

Analysis of the assessment of risks related to working conditions in mines and how to improve it.

**Bachelor Project submitted for the Bachelor of Science HES in Business
Administration with a major in International Management**

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Declaration

This Bachelor Project is submitted as part of the final examination requirements of the Geneva School of Business Administration, for obtaining the Bachelor of Science HES-SO in Business Administration, with major in International Management.

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Executive Summary

Metals and Minerals are commodities essential to the development of a country and to the survival of an individual, but the press relates relatively often tragic accidents happening in mines. Moreover, NGOs and other organisations regularly point the finger to the practices of the extractive industry in terms of sustainability.

Therefore I wanted to see what the reality was and why companies continued to use their bad practices and changes them at a very slow pace.

The methodology used in this research was made of three dimensions. First a selection of countries were analysed to see what their working conditions requirements were. Then, a set of 6 companies among the biggest one were analysed to identify how they apprehended the risks related to working conditions. Finally, a few recent mining disasters were also analysed to see the reaction of countries to the lack of safety in mines.

The analysis was conducted through a hypothesis testing process, to allow me to define the parameters that may serve as incentive for mining companies to improve their working conditions in a profitable way. This report does not aim at providing solutions to improve safety in mines but only to see how firms managed the risks related to working conditions.

The results of the hypothesis testing process surprised me thoroughly, because if I had to answer the question in an intuitive manner, I would have said the opposite to the findings of this report. Indeed, I tried to see how corruption, the level of development, the location of the headquarter and the size of the company could influence the working conditions. The results I got show that the three first parameters do not influence them.

Finally, I discuss what in my opinion may be incentives to changes the mining companies practices towards more sustainability, in working conditions especially but also in a broader way.

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1. Introduction

Every individual needs commodities to live, since these products range from cereals to energy products such as oil. These basic goods are either cultivated or extracted mainly through mining (all metals and coal) or pumping (crude oil and natural gas). This report will be focused on the worldwide mining activities.

1.1 Industry overview:

To have a better overview of what mining activities, also referred to as metals and mining industry, represents, a brief analysis of the industry will be conducted.

According to Marketline (2014), the metals and mining industry had revenue of \$2,844.4 billion in 2012. Although it decreased compared to the previous year, the industry still experienced a compound annual growth rate (CAGR) of 3.8% between 2008 and 2012. As a comparison, according to the same report, the CAGR of the European industry decreased by 4.5%. If the volume is considered, then the metal and mining industry production increased by 2.3% in 2012 (Marketline, 2014) which means that commodity price in general decreased over the year. However, if the period 2008 – 2012 is considered, then the CAGR is 2.5% (Marketline, 2014), hence it is possible to say that the price of the commodities increased over that time scale.

In terms of product segmentation, the Iron and steel has the biggest share followed by coal.

Metals & Mining Industry: Product Segmentation

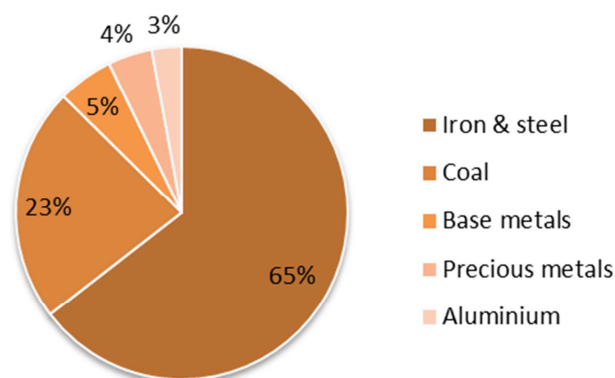


Figure 1: Metals & Mining Industry: Product segmentation. (Marketline, 2014)

1.1.1 Geographical repartition

Commodities that need to be extracted are natural resources that take a very long time to form; for example, coal comes from organic residue that takes millions of year to be transformed into coal (Planete-energies, 2010). Hence, they are available in limited amount and in specific regions of the world where the geological conditions were met. The countries with the most mining resources are, according to a Citibank report cited in Business Insider (2010), South Africa with \$2,494 billion worth in mineral reserves followed by Russia, Australia, Canada, Brazil, China, Chile, USA, Ukraine, Peru, India, Kazakhstan, Mexico, Indonesia and Guinea. However the countries that are known for being the biggest mining countries are South Africa, Russia, Australia, Ukraine and Guinea (Wealth Wire, 2011; Mining Australia, 2013). Therefore, it is possible to say that some countries for some reason do not exploit their resources to their fullest. This may be due to the will of preserving the resources for the future or because it requires too much capitals to extract the minerals and the return on investment is not enough or because investors do not perceive the country to be a safe place to invest. For some countries, the mining industry represents a significant amount of their GDP for example, in Russia, this industry represents 33% of the national GDP which is huge, in South Africa which is traditionally known as a mining country it represents “only” 18% (Mining Australia, 2013). It is also to be noted that a country may be rich in only one kind of metals while other have reserves of different metals in their soils.

1.1.2 Industry segmentation:

The mining and metals industry is dominated by a few big companies and as mentioned above, it is experiencing an increasing consolidation through mergers and acquisitions. Since a commodity is by definition relatively undifferentiated it is difficult for companies to have a unique product. Hence, companies tend to make the difference by offering complementary services. To ensure a sustainable growth, they also diversified geographically and towards a range of products (Marketline, 2014). Hence Glencore-Xstrata is active in 50 countries and it has business activities in energy products, metals and minerals and soft commodities (Glencore-Xstrata, 2013). Its metals and minerals business segment comprise a wide range of products. This company is however, a bit of an outsider since it provides services from the extraction to the trading of those products. To the author’s knowledge, no other company active in mining has such a vertical integration.

The biggest mining companies varies following the evaluation criteria chosen but the following six companies are often found in the top ten of mining companies:

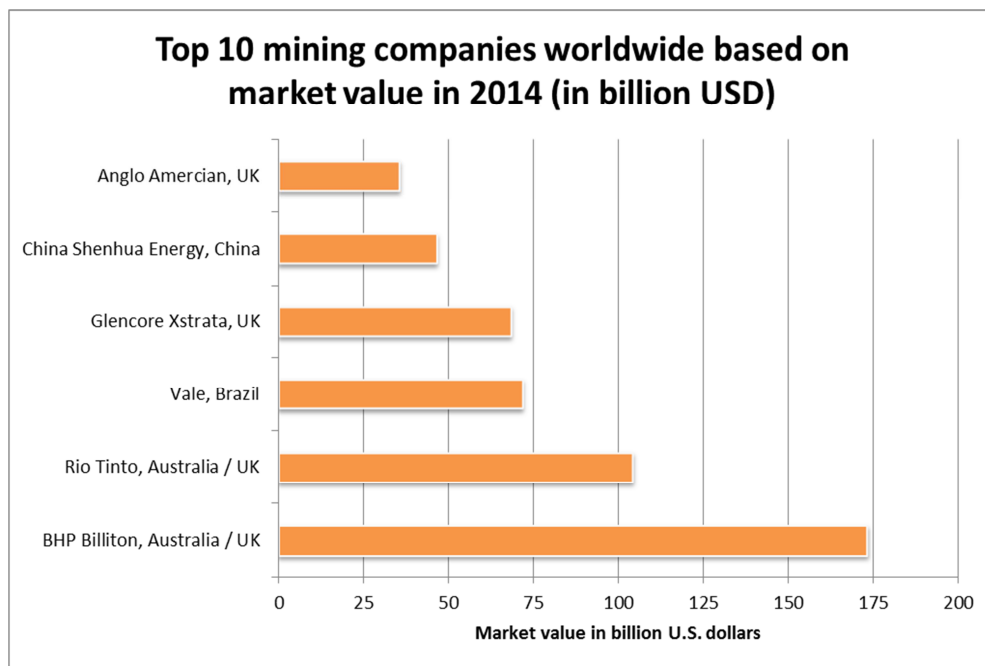


Figure 2: Top 10 mining companies based on market value in 2014 (Statista, 2014).

Although the big companies represent a vast majority of the minerals extracted worldwide, approximately “95 percent of the world’s total mineral production” at the beginning of the 2000s (Weber-Fahr et al, 2002) artisanal and small scale mining (ASM) still has an important impact because more miners are active in ASM than those employed by the large scale mining (LSM) industry. Indeed, it is estimated that around 15 to 25 million people around the world are making their living through ASM (Dorner et al, 2012; Mining facts, n.d.) while the LSM companies employ around 7 million miners (Dorner et al, 2012). Moreover as shown in figure 3, it can represent a large amount of the world production in certain metals.

Table 1: Artisanal and small-scale mining proportion of world production in various metals in 2011. (ICMM, 2012)

Metal	ASM share (%)	ASM production (tonnes)	Total world production (tonnes)
Tantalum	26	205	790
Tin	25	88,500	354,000
Gold	25	681	2,724
Tungsten	>6	>4,320	72,000
Iron ore	<4	<79,720,000	1,993,000,000
Lead	3	140,100	4,670,000
Zinc	1	129,640	12,964,000
Copper	0.5	80,175	16,035,000

ASM includes mining activities done with the help of none or only very basic machinery by individuals. ASM can be illegal and is more common in developing countries; hence it is very difficult to find reliable statistics on it (Mining facts, n.d.).

LSM is dominated by less than 100 big companies including the one mentioned above. The rest of it is made of smaller and junior mining companies which may be privately held and active only in one place.

1.1.3 Industry forecast:

The metals and mining industry value is expected to continue its growth until 2017 to reach a value of \$3,999.5 billion. This represents an increase of 40.6% since 2012 (Marketline, 2014). It is to be noted, however, that since metals and coal are commodities their growth is subject to cyclicalities. Indeed, when the world economy slows down, then commodities prices vary accordingly. Since it is not possible for the industry to experience constant growth, companies' rivalry tends to increase in terms of economic downturn and companies without strong financial resources will be in troubles.

Although the industry is expected to continue to grow over the next few years, mining companies will still need to face several issues according to Deloitte (2012) and ICMM (2012).

The first category of these challenges regroups the financial ones such as the increase of the cost of doing business, the need to keep profits high, and the volatility of the commodities prices. The first issues are related to the decrease in easily accessible metals reserves. Indeed, mines are increasingly found in remote areas where infrastructure must be built before exploiting the mine, in traditional mines, the veins are found deeper and deeper, the ore found is of lesser grade and it is even possible to dig deep underwater. Then there is also a lack of talent and workers ask for increase in wages, hence, the labour cost is also increasing. Finally, the local authorities and communities ask for more guarantees such as a reconstruction after the exploitation of the mine.

The second category is the one concerned with sustainability; mining companies have to face an unrecorded amount of demands and expectations by their stakeholders. Workers have higher wages expectation than before; local communities want guarantees on the safety of the exploitation. Safety in underground mining is also becoming an issue since miners have to go deeper and experience new technologies to dig the metals.

Since metals and minerals demand is growing at the moment and is expected to continue its rise as emerging economies develop their infrastructures, mining is important. But it also raises the question of the working conditions for miners.

Accidents in mines are relatively common and mining is not considered a very safe profession but some could be avoided. Moreover, the number of miners who died while working is estimated at 12,000 per year (Nebehay, 2010). This can only be an estimate because ASM represents a significant proportion of miners but statistics on them are not always available since it can be illegal and / or unregulated. Finally, according to the International Labour Organisation (ILO) statistics, while mining employs around 1% of the global labour force, it generates 8% of fatal accidents (Norman, 2011).

The goal of this research is not really to determine why mining accident happen but what are their impact on the company exploiting the mine. It is important to note that mining is a dangerous activity due to its inherent characteristics. However, with some measures, the number of accident and the resulting number of injured and fatalities can be decreased. But to do so the owner of a mine need to have enough incentives to ensure a certain level of safety in their facilities.

Hence, in this work, the way companies manage risk will be evaluated to see why they take measures to ensure work safeness. I will try to see if there is a difference in the measures taken depending on the location of the facility and of the headquarter of the company (developing or developed country). I will also try to determine if the fact of being a public company has an impact on the way risk is managed.

1.2 The resources curse:

I felt I could not speak about the working conditions in mines without at least mentioning what is known as the resources curse. I feel this theory is worth mentioning because it touches the redistribution of wealth / profit from the mining exploitation to the local authorities / communities. Since working conditions may be part of the curse if they are bad this theory relates to this report topic. The concept can be defined as “the observation that countries rich in natural resources tend to perform badly” (Sachs and Warner, 2001). Although it is difficult to prove, this concept is widely accepted but the real reason behind this lack of economic performance is to my knowledge still unknown. According to the same article, it can be associated with other criteria such as a stronger authoritarian political system, a significant income inequality or a lack of saving and future vision, but those parameters cannot be considered a cause of the issue.

1.3 Risk definition

Risk is present in everyone's everyday life and it is the same for companies. Some have said that with no risk there is no profit but on the other hand, if too much risk is taken then losses may incur. Therefore, companies need to find the right balance between the amount of risk they are willing to take and the profit they want to make. Risk is not only difficult to manage it is also difficult to define.

Indeed, risk is a simple word in itself but it can be pretty difficult to grasp all its components and provide a complete definition of it. One of the reasons for this difficulty is that risk is a multidimensional and nuanced concept (Haimes, 2009). The simplest definition that has been found is the mathematical one as expressed by Fragnière and Sullivan, (2007):

$$\text{Risk} = \text{Probability} \times \text{Damages}$$

Although this is a pretty simple formula, it becomes trickier when one has to define what is meant by probability and by damages (to what extent are damages considered). Researchers proposed other definitions, but the mathematical one was retained because it is wide enough to apply for any companies and any system. This is important because risk is "inherently and fundamentally a function of the states of the system and its environment" (Haimes, 2009). Hence, it will differ from one company to another.

Since taking all the risk inherent to a business sector would be too dangerous for the growth of the business or even for its survival, companies have implemented risk management processes. The problem, however, is defining all the risks a company is exposed to and then quantify them to decide how much risk exposure it wants to take. If the Haimes (2009) approach to risk identification and management is considered, then 5 points need to be taken into account: performance capability of the system; its vulnerability and resilience; the consequences of a specific event; the state of the system at the time of the event and the probability of the event happening. All of these points need to be carefully analysed to determine risks the problem is that they involve a part of subjectivity.

1.3.1 Risk management definition

As seen above, risk is already a difficult notion to fully understand, but it becomes even more complicated when a company has to start managing its risk exposure. In fact, risk management is still, according to Fragnière and Sullivan (2007), new except in finance and commodity trading where companies hedge their exposure to price volatility since the creation of the relevant market. But, actually, risk management can be quite intuitive since the goal is to identify all the potential risks your business is subject to and then to try and define as best as possible all the possible consequences of an event happening. Then the company has to decide how much risk exposure it is ready to bear and which share of their exposure they want to mitigate. It is not profitable to mitigate all existing risks since “no risk often equals no profit”, hence, a business need to find the right balance between risk and profit. Put like that it can sound relatively easy, but in reality, risk manager need an increasing dose of creativity to identify the most far-fetched and improbable risk his company may be expose to. Some could argue that since the calculation to find the cost of each risk is a basic multiplication then if the probability is (very low) then it should not be considered even if the potential damages are high, but in the recent years this has changed and managers have to be creative to define those low probability risk and try to catch all their implications.

For mining companies, this can be summarized as defining all the “traditional” risks such as price volatility of the commodity, halt of operation due to an accident, etc. But it also means identifying the risk of your mine being flooded by a huge tsunami, or the risk the region you are located in switch from a political system to another (Deloitte, 2012). Hence risk manager in mining companies have to become more creative in order to identify those events.

However, this report will focus on risk related to the working conditions in mines and the impact it had on the sustainability of the exploiting company. The risks can range from a small injury at work to death of miners due to a blast or a cave down of the mine. It also includes the health issues that may happen due to inhalation of chemicals or damages to the environment due to human errors. It is to be noted that mining is not a risk free activity, but risk can still be mitigated.

1.3.2 Operational risk

There are a lot of different types of risks. Some of them are of a financial nature, other are non-financial or operational risks such as the legal risks, risks developing from the environment the company is active in, and finally there are reputation and compliance risks.

Operational risks are “the risk of indirect loss resulting from inadequate or failed internal processes, people, and systems, or from external events. (...) Non-financial risks tend to be of a human, market, or environmental nature and to be conceivable but not measurable.” (Fragnière and Sullivan, 2007).

This report is concerned about the operational risk resulting from the working conditions in the mines. This has a direct impact on the compliance and the reputational risks of a company, since accidents with injured and/or dead are frequently reported in the media and can, hence, hinder the reputation of the company. Safety in mines is also, usually, subject to regulations from authorities, hence an accident may be due to the non-compliance of those rules. In the case of an accident to happen due to a wrongly evaluated operational risk, the financial consequences may also be an issue.

Therefore, although this report is not directly concerned about compliance risk and reputational ones, they may be increased due to the working conditions, thus, I felt I could not avoid speaking about them. They may also influence the conclusion from this research since if they increase, it also means that the risk exposure of a company increase, hence, they may be part of the incentive for company to tackle the working conditions issues.

1.4 Developing countries definition

Since in this report the concept of developed and developing countries is the basis of the comparison it is important that every reader have a common understanding of what is meant by it. Because it is difficult to find a common definition of this concept; this report bases its categorization of country on the definition proposed by the World Bank (2013): a developing country is one where the gross national income is equal to or below \$12,675.00 per year.

1.5 Working condition definition

By working conditions, it is meant the number of hours worked per day, the wages, the safety of the pit for the miners, their training, and the presence or not of chemicals in the tunnels.

1.6 Hypothesis:

After reviewing what the literature says on this research topic, I formulated a few hypothesis that will be tested after the data collection. The hypothesis testing method states that if the positive one cannot be proven, then it is assumed that the negative one is correct. Here are my hypothesis:

H1a: The working conditions in mines are influenced by the level of development of the country it is in.

H1b: The working conditions in mines are not influenced by the level of development of the country it is in.

H2a: The working conditions are influenced by the level of corruption in the relevant country.

H2b: The working conditions are not influenced by the level of corruption in the relevant country.

H3a: The working conditions are influenced by the location of the Headquarters of a company.

H3b: The working conditions are not influenced by the location of the Headquarters of a company.

H4a: The working conditions are influenced by the type of company (public/private; big small) exploiting the mine.

H4b: The working conditions are not influenced by the type of company (public/private; big small) exploiting the mine.

In the end the idea is to determine if companies have enough incentives to improve the working conditions or not. It is possible that the results of this research will not be very affirmative as it is expected that they will differ following the type of companies.

2. The research methodology and data collection

The methodology used to test the hypothesis is made of three parts: the first one is an analyse of a selection of countries. This will help to determine the impact of corruption and development on the working conditions in mines. Then six public companies will be analysed to see what their politic on working conditions is. Finally, a few mining accident of the last few years will be analysed to see the impact on the concerned company and the measures, if any, that were taken afterwards.

To achieve a comparison one of the best way would have been to systematically collect data on mining accident for the past few years. A way of doing that could have been to systematically check the press. However, it was not feasible since for 2013, more than 800 press articles were found when doing a research by keyword on Nexus database. Therefore, the following methodology was retained even if it is a huge simplification of the industry.

These three approaches will be crossed in order to help me determine what parameters impact the working conditions in one way or another.

2.1 Selection of countries

The countries selected for this report are the following.

- Australia
- USA
- Canada
- Ukraine
- South Africa
- Russia
- China
- Chile
- Botswana

They have been chosen according to several criteria; the main one being their importance for the worldwide mining industry. However since for some countries there was not many data available, these countries are not a list of the top nine countries of the world. Moreover, countries from the 5 continents were selected.

The data collected for those countries comprise the population size, the GDP and the GDP growth rate, the status given to each country by the World bank, their political regime, the corruption level, their country risk as defined by Euromoney and the importance of the mining industry for their national economy.

Country risk has been defined using the Euromoney ranking; as a comparison, the country that ranked number 1 in 2011 was Norway with a score of 93.44 out of 100. The 2011 ranking was used because more recent ones were not freely available.

The measure of corruption used was the evaluation from Transparency International from 2009 to 2013 to try to see if an evolution happened. To allow for a comparison, the score of the country that ranked number 1 was recorded under “Number 1” and the score of Switzerland (CH) was also taken into account:

Table 2: Corruption level according to Transparency International, (Transparency International).

Corruption level according to Transparency International					
Country	2009	2010	2011	2012	2013
Canada	87	89	87	84	81
USA	75	71	71	73	73
Australia	87	87	88	85	81
Ukraine	22	24	22	26	25
South Africa	47	45	41	43	42
Russia	22	21	24	28	28
China	36	35	36	39	40
Chile	67	72	72	72	71
Botswana	56	58	61	65	64
CH	90	87	88	86	85
Number 1	94	93	95	90	91

2.1.1 Australia¹

Table 3: Australia in number

Population size	22.3 million
GDP (2013)	1560.597 million US dollars
GDP growth rate	2.7%
Countries status (World bank)	Developed
Percentage of mining industry in GDP	9.2%
Main mining resources	Among others: Bauxite; Iron Ore; Gold; Zinc; Uranium; black coal and copper.
Political regime	Constitutional monarchy (part of the Commonwealth)
Country risk according to Euromoney (2011)	85.36 (rank:10)

¹ The references for the data for the « country » in number tables can be found in the bibliography in the country section. Putting them in each table was not practical.

This country has been selected because it is among the main mining country in the world, it is ranked number 3 by Citi bank in 2010 (Lubin, 2010).

The mining industry employs 245,000 people in 2011-12 (Safe Work Australia, 2013) and 10 miners lost their life while working in 2013 (Safe Work Australia, 2014). Moreover, there were 3365 successful claims for serious injury during the period 2010-11 (Safe Work Australia, 2013). Although this average is still above the average for other industry, it still decreased significantly since the 2000s as it can be observed on the graph below:

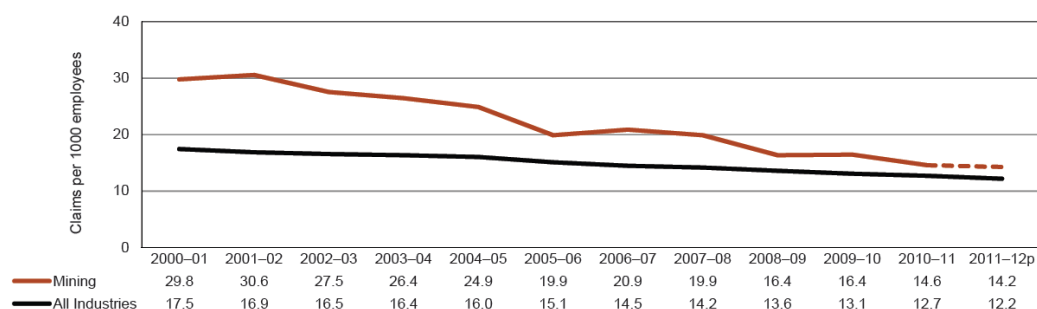


Figure 3: Serious claim: incidence rate per year (Safe Work Australia, 2013).

2.1.2 USA

Table 4: USA in number

Population size	318.6 million
GDP (2013)	16,800,000 million US dollars
GDP growth rate	1.9%
Countries status (World bank)	Developed
Percentage of mining industry in GDP	0.6%
Main mining resources	Copper, Molybdenum, Gold, Iron ore, Zinc, Coal, Lead
Political regime	Democracy (federation of state)
Country risk according to Euromoney (2011)	82.1 (rank 15)

The mining industry in the United States of America employed 800,500 persons as of 2012 (Bureau of Labor Statistics, 2013). 41 miners died while working in 2013 in the country; this represented a slight increase compared to 2012 and 2011 (MSHA, 2014). According to the National Mining Association (2014), 3,878 workers were injured in 2012.

The United States were selected because it is among the top mining nation and it is the first economy in the world; hence, it has a role to play and it is interesting to see what kind of legislation they put in place to guarantee mines safety.

2.1.3 Canada

Table 5: Canada in number

Population size	35.428 million
GDP (2013)	1,825,096 million US dollars
GDP growth rate	2.0%
Countries status (World bank)	Developed
Percentage of mining industry in GDP	3.4%
Main mining resources	Among others: Potash; Uranium; Aluminium; Cobalt; Diamond; Platinum; Nickel, Oil sands
Political regime	Constitutional Monarchy
Country risk according to Euromoney (2011)	87.17 (rank 7)

In Canada, 400,000 persons are employed in mining and minerals industries and in 2012, 69 miners lost their life at work, while 2440 were injured (Association of Worker's Compensation Boards of Canada, n.d.)

Canada was selected, because it apparently hosts headquarters of around 75% of all mining company on its territory (Canadian Network on Corporate Accountability, 2011). It also has important reserves of mineral resources on its own soil since it is ranked among the top mining nation by Citi bank (Lubin, 2010). Hence, it has the possibility to implement regulation that may have an impact on their territory but also abroad since the companies have offices in the country.

2.1.4 Ukraine

Table 6: Ukraine in number

Population size	45.55 million
GDP (2013)	177,431 million US dollars
GDP growth rate	1.9%
Countries status (World bank)	Economy in transition
Percentage of mining industry in GDP	7% in 2011
Main mining resources	Aluminium; Ferroalloys; Iron and steel; Iron ore; Manganese; Titanium; coal
Political regime	Democracy
Country risk according to Euromoney (2011)	43.97 (rank 89)

446,000 persons were employed in the mining industry in 2011 (USGS, 2011). Among them, 189 died the same year and 161 in 2012 from work related accident. There were also 4456 worker injured in 2011 and 3817 the following year according to the International Labour Organisation (2013). It is to be noted that in Ukraine, illegal mining is important; hence, those statistics may not reflect the actual situation since work related injury in ASM may not be reported as such to the authorities. Moreover, they only reflect the death of active miners, but miners are also likely to have contracted diseases while working in illegal mines due to the lack of safety equipment and the amount of toxic present in the air (Bauerova and Choursina, 2013).

This country was selected because it is among the top ten mining nation according to Citi bank (Lubin, 2010). Moreover it is the only country located in Europe to appear in this ranking, hence, I wanted to see how they managed their mining industry. Finally, their illegal mining is known to represent an important part of the industry and it is one of the country with the highest rate of mining accidents.

2.1.5 South Africa

Table 7: South Africa in number

Population size	52 million
GDP (2013)	350,630 million US dollars
GDP growth rate	1.9%
Countries status (World bank)	Developing
Percentage of mining industry in GDP	18%
Main mining resources	Gold, Coal, Chromium; Iron, Manganese; Uranium and many others
Political regime	Democracy
Country risk according to Euromoney (2011)	59.2 (rank 48)

South African mines employed 517,104 persons in 2011, 123 of them died at work and there were 3,299 injured in 2011 (SACEA, 2012). However, there may be some unrecorded death and injury as ASM is significantly present on the South African territory.

This country was selected because it is the biggest mining country in terms of natural resources, with lots of big mining companies operating in it. Moreover, in recent years, unions have been asking for an increase in wages.

2.1.6 Russia

Table 8: Russia in number

Population size	143.3 million
GDP (2013)	2,096,777 million US dollars
GDP growth rate	1.3%
Countries status (World bank)	Economy in transition
Percentage of mining industry in GDP	33%
Main mining resources	Chromium; Nickel; Palladium; Aluminium Palatinum; Zirconium; Valladium
Political regime	Federal democracy
Country risk according to Euromoney (2011)	56.83 (rank 57)

1,063,000 people worked in the mining industry in 2011. 306 persons died in mines in 2013, and 3,373 suffered from an injury (ILO, n.d.).

Russia, is also one of the biggest mining country in the world and it is one that has the biggest rate of exploitation of its natural resources. Hence, I thought it was interesting to see how they manage the risks related to working conditions.

2.1.7 China

Table 9: China in number

Population size	1,347.4 million
GDP (2013)	9,240,270 million US dollars
GDP growth rate	7.7%
Countries status (World bank)	Developing
Percentage of mining industry in GDP	N/A
Main mining resources	Aluminium; Coal Fluorspar; Gold; Mercury; Rare earth
Political regime	Dictatorship of a party
Country risk according to Euromoney (2011)	63.55 (rank 40)

In 2010, it is estimated that 3704 miners died in China; 2433 of them were working in coal mines (China org, 2011). Approximately 55,360,000 persons worked in mines in 2009. The number of injured persons was not found. It is also to be noted that these numbers comes from the Chinese authorities but they may be undervalued as China is suspected of covering mining accidents. Finally, ASM is significantly present in China because of the rapid growth of the sector, hence, the miner who died while working in this kind of exploitation may not be recorded.

China was chosen because it is part of the BRIC and it is rapidly growing. Hence, it is sucking in a big part of the commodities extracted in the world. To secure sources of mineral resources, it is rapidly developing its own industry but China is also strongly investing abroad especially in Africa to secure mineral reserves. Therefore, it is interesting to see the kind of risk management put in place in the country since it has a certain impact on the worldwide mining industry.

2.1.8 Chile

Table 10: Chile in number

Population size	17.4 million
GDP (2013)	277,199 million US dollars
GDP growth rate	4.1%
Countries status (World bank)	Developing
Percentage of mining industry in GDP	13% in 2012
Main mining resources	Copper; Gold; Lithium; Molybdenum;
Political regime	Democracy
Country risk according to Euromoney (2011)	73.61 (rank 27)

In Chile, 237,000 persons work in mines in 2012 according to the Chilean Mining Council, (n.d.). Although the country has quite stringent regulation concerning the safety in mines, there were still, 29 deaths in 2011 (Crellin, n.d.).

Chile was chosen because it also is among the biggest miner in the world; moreover, it relies mainly on one commodity: copper. Finally, it is located in South America, which allows me to have a brief glance at what is done in terms of working condition risk management in this part of the world. Its mining industry was also brought to light in

2010 with the cave in of the San José mine which trapped 33 miners underground for 10 weeks and required huge financial and material resources to save them.

2.1.9 Botswana

Table 11: Botswana in number

Population size	2 million
GDP (2013)	14,788 million US dollars
GDP growth rate	5.9%
Countries status (World bank)	Developing
Percentage of mining industry in GDP	35%
Main mining resources	Diamonds; Coal; Copper; Nickel
Political regime	Democracy
Country risk according to Euromoney (2011)	54 (rank 62)

Around 15,482 persons were employed as miners in Botswana in 2009, the same year 32 accident were reported and only 2 of them resulted in a fatal issue (Department of Mines, 2009). This low number of accidents can be partially explained by the definition of accident used in this report: only the accident important enough to incapacitate an employee for more than 3 days excluding the day of the event, or in case of heat stroke, electric shock and inhalation of poisonous fumes or gases for 48 hours after the accident. Hence, if it resulted only in small injuries, then they are not reported and, therefore not taken into account in the official statistics. The data are a bit older than for the other countries but they were the most recent I could find.

Botswana was selected not because of the amount of mineral resources it has since it is not in the top mining nations but it is a country where the corruption is quite low and it is considered to have been able to avoid or beat the resource curse. Hence, I wanted to see if this had a positive impact on the working conditions in the country. Unfortunately, the data are a biased and the number of accident is likely to be higher than the one reported above, hence, comparison with other country is difficult.

2.2 Selection of companies

For the purpose of this research, 6 companies were selected:

- BHP Billiton
- Vale
- Anglo-American
- Rio Tinto
- Glencore-Xstrata
- Shenhua Energy

They are the six biggest mining companies in terms of market value according to Statista (2014). They also all are publicly traded; although this can biased the results, it was a criteria of selection due to the availability of data (annual report and CSR report). On the other hand, their headquarters location is more varied; this will allow me to see if this criterion has an impact on how they deal with working conditions.

The data collected for each of them, includes their revenues, their Headquarters location, the location of their mining activities, the main metals and minerals they extract, the number of miners (if available), the number of accident they recorded per year and how they manage the risk linked to the working conditions.

2.2.1 BHP Billiton

BHP Billiton has its headquarter in Melbourne Australia (BHP Billiton, 2014) and it is a dual listed company since its shares are traded in London (LSE), Johannesburg (JSE) and New York (NYSE; through American Depositary Shares) for the public listed company (Plc.) and on the Australian Securities Exchange (ASX) for the limited (Ltd) company (BHP Billiton, n.d.). Its revenue for the financial year 2013 were \$66.0 billion, it employed around 128,800 persons in 141 locations in 26 countries (BHP Billiton, 2013a). The company is extracting, apart from petroleum, Copper, Iron Ore, Coal, Aluminium, Manganese and Nickel and their mines are located in South America (Chile, Peru, Brazil and Colombia) North America, Africa (South Africa and Mozambique) and Oceania (Australia); 12 of their mines are underground (BHP Billiton, 2013a). During 2013 it unfortunately had 3 fatalities among its worker (at least one of them died on a petroleum extraction site which does not directly concern this research) and a total recordable injury frequency (TRIF) of 4.6 per million hours worked (BHP Billiton, 2013b).

The company has identified the following risks (BHP Billiton, 2013a):

- The safety and health risks for its employee, which can lead to a decrease in production and an increase in cost in case they need to pay damages and / or fines.
- The risk that a breach of their governance processes may lead to an increase in cost and a loss of reputation.

Among its core value, sustainability holds the first place and it is committed to “putting health and safety first” and they state that they follow the articles 6 and 12 of the ILO Safety and Health in Mines Convention 1995 (BHP Billiton, 2013b). Moreover, the company seems to be aware of the risk of durable health issues for miners (BHP Billiton, 2013b). It has a target of zero fatalities and a year-on-year improvement of their TRIF score and they aim at reducing the exposure to toxic products. I could not find any recent NGO report on the working conditions in BHP Billiton’s mines but the actual results shows that the company still need to improve its safety measure. They plan on reducing those risks through investments in new technologies and mining methods (driverless trucks, etc.); but this usually means that less worker are required to attain the same productivity level (BHP Billiton, 2013b).

It is part of several initiatives and commitments that aims at a better sustainability especially: the Voluntary principles on Security and Human Rights, the Extractive Industry Transparency Initiative and the United Nations Global Compact Principles (BHP Billiton, 2013b).

2.2.2 Vale

Vale is a Brazilian company with headquarters in Rio de Janeiro. It is traded in three different locations: New York (NYSE), the EuroneXt Paris and the stock exchange of Hong Kong limited (Vale, n.d. a). Its revenue for the fiscal year 2013 was \$46,767 billion and the company employed 212,400 persons around the world and it reported an injury rate of 2.6 per million hours worked and 7 fatalities (Vale, n.d. b). Their main source of revenue is the extraction of Iron Ore and Nickel (Vale, n.d. a).

This firm did identify the following risks in its annual report 2013 (Vale, 2014):

The first on is the safety and health risk because mining is a hazardous activity and this may be translated for the employee as injury, death or a lasting illness. They manage it by implementing safety and environmental standards and by putting in place processes to prevent those risks.

The also identified the risk of the shortage of talents, this may be due to the fact that the reputation of mining and of the company is not up to the expectations of young adults.

Finally, like BHP Billiton, they identified a reputational risk but only on case of non-compliance of the applicable regulations. They try to mitigate this by following update on local and international rules, laws and standards.

Although, they say they implement processes to improve the safety of their employees, Vale still has more death than BHP Billiton even if it apparently has a lower TRIF. Moreover, NGOs report on the working conditions in the company are more frequent than for the previous firm and Vale even received the Public eye award (also known as the Nobel prize of shame) in Davos in 2012 for diverse reasons including poor working conditions (International Rivers, 2012).

Finally, Vale is part of the EITI and also of the United Nations Global Compact group (Vale, n.d. b).

2.2.3 Anglo-American

Anglo-American is a British company with headquarters in London, United Kingdom. It has a primary listing in the London stock exchange (LSE), and secondary listings in the Securities Exchange South Africa (JSE), the Swiss Exchange (SWX), the Botswana Stock Exchange and the Namibian Stock Exchange (Anglo-American, 2014a). Its revenue for the fiscal year 2013 was \$29.342 billion and the company is employing 158,900 persons around the world. It has mining operation in South and North America, Africa and Oceania. Their business units includes: Iron Ore and Manganese, Coal (metallurgical and thermal), Copper, Nickel, Niobium and Phosphates, Platinum and finally Diamonds (Anglo-American, 2014b).

Last year, it unfortunately reported 14 deaths and it recorded a total recordable case (injury) frequency rate of 1.08 per 200,000 hours worked (Anglo-American, 2014c). Which should, as a comparison, represent a TRIF of 5.4 per million hours worked.

The company has identified the following risks related to working conditions (Anglo-American, 2014b):

The first one is the risk to fail to nurture and attract talent into the organisation, as for Vale this is linked to the working conditions through the company reputation and the working environment. They manage this risk by keeping a dialog with workers union and by creating a nice working environment.

The company also identified the risk that safety and health of their employee is at risk in case of accidents, this may lead to an impairment of their reputation and an increase in cost due to compensation. They mitigate it through implementation of safety processes.

Anglo-American also identified sustainability as one of their core value but as it can be seen with the number of fatalities and injuries, they still have not achieved that goal of zero harm. However, the safety in mines seems to have improved in the past few years (Carroll, 2012) and recent report by NGOs on working conditions in the company's facilities were not found.

Finally, Anglo-American is part of the Dow Jones Sustainable Index and has engaged in the UN global compact and the EITI (Anglo-American, 2014c).

2.2.4 Rio Tinto

Rio Tinto is a British-Australian company with headquarters in London, UK (Marketline, 2014). As it is a dual listed company, the shares for Rio Tinto Plc. are traded in primarily in London (LSE) and as a secondary listing, on the NYSE Euronext Brussels and in New York (NYSE). The shares for Rio Tinto limited are traded on the Australian Securities Exchange (ASX) (Rio Tinto, n.d.).

During the Fiscal year 2013, the company made \$51,171 billion in revenues (Rio Tinto, 2014a). Moreover, it is employing 66,000 persons across the world. The number of fatalities was 19 including 16 deaths in the Grasberg Mine, a non-managed operation (Rio Tinto, 2014a). The injury frequency rate was 0.65 for 200,000 hours worked (Rio Tinto, 2014a) which means a TRIF of 3.25 for a million hours worked.

According to their Annual Report 2013 (Rio Tinto, 2014a), the company identified the following risks linked to the working conditions:

- The risk to fail to comply to standards and laws which includes the failure to guarantee the safety and health of the work force.
- The risk that the company will not be able to retain and / or recruit the necessary talent to ensure the sustainability of its operations.
- The risk that labour disputes may arise and disrupt the operations of a mine.

Finally, Rio Tinto seems to work on a regular basis with partners to operate a mine (joint venture), hence they identified the fact that those partners may fail to comply with the company standards especially in health and safety as a risk.

As for the other company, it aims at “a zero harm” but it failed in 2013 since they had to record 19 deaths. Moreover, it seems to have some bad relation with NGOs and worker Union such as the London Mining Network (2010) and IndustriALL (2012) who reported bad working conditions among other breach of sustainable development. However, it is part of the Dow Jones Sustainability Index and the FTSE4 Good which are used to measure the sustainability performance of companies (Rio Tinto, 2014a).

Rio Tinto states that it support the EITI initiatives as well as the UN guiding principles of Business and Human rights as well as the WEF Partnering Against Corruption Initiative (Rio Tinto, 2014b).

2.2.5 Glencore-Xstrata

Glencore-Xstrata is a Swiss company based in Baar, Zug and according to its website; the company is listed in London (LSE), Hong Kong (HKEX) and Johannesburg (JSE). The main minerals mined by the company are Copper, Zinc, Nickel, Iron Ore, Aluminium, Gold, and Cobalt.

It has revenue of \$232,694 million in 2013 and it employed around 200,000 persons in 50 countries around the world. It is to be noted, however, that this company is active in both the extraction of minerals and metals and in the marketing of those products. Moreover, it also has production facilities in energy product such as crude oil and gas and in soft commodities (cereals) (Glencore Xstrata, 2014a). Hence, the revenue mentioned above is comes not only from minerals extraction. Among its 200,000 employees, 152,145 works in the metals and minerals segment including marketing activities. A total of 26 workers lost their life at work and their TRIF was 1.933 per million hours worked (Glencore-Xstrata, 2014b).

Among the risk identified in their annual report 2013 (Glencore-Xstrata 2014a), the following were related to the working conditions.

The first risk evoked is the possibility of bad relations with the workers and / or their unions. These are likely to be due to the workers unhappiness about their working conditions, and may lead to financial loss due to a decrease in productivity.

The second risk mentioned is the health and safety of their employee because if someone is (fatally) injured, then the company may face a shutdown of the mine for the purpose of an investigation and the cost linked to compensation due to the worker.

Although its TRIF score seems low compared to the other companies analysed in this report, Glencore-Xstrata is still in conflict with a lot on NGOs and has a fairly bad

reputation among them. However, it is part of the Down Jones sustainability index and it upholds the UN Universal declaration on Human Rights and the ILO Declaration of Fundamental Principles and Rights at Work (Glencore-Xstrata, 2014b).

2.2.6 Shenhua Energy

Shenhua Energy is a Chinese company with headquarters in Beijing, China. It is listed on the Shanghai Stock Exchange and on the Stock Exchange of Hong Kong Limited (Shenhua Energy, 2014). It is a company that is active at several steps of the coal supply chain including the mining of the mineral and its marketing and transportation.

It had total revenues of RMB283, 797 million which represents around \$46,133 million with the current exchange rate (1USD=6.15RMB according to Bloomberg, 2014). As mentioned above it is mainly mining coal mostly because it is a key commodity for China since they are in need of energy to pursue their development. The company is employing 91,487 persons and 25,998 are working in the coal production segment. Concerning the safety at work, they recorded a death rate of 0.003 per million tons of coal produced. If computed correctly, it represents around 1 or 2 fatalities for the year; hence, it is quite low compared to the other companies analysed. However, they do not report their injury frequency rate, therefore, it is impossible to find the number of injured employee (Shenhua Energy, 2014).

In their annual report 2013 (Shenhua Energy, 2014), they defined only one risk related to the working conditions; it is the risk of production safety for coal mines. They did not mention the reputational risk that may happen as a consequence of lacking working conditions. Neither do they identified the risk of not being able to recruit talent if the reputation is bad.

To conclude, the zero harm goal of the company is not yet achieved, but their mines seem to be relatively safe. Moreover, no report concerning the working conditions in Shenhua mines was found so it may be possible to assume that it has implemented good safety processes. I would, however, be careful with the number provided since the Chinese government is not in itself a model of transparency in my opinion.

2.3 Selection of accidents

The accident selected were the ones with international press coverage and/or of certain importance because it was considered that if a mining accident with these two characteristics did not have an impact on either party concerned (authorities, company, union, NGOs) then it is unlikely that accident without that do not meet those two criteria would have a significant impact.

Those accidents will be analysed with the following parameter: year; location (country/region); number of death; number of injured; type of mining; owner; consequences for the owners and resulting changes in regulations if any. Only 5 accidents were analysed but I believe they are among the worst mining accident in the past few years. The recent Turkey mining accident was not taken into account because I believe it is still too early to see the consequences of it.

The accidents selected are:

- The San José mine accident in 2010
- The double accident in Ukraine in 2011
- The Guangdong mine flooding in 2005
- The Ravensworth accident in 2013
- The Upper Big Branch Mine accident in West Virginia in 2010

The data collected on these accidents were summarized in a table that can be found in Appendix 1. The observations that may be made are the following:

Except for the Chilean accident, no regulation changes were made. However, consequences for the owner were except in the Ukrainian case relatively severe. In two occasions, the owning company had to be bought by another to pay for the compensation.

Most of the company involved were small to medium company except in the case of the Ravensworth death: Glencore-Xstrata owns the facility (Woodburn and Cook, 2013). But this last case was most likely due to negligence from the victim.

2.4 Bias

The methodology chosen is not free of bias. The following ones have been identified:

Due to a time and volume constraints, only a selected number of countries were selected and analysed. Although they are among the biggest mining country in the world, they may not be representative of the worldwide situation.

Then, only a few companies were chosen, hence this analysis can in no way pretend to be a representation of the worldwide mining industry. Moreover, the companies selected are all big groups and publicly traded which automatically eliminate the ASM and the medium to small mining company.

A third bias is created by the fact that only 5 accidents were analysed. This can in no case represent a complete overview of the mining industry accident. However, I believe that they are considered big in the countries where they happened and if no consequences were observed after them, then it is unlikely that smaller accident would have more impact.

The last bias is the fact that only publicly available data were used and since most of them are a reflection of the interest of the publisher, they by definition are biased.

3. Analysis

Now that all the required data have been collected, presented and explained, I will test the previously stated hypothesis to see if they can be proven or not. But first I will explain a few shortcuts that were necessary.

To simplify the data collection and to try to have a certain unity in the data collected, some assumptions were made:

Firstly, although the working conditions definition chosen included the number of hours worked, the wages, the training of the miners, the presence of toxic chemicals in the pit and finally the safety of the workers, it was simplified to the safety of miners. To evaluate this last parameter, the number of deaths and the injured per year were taken into account. Another issue is that the figures were not necessarily available for the same year. Hence, I took the most recent figures for all the countries.

All of the countries analysed have some set of regulations concerning safety in mines as well as working conditions minimum requirement. Hence, they were not systematically mentioned. The question is therefore not if countries have some regulations but it is how those regulations / standards / laws are implemented and controlled over the country. So this eventually leads to the level of corruption of a country.

Finally, when analysing the companies, I checked the type of sustainability initiatives the company was affiliated to. The one mentioned in this research are the one the company put in their annual or Corporate Social Responsibility report, hence, in some cases, NGOs do not agree with such statement; or they find that not enough is done towards sustainability.

In this section, all the data used come from the methodology and data collection section, hence; I did not repeat the sources of the numbers except when an information or a concept was for a reason or another new.

3.1 Testing of the first Hypothesis

As a reminder, the first set of hypothesis is the following:

- H1a: The working conditions in mines are influenced by the level of development of the country it is in.
- H1b: The working conditions in mines are not influenced by the level of development of the country it is in.

Since this hypothesis tries to prove that the safety in mine is dependent on the level of development of a country, I opposed the development status as defined by the World Bank to the number of death per year and made the following graphs:

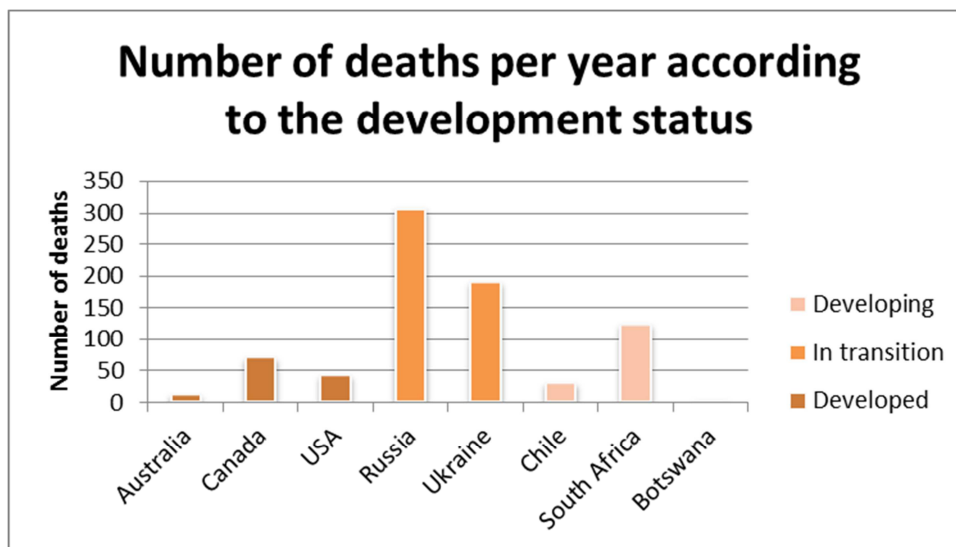


Figure 4: number of death per year according to the development status

China was excluded from the graph because the number was too big (3704) to have a clear representation of the number of death in the other countries.

Then I did the same with the number of injured per year and I got the following graph:

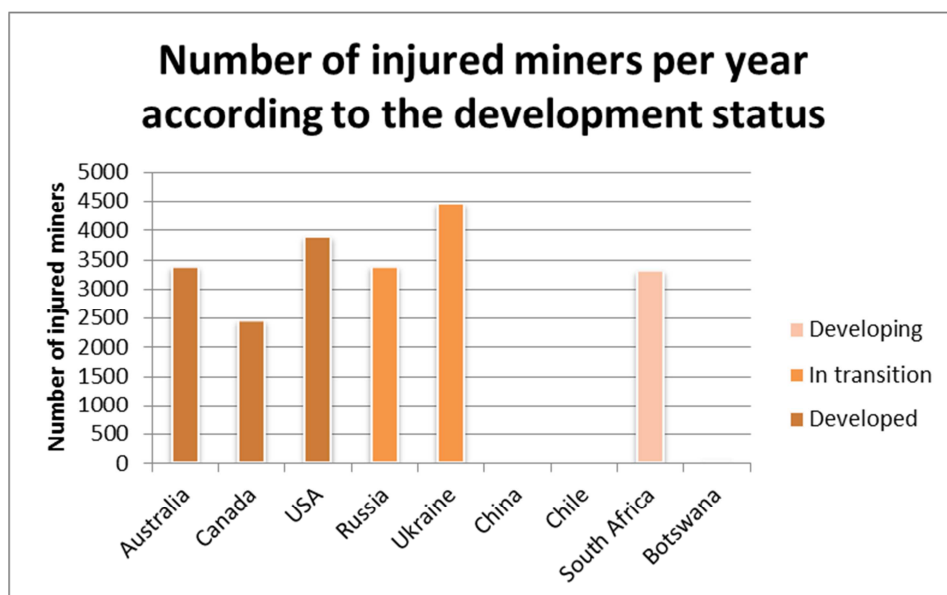


Figure 5: Number of injured miners per year according to the development status

Unfortunately, for this second graph, the data for China and Chile were not found, but since the number of deaths for China is already very high, it is highly possible that the number of injured is also significant.

The conclusion that may be made from these two graphs, is that the development status does not play a significant role in the prevention of mining accident. For some reason, the countries with the status of economy in transition are the one with the worse score in terms of mining deaths. However, when the figures above are showed as percentage of the total number of miners in the country, things change a little:

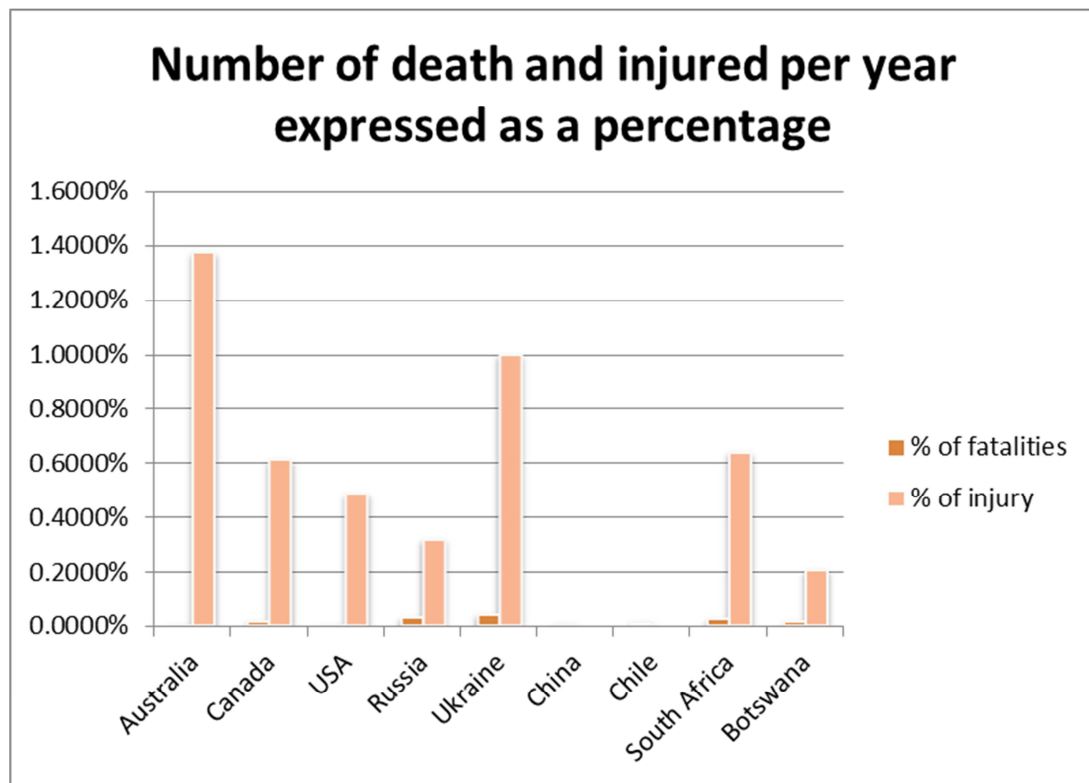


Figure 6: Number of death and injured per year expressed as a percentage

As it is possible to see on the Figure 6, Australia is quite bad when considering the percentage of injury among its active miners population. Moreover, the graph above shows us that the economies in transition have a bad score when considering the number of fatalities. This is difficult to explain with only the 2 set of data used in this hypothesis.

The conclusion that can be made after studying these graphs is that there is apparently no correlation between the development status of a country and the state of its miners' working conditions.

3.2 Testing of the second Hypothesis

As a reminder, the second hypothesis was:

- H2a: The working conditions are influenced by the level of corruption in the relevant country.
- H2b: The working conditions are not influenced by the level of corruption in the relevant country.

Since this hypothesis is again trying to find a correlation between two set of data, I decided to oppose them and show the results in a graphic form.

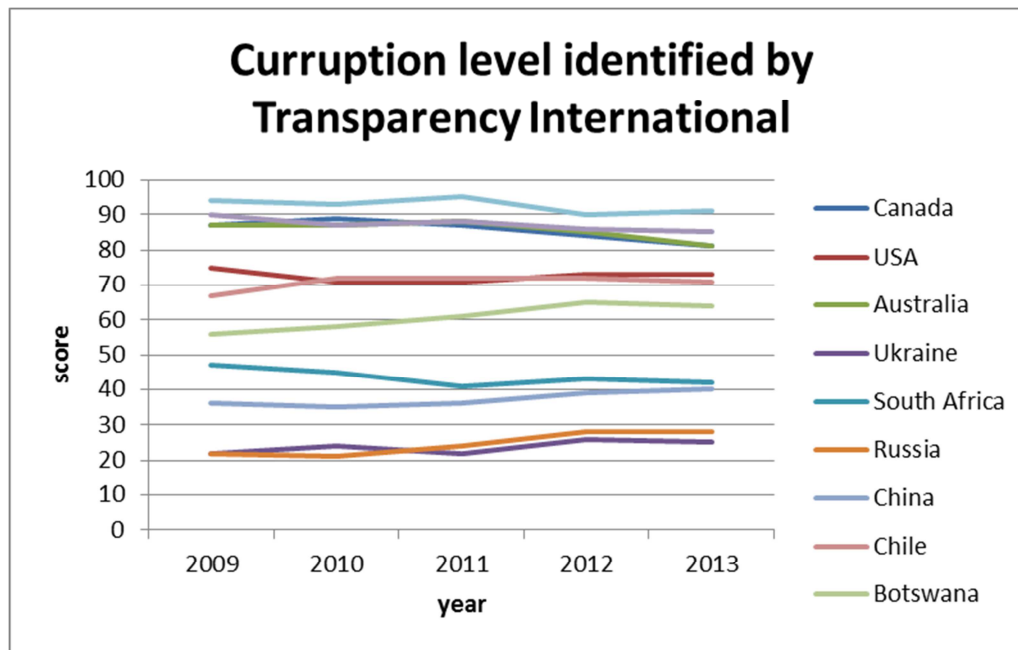


Figure 7: Corruption level identified by Transparency International

According to the figure 7, Russia, Ukraine, China, South Africa should be the country with the worse working conditions and, hence the biggest amount of injuries and / or fatalities. This theory works as long as one looks only at the absolute numbers, but as soon as the percentages are used, then it does not work. Indeed, and as mentioned above, Australia has the biggest percentage of injury which is in total contradiction with its level of corruption.

To conclude, for this set of hypothesis, the first one cannot be proven hence, it is assumed that the second one is true.

3.3 Testing of the Third Hypothesis

The third set of hypothesis was the following:

- H3a: The working conditions are influenced by the location of the Headquarters of a company.
- H3b: The working conditions are not influenced by the location of the Headquarters of a company.

Among the 6 companies analysed, 2 had their headquarters in countries the World Bank consider as developing economies: Brazil and China. The two companies are Shenhua Energy and Vale. Out of the two, Vale has according to NGO some working conditions issues, while the other almost seems to be an example of good practice according to the data found.

However, when one looks at the number of death and injury per company, the following results appear:

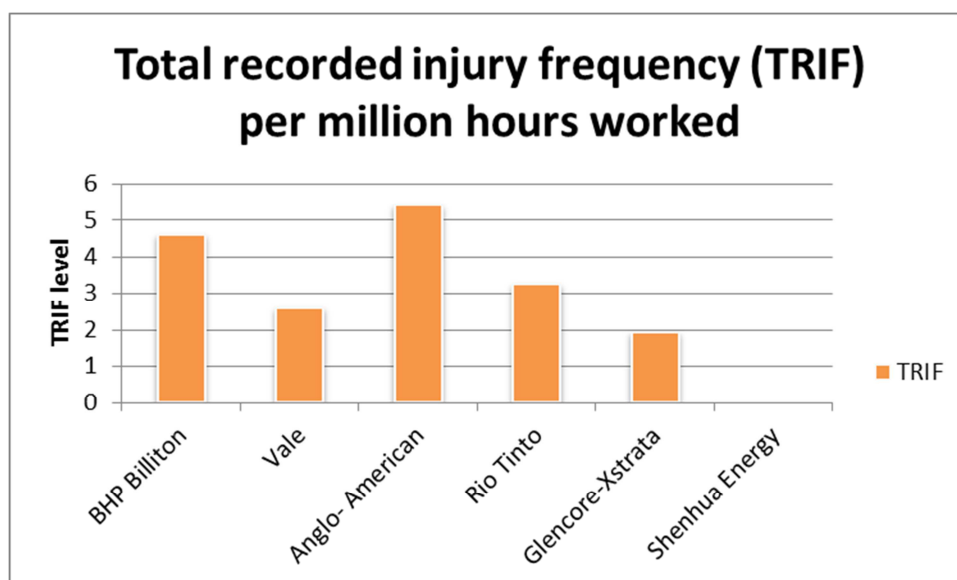


Figure 8: Total recorded injury frequency (TRIF) per million hours worked

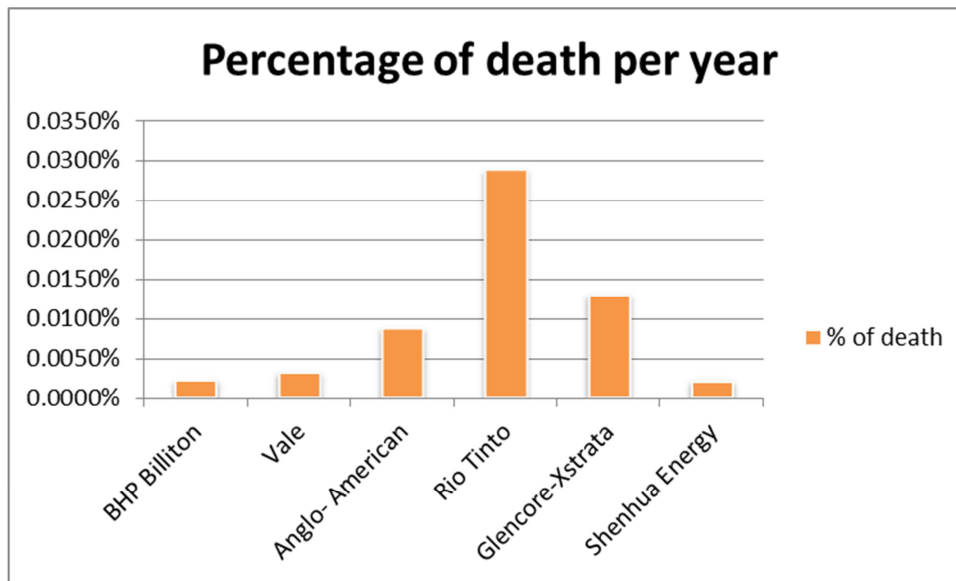


Figure 9: Percentage of death per year per company

As can be seen on figure 8, Anglo-American seems to be the company with the worse working conditions while Glencore Xstrata looks like the best. This is somehow funny because I would have thought it was the opposite while doing research. Indeed, the latter has a much worse reputation than the first. The TRIF for Shenhua was not available.

When looking at the number of death per year then Rio Tinto is clearly the worse company while Shenhua and BHP Billiton come out as the best. The results may be explained by the fact that the data collected are the one the company disclosed but the reality may be different for some companies. Moreover, working conditions, as mentioned before, were simplified as being the number of death and injury per year, but they can hardly be summarized as being only that.

To conclude, according to the data collected, the hypothesis stating that the location of the headquarters may have an impact on the working conditions cannot be proven, hence the hypothesis H3b is retained.

3.4 Testing of the fourth Hypothesis

The final set of hypothesis is:

- H4a: The working conditions are influenced by the type of company (public/private; big small) exploiting the mine.
- H4b: The working conditions are not influenced by the type of company (public/private; big small) exploiting the mine.

This hypothesis is difficult to verify since very few data were collected on small to medium mining companies. The only point that can help me define if it holds is the data

collection on the accidents (see appendix 1), which clearly shows that the worse accident happened in facilities owned by small to medium mining companies. This would tend to show that indeed, the size of the company plays a role in the state of the working environment. However, as this assumption is based on 4 accidents only, it is not very conclusive.

4. Discussion

After having tested the proposed hypothesis I could not determine if companies had enough incentives to manage their risk related to working conditions. Indeed, the unique hypothesis that went in that direction is the last one but only a very small set of data was used; hence it can probably provide only direction in which to further the research.

For the three first sets of hypothesis, the evidence collected show that the corruption level of a country, the localisation of the headquarters, and the development status of a country has no impact on the working conditions in mines.

My opinion is that the size of the company has an impact on working conditions in mines and especially on safety: the smaller the company, the worse the working conditions. In that case, I believe the other parameter tested in the hypothesis may hold some truth: if the country is heavily corrupted, then the regulations if any are less likely to be applied and controlled. Hence, one may assume that the bad reputation of the mining sector is fuelled by the way small and medium mining companies manage their working environment and not really by the huge mining group analysed in this report.

The development status of a country, however, plays a smaller role in the working conditions and on the corruption score. As could be seen in this research (figure 7), Botswana which is a developing country has a better corruption score than Russia and Ukraine who are considered economies in transition and it also holds a better score than the two BRICS countries analysed (China and South Africa). Botswana is also praised by NGOs and other actors for managing, until today at least, to beat the resources curse.

4.1 Future incentives

On the other hand, relatively recent developments towards sustainability tend to make me think that if companies still do not have enough incentive to start managing the risk related to working conditions, then they soon may start caring more about it.

Indeed, the apparition of several sustainability indices such as the Dow Jones Indices or the FTSE4 Good and the creation of hedge funds such as Ethos in Switzerland, that invest only in responsible companies shows that some investors care for the future. Hence, it will push company to develop in a more sustainable manner.

4.1.1 Compliance risks incentive

Countries are also implementing increasingly stringent regulations regarding working conditions in mines and some even start putting in place laws that allows them to take legal action against a company that has activity on its territory for practices done in other part of the world.

For example, “[t]he Canadian courts have interpreted the Canadian territorial jurisdiction to extend to offences committed outside Canada when there is a “real and substantial link” between the offence and Canada.” (Foreign Affairs, Trade and Development Canada, 2009). Although this currently apply mainly in case of corruption and bribery it can still become a serious incentive for mining companies with a presence in Canada to start managing their working conditions in their worldwide facilities.

Another example of this broadening of the vision of what is meant by territory is the recent court decision against BNP Paribas and the resulting billion dollars fine. The Bank had nothing to do with the US in the relevant transactions except the fact that the deals were made in dollars. So how long will it take for country to start applying their regulation and compliance system for the worldwide operation of a company and not only for its national activities?

Since paying millions of dollars in fine is not the dream of company, I believe that they should already start changing their practices to comply with international standards to anticipate this change.

4.1.2 Human resources incentives:

As mentioned a few times in this report, there is a shortage of human capital in the mining sector. This is more visible in some region than in others. A question that can be asked is why this shortage happened? My answer to that question is that an employee needs to be proud to work for a company. But if the company is frequently cited in the press for bad practices (even the one that are legal but immoral) then, he may find it a shame to continue working in this company so he will leave. Therefore, the firm needs to replace him, but what if all future talents heard of its bad reputation and do not want to be employed by it.

I think this case summarizes relatively well the actual situation in the extractive industry: it usually has a bad reputation because of the way it operates. The perceived lack of sustainability and in our case the bad working conditions do not motivate young

adults to enter the industry. So the bad working conditions inherently increase the shortage of talent that some company already identified in their risks.

4.1.3 The reputational incentives:

Mining companies, especially big groups, are multinationals with operations in several countries. But if it has a bad reputation, then hosting countries may start to think they do not want this company to be active in the country. The authorities may refuse further or any implementation of the firm which can lead to difficulty to access already scarce mineral resources.

Countries where the company is already implemented may start developing more stringent regulation to manage the company and try to avoid its reputation detaining on the national image. For example, if Glencore-Xstrata reputation (considered fairly bad) starts to detain on the Swiss image (everything in order and clean), then it may cause a prejudice to the hosting country.

4.1.4 “Counter incentives”:

At the moment, the majority of the demand is generated by the developing countries that need a lot of mineral to continue their growth. This is especially true for China and the BRICS countries. Hence I think that as long as they are not picky about the origin and the conditions in which the minerals were extracted, companies may still find ways to ignore the other incentives.

5. Conclusion

To conclude I think that mining companies can find incentives to change the way they manage working conditions. Some of them started to increase the automatisisation of their facilities. Although that may be seen as an increase in safety, I am not sure that miners will appreciate losing their jobs to robots.

On a more personal note, I was surprised on how little information on the mining working conditions was available. I thought NGOs would have published plenty of report on the topic, but it was not the case. As a matter of fact the majority of the reports were about environmental issues and about relations with local communities.

I also was surprised to see the results of the hypothesis testing. If I had to guess, I would have said that all the parameters used had an impact on working conditions and how companies manage them. Overall it was an interesting research and I enjoyed doing it.

Finally, this report provided only a glance on the topic and it does not aim at defining the whole industry practices. Hence, further research may easily be done; especially, if one focus on one of the chosen parameters and analyse it in depth.

Bibliography

Books:

FRAGNIERE, Emmanuel, SULLIVAN, George, 2007. *Risk Management: Safeguarding Company Assets*. Boston: NETg (Thomson Learning). ISBN 978-1-4239-1800-4.

FRAGNIERE, Emmanuel, TUBEROSA, Jean, MORESINO, Fransesco, TURIN, Nathalie, 2013. *L'étude de marché en pratique*. Bruxelles: De Boeck. ISBN 978-2-8041-7498-9.

WEBER-FAHR Monika, STRONGMAN John E., KUNANAYAGAM Ramani, MCMAHON Gary, and SHELDON Christopher, 2002. Mining. In KLUGMAN, Jenny. A Sourcebook For Poverty Reduction Strategies: Volume 2: Macroeconomic and Sectoral Approaches. [e-book]. Washington DC: World Bank. Pp 443-461 [Accessed: 01 August 2014]. Available at:< <http://documents.worldbank.org/curated/en/2002/01/5048221/sourcebook-poverty-reduction-strategies-vol-2-2-macroeconomic-sectoral-approaches> >.

Company report:

ANGLO-AMERICAN, 2014a. *Share Information*. [online]. [Accessed 01 August 2014]. Available at:< <http://angloamerican.com/investors/shareinfo.aspx>> .

ANGLO-AMERICAN, 2014b. *Annual Report 2013*. [online]. [Accessed 01 August 2014]. Available at:< <http://angloamerican.com/investors/reportingcentre.aspx>>.

ANGLO-AMERICAN, 2014c. *Sustainable Development Report 2013*. [online]. [Accessed: 01 August 2014]. Available at:< <http://angloamerican.com/investors/reportingcentre.aspx>>.

BHP BILLITON, 2013a. *Annual Report 2013*. [online]. [Accessed 01 August 2014]. Available at: < <http://www.bhpbilliton.com/home/investors/reports/Pages/Roll%20up%20Pages/2013-Annual-Report-Summary-Review-Form-20-F-Sustainability-Report-and-Sustainability-Reporting-Navigator-.aspx> >.

BHP BILLITON, 2013b. *Sustainability Report 2013*. [online]. [Accessed 01 August 2014]. Available at: < <http://www.bhpbilliton.com/home/investors/reports/Pages/Roll%20up%20Pages/2013->

[Annual-Report-Summary-Review-Form-20-F-Sustainability-Report-and-Sustainability-Reporting-Navigator-.aspx](#) >.

BHP BILLITON, n.d. Our company. [online] [Accessed 01 August 2014]. Available at: <<http://www.bhpbilliton.com/home/aboutus/ourcompany/Pages/default.aspx> >.

GLENCORE-XSTRATA, 2014a. *Annual Report 2013*. [online]. [Accessed 01 August 2014]. Available at: <<http://www.glencore.com/investors/reports-and-results/reports-archive/> >.

GLENCORE-XSTRATA, 2014b. *Sustainability Report 2013*. [online]. [Accessed 01 August 2014]. Available at: <<http://www.glencore.com/who-we-are/integrating-sustainability/sustainability-reports/>>.

MARKETLINE, 2014b. Rio Tinto: Company Profile. [online]. [Accessed 07 July 2014]. Available at: <<http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=5&sid=ad6e6a66-a9b8-4e15-8766-e23660c67882%40sessionmgr4001&hid=4214> > [access through subscription].

RIO TINTO, 2014a. *Annual Report 2013*. [online]. [Accessed 01 August 2014]. Available at: <<http://www.riotinto.com/reportingcentre2013/> >.

RIO TINTO, 2014b. *Sustainable Development 2013*. [online]. [Accessed 01 August 2014]. Available at: <<http://www.riotinto.com/reportingcentre2013/> >.

RIO TINTO, n.d. *Group Overview*. [online]. [Accessed 01 August 2014]. Available at: <<http://www.riotinto.com/aboutus/group-overview-5231.aspx> >.

SHENHUA ENERGY, 2014. *2013 Annual Report*. [online].]. [Accessed 01 August 2014]. Available at: <http://en.shenhuachina.com/cs/sh_china_en/PAGE1382683238772/sh_china_en_PL.html >.

VALE, 2014. *Annual Report 2013*. [online]. [Accessed 01 August 2014]. Available at : <<http://www.vale.com/EN/investors/Annual-reports/20F/Pages/default.aspx> >.

VALE, n.d. a. *Factsheet*. [online].]. [Accessed 01 August 2014]. Available at: <<http://www.vale.com/EN/investors/company/fact-sheet/Pages/default.aspx>> .

VALE, n.d. b. *Sustainability Report*. [online]. [Accessed 01 August 2014]. Available at : <<http://www.vale.com/EN/investors/Annual-reports/Sustainability-reports/Pages/default.aspx> >

Web Page:

BUSINESS INSIDER, 2011. The World's Top 5 Mining Countries. *WealthWire.com* [online]. 14 December 2011. [Accessed: 15 July 2014]. Available at: <<http://www.wealthwire.com/news/global/2372>>.

LUBIN, Gus, 2010. Forget Oil: 15 Countries Sitting On A Fortune Of Metals And Minerals. *Business Insider.com* [online]. 26 April 2010. [Accessed: 15 July 2014]. Available at: <<http://www.businessinsider.com/15-resource-rich-countries-2010-4?op=1>>.

MINING AUSTRALIA, 2013. The top five mining countries and their GDP. *MiningAustralia.com* [online]. 28 August 2013. [Accessed: 15 July 2014]. Available at: <<http://www.miningaustralia.com.au/news/thetopfiveminingcountriesandtheirgdp>>.

MINING FACTS, n.d. What is Artisanal and Small-Scale Mining? *MiningFacts.org* [online]. [Accessed: 15 July 2014]. Available at: <<http://www.miningfacts.org/Communities/What-is-Artisanal-and-Small-Scale-Mining/>>.

NEBEHAY, Stéphanie, 2010. Many mining deaths go unrecorded: ICEM. *Mines and Communities.org* [online]. 11 October 2010. [Accessed: 15 July 2014]. Available at: <<http://www.minesandcommunities.org/article.php?a=10443>>.

NORMANN, Jennings, S., 2011. Mining: An Overview. *Ilo.org* [online]. [Accessed: 3 August 2014]. Available at: <<http://www.ilo.org/oshenc/part-xi/mining-and-quarrying/item/594-mining-an-overview?tmpl=component&print=1>>.

PLANETE-ENERGIES, 2010. How Coal is Formed- A Long Story. *planete-energies.com* [online]. 10 December 2010. [Accessed: 15 July 2014]. Available at: <<http://www.planete-energies.com/en/energy-sources-/coal/the-formation-of-coal-56.html>>.

STATISTA, 2014. Top 10 mining companies worldwide based on market value in 2014 (in billion U.S. dollars). *Statista.com* [online]. [Accessed: 15 July 2014]. Available at: <<http://www.statista.com/statistics/272706/top-10-mining-companies-worldwide-based-on-market-value/>>.

General report and articles:

BASEL COMMITTEE ON BANKING MANAGEMENT, 1998. *Operational Risk Management*. [online]. [Accessed 15 July 2014]. Available at : <
http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCQQFjAA&url=http%3A%2F%2Fwww.bis.org%2Fpubl%2Fbcbs42.pdf&ei=UH_sU8zvCY2p7Aal9oDoBQ&usq=AFQjCNH7IQRSAUax3BTulKiLh8eKYYcJlg&bvm=bv.72938740,d.ZGU>.

BASEL COMMITTEE ON BANKING MANAGEMENT, 2001. *Consultative Document : Operatinonal Risk*. [online]. [Accessed 15 July 2014]. Available at : <
http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCCEQFjAA&url=http%3A%2F%2Fwww.bis.org%2Fpubl%2Fbcbsca07.pdf&ei=DX_sU-6MCLLQ7Aar34HwDA&usq=AFQjCNEr1K2JKuqLPJGq9ltaQwQUK5ywnA&bvm=bv.72938740,d.ZGU>.

DELOITTE, 2010. *Tracking the trends 2012: The top 10 trends mining companies may face in the coming year*. [online]. [Accessed 15 July 2014]. Available at: <
www.deloitte.com/assets/Dcom-Canada/Local%20Assets/Documents/EandR/Mining/ca_en_energy_Tracking_the_trends_2012_113011.pdf>.

DORNER, Ulrike, FRANKEN, Gudrun, LIEDTKE, Maren, SIEVERS, Henrike, 2012. *Artisanal and Small-Scale Mining (ASM)*. [online]. [Accessed 15 July 2014]. Available at: <
http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CBwQFjAA&url=http%3A%2F%2Fwww.polinaires.eu%2Fdocs%2Fd2-1%2Fpolinares_wp2_chapter7.pdf&ei=bnbsU7_qEO7b7AaO1YGABg&usq=AFQjCNEiU1l9iPCK_oengBI0KwBSZnX-Lg&bvm=bv.72938740,d.bGE>.

EY, 2013. *Business risks facing mining and metals 2013-2014*. [online]. [Accessed 15 july 2014]. Available at: <
http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CDAQFjAC&url=http%3A%2F%2Fwww.ceecthefuture.org%2Fwp-content%2Fuploads%2F2013%2F12%2FBusiness_risks_facing_mining_and_metals_2013%25E2%2580%25932014_ER0069-1.pdf&ei=Sn3sU8mXGuuM7Ab4IYEo&usq=AFQjCNGCJqJUkNo7UDEOIATAovbUsBu8xw&bvm=bv.72938740,d.ZGU>.

HAIMES; Yacov Y, 2009. On the complex definition of risk: a system-based approach. *Risk Analysis* [online] [Accessed 07 July 2014]. Available at:

<<http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=3&sid=70075de7-9b05-4353-9164-6a8e66652de5%40sessionmgr4002&hid=4214>> [access through subscription].

ICMM, 2012. *Trends in the mining and metals industry*. [online]. [Accessed 15 July 2014]. Available at : <

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCsQFjAB&url=http%3A%2F%2Fwww.icmm.com%2Fdocument%2F4441&ei=VXvsU6f7NKmu7A bx24CoDA&usq=AFQjCNH996NL0eisFa5ExWZulcfFBRK-6Q&bvm=bv.72938740,d.ZGU> >.

IIED, 2013. *Responding to the challenge of artisanal and small-scale mining : How can knowledge networks help ?*. [online]. [Accessed 15 July 2014]. Available at : <

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CDoQFjAC&url=http%3A%2F%2Fpubs.iied.org%2Fpdfs%2F16532IIED.pdf&ei=k3zsU9ihMeGM7Aa30oGYDg&usq=AFQjCNFR8z12ljK0qr jsMkdfIPohY2cDw&bvm=bv.72938740,d.ZGU> >.

Marketline, 2014 Global Metals and Mining: industry profile. [online] [Accessed 07 July 2014]. Available at:

<<http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=ad6e6a66-a9b8-4e15-8766-e23660c67882%40sessionmgr4001&vid=4&hid=4214>> [access through subscription].

SACHS, Jeffrey D, WARNER, Andrew M, 2001. The curse of natural resources.

European Economic Review [online] [Accessed 15 July 2014]. Available at : <

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCCEQFjAA&url=http%3A%2F%2Fearth.columbia.edu%2Fsitefiles%2Ffile%2Fabout%2Fdirector%2Fpubs%2FEuroEconReview2001.pdf&ei=OZHsU4SxGMay7AaYwoGoCQ&usq=AFQjCNEsjXcpizz2t3BuZBvgwZ3RuojW3Q> >.

UNITED NATIONS, 2012. *World Economic Situation and Prospects 2012 : Statistical annex*. [online]. [Accessed 15 July 2014]. Available at : <
http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.un.org%2Fen%2Fdevelopment%2Fdesa%2Fpolicy%2Fwesp%2Fwesp_current%2F2012country_class.pdf&ei=03_sU8LIK8Su7AbzplGQAq&usq=AFQjCNGM1q_-vdfWK_qNrLi-HJoQ1y4Qkw&bvm=bv.72938740,d.ZGU >.

Country data

General

EUROMONEY COUNTRY RISK, n.d. Country Wiki. EuroMoneyCountryRisk.com [online]. [Accessed: 15 July 2014]. Available at:
<<http://www.euromoneycountryrisk.com/Wiki/Countries> >.

WORLDBANK, 2013. New Country Classifications. *WorldBank.org* [online]. 07 February 2013. [Accessed: 15 July 2014]. Available at:
<<http://data.worldbank.org/news/new-country-classifications> >.

WORLDBANK, 2014. Gross domestic product 2013. [online]. [Accessed: 15 July 2014]. Available at:
<<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=8&ved=0CGIQFjAH&url=http%3A%2F%2Fdatabank.worldbank.org%2Fdata%2Fdownload%2FGDP.pdf&ei=-UjmU4irJaQb7QavnIGIDg&usq=AFQjCNEIwhnm5v2jnwU2M-1JvCc0lXLXsw&bvm=bv.72676100,d.ZGU> >.

WORLDBANK, n.d. GDP Growth Rate. *WorldBank.org* [online]. [Accessed: 15 July 2014]. Available at: <
<http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG/countries?display=default> >.

Australia

AUSTRALIAN GOVERNMENT, n.d. Our Government. *Australia.gov.au* [online]. [Accessed: 1 August 2014]. Available at: <<http://australia.gov.au/about-australia/our-government> >.

GEOSCIENCE AUSTRALIA, n.d. Minerals Basics. *Ga.gov* [online]. [Accessed: 1 August 2014]. Available at: <<http://www.ga.gov.au/scientific-topics/minerals/basics> >.

SAFE WORK AUSTRALIA, 2014. Worker fatalities. *SafeWorkAustralia.gov.au* [online]. [Accessed: 10 August 2014]. Available at: <<http://www.safeworkaustralia.gov.au/sites/swa/statistics/work-related-fatalities/pages/worker-fatalities> >.

SAFE WORK AUSTRALIA, n.d. Mining Fact Sheet. *SafeWorkAustralia.gov.au* [online]. [Accessed: 1 August 2014]. Available at: <<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/fs2010mininginformationsheet> >.

SAFE WORK AUSTRALIA, n.d. Work-related Traumatic Injury Fatalities Australia 2013. *SafeWorkAustralia.gov.au* [online]. [Accessed: 1 August 2014]. Available at: <<http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/work-related-traumatic-injury-fatalities-australia-2013> >.

TRADING ECONOMICS, n.d. Australia | Economic Indicators. *TradingEconomics.com* [online]. [Accessed: 1 August 2014]. Available at: <<http://www.tradingeconomics.com/australia/indicators> >.

US

BARNES, Wade, 2006. Mining in USA. *Infomine.org* [online]. May 2006. . [Accessed: 1 August 2014]. Available at: <<http://www.infomine.com/countries/SOIR/USA/welcome.asp?i=usa-soir-3> >.

BUREAU OF ECONOMIC ANALYSIS, n.d. Gross-Domestic-Product-(GDP)-by-Industry Data. *Bea.gov* [online]. [Accessed: 1 August 2014]. Available at: <http://www.bea.gov/industry/gdpbyind_data.htm>.

BUREAU OF LABOR STATISTICS, 2013. Employment by major industry sector. *Bls.gov* [online]. December 2013. [Accessed: 1 August 2014]. Available at: <http://www.bls.gov/emp/ep_table_201.htm >.

MINING SAFETY AND HEALTH ASSOCIATION, 2014. All mining fatalities by state by calendar year. [online] [Accessed: 1 August 2014]. Available at: <<http://www.msha.gov/stats/charts/chartshome.htm>>.

NATIONAL MINING ASSOCIATION, n.d. Most Requested Statistics - U.S. Coal Industry. [online]. [Accessed: 1 August 2014]. Available at:

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&ved=0CEwQFjAF&url=http%3A%2F%2Fwww.nma.org%2Fpdf%2Fc_most_requested.pdf&ei=S2_mU6PKKve7AaG7oDQDg&usq=AFQjCNEPXbpyk2mPVwRPuA4mjakxvb2LkQ&bvm=bv.72676100,d.ZGU>.

Canada:

ASSOCIATION OF WORKERS' COMPENSATION BOARDS OF CANADA, n.d. Statistiques. *AWCBC.org* [online]. [Accessed: 1 August 2014]. Available at: <http://awcbc.org/fr/?page_id=381#injuries>.

CANADIAN NETWORK ON CORPORATE ACCOUNTABILITY, 2011. Siding With Mining: Canada's role in mining-related conflicts unbecoming of a peacemaker. *CNCA-RCRCE.ca* [online]. 01 May 2011.]. [Accessed: 1 August 2014]. Available at: <<http://cnca-rcrce.ca/siding-with-mining/>>.

FOREIGN AFFAIRS, TRADE AND DEVELOPMENT CANADA, 2009. Building the Canadian Advantage: A Corporate Social Responsibility (CSR) Strategy for the Canadian International Extractive Sector. *International.gc.ca* [online]. March 2009. [Accessed: 1 August 2014]. Available at: <<http://www.international.gc.ca/trade-agreements-accords-commerciaux/topics-domaines/other-autre/csr-strat-rse.aspx#8>>.

KPMG, 2014. *Canada : Country mining guide*. [online]. [Accessed 15 July 2014]. Available at : <http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCYQFjAB&url=http%3A%2F%2Fwww.kpmg.com%2FCa%2Fen%2Findustry%2FMining%2FDocuments%2FKPMGMining-country-guide-Canada.pdf&ei=fXnsU83pG-HA7Aaq54DwBw&usq=AFQjCNGEtO_9mo4ETCMIrmQefiM9pSKHXQ&bvm=bv.72938740,d.ZGU>.

Ukraine:

BAUEROVA Ladka, CHOURSINA Kateryna, 2013. Ukraine's Illegal Coal Mines Lure Desperate Workers. *BusinessWeek.com* [online]. 27 November 2013. [Accessed: 1 August 2014]. Available at: <<http://www.businessweek.com/articles/2013-11-27/ukraines-illegal-coal-mines-lure-desperate-workers>>.

INTERNATIONAL LABOUR ORGANISATION, n.d. Ukraine. *Ilo.org* [online]. [Accessed: 1 August 2014]. Available at:

http://www.ilo.org/ilostat/faces/home/statisticaldata/data_by_country/country-details?_afLoop=173648332503849&country=UKR&_adf.ctrl-state=p6o90er3x_4>.

WORLD POPULATION REVIEW, 2014. Ukraine Population 2014.

WorldPopulationReview.com [online]. 2 April 2014. [Accessed: 1 August 2014].

Available at: <<http://worldpopulationreview.com/countries/ukraine-population/>>.

South Africa

MINERAL RESOURCES, n.d. Mine Health and Safety Inspectorate. [online].

[Accessed: 1 August 2014]. Available at:

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CBwQFjAA&url=http%3A%2F%2Fwww.sacea.org.za%2F.%255Cdocs%255CDMR_2012.pdf&ei=T5HnU-PpPMew7AaO4lCQDg&usq=AFQjCNETXy74P9OKf-lz2SlzwHYiA47Wew>.

SOUTH AFRICA INFO, n.d. South Africa's population. *SouthAfrica, info* [online]

[Accessed: 1 August 2014]. Available at:

<<http://www.southafrica.info/about/people/population.htm#.U-c-lGOmdJI>>.

USGS, n.d. The mineral industry of South Africa. *Search.usa.gov* [online]. [Accessed: 1 August 2014]. Available at:

<<http://search.usa.gov/search?affiliate=usgs&utf8=%E2%9C%93&query=south+africa&commit=Search>>.

Russia

GKS, 2013. Population. *Gks.ru* [online]. [Accessed: 3 August 2014]. Available at:

<http://www.gks.ru/bgd/regl/b13_12/lssWWW.exe/stg/d01/5-01.htm>.

INFOMINE, n.d. Mining in Russia. *Infomine.com* [online]. [Accessed: 1 August 2014].

Available at: <<http://www.infomine.com/countries/russia.asp>>.

INTERNATIONAL LABOUR ORGANISATION, n.d. Russian Federation. *Ilo.org* [online].

[Accessed: 1 August 2014]. Available at:

<http://www.ilo.org/ilostat/faces/home/statisticaldata/data_by_country/country-details?_afLoop=197465217844238&country=RUS&_adf.ctrl-state=gvox2mc4f_4>.

USGS, n.d. 2011 *Minerals Yearbook Russia*. [online] [Accessed: 3 August 2014].

Available at: <<http://minerals.usgs.gov/minerals/pubs/country/europe.html#rs>>.

China:

CHINA ORG, 2011. Coal mine deaths fall 'but still remain high'. [online]. 26 February, 2011. [Accessed: 3 August 2014]. Available at: <http://www.china.org.cn/china/2011-02/26/content_22008017.htm>.

ILO, 2012. National Profile report occupational safety and health china. [online]. 01 March 2012. [Accessed: 3 August 2014]. Available at: <http://www.ilo.org/safework/areasofwork/national-occupational-safety-and-health-systems-and-programmes/WCMS_186991/lang--en/index.htm>.

MINING TECHNOLOGIES, 2012. China's appalling mining death rate – dealing with 'disorderly' management. Mining<technology.com [online]. 31 October 2012. [Accessed: 3 August 2014]. Available at: <<http://www.mining-technology.com/features/featurechina-mine-death-rate-coal-safety/>>.

USGS, n.d. 2012 *Minerals Yearbook CHINA*. [online] [Accessed: 3 August 2014]. Available at: <<http://minerals.usgs.gov/minerals/pubs/country/asia.html#ch>>.

Chile

AZUL, Raphael, 2010. Chile mine rescue exposes precarious working conditions. WWSWS.org [online] 18 October 2010. [Accessed: 3 August 2014]. Available at: <<http://www.wsws.org/en/articles/2010/10/chil-o18.html>>.

CONSEJO MINERO, n.d. Human capital. *En.consejominero.cl* [online] [Accessed: 3 August 2014]. Available at: <<http://en.consejominero.cl/human-capital/>>.

CRELLIN, Olivia, n.d. Protecting Chile's Miners. *OliviaCrellin.com* [online]. [Accessed: 3 August 2014]. Available at: <<http://oliviacrellin.com/protecting-chiles-miners/>>.

KPMG, 2014. *Chile : Country mining guide*. [online]. [Accessed 15 July 2014]. Available at : <
<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCYQFjAB&url=http%3A%2F%2Fwww.kpmg.com%2FGlobal%2Fen%2FIssuesAndInsights%2FArticlesPublications%2FDocuments%2Fchile-mining-guide.pdf&ei=i3fsU8zaHczn7Aa3hYDYBQ&usq=AFQjCNGY6QTj67r94bdTRXWH6S1OFJUWKw&bvm=bv.72938740,d.ZGU>>.

WORLD POPULATION REVIEW, 2014. Chile Population 2014. *WorldPopulationReview.com* [online]. 23 March 2014. [Accessed: 3 August 2014]. Available at: <<http://worldpopulationreview.com/countries/chile-population/>>.

Botswana:

DEPARTMENT OF MINES, n.d. 2009 Department of mines annual report.

Mines.gov.bw [online]. . [Accessed: 3 August 2014]. Available at:

<<http://www.mines.gov.bw/publications.php>>.

KPMG, 2013. *2013 Quarter 1*. [online]. . [Accessed 15 July 2014]. Available at :

<<http://www.kpmg.com/africa/en/kpmg-in-africa/botswana/pages/default.aspx>>.

KPMG, 2014. *Botswana : Country mining guide*. [online]. [Accessed 15 July 2014].

Available at : <

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&ved=0CCwQFjAC&url=http%3A%2F%2Fwww.kpmg.com%2FGlobal%2Fen%2FIssuesAndInsights%2FArticlesPublications%2FDocuments%2Fbotswana-mining-guide.pdf&ei=yXjsU-veJYbe7AamulDgCw&usq=AFQjCNE1NWxVsDKRTiL7eF6mpu-JBtaOQw&bvm=bv.72938740,d.ZGU> >.

USGS, n.d. 2012 *Minerals Yearbook BOTSWANA*. [online]. [Accessed: 1 August

2014]. Available at: <

<http://www.google.ch/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CCYQFjAB&url=http%3A%2F%2Fminerals.usgs.gov%2Fminerals%2Fpubs%2Fcountry%2F2012%2Fmyb3-2012-bc.pdf&ei=h43sU-cvylisBob1gegL&usq=AFQjCNH7V50TPiAjtL1ihYHSsVgb3nx7Mg&bvm=bv.72938740,d.ZGU>>.

WORLD POPULATION REVIEW, 2014. Botswana Population 2014.

WorldPopulationReview.com [online]. 23 March 2014. [Accessed: 3 August 2014].

Available at: <<http://worldpopulationreview.com/countries/botswana-population/>>.

Companies:

BLOOMBERG, 2014. USD CNY Quote. [online]. 13. August 2014. [Accessed 13

August 2014]. Available at : <<http://www.bloomberg.com/quote/USDCNY:CUR>>.

CARROLL, Cynthia, 2012. The CEO of Anglo American on Getting Serious About

Safety. *Hbr.org*. [online]. June 2012. [Accessed 15 July 2014]. Available at :

<<http://hbr.org/2012/06/the-ceo-of-anglo-american-on-getting-serious-about-safety/ar/1>>.

INDUSTRIALL, 2012. Rio Tinto in Africa Global Citizen or Corporate Shame? [online] [Accessed 13 August 2014]. Available at : < <http://www.industrialunion.org/fr/industrial-pr%C3%A9nd-pour-cible-le-geant-minier-rio-tinto> >.

INTERNATIONAL RIVERS, 2012. Brazilian Mining Giant Vale Voted Worst Corporation in the World. [online] 30 January 2012. [Accessed 15 July 2014]. Available at : <<http://www.internationalrivers.org/resources/brazilian-mining-giant-vale-voted-worst-corporation-in-the-world-3690> >.

LONDON MINING NETWORK, 2010. Rio Tinto: A Shameful History of Human and Labour Rights Abuses And Environmental Degradation Around the Globe. *LondonMiningNetwork.org* [online] 20 April 2010. . [Accessed 15 July 2014]. Available at : <<http://londonminingnetwork.org/2010/04/rio-tinto-a-shameful-history-of-human-and-labour-rights-abuses-and-environmental-degradation-around-the-globe/>>.

Accident data:

BERKES, Howard, 2013. Former Massey Exec Gets 42 Months In Mine Disaster Case. *Npr.org* [online]. 10 September 2013. [Accessed 6 August 2014]. Available at : <<http://www.npr.org/blogs/thetwo-way/2013/09/10/221161240/former-massey-exec-gets-42-months-in-mine-disaster-case>>.

BONNEFOY, Pascale, 2013. Inquiry on Mine Collapse in Chile Ends With No Charges. *NewYorkTimes.com* [online] 1 August 2013. [Accessed 5 August 2014]. Available at : <http://www.nytimes.com/2013/08/02/world/americas/inquiry-on-mine-collapse-in-chile-ends-with-no-charges.html?_r=0 >.

CBCNEWS, 2011. Ukraine mine accidents kill 20. *CBC.ca* [online]. 29 July 2011. [Accessed 5 August 2014]. Available at : <<http://www.cbc.ca/news/world/ukraine-mine-accidents-kill-20-1.1046036>>.

CHINESE GOVERNMENT, 2005. Govt probes into Guangdong coal mine flooding. *Gov.cn* [online] 19 August 2005. [Accessed 5 August 2014]. Available at : <http://english.gov.cn/2005-08/19/content_24696.htm>.

CNN, 2014. Chilean Mine Rescue Fast Facts. *CNN.com* [online]. 24 February 2014. [Accessed 5 August 2014]. Available at : <<http://edition.cnn.com/2013/07/13/world/americas/chilean-mine-rescue/>>.

GALUSZKA, Peter, n.d. How Many Coal Miner Deaths Does It Take To Pass Safety Regulations? Slate.com [online] [Accessed 6 August 2014]. Available at : <http://www.slate.com/articles/health_and_science/coal/2012/11/mine_disaster_west_virginia_no_new_safety_regulations_after_massey_s_upper.html>.

KRASNOLUTSKA Daryna and CHOURSINA Kateryna, 2011. Ukraine Halts Rescue Effort After 37 Miners Die in Accidents (1). *Bloomberg.com* [online] 1 August 2011. [Accessed 5 August 2014]. Available at : <<http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a8qFGKleIVKo>>.

KYIVPOST, 2011, Government commission names reasons for July accidents at coalmines and those responsible. Kyivpost.com [online]. 23 August 2011. [Accessed 5 August 2014]. Available at : <<http://www.kyivpost.com/content/ukraine/government-commission-names-reasons-for-july-accid-111467.html>>.

MINING JOURNAL, 2011. Special report: Chile, one year on. MiningJournal.com [online]. 14 October 2011. [Accessed 5 August 2014]. Available at : <http://www.mining-journal.com/reports/special-report-chile,-one-year-on?SQ_DESIGN_NAME=print_friendly>.

PEOPLE, 2005. 11 people accountable for coal mine flooding in Guangdong seized. People.com [online]. 10 August 2005. [Accessed 6 August 2014]. Available at : <http://english.people.com.cn/200508/10/eng20050810_201451.html>.

RT, 2011. Accidents at two Ukrainian mines kill 37. Rt.com [online]. 31 July 2011. [Accessed 5 August 2014]. Available at : <<http://rt.com/news/mine-accident-ukraine-lugansk/>>.

URBINA, Ian, 2010. No Survivors Found After West Virginia Mine Disaster. NewYorkTimes.com [online] 9 April 2010. [Accessed 6 August 2014]. Available at : <http://www.nytimes.com/2010/04/10/us/10westvirginia.html?_r=0>.

WOODBURN Joanna and COOK Carly, 2013. Worker killed at Ravensworth mine after vehicle run over by coal truck. Abc.net [online]. 2 December 2013. [Accessed 5 August 2014]. Available at : <<http://www.abc.net.au/news/2013-12-01/worker-killed-at-hunter-valley-coal-mine/5127356>>.

Appendix 1

Summary of the data collected regarding the mining accidents

Year	Country/ region	Mine	Nb of death	Nb of injured	Type of mining	owner	Consequences (owner)	Consequences (regulations/laws)	Additional remarks
2010	Chile / Copiapo	San José	0	33	Gold Copper	San Esteban Mining	Went Bankrupt: has to sell the mine to reimburse the rescue cost and compensation. No criminal charges were	Some change in mines regulation were implemented in the form of the "Mining Safety and Institution Bill" to increase mines safety.	The San José mine was known for its lack of safety and accidents have happened before.
2011	Ukraine / Donetsk and Lugansk	Bazhanova mine & Suhodil'ska- Eastern mine	37	6	Coal	Rinat Akhmetov (Lugansk) Makiivuhillia state enterprise (Donetsk)	Production was frozen in the Lugansk mine for 16 months 6 heads of the companies were fired	Instructions were issued by the government but that is all	2 distinct accidents but happened on the same day Safety issues in Ukraine are common
2013	Australia / New South Wales	Ravensworth mine	1	0	Coal	Glencore- Xstrata	Mine was shutdown to allow an investigation	To my knowledge, none	The victim probably did not respect safety measures
2005	China / Guangdo ng	Daxing Coal Mine	123	0	Coal	Privately owned	arrested	To my knowledge, none except that authorities who failed to perform their role were removed	It was a flooding and some safety measures were not respected
2010	USA / West Virginia	Upper Big Branch Mine	29	2	coal	Massay Energy company	Executives were jailed The company was acquired by another that settled the fine	New regulations did not pass through the congress and hence nothing changed	The few preceding month, the mine had methane build- ups Safety measures concerning methane were not respected