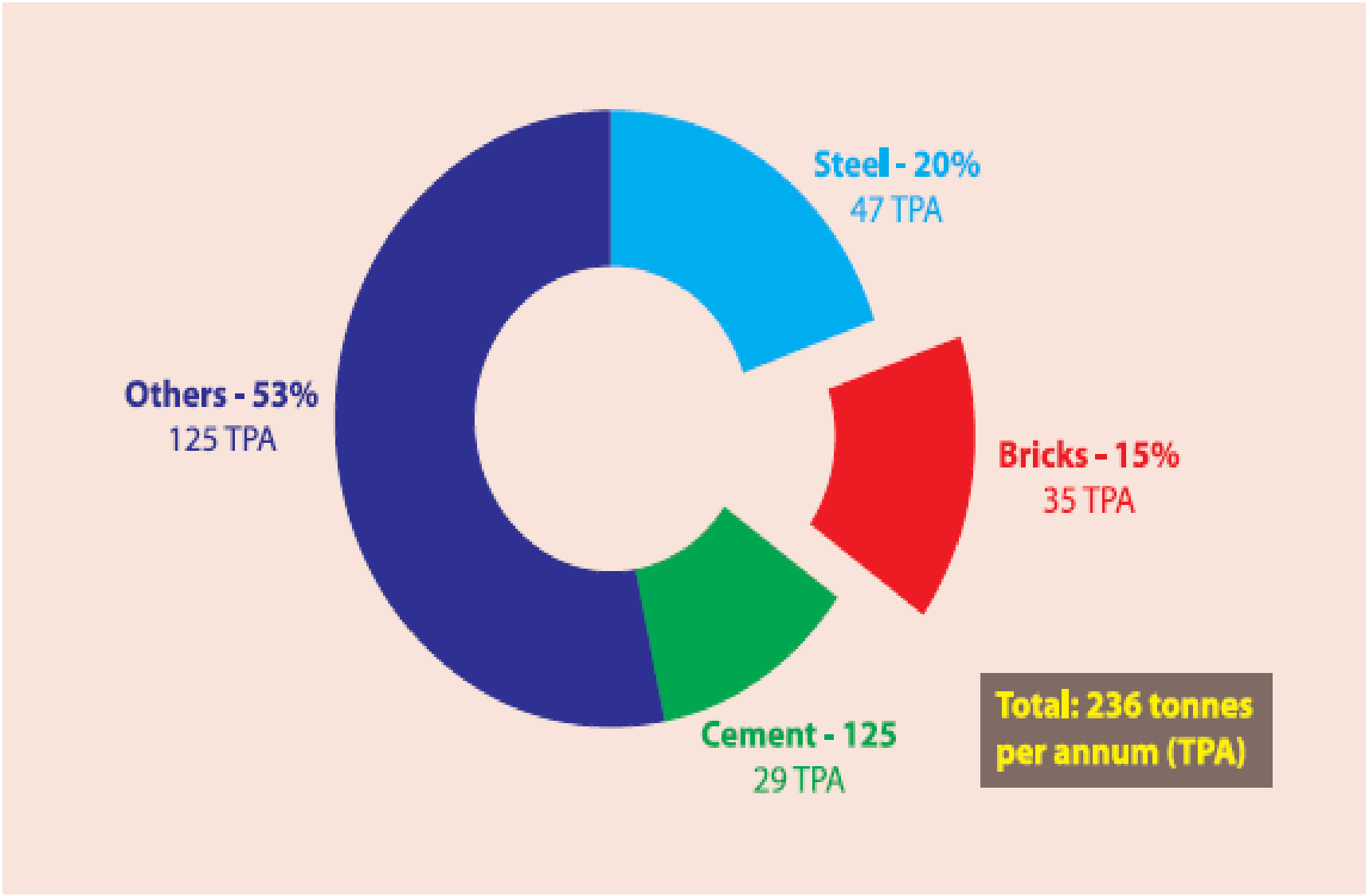
Country	Emission standard (mg/Nm^3)	Stack height (m)
Bangladesh	1000	37
Nepal	400 -700	15-30
India	250-1200	12-30
Vietnam	No emission standard	
South Africa	Clamps: Ambient air quality standard	
Pakistan	No standards for brick kiln, ambient air quality standard applies	

CSE

Problem in implementation

Size	*Kiln capacity*	*Stack height*
Small	Less than 15,000 bricks per day (less than 15 ft tench width)	Minimum stack height 22 metre [OR] Induced draught fan operating with minimum draught 50 mm WG with 12 metre stack height
Medium	15,000 to 30,000 bricks per day (15 ft to 22 ft trench width)	Minimum stack height 27 metre with gravitational settling chamber [OR] Induced draft fan operating with minimum draft 50 mm WG with 15 metre stack height
Large	More than 30,000 bricks per day (More than 22 ft trench width)	Minimum stack height 30 metre with gravitational settling chamber [OR] Induced draft fan operating with minimum draft 50 mm WG with 17 metre stack height

2nd largest industrial consumer of coal



AAETI

Clay Mining

- Run majorly by informal players

- Regulations are lax- comes under 'eco-friendly mining' (*No blasting, less manpower*)--- CTO obtained easily from SPCB

- No specific guidelines on working depth

- Nexus between brick manufacturers and farmers: Brick manufacturer procures clay from unregistered farmlands also--- goes unrecorded

CSE

AAETI

Siting Guidelines

- India, Bangladesh and Nepal has

- Distance from human settlement, hospitals, school
- Distance between two kilns
- Distance from water body, forest
- Water sprinkler, paved approach road, housekeeping,
- A Sign Board showing the name, address and capacity of the brick kiln as well as validity of the consents should be displayed at the entrance of the site

- **Rarely followed**

CSE

AAETI

Challenges with the sector

- Run by informal players
- **Cheap traditional kiln**: cost of conversion is not small.
- **Low cost of labor**: hindrance to mechanization
- Conservative building material
- Lack of R&D

Policy interventions

- Nepal: Banned the movable bulls trench kiln
- Europe: Tall chimney because of acid rain issue
- Bangladesh: Banned FCBTK, moving towards zigzag, Hoffman kiln and VSBK, banned use of agricultural soil
- India: Banned Moving bulls trench kiln in 1996 and introduced emission standard for VSBK kiln
- South Africa: Government incentive to move from energy inefficient clamps to cleaner technology, carbon tax on brick sector

Policy interventions

- Vietnam
  - Department of building Materials
  - Vietnam Construction Glass and Ceramic Corporation
- China
  - Organised sector: Township and Village enterprises & State Owned Enterprises
  - Easy to regulate
  - 1999: Banned the use of solid clay bricks in coastal cities
  - 2004: Controlled use of solid clay brick in small towns and rural areas
  - 2005: 170 cities
  - 2007: Phasing out outdated technologies