



# Iron, Steel and other Metals

High Risk Sector



Processing ore into metal such as iron, steel or precious metals as raw materials for further activities.  
For product manufacturing refer to related sectors.

Related Sectors:

- Mining and Quarrying
- Metal Products and Machinery
- Electronic Products
- Precision Instruments



## Production Processes

The production of iron, steel, non-ferrous metals such as copper and precious metals such as silver starts with metal ores, raw metals and scrap metal. As the chemical and physical characteristics of metals differ widely (aluminum, steel, mercury), the metals industry employs a wide range of technologies.

**Iron:** After mining, the ore is crushed and milled, sorted by size and sintered. In a blast furnace coke is added to the ore and the sinter, reacting with oxygen and producing carbon monoxide. Carbon monoxide then interacts with the ore, generating liquid metal. Impurities like silicon dioxide are removed by adding lime.

**Precious and non-ferrous metals** are produced from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes.

**Aluminum**, for example, is extracted from bauxite, which is produced mainly in Australia, Guinea, Brazil and Jamaica. Via a wet chemical leach method, the alumina is purified and then turned into aluminum metal via an electrolytic reduction. The production of **gold** may involve liquid mercury as an auxiliary or chemicals such as cyanides.

**Steel** is an alloy made of low-carbon iron. It is obtained by blowing oxygen through molten iron, thereby reducing its carbon content. Fluxes are added to remove any remaining impurities. The properties of steel can be adapted by alloying it with other metals such as copper, chromium, titanium or vanadium. Usually the steel is then cast, forged or rolled into sheets, strips, bars or plates.

## 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

- **The production of iron, steel and other metals requires large amounts of energy.**  
The most common sources of energy for generating heat are coal (often in the form of coke) and natural gas. Metal producers are the largest energy consumers in the manufacturing sector.
- **Wastewater may contain heavy metals and oils.**  
Wastewater from processes such as coating may contain (heavy) metals in high concentrations. Water used for cooling processes may also be contaminated.
- **Waste from metals production includes furnace slag and collected dust. Quantities may be huge.**  
Solid waste stems in particular from dismantled refractories and furnace scale. In the iron and steel industry, risks related to solid waste arise from the quantity rather than from toxicity.
- **Furnaces and smelters are the main sources of emissions in metal production.**  
Exhaust gases may present a temporary nuisance and a health risk for residents in the surroundings. Metal dusts can result in long-term contamination and poisoning. Air pollution depends upon the metals produced, the fuel used and the level of technology.
- **The main risks to workers' health are: Exposure to heat and hot materials, noise, metal dust, vapours and fumes as well as exposure to heavy machinery.**  
In order to mitigate substantial risks to workers exposed to extreme conditions, adequate training, process and workflow design as well as state-of-the-art protective equipment are essential.