LCA as decision tool for sustainable choices in mineral materials field: environmental declarations of Belgian products and their foreign equivalents

CHEMICAL ENGINEERING

Processes and Sustainable Development

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Introduction

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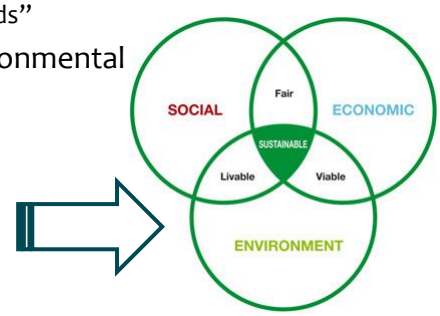
Sustainable Development

- 1987 – « Brundtland report » - United Nations
  - First reference to the « **sustainable development** » concept
  - "Development which meets the needs of the present without compromising the ability of future generations to meet their own needs"
- 3 pillars : social, economic, environmental
- Politic sustainable decisions
  - Tools for decision support

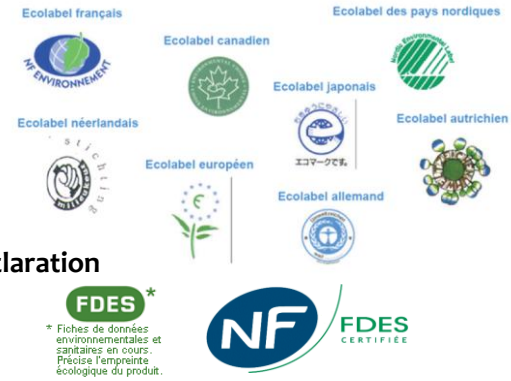


Environmental pillar

- To take environment into account = essential
  - Industries, public services
- Why essential ??
  - Regulatory compliance
  - « Sustainable development » or « nature protection » approaches
  - To improve its image
  - Environmental damage risk reduction
  - Cost reduction (repair, insurance, etc.)

Environmental pillar

- 2 approaches for environmental management
  - System approach
    - Establishment of an environmental management system
  - Product approach
    - Label, eco-design, …
- Large variety of tools
  - Impact study
  - Environmental reports
  - ISO 14001 – EMAS → SME
  - **Life cycle assessment**
  - **Environmental product declaration**
  - …



FDES *
* Fiches de données environnementales et sanitaires en cours. Précise l'empreinte écologique du produit.

NF FDES CERTIFIÉE

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Life Cycle Assessment (LCA)

- General rules described in ISO standard 14040
  - " LCA describes environmental aspects and potential impacts throughout a product's life cycle, i.e. raw material acquisition, production, use and disposal"

- Cradle-to-grave approach

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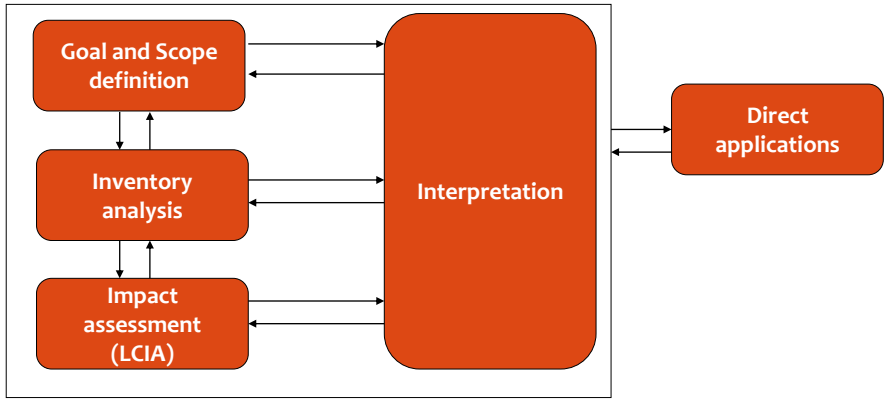
Life Cycle Assessment

- Four stages described in ISO 14040



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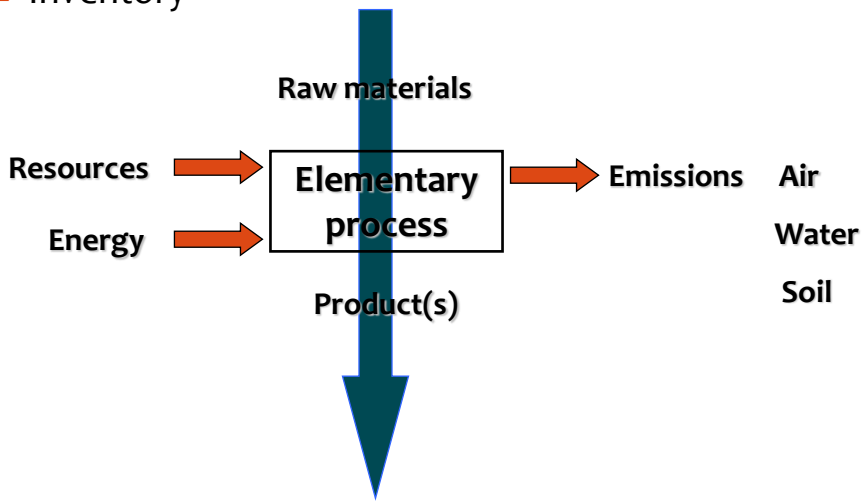
Life Cycle Assessment

- Inventory



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Life Cycle Assessment

- Impact assessment
  - Carcinogen effects/ human toxicity
  - Respiratory effects caused by inorganics
  - Respiratory effects caused by organics
  - Global warming
  - Ozone layer depletion
  - Ecotoxicity
  - Acidification
  - Eutrophication
  - Resources depletion
  - …

Environmental Product Declaration

- Tool based on LCA
- Permits the comparison between products using ten environmental impact indicators
  - Energetic resources consumptions
  - Resources depletion
  - Water consumptions
  - Solid waste
  - Global warming
  - Acidification
  - Air pollution
  - Water pollution
  - Ozone layer depletion
  - Photochemicals formation

Environmental Product Declaration

- Example: global warming
  - GHG inventory: CO_2, CH_4, N_2O throughout the whole life of the product
- French standard NF P01-010
- No Belgian equivalent (under discussion)
- Declarations published on internet
  - To help decision for the building sector
  - → sustainable construction

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Study context

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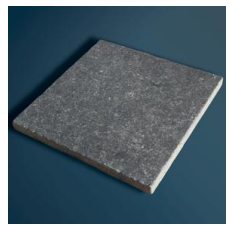
Unfair competition from Asia?

Proximity and quality ⟺ **Exoticism and low prices**



Context

- Asian products on market
  - Unbeatable prices
- Arguments need for Belgian products

⇩

ENVIRONMENT

Goals of study

- To obtain an environmental product declaration
  - To perform a Life Cycle Assessment
    - Belgian products
      - Bluestone
      - Sandstone
    - Transport Asia - Belgium

- To compare Belgian and Asian products on an environmental basis
- Dissemination of results to the public

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Scope of study

- Functional Unit
  - One thousand square meters of paving
- System boundaries
  - Production of paving
    - Extraction
    - Shaping
  - Transportation from production site to Brussels
  - Implementation

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Main results

- Arguments against Asian products
- Environment
  - Transport from Asia → very disadvantageous
- Tool to insert in buildings specifications ?

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Main results – details

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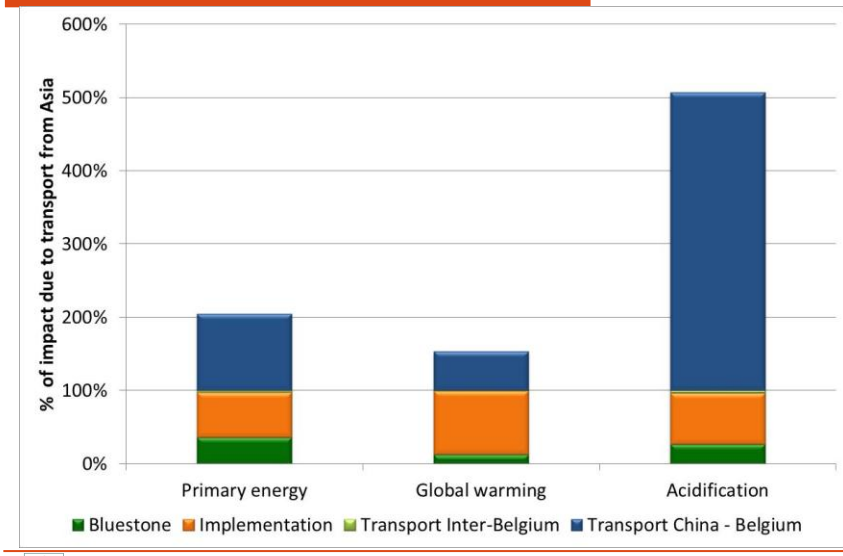
Bluestone vs. Chinese stone

- Compared products :
  - Outside paving in Belgian bluestone
  - Outside paving in Chinese stone
- Environmental product declaration for Belgian product
- Environmental product declaration for transport from China to Belgium

Bluestone vs. Chinese stone

Impact Category	Production Bluestone	Implementation	Transport Inter-Belgium	Transport China – Belgium	Impact Chinese stone
Primary energy	1209,15 MJ	2046,28 MJ	72,37 MJ	3493,5 MJ	6821,3 MJ
Global warming	55,44 kg $_{eq}CO_2$	386,30 kg $_{eq}CO_2$	4,56 kg $_{eq}CO_2$	236,55 kg $_{eq}CO_2$	681,85 kg $_{eq}CO_2$
Acidification	0,28 kg $_{eq}SO_2$	0,73 kg $_{eq}SO_2$	0,036 kg $_{eq}SO_2$	4,26 kg $_{eq}SO_2$	5,3 kg $_{eq}SO_2$

Bluestone vs. Chinese stone



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Belgian sandstone vs. Indian sandstone

- Compared products:
  - Outside pavement in Belgian sandstone
  - Oustide pavement in Indian sandstone
- Environmental product declaration for Belgian product
- Environmental product declaration for transport from India to Belgium

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Belgian sandstone vs. Indian sandstone

Impact Category	Belgian sandstone production	Impleme ntation	Transport Inter-Belgium	Transport India - Belgium	Impact Indian sandstone
Primary energy	4631,27 MJ	703,52 MJ	637,57 MJ	6887 MJ	12859 MJ
Global warming	212,76 kg $_{eq}CO_2$	143,70 kg $_{eq}CO_2$	39,63 kg $_{eq}CO_2$	442,36 kg $_{eq}CO_2$	838,45 kg $_{eq}CO_2$
Acidification	2,48 kg $_{eq}SO_2$	0,25 kg $_{eq}SO_2$	0,27 kg $_{eq}SO_2$	5,33 kg $_{eq}SO_2$	8,33 kg $_{eq}SO_2$

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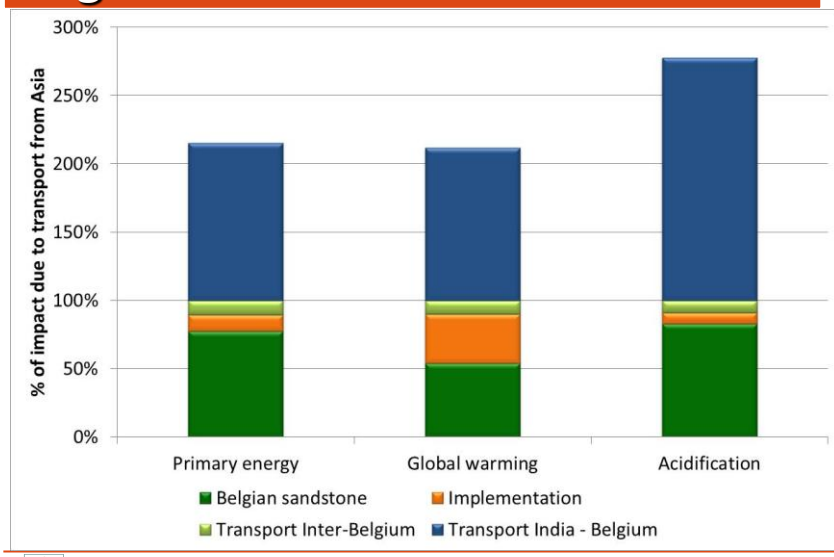
Belgian sandstone vs. Indian sandstone



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Conclusions and perspectives

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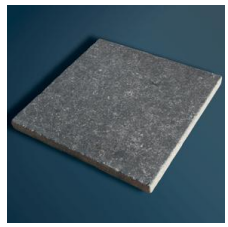
Conclusions and perspectives

- Impact of the sole transport from Asia is equivalent to the impact of the production and the implementation of Belgian products
- Impact is twofold for Asian products
  - Global warming
  - Primary energy
  - Acidification

Unfair competition from Asia?

Proximity and quality ⟺ **Exoticism and low prices**



Minimum = reduction by two for energy consumption and GHG emissions

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