ICMM
International Council on Mining & Metals

InBrief

Competitiveness implications for mining and metals

Climate Change
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This paper forms part of a series of InBrief publications that begin to scope out the links between the mining and metals industry and the three focus areas in ICMM's climate change program.

Mining is a global industry with operations spread across developing and developed countries. In many developing countries it is often a significant contributor to GDP and poverty alleviation. Minerals and metals are also required for low carbon development – e.g. copper, aluminium, platinum and coking coal are inputs for building renewable energy infrastructure.

Climate change presents both challenges and opportunities for the mining and metals industry. The three focus areas in ICMM's climate change program offer industry-specific insights on issues important to climate policy formation.

Background

Different carbon pricing policies in different countries give rise to variation in production costs. This raises the possibility that production in one location will become less competitive than in another. There is the potential for increased imports, loss of market share in the short term and a relocation of production in the long term, with associated economic and social consequences known as carbon leakage. There is a risk that there will be a relocation of industry which may compromise the environmental integrity of a policy. Preserving it by managing the competitiveness impacts is one way of addressing this risk. It may also have environmental implications if production is relocated to a facility with higher emissions intensity or more generally less stringent environmental standards.

A number of potential policy options have been proposed for dealing with the competitiveness and leakage effects arising from unilateral carbon pricing policies. The policies most extensively considered include allocation of free allowances and border carbon adjustments (BCAs), sectoral approaches, state aid and carbon standards. Free allowances and BCAs have received the most attention from policymakers and are the focus of the discussion in the InBrief.

Free allowances
By allocating free allowances to sectors, a government effectively exempts the sectors from purchasing allowances and thus removes a large proportion of costs associated with the carbon pricing policy. With free allocation, firms should therefore not face any significant loss of competitiveness but will still have an incentive to reduce emissions as they can sell any excess allowances whilst maintaining the environmental effectiveness of the policy. The extent to which these incentives are preserved depends on the design of the free allowance allocation.

In the first two periods of the EU Emissions Trading Scheme (EU ETS), allowances were allocated to installations based on historical emissions. Under Phase III (2013–2020) of the EU ETS allowances will be allocated to trade-exposed industries based on the historical level of production and an emissions-intensity benchmark. This benchmark is set by reference to the emissions intensity of the best 10% of producers, with the intent of preventing over-allocation whilste maintaining incentives for emissions reduction. This process has required collaboration between industry and government to collect the necessary data to implement the scheme.

There is only limited empirical evidence on the effectiveness of free allowances in addressing competitiveness and leakage effects, mostly derived from the first two phases of the EU ETS. Results from modeling exercises on the effect of free allowances on location decisions are similarly uncertain, and highly sensitive to input assumptions and modeling approaches – particularly in relation to the duration of free allowances allocation and the way in which it is phased out over time.

A lot of this discussion is also relevant when carbon pricing occurs through taxation. Instead of free allocation, the instruments to address competitiveness concerns and risk of leakage are either exemptions or rebates.

Border carbon adjustment (BCA)
Typically, BCAs are understood as requiring importers, not subject to a carbon price, to purchase allowances in line with the carbon intensity of production or to pay a tax equivalent to the carbon charge faced by domestic producers. A BCA regime could also involve a tax rebate in line with carbon costs on goods exported so as to preserve the competitiveness of domestic production from a carbon pricing region in international markets. Although not currently in place, BCAs have been retained as a policy option in both the EU ETS and a number of US proposals. Since a BCA is a trade measure, it would be covered by the rules of international trade as embodied in the World Trade Organization (WTO), as would free allowances if identified as subsidies, with legality likely to depend on the precise form of the BCA in question.

Modeling exercises on the effects of BCAs are generally inconclusive with the outcomes dependent on the scope of the analysis and the type of modeling approach used. Tentative conclusions are that sectors are protected, but to the economic cost of other sectors and other countries. While in principle carbon prices can be equalized at the border for products being imported from areas outside of the carbon pricing region, accurately calculating the carbon content of all imports would require extensive data and be extremely costly. It is therefore only conceivable to implement for a specific set of commodities.

In addition, some regions in North America (California, British Colombia and Quebec) are putting in place legislation for low carbon fuel standards for transportation. In effect this disallows the import of any fuels that exceeds a particular level of life-cycle carbon intensity.

For each of these policy options, the specifics of the scheme's design are important. As an example, the design of a BCA needs to consider: the scope of emissions captured (e.g. should fugitive emissions be included?); the basis on which a charge is calculated (e.g. is the charge based on the carbon content of imported or exported goods?); and the countries and products

that are covered by the regime (e.g. are least developed countries exempt from charges?). The effectiveness of a BCA scheme in addressing leakage and competitiveness concerns will vary with these elements. Similarly, the allocation of free allowances will have different effects depending on the design of the scheme – such as the method of allocation.

The discussion on the effects of carbon pricing highlights the potential for loss of competitiveness and leakage varies across industries in-line with the characteristics of that industry. Similarly, the appropriate policies to deal with such effects can also be expected to vary, depending upon the industry under examination. Analysis that takes into account the specific characteristics of the mining and metals industry is necessary if the likely effects of policy measures are to be properly understood. Furthermore this analysis needs to consider different product groupings to prevent important differences from being obscured and to ensure that policy recommendations are appropriate for all industry participants. Notwithstanding the policies listed above and the different characteristics for each commodity, reducing emissions will reduce exposure to carbon pricing policy. Some reductions will be economic under current circumstances and others will be so under increasing energy prices or the introduction of a carbon price. However, some reductions may require additional policy support, such as fiscal incentives, R&D support or capital grants.

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Our Climate Change program

In May 2011, ICMM formally launched its climate change program. Building on ICMM's 2009 *Policy on climate change: Implementing a global solution to managing a low emissions economy*, ICMM's Council of CEOs established a climate change program with three elements: principles governments should follow should they decide to regulate greenhouse gas (GHG) emissions, a set of commitments that members will meet, and three focus areas of work.

The program is aimed at: (1) ensuring ICMM companies continue to contribute to sustainable development while participating positively in the resolution of the climate change challenge; and (2) securing the continued competitiveness of the mining and metals industry in a future low carbon economy.

This initiative seeks a measured transition to a low-carbon future. The principles-based approach at its core is intended as a contribution to the evolution of climate change-related public policy when policies are being designed and implemented. This approach recognizes the reality of nation-specific solutions which need to respect the circumstances around the world and a country's different priorities (for example, poverty reduction, development, adaptation).

The core of ICMM's climate change program implementation is provided by:

a) an integrated set of seven principles for climate change policy design that build on those contained in the 2009 policy:
   1. provide clear policies for a predictable, measured transition to a long term price on greenhouse gas (GHG) emissions
   2. apply climate change related revenues to manage a transition to a low carbon future
   3. facilitate trade competitiveness across sectors
   4. seek broad-based application
   5. be predictable and gradual
   6. be simple and effective
   7. support low-emission base-load generation technology development.

b) the work program will initially focus on the following three topics:
   1. national climate policies and competitiveness
   2. land use and adaption to the impacts of climate change
   3. measurement, reporting and verification of net greenhouse gas activities.

c) a set of ICMM member company commitments. As a minimum, ICMM members accept their responsibility to:
   1. develop greenhouse gas emission reduction strategies and implement economic emissions reductions opportunities
   2. ensure efficient use of natural resources
   3. support research and development of low greenhouse gas emission technologies that are appropriate to the industry
   4. measure progress and report results.

InBrief

The impact of climate policies on the mining and metals industry

The mining and metals industry covers a range of products, activities and locations. Between them, ICMM member companies have some 800 operations spanning all the major minerals and metals in over 60 countries. Climate policies in those countries differ in a number of ways, including: the terms of the policy instrument used, choice of target and stringency, compensatory measures, measurement reporting and verification (MRV) requirements and scope of coverage. These differing approaches reflect each nation's right to develop their own climate policies in differing national circumstances.

However, different policies in different countries give rise to variation in carbon prices. This raises the possibility that production in one location will become less competitive than in another due to carbon price differentials, with the potential outcome being a loss of market share in the short term and a relocation of production in the long term; known as carbon leakage. This may be of particular concern in the mining and metals industry as it is broadly speaking emissions intensive and trade exposed (EITE) and produces commodities whose prices are often determined globally. In addition to the economic and social impact of a relocation of industrial production, there may be environmental implications if production is relocated to a facility with higher emissions intensity or less stringent environmental standards. This paper begins to explore the impacts this may have on the mining and metals industry based on their production and investment characteristics.

Increasingly, climate change policy in the EU and in other jurisdictions includes pricing carbon emissions (see Box 1). Given the diversity of the mining and metals industry, the effects of any eventual carbon pricing policy will depend on the commodity and the specific operation in question.

In principle, the effects of carbon pricing on industrial competitiveness will vary with: the specific structure of the market, linkages with the broader economy, and the decision-making behavior of individual firms. For the mining and metals industry, as producers of globally traded commodities with globally determined prices, the effects of carbon pricing policies are mainly driven by whether there is a potential for price pass-through for an individual firm or asset. Understanding these factors requires detailed data and analysis which takes into account the specifics of the industry. Without this, policy-making will be subject to considerable uncertainty.

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Box 1: Carbon pricing policies worldwide

The EU ETS regulates approximately half of EU emissions, those arising from electricity generation and energy intensive industrial sectors. Covered installations are required to submit allowances in line with their emissions – to date these allowance have been almost entirely allocated free of charge to the covered sectors but this free allocation will be progressively reduced between 2013 and 2020. Sectors assessed and judged to be at significant risk of relocating production outside of the EU due to the carbon price will receive up to 100% of the benchmarked allocation for free. Analysis conducted by the European Commission identified 164 such sectors, including a number of mining sub-sectors who produce a range of metals and minerals.

A number of policies are being developed elsewhere. This includes New Zealand which operates a carbon trading scheme, Australia which has recently passed a law to introduce a carbon price and California plans to introduce a cap and trade system in 2013. Carbon pricing policies are also under consideration in a range of other countries where there is a large mining presence.

Emissions sources in the mining and metals industry

Since the majority of emissions arise from on-site energy use, mitigation options to date in the mining and metals industry have focused on increasing energy efficiency. However, the extent to which energy efficiency measures can be achieved in the short-term is limited by the existing capital structure and technologies used. Low carbon technologies like renewable sources or the use of coal or gas with carbon capture and storage (CCS), which are currently often uneconomic, may become more financially viable under higher energy and carbon pricing and with continuing reductions in the costs as technologies mature. However, in all cases successful implementation will require thorough assessment of emissions sources and abatement opportunities.

A number of lower carbon technologies and practices may be applicable. The precise choice of measures will be dependent on the availability of options, the relative costs of supply and quality of supply. For governments and the industry, the challenge is to ensure that the potential of these options is fully exploited through appropriate fiscal and/or non-fiscal policies.

Transportation is another source of emissions in the mining and metals industry. When mitigating these sources of emissions, from a cost and environmental perspective, there is an incentive to switch to forms of transport with lower emissions and to reduce transportation distances. However, mitigation will be limited to an extent by the operating environment. Using alternative forms of transport will depend on cost and availabilities of alternatives (e.g. rail infrastructure). Reducing transportation distances is only likely to be possible when considering the siting of new mines, and will be constrained by the location of resources.

Process emissions also arise in the mining and metals industry. These non-energy emissions sources are often very difficult or impossible to eliminate with current technology as they arise from fundamental process chemistry. They require different abatement activities and technologies from energy-related GHG emissions.

Box 2: Categorizing emissions

The Greenhouse Gas Protocol Initiative (WRI/WBCSD) classifies emissions as either direct when arising from sources that are owned or controlled by a company, or indirect when are a result of the company's activity but occur at sources owned by another entity. Direct emissions are termed Scope 1 emissions. Indirect emissions are divided into Scope 2 which covers emissions from the consumption of purchased electricity, and Scope 3 which covers all other indirect emissions (e.g. emissions from production of purchased raw materials and transport in vehicles owned by other entities). For mining and metals, Scope 2 emissions will mainly include the electricity used to power machinery.

Further information can be found at:

http://www.ghgprotocol.org/

The mining and metals industry needs to identify the extent to which it is possible to measure and manage these emissions (see Box 2 for a common categorization of these emissions sources).

Greenhouse gas emissions arise at each stage of the production process, with the majority resulting from the energy requirements of operations. While Table 1 gives a general overview of energy requirements at each stage, the exact nature of these needs will depend on the commodity in question, whether the operation is an underground or a surface mine and the degree of sorting and processing required. In addition, energy is also consumed and greenhouse gas emissions are released as products are transported to smelting facilities or end-users and indeed in the smelting process itself.

The mining and metals industry accounts for approximately 2% of global emissions, compared to a total for heavy industry of 18%. The variety of products and activities covered by ICMM members means there will be significant variation in emission intensity of extraction and processing in the industry. Even within commodities, there is significant variation across sites with emission intensity likely to be lower in the case of open pit mines, high ore grades, and availability of less emissions intensive electricity.

Table 1: Primary energy requirements by stage

Extraction	Drilling equipment, digging machinery, ventilation and pumping systems
Materials Handling	Transfer or haulage of materials using diesel equipment
	Transfer or haulage of materials using electric equipment
Beneficiation & Processing	Crushing, grinding, separation, smelting and processing

Source: USA Office of Energy Efficiency & Renewable Energy

InBrief

The economic and strategic importance of the mining and metals industry

The mining and metals industry is core to the global economy. The outputs from the industry are necessary inputs to many sectors of the economy, from those that are vital for economic development, such as construction to sectors that build the foundations for future advancement and technological progress, such as aerospace engineering. As such, the sector is often considered to be of high strategic importance by governments.

Table 2 shows the countries where mineral rents (the difference between production costs and world prices) are greater than 10% of GDP and coal rents are greater than 2.5% of GDP – which could therefore be particularly exposed to the effects of carbon price differentials.

While direct jobs in large scale mining are estimated at less than 0.5% of the global workforce, this percentage can be much higher in certain countries and regions. For example, in South Africa, it is estimated that a total of half a million people are directly employed in the mining industry which accounts for over 6% of non-agricultural total employment. The industry also generates at least one indirect job (e.g. catering) for each direct job, and there are many dependents that are reliant on the industry.

The diversity of the activities and products covered by mining and metals companies makes generalizations challenging, but some broad common factors exist. The basic value chain of exploration, mining and processing is the same across the industry, but the specifics of the process will vary depending on the resource being mined. Further, the production process will reflect the characteristics of the deposit and the technology used to extract and process that deposit. Each mining operation is embedded within a local environment which will affect the way in which mining and processing is conducted, given that a mining operation is fundamentally tied to a resource deposit and local infrastructure. For example, the availability of a particular fuel source within an area is likely to be reflected in the energy mix used by an operator at least in the short-term. Finally, while the structure of each company will vary both in terms of geographical scope and in terms of the parts of the value chain covered, each is operating in a global environment that is increasingly focused on social and environmental concerns.

For the mining industries, social concerns such as miner welfare and impacts on local communities have been, and will continue to be, of high importance. Environmental concerns have been dominated by local impacts such as waste management and land use, but greenhouse gases (GHG) emissions from operations have risen up the agenda in recent years. ICMM serves as an agent for change and continual improvement on issues relating to mining and sustainable development and introducing ICMM's climate change program in May 2011 is confirmation of the industry's continuing commitment.

Table 2: Rents as a % of GDP by location

Mineral rents		Coal rents	
Country	**% GDP**	**Country**	**% GDP**
Papua New Guinea	29.7	Kazakhstan	4.3
Mauritania	29.5	South Africa	4.2
Zambia	16.4	Mongolia	3.9
Chile	14.8	Zimbabwe	3.2
Congo, Democratic Republic	11.6	China	2.7
Mongolia	11.0	Indonesia	2.5

Source: Data from the World Bank

"While direct jobs in large scale mining are estimated at less than 0.5% of the global workforce, this percentage can be much higher in certain countries and regions."

A vital cog in the low carbon future

The industry faces a range of challenges in responding to climate change policy as we move towards a future low carbon economy.

Initial capital investment is high in the mining and metals industry – one estimate for fossil fuels, non-ferrous metals, iron ore and other products in Australia indicates that this accounts for up to half of total costs, compared to labour costs of around 12% and intermediate inputs of around 40%. This capital is tied to a specific resource deposit and is largely immobile with respect to location and rigid with respect to technology used, at least in the short term. As a result, the decision made regarding location and technology will have long-term effects on both the company making the investment, the local area, and potentially the national economy if mining is a large contributor to GDP. Further, these decisions need to be made anticipating changes in the direction and extent of policies, and are therefore likely to be subject to considerable uncertainty which represents investment risks. For companies seeking to make a long term investment in a particular region, it becomes vital to identify and assess the impact that policies, such as carbon pricing, will have on the economic viability of the mine and plant over time.

For both governments and industry, the place of the commodity within the value chain is an important consideration in climate policy. In particular, minerals and metals are frequently inputs to other industries that are key to low carbon development – e.g. copper, aluminum, platinum and even coking coal are inputs for building renewable energy infrastructure. For policy makers, the challenge is to ensure that policies encouraging emissions reductions do not jeopardize the availability of mined goods for this low carbon development, while the industry needs to ensure that its contribution is understood and recognized. Similarly, policies targeted at the downstream parts of the value chain may have adverse impacts on the mining and metals industry where these lead to significant reductions in demand – i.e. polices should be applied fairly across industries to help mitigate such effects.

The existence of different carbon pricing policies with different approaches to implementation in terms of coverage, stringency and choice of policy instrument in different countries, introduces complexity into decision making for multi-national companies. In the short term the operational decisions of a company – how a mine is operated and how much is produced – are likely to be affected as a company attempts to optimize costs and prices. In the long term, national climate change policies will likely be a factor in the investment decisions of a company – for example, which technology should be used and in which locations. Companies with operations across a number of countries and commodities need to account for the different climate policy regimes with potentially different effects on commodities. Uncertainty in national policy making complicates this analysis further, with decision-making having to account for the possibility of the introduction of a new regime or alterations in the existing regime. Such long term changes are particularly pertinent to the mining and metals industry, given the long investment cycles.

"For companies seeking to make a long term investment in a particular region, it becomes vital to identify and assess the impact that policies such as carbon pricing will have on the economic viability of the mine and plant over time."

The International Council on Mining and Metals (ICMM) was established in 2001 to improve sustainable development performance in the mining and metals industry. Today, it brings together many of the world's largest mining and metals companies as well as national and regional mining associations and global commodity associations. Our vision is one of leading companies working together and with others to strengthen the contribution of mining, minerals and metals to sustainable development.

ICMM
35/38 Portman Square
London W1H 6LR
United Kingdom

Phone: +44 (0) 20 7467 5070
Fax: +44 (0) 20 7467 5071
Email: info@icmm.com

www.icmm.com

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Collaboration is key

The mining and metals industry is part of a broader economic and policy environment, and the actions it takes will affect and be affected by this environment. Effective action on carbon pricing, and any measures to address the unintended effects of this, will need to be based on consultation with governments and multiple external stakeholders.

Governments
Given the range of policy options facing governments, engagement is crucial to develop appropriate policy that reflects the specific circumstances of the mining and metals industry. By establishing a dialogue, it is possible to ensure that the concerns and issues of companies are reflected in policy, increasing the likelihood of the policy meeting its goals and minimizing the potential for competitive distortions.

ICMM's principles for climate change policy design can be used to guide the development and assessment of climate and related policies, ensuring that these policies meet the needs of the industry. Applying the principles to a policy that leads to the collection of public sector revenues suggests that these should be used to develop energy efficiency technologies and techniques.

Broader stakeholders
As discussed, mining operations affects a number of external stakeholders. For example, products from the sector are inputs for downstream industry and it is an important source of local employment (both directly and indirectly). Any actions that are undertaken by the industry in response to the physical impacts of climate change or climate change policy will require communication with these stakeholders. There is a need to ensure the most appropriate response is taken and to ensure broader understanding of the climate change challenge.

Summary and conclusions

Mining and metals is a highly diverse industry, covering a range of geographies, activities and products. It is important to recognize that:

- the effect of policies will not be the same across all commodities and operations.
- policies can have significant direct and indirect effects. In particular, policies affect price levels, output quantities and methods of production in other parts of the supply chain are likely to have further effects in the mining and metals industry.

Based on these considerations, an appropriate next step for the industry could include developing a deeper analysis of potential impacts of climate change policy on the competitiveness and location decisions of the industry. A deeper understanding of the impact on specific sub-sectors would also ensure realistic and effective policy development to reflect product and production specific characteristics of the mining and metals industry. When conducting this analysis it is important to reflect the industry's role in the current economic structure of a region and its contribution to a future low carbon economy.

"Effective action on carbon pricing and any measures to address the unintended effects of this will need to be based on wide consultation, particularly governments and multiple external stakeholders."

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