Marketing and Societal Challenges of Alternative Cementitious Binders Made with NORM-Contained By-products (Industry’s Perspective)

Nazanin Love

This project has received funding from the Euratom research and training programme 2019-2020 under grant agreement No 900009.
Cement makers across world pledge large cut in emissions by 2030

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The Guardian

Global emissions

Net Zero Emissions Scenario

+ 1.8% annual increase

- 3% annual declines
Alternative Cementitious Binders for Sustainable Society

- Two key strategies with the most direct CO$_2$ reductions to achieve the Net Zero Emissions by 2050 Scenario (IEA, 2021)
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    - main ingredient in cement
    - the amount used is directly proportional to the CO$_2$ emissions

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- Different industrial by-products have the potential to substitute clinker
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- Different industrial by-products have the potential to substitute clinker
  - Reduce CO\textsubscript{2} emissions
  - Contribute to circular economy through usage of secondary raw materials
Currently there are two main by-products used in cement and concrete industry
- Blast furnace slag (by-product of steel industry)
- Fly ash (by-product of coal power plants)
Alternative Cementitious Binders for Sustainable Society

- Currently there are two main by-products used in cement and concrete industry

- Several alternative cementitious binding materials currently at various stages of development
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- Many research is being conducted to study technical and environmental potential of alternative cementitious binders made with industrial by-products, some of which contain NORM such as phosphogypsum, copper slag, and red mud.
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Reducing 7% of global CO₂ emissions has great societal impact...
Research Questions

- Is the industry interested to use these alternative cementitious binders?
- What are their selection criteria?
- What are their concerns?
Methodology
Methodology

● Semi-structured interviews with concrete industry representatives including concrete producing companies and related associations in Belgium
  ● Online interviews (Oct 2021-Jan 2022)
  ● 14 participants (Data Saturation)
  ● 1 hour each interview

● Participant recruitment
  ● Snowball sampling
Designing Interview Protocol

List of questions based on the literature review of similar product (e.g., carbon capture product)
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Organised in 4 sections
1. Company’s current decision making process for choice of cement type
2. Sustainability
3. Cementitious binders
4. NORM-contained cementitious binders

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Results
Industry’s Current Sustainable Actions

- **Push factors**
  - The CO₂ taxes
  - Availability of by-products

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● **Companies at different stages of decision making processes**
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Investigation at the initial discussion level

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**Actions the industry is taking**
- Alternative fuels
- Green electricity
- CO₂ capture and storage
- Reduction in water consumption
- Alternative cementitious binders

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Six main Factors Affecting Concrete Industry’s Perception

1. Financial Factors
2. Quality & Performance
3. Customer Demand
4. Common sustainability parameters
5. Perception of NORM-contained by-products
6. Availability of by-products
1. Availability of By-products

Selection criteria
- Available in certain scale
- Available locally

Concerns
- Importing by-products and cement outside Europe
  - Reducing the CO₂ on the paper but global emissions is the same
  - Financial threat
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2. Financial Factors

- Selection criteria
  - Extent of required costs of new infrastructure
    - New forming technology
    - Minor changes to current procedure
    - Preference of carbon capture technologies

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- Very little pressure from government
  - Increase of CO₂ costs
  - Penalising non-sustainable actions
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3. Quality and Performance

● Selection criteria
  ● Technical specifications
    ● Specification of strength in certain time
    ● Resistance to freeze and thaw cycle
    ● Level of reactivity
    ● Durability
    ● Workability
3. Quality and Performance

- Selection criteria
  - Technical specifications
  - Making distinction between applications
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    - Current certifications like BENOR
    - Future regulations (regional, federal, national) - “cascade of things”
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    - Future regulations (regional, federal, national)- “cascade of things”
      “I hope not to end up with three different legislations on three different parameters.”

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4. Customer Demand

- Barriers
  - Talk and not much tangible request
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“On the floor in 99.6%, nothing has changed so far. So most of them just do business as usual and they just want concrete that's cheap and okay in terms of quality.”
4. Customer Demand

- Barriers
  - Talk and not much tangible request
  - Motivation of greenwashing
4. Customer Demand

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  “just want something new that sounds green”

  “a little bit of sustainability awareness in our product”
4. Customer Demand

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- **Facilitators**
  - Government setting an example by demanding sustainable concrete
  - Stimulating demand for sustainable products through regulations
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5. Common Sustainability Parameters

- **Concern**
  - Lack of common sustainability parameters in the industry
5. Common Sustainability Parameters

Concern

- Lack of common sustainability parameters in the industry
  - Reducing CO₂ while increasing other environmental impact
  - Lack of alignment of sustainability parameters
  - Facilitating greenwashing
  - Creating confusion for end-customers
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Perception of By-products
6. Perception of NORM-contained By-products
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  - Aware of the radioactivity in fly ash
  - Having to measure radioactivity threshold when applying for cradle to cradle certificate
  - Having experience in dealing with waste containing heavy metals
  - Aware of high radon level in some parts of Belgium

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- Those who had higher perceived risk were more sceptical about it

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6. Perception of NORM-contained By-products

- Selection criteria
  - Being certified
6. Perception of NORM-contained By-products

- Selection criteria
  - Being certified
  - End of life (different expectations)
    - Not encountering issues similar to asbestos
    - Being able to use the crushed column as aggregate to make another column
    - Being able to make new concrete with exactly same capacities as today’s fresh concrete
    - Being able to use it in its third or fourth life without leaching problems
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- **Concerns**
  - Difficulty of communicating NORM to end customers
  - Negative impact on the marketing
  - The safety after the product is made
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Regulatory Certainty Plays a Crucial Role in Industry’s Transition into the Net Zero Emissions

1. Financial Factors
   - Availability of by-products

2. Quality & Performance
   - Perception of NORM-contained by-products

3. Customer Demand
   - Common sustainability parameters

4. Purchase regulations
   - Common standard and calculation method

5. Harmonised EU regulations
   - Certification for new products

6. Increasing CO2 tax and penalizing non-sustainable cement
   - Import regulations

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- End-users’ perspective (those who are building or renovating their home or working place)
- Regulatory perspective
Thank you for your attention

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