



Cement and Concrete

High Risk Sector



Processing of limestone and mining material into cement, concrete and related products.

Related Sectors:

- Mining and Quarrying
- Glass and Ceramic Products
- Construction



Production Processes

The process of cement production consists of three main steps:

- raw milling
- clinkering
- finish milling.

Step 1: The main raw materials are **limestone (80%), clay, iron ore and sand**. These materials are proportioned and crushed in a first step. In the so-called dry process, the raw materials are preheated by recycled hot exhaust gases from the kiln. The second step – a wet process – follows directly.

Step 2: The raw feed from Step 1 is fed into a kiln, a rotating cylindrical metal tube of several meters' diameter. Material passing through the kiln is heated to **very high temperatures** achieved by burning fuel, such as heavy oil, coal, waste or natural gas. This results in a chemical and physical transformation into a grey pebble-like material called clinker. The limestone loses approximately 50% by weight as carbon dioxide.

Step 3: Finish milling is the grinding of clinker into a **fine grey powder**. Gypsum (CaSO₄) is blended with the ground clinker, along with other materials, to produce finished cement.

Cement is primarily used for building brick and concrete structures. Concrete is a mixture of cement with gravel, sand and possible further mineral components, such as broken stone and recycled concrete.

Sustainability Issues

	Energy
	Water Use
	Emissions to Water
	Waste
	Emissions to Air
	Ecosystems
	Workplace Health & Safety
	Disaster Risk
	Site Contamination

Sector Rating

- High risk issue
- Medium risk issue
- Low risk issue

Risks & Opportunities

- **Cement production requires large amounts of energy. A reliable supply is essential for continuous output**
Common sources of energy are oil, coal, wood and waste. Owing to the high process temperatures, cement kilns consume large amounts of energy. There may be a significant potential for energy - and thus production cost - savings.
- **High temperatures, caustic dust, moving machines and falls from heights are the main health and safety issues.**
Heavy machinery is involved in cement and concrete manufacturing. Production processes expose workers to high temperatures and caustic dust. Risks to the health and lives of workers are mitigated by training, protective equipment and technical measures ensuring distance from danger zones.
- **Fumes from combustion processes and dust may be emitted to the air.**
Emissions to the air depend upon the technology installed and the type of fuel used. The combustion of coal or waste such as used tires results in more toxic emissions than natural gas or oil. Most steps in cement production emit dust, which may be a nuisance or entail a risk to humans exposed to it. Up-to-date technology is more efficient and minimizes emissions to air.
- **Fuel stored on site presents a risk of fire and explosions.**
In order to ensure continuous production, large amounts of fuel may be stored. Tanks for gas, petrol and light oil present risk of fires and explosions. Heavy oil, coal and waste could lead to large fires but not to explosions.
- **The extraction of raw materials (from quarries) may have an impact on landscapes.**
The main raw materials for producing cement are limestone, clay, iron ore and sand. Cement and concrete plants process large amounts of these raw materials. Extracting raw materials and building the roads to transport them may alter local landscapes and impact upon agricultural uses and ecosystems.