

# Carbon management strategies to deal with "beasts" which prodigious energy consumption and chemical processes: A case study in Indonesia cement industry

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## Introduction

**Concrete, which cement is the key ingredient, is the second most consumed resource on the planet after water**

Cement contributes 8% of global CO<sub>2</sub> emissions, higher than the individual output of the leading countries, exclude China and the United States

Indonesia, the world's eighth largest contributor to global GHG emissions, made initial initiative to lowering GHGs emissions by 26 - 41% by 2030

One of the main targets is energy and emission-intensive industries, specifically the cement industry

Indonesia, the world's six largest cement-producing countries

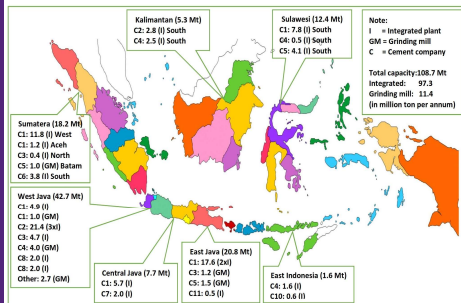


Figure 1. Cement plants in Indonesia

**Aim: How to be able to reduce emissions as much as possible most safely and cost-effectively in Indonesian cement industry by highly adjust with local conditions**

Primary Research Problem: What factors influence the adoption of emissions abatement opportunities in the Indonesian cement industry?

Research Questions	Tasks
1. What are the sources of emissions from cement manufacturing in Indonesia?	1.1 Defined the firm/location for study 1.2 Define the scopes of emissions sources 1.3 Calculate the carbon footprint within main process production 1.4 To explore the activities that have the potential to be target of development
2. What are the emissions abatement opportunities in the Indonesian cement industry?	2.1 To examine possible actions that have the potential for GHG reductions. 2.2 To examine actions along with the amount of potential reduction of greenhouse gas emissions and abatement cost by using the Marginal Abatement Cost Curve (MACC) approach.
3. How do cement industry firms in Indonesia make decisions about emissions abatement opportunities?	3.1 Determine and define the research questions 3.2 Select the cases and determine data gathering and analysis techniques 3.3 Prepare to collect the data 3.4 Collect data in the field by conduct interviews 3.5 Evaluate and analyse the data 3.6 Prepare the report.



## Method

### Case study approach

- Quantitative and qualitative methods
- Define scope and research object

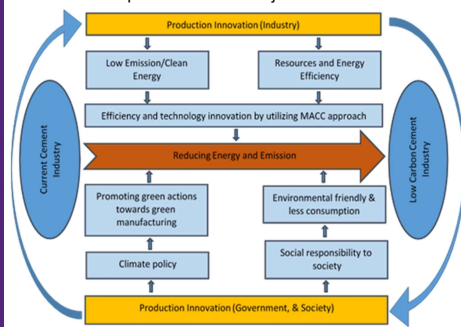


Figure 2. Conceptual framework

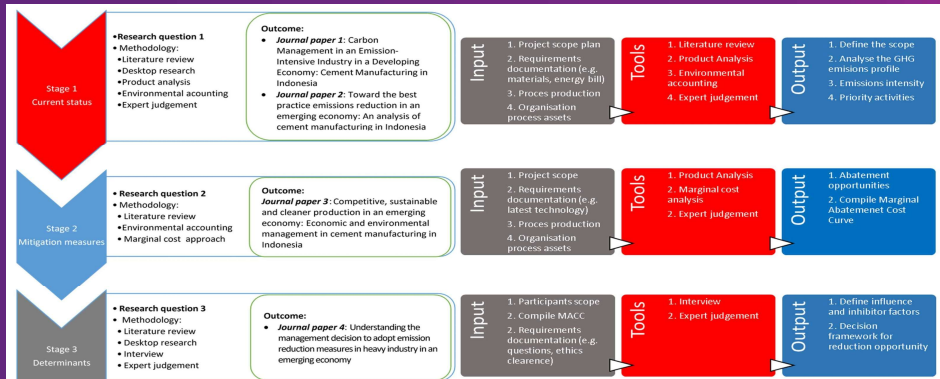


Figure 3. Structure of the research methodology and input, tool and output for each RQ

## Result

### Current conditions

- 7% of Indonesian emissions from cement industry, equals 20% of total manufacturing emissions
- AF (Refused Derived Fuel (RDF) and biomass) utilisation ≤ 2% (SDSs by 18 % in 2030).
- Sources availability: ≥ 10 million t Fly Ash/year from power plants, ≥ 66 million t biomass/year from rice husk and ≥ 66 million t MSW/year for RD
- Market oversupply
- Around 80% of the national installed capacity and market share is controlled by only 2 out of eleven companies (Figure 1).
- Case study firm controlled 50-55% of total national cement capacity and market.
- The leading emission source is calcination, followed by coal-burning for kilns, electricity (Fig 4 & 5)
- The firm needs to reduce its direct emissions by at least 20% and indirect emissions by 12.5% to meet the global target by 2030 (Fig 6).

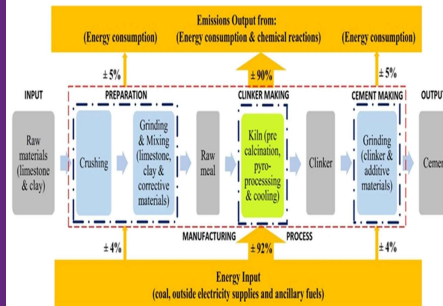


Figure 4. Cement production process

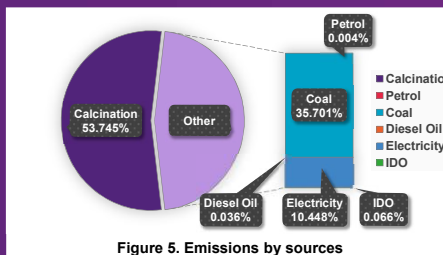


Figure 5. Emissions by sources

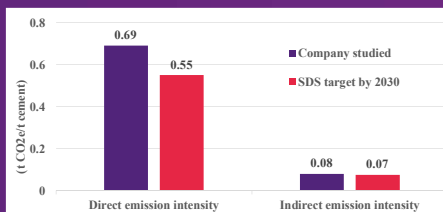


Figure 6. Emission intensity

### Marginal Abatement Cost Curve

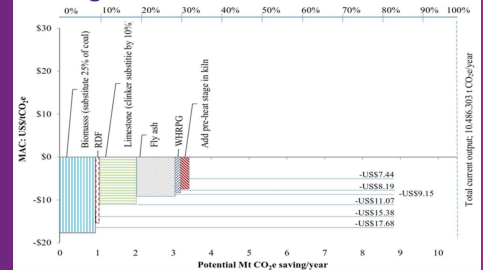


Figure 7. MACC

### Determinants

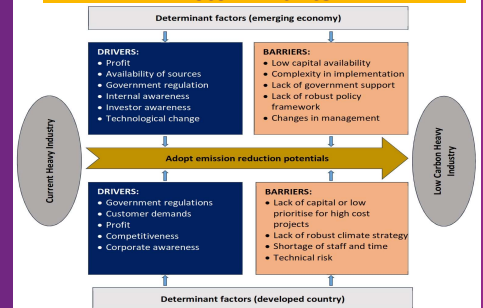


Figure 8. Determinants that underlie the decision to adopt measures

## Conclusion

- This study identified a research gap in the cleaner production literature which, hitherto, has concentrated on the secondary sector of developed countries.
- The firm equates to a saving of 3.416 Mt CO<sub>2</sub>e annually, or 33% of its total current discharge. Five measures are capable of reducing direct emission intensity by 30%, although only a 20% needed to meet the 2030 global direct emission intensity target of 0.55 t CO<sub>2</sub>e/t cement.
- The sixth measure, WHRPG, will lower the indirect emission intensity to 0.07 t CO<sub>2</sub>e/t cement.
- The materials needed for such measures are widely available at low prices, especially in emerging economies.
- The primary drivers that underlie a company's quest to reduce emissions are profit and availability of sources or materials, while the primary barrier is low capital availability, followed by complexity in implementation.
- The Indonesian cement industry with its production capacity surplus is focused on a "best value for money" approach, not necessarily prioritise emission reductions.
- The firms need to develop action strategies to deal with increasingly stringent environmental regulations and international and market pressures. They should also refer to best practices or mimic those in advanced nations.
- Government incentives might initially needed but, in the longer term, if emerging economies are going to meet their 2030 Nationally Determined Contributions (NDCs), they might have to regulate domestic and foreign-invested firms in a heavier-handed way.