

Environmental Performance (EN)

Environmental sustainability is a precondition for successful mining and smelting operations. Boliden's environmental strategy is based on three component parts: Environmental Impact, Resource Efficiency, and Credibility. These elements address the most important areas for Boliden's licence to operate and our long-term competitiveness.

Environmental Targets, 2014–2018

(Base year 2012)

METAL DISCHARGES TO WATER	Discharges of metals to water shall decrease by 25% from 2012 to 2018
METAL EMISSIONS TO AIR	Emissions of metals to air shall decrease by 10% from 2012 to 2018
SULPHUR DIOXIDE EMISSIONS	Emissions of sulphur dioxide to air shall be reduced by 10% from 2012 to 2018
CARBON DIOXIDE EMISSIONS	The carbon dioxide intensity shall not exceed 0.77 tonnes of carbon dioxide per tonne of metal produced by 2018
ENVIRONMENTAL INCIDENTS	Boliden's target is to have zero environmental incidents every month by 2018

Material environmental aspects

Some of the environmental aspects, such as energy, water, emissions, effluents & waste, compliance and transport, are directly connected to how we run our operations and whether we maintain stable processes that comply with our permits. Several aspects are linked and impact on Boliden's overall performance and compliance. Other environmental aspects, such as materials, biodiversity, closure planning, grievance mechanisms and supplier assessments constitute material aspects as they impact external stakeholders, and determine Boliden's licence to operate and ability to develop the business. Also reclamation work is important and by 2018, Boliden aims to have completed the reclamation of at least five prioritised objects out of 20 identified.

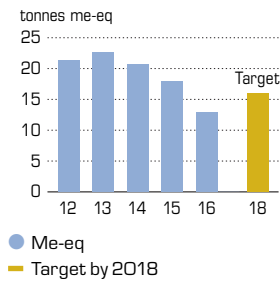
Performance in relation to targets – 2016

The outcome in 2016 is positive in the sense that discharges of metals to water significantly decreased during the year. Metal to water and sulphur dioxide are declining and developing in the direction that Boliden has identified through its Group targets.

In 2016, 17 (14) environmental incidents occurred. According to Boliden's definition, these include permit violations and serious incidents, whether environmental damage occurred or not. Nine of the events dealt with discharges to water, either due to internal effluent treatment not working according to permit or unforeseen leaks due to weather conditions or from processes. Five incidents involved unauthorized air pollution. Two of the incidents were related to limits for internal waste streams, and therefore did not cause any direct influence outside the industrial area. None of these events are assessed to have been of a level of seriousness that caused lasting harm or significant environmental impact. One incident involved a violation of the Cultural Environment Act due to an ancient fireplace being damaged by a construction machine before it could be examined by archaeologists. Boliden was fined SEK 100,000 for the violation.

Environmental Performance

METAL DISCHARGES TO WATER



Results 2016

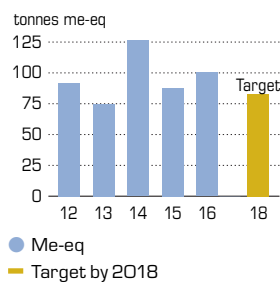
The environmental impact from discharges of metals to water (metal equivalents) has declined by 40% since the base year of 2012. The discharges of metals with high toxicity (mercury, cadmium and arsenic) decreased in 2016. Rönnskär's new water treatment plant enables reduced discharges of metals, e.g. zinc and lead.

Comments

Since 2015, Boliden has been reporting the impact of metal discharges as metal equivalents, a method, whereby the various elements are allocated a power factor, depending on how toxic they are to the aquatic environment. The method is based on copper equivalent toxicity (as if the toxicity were only caused by Cu). This method has been used retroactively in this report since 2012.

Boliden also reports water discharges in accordance with GRI, see indicator EN22.

METAL EMISSIONS TO AIR



Results 2016

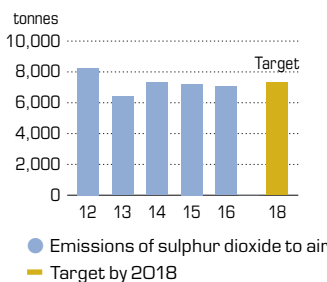
The environmental impact from emissions of metals (metal equivalents) to air has increased by 9% since the base year of 2012. Emissions of copper, mercury and cadmium have decreased, while emissions of lead increased during the year.

Comments

Since 2015, Boliden has been reporting the impact of metal emissions as metal equivalents, a method, whereby the various elements are allocated a power factor, depending on how toxic they are to humans exposed to them. The method is based on copper equivalent toxicity (as if the toxicity were only caused by Cu). This method has been used retroactively in this report since 2012.

Boliden also reports emissions in accordance with GRI, see indicator EN21.

SULPHUR DIOXIDE EMISSIONS



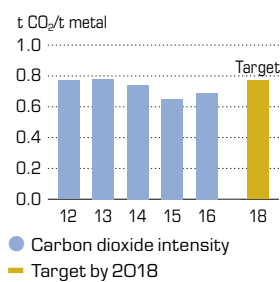
Results 2016

Emissions of sulphur dioxide to air have declined by 14% in comparison with the base year of 2012. The year on year decrease is mainly due to Boliden's investment in a new converter at the Kokkola smelter.

Comments

Sulphur dioxide is currently within the internal targets, but performance is uneven due to some installations approaching a point where re-investment is required. Boliden's investment in a new sulphuric acid plant in Harjavalta is expected to contribute to a further decline in sulphur dioxide emissions in the coming years. See indicator EN21 for more information.

CARBON DIOXIDE EMISSIONS



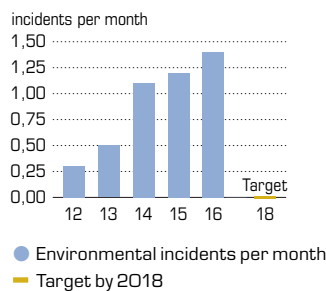
Results 2016

The carbon dioxide intensity has increased from 0.65 to 0.69 as a result of Kevitsa being integrated in the Boliden Group. The increase is due to production, including concentration, being more energy-intensive in an open pit mine and to indirect carbon dioxide emissions being higher for Finnish electricity production than for the average of Boliden's other units.

Comments

The relative emissions of carbon dioxide shall stabilize to the 2012 level (0.77 t CO₂/t metal), regardless of increased production. To achieve this Boliden has to work with energy efficiency and technological development. See indicators EN3-6 and EN 15-19 to learn more about Boliden's work related to carbon dioxide.

ENVIRONMENTAL INCIDENTS



Results 2016

The number of environmental incidents has increased to 1.4 (1.2) per month. 17 (14) environmental incidents occurred in 2016. Nine of the events involved discharges to water, five involved prohibited air pollution, and two involved waste handling. None of the above incidents are adjudged to have caused lasting damage or significant environmental impact. One incident involved a violation of the Cultural Environment Act and is described in EN-DMA and EN-29.

Comments

Boliden has changed the title of the key performance indicator in 2016, from environmental accidents to environmental incidents, because the majority of the incidents do not result in any significant environmental impact. Reducing the number of environmental incidents demands efficient systems at every stage of the value chain, but also requires a focused way of working with routines, risk assessments, action plans and advanced technology.

Material Aspect: Materials

EN1 Materials used by weight

Mined rock, milled ore, and concentrate production increased in 2016, while smelting materials are at a similar level as in previous years. Boliden has included tonnage of rock, ore and concentrates in the material used in its reporting. Waste rock and sand are then reported as output under EN23 Total Waste. Some of the concentrate produced in the mines is sold to external parties. The total smelting material feed comprises concentrates both from Boliden's own mines and from external mines, purchased secondary materials, and secondary materials sent from one smelter to another.

Materials are mostly weighed in connection with loading and/or charging (ore, concentrates, and most smelting materials). The mined rock figure is based on calculations (waste rock and ore). A minor part of input materials is calculated from input and stock.

Materials used by weight, ktonnes	2014	2015	2016
Mined rock	85,357	75,317	100,765
Whereof milled ore	46,000	44,000	49,000
Whereof concentrate produced	961	1,043	1,249
Smelting materials	2,639	2,654	2,671
Other materials	625	670	786
Whereof non-renewables	135	133	150

EN2 Percentage of materials that are recycled input materials

Boliden uses its own and other companies' by-products and residues for the extraction and recycling of metals. The Boliden Rönnskär smelter began using a new electronic scrap recycling facility in 2012, making Boliden among the world leaders in e-scrap recycling. Boliden Bergsöe, which recycles 70,000 tonnes of lead acid batteries and other lead scrap per year, is, furthermore, the only secondary lead smelter in the Nordic region.

Metals can be recycled endlessly without any deterioration in their quality. It is important, therefore, that electronic materials and scrap, such as telephone cables, copper roofs and copper pipes, from the demolition or construction of buildings and infrastructure is reutilised. The Rönnskär smelter produces 45% (50) of the gold, 25% (30) of the copper, 20% (30) of the silver, and 65% (70) of the zinc from secondary raw materials.

The recycling input rate (RIR) shows the fraction of secondary materials in the total input to Boliden Smelters. Recycled materials include secondary materials from external sources and secondary materials sent from one plant to another within the Group. By-products and non-product outputs recirculated internally at the sites and slag sent from smelters to mines are not included.

Percentage of recycled materials	2014	2015	2016
Total secondary feed, tonnes	304,200	296,800	299,300
Total feed (primary and secondary), tonnes	2,639,000	2,654,000	2,671,000
Recycling rate	12%	11%	11%

Material Aspect: Energy

Aspect Specific DMA

Metal production is very energy intensive, both in the mining phase and in the refining processes. Boliden's energy consumption is a major cost item, accounting for approximately 14% (16%) in the breakdown of the Group's total operating costs. Boliden's energy policy states that all business units shall implement and maintain energy management systems. Boliden shall also reduce its dependence on fossil fuels by using renewable and/or recycled energy where possible. In previous years, energy efficiency measures have also been promoted on a broader scale through voluntary commitments within the framework of national programmes, e.g. through the Swedish Energy Agency programmes, the Finnish equivalent (MOTIVA), and collaborations

with Enova in Norway and SEAI in Ireland. The main aim of these programmes has been to increase the efficiency with which electricity is used. The changes in the total use of energy use and energy intensity in the reporting year are mainly related to the integration of the Kevitsa mine. This unit has been included June to December, and will be fully accounted for in the 2017 report.

Energy Management Systems

Boliden's approach is to have energy management systems, in accordance with ISO 50001, at all significant operational locations. This also ensures the company's compliance with the rules and regulations imposed by the Energy Efficiency Directive 2012/27/EU.

EN3 Energy consumption within the organization

Energy consumption in 2016 totalled 19.1 (16.8) million gigajoules (GJ). Electricity accounts for 16.1 (14.6) million GJ of this consumption, which equates to 4.5 (4.1) TWh.

The reported energy usage is based on invoiced incoming and outgoing deliveries, supplemented by internal measurements and stock inventories at the end of the year. Conversions between weight and energy have been performed using energy values specified by the supplier or by using tabled values provided by national bodies.

Electricity is the dominant source of indirect energy in the Group. Out of 16,533,000 GJ of indirect energy used, 97% comprises electricity and only 3% is purchased heat. Coke, coal, oil and fuel gases are used for the reduction and smelting of copper, lead and zinc concentrates. Diesel is used for transportation purposes, in mining operations and for internal transportation. Limited amounts of heating oil and gas are used for heating purposes during the cold season. The use of biofuels in metallurgical processes has been tested and evaluated, but has up to now, been negligible in the larger context. A boiler based on biomass has been added during the reporting period. Bio-based fuels have also been used in road transports, to a limited extent.

Direct Energy consumption within the organisation (GJ)	2014	2015	2016
Coal & coke	1,961,000	1,757,000	1,743,000
Gas	402,000	395,000	446,000
Oil	1,057,000	1,187,000	1,794,000
Diesel & petrol	1,795,000	1,692,000	1,689,000 ¹⁾
Other	-	-	13,000
Total renewable energy	-	-	29,000
Total non-renewable energy	5,216,000	5,031,000	5,686,000
Electricity, purchased	14,473,000	14,635,000	16,080,000
Heat, purchased	420,000	381,000	453,000
Gross energy input	20,109,000	20,047,000	22,218,000
Produced energy, for internal use	2,052,000	2,117,000	2,205,000
Produced energy, sold	2,878,000	3,234,000	3,157,000
Net energy used	17,231,000	16,813,000	19,061,000

¹⁾ Whereof 16,000 GJ diesel from renewable sources

EN5 Energy intensity

Boliden's energy intensity was 13.17 (12.22) GJ/t metal, an increase from the previous year. The energy intensity ratio is reported as the product intensity (energy consumed per unit produced). It is calculated as Boliden's net total energy consumption (same as in EN3) for all Boliden sites divided by the production output in metal tonnes from Boliden production sites. This indicator is affected both by process efficiency and the product mix and raw material properties. The intensity increase in the reporting year is due to a new business unit (Kevitsa) being added to the Group.

EN6 Reduction of energy consumption

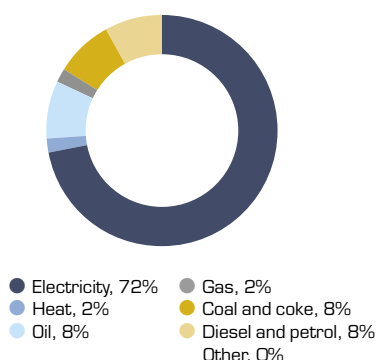
Boliden has implemented routines for purchasing high-consumption electrical equipment and procedures for the evaluation of life-cycle costs in construction and renovation as important parts of its ISO certified energy management systems. Because of the different character of mining and smelting operations, Boliden has chosen to work with local energy targets instead of Group targets.

In its mining operations, Boliden has put a lot of effort into reducing the energy used for ventilation (electric energy) and heating (oil or propane) of its underground mines. In a "Ventilation on Demand" project at the Kankberg mine in the Boliden area, commissioned in 2016, electrical consumption was reduced by 54% and the propane consumption by 21%. Ventilation on Demand means that the ventilation is real-time adjusted depending on where people and machines are working in the mine. Large energy reductions could be accomplished without impairing the working environment.

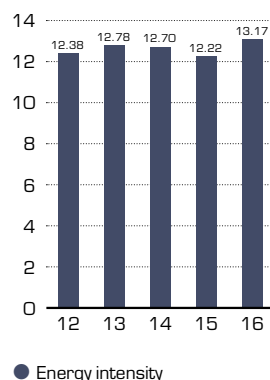
In its smelting operations, Boliden strives to take advantage of excess heat from the processes, transforming it either to electric power or supplying it for use in external district heating or steam deliveries. In 2016, 2,205,000 (2,117,000) GJ of heat was used internally, and 3,157,000 (3,234,000) GJ was delivered externally for use in district heating systems.

ENERGY INPUT, 2016 PER SOURCE

Energy accounts for approximately 14 per cent (16%) of the Group's operating cost.

**ENERGY INTENSITY**

GJ/t metal



Material Aspect: Water

EN8 Total water withdrawal

Boliden's operations are located in areas where there is no scarcity of water, and no water sources are significantly affected by the water withdrawal by Boliden's operations. Boliden aims, nonetheless, to reduce both its consumption of fresh water and the discharge of used water. The water volumes are measured and/or calculated for each site by the use of flow meters and/or the monitoring of pump operating data.

Total water withdrawal by source	2014	2015	2016
Surface water (sea)	111	92	80
Surface water (inland)	43	39	40
Ground water	17	16	17
Collected rain water	1	1	1
Municipal water	2	2	2
Total water withdrawal in million m³	173	150	140

EN10 Water recycled and reused

In mining, water is typically used in mineral processing and slurry transport; while in smelting, it is used for cooling and gas cleaning purposes. Boliden's operations do not re-use water from other organisations, but in Harjavalta and Kokkola, waste water from adjacent operations is ducted into Boliden's waste water treatment plants for treatment before being discharged to recipients. These volumes are not reported to Boliden. All other water volumes are based on data from flow meters.

Water recycled and reused	2014	2015	2016
Recycled volume in million m ³	117	107	110
Percentage of water recycled	68%	72%	78%

Material Aspect: Biodiversity

Aspect Specific DMA

Access to large areas of land is essential to a majority of Boliden's activities i.e. exploration, mining, and the construction of tailings ponds and dams. Boliden's land holdings include key habitats, habitat protection areas, nature reserves and voluntary designated areas for nature conservation. Most of the mines are located in rural areas. The exception is Tara Mines, which is located near the community of Navan in Ireland. The smelters are all located in industrial areas adjacent to a community and close to the coast.

The establishment of new mines and the expansion of existing businesses require land to be utilised. The physical impact on surrounding areas of land of the opening of a mining operation, for example, is considerable. A substantial amount of forested land must often be cleared to create space for industrial activities. The aim is to have the minimum possible impact on biodiversity. Once the mine is operational, the impact continues in the form of waste products – such as waste rock and tailings sand – traffic, noise, dust and other emissions and discharges to air and water.

When new mines are opened in previously undisturbed areas, all of the relevant areas' natural and cultural values are inventoried. This is part of the EIA, (Environmental Impact Assessment) which is a mandatory part of the permit application process for new activities. The EIA makes it possible to measure the effects on the flora and fauna before, during and after any operation is carried out. This inventory, or baseline, can be used as a reference when planning and utilising the remediation actions. EIAs are also carried out and a current baseline established in conjunction with changes to existing operations and the establishment of new operations in already disturbed areas. The majority of Boliden's acreage in northern Scandinavia is adjacent to reindeer grazing land and Boliden prioritises in-depth dialogues with representatives of the reindeer industry to ensure the optimum protection of their interests. This may, for example, entail ensuring that the reindeer herds can roam freely between grazing areas, or that grazing land is, as far as possible, maintained in an undisturbed

condition and that the lichen and plants on which the reindeer feed are included in the flora planted when areas are reclaimed. Boliden's forests are FSC certified in order to promote responsible forestry, and Boliden has assigned approximately 10% of its productive forested land for nature conservation. This area is partly protected through the establishment of nature conservation land, key habitats and habitat protected areas, and partly managed to promote nature conservation interests. The areas protected by Boliden mainly comprise older forests, wetlands and areas dominated by deciduous forest. Over time, some of the older forests are becoming more and more primeval. In areas dominated by deciduous forest, forestry is conducted in a way that prioritises deciduous tree species. On the productive forested land, Boliden manages the forestry from a landscape ecological perspective.

In previous years, the Group's forestry management in these areas has included prescribed felling, which is intended to benefit deciduous wooded pastures, and controlled burning in order to promote certain species and biological diversity. By adapting the forest management in areas used for outdoor recreation, social values are created and maintained. Boliden's ambition is for the wildlife on Boliden's land to be in harmony with the forestry, hunting and other public interests. Current long-term plans extend for at least ten years and include remediation, planned measures and allocated funding for a number of abandoned pit mines. Boliden is constantly working to develop new options for restoring impacted ecosystems and to identify opportunities to compensate for impact through offsets.

EN11 Operational sites in areas of high biodiversity values

Boliden's impacts on biodiversity are above all related to land use in current or abandoned operations. As of December 31, 2016, Boliden owned or controlled 22,600 ha of land in connection with existing operations, in areas adjacent to existing or former operations, or in other areas of interest for exploration. Most operations are located in areas where mining or smelting activities

have been carried out for anything between several decades and several hundred years. Some of the older mining areas are from a time when environmental legislation did not exist and knowledge levels were much less developed than is currently the case, and it is consequently not only impossible to determine an original baseline, but difficult to quantify the precise long-term impact of the activities. For every operation there is a permit process, and for time-limited operations, such as mines, Boliden always ensures that the areas can be reclaimed after the mine closing. Strategies are constantly being developed for the definition of proper compensation measures for application when utilising land and thus causing a loss of biodiversity. Closure and remediation plans, including biodiversity aspects, are a mandatory part of the environmental permit issued to operate a mine.

Details of the sites that are located in or adjacent to national or regional protected areas, including Natura 2000 habitats defined by EU Member States, can be found in the table.

Sites	Operation	Country	Size, ha	Protected areas
Aitik	Mine	Sweden	7,056	Yes ^{1) 2) 3)}
Bergsöe	Smelter	Sweden	13	No
Boliden Area	Mine	Sweden	5,205	Yes ²⁾
Garpenberg	Mine	Sweden	1,312	No
Harjavalta	Smelter	Finland	451	No
Kevitsa	Mine	Finland	1,420	Yes ^{1) 2)}
Kokkola	Smelter	Finland	340	No
Kylylahti	Mine	Finland	654	Yes ^{1) 2)}
Odda	Smelter	Norway	40	No
Rönnskär	Smelter	Sweden	153	No
Tara	Mine	Ireland	820	Yes ²⁾
Old mining areas and forests	-	Sweden	5,115	Yes ^{1) 2) 3)}

¹⁾ in the area

²⁾ adjacent to

³⁾ containing portions of area

EN13 Habitats protected and restored

Once reclamation work is completed, the measures must be inspected by the environmental authorities who will either approve them or propose additional measures. Where appropriate, reclamation is done in partnership with affected land owners or Sami villages. Boliden continues to monitor and manage the areas that have been reclaimed for an indeterminate period of time, and this may, if necessary, entail implementing additional measures in already reclaimed areas.

There are various different types of protected area in the vicinity of the majority of Boliden's mining operations, such as wildlife and plant sanctuaries, key biotopes, protected watercourses of national interest, nature reserves, and Natura 2000 areas.

A list of 20 prioritised reclamation objects has been drawn up and is updated on the basis of the results of studies showing changes in the status of the respective objects. An object may be anything from measures designed to improve dam safety, or

large-scale ground installation projects, to out-and-out nature conservation in the form of water treatment, planting or the installation of nesting boxes for birds. Boliden's interventions in older abandoned mining areas are often aimed at complementing the old techniques with new and improved methods.

Habitats restored	Type of activity	Size, ha	Start	End
Stekenjökk	Dam safety measures	-	2014	2017
Laver	Dam safety measures and reclamation work	12	2014	2016
Gillervattnet	Reclamation work	300	2014	2017
Näsliden	Reclamation work	5	2015	2017
Forests	Own deposition forest conservation	463	2016	2016

During the year, reclamation work has been ongoing i.e. in Laver and Gillervattnet. In Laver an old dam has been torn out and treatment of the exposed tailings has been ongoing since 2014. In the upper parts exposed tailings has been covered and sealed and below this area two walls have been raised to create elevated water tables. In the lower area the moraine has been supplemented with an alkali buffer to prevent the leakage of metals. Green areas have been established. The measures are showing good results with decreased metal leakage, as well as the elimination of dam safety hazards connected with the old dam. In Gillervattnet the covering of the old tailings dam is ongoing, and measures are being taken to increase the biodiversity in the area.

MM1 Amount of land disturbed or rehabilitated

Mining companies can often own or hold licences over very large areas of land. The extraction sites, infrastructure or other production activities will often disturb a small proportion of that land holding.

Soil conservation and the reclamation of mining areas that have reached the end of their productive lifespan are part of Boliden's operations and responsibility. The reclamation programmes are designed to reduce the impact on surrounding areas of land and the local biological diversity. In 2016, approximately 95 (68) hectares were restored/ reclaimed, while 963 (48) hectares were utilised. A large portion of this increase (941 ha) consists of land that has been added in connection with the incorporation of the Kevitsa site. Boliden has made ongoing provisions of funds for future rehabilitation. At the end of 2016, a total of SEK 1,943 million (1,943 m) had been allocated for future reclamation of mining areas and smelters.

Land management (hectares)	2014	2015	2016
Total land holding	21,900	20,900	22,600
Disturbed and not yet rehabilitated (opening balance)	5,761	5,957	5,937
Disturbed in the reporting period	239	48	963
Rehabilitated in the reporting period	43	68	95
Disturbed and not yet rehabilitated (closing balance)	5,957	5,937	6,805

Material Aspect: Emissions

Aspect Specific DMA

Boliden is working with systematic reviews of the actual energy and CO₂ emission trends, to identify possible improvements and efficiency measures. The overall objectives are to stabilise CO₂ emissions and to identify sustainable solutions for reducing them. Boliden's work in this area focuses primarily on direct emissions.

The current stabilisation target has led to an increase in the focus on and following up of energy use and CO₂ emissions. The 2014-2015 investments in Garpenberg contributed to more efficient energy use, and hence decreases in CO₂ intensity. The 2016 acquisition of the open pit operation in Kevitsa has increased CO₂ intensity, but Boliden will still work towards achieving the set stabilisation target of 0.77 t CO₂/t metal in 2018.

Using the best available technical solutions, using resources efficiently, and replacing fossil fuels with renewable ones will all be important components of Boliden's efforts to reduce CO₂ emissions. All units are also obliged to work continuously on making improvements to process efficiency.

Local actions plans are also being drawn up with the aim of reducing diffuse emissions (ore dust or emissions from open converter plants that are spread on the wind). The aim is not only to reduce emissions, but also to improve both the monitoring and management thereof. Stricter legislation is anticipated in this area.

EN15 Direct greenhouse gas emissions (Scope 1)

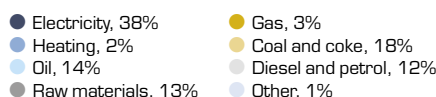
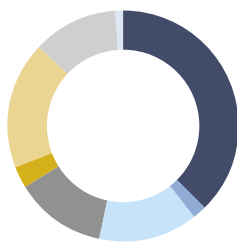
Boliden reports this indicator for the units over which it has operational control. The direct carbon dioxide emissions arise primarily from the use of carbonaceous reducing agents, from fuels in metal extraction processes, and from the use of fuels for mining operations and road transportation within the company.

The direct emissions are calculated in accordance with the procedures laid down in the WBCSD GHG Protocol, together with additional guidelines from the EU and/or national authorities.

Note. Data in this GRI Report were compiled before the EU-mandated ETS reporting to the national authorities. The CO₂ reporting within the framework of ETS is carried out in accordance with separately audited procedures in each country, and although we seek to report the same data, we cannot guarantee that the Group's GRI disclosure will correlate exactly to the CO₂ data reported within ETS.

CARBON DIOXIDE EMISSIONS (SCOPE 1 + SCOPE 2), 2016 PER SOURCE

The total reported CO₂ emissions are 0.998 (0.889) Mtonnes for the year.



EN16 Energy indirect greenhouse gas emissions (Scope 2)

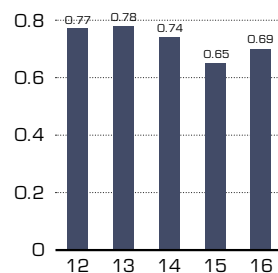
Boliden reports this indicator for the units over which it has operational control and includes only production-related indirect emissions. Commencing in 2015 Boliden has begun using location-based emission factors. This is an adaptation to the updated GHG Protocol Guidelines for Scope 2 reporting. The calculation is made by multiplying the energy used with the production mix for the specific region. The production mix should be as current as possible, and Boliden uses emission factors published by International Energy Agency. For the 2016 reporting, the following emission factors were applied: for the operations in Sweden 13 (12), Finland, 175 (135), Norway 8 (8) and Ireland 435 (457) g/kWh. The aggregated CO₂ intensity for Boliden reference year of 2012, however, is at a similar level as by the previous calculation method, and the Group CO₂ target has consequently been retained, also after the adjustment to the location-based emission factors.

Carbon dioxide emissions, Scope 1+2, tonnes	2014	2015	2016
Direct emissions, (EN15)	554,000	559,000	594,000
Indirect emissions, (EN16)	447,000	330,000	404,000
Total (EN15 + EN16)	1,001,000	889,000	998,000

EN18 Greenhouse gas emission intensity

Boliden's GHG intensity was 0.69 (0.65) t/t metal, corresponding to a significant increase from the previous year. The GHG intensity is reported as the product emission intensity (metric tons of CO₂ emissions per unit produced). The same principles as those used for calculation of energy intensity (EN5) apply. Boliden only includes CO₂ gas in the GHG intensity.

GREENHOUSE GAS EMISSION INTENSITY t CO₂/t metal



● Greenhouse gas emission intensity

EN19 Reduction of greenhouse gas emissions

The GRI definitions state that this indicator should reflect reductions of CO₂ emissions identified under EN15-16. The reductions result is estimated from reported energy savings and energy efficiency initiatives reported in EN-5 and EN-7.

Boliden strives to deliver the excess heat from its processes for use in district heating, whenever possible. The heat supplied by Boliden Bergsöe, Boliden Rönnskär, Boliden Kokkola and Boliden Harjavalta in 2016 corresponds to 260,000 t/a of CO₂ (Scope 1) if the same amount of heat had been produced from a fossil fuel source.

Boliden is also, over and above these measures, actively initiating attempted reductions in fossil fuel emission by means of fuel substitution tests, participation in demonstrations of electrified road transports, and improved heat recovery/exchange with the aim of phasing out the use of fossil fuels for heating purposes. Boliden is a co-owner of a production company for wind-based power, VindIn AB, which builds and operates wind farms in Scandinavia. The purpose of VindIn is to take a longer-term approach and to deliver low-cost, renewable electricity. VindIn currently produces about 300 GWh in its three wind farms in Sweden and Finland.

EN21 Other significant air emissions

Other significant air emissions deriving from Boliden's operations are sulphur oxides, metals and dust. The most common of the sulphur oxides (SO_x/SO₂) is sulphur dioxide, and Boliden generally uses the expression 'sulphur dioxide' to describe this emission. The figures for sulphur dioxide presented in the table are divided into emissions from stacks and calculated emissions from fuel used in both stationary and mobile equipment and the use of explosives. The figures for metals and dust include the emissions from stacks but exclude diffuse emissions. Boliden measures or calculates NO_x emissions at several units, but the methods to account NO_x currently differs too much to allow the emissions to be aggregated at Group level.

Diffuse emissions are generated at both mines and smelters and the environmental impact is due to dust particles containing metals being dispersed by the wind. All operations are working systematically to reduce particle emissions to air, e.g. by enclosure of dust-generating equipment and by salting and watering roads. The diffuse emissions are monitored but are difficult to quantify in an aggregated manner.

Emission Reduction Efforts

Boliden's efforts to reduce emissions are based on an overall analysis of the environmental impact. The impact and risk assessments are revised on a regular basis, as are the measures to be taken. The work is controlled and conducted by each individual business unit, as local circumstances may differ. Follow-up at Group level is conducted on a monthly basis.

Sulphur dioxide emissions to air are mainly attributable to gases generated during the smelting processes at the Harjavalta and Rönnskär copper smelters. The amount of sulphur dioxide emitted during the process depends on such factors as process stability and the efficiency of the gas cleaning systems, and, to some extent, on the amount of sulphur in the raw material. One way of reducing emissions is, therefore, to control the smelting process and to allow emission levels to be a factor when deciding which raw material to smelt. The monitoring and control of abatement systems for effective gas cleaning is important work and is carried out continuously.

The ongoing work focuses on process stability and improvement and/or replacement of technology. The emission of metals to air during the previous target period (2007–2013) decreased, mainly due to well-performing abatement systems and stable processes with few disruptions.

Emissions to air are mainly based on periodic monitoring in accordance with such standards as SS-EN 14385, or other applicable standards. Emissions from fuel are calculated using the fuel properties data provided by the supplier. Accredited laboratories, both internal and external, are used for the analyses of samples taken on site.

Emissions to air (tonnes)	2014	2015	2016
SO ₂	7,320	7,210	7,060
SO ₂ , indirect emissions from fuel	24	32	38
Particulate matter	75	66	110
Metal emissions to air (me-eq)	126	88	100
Metal emissions to air (mass)	22	18	22

Material Aspect: Effluents and Waste

EN22 Water discharge

Discharges to water derive from dams and tailings ponds at the mines, and from water treatment plants and collection of surface water at smelters and mines. Boliden's smelters account for approximately 72% of metal discharges to water while the mines account for the remaining 28%. Boliden mines account for 85% of the Group's nitrogen discharges with the nitrogen generated mainly from the use of explosives and their handling. The remaining 15% comes mainly from wastewater recycling at the Kokkola smelter.

Ensuring efficient and stable operations at water treatment plants and re-circulating the process water as much as possible are important parts of reducing discharges to water. Boliden's operations include purifying process water as well as a significant amount of the rainwater that falls within the industrial areas. In recent years, there has been heavy rainfall, underlining the need for increasing the water treatment capacity, and several of Boliden's operations have consequently implemented measures to meet this need.

The way in which Boliden manages nitrogen discharges to water will be particularly important in the years ahead. The ongoing expansion projects can result in marked increases in the mines' nitrogen discharges (by up to an estimated 45%) by 2018. A specific nitrogen action plan will be drawn up and the management and monitoring of water consumption will be improved through the establishment of a dedicated Water Management Plan that will apply to all units.

Once the water cleaning process is completed, the smelters discharge their water to the sea while the mines discharge the water into rivers and lakes. The water discharged to recipients is monitored to ensure that levels of pollutants are within the quality standards stipulated in the environmental permit. Accredited laboratories, both internal and external, are used for analyses of samples taken on site. No discharges are made into wetlands, ground water or municipal treatment plants. Volumes are based on flow meters.

Water discharge	2014	2015	2016
Metal discharges to water, t (me-eq)	21	18	13
Metal discharges to water, t (mass)	28	25	22
Nitrogen /N-tot/ to water (tonnes)	225	261	300
To wetland (million cubic metres)	-	-	0
To inland surface water (million cubic metres)	63	60	64
To sea surface water (million cubic metres)	71	64	62
To municipal treatment plants (million cubic metres)	0	0	30
Discharged water volume (million cubic metres)	134	124	126

EN23 Total waste by type and disposal method

Boliden handles considerable amounts of waste materials. These waste materials mainly comprise various types of dust and slag, tailings, rock, and other mineral formations. Boliden has developed processes to extract as much value as possible out of

the material streams at mines and smelters. There are virtually no materials left that can be reused, composted, or incinerated. Boliden chooses, therefore, to report the waste types in a manner that differs from that indicated in the GRI guidelines. Hazardous waste is sent for disposal or stabilisation, in some cases to landfill and deep repository. The increasing amounts of waste rock in 2016 can be derived from the addition of the Kevitsa mine, a large-scale open pit operation, similar to the Aitik mine.

Waste by type and disposal method (tonnes)	2014	2015	2016
Hazardous waste, total	791,000	825,000	826,000
Whereof to external use, treatment, or recovery	4,700	4,900	5,800
Whereof to external disposal	20	0	220
Non-hazardous waste, total	269,000	239,000	252,000
Whereof to external use, treatment, or recovery	78,900	71,900	69,800
Whereof to external disposal	800	800	1,500
Waste rock, total	39,724,000	31,781,000	52,036,000
Waste rock for internal construction	3,181,000	3,372,000	5,417,000
Storage of waste rock for future use	30,203,000	13,845,000	11,134,000
Sold waste rock	108,000	125,000	404,000
Tailings total	44,428,000	41,946,000	46,919,000
Tailings for internal constitution	2,089,000	2,625,000	2,729,000

MM 3 Waste types and disposal methods including overburden, rock, tailings and sludge, and their associated risks

Boliden processes a number of different metals and substances that are both toxic and environmentally harmful. The mining and smelting operations generate residual waste consisting of waste rock, tailings, slag, sludge and dust. EU waste legislation currently has a strategic approach that views waste as a resource and deposition as the last option (Waste Framework Directive, 2008/98/EC). There is already considerable awareness of the importance of waste issues within the Boliden Group: e.g. waste sorting, significant recycling of process residues and scrap, good reporting procedures and ongoing waste projects. The majority of Boliden's process and mining wastes are sent to landfills in accordance with the EU Landfill of Waste Directive (1999/31/EC) and the Mining Waste Directive (2006/21/EC). The remainder is used as construction material or as filler material. Waste rock tips are covered continuously, wherever possible, in order to prevent weathering or leaching. Boliden's mine waste is generally handled in accordance with applicable environmental permits that specify how and where it may be stored and how it shall be covered and reclaimed.

Extensive monitoring programmes are in place to ensure a high level of dam safety and several measures to increase dam safety have been finalised or are in progress. Boliden is responsible for around 40 dam facilities in Sweden, Norway, Finland, Ireland and Canada. They are used or have been used to deposit tailings

sand or other waste and for water management. This figure includes both operational and decommissioned facilities. Dam facilities are managed according to GruvRIDAS (mining industry guidelines for dam safety).

Correctly processed waste can be turned into valuable products. What is considered waste for one operation can often constitute a raw material for another. Approximately 45% of the process residues generated are sent to another Boliden site for metals recovery or final deposition. Appropriately handled, the trade in waste and by-products can be of benefit to society by increasing overall resource efficiency. Boliden works continuously to identify internal and external recycling or landfill solutions for any process wastes generated. Boliden receives significant amounts of waste from external parties for recycling, construction purposes or safe deposition in landfills.

The export of waste to landfill or for recycling is extensively regulated. Boliden has also developed procedures for monitoring and following up on the receiving party's processing operations to ensure that their waste processing is acceptable from a health and environmental viewpoint.

The secondary raw materials to Boliden smelters, i.e. electronic scrap and waste batteries, contain plastics that are incinerated in the process. The incineration of the plastics has two purposes: it serves as a reducing agent in order to produce the metal and it also generates heat that is necessary for the process. The excess heat from the process is used for district heating.

Volumes are mainly based on loaded weight. Waste rock tonnage is based on calculations of volume and density. Tailings are based on calculations of tonnage of ore minus tonnage of concentrate output.

There are no statistics available for overburden as it is seldom that any overburden exists, and what constitutes a insignificant

volume of waste is not defined. Metal-bearing sludge is not considered waste, but rather is reused in the process. Sludge that is not reused in the process accounts for an insignificant percentage of either hazardous waste or non-hazardous waste, depending on its properties.

Some waste is sent for final storage in underground facilities. Tailings are, for example, used as back-fill wherever this is possible, both as re-inforcement and to reduce the amount of tailings above ground. Odda stores jarosite and slag in mountain caverns. Rönnskär is in the process of completing underground disposal facilities for arsenic-bearing waste.

Boliden has no organic waste material that is suitable for composting, other than small amounts from canteens, which are sent for municipal treatment.

Boliden does not practise deep well injection or waste incineration.

EN24 Significant spills

A total of 28 (14) larger oil and/or diesel spills i.e. more than 150 litres, were reported from Aitik, Boliden Area, Garpenberg and Kevitsa. All spills occurred within the mining area. 27 spills were immediately sanitized and any contaminated soil was excavated. One hydraulic oil spill of 150 litres in Garpenberg occurred at 750 metres depth at a location where clean-up could not be carried out in a safe way. There are oil separators in the mine, and no oil has been detected in the water leaving the mine.

These events have not entailed any significant environmental impact or caused lasting harm to the surroundings. Investigations have been conducted in conjunction with all of the incidents in order to ascertain the causes of the spills and, wherever possible, to institute measures that will prevent any repeats.

Material Aspect: Compliance

EN29 Significant fines and sanctions

In January the Skåne County Administrative Board decided to ban Boliden Bergsöe to store and manage large amounts of lead containing residuals. The smelter reduced the storage of waste and the ban was lifted by a court decision.

Boliden has been hit by two corporate environmental fines in 2016. One fine was of SEK 100,000 due to a violation of the

Cultural Environment Act as a result of an ancient fireplace being damaged. Another fine of SEK 50,000 was charged due to a violation of permit as a result of a control plan not being submitted to the authority in time.

No cases have been brought via dispute resolution mechanisms during the reporting period.

Material Aspect: Transport

EN30 Significant environmental impact of transporting products and other goods and materials used in the organisation's own operations, and transporting members of the workforce

Transportation of material and goods plays a major part in reducing emissions to air from Boliden's operations. In 2016, the metal transport volumes were basically unchanged, while the volumes of concentrate increased by 10-15%. When determining the areas on which to focus in order to reduce the environmental impact from transportation, Boliden uses statistics from the existing con-

sumption of fuels, the tonnages transported, and the alternatives that are available when choosing routes and means of transport. Experts in planning and purchasing are constantly working to optimise our transportation, from both an environmental and an economic viewpoint.

Boliden utilises a comprehensive transportation system for transporting raw materials, products and by-products by ship, rail, or road, depending on the volume being transported and the distance involved. A large number of suppliers and subcontractors are part of Boliden's transportation system and it has proven dif-

difficult to compile a uniform report based on information provided by the respective carriers.

Currently, Boliden can only report on the environmental impact on road transports the company controls, i.e. shipments within or in connection to its own operation, and the logistics to/from ports and terminals which serve as delivery and pick-up points for Boliden.

The use of fuel for internal transportation within Boliden's operations was 40,000 (40,000) tonnes which has been accounted for in EN3 and EN15.

Tests with bio-fuels in lorries have been ongoing in connection with transports of ores and concentrates to/from the Boliden and Garpenberg mines. This has reduced the estimated CO₂

emissions by about 2,500 tonnes. Only transports chartered by Boliden have been accounted for.

As a producer and importer of metal concentrates, Boliden has taken measures to comply with the new IMO MARPOL Annex V criteria for substances harmful to the marine environment. In practice, this means that a tank lorry receives the contaminated wash water from the ship and transports it to Boliden's internal landfills or water treatment plants.

A relatively small part of the environmental impact from transportation comes from business travel, but Boliden is increasing the use of video and web conferencing equipment and telephone conference calls to reduce its business travel. These measures have reduced the need for air travel.

Material Aspect: Supplier Environmental Assessment

Aspect Specific DMA

Environmental criteria are a vital part of Boliden's Corporate Business Principles, and therefore also a crucial part of the supplier assessment. Boliden expects business partners to identify and document their significant environmental aspects, and to be aware of and comply with environmental legislation and common practices.

EN32 Percentage of new suppliers that were screened using environmental criteria

Boliden cannot currently disclose this information. New routines and a new system for supplier screening is being implemented, which means that the information will be presented from 2017 onwards.

Reason for omission: data is unavailable

Material Aspect: Environmental Grievance Mechanism

Aspect Specific DMA

It is the responsibility of every employee to ensure that operations are conducted properly and in compliance with given instructions. Employees must promptly report any suspected violation relating to accounting, internal controls and auditing to their immediate superior.

EN34 Number of grievances about environmental impacts filed, addressed, and resolved through formal grievance mechanisms

Neighbours' and other stakeholders are welcome to contact either the business unit or any of the company function by a variety of channels, i.e. phone, e-mail, written correspondence.

Reports involved, amongst others, noise, vibrations, dust, and other types of disturbances on the surroundings. Complaints are handled in accordance with local procedures.

Number of grievances about environmental impact	2015	2016
Filed during the reporting period	49	95
Adressed during the reporting period	33	63
Resolved during the reporting period	38	60
Grievances filed prior to the reporting period that were resolved during the reporting period	0	0