SUSTAINABLE STEEL
Indicators 2017 and the future

- By-products
- Raw materials
- Air quality
- Water
- Energy
- Employees
- Environment
- Education
- Investment
- Local community
- Supply chain
- Recycling
- Technology
- Safety & health
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- Technology
- Safety & health

Steel
Sustainable development and the steel industry

A sustainable circular economy is one in which society reduces the burden on nature by ensuring resources remain in use for as long as possible. Once the maximum value has been extracted, the resources are then recovered and reused, remanufactured, or recycled to create new products. Society’s needs for things such as food, housing, transportation and energy, can be met without the production of waste.

Steel is fundamental to the circular economy. Not only can steel products be reused and remanufactured, steel is also a permanent material which can be recycled over and over again without losing its properties.

The industry is continuing to expand its offer of advanced steel products for many different sectors, such as high-strength steels which reduce the weight of applications, and encourage circular economy practices. For society, the benefits include more efficient and durable products, reduced emissions, and the conservation of raw materials for future generations – a more sustainable future.

In addition, the steel industry is also making a concerted effort to ensure the safety and health of its employees and to engage with local communities where steel is produced. The industry also provides education and training opportunities that will foster the innovation needed for a circular economy, through company-specific and industry-led initiatives.

This year our sustainability report focuses on three aspects: steel as a critical enabler and partner for other industries in a sustainable society; steel as an industry which takes its commitments and responsibilities seriously; and the challenges facing the industry along with initiatives that are in place to address them.

OUR SUSTAINABILITY REPORTING FACTS & FIGURES

8 sustainability indicators
125 steel companies worldwide contributed to data collection
54% of global crude steel production represented
75 steel companies signed the sustainability charter
2004 year our annual reporting started
1 of very few industries reporting at a global level
Sustainability performance of the steel industry

The steel industry recognised the need for a systematic method to measure and report on its sustainability performance. To this end, worldsteel established a set of sustainability indicators in 2003. The indicators are aligned to the principles in worldsteel’s sustainable development policy and to the UN Sustainable Development Goals.

Sustainability reporting at a global level is one of the major efforts that the steel industry undertakes to manage its performance, demonstrate its commitment to sustainability and enhance transparency. It is one of the few industries that reports at a global level and has done so since 2004, when the first steel industry sustainability report was published.

Steel companies report on up to 8 sustainability indicators every year. Reporting is voluntary. In 2017, 125 steel companies and 6 associations participated. Crude steel produced by companies who reported on one or more indicators for fiscal year 2016 was 875 Mt, representing 54% of global crude steel production. The average indicator results, participation by indicator, as well as the performance trends of the steel industry over a decade, are provided in the sustainability section on worldsteel.org.

### Indicators

**Environmental Performance**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Greenhouse gas emissions</td>
<td>tonnes CO₂/tonne crude steel cast</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>2.</td>
<td>Energy intensity</td>
<td>GJ/tonne crude steel cast</td>
<td>19.8</td>
<td>20.4</td>
</tr>
<tr>
<td>3.</td>
<td>Material efficiency</td>
<td>% of materials converted to products and by-products</td>
<td>97.5</td>
<td>97.3</td>
</tr>
<tr>
<td>4.</td>
<td>Environmental management systems</td>
<td>% of employees and contractors working in registered production facilities</td>
<td>94.0</td>
<td>93.6</td>
</tr>
</tbody>
</table>

**Social Performance**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Lost time injury frequency rate</td>
<td>injuries/million hours worked</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>6.</td>
<td>Employee training</td>
<td>training days/employee</td>
<td>6.4</td>
<td>6.8</td>
</tr>
</tbody>
</table>

**Economic Performance**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>Investment in new processes and products</td>
<td>% of revenue</td>
<td>7.4</td>
<td>12.6</td>
</tr>
<tr>
<td>8.</td>
<td>Economic value distributed</td>
<td>% of revenue</td>
<td>96.6</td>
<td>96.7</td>
</tr>
</tbody>
</table>

Notes:

Indicators 1 & 2: Data updated in April 2018. These indicators are calculated using route-specific energy and CO₂ intensity for the basic oxygen furnace and electric arc furnace. The indicators are also weighted based on the production share of each route. Indicator 1 includes CO₂ emissions only as these make up approximately 93% of all steel industry greenhouse gas emissions. The 2015 figure for Indicator 2 (energy intensity) is lower due to increased use of scrap in the EAF route and increased use of by-product gas in the BOF route.

Indicator 5: Lost time injury frequency rate includes fatalities and is calculated based on figures including contractors and employees.

Indicator 7: Investment in new processes and products includes capital expenditure and R&D investment.

Values for Indicators 2 and 8 have been updated for 2015.
Let’s talk about steel

The figures above are derived from the worldsteel 2016 Sustainability Indicator data, based on 125 steel companies and 6 associations reporting.

Essential in all sectors of the economy

There are more than 3,500 different grades of steel. New modern steel products are lighter and stronger than before, helping other industries to reduce their environmental footprint.

Taking action to fulfil responsibility

The well-being of the community and the health of the environment are priorities for us. Abiding by environmental regulations is a prerequisite for acceptance by society. We aim to continually reduce our environmental impact.

Innovation is crucial

New and innovative steels are continually developed and provide sustainable solutions. In 2016, the steel industry invested 13% of revenue in new processes and products.

Contributing to society

Steel is vital for making modern society sustainable. In 2016, the steel industry distributed an estimated 1,029 billion USD, 98.8% of its revenue, to society directly and indirectly.

Safety first, nothing is more important

We are working towards zero incidents. In 2016, the industry's Lost Time Injury Frequency Rate was 1.0, an improvement of 78% from 2006.

Human capital is a key asset

Worldwide 6 million people work for the steel industry. In 2016, steel companies provided each employee with 7.0 training days on average.

A systematic approach brings effective results

Environmental management systems (EMS) help to improve environmental performance and operating efficiency. In 2016, about 97.1% of steel industry employees and contractors worked in EMS-registered production facilities.

Biggest challenge of the industry

In 2016, on average 1.9 tonnes of CO₂ were emitted for every tonne of steel produced. The majority of this comes from the chemistry of steelmaking. Breakthrough technologies are being developed worldwide to address this challenge.

Significant improvement in energy consumption

In the last 50 years the steel industry has reduced its energy intensity per tonne of steel produced by 60%. The average in 2016 was 19.1 GJ/tonne.

Responsible management of natural resources

Very little waste is produced. In 2016, 97.6% of the raw materials used for steelmaking were converted to steel products and by-products.

Optimal resource efficiency, nothing to waste

Steelmaking by-products are valuable resources and used in e.g. concrete, fertilisers, plastics, paints and cosmetics. Nearly 100% of our industry by-products can be used.

Informed decisions on material choice

We provide life cycle inventory data for 16 key steel products. This helps customers to select the most sustainable materials and to understand the overall environmental performance of their products.

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Steel Innovation

RENEWABLE ENERGY
Steel helps to turn buildings into power stations. Innovative integrated steel building components are used to generate, collect, store and release solar and geothermal energy.

CEMENT PRODUCTION
Blast furnace slag, a steel industry by-product, is used in cement production. Substituting clinker with granulated blast furnace slag would allow significant reductions in CO₂ emissions up to 200 Mt of CO₂ annually.

ELECTRIC MOBILITY
There would be no electric mobility without steel. Electrical steels are essential to build high-speed motors for electric and hybrid vehicles.

ARTIFICIAL REEFS
Retired steel applications have been used to create more than 400 artificial reefs worldwide, from subway cars and ships to retired armoured personnel carriers.

REPURPOSED BUILDINGS
Steel's long product life and adaptability enable old buildings to be reused or converted for different purposes. CO₂ emissions savings from building reuse are estimated at 1 to 1.5 kg CO₂/kg steel.

DECOMMISSIONED OIL RIGS
Steel is the main component of rigs. Decommissioned rigs are reused as offshore wind turbines, diving resorts, artificial reefs and cruise ship ports-of-call.

LONGER & STRONGER BRIDGES
High performance steels build longer and stronger bridges that shorten distances and carry more vehicles. The Sydney Harbour Bridge has saved 12 Mt of CO₂ equivalents from reduced distance travelled over 80 years.

FERTILISERS & LIMING MATERIALS
Steel slags are a valuable resource in agriculture. They are used as fertilisers and liming materials, improving plant nutrition and soil quality.

SHIPS & CONTAINERS
Steel ships and containers allow for enormous loads to be transported in one go. Shipping consumes less energy and emits less GHGs compared to other modes of transport.

PACKAGING & RECYCLING
Globally, about 7.2 Mt of steel packaging is recycled each year. This saves 11 Mt of CO₂, equivalent to taking about 280,000 cars off the road.

Steel products and applications help other industries to reduce their environmental footprint.
You can rely on steel. Together we find sustainable solutions.

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**AIRCRAFT ENGINES & LANDING GEAR**
Highly valuable steel parts, like engines and landing gear, are extracted from decommissioned aircraft and are remanufactured and reused as spare parts for aircraft in service.

**SEA FORESTATION**
Steel slag sea forests provide a high proportion of minerals like iron and calcium. They dramatically boost biomass and capture up to 0.5 tonnes of CO2 per tonne of the structure.

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More detailed information is available on worldsteel.org.
Tackling our material issues

Materiality is a principle to help define and determine the economic, social and environmental topics that matter most to a business and its stakeholders. A materiality assessment is a process through which an organisation’s most important, or “material”, sustainability issues can then be prioritised, based on relevance to stakeholders and impact on society.

worldsteel performs materiality assessments on a regular basis to ensure that the industry’s reporting is relevant and meaningful to its stakeholders. This includes a review of the materiality assessments of our own member companies, and a broad range of reporting guidelines and standards, such as those of the Global Reporting Initiative (GRI).

Through these assessments we identified 7 key focus areas for further development to supplement and go beyond our 8 sustainability indicators. We plan to broaden our sustainability communications with our stakeholders by addressing these areas in more detail over the coming years. Our intention is to understand the industry’s performance, identify areas for improvement, and provide meaningful reporting of the industry’s contributions and impacts on society.

7 FOCUS AREAS

- Environmental investment
- Recycling
- Water
- Air quality
- Supply chain
- Product applications
- By-products
WATER

Who uses fresh water?
Domestic use 8%
Industrial use 22%
Agricultural use 70%

MANAGE OUR WATER
USE RESPONSIBLY

Minimise water intake in areas of water scarcity.
Ensure high quality water returned to source.
Exchange and implement best practices.

THE STEEL INDUSTRY
Water is used for cooling and in the steelmaking processes.
While water usage is substantial, water consumption is low. About 90% of the water used is returned to source. Most of the remainder evaporates, returning to the natural water cycle.
Water treatment facilities are an integral part of the steel plant. Water returning to source is often cleaner than extracted.
In areas of water scarcity steel plants are able to recycle and reuse around 98% of their water.

AIR QUALITY

The number of smartphone users is forecast to grow from 1.5 billion in 2014 to around 2.5 billion in 2019.
There are air quality apps available with real-time air quality information that people can use to protect their health when planning their day.

ENSURE GOOD AIR QUALITY
IN THE COMMUNITIES
WHERE WE OPERATE

Encourage industry-wide uptake of best available technology.
Monitor and minimise air emissions.

THE STEEL INDUSTRY
The main emissions to air by the steel industry are dust, nitrogen oxides (NOx) and sulphur oxides (SOx). The most prevalent sources of dust are sinter plants and stockyards.
All steel plants worldwide have air emissions control technologies and equipment in place.
The majority of steel plants have ambient air monitoring for PM10 (Particulate Matter smaller than 10 μm) in their vicinity.

RECYCLING

According to the United Nations, 2.12 billion tonnes of waste are dumped every year.
Recycling helps to reduce the amount of waste that goes to landfill.

ENSURE OPTIMAL
USE OF NATURAL
RESOURCES

Improve product design to support customers in reducing scrap in their manufacturing processes.
Maximise circular economy practice: reduce, reuse, remanufacture, and recycle.

THE STEEL INDUSTRY
More steel is recycled worldwide annually than all other materials put together.
600 Mt of steel scrap are recycled every year. This avoids over 900 Mt of CO2 emissions.
More than 95% of vehicles are recovered for recycling and nearly 100% of the steel in these recovered vehicles is recycled.
Every single steel plant is also a recycling plant as they use steel scrap in their production.

Beyond indicators
Steel Initiatives

In order to address its challenges and ensure the sustainable development of the steel industry, steel companies are taking action both on the individual company level and are collaborating on a global level on a range of initiatives through worldsteel. Some examples are summarised below. Further details can be found at worldsteel.org.

CLIMATE ACTION
The programme recognises steel producers that submit CO₂ emissions data for worldsteel’s data collection, according to the worldsteel methodology – now a standard, ISO 14404. It enables individual steel plants to compare themselves against both average and best performers, to track their performance over time and to identify their scope for improvement.

GLOBAL TECHNOLOGY INNOVATION FORUM
The reduction of CO₂ emissions is one of the biggest challenges facing the steel industry. These emissions are mostly due to the chemistry of steelmaking and cannot be significantly improved with current technology. The industry is working together on a number of initiatives to develop breakthrough steelmaking technologies that can reduce CO₂ emissions by at least 50%, potentially revolutionising the way steel is made. The success of many new projects depends on a supply of carbon-free energy or hydrogen. worldsteel facilitates a global technology innovation forum for its members to exchange information on these initiatives, share improvements and identify gaps or overlaps in research.

ONLINE BENCHMARKING SYSTEMS
worldsteel offers free online benchmarking systems for its members on reliability, process yield, and energy intensity for each process of the basic oxygen furnace and electric arc furnace production routes. These systems allow companies to understand their performance, including the influence of raw materials, on a site or process level, for both in-house benchmarking and with best performers, fostering greater material and energy efficiency across the industry.

STEEL SAFETY DAY
A safe and healthy working environment for all employees and contractors is the number one priority for every worldsteel member. Established in 2014, Steel Safety Day was set up to reinforce awareness of the five most common causes of safety incidents, to identify and mitigate hazards on site, and to create a safer working environment across the entire steel industry worldwide. Significant improvements in safety performance have been observed globally over the past decade.

STEELCHALLENGE
To inspire innovative thinking and to provide education and training for both future and existing employees, steeluniversity was established and now hosts an annual competition, steelChallenge, for students and young industry employees to test their knowledge and skills using sophisticated simulations. Over 10,000 people have participated in the competition since it began in 2005.

LIFE CYCLE ASSESSMENT
worldsteel recently released its 2017 global and regional steel life cycle inventory (LCI) data which has been developed following international standards on LCA. The datasets provide the most accurate and comprehensive data worldwide on the environmental profile of 16 key steel products used in a broad spectrum of industries. The data enables a full life cycle approach to be utilised when determining the environmental performance of steel-containing products, including their carbon and water footprints. The LCI data is often used by customers and specifiers for material decision making and product design. worldsteel has developed two market-sector specific LCA models, autoLCA and buildLCA, which help understand the environmental performance of steel in the automotive and construction sectors.
Excellence in Sustainability Steelie Award

worldsteel's Excellence in Sustainability Steelie Award seeks to recognise an initiative that has made a positive impact, or provided benefits in all three areas of sustainability: economic, environmental and social performance. The sustainability initiatives presented below are the 2017 finalists, and demonstrate actions being taken by worldsteel members to respond to sustainability challenges in their region. More details are available on worldsteel.org.

**Acindar Grupo ArcelorMittal and Ternium:**
**Steel reuse for the conservation of jaguars**
These companies have teamed up with NGOs and local authorities to promote biodiversity and reintroduce the native jaguar, which has been declared as a National Natural Monument, in a 35-hectare Breeding Center in Argentina's Iberá reserve. The Center, including 4 steel pens, was constructed using 400 tonnes of steel, 75% of which was recovered steel, avoiding the use of new steel products and raw materials. The creation of a world-class eco-tourism destination is benefiting 200,000 people in 20 districts in the Iberá area.

**ArcelorMittal Tubarão and Usiminas:**
**Paving rural roads in Brazil with steel by-products**
ArcelorMittal Tubarão has developed REVSOL Plus® using steelmaking slag, avoiding the extraction of natural aggregate. This is a low-cost, environmentally sound product used to coat 650 km of previously unpaved roads in the state of Espirito Santo, benefiting 30 municipalities. Usiminas has also developed a slag product, SIDERBRITA, to pave 750 km of rural and urban roads in the state of Minas Gerais, benefiting 650,000 residents in 26 municipalities. These communities now have access to basic services such as transportation, garbage collection, schools, ambulances, and police.

**China Baowu:**
**Renewable energy in steelmaking**
China Baowu has created the world's largest roof-top solar energy installation covering 25 steelmaking buildings at two urban sites in the Shanghai and Nanjing areas. The installation includes 1.3 million m² of photovoltaic panels, producing 80 million kWh per year - enough to power 59,000 average Chinese households. All of this energy is being used in their steelmaking operations, reducing energy costs and improving air quality for society.
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