



# CLIMATE CHANGE AND MINING

## A Foreign Policy Perspective

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## A Foreign Policy Perspective

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## EXECUTIVE SUMMARY:

### The impacts of climate change pose serious risks for the extractives sector:

- 1.** The mining sector is extremely energy-intensive and one of the major emitters of greenhouse gases. Total CO<sub>2</sub> emissions vary across the industry, largely depending upon the type of resource mined as well as the design and nature of the mining process. It is widely recognised that available mining deposits are increasingly deeper and of declining ore grade. This will lead to growing demands for water as well as greater mine waste, thereby raising energy consumption, and increasing the industry's climate footprint. At the same time, greater scrutiny of the industry's carbon emissions and the recent success in climate negotiations are increasing pressure on mining companies to explore ways to reduce their emissions, for example by using renewable energies.
- 2.** Mining is a sector that is particularly vulnerable to climate change. Changing climatic conditions will have both direct (operational and performance-based) and indirect (securing of supplies and rising energy costs) impacts on the mining sector. Increasingly a number of these impacts may cross-fertilise to potentially result in newer, more complex arrangements of second-order impacts. Underlining these risks is the fact that some of the world's largest mining operations currently operate in remote, climate-sensitive regions. In addition to these risks, the associated reputational risks to the companies and their social licence to operate may be fatally permanent in nature. These risks and the absence of a concerted industry-wide approach to adaptation to climate change may threaten investor confidence and impact insurance dynamics over the long-term. However, such 'tipping points' can also trigger innovation and some of this innovation has begun to take place already, albeit mainly to reduce costs.
- 3.** The extractives sector plays an indispensable role in the economic development models and plans of many regions and countries. However, very little knowledge exists that draws out the connection between climate change and natural resource development within the context of developing countries, which are projected to experience greater vulnerability to climatic shifts. On the one hand, climate change carries the risk of further aggravating changes in natural environmental conditions. This may, in turn, disrupt resource-dependent livelihood generation, including herding, agriculture and fisheries. On the other hand, limited technical and financial resources already pose a challenge for current efforts to adapt to a changing climate. Therefore, it is important that the role of the extractives sector in a broader development context, including its complex interlinkages with a changing climate is better understood and incorporated in policy and strategic decision making.
- 4.** Developing, newly industrialised and industrialised countries share climate risks faced by mining companies and countries that depend on the mining sector for their development – especially those with large producing sectors such as Germany. These countries are highly dependent on a secure and stable supply of resources and any risks or vulnerabilities that global supply chains may be exposed to can potentially cause a suite of social, economic and geopolitical disruptions. Climate change will have a multiplier effect on supply chain risks by adding to the complexity and increasing or altering existing risks. Since a large and increasing number of extractive resources come from developing nations which already lack resources for climate adaptation, there is an increasing need to undertake robust measures to ensure that supply chains are climate-resilient.

**In order to address these risks and to contribute to sustainable and inclusive development, we propose four recommendations for foreign policy makers. These recommendations could form part of a more strategic foreign policy approach and a starting point for defining the role climate diplomacy can play in addressing the climate risks the mining sector faces:**

**1. Climate-proof critical minerals policies and security of supply strategies:** How climate change will impact individual mining areas is in most cases not included in criticality assessments. This gap in criticality assessments is mirrored in critical minerals policies and resource strategies that mostly do not include climate risks. To overcome this gap, climate change risks should be integrated into criticality assessments and also be included and reflected in critical minerals and resource policies based on these improved assessments. In general, these strategies should put more emphasis on long term security of supply strategies. To further engage the private sector, foreign policy makers could also support and encourage the industry to address supply chain risks more pro actively by supporting international knowledge hubs for supply chain monitoring.

**2. Improve social and environmental standards in the extractives sector:** There are an increasing number of standards and initiatives to enhance the sustainability of the sector. These are a good starting point to address climate risks and augment the resilience of the sector as a whole and afford an opportunity for foreign policy makers to take a more pro active role in improving global social and environmental standards. This would include promoting the ratification and implementation of existing international conventions and standards that are important for the extractives sector, implementing these standards at home and supporting the implementation as part of bilateral and multilateral development cooperation. Foreign policy makers can also seize the opportunity and point towards governance gaps and argue for the review of existing or the creation of new standards. The goal would be to advance the normative framework through soft instruments that carry authority and provide more guidance along with harder legal instruments that set mandatory standards for advancing the ideal of a global level playing field with higher standards for everybody.

**3. Support national and regional dialogues on responsible mining:** The extractives sector can – if responsibly managed – contribute to economic growth and development. Yet, it is often accompanied by the risk of the resource curse and conflicts with other sectors and population groups. Dialogue forums, transparency initiatives, consultations prior to decision-making and early information, for example in the form of independently conducted environmental and social impact assessments, can help to address many of these risks. The European Commission has been active in establishing dialogues with the EU's strategic partners for raw materials, and Germany has established a number of "resource partnerships" with different countries. These partnerships and modes of engagement could be used to have a broader debate on the role of extractives in sustainable development. In addition, foreign policy makers can play an active role fostering national and regional dialogue processes through diplomatic campaigns and development cooperation, encouraging and supporting international organisations or initiatives to provide a forum for such dialogue processes and partner with academia, cultural or political organisations or foundations to foster dialogue.

**4. Proactively use extractives as a topic for climate diplomacy:** The link between extractives and climate change cannot only provide an entry point for a larger debate on environmental and social standards in mining, but also a way to engage on climate change in general, in particular with countries that do not see climate change as a policy priority. Extractives are one way of linking climate change to the broader development discourse of a country or region. Conversely, in countries or regions in which climate change is already part of a larger discourse on how to transform economies and societies towards more sustainability, climate change impacts on the extractives sector could add another important perspective. In order to use the links between climate change and the extractives sector more pro actively as part of larger climate diplomacy efforts, foreign policy makers could identify clear narratives around the risks and opportunities of climate change and its impacts on the extractives sector for different countries and regions.

## INTRODUCTION

Awareness in the extractives industries of the potential negative impacts of climate change on the mining sector has grown in the past years. The impacts of extreme weather events such as recurring droughts, floods and cyclones experienced in some of the world's leading mining regions, such as Australia, Chile and Mongolia have led some sections of the industry to start thinking about their own vulnerabilities and the risks climate change could pose. However, there has been little research and debate that takes a more comprehensive look at the links between climate change and mining.

This report tries to shed some light on these links and provides an overview of the complex challenges around extractive resources in the context of climate change. It further argues that foreign policy makers should pay more attention to the links between mining and climate change because 1) the mining sector is one of the major emitters of greenhouse gases and it produces fossil energy resources that also significantly contribute to global CO<sub>2</sub> emissions, 2) mining is a sector that is particularly vulnerable to climate change, 3) mining is a significant contributor to the development of many countries around the world, in particular many developing and emerging economies, and 4) developed, industrialised economies are dependent on functioning supply chains and security of supply of the resources that drive their economies. Each of these four topics will be explored in more detail.

Based on this risk analysis, the paper explores the role foreign policy can play in addressing these challenges as part of its climate diplomacy efforts. It analyses current policy approaches and initiatives and provides four recommendations and policy options that could form part of a more strategic climate diplomacy approach towards mining.



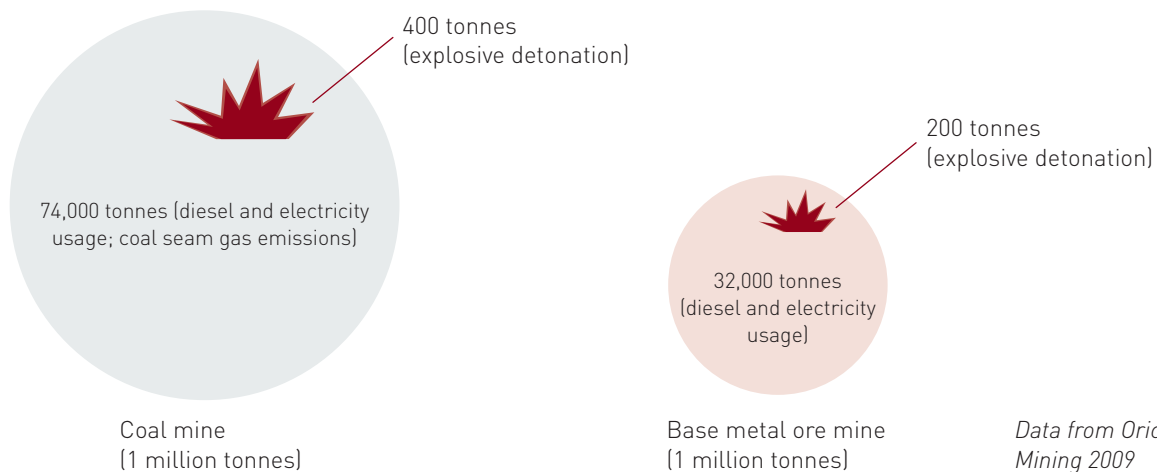
Coal washing machine

# I. THE CLIMATE FOOTPRINT OF MINING

The mining sector is extremely energy-intensive and therefore, one of the major emitters of greenhouse gases (Norgate and Haque 2010). In Australia, for example, mining is the fourth largest consumer of energy and recorded the largest energy consumption growth rate over a 3-decade period between 1980-81 and 2012-13 (Stanwix et al. 2015). Additionally, the industry produces fossil energy resources that further contribute to global CO<sub>2</sub> emissions. Coal provides for approximately 20% of the world’s primary energy demand, contributing to global warming through direct emissions when burned, but also through fugitive emissions that are released during the process of mining coal from under the earth’s surface (MCA 2015). Although large mining companies continue to undertake efforts to trap and conserve fugitive emissions, industry-wide efficiency on this front remains ad hoc and inconsistent, particularly in weaker regulatory environments (CIE 2011, Cooke and Hearps 2011).

Total CO<sub>2</sub> emissions vary across the industry, largely depending upon the type of resource mined as well as the design and nature of the mining process, for example open pit versus underground mining. The figure below provides typical CO<sub>2</sub> emissions from mining two different resources.

## SAMPLE CO<sub>2</sub> EMISSIONS FROM MINING



Finally, it is widely recognised that available mining deposits are increasingly deeper and of declining ore grade. Together, this will lead to increased demands for water as well as greater mine waste, thereby raising energy consumption, and increasing the industry’s climate footprint (Mudd et al. 2012).

Although commodity prices for many minerals and metals may have stabilised in 2015, mineral demand is expected to continue, particularly as countries across South, South-East Asia and Africa scale up their infrastructure to meet rising consumer demand. At the same time, greater scrutiny of the industry’s carbon emissions (Paulson 2015) and the recent success in climate negotiations are increasing pressure on mining companies to explore the renewables option. The use of renewables in the mining sector is gradually expanding across Latin America, Africa and Australia. The Chilean mining sector, in particular, stands out not only for its efforts to cut down CO<sub>2</sub> emissions from mining but also in making a systematic transition to renewables, including concentrated solar power and wind (Mathews 2014). Traditionally an importer of energy, Chile’s pioneering efforts in reducing its mining industry’s carbon footprint through locally-produced renewable energy are exemplary (Kirschke 2015).

## II. VULNERABILITY OF THE MINING INDUSTRY TO CLIMATE CHANGE

Mining is a sector that is particularly vulnerable to climate change (Arent *et al.* 2014). It is inherently dependent on the natural environment and the industry's long-term viability – and therefore, strategic decision-making with regard to mining operations – is directly tied to the location of the resource to be mined from under the earth's surface. As a result, the industry is not relocatable should natural environmental conditions become unsupportive for varying reasons. The mining sector requires a number of suitable natural conditions including, but not limited to, a habitable climate, access to water resources and supporting infrastructure to extract resources and process them for future domestic and/or international use (Pearce *et al.* 2009).

Relatively little knowledge exists on how climate change may impact mining operations and the extractives sector. Although there are some efforts underway to recognise and address the mining industry's sensitivity to climatic changes, evidence-based robust knowledge that explores the full range of causal relationships and links between the two remains little and far between. There has been some work emerging from Canada and Australia – OECD's two most resource-dependent regions – in the recent past that has investigated the influence of climatic changes on the future of the mining industry in these economies (Ford *et al.* 2011, Pearce *et al.* 2011, Loechel *et al.* 2013, Sharma *et al.* 2013).

Changing climatic conditions will have both direct (operational and performance-based) and indirect (securing of supplies and rising energy costs) impacts on the mining sector (Sharma *et al.* 2013). These include, but are not limited to: water-related impacts (droughts, floods, cyclones and storms); heat-related impacts (bush fires and heat strokes); and sea level rise. A combination of these effects may jeopardise the sector's viability by denying the industry – and its personnel – a safe operating landscape, both spatially (impacts felt across the immediate vicinity of the mining site and areas further downstream) as well as temporally (including, sporadic short-term and more permanent long-term changes). Underlining these risks is the fact that some of the world's largest mining operations currently operate in remote, climate-sensitive regions (e.g. Mongolia's Gobi Desert, the Atacama in Chile, Pilbara in Western Australia and the Canadian North and Arctic).



The Chuquibambilla open pit copper mine is the biggest of its kind and located in one of the driest places in the world – the Atacama Desert in Chile.



Under the Greenlandic Kvanefjeld Plateau lies one of the worldwide largest deposits of rare earth elements.



## Case study

## CLIMATE CHANGE, DISASTERS AND MINING IN CENTRAL QUEENSLAND, AUSTRALIA



In 2014, Australia was the world's second largest coal exporter (both thermal and coking), but retained the top position for total coking coal exports (*WCA 2014*). For more than four decades now, Queensland has provided a significant share of these exports. In 2014-15, mining contributed to nearly 11 % of Queensland's Gross State Product and employed nearly 8 % of the total workforce (*Roche 2015*). The Bowen Basin in Central Queensland is the largest coal reserve in Australia, and produces Queensland's high-grade coking coal along with most of the exported thermal coal.

Australia's climatic and oceanographic conditions have traditionally contributed to high natural climatic variability across the continent, thus causing an unstable climate that oscillates between extreme dry and wet conditions (*Hennessy et al. 2007, BoM 2008*). From June 2002 to late 2010, a strong negative Southern Oscillation Index (SOI) resulted in an extended El Niño state causing severe drought conditions across several parts of Queensland, including the Bowen Basin. During the period of 2000 to 2011, four cyclones were recorded that resulted in significant impacts on coal mining operations across the Basin. At the same time, major flood events occurred between the summer periods of 2007-08 and 2011-12 due to a positive SOI, resulting in a strong La Niña event. Only recently, a formal link between the 2010-11 extreme flooding event in north-eastern Australia and the role of long term climate change-induced ocean warming has been established (*Ummenhofer et al. 2015*).

In the most recent flood event of 2010-11, several towns – both mining-intensive and larger service hubs – in and around Central Queensland were flooded and it took a long time before normal services and mining operations could resume. In fact, the La Niña effect observed in 2010 was one of Australia's strongest since 1917 (*Nicholls 2011*), leading to 'flooding of historic proportions' (*ABARES 2011*). Almost 80 % of the entire state of Queensland – with more than 2.5 million people and several thousand kilometres of road and rail infrastructure – was declared flood-affected. The state's agricultural and mining



Flooded open pit coal mine in Australia's Bowen Basin.

sectors, in particular, suffered huge losses both directly and indirectly due to prolonged floods in the region (*Queensland Reconstruction Authority 2011, ABARES 2011*). According to estimates, the 2010-11 floods led to a total loss in excess of A\$ 5 billion (US\$ 5.15 billion) to Queensland's gross state product that included more than A\$ 2 billion (US\$ 2.06 billion) in lost coal export earnings (*QFCI 2012, ABARES 2011*).

Not only are climate-induced organisational and operational risks for mining activities important in and of themselves, but the associated reputational risks to the organisation and its social licence to operate may be fatally permanent in nature (*ICMM 2013*). Some examples of how climate change-induced (mis)management of mining impacts may exacerbate tensions with host communities include: tailings dam disintegration due to extreme flooding or sea level rise; competition (and in some cases, potentially conflict) with host communities and local industries over access to limited reserves of water during and/or following a drought; heat and dust-related health stress among local residents; and meeting community's growing expectations from the industry to invest and be involved in local climate adaptation.

Furthermore, changing climatic conditions and the absence of a concerted industry-wide approach to adaptation may also threaten investor confidence and therefore, impact insurance dynamics across the mining sector over the long-term. With growing civil society expectations and an increasing number of mining companies embracing the idea of sustainable inclusive development, investment agencies – both multilateral and private – are becoming cautious of who, where and when to support (*Sharma et al. 2013*). Company proposals to mine in regions that are expected to become climatically vulnerable over the next few decades, including regions that may already be reaching climate thresholds will find reduced traction with insurers as well as investors. To this extent, climate change may force the industry to seek adaptive measures to maintain its functions and longevity.

Such 'tipping points' can also trigger innovation – in hard and soft forms, both equally valuable nonetheless. Some of this innovation has begun to take place already, albeit mainly to reduce costs. A case in point is the automation of parts of the iron ore industry in Western Australia's Pilbara region, where machines and equipment are remote controlled from sites located several hundred kilometres away from the actual mine site (Franks *et al.* 2013). Pilbara, with one of the world's greatest reserves of iron ore, remains extremely vulnerable to high temperatures, storms and cyclonic activity that are projected to increase in intensity and frequency over time (Loechel *et al.* 2011). The latter may pose serious health and safety concerns for the mining workforce; automation may therefore, provide an innovative response worth further deliberation. Another example that illustrates softer forms of innovation is the Fitzroy Partnership for River Health (FPRH), developed in the coal mining belt of Australia's Bowen Basin (Sharma *et al.* 2013). The partnership was an effort to bring stakeholders together to manage cumulative impacts from multiple mining operations in the Basin, particularly in light of the 2007-08 extreme flooding event that raised concerns about rising salinity levels in the waterways across the Fitzroy Catchment, including domestic water supplies. Among other things, FPRH has played an indispensable part in better strengthening relationships across representatives from multiple industry groups, government and civil society.

The impacts from climate-influenced extreme events on the mining industry remain highly complex in nature, largely due to the underlying multi-causality that takes effect across varied scales and dimensions. A whole-of-region approach is fundamental to capturing the full breadth of impacts felt directly or indirectly by the industry but also communities and the wider ecological landscape that may both influence, and be influenced by the presence of extractive industries in the region. The figure below advances knowledge of climatic impacts, both direct and indirect, on various stakeholders associated with the mining industry. Many of these impacts are multi-layered and therefore, difficult to ascertain and address in the short term. More often than not, a number of these impacts may cross-fertilise to potentially result in newer, more complex arrangements of second-order impacts. Anticipating and subsequently managing the latter can be particularly challenging in the absence of adequate experience, foresight and/or knowledge of the broader local context.



Climatic impacts on the mining sector and its social and environmental impacts are complex: Open pit gold mine, Australia.

## KEY CLIMATIC IMPACTS ON VARIOUS STAKEHOLDERS ACROSS THE RESOURCES SECTOR


**MINING  
INDUSTRY**

- Increased demand for water conservation during droughts
- Increased demand for emergency services during flood events
- Reduced asset operating life
- Health and Safety risks for workforce
- Inability to meet performance targets resulting in impacts on share prices
- Increased demand for changing infrastructure design standards
- Increase in costs of water
- Disrupted access routes, leading to forced mine closures
- Potential employment loss due to lack of safe access to sites
- Conflicts with other water users in the region over water availability
- *Force Majeure*, sometimes also leading to disputes around delivery obligations
- Supply chain breakdowns
- *Opportunity to review potential industry-wide vulnerability to loss and liability\**


**COMMUNITIES  
IN THE VICINITY  
OF MINING  
OPERATIONS**

- Increase in costs of water
- Health risks for communities
- Reduced reliability of supply sources
- *Opportunities to facilitate better relationships with relevant stakeholders\**
- Environmental risks (e.g. resulting from contaminated flows downstream, unauthorised release of flood waters, overflow of tailing dams degrading aquatic ecosystems)
- Increased demand for emergency services
- Hostility with mining companies over sharing of water sources
- Substantial increase in community expectations around water conservation


**GOVERNMENT  
AGENCIES**

- Economic threats for the local government, largely due to reduced industrial and agricultural productivity
- Permanent changes to regional economic diversity
- Increasing unpredictability in making future investment decisions
- *Opportunities to develop new markets for climate resilient infrastructure and related services\**
- Implications for future growth in the region
- Added pressure from local vote banks to tighten regulations on industry performance
- Reduced attractiveness for industry to invest locally and or regionally

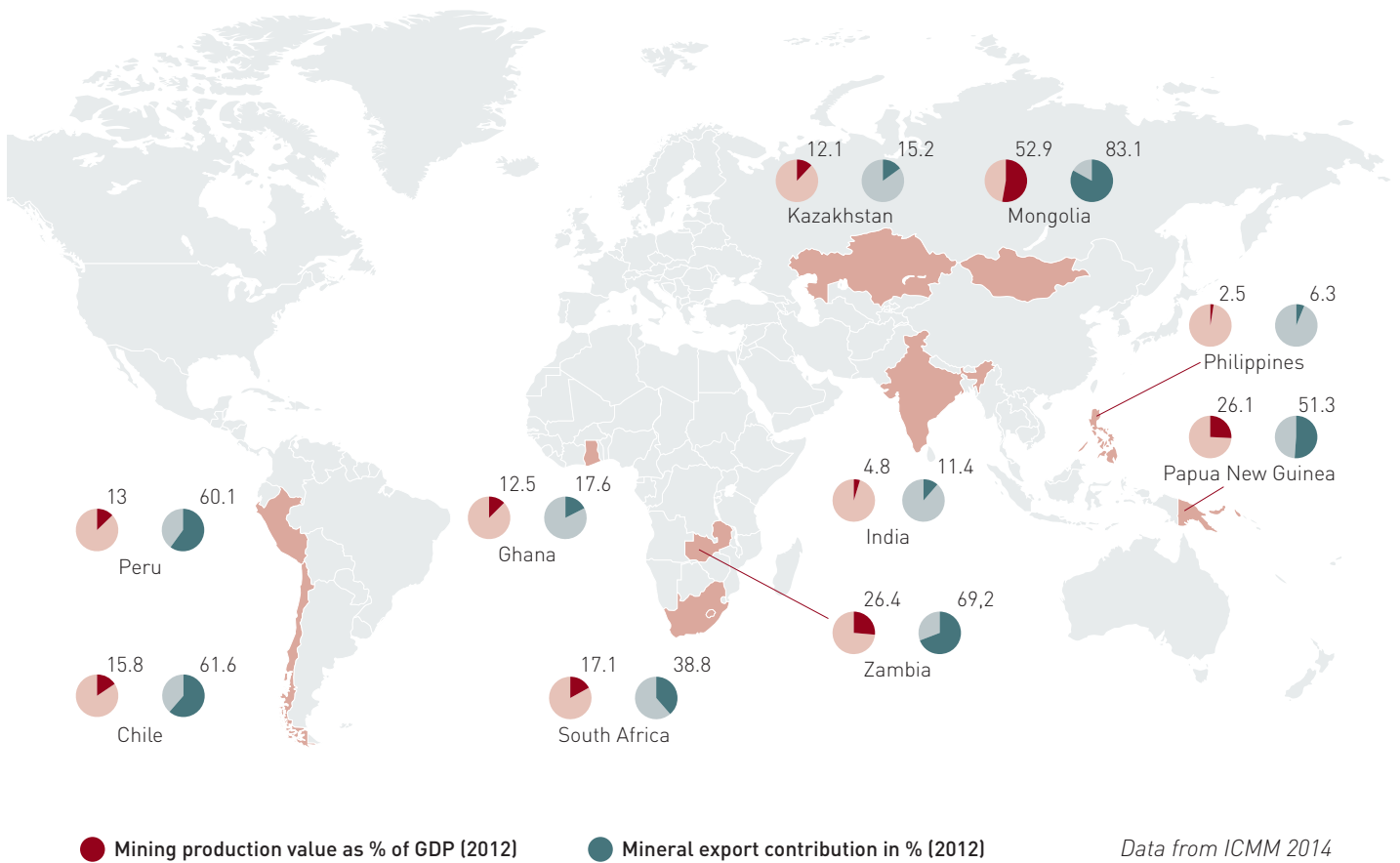
\*Positive impacts

Drawn from Sharma et al. 2013

### III. MINING AND DEVELOPMENT

The extractives sector plays an indispensable role in the economic development models and plans of many regions and countries. Based on its enormous economic potential it is often a preferred pathway for poverty alleviation and development, especially since it has the promise of a relatively quick return on investment (see figure below for a selection of countries and their economic dependence on the mining sector). However, in order to have positive effects, operations have to be guided by a strong commitment to international performance standards and overseen by a robust regulatory environment.

#### MINING'S CONTRIBUTION TO NATIONAL ECONOMIES



In the absence of these preconditions, the development of extractive industries brings with it a suite of enduring costs and impacts at various stages of the mining lifecycle. These challenges permeate disciplinary boundaries and encompass a range of social, cultural, environmental, economic and institutional concerns that lie at the heart of sustainable development and influence future development pathways in important, at times irreversible, ways (*Ross 1999, Sachs and Warner 2001, Robinson et al. 2006*).

**Typically, key impacts from mining operations include, but are not limited to:**

- a)** changes to labour and employment patterns, thereby limiting opportunities for sustained development of other forms of non-mining economic activities, such as agriculture (*Richards 2009*)
- b)** inflow of transient workforce leading to loss of community solidarity and local belonging (*Lawrie et al. 2011*)
- c)** income inequality, resulting in further disadvantaging those engaged with the non-mining sector (*Rolfe et al. 2007*)
- d)** conflicts and conflict financing (*Ross 2006; Davis and Franks 2014*)
- e)** misuse of human rights (*Kemp et al. 2011*)
- f)** inequitable redistribution of returns, loss of transparency in profit sharing and revenue management, and corruption, thereby generating lack of trust between the government and affected peoples (*McNeill et al. 2012*)
- g)** loss of ancestral and cultural land and impacts on indigenous culture and communities, thus influencing psychological wellbeing (*Ritter 2001, Katona 2002, Ballard and Banks 2003*)
- h)** gendered effects of mining due largely to the weak gender-inclusive nature of the work environment (*Solomon et al. 2008, Hill and Newell 2009, Kemp 2009*)
- i)** a range of short and long-term ecological impacts, including pollution of water sources, increasing levels of dust and noise, deforestation and loss of biodiversity, land degradation and challenges of tailings storage (*McMohan and Remy 2001, Aubynn 2003, Kitula 2006, Franks et al. 2011*)
- j)** impacts on human health in the region, largely from vehicular and mine dust, noise and greater incidence of prostitution and sexually transmitted diseases (*Scott and Minichiello 2012, Kazilimani et al 2003*)
- k)** post-mining impacts, often poorly managed, thus resulting in mining legacies with lasting consequences for local communities, ecosystems and institutions (*Solomon et al. 2008*) and
- l)** economic over-dependence on the mining sector, leading to a suite of macroeconomic challenges. Some of them are outlined above but others include cost of doing business, decreasing competitiveness in non-mining sectors, negative impacts on financial accountability (*WTO 2009*)

Very little knowledge exists that draws out the connection between climate change and natural resource development within the context of developing countries, which are projected to experience greater vulnerability to climatic shifts. On the one hand, mining promises a significant pathway to development in low-income economies. However, it also carries the potential risk of further aggravating changes in natural environmental conditions (e.g. by restricting access to land and water) that may, in turn, cause disruptions to conventional forms of resource-dependent livelihood generation, including herding, agriculture and fisheries (*Holden 2013*). On the other hand, limited technical and financial resources already pose a challenge for current capacities to adapt to a changing climate. It is particularly important therefore, that the role of the extractives sector in broader development, including its complex interlinkages with climate change is better understood and incorporated in policy and strategic decision-making.

Case study

**MINING-CLIMATE-LIVELIHOODS NEXUS IN MONGOLIA**

Mongolia’s rapid resource boom based on its vast resources of copper, coal, gold, fluorspar and uranium led to a GDP rise of approximately 17.3% in 2011 (*UN Stats 2013*). In 2012, mining accounted for approximately 9% of all new employment opportunities created in Mongolia (*Dalaibuyan 2013*). The minerals sector already employs in excess of 14,000 people and contributes to more than 70% of Mongolia’s total export earnings (*Austrade 2011*). Oyu Tolgoi (OT), besides being one of the world’s largest copper mines, is expected to contribute to approximately 34% of Mongolia’s total GDP once fully operational by 2020 (*Dalaibuyan 2013*). The two major mining centres in the South Gobi, Khanbogd and Tsogttsetsii, have witnessed an exponential growth in their population between 2000 and 2010 (approximately 201% and 229% respectively) (*Ochirsukh 2011*).



At the same time, Mongolia is considered a climate hotspot with more than 80% of its total territory vulnerable to climate extremes (*Batima et al. 2005*). The last two decades have already witnessed some of the country’s most devastating weather-related disasters (*Tachiiri et al. 2008*). As a case in point, desertification in Mongolia is currently estimated to affect 44% to 90% of the country’s territory (*Reeves 2011*).

The nature of the relationship between the mining industry and rural, remote communities holds great significance for its people. Both water availability (quantity) and quality remain central to the survival of several pastoralist communities (*Sternberg 2008*). With an expanding, water-intensive mining industry at a time when the country is experiencing reduced rainfall, there is a real possibility that minerals development will further exacerbate the situation with regard to Mongolia’s already compromised water sources (*Tiwary 2001, Hart et al. 2008, Combellick-Bidney 2012*). Resulting impacts of any magnitude on pasture availability may become a potential source of long-term conflict between various actors operating in the region (*Austrade 2011, Upton 2012, Wang et al. 2013*).



Pastoralist communities in Mongolia compete with the mining industry over water resources.

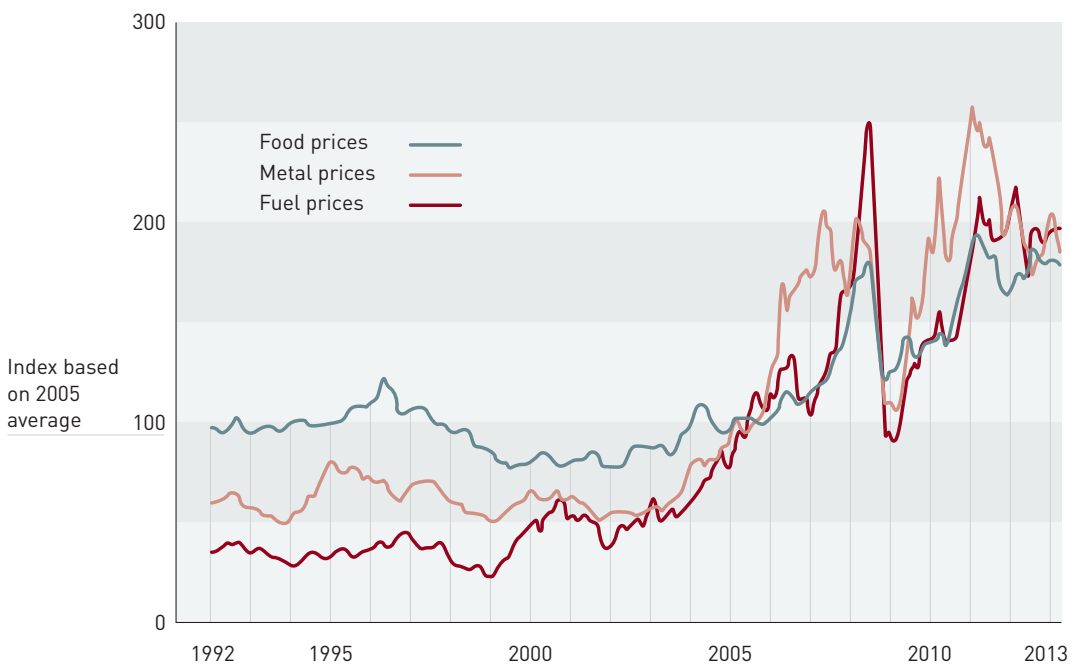


Illegal coal mine in Nalaikh, Mongolia

## IV. SUPPLY CHAIN RISKS AND SECURITY OF SUPPLY

Developing, newly industrialised and industrialised countries share climate risks faced by mining companies and countries that depend on the mining sector for their development – especially those with large producing sectors such as Germany. These countries are highly dependent on a secure and stable supply of resources. Any risks or vulnerabilities that global supply chains may be exposed to can potentially cause a suite of social, economic and geopolitical disruptions. Climate change will have a multiplier effect on supply chain risks by adding to the complexity and increasing or altering existing risks (Gledhill et al. 2013). These risks include disruptions caused by extreme weather events as well as political and policy reactions to such risks, such as export bans and tariffs to promote domestic supply.

### THE COMMODITY SUPER-CYCLE: DEVELOPMENT OF FOOD, METAL AND FUEL PRICES 1992–2013



Data from IMF 2014

Commodity prices have decreased compared to the record highs between 2008 and 2011 (see figure above showing the development of food, metal and fuel prices from 1992 to 2013). However, there is a debate whether this means that the commodity super cycle has come to an end (World Bank 2014). What seems to be clear is that structural trends, beyond climate change as well, are pointing towards continued volatility: 1) Globalisation in the form of outsourcing and just-in-time delivery has increased efficiency but reduced the resilience of supply chains to supply shocks (World Economic Forum 2012); 2) commodity



prices have become more interdependent, for example high oil and gas prices can affect energy-dependent sectors and transmit shocks across the system; 3) resource extraction is becoming more expensive and harder in part because of decreasing ore grades and more and more extraction taking place in fragile regions, thereby increasing political risks. These developments make it harder to increase supplies quickly, leading to more supply inelasticity, which is one of the main drivers of price volatility (*World Bank 2014*).

Internationally, efforts are being undertaken to improve governance around mineral supply chains from high-risk and conflict areas, most notably in the form of OECD's due diligence guidelines (*OECD 2013*). However, these efforts are for the moment mainly focused on the Great Lakes Region in Africa and a small number of so-called conflict minerals that are used by armed groups to finance themselves and their activities. Very little has been done to bring in a systematic 'climate' focus to this discussion and explore the role a changing climate may play in further disrupting supply chains and the sustainability of critical metals and minerals. Since a large and increasing number of extractive resources come from developing nations, which already lack resources for climate adaptation, there is an increasing need to undertake robust measures to ensure that supply chains are climate-resilient. Improved mechanisms of due diligence are particularly important in this regard, as multiple actors are involved from across the globe at different stages, including mineral supply, product manufacturing, assembly and subsequent dis-assembly. A comprehensive assessment of potential impacts from climatic changes across each of these stages is critical to provide localised asset-based solutions to address climate impacts on mineral supply and distribution.



Just-in-time delivery is efficient but makes supply chains more vulnerable to supply shocks: Container ship in Hamburg's harbour.

## V. THE ROLE OF FOREIGN POLICY

In order to address the risks outlined in the sections before and to contribute to sustainable and inclusive development, we propose four recommendations for foreign policy makers that are described in more detail below. Each recommendation includes a short analysis of policies and strategies in place and identifies ways of building upon and improving them. These recommendations could form part of a more strategic foreign policy approach and a starting point for defining the role climate diplomacy can play in addressing climate risks that the mining sector faces.



**Recommendation 1**  
**Climate-proof critical minerals policies and security of supply strategies**



**Recommendation 2**  
**Improve social and environmental standards in the extractives sector**



**Recommendation 3**  
**Support national and regional dialogues on responsible mining**



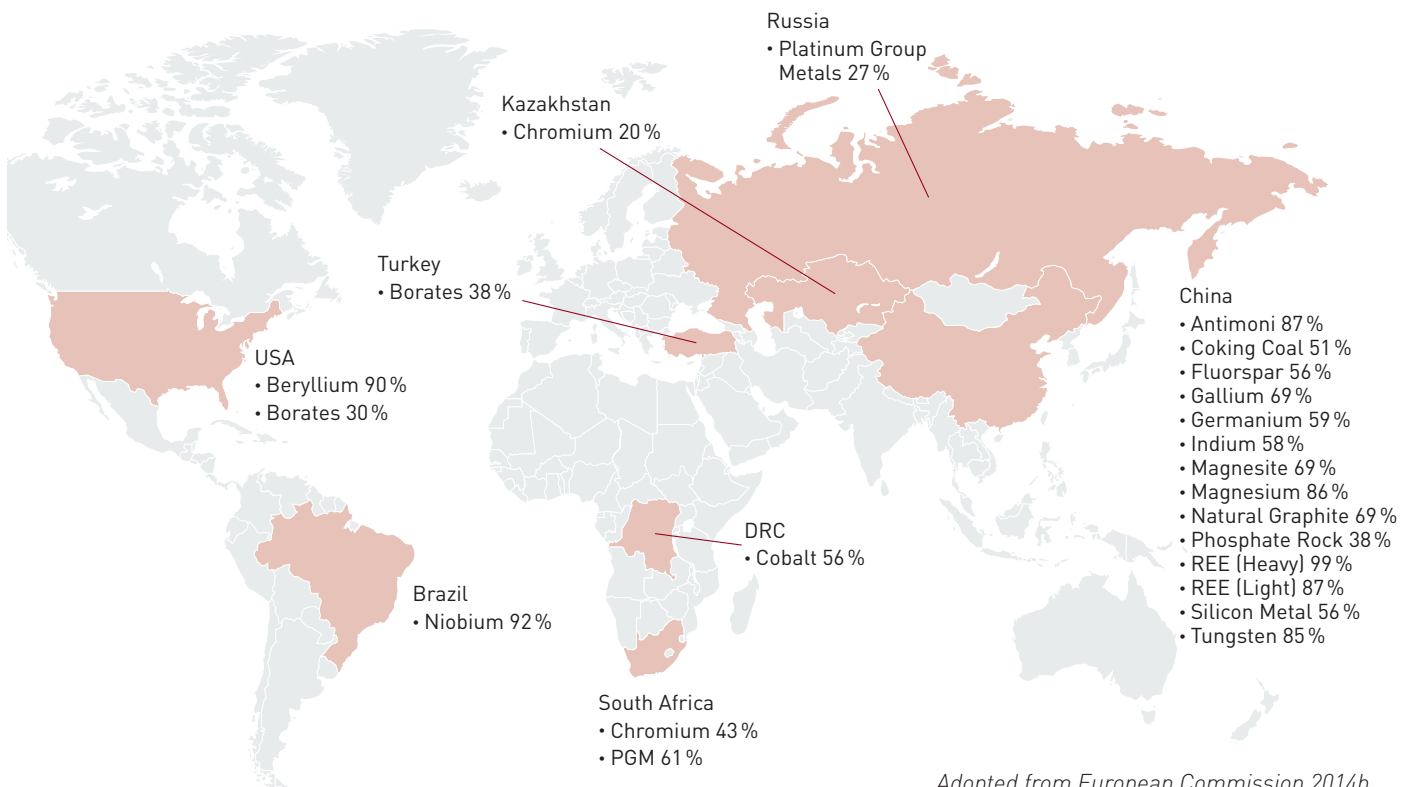
**Recommendation 4**  
**Proactively use extractives as a topic for climate diplomacy**

## **RECOMMENDATION 1: CLIMATE-PROOF CRITICAL MINERALS POLICIES AND SECURITY OF SUPPLY STRATEGIES**

Rising and volatile commodity prices have increased the perception of supply insecurity among governments and the private sector – in particular between 2008 and 2011 when commodity prices were very high. As a result, new critical minerals policies and security of supply strategies were developed. These were mostly based on assessments that tried identifying minerals that are critical for sustained economic development and thus of particular (national) strategic importance. For example, both the European Union (EU) and the German government regularly assess the criticality of minerals (see figure below on the world primary supply of the 20 critical raw minerals identified by the EU) and have developed resource policies and strategies to raise awareness about potential supply risks, foster innovation, promote cooperation and set priorities for research (DERA 2015, European Commission 2014a). Both the EU’s Raw Materials Initiative and Germany’s resource strategy include calls for an integrated foreign policy approach, with the EU even defining the role of “raw materials diplomacy”.

However, only a limited number of factors are normally taken into account to determine the criticality of minerals. Factors such as regulations and policies, prices, tariff and non-tariff trade barriers, development levels and changing life styles are usually not considered (European Commission 2014b). In addition, these methodologies often do not take into account whether a mining operation is located in regions with increased seismic risks, water stress or ecologically sensitive regions (Vogt 2015). The same is true for climate change and how it will impact individual mining areas, which in most cases is not included in criticality assessments (Mason and Guirco 2013).

### EU CRITICAL MINERALS: WORLD PRIMARY SUPPLY OF THE 20 CRITICAL RAW MATERIALS



This gap in the assessments is mirrored in critical minerals policies and resource strategies that mostly do not include climate risks. For example, Germany's resource strategy mainly refers to the potential and need to decrease CO<sub>2</sub> emissions (*BMWi 2010*); the EU's Raw Materials Initiative does not mention climate change at all (*European Commission 2008 and 2014a*). In general, these strategies and policies often put too much emphasis on short term risks and responses. Their main goal is to address short term security of supply and not the deeper structural problems or challenges that are more long-term in nature (*Perincek 2013, Nguiffo et al. 2010*). Similarly, the private sector is essentially profit-driven, relying on short planning cycles that focus on meeting production targets and making profits in the immediate to short-term. From a strategic planning perspective, this focus on the short term is directly antithetical to the long-term preparation and management needed to build resilience to, and address climate risks (*Sharma et al. 2013*).

Policy makers, in particular foreign policy makers and the mining sector need to undertake a well-informed approach to address this institutional shortsightedness. A first step would be to include climate change risks into criticality assessments. Research on how to include environmental factors and climate change into criticality assessments is advancing<sup>1</sup> and can be built upon. Based on these improved assessments, climate risks should also be included and reflected in critical minerals and resource policies. In general, these strategies should put more emphasis on long term security of supply strategies.

To further engage the private sector, foreign policy makers could also support and encourage the industry to address supply chain risks more pro actively by supporting international knowledge hubs for supply chain monitoring. These knowledge hubs would be public-private-civil society partnerships. They would allow the public and private sectors to better identify knowledge gaps and current needs to manage climate risks, as well as address and support due diligence on climate risks in long-term supply management, including localised solutions to address such risks. As such they would help to overcome the problem that much of the current global conversation on supply chain security is undertaken in silos with few attempts to develop synergies with other industries and coordinate resources and knowledge to address common concerns (*Sharma and Dalaibuyan 2015*).

The ultimate goal would be to institutionalise public-private-civil society partnerships that foster ongoing supply security and sustainability. However, until such time when legislative requirements call for cross-sectoral cooperation, knowledge hubs could provide a robust and timely platform that allows various stakeholder groups to come together and contribute to creating a rich repository of data that is helpful for analysis and making informed policy choices. Over time, data may include, among other things, all known risks, past events, lessons and experiences from these events, particular impacts on the mining sector and other notable occurrences related to climate change and mining.

<sup>1</sup>See for example the research project ÖkoRess funded by the German Environment Agency: <https://www.umweltbundesamt.de/umweltfragen-oekoress>



## RECOMMENDATION 2: IMPROVE SOCIAL AND ENVIRONMENTAL STANDARDS IN THE EXTRACTIVES SECTOR

Many companies have become more aware of the vulnerability of their increasingly complex supply chains to sustainability risks. The risks include climate change, in particular extreme weather events, environmental damage such as habitat destruction or pollution, as well as social, safety, labour practice and human rights issues (*Reed and Willis 2012*). Also reacting to those risks, the industry, governments, and civil society have pushed for new voluntary and regulatory standards to improve the sustainability of raw material production and sourcing, manufacturing and business practices, and the transparency of supply chains and supply chain impacts. This has resulted in a growing number of standards and initiatives. Some of these are industry and mineral-specific, while others are cross-industry. With efforts to enhance social and environmental standards, these initiatives provide a good starting point to address climate risks and increase the sustainability and resilience of the sector as a whole (*Ruettinger et al. forthcoming*).

This is also important in relation to fears that geopolitical competition between countries over access to resources is increasingly fought by lowering or undercutting standards. If countries are trying to gain access to resources and compete by lowering standards, their security of supply will suffer as risks increase and resilience decreases.

There is an opportunity for foreign policy makers to take a more pro active role in improving global social and environmental standards. This starts by promoting the ratification and implementation of existing international conventions and standards that are important for the extractives sector, such as the Indigenous and Tribal Peoples Convention (ILO 169), the Minamata Convention on Mercury and the UN Guiding Principles on Business and Human Rights. These efforts would include diplomatic activities, implementing these standards at home to increase credibility and create lessons learned for implementation, and supporting the implementation as part of bilateral and multilateral development cooperation. For example, the UN Guiding Principles were adopted by the United Nations Human Rights Council in 2011 and member states requested to develop and implement National Action Plans. Only six have completed the implementation process.

In addition to fostering existing standards, foreign policy makers can seize the opportunity and point towards governance gaps and argue for the review of existing or the creation of new standards. The general dynamics of greater public pressure, more open companies and the increasing number of voluntary sustainability initiatives could be used and complemented by advancing the normative framework through soft instruments that carry authority and provide guidance, such as OECD guidelines, along with harder legal instruments that set mandatory standards and advance the ideal of a global level playing field with higher standards for everybody.



### RECOMMENDATION 3: SUPPORT NATIONAL AND REGIONAL DIALOGUES ON RESPONSIBLE MINING

The extractives sector can – if responsibly managed – contribute to economic growth and development, as witnessed in countries such as Chile, Norway, and Botswana. In many countries around the world, extractives play a key role in national development strategies. However, this development path is often accompanied by the risk of the resource curse and conflicts with other sectors and population groups that feel that the negative impacts of mining outweigh its (potential) development impacts.

Dialogue, consultations prior to decision-making, transparency, and early information, for example in the form of independently conducted environmental and social impact assessments, can help to address some of these challenges. Transparency of payments and contracts is also of particular importance. Dialogue forums, initiatives and processes, such as the Extractives Industries Transparency Initiative can play an important role in this regard. Their aim is to give all stakeholders a voice and provide a forum to discuss challenges and opportunities for cooperation between different sectors. For example, in Latin America, a dialogue group on mining, democracy and sustainable development was launched in 2008.<sup>2</sup> It is based on national initiatives in Argentina, Brazil, Ecuador, Chile, Colombia, and Peru that aim to promote dialogue among governments, mining companies, civil society, local communities, indigenous groups and academia. The knowledge hubs proposed earlier could also play a role in this regard and provide a platform for dialogue and consultations to increase transparency and accountability.

The European Commission has been active in establishing dialogues with the EU's strategic partners in raw materials as part of its Raw Materials Diplomacy. These activities have been mainly focused on Europe's security of supply. On a bilateral level Germany has established a number of "resource partnerships" with different countries. While these partnerships have not had the desired effect of improving Germany's security of supply, they have in some cases provided a forum for dialogue with partner countries. Building on these experiences, these partnerships could be revived by including more stakeholders and using them to have a broader debate on the role of extractives in sustainable development. In the same vein, the European Commission could broaden its engagement and use its policy dialogues more broadly. In addition, and outside of already existing partnerships, foreign policy makers can play an active role fostering national and regional dialogue processes through diplomatic campaigns and development cooperation, encouraging and supporting international organizations or initiatives to provide a forum for such dialogue processes and partnering with academia, cultural or political organizations or foundations to foster dialogue.

<sup>2</sup>For more information see <http://www.dialogolatinoamericano.org/>

## **RECOMMENDATION 4: PROACTIVELY USE EXTRACTIVES AS A TOPIC FOR CLIMATE DIPLOMACY**

The link between extractives and climate change provides not only an entry point for a larger debate on environmental and social standards in mining, but also a way to engage on climate change in general, in particular with countries that see climate change not as a policy priority. Extractives are one way of linking climate change to the broader development discourse of a country or region by discussing the risks that climate change poses for long term development. Conversely, in countries or regions in which climate change is already part of a larger discourse of how to transform economies and societies towards more sustainability, climate change impacts on the extractives sector could add another important perspective. One example is the role of the extractives sector in the transformation agenda on the European level as well as the resource needs of this transformation.

In order to utilise the links between climate change and the extractives sector more pro actively as part of larger climate diplomacy efforts, foreign policy makers could identify clear narratives around the risks and opportunities of climate change and its impacts on the extractives sector for different countries and regions.



Looking into the future: A strategic foreign policy approach is needed to address climate risks in the mining sector.

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