

Baseline on concrete production

Dorthe Mathiesen
Danish Technological Institute



Content

- **Sustainability in the concrete production sector**
- **Key figures of concrete production in Europe**
- **State-of-the-art covering on-going research and current practice**
- **Environmental benchmarking**

- **An example –**

Hydrocarbons in concrete slurry – a topic which is very much in focus in the Danish concrete industry

by / Jørn Bødker, DTI

Why focus on the environmental impact related to concrete ?

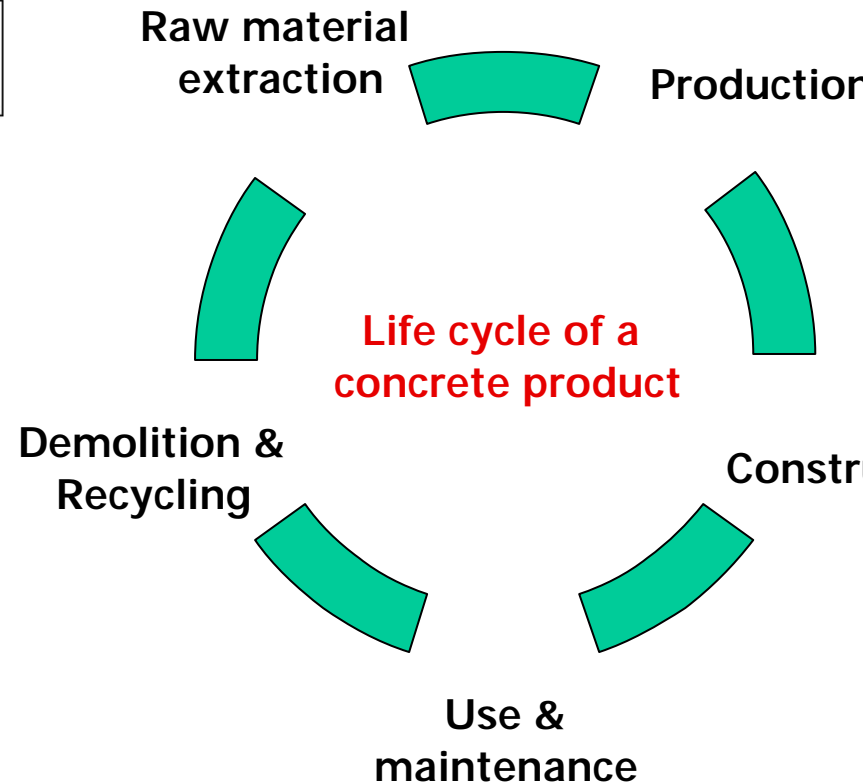
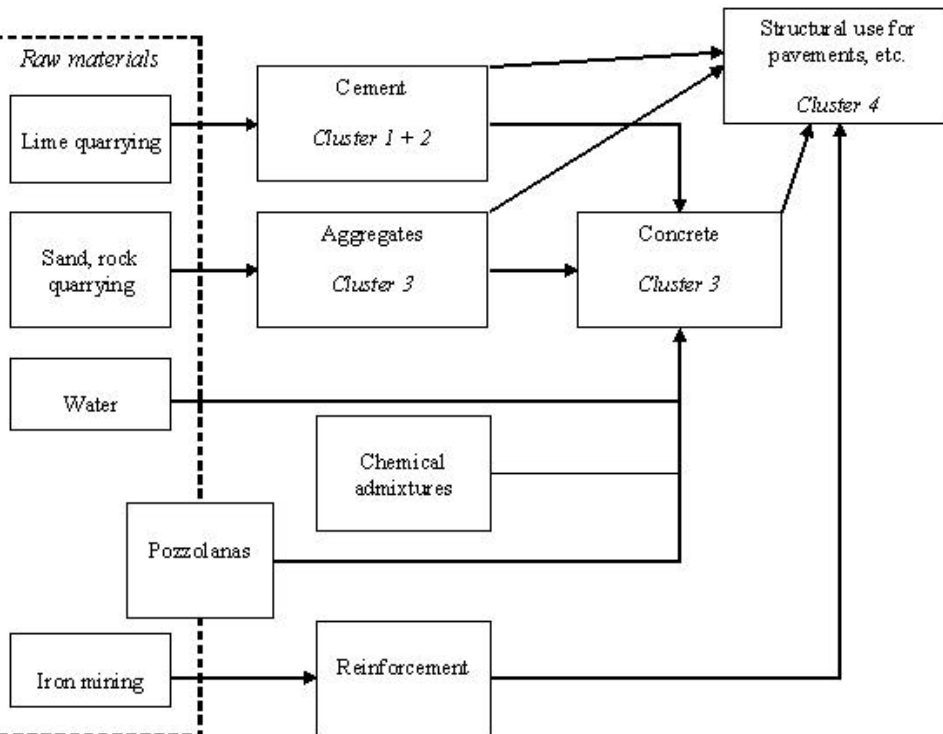
Concrete has developed into one of the most important building materials in the world

Production of concrete annually amounts to 1.5-3 tonne per capita in the industrialised world

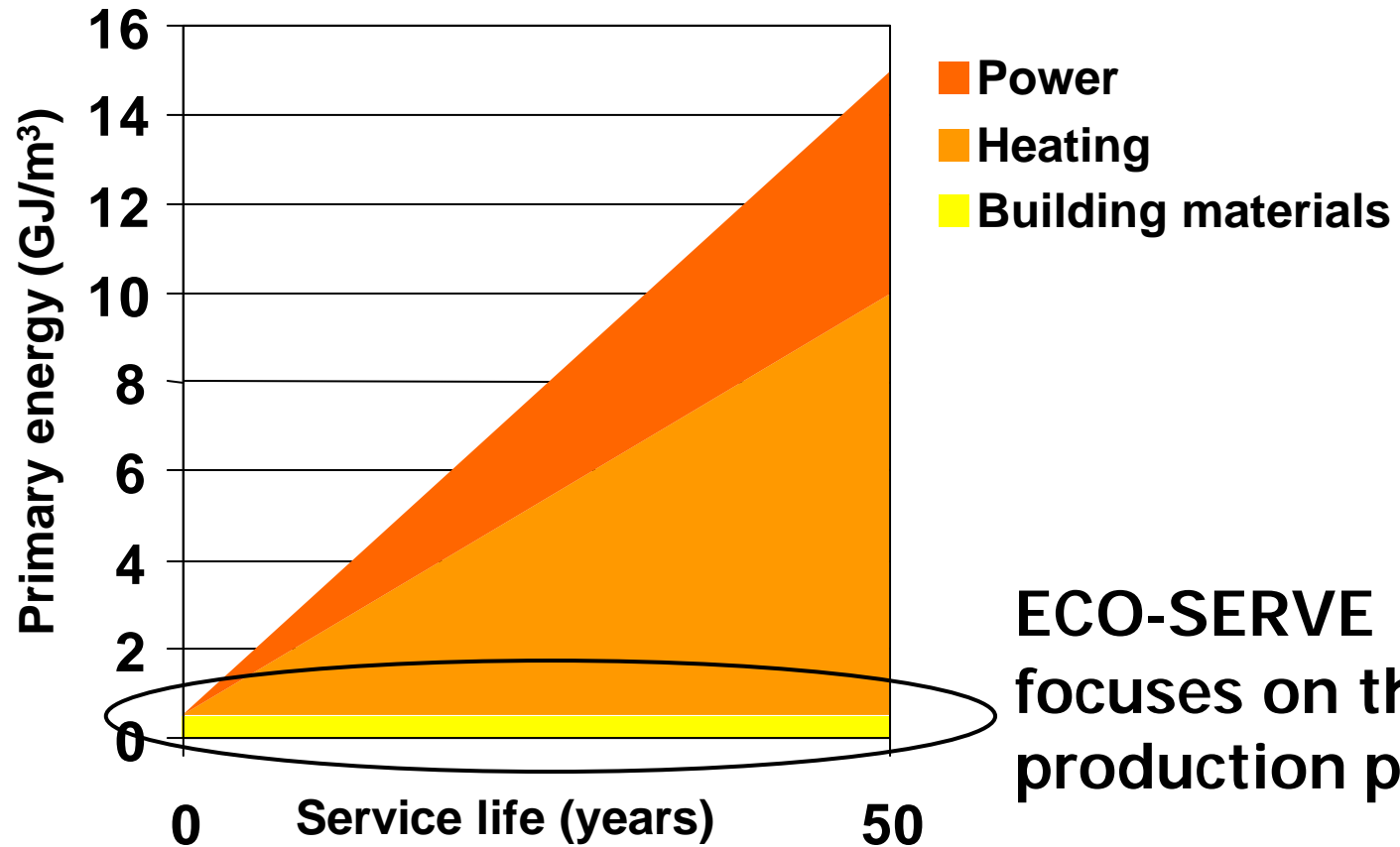
β

Improvements in the concrete industry lead to significant improvements in the building sector as a whole

Environmental impact of concrete – a complex mechanism



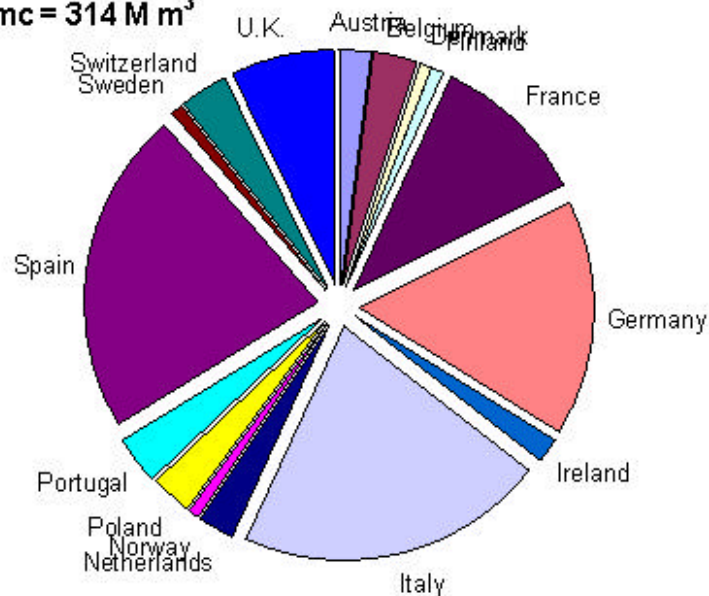
Reinforced concrete office building



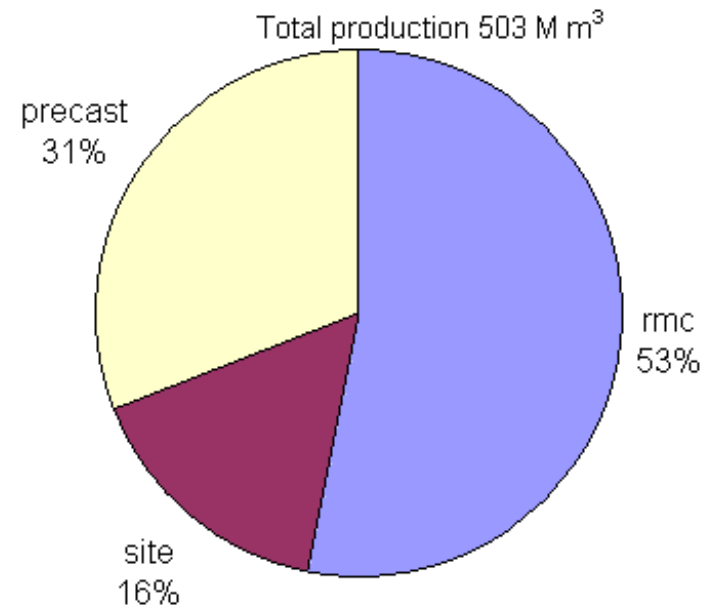
ECO-SERVE
focuses on the
production phase

Concrete production in 16 European countries

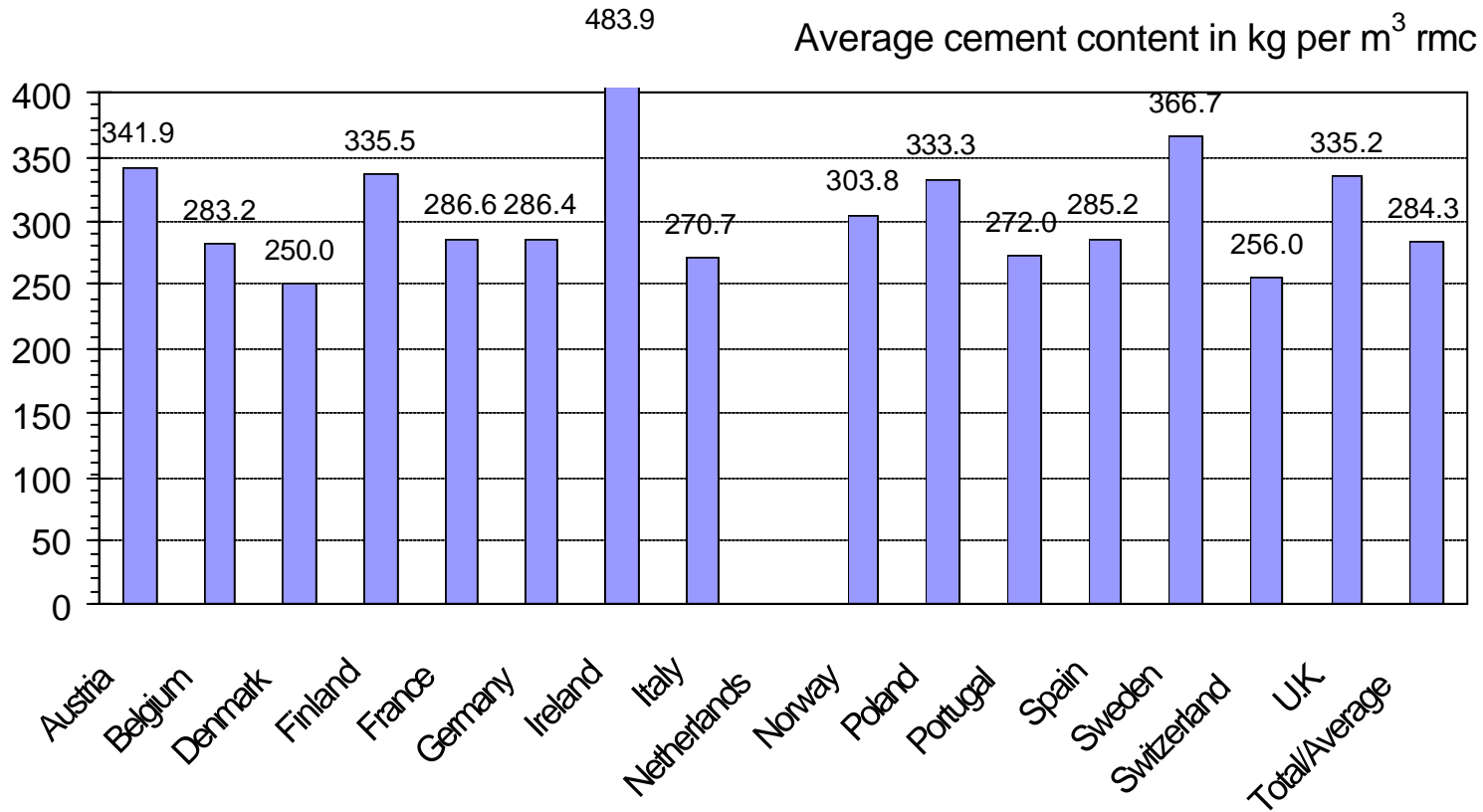
Total rmc = 314 M m³



Concrete production (excl. France, Denmark and Sw



Cement consumption divided with concrete production for rmc industry



Tools to improve the environmental profile of concrete

- ☞ **Reducing clinker content in concrete**
 - Use of supplementary materials
 - Use of blended cement and environmentally friendly cement
 - Optimising concrete mix design

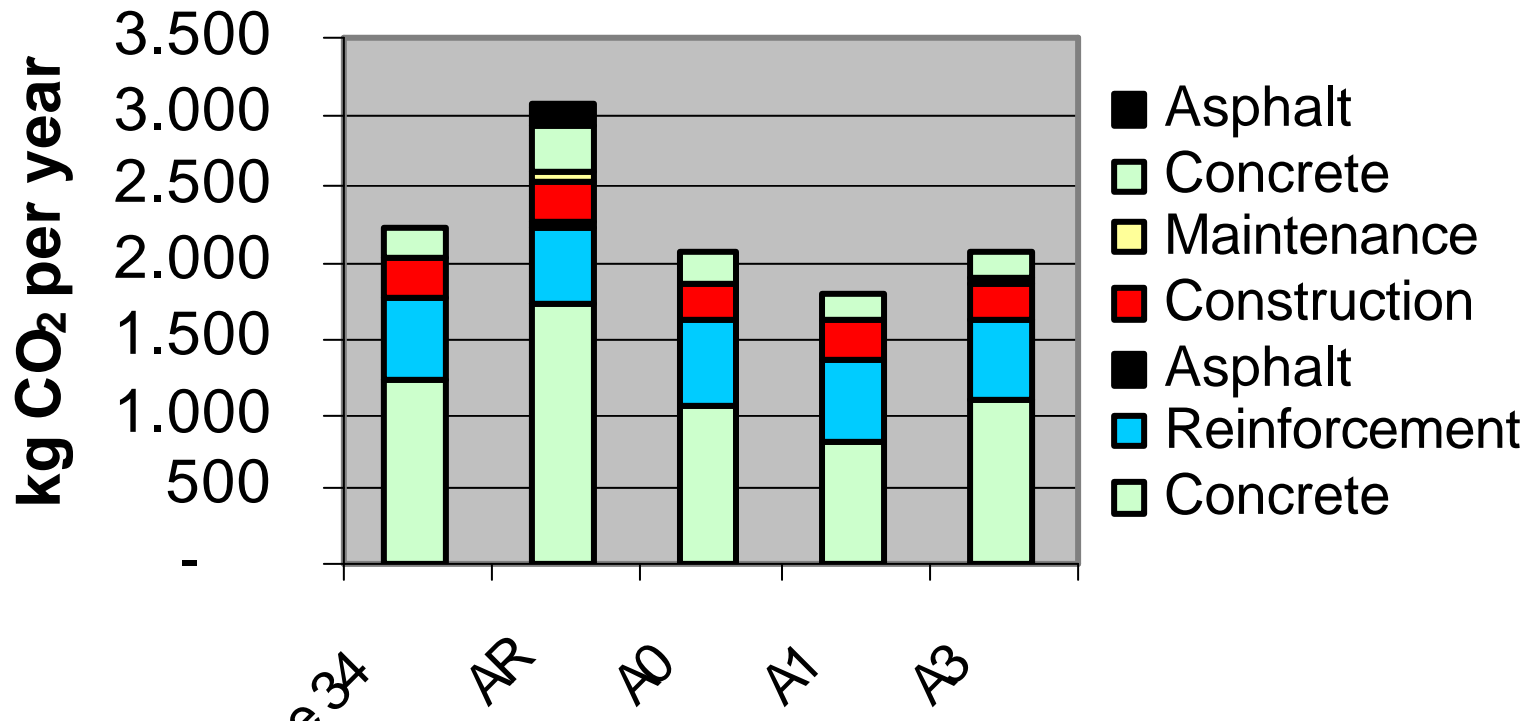
- ☞ **Recycling of waste products**
 - Reuse of water
 - Recycled aggregate from C&DW

- ☞ **Working environment**
 - Noise and vibrations
 - Harmful substances

Use of supplementary materials

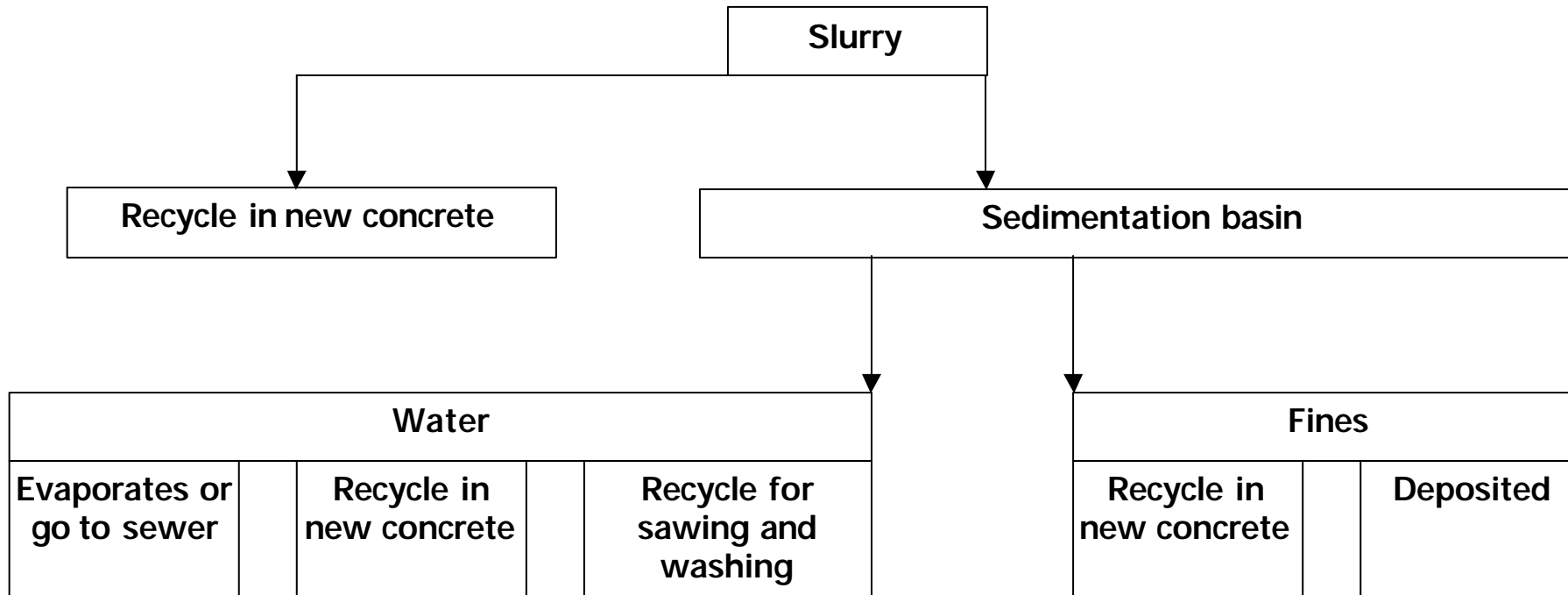
- **Fly Ash (e.g. Denmark and Germany)**
- **Silica Fume (e.g. Norway and Denmark)**
- **Blast Furnace Slag (e.g. Germany)**
- **Limestone filler (e.g. The Netherlands, France and Sweden)**
- **Sewage Sludge Incineration Ash (e.g. Denmark and Turkey)**
- **Ashes from co-combustion (e.g. The Netherlands)**
- **Ashes from biofuel (e.g. Sweden)**
- **Metakaolin (not very utilised in Europe)**

CO₂ emission from a concrete bridge – 74 years



The CO₂ uptake (carbonation) is not taken into account !

Recycling of waste products



Hydrocarbons in concrete slurry – an environmental issue to be aware of !

Working environment

The utilisation of Self Compacting Concrete (SCC) is a major step towards improved working environment

..... but the use of SCC is a technical challenge, which has initiated a lot of R&D programmes e.g.:

- **The SCC-Consortium (DK), Total budget 7 mio Euros, 2003-2006**

Environmental benchmarking

- ☞ **Material unit:**
 - 1 m³ of a specific type of concrete according to EN 206-1
 - 1 m² of a specific concrete panel

- ☞ **Indicators (environment, working environment and productivity, competitiveness, quality):**
 - CO₂ emission
 - Energy consumption
 - Surplus cement content
 - Use of mineral based form oil
 - The use of SCC
 - Noise, dust
 - Costs
 - No of employees

Baseline, BAT and R&D level

Indicator: **CO₂ emission**

Material unit: **Concrete Mix Design (X0, 20 MPa, w/c » 0,70)**

	Baseline	BAT	R&D
Cement	143	90	?
Puzzolans (FA, SF)	61	168	?
Water	136	126	?
AEA	0,22	0,69	?
WRA	1,41	3,00	?
Fine Agg. (0-4)	793	781	?
Coarse Agg. (8-32)	1135	1100	?

Reduction of
CO₂ emission =
37 %