



2011 Progress Report – Pollution Prevention Planning by Base Metals Smelters and Refineries and Zinc Plants

Last Updated: February 2013

This 2011 progress report provides an overview of the results from the 11 facilities subject to the *Notice requiring the preparation and implementation of pollution prevention plans in respect of specified toxic substances released from base metals smelters and refineries and zinc plants* (the Notice). This is the third progress report published by Environment Canada to synthesize information reported by facilities covered by the Notice. Previous reports were published in 2009 and in 2010. This report draws on data from facility reports prepared under the requirements of the Notice and received by Environment Canada between 2005 and 2011. It outlines the progress made by facilities in achieving 2008 and 2015 targets for sulphur dioxide (SO₂), particulate matter (PM), mercury, and dioxins and furans. The report also describes how facilities have implemented their pollution prevention (P2) plans and how the factors to consider contained in the Notice have been reflected in the implementation of these plans.

Base metals smelting sector: What is it, and why prevent pollution from this sector?

Canada's base metals smelting (BMS) sector includes producers of zinc, copper, lead, nickel and cobalt. The Notice applies to 11 metallurgical complexes located in British Columbia, Manitoba, Ontario, Quebec and New Brunswick:

- Teck-Trail Operations, British Columbia
- Hudson Bay Mining and Smelting (HBMS),* Manitoba
- Vale Canada Ltd.-Thompson, Manitoba
- Vale Canada Ltd.-Copper Cliff, Ontario
- Vale Canada Ltd.-Port Colborne, Ontario
- Xstrata Nickel-Sudbury, Ontario
- Xstrata Copper-Kidd/Timmins,* Ontario
- Xstrata Copper-Horne, Quebec

- Xstrata Copper-CCR, Quebec
- Xstrata Zinc-CEZ, Quebec
- Xstrata Zinc-Brunswick, New Brunswick

* **Xstrata Kidd/Timmins closed all its smelting operations on May 1, 2010.** HBMS closed its copper smelter on June 11, 2010, but still operates a zinc plant.

These facilities release substances specified on the List of Toxic Substances (Schedule 1 of the *Canadian Environmental Protection Act, 1999*).

Assessment of these releases led to the conclusion that they enter the environment in quantity, concentration or conditions that can have an immediate or long-term harmful effect on the environment or biological diversity, and that constitute a danger to human health or life in Canada.

Toxic substances contained in those releases include SO₂, PM of less than 10 microns (PM₁₀), PM containing metals released from copper smelters and zinc plants, mercury, dioxins and furans, lead, inorganic arsenic compounds, inorganic cadmium compounds, and oxidic, sulphidic and soluble inorganic nickel compounds.

The BMS sector reported the following overall reductions in 2011 compared to 2005 releases:

- 50% for SO₂
- 61% for PM
- 83% for mercury
- 50% for dioxins and furans

In addition, reported metal releases not subject to any targets under the Notice (arsenic, cadmium, lead and nickel) have decreased substantially since 2005.

More information about the releases reported by the facilities can be found in the appendices. Appendix A provides the overall results for the toxic substances. Appendix B provides the results for facilities that have implemented the P2 plan, while Appendix C presents the releases for the remaining facilities.

Pollution Prevention Planning Notice Requirements

On April 29, 2006, Environment Canada published in the *Canada Gazette*, Part I, a *Notice requiring the preparation and implementation of pollution prevention plans in respect of specified toxic substances released from base metals smelters and refineries and zinc plants*. This Notice applies to the 11 facilities and the toxic substances listed above. To prepare and implement their P2 plans, facilities were required to take into consideration a number of factors, including:

- **Achieving Annual Emissions Targets** – Development and implementation of a Smelter Emissions Reduction Program to prevent and control releases, taking into account the achievement of annual limit targets for 2008 and 2015.
- **Reducing Total Emissions of Metals** – Reduction of total releases for metals from 1988 by 80% as of 2008 and by 90% beyond 2008, as set out in Recommendation No. 1 of the Base Metals Smelting Sector Strategic Options Report.
- **Community Air Quality Protection Program** – Development and implementation of a Community Air Quality Protection Program (CAPP) to prevent exceedances of air quality objectives.
- **Environmental Code of Practice** – Recommended practices that are contained in the Environmental Code of Practice for Base Metals Smelters and Refineries (www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=9233A7E7-1).
- **Achievement for Mercury** – Achievement of the environmental performance guideline for mercury emissions.

The Notice includes 2008 and 2015 annual SO₂ and PM targets for nine facilities. In addition, one facility was subject to a 2008 target for mercury, and another one to a 2008 target for dioxins and furans. Two facilities, Vale Canada Ltd.-Port Colborne and Xstrata Copper-CCR, are not subject to targets due to their low levels of emissions.

All 11 facilities have submitted their Declaration of Preparation to indicate that they have prepared a P2 plan. In addition, facilities were required to submit an interim report every June 1 until their P2 plans are fully implemented. To date, four facilities have presented their Declarations of Implementation and the remaining ones submitted the required interim reports.

This report draws on data contained in the Declaration of Preparation, interim reports and Declarations of Implementation submitted to Environment Canada from 2006 to 2011 and received by Environment Canada. These documents for the 11 facilities subject to the Notice are publicly available at www.ec.gc.ca/planp2-p2plan.

Achieving Annual Emissions Targets

To date the progress towards achieving the toxic substances targets is as follows:

- *SO₂*: The annual emissions at eight facilities out of nine were below their 2008 targets. The annual emissions at five facilities out of nine were below their 2015 targets. Although the Tech-Trail Operations is above its target due to high production levels, its SO₂ capture rate is at 98%.
- *PM*: The annual emissions at all nine facilities were below their 2008 targets. The annual emissions at seven facilities out of nine were below their 2015 targets.
- *Mercury*: The annual emissions at HBMS, the only facility with a specific target as it did not meet the Canada-wide Standard for mercury releases, were below the 2008 target for the first time since the inception of the P2 plan. The shutdown of its copper smelter in June 2010 contributed to lower annual emissions.
- *Dioxins and furans*: The annual emissions at Xstrata Nickel-Sudbury, the only facility within the sector with a specific target, were below the 2008 target. Emissions have been below the 2008 target since 2009.

Details can be found in Appendix C.

Reducing Total Emissions of Metals

The Notice required facilities to consider Recommendation No. 1 in the Strategic Options Report, which recommended that the total releases of metals from the sector be reduced from 1988 levels by 80% as of 2008 and by 90% beyond 2008, through the application of technically and economically feasible methods. In 2011, the sector as a whole reported releasing 240 t of metals, which represent a 92% reduction compared to the total of 3197 t reported in 1988. Details on metal emissions by facilities from 2005 to 2011 can be found in Appendix A.

The Notice does not include targets for metal emissions for each facility. Metals are typically released as PM, and measures to reduce PM are generally expected to reduce metals emissions. Variation of metals content in ore concentrates is responsible for some of the year-to-year variability of annual metal emissions for each facility.

Community Air Quality Protection Program

The Notice recommended the development and implementation of a CAPP to prevent exceedances of air quality objectives in communities surrounding the facility. According to the 2005 Declaration of Preparation, 10 facilities out of 11 had developed and implemented their CAPP prior to publication of the Notice. As the Vale Canada-Port Colborne facility is a low-emission facility without any targets in the Notice, a CAPP was not necessary.

All facilities that have a CAAP have improved their programs between 2005 and 2011. Automated monitoring of air quality is carried out by facilities, mainly for SO₂, PM and metals. Some facilities have control rooms equipped with environmental information systems, which provide a continuous display of SO₂ levels and weather conditions. Other facilities have developed modelling systems to anticipate and prevent exceedances of ambient air quality objectives. In addition, some facilities continue to rely on alarm systems to warn operators when ambient air quality objectives are being exceeded, therefore requiring actions such as interruptions or reductions of production, or any other as seen fit.

Environmental Code of Practice

One of the most important factors to consider in the Notice is conformance with the 38 recommendations of the Environmental Code of Practice. Facilities are required to report on their conformance with the recommendations of the code.

An amendment to the P2 Notice was published in the *Canada Gazette* on June 11, 2011. The amendment updated the form (Status Report Form on Conformance with the Environmental Code of Practice for Base Metals Smelters and Refineries) to be used by base metals smelters when reporting on their level of conformance with the Environmental Code of Practice. The updated form was intended to facilitate the interpretation of conformance with the recommendations of the Code.

A review of the annual conformance reports indicates that 78% of the Code recommendations were implemented in 2011. The following table shows the sector-wide conformance trend with the practices recommended in the Code of Practice.

	2005(Base Year)	2006	2007	2008	2009	2010	2011
Completed	67%	73%	75%	76%	75%	77%	78%
Under development	22%	18%	20%	17%	17%	14%	13%
Not yet developed	5%	4%	2%	4%	1%	1%	0%
Not applicable ¹	6%	5%	3%	3%	7%	7%	9%

Achievement for Mercury

The Notice required facilities to consider the Canada-wide Standards for Mercury emissions, which specify that facilities should achieve an environmental source performance guideline of 2 grams of mercury per tonne of total production of finished metals. With the closure of HBMS's copper smelter, this standard for mercury has now been met by all the facilities.

Towards the Full Implementation of the P2 Plans

Four facilities out of 11 have now submitted their Declarations of Implementation attesting that they have fully implemented their P2 plans.

- Xstrata Zinc CEZ submitted its Declaration of Implementation on November 8, 2010.
- Following the permanent closure of its copper smelter on June 11, 2010, HBMS submitted its Declaration of Implementation in 2010.
- Following the closure of its copper and zinc operations on May 1, 2010, Xstrata-Kidd/Timmins submitted its Declaration of Implementation in 2011.
- Teck-Trail submitted its final Declaration of Implementation in 2012. Although the facility failed to meet the SO₂ targets set out in the Notice, Teck-Trail has met the intent of the Notice by capturing 98% of sulphur from its operation. The target was set as an annual SO₂ emissions cap that does not account for increased emissions due to increased production

¹ Changes in conformance classified as "Not applicable" vary because of facilities that are closed or are scheduled to be closed.

Continuing Progress

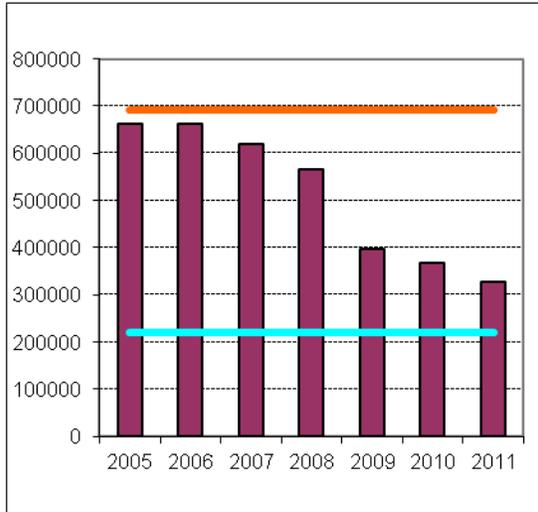
Review of the reports and analysis of performance against 2008 and 2015 targets indicate that the implementation of P2 plans has reduced toxic substances released and that most factors to consider listed in the Notice are either met or being achieved. Environment Canada anticipates that most facilities subject to the Notice will have achieved all of the factors to consider by December 2015 when the P2 Notice comes to an end. Environment Canada will continue to monitor and report on the progress of facilities.

Appendix A: Overall Results²

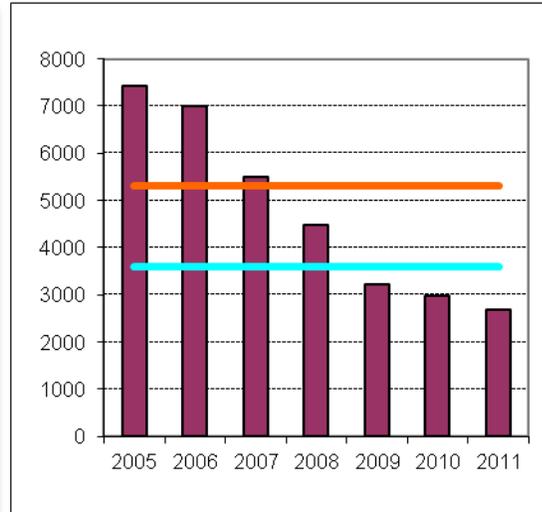
Overall results include all stacks or point releases of the 11 facilities

Legend  Annual emissions  2008 target  2015 target

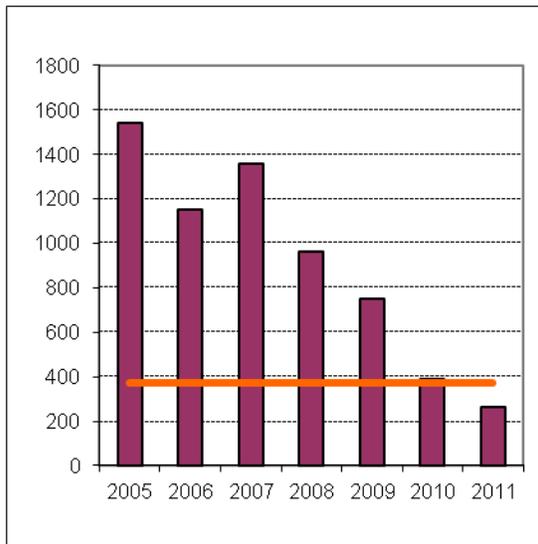
Sulphur dioxide (t/year)
51% reduction (335 189 t)



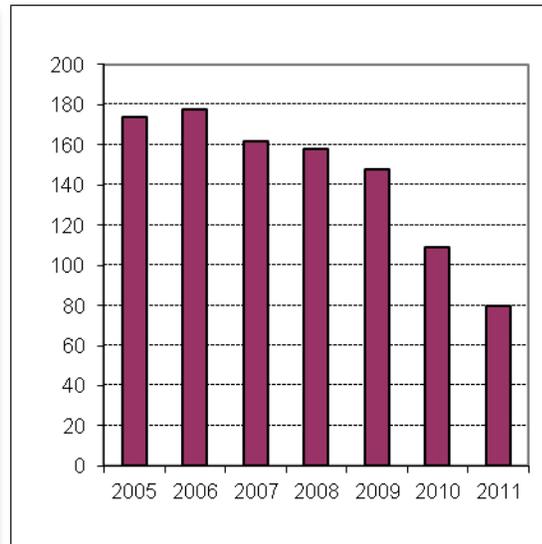
Particulate matter (t/year)
64% reduction (4734 t)



Mercury (kg/year)
83% reduction (1277 kg)

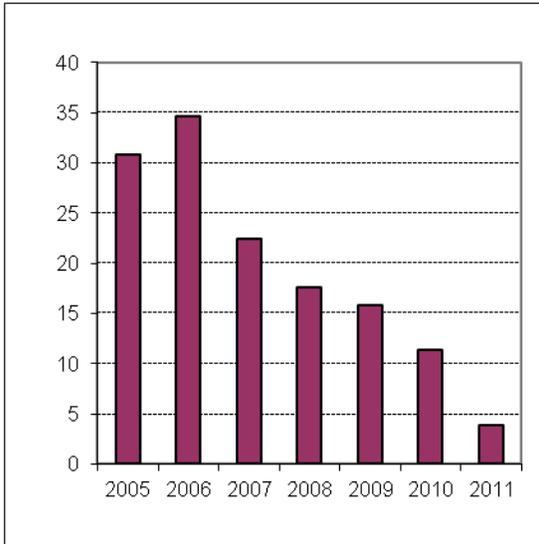


Lead (t/year) - No targets
54% reduction (94 t)

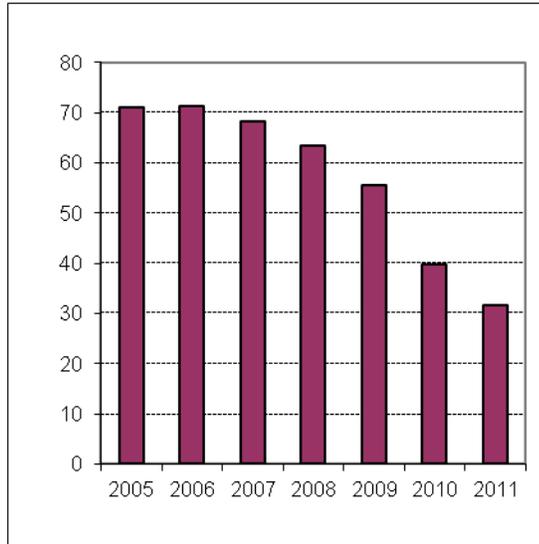


² The 2011 Progress Report presents data for stack emissions as reported by facilities in their June 1, 2012, Interim Reports. This allows for comparison with the P2 Notice targets, which were established for stack emissions only. The results (reduction /increase) are compared to 2005 benchmark releases.

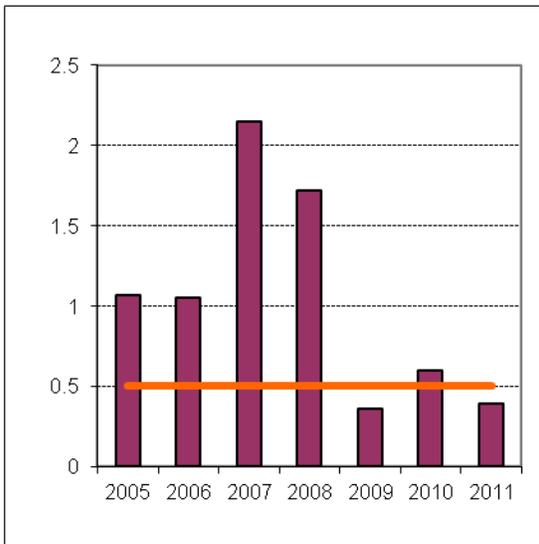
Cadmium (t/year) - No targets
87% reduction (27 t)



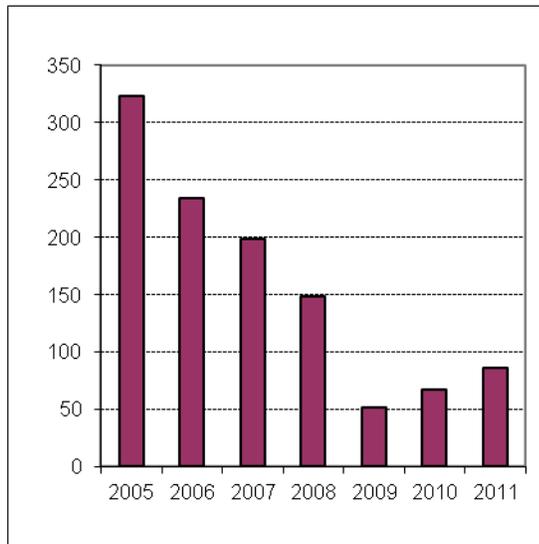
Arsenic (t/year) - No targets
56% reduction (39 t)



Dioxins and furans (g I-TEQ)
63% reduction (0.68 g I-TEQ)



Nickel (t/year) - No targets
73% reduction (237 t)



Appendix B: Results for Facilities that Have Implemented Their P2 Plans

This appendix provides an overview of the implementation of the P2 Notice by four facilities that have already submitted their Declarations of Implementation (Schedule 5).

The metals releases from most facilities are not subject to annual targets. The year-to-year variation in metals releases is partly caused by variability in the feed stocks. Metal release charts of some facilities with low metals emissions are not provided.

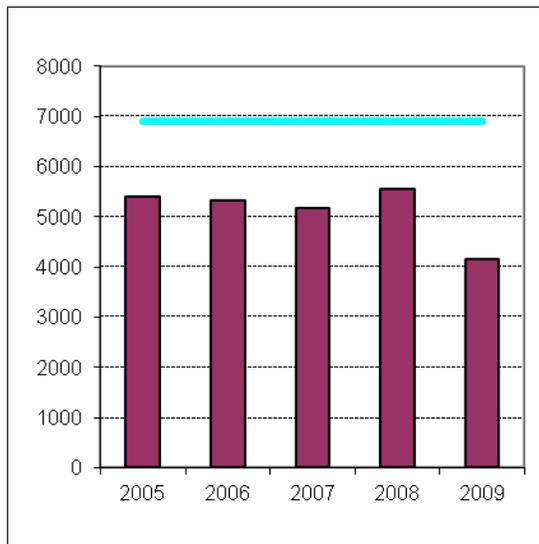
Legend  Annual emissions  2008 target  2015 target

Note: A single line indicates that the target is the same in 2008 and 2015.

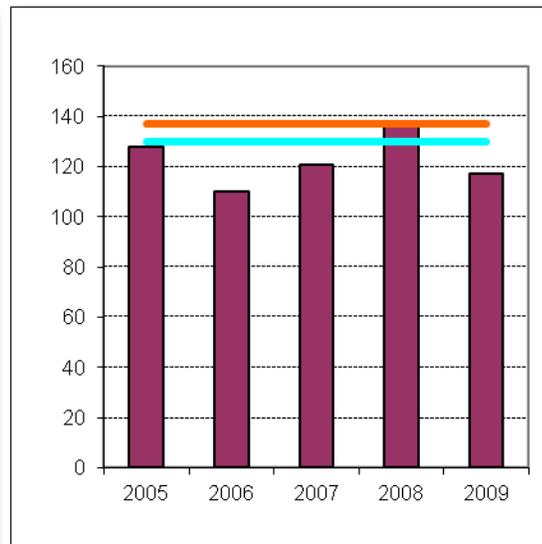
Xstrata Zinc-CEZ

On November 8, 2010, CEZ became the first smelter to submit the Declaration of Implementation, attesting that it has fully implemented its P2 plan. CEZ is a relatively low toxic substance emitter, compared to other smelters. Additionally, CEZ does not release any nickel emissions. From 2005 to 2009, CEZ reported overall reductions of 24% for SO₂ and 9% for PM. Releases of mercury, arsenic, dioxins and furans, and nickel are not included in the charts, due to their low levels.

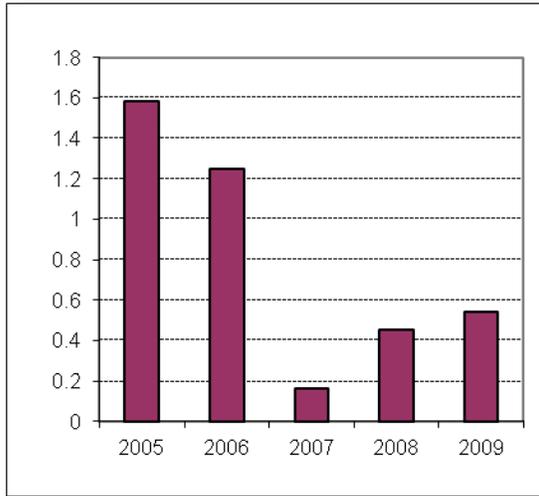
Sulphur dioxide (t/year)



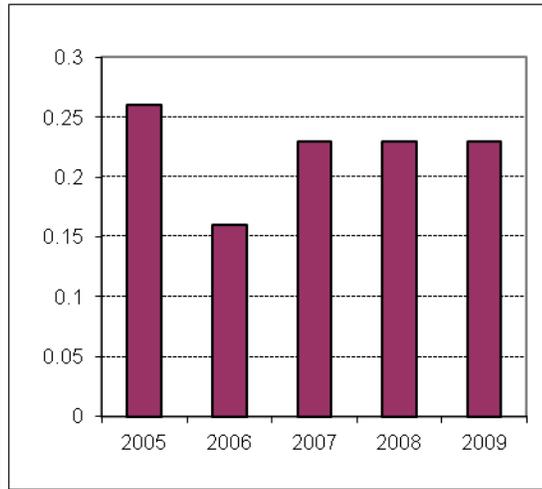
Particulate matter (t/year)



Cadmium (t/year) - No target



Lead (t/year) - No target



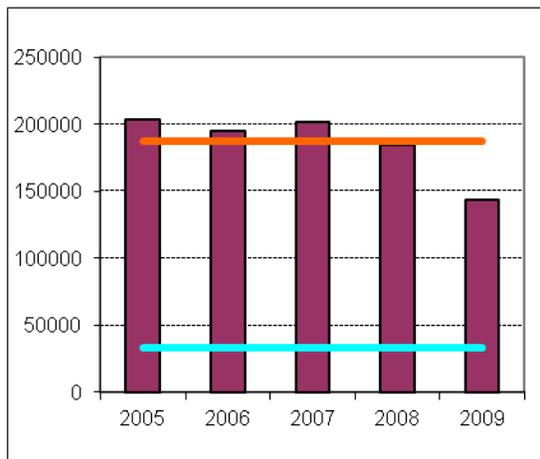
Hudson Bay Mining and Smelting

HBMS closed its copper smelter on June 11, 2010, but still operates a zinc plant. With the closure of its copper smelter, HBMS met all its requirements under the Notice and submitted its Declaration of Implementation on November 12, 2010.

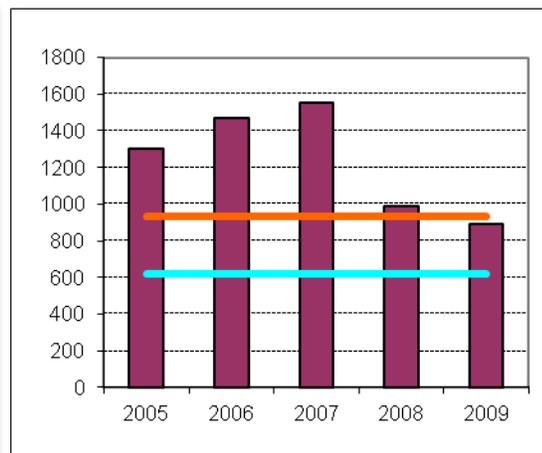
From 2005 to 2009, HBMS was the largest emitter of toxic substances among base metals smelters in Canada. In 2009, HBMS accounted for most emissions of sulphur dioxide (36% of all smelters), mercury (84%), arsenic (38%), cadmium (71%) and lead (47%).

The charts show annual toxic substances emissions of HBMS from 2005 to 2009, the last full year when the copper smelter and zinc plant were both operating.

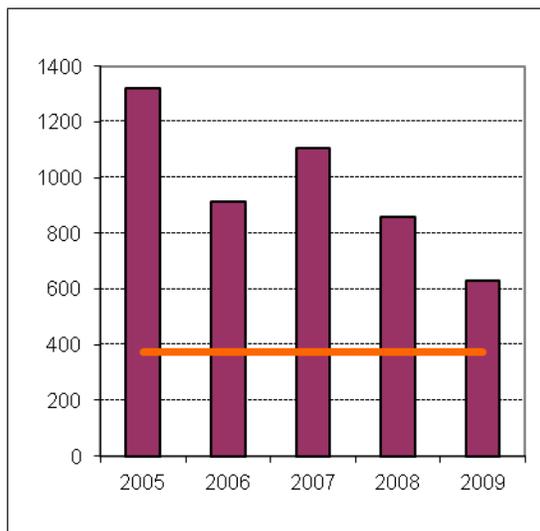
Sulphur dioxide (t/year)



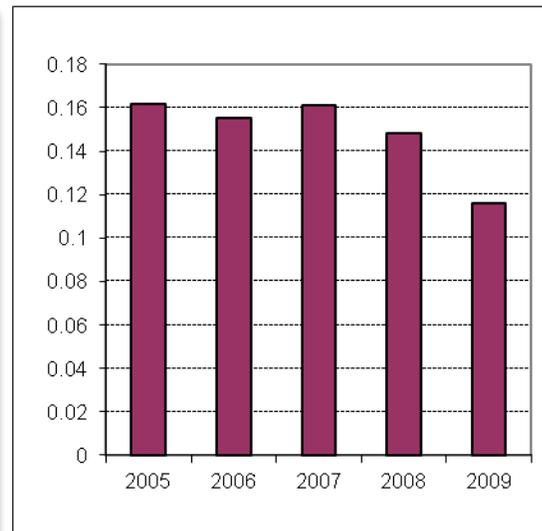
Particulate matter (t/year)



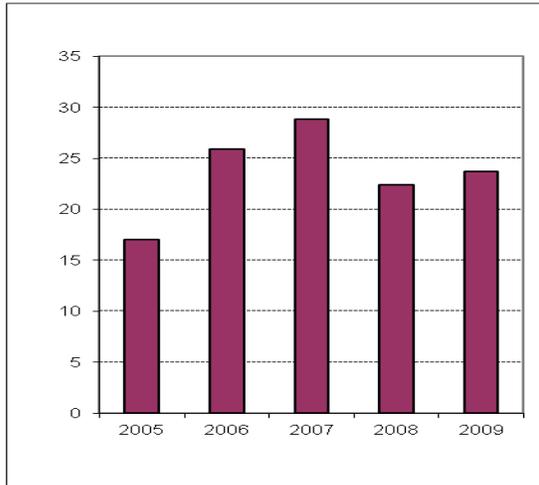
Mercury (kg/year)



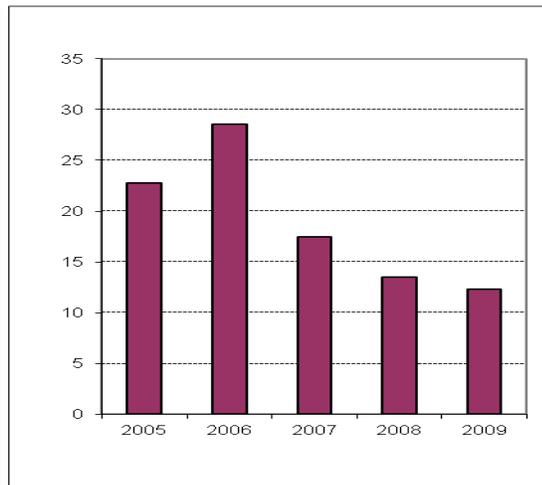
Dioxins and Furans (gI-TEQ) - No target



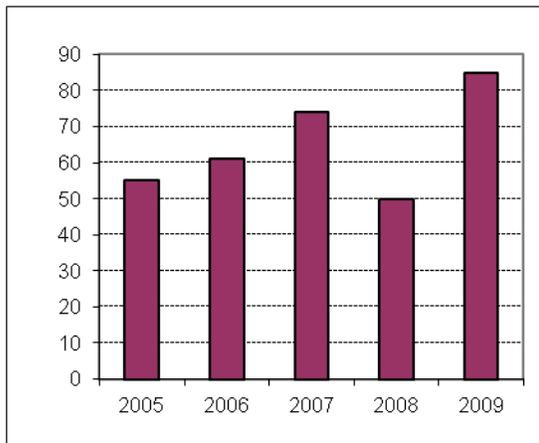
Arsenic (t/year) - No target



Cadmium (t/year) - No target



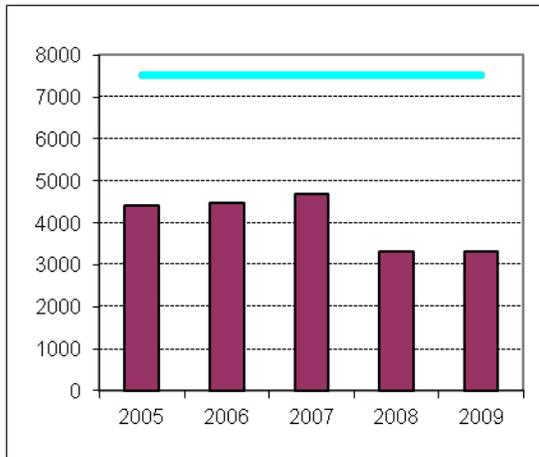
Lead (t/year) - No target



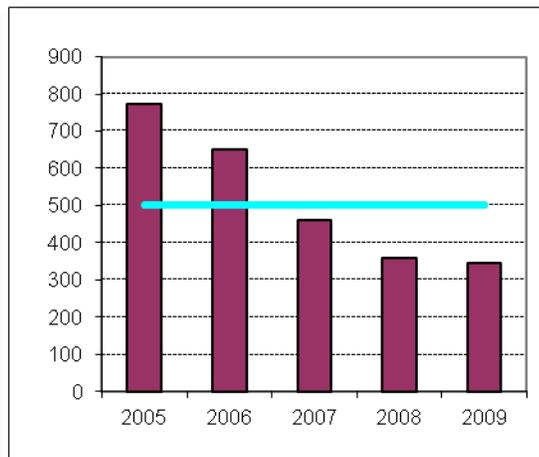
Xstrata Kidd/Timmins

Xstrata Kidd/Timmins closed its copper and zinc operations on May 1, 2010, and the final Declaration of Implementation was submitted on June 15, 2011, attesting that it has fully implemented the P2 plan. From 2005 to 2009, the last full year of operations, Xstrata Kidd/Timmins reported overall reductions of 25% for SO₂ and 56% for PM. Over the same period, total releases of mercury increased nearly eight-fold from 0.72 kg/year in 2005 to 6.29 kg/year in 2009. The facility reported that the increase was the result of change in estimation technique. The charts show annual toxic substances emissions of Xstrata Kidd/Timmins from 2005 to 2009.

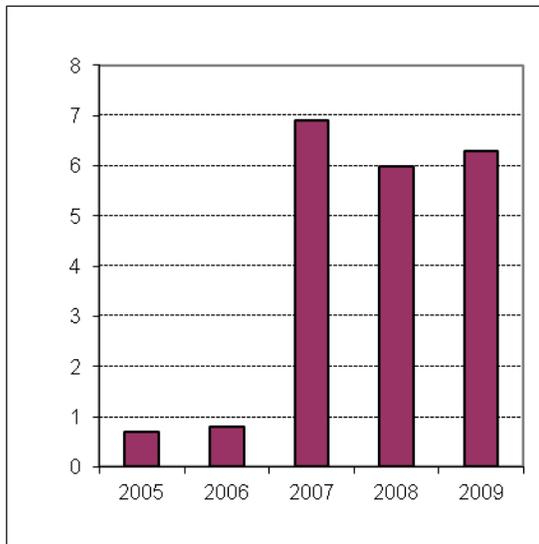
Sulphur dioxide (t/year)



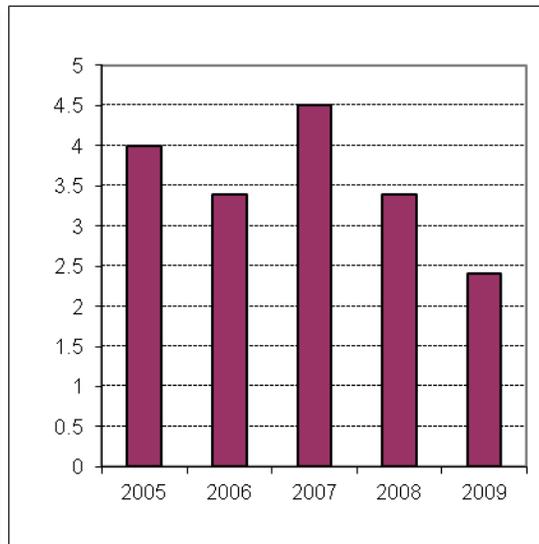
Particulate matter (t/year)



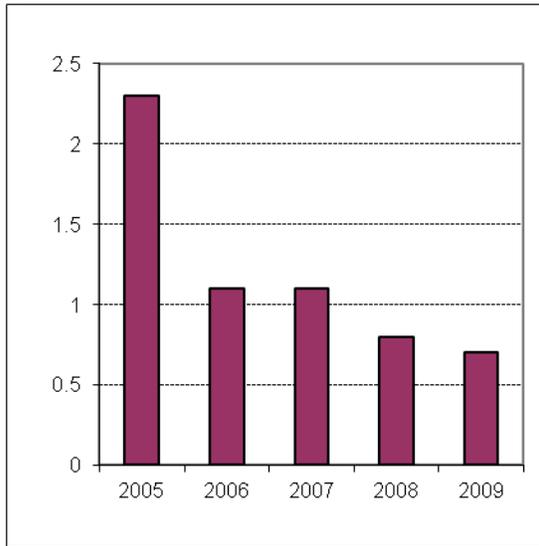
Mercury (kg/year) - No target



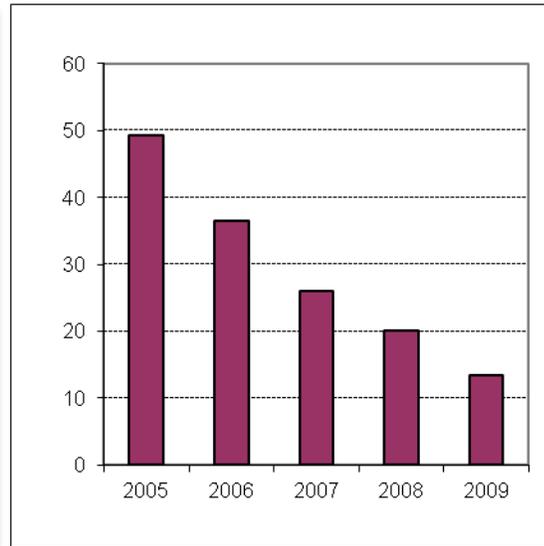
Arsenic (t/year) - No target



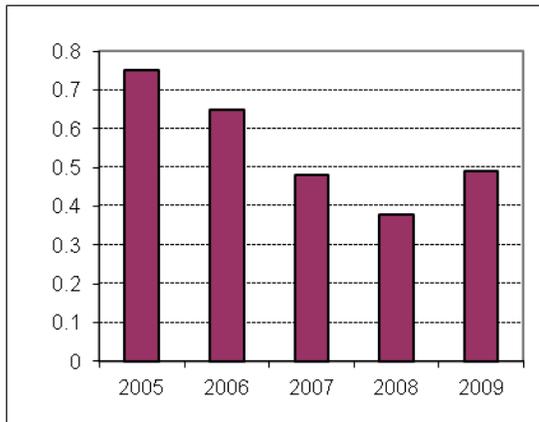
Cadmium (t/year) - No target



Lead (t/year) - No target



Nickel (t/year) - No target



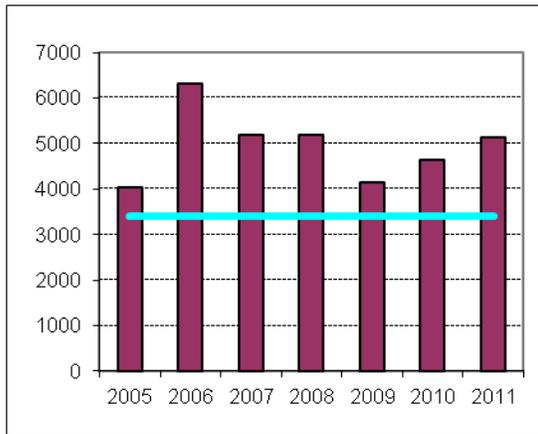
Teck-Trail Operations

Teck-Trail Operations' PM emissions are below the 2008 and 2015 targets; however, emissions of SO₂ are above the targets. Although the facility failed to meet its SO₂ targets, Teck-Trail has met the intent of the Notice by capturing 98% of sulphur from its operation. The target was set as an annual SO₂ emissions cap which does not account for increased emissions due to increased production.

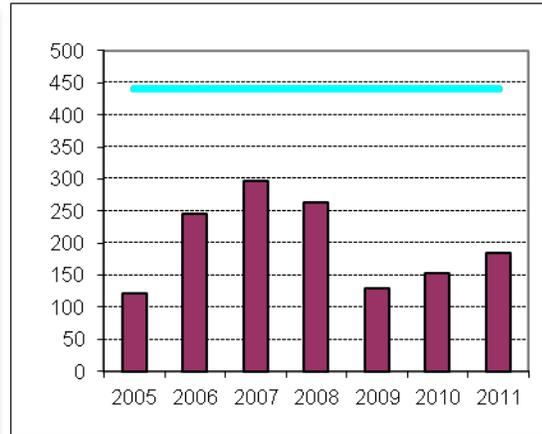
On June 14, 2012, Teck-Trail Operations submitted its Declaration of Implementation, confirming that it has implemented its P2 plan.

From 2005 to 2011, Teck-Trail Operations reported overall increases of 27% for SO₂ and 52% for PM. Zinc production in 2011 was 30% higher than in 2005, while the production of lead increased by 25%. No plots are provided for metals releases, as Teck-Trail is a low emitter.

Sulphur dioxide (t/year)



Particulate matter (t/year)



Appendix C: Performance of Facilities

Appendix C provides the stack releases of toxic substances for the seven facilities that submitted interim reports (Schedule 4) for 2011. These facilities have not yet implemented their P2 plans.

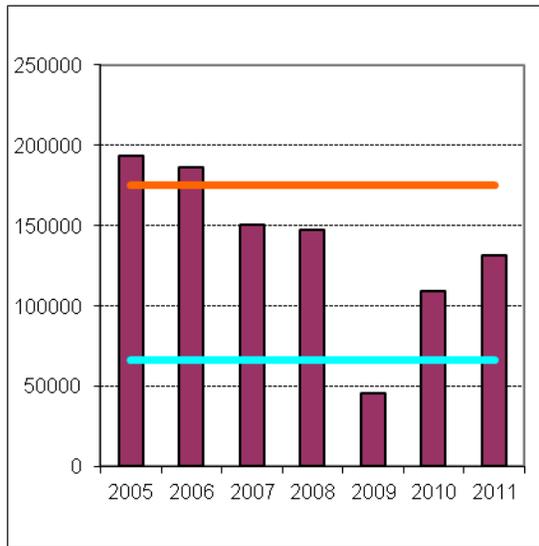
The metals releases from most facilities are not subject to annual targets. The year-to-year variation in metals releases is partly caused by variability in the feed stocks. Metal release charts of some facilities with low metals emissions are not provided.

Legend  Annual emissions 2008 target 2015 target
Note: A single line indicates that the target is the same in 2008 and 2015.

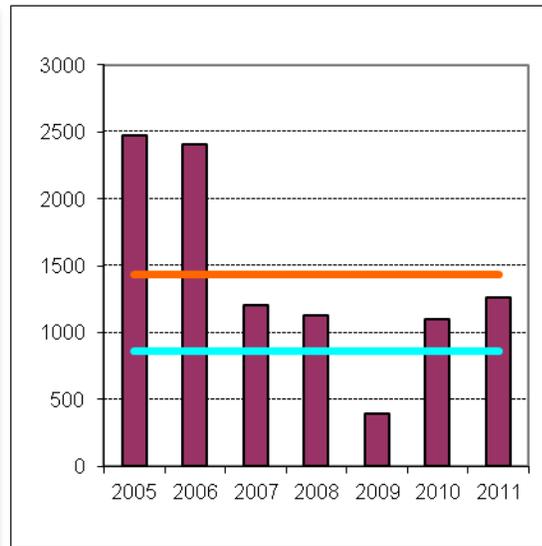
Vale Canada Ltd.-Copper Cliff

This facility has met its 2008 targets for SO₂ and PM and has not yet met the 2015 targets for these substances. The facility has reduced releases of SO₂, PM, arsenic and cadmium, while the releases of lead and nickel have increased from their 2005 levels. The 2009 and 2010 lower emission levels reflect the plant shutdown for a period of about 12 months due to a labour dispute.

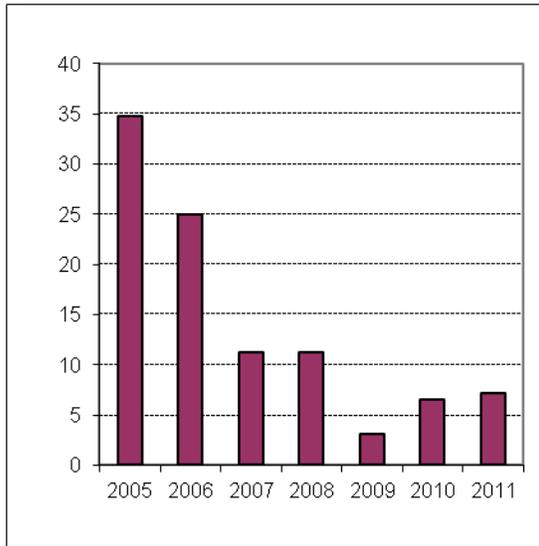
Sulphur dioxide (t/year)



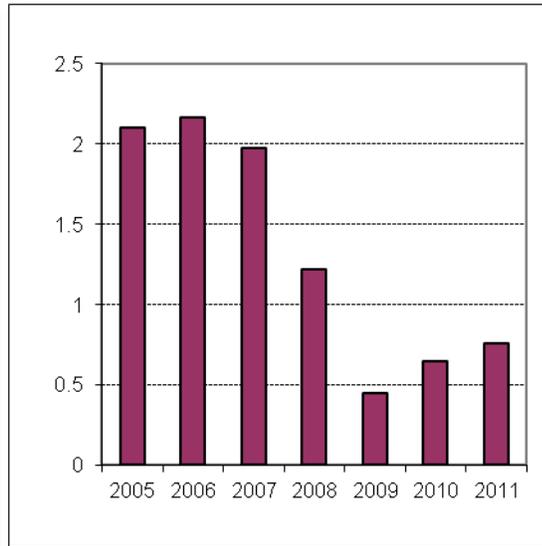
Particulate matter (t/year)



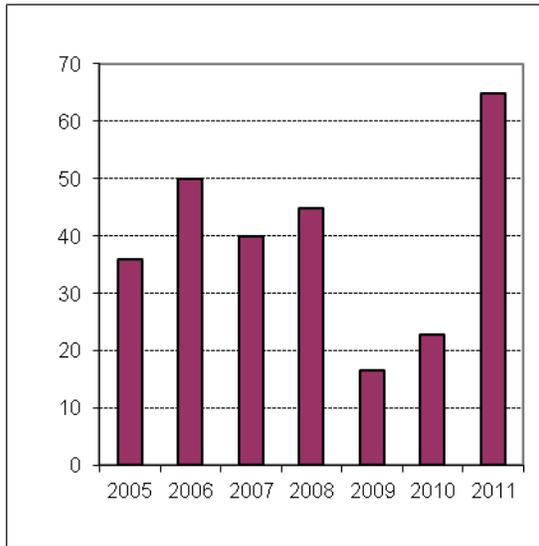
Arsenic (t/year) - No target



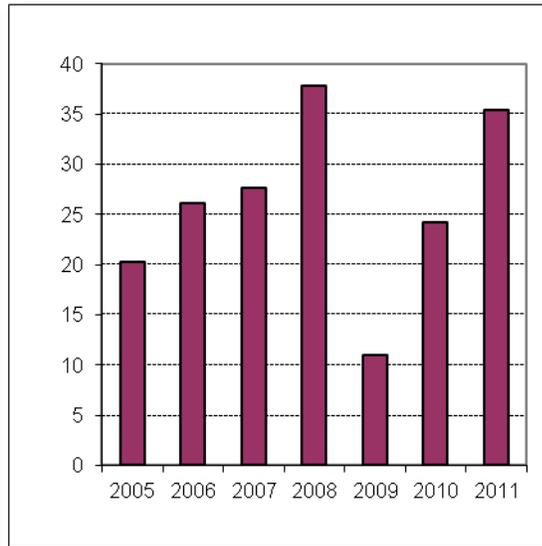
Cadmium (t/year) - No target



Nickel (t/year) - No target



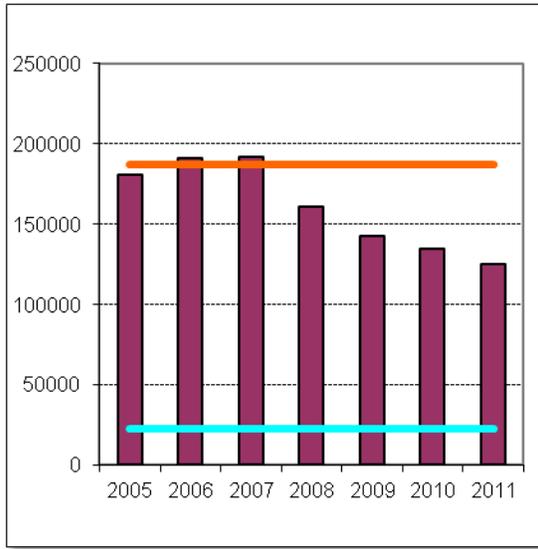
Lead (t/year) - No target



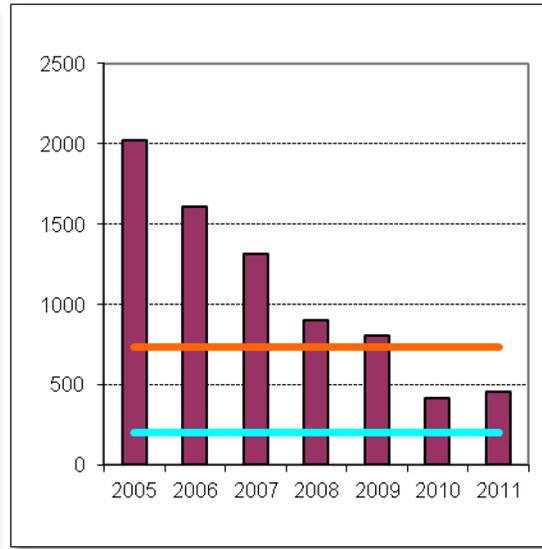
Vale Canada Ltd.-Thompson

Vale Canada Ltd.-Thompson has met its 2008 targets for SO₂ and PM but has not yet met its 2015 targets for these substances. This facility is a low emitter of dioxins and furans, and has reduced releases of SO₂ and PM.

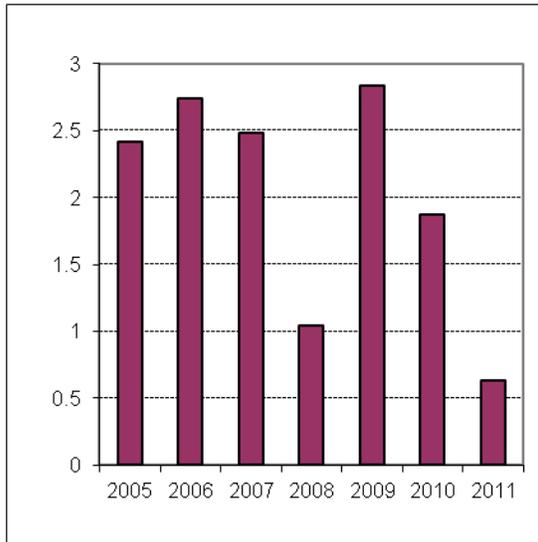
Sulphur dioxide (t/year)



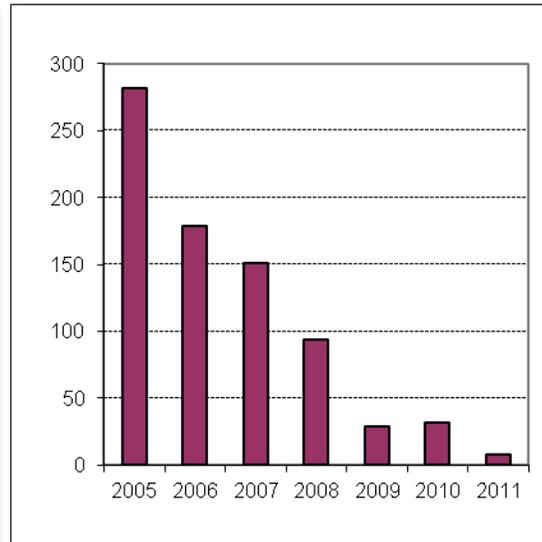
Particulate matter (t/year)



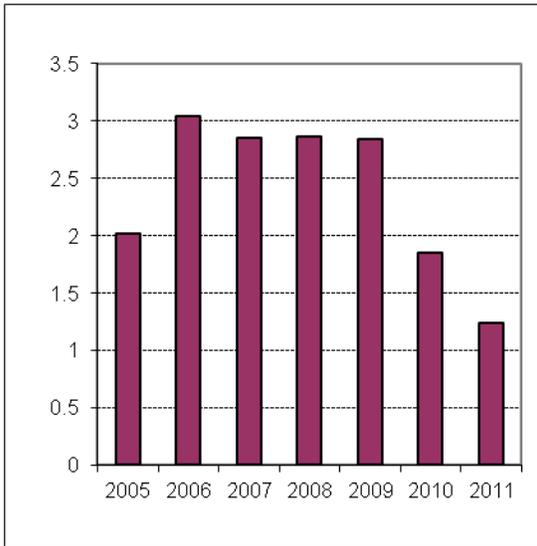
Arsenic (t/year) - No target



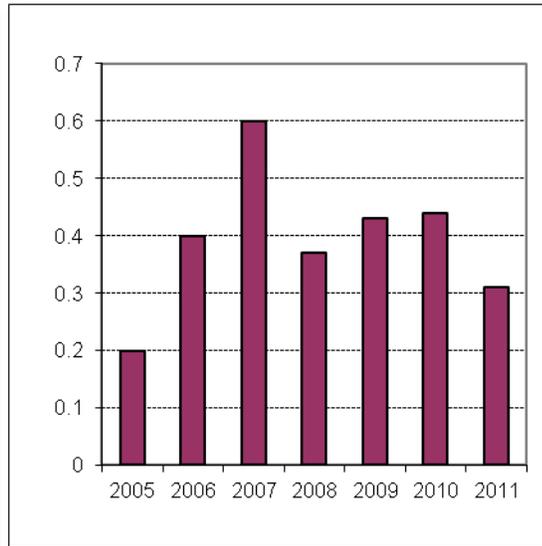
Nickel (t/year) - No target



Lead (t/year) - No target



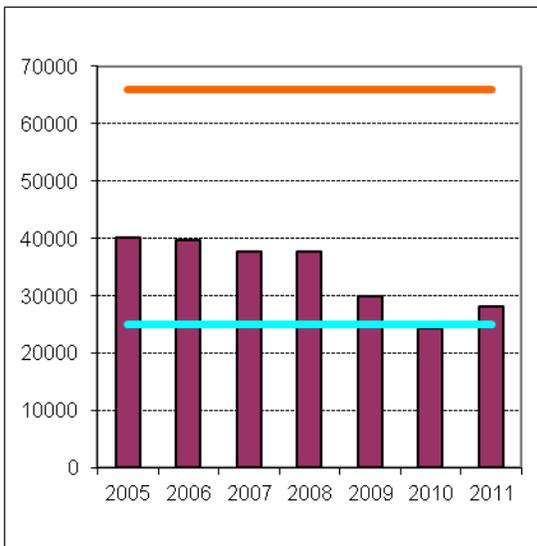
Cadmium (t/year) - No target



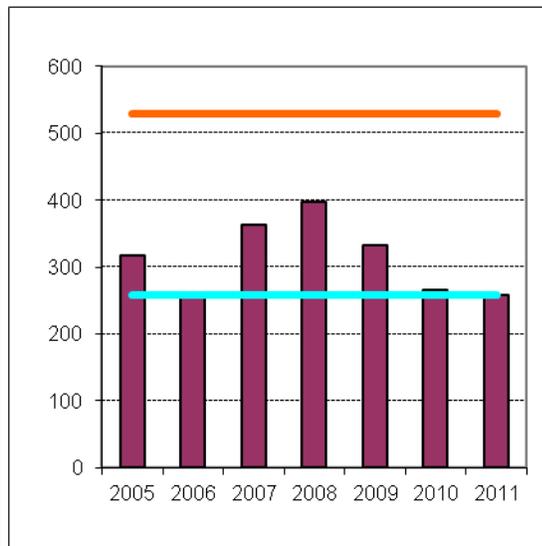
Xstrata Nickel-Sudbury

Xstrata Nickel-Sudbury has met its 2008 targets for SO₂, PM, and dioxins and furans. The facility has met the 2015 target for PM and has not yet met the 2015 target for SO₂. Emissions of SO₂ and PM were lower in 2011 than in 2005.

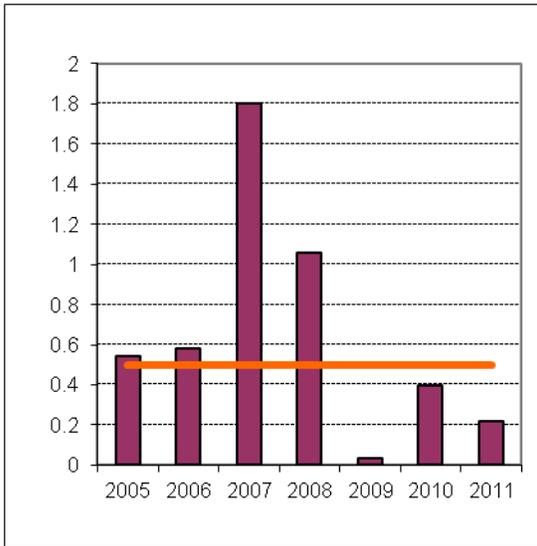
Sulphur dioxide (t/year)



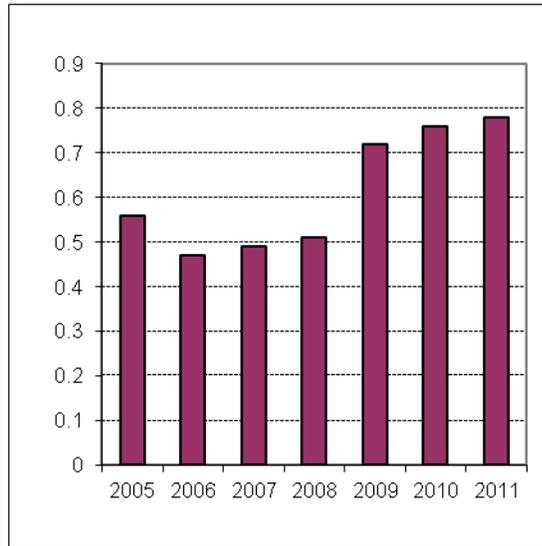
Particulate matter (t/year)



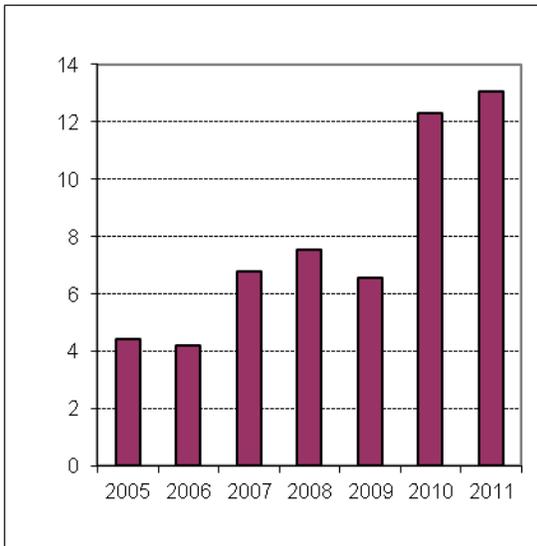
Dioxins and furans (g I-TEQ)



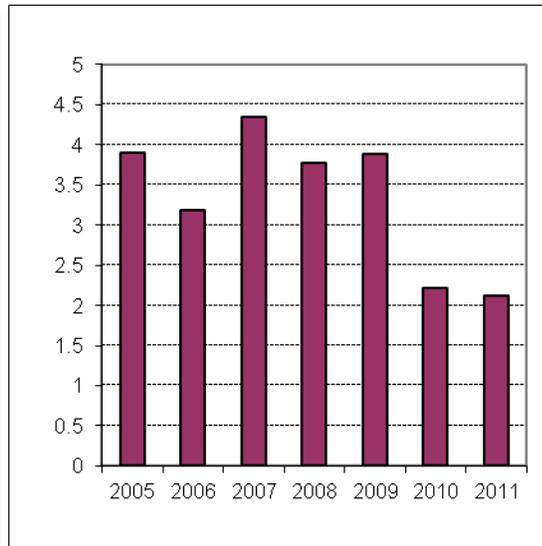
Cadmium (t/year) - No target



Nickel (t/year) - No target



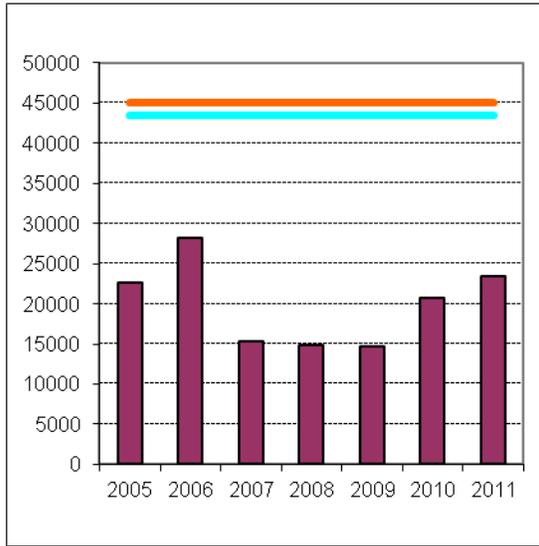
Lead (t/year) - No target



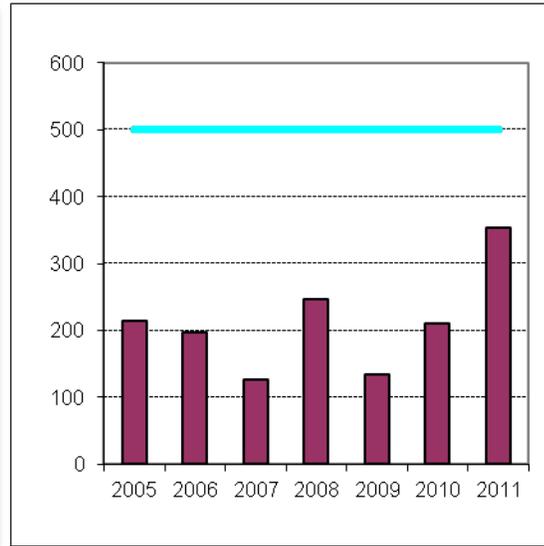
Xstrata Copper-Horne

Xstrata Copper-Horne has met both its 2008 and 2015 targets for SO₂ and PM.

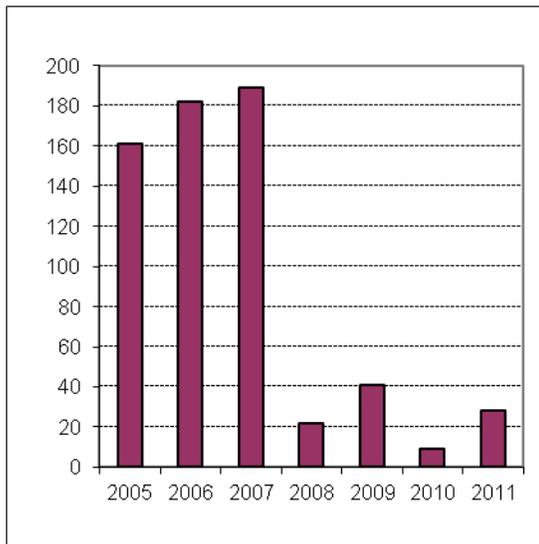
Sulphur dioxide (t/year)



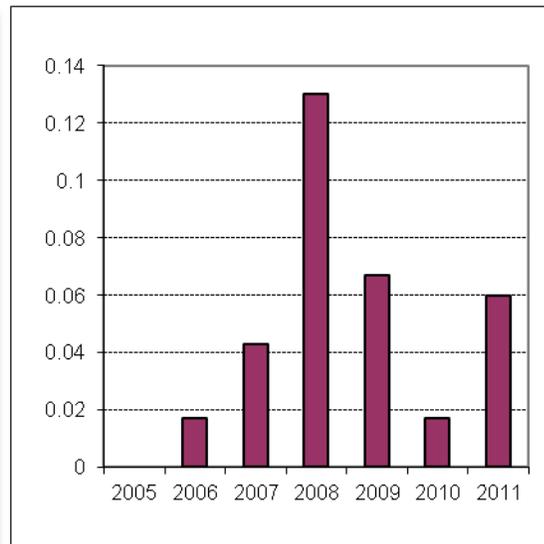
Particulate matter (t/year)



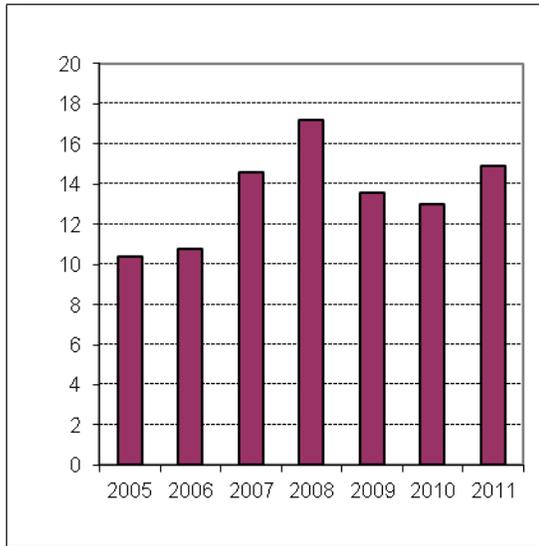
Mercury (kg/year) - No target



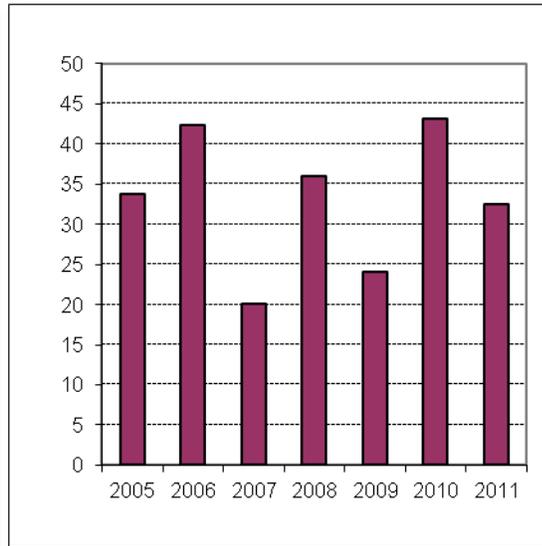
Dioxins and furans (g I-TEQ) - No target



Arsenic (t/year) - No target



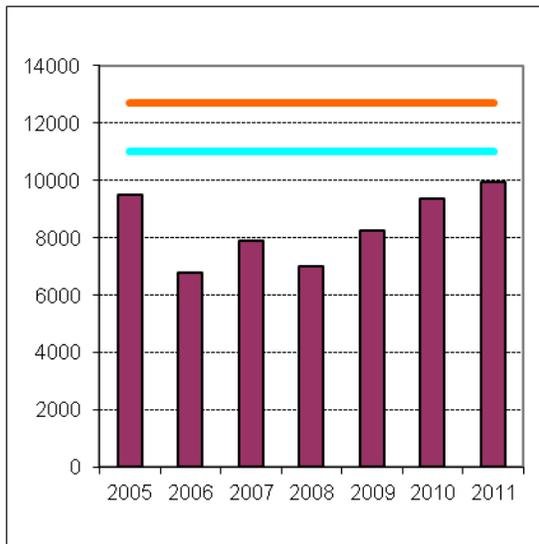
Lead (t/year) - No target



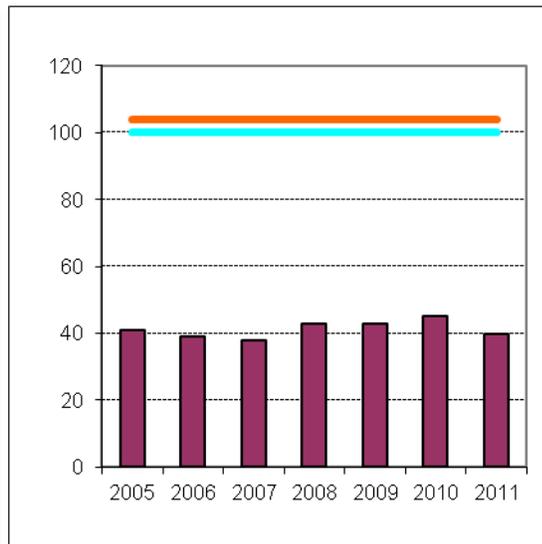
Xstrata Zinc-Brunswick

Xstrata Zinc-Brunswick has met both its 2008 and 2015 targets for SO₂ and PM.

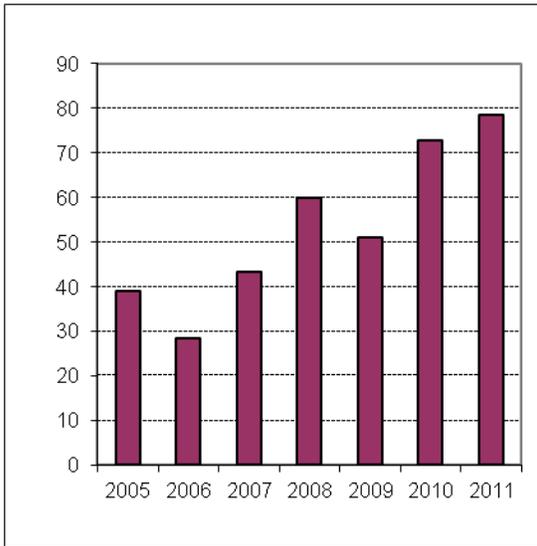
Sulphur dioxide (t/year)



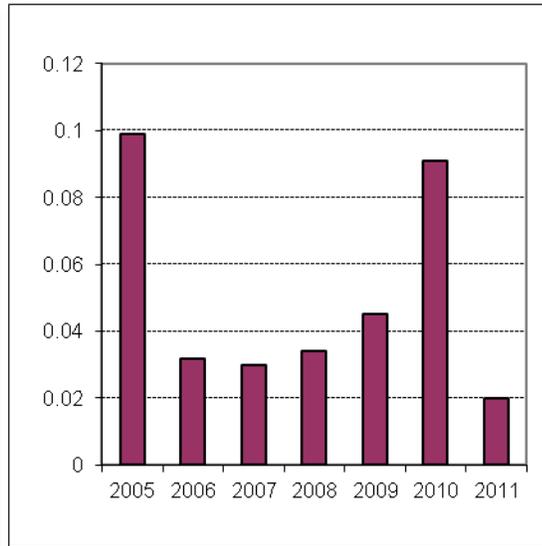
Particulate matter (t/year)



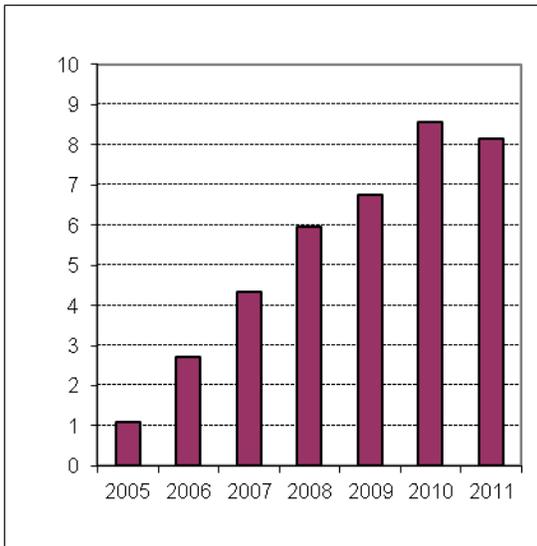
Mercury (kg/year) - No target



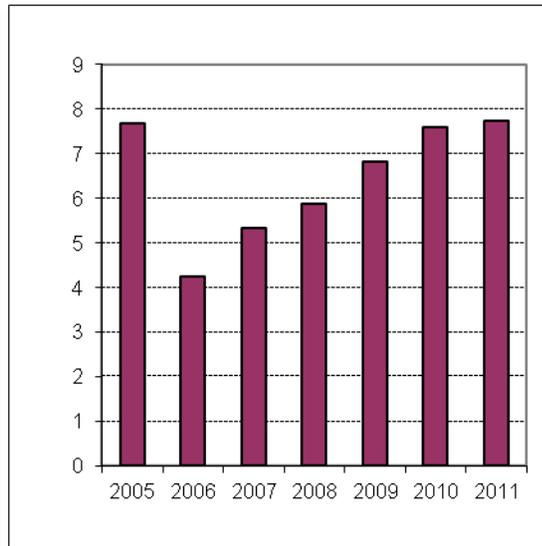
Dioxins and Furans (gI-TEQ) - No target



Arsenic (t/year) - No target



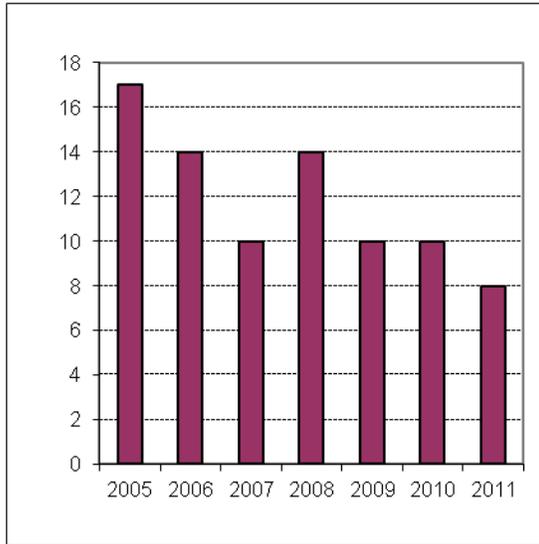
Lead (t/year) - No target



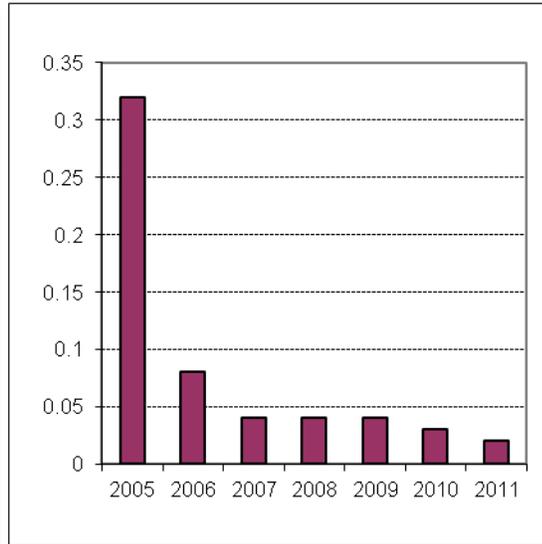
Xstrata Copper-CCR

Xstrata Copper-CCR has reported low-level emissions and has no targets to meet.

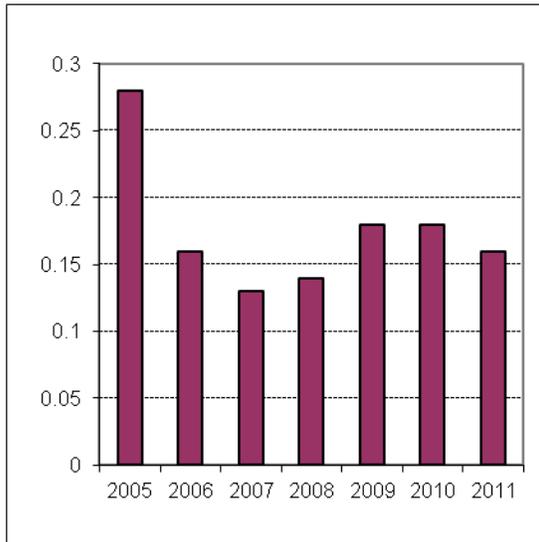
Particulate matter (t/year) - No target



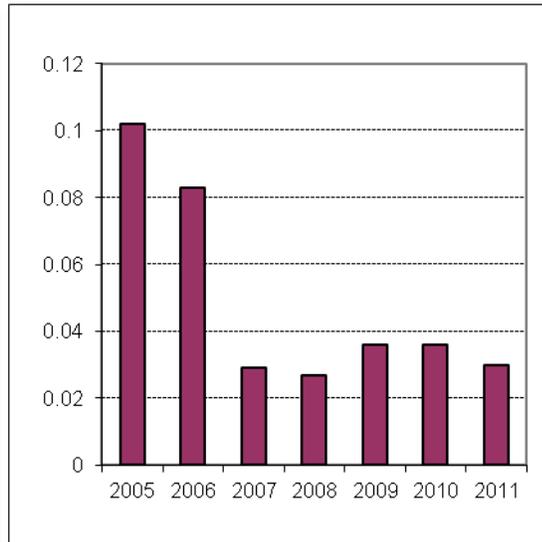
Arsenic (t/year) - No target



Lead (t/year) - No target



Nickel (t/year) - No target

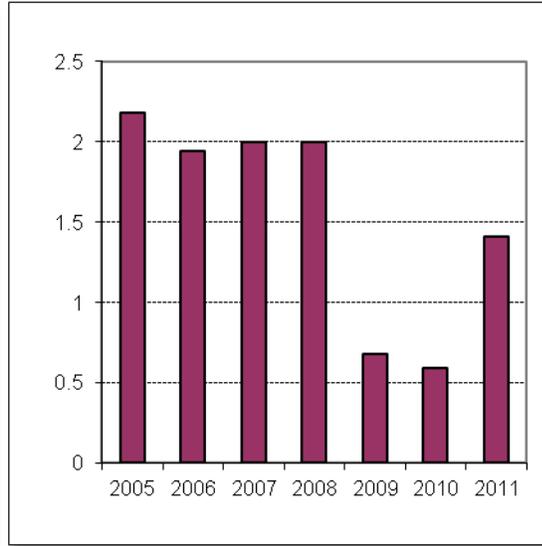
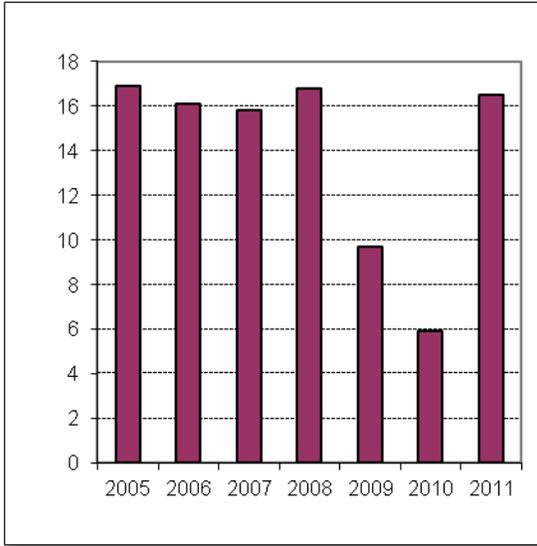


Vale Canada Ltd-Port Colborne

Vale Canada Ltd-Port Colborne is a low-emission facility with most metal emissions considered negligible (less than 5 kg each) and has no target to meet.

Sulphur dioxide (t/year) - No target

Particulate matter (t/year) - No target



Nickel (t/year) - No target

