

# Promoting Alternate Fuel and Raw material (AFR) utilisation in Indian Cement Industry



**Confederation of Indian Industry**  
**CII – Godrej Green Business Centre, Hyderabad**

**15 March 2017**

# Project Background - Waste Management

- ❖ **Waste management in India is of paramount importance with increasing industrialization & rapid urbanization**
  - **MSW generation estimated to be 140 Million Tons by 2025**
  - **7.9 Million Tons of Hazardous waste generated annually**
  - **Large quantity of agro-wastes get burnt in the fields annually**
- ❖ **INDC : Intended Nationally Determined Contribution**
  - **Reduce the Emissions Intensity of its GDP by 33 to 35 Per Cent by 2030 from 2005 Level**

**Waste Management in India needs a sustainable solution**



# Project Background – Indian Cement Industry

- Indian Cement Industry emitted 137 Mt of CO<sub>2</sub> (2012), 7% of India's total man made emissions
- Low Technology Roadmap for the Indian Cement Industry has identified usage of wastes as Alternative Fuels and Raw materials as one of the key levers in reducing the GHG emissions
- Currently Indian Cement Industry's average Thermal substitution rate (TSR) is around 4%, whereas the TSR in few countries are as high as 60% (Austria, Germany)
- Cement demand in India is projected to reach 500-650 MTPA by 2025
- Per-capita cement consumption is 190 kg as of 2015 against the world average of 350 kg per capita

Indian Cement Industry, therefore, can provide a sustainable solution for the management of wastes and help reduce the GHG emissions in the country



# Project Objective

- ❖ **Main objective of the project is to facilitate use of urban & industrial waste as Alternate Fuel & Raw Material (AFR) in Indian cement industry**
  - **Support the Country in moving towards Low Carbon Economy**
  - **Facilitate Cement Industry to enhance AFR utilization to 25% by 2025 with focus on MSW as fuel**
- ❖ **Supported by Shakti Sustainable Energy Foundation (SSEF)**



# Major areas of activities carried out

## ❖ Policy Advocacy

- Developing draft recommendations for inclusion of Co-processing in HWM rules
- Frequent meetings & discussions with various Government bodies (MoEFCC, CPCB & SPCBs)
- Stake holders meetings, Expert group meetings & Industry consultation
- Various submissions to MoEFCC & CPCB on promoting co-processing

## ❖ Technical Research & Analysis

- Life Cycle approach for AFR utilization in Cement industry
- Status paper on AFR usage in Indian Cement industry
- Waste forecasting for Indian Cement Industry
- Variation in chemical constituents of waste streams



# Major areas of activities carried out

## ❖ Capacity Building activities

- National & International missions
- Inventory of waste generation
- Inventory of Co-processing cement plants
- Technical Publications
- Website on Co-processing



# Key milestones in the initiative

- ❖ AFR substitution increased from less than 1 % to more than 4% in 2016
- ❖ Recognition for Co-processing in the policy framework
- ❖ >45 Cement plants started co-processing in their production units
- ❖ Few state pollution control boards like Gujarat and Tamil Nadu, developed specific action plan & implementation schedule to promote co-processing
- ❖ >12 cement plants set up pre-processing facilities to convert non-homogeneous waste in to AFRs
- ❖ LCA (Life Cycle approach) considered as a part of manufacturing process & extended producer responsibility



# Expert group for Industrial Waste Management

| S. No | Name                   | Designation   | Organisation  |
|-------|------------------------|---|---|
| 1     | Mr Ulhas parlikar      | Chairman – CII Initiative on increasing AFR usage in Indian Cement industry | Geocycle India  |
| 2     | Ms Lakshmi Raghupathy  | Ex Director   | Ministry of Environment, Forest and Climate Change (MoEFCC) |
| 3     | Mr A Ramchand          | Chief Environmental Engineer  | Andhra Pradesh Pollution Control Board                      |
| 4     | Mr R P Tiwari,         | Superintendent Engineer   | Chhattisgarh Pollution Control Board                        |
| 5     | Mr P K Gupta           | Scientist E   | Central Pollution Control Board                             |
| 6     | Mr V R Ghadge          | Senior Environmental Engineer   | Gujarat Pollution Control Board                             |
| 7     | Mr Venkatesh Shekar    | Senior Environmental Officer  | Karnataka State Pollution Board                             |
| 8     | Mr P S Bundela         | Regional Officer, Bhopal  | Madhya Pradesh Pollution Control Board                      |
| 9     | Mr V M Motghare        | Joint Director – Air Pollution Control                                      | Maharashtra Pollution Control Board                         |
| 10    | Dr Vijai kumar Singhal | Chief Environmental Engineer  | Rajasthan Pollution Control Board                           |
| 11    | Mr S Selvan            | Joint Chief Environmental Engineer  | Tamil Nadu Pollution Control Board                          |
| 12    | Mr Raghunatha Swamy    | Joint Chief Environmental Engineer  | Telangana State Pollution Control Board                     |



# Round table discussion in Eight states

- ❖ Bring waste generators and cement plants together – In presence of State PCB officials & other stakeholders to discuss the following
  - Understanding barriers & constraints in co-processing
  - To take cognizance of concerns of all stakeholders
  - Evolve a roadmap for successful demonstration of co-processing initiatives in the state
  - Moving towards a low carbon economy



# Stake holders consultation

## ❖ Stake holders consultation on Co-processing & Technical sessions involving different industrial sectors

- Cement
- Paint
- Engineering
- Automobile
- Beverages

## ❖ Industry consultation feedback submitted to Maharashtra pollution control Board



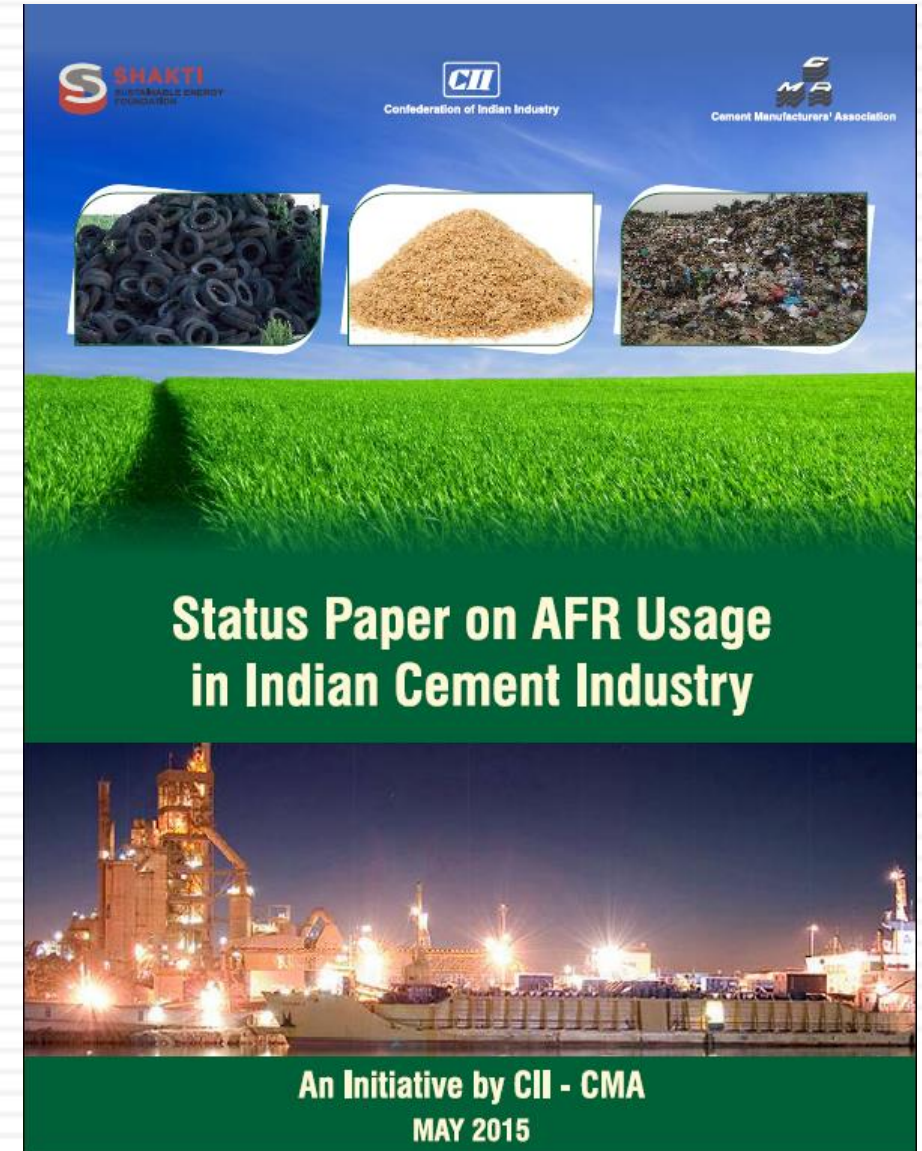
# Recommendations submitted to MoEFCC & CPCB on HWM Rules

- ❖ Extensive research work carried in developing & finalising the recommendations
- ❖ Inputs taken from round table discussions, International experts & policy framework adopted in different countries
- ❖ All the inputs were driven down to core levels through discussions by the expert group led by Chairman & Ms Lakshmi Raghupathy, Ex Director MoEF



# Status paper on AFR usage in Indian Cement industries

- ❖ The maximum Thermal substitution Rate (TSR) by a single plant is 20%
- ❖ The average usage by top 3 plants is 15 %
- ❖ The average usage by top 10 plants is 10 %
- ❖ 20 plants have >1% TSR
- ❖ Commonly used fuels : Bio mass, Carbon black, ETP & paint sludge, Tyre chips, Liquid waste



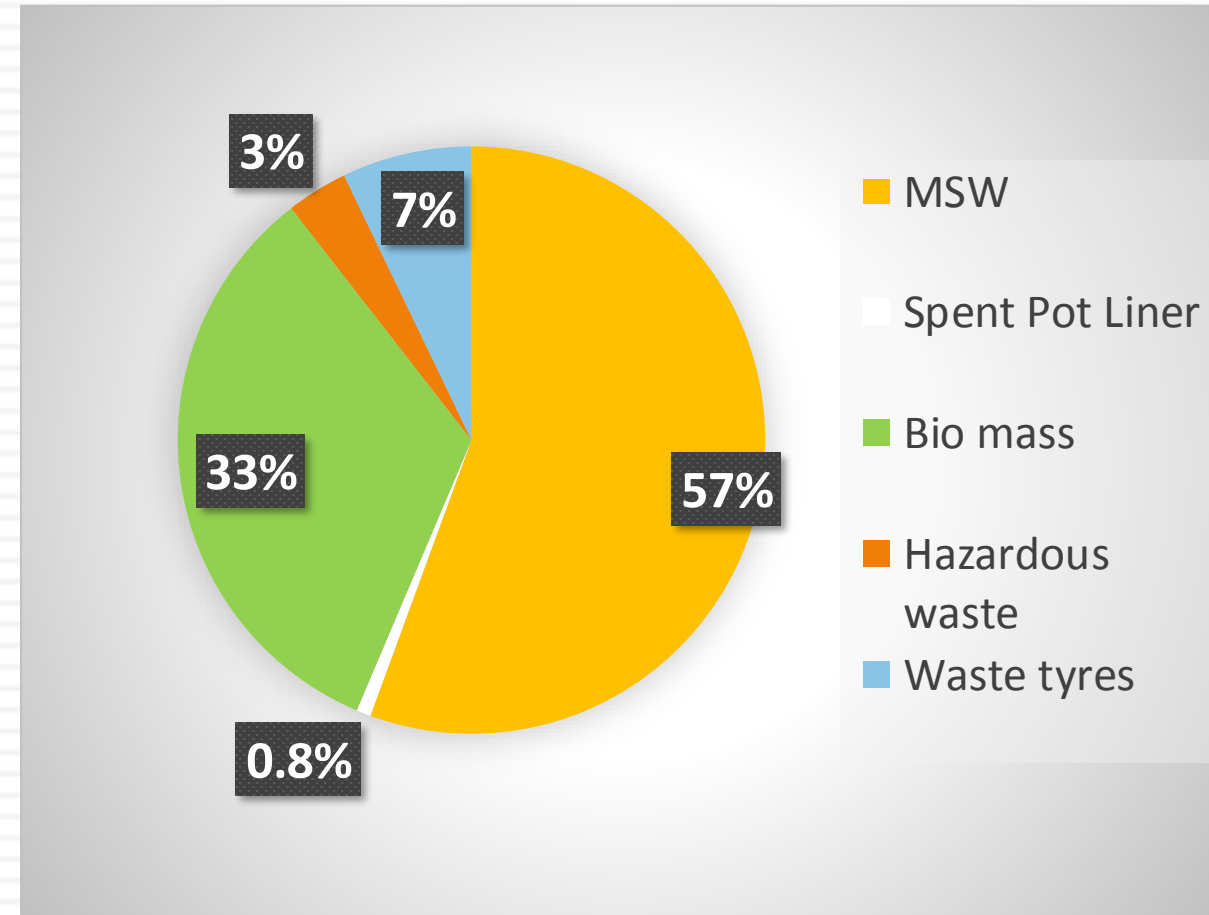
# Approach Paper for achieving 25% TSR by 2025 in Indian Cement Industry

❖ To achieve 25% TSR at 2025 : Indian Cement industry requires 7.07 million TOE of energy from Alternate fuels



# Approach paper on Waste forecasting

- ❖ Created roadmap for Indian cement industry to achieve 25% TSR by 2025
- ❖ **Supports India's INDC**
- ❖ Coal consumption reduces by 25%
- ❖ Land filling area requirement in the country will reduce by 20%
- ❖ GHG emissions from fuel reduces by 25%
- ❖ Reduced environmental and health impacts
- ❖ Reduce imports & increase economic activity of the country



# Life Cycle Assessment (LCA) - Environmental Impact of producing 1 Ton of Clinker with 0%, 1% and 25% AFR

❖ LCA is a methodology used to identify the environmental impacts related to a product, service or system.

❖ Study carried out with the following waste streams as a substitute to coal

- MSW
- Bio Mass
- Used tyres



| Impact category           | Unit                  | S1       | S2 (1%)  | S7 (25%) |
|---------------------------|-----------------------|----------|----------|----------|
| Climate change            | kg CO <sub>2</sub> eq | 1047.18  | 1042.87  | 939.33   |
| Ozone depletion           | kg CFC-11 eq          | 1.77E-05 | 1.75E-05 | 1.39E-05 |
| Terrestrial acidification | kg SO <sub>2</sub> eq | 1.68     | 1.67     | 1.59     |
| Freshwater eutrophication | kg P eq               | 0.18     | 0.18     | 0.15     |
| Marine eutrophication     | kg N eq               | 0.12     | 0.12     | 0.11     |
| Human toxicity            | kg 1,4-DB eq          | 22.11    | 21.96    | 18.54    |
| Fossil depletion          | kg oil eq             | 111.14   | 110.22   | 88.31    |

# Outcome of the study

| Impact category                                  | No AFR       | 25% AFR      | Potential Reduction (%) |
|--|--------------|--------------|-------------------------|
| Climate change (T CO <sub>2</sub> eq)            | 43,97,40,000 | 39,43,80,000 | 10                      |
| Ozone depletion (T CFC-11 eq)                    | 7.14         | 5.88         | 17                      |
| Terrestrial acidification (T SO <sub>2</sub> eq) | 7,14,000     | 6,67,800     | 6.5                     |
| Freshwater eutrophication (T P eq)               | 79,800       | 63,000       | 21                      |
| Marine eutrophication (T N eq)                   | 54,600       | 46,200       | 15                      |
| Human toxicity (T 1,4-DB eq)                     | 92,40,000    | 78,12,000    | 15                      |
| Fossil depletion (T oil eq)                      | 4,66,20,000  | 3,69,60,000  | 21                      |

- ❖ Awareness creation on LCA improved substantially
- ❖ Life cycle approach study has been initiated by many industries
- ❖ Manufacturing units started seeing it has their extended responsibility
- ❖ Industries are keen to know the environmental impacts created and how to reduce the impacts



# Green Cementech & Waste management summit

- National level conferences for Cement Industry conducted annually
- More than 150 participants from representing different stake holders
- Panel discussions with representatives from PCBs, Cement plants and CMA
- Technical session on latest technological developments to increase AFR in cement industry with case studies
- B2B Meetings between suppliers, Waste generators & Cement plants
- Best practices on waste management waste processing companies and waste generators presented their





# National & International Missions

- ❖ As part of this project, Expert group visited, Pre-processing platforms & cements plants that use AFR in India and abroad
  - ❖ Visit to European countries
  - ❖ Visit to Malaysia and Philippines
  - ❖ Best plants in India (Karnataka, AP, TN, Rajasthan)



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# International Missions

- ❖ **The purpose of these visits is to:**
  - **Discuss with policy makers to understand policy frame work and implementation**
  - **Visit waste pre- processing and co- processing facilities for converting wastes to AFR**
  - **Observe, Understand and experience Challenges faced while co-processing wastes at higher level**



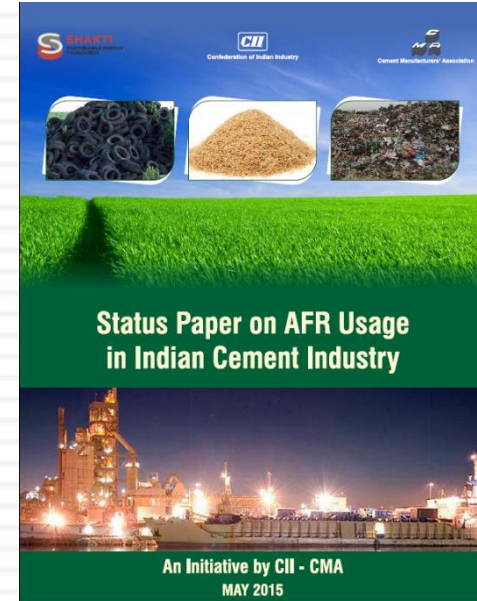
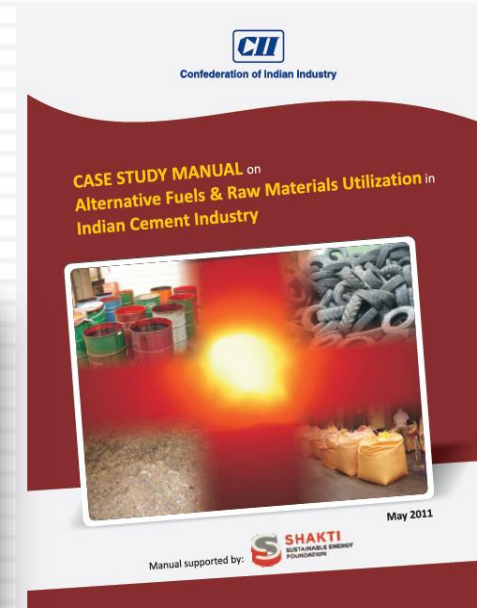
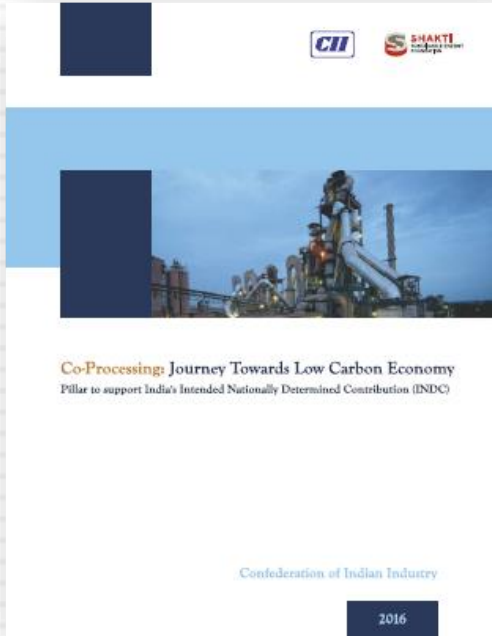
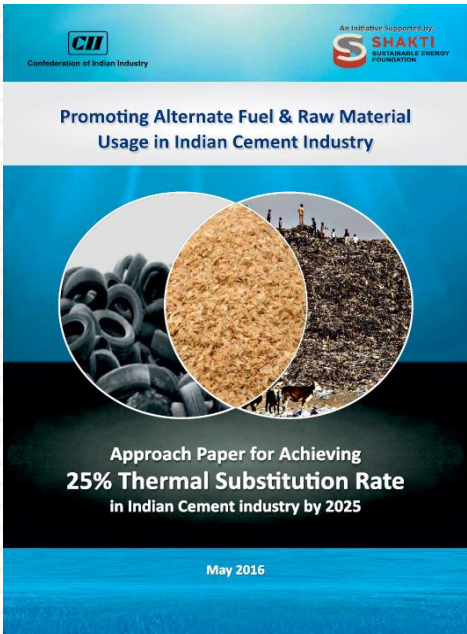
# Website on Co-processing - [www.ciiwasteexchange.org](http://www.ciiwasteexchange.org)

## ❖ A unique website for AFR co-processing launched

- Details of Cement plants approved for Co-Processing with types of AF utilised
- Inventory of Hazardous waste
- Step by step procedure for getting approval from SPCB / CPCB for co processing in cement kiln
- Hazardous waste streams for which regular permission has been granted by CPCB for Co-Processing & List of potential substance that can be utilized in Cement plants
- Technical bulletins & Case studies on Co-Processing



# Publications on Co-processing



# Way Forward

## ❖ Awareness creation on New Waste Management Rules & Guidelines

- Regional level workshops
- Sharing of Best practices
- Publications



# Way Forward

- ❖ **Large scale MSW management through cement kiln co-processing**
  - **Developing roadmap for MSW management through Co-processing**
  - **Cluster based approach**
  - **Knowledge sharing on best practices**
  - **Working with different Government bodies (CPCB, MoEFCC, MoUD, DIPP, NEERI, MNRE, etc)**





# Cluster based approach

| State          | Urban Local Bodies  | Cement plants   |
|----------------|---|---|
| Chhattisgarh   | Raipur, Bilaspur, Korba, Raigarh                                      | Ambuja Cements Ltd , Cement Corporation of India , Century Cement, Jaypee Cement, Lafarge India (P) Ltd, UltraTech,   |
| Gujarat        | Rajkot, Jamnagar, Ahmadabad   | Ambuja Cements Ltd , Cement Ltd , Jaypee Cement, JK Lakshmi , UltraTech   |
| Karnataka      | Gulbarga, Bagalkot, Bellary, Koppal, Bangalore                        | Ambuja Cements Ltd , Cement Corporation of India , Chettinad Cement, J.K. Cement Ltd, Kesoram Cement , UltraTech,   |
| Madhya Pradesh | Satna, Ratlam, Jabalpur, Katni, Rewa                                  | Cement Corporation of India Ltd, Century Cement, Jaypee Cement , Kymore Cement Works, Prism Cement Ltd , UltraTech  |
| Rajasthan      | Jaipur, Kota, Udaipur, Ajmer, Bhilwara                                | ACC , Ambuja Cements Ltd , Birla Cement Works , Binani Cement Ltd , J.K. Cement Ltd , Shriram Cement Works , Shree Cement Ltd , The India Cements Ltd , UltraTech , Wonder Cement Ltd,  |
| Tamil Nadu     | Thanjavur, Tiruchirappalli, Coimbatore, Perambalur, Ariyalur, Madurai | Chettinad Cement, Dalmia Cement (Bharat) Ltd, The India Cements Ltd, Tamil Nadu Cements Corpn. Ltd, UltraTech   |
| Telangana & AP | Hyderabad, Warangal, Vijayawada, Kadapa, Kurnool, Guntur              | Anjani Portland Cement Ltd, Bhavya Cement Ltd , Cement Corporation of India Ltd, Hemandari Cement Ltd , Jaypee Cement, My Home Industries Ltd, Penna Cement Industries Ltd , Rain Cements Ltd, Sagar Cement Ltd, , , The India Cements Ltd, The K.C.P. Ltd., Zuari Cement Ltd |



# Thank you



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