

Safety and Health Comparison between European Union and United States regarding the Mining Industry

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Safety and Health Comparison between European Union and United States Statistics regarding the Mining Industry

By

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Executive summary

European Union law takes precedence over national law of the member states. There are only two direct directives that are specific for the mining industry. There are however safety and health directives, laws and regulations that cover most industries and therefore also the mining industry.

Member States are free to adopt stricter rules for the protection of workers when transposing EU directives into national law. It is therefore the legislative requirement in the field of safety and health at work that can vary across EU Member States.

There is however a lack of supervision on European and national level concerning mine operation and sight visits. There are no real records of penalties that are given to mining companies that do not follow these set out directives.

On the other hand, the United States of America has a department of labor which runs the Mine Safety and Health Administration (MHSA).

The Federal Judiciary, operating a system of US Courts, has the power to review the actions of administrative agencies, this to ensure that they comply with the statutory responsibilities and goals. The power of the judicial review for the mine safety legal framework in the USA and EU can be called identical.

Looking statistically, the European Union has a database called EUROSTAT which shows accidents classified into two segments. Employees are either injured for 4 days or more or it is fatal. This covers only the top of the iceberg concerning health and safety statistics. However one thing to note is that the minor incidents are classified into a wide range of accident types. These are found under the section "Health and Safety at Work (HSW)". One of the many subsections includes accidents by part of body injured.

The United States has full reports about the accidents happening in the mine, which can be found on the MSHA website. There is no database, however, the full reports give insight information on how the mine operation performs. Classified into operator injuries and contractor injuries and also a whole list of accident classification. The numbers of these accidents are also classified into FATAL which means occurrence resulting in death, Non-Fatal occurrence with Days Lost (NFDL) meaning a non-fatal injury occurrence which results in days away from work or days of restricted work activity and as last occurrence with No Days Lost. That is, non –fatal injury occurrence resulting only in loss of consciousness or medical treatment other than first aid. These reports are written yearly. The mining industry is divided into coal and mineral industry and statistics regarding accidents are reported per industry.

Looking at 2015, the United States had a total of 6696 occurrences covering the contractor and operator side for both the mineral and the coal industry. For the European Union this rate was a bit more than 10.000 reported occurrences.

To keep it short, there can be concluded that the European Union is a union with member states and that is impossible to check and force every member state to follow protocol regarding implementing of directives into national law. This is easier for the United States due to it is one nation and one country. There are 556 thousand people working in the mining and quarrying business in the EU and in the US there are almost 350 thousand people working. Dividing the amount of accident occurrences by the amount of employees gives a rate of 0.02 for both the EU and the US. Which means that the rate of occurrences of accidents by employment is identical.

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Introduction:

Even though mining is of great importance in meeting need for minerals and its contribution to economic and social development, there are concerns about aspects of its operational performance. The operation of mining, the use of land and disposal of mining wastes have – in some cases – caused significant social and environmental damage.

In these cases it occurs that the surroundings of mines and employers suffer from a lack of safety that need to be taken care of by mining companies. It is however hard for mining companies to find out which legislations they have to implement in their operations per country. This due to the fact that there are regional, national, European and international laws and procedures concerning safety.

It is therefore of great academic and social importance to find out how safety is guaranteed during mining operations and what the statistics are regarding health and safety.

This report aims to distinguish and find out how the European Union compares itself with the United States with regards to health and safety in coal mining and mineral mining industry. There is relevant data and statistics collected and literature studied to make a sound judgment of the current situation.

There are three main parties that are involved regarding safety in mining operations, these are the mining company, the employers and the surrounding of the mine operations. There are also two governmental parties involved in this report and these are the European Union and the United States of America (US).

In some cases it is not enough to maintain –the in total - these five parties due to the fact that countries and unions have institutions and other governmental bodies that are also involved in making legislations regarding safety. However, these have no impact on role in this report.

Theory (literature studies and case studies):

European Union

There are some spectacular mining accidents that happened in the European Union (EU). One of them is the burst in the tailing dam of the Baia Mare mine in Romania which led to an environmental hazard where mining waste was disposed. This highlighted the need for major reforms in mining laws in the European Union to never let these occurrences happen again and therefore form a health and safety risk for the environment (Scannel, Y. 2012). In Europe the mining sector operates in countries where there is ultimate governance - Germany, UK and Ireland –, but also in poor governance – Poland and Czech Republic. In this paper regulations of UK mines will be taken as European regulations this due to it is in English written and on the other hand all EU member states have almost identical regulations and legislations when talking about mine operations.

The European Union ensures that mines and mining waste are controlled and managed by a combination of environmental, health and safety, and human rights law. There are three institutions of the EU that bind all EU member states and guarantee certain human rights that can be impaired by mining activities. The three institutions are The European Convention on Human rights (ECHR), the Charter of Fundamental Rights of the European Union and the European Social Charter. The aim of these institutions is to protect and guarantee the EU citizens' health, safety and the environment from serious actual or threatened harm (Scannel, Y. 2012).

Mines operating in European Union countries are all governed by set of laws, which are generally combined in a Mining Code. The European Union does not set out controls for mine operations, it is a matter of concern for national administrations of EU member states. Waste management of mine operations are governed by general laws and texts and to this extent environmental concerns are addressed in national law and thus varies from Member States to Member states (BRGM/RP-50319-F, 2012).

Mine operations are distinguished by surface and underground mining and placed in four main categories of ore were considered into which all extracted substances can be placed:

- └ Ferrous metals
- └ Non-ferrous metals
- └ Industrial metals
- └ Coal

All substances are mined by either the underground - or surface mining.

Within the European Union more than half of the mining sites are now closed this holds also for the metal and coal mining (Annual Report Euromines, 2016). At the same time industrial metal mining is growing and thus still active.

Laws and Provision – EU

General

European Union (EU) law takes precedence over national law. Discussions made on laws and provisions in EU therefore affects the law in the member states of the EU. It is of greater importance to understand EU laws first to understand the impact it has on national level law of member states.

Health and safety laws have evolved compared to the past, but it is easier to have a look in the future and how these laws will evolve.

Following section is dedicated to EU laws and application, compliance of these laws and the health and safety harmonization in EU.

EU legal framework

The European Union sets out rules, laws and agreements to assure maximum sustainability and movement of four freedoms: the movement of services, goods, people and money.

The EU treaty is the highest binding agreement between the EU member states. It is all approved voluntarily and democratically by all EU member states. In practice it translates to that member states give up parts of their authority to rule their nation which then falls under the treaty.

Legal acts of the European Union are listed in Article 288 TFEU, which is realized by five type of acts, called directives, regulations, decisions, recommendations and opinions. Institutions in the EU may adopt legal acts of these kinds, but only if they are empowered to do so by the Treaties (Fact Sheets on the European Union – 2017).

Under primary law, the EU has only limited powers of enforcements. EU law is usually enforced by the member states. Furthermore, Article 291(1) TFEU adds that Member states shall adopt all measures of national law. This is necessary to implement legally binding Union acts (Fact Sheets on the European Union – 2017). Where uniform conditions for implementing legally binding Union acts are needed, the Commission exercises its implementing powers (Article 291(2) TFEU). However, acts can be binding or not and apply to all EU member states or just some, this has to do with the implementing powers. This is set out in a tree diagram to show how five acts are related to each other and how they are executed.

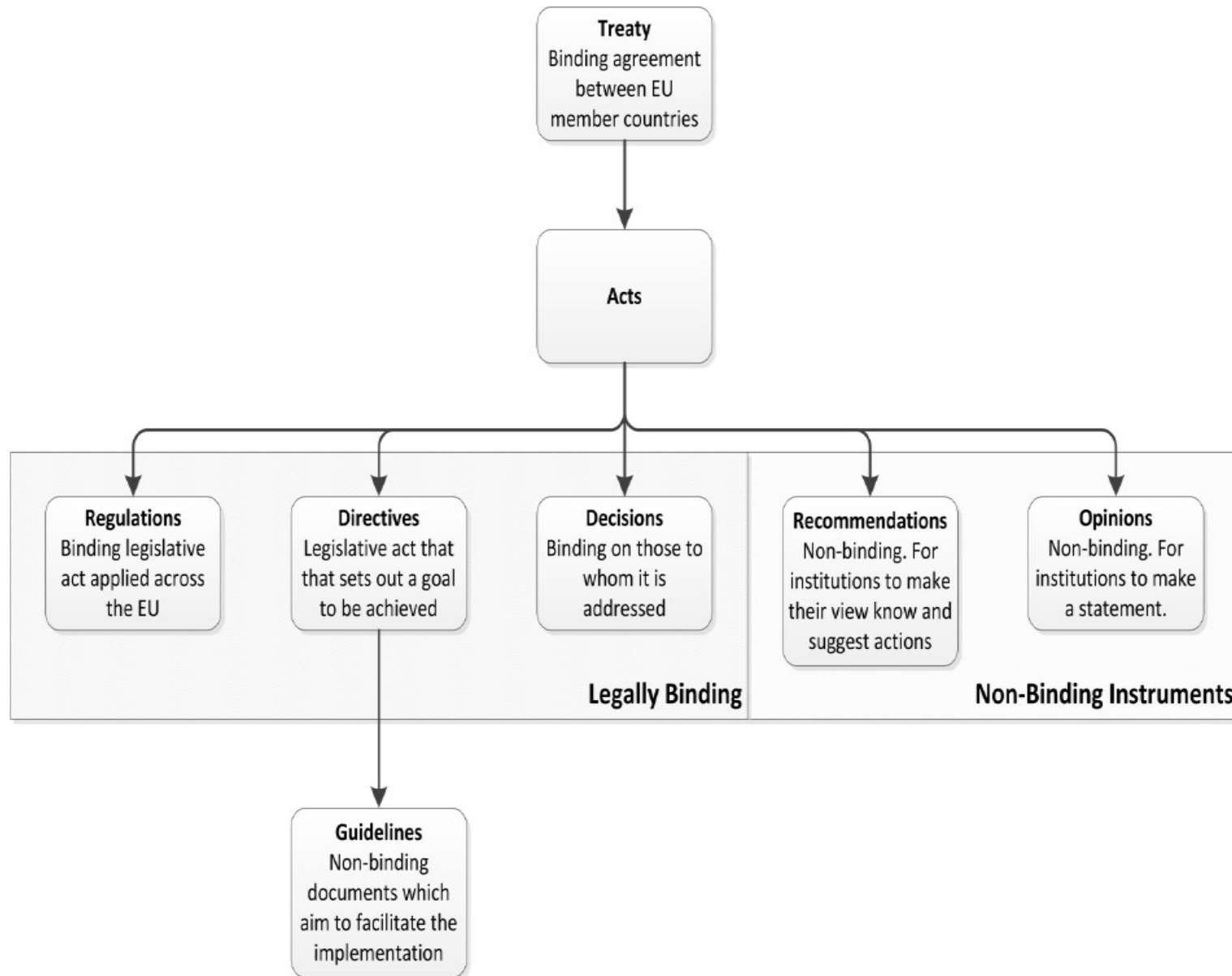


Figure 1, Structure of EU Health and safety law (Shooks, M., Johansson, B., Andersson, E., & Löw, J. 2014)

The five acts are adopted from Article 288 of the consolidated version of the treaty on the functioning of the European Union, legal acts of the Union. This can be seen in the table below.

<i>ACTS</i>	<i>DESCRIPTION</i>
<i>OPINIONS</i>	Shall have no binding force
<i>DECISIONS</i>	Binding in its entirety upon to those to whom it is addressed.
<i>DIRECTIVES</i>	Binding, as to the result to be achieved, upon each Member State to which it is addressed, but shall leave to the national authorities the choice of form and methods (Article 288, EURLEX).
<i>REGULATIONS</i>	Binding legal act of the European Union that becomes immediately applicable and enforceable as law in all Member States. It can be distinguished from directives which, in theory, need to be transposed into national law (Christine Fretten; Vaughne Miller, 2005).
<i>RECOMMENDATIONS</i>	Recommendations have no binding legal force, used by institutions and others to make their view and suggestions known.

Table 1

These Regulation, Directives and decisions shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union according to REGULATION (EU) No 1025/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL.

Application of EU Law

Member states of the European Union answer both to their national and to European Union laws. This is illustrated in the figure 2.

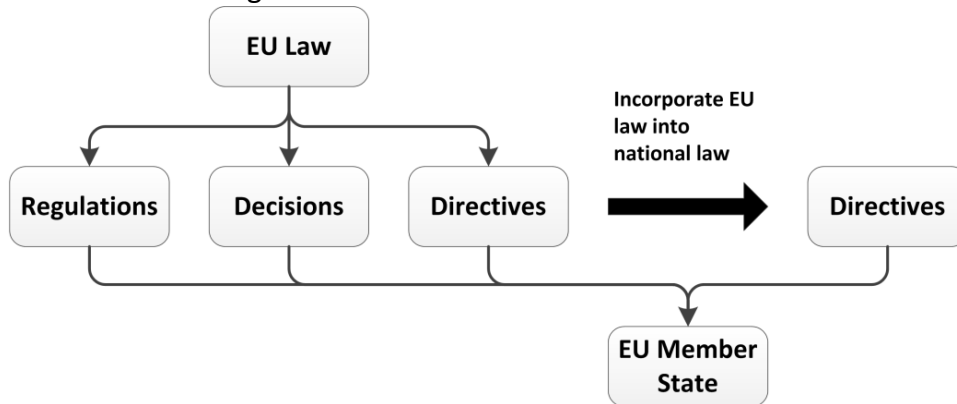


Figure 2, Application of EU law (Shooks, M., Johansson, B., Andersson, E., & Lööw, J., 2014)

As can be seen from fig. 2, regulations, decisions and directives have legal binding force to the member states. In practice this states that EU law take precedence over national law. Member states cede part of their obligations to the EU under the treaty.

To give an example of how this works, EU directives incorporated into national laws is the Dutch Mining Code, the law of environmental management and the law of economical delicts directed to the implementation of code number 2013/30/EU of the European parliament and the Council of 12 June 2013 concerning the safety of the offshore oil- and gas activity and the alteration of the directive 2004/35/EG (Pb EU 2013, L 178). Due to the fact that Dutch safety regulations related to mining were in order with the changed EU law, the Dutch government did not have to modify their own law.

Compliance to EU laws

It is the responsibility of the European Commission to ensure that all EU members follow the EU law. The European Commission gets the help of the Secretariat-General to ensure that all EU Member States incorporate EU law into their national law. When Member States do not meet their obligations the European Commission is required to take action, Members will be taken to the European Court of Justice if they fail to comply.

To illustrate how such a process evolves can be best described by an example. In 2007 the Swedish Confederation of Professional Employees (TCO) reports Sweden to the European Commission. Swedish rules for workers on fixed term contracts were in breach of European Unions fixed-term work directive 1999/70/EC was the argument. The Swedish Government was asked questions by the European Commission, which in the end found the allegation unjustified. An infringement procedure was launched by the EU-commission due a disagreement.

Again in 2013 the TCO reported Sweden to the European Commission. There was found an agreement and Sweden must now fully implement Directive 1999/70/EC and must notify the European Commission of the measures taken. When obligations are not met, the European Commission is allowed to refer Sweden to the European Court of Justice (ECJ).

This procedure holds for all European Union Member states and when an EU Member State does not comply when brought to the ECJ, a penalty of paying a fine is a consequence. Which in practice never really happens.

Exemption to European Union Laws

If there are specific reasons, there is a possibility where EU Member States are capable to negotiate to exempt themselves from certain regulations. For example, the German government did reach an agreement with the European Commission over exemption to the renewable energy surcharge. It was granted to the industrial companies who produced electricity for their own consumption.

There was also a case in Sweden over the oral use – not including smoking or chewing - of tobacco. In Europe there is a ban of tobacco for oral use but Sweden is excluded due their exemption.

There are many other Member States who also have exemptions on EU law.

Health and safety laws in Europe

Major concern of the European Union authorities since the 1980's is improving of health and safety at work. With the increasing movement across European Member States borders and thus the movement of labour the need for harmonization of health and safety rules increased. Common health and safety regulations needs increase when two member states work on a project that involves ground on both places. This is the case in the OPERA project where radioactive waste storage will be realized in the Booms clay formation that lies in the Netherlands and Belgium.

It is great interest for the Community to promote health and safety of workers and it does since research programs of the mining and steel industries under the European Coal and Steel Community starting in 1978. The European economy became a more knowledge based and through information technology. The Community had to adapt to the changing environment that was created. In the time span of 1996-2000 principles concerning health, safety and legislation were improved. It was stated that health and safety improves competitiveness and existing legislation must be better enforced.

The needs for harmonizing work health and safety regulations in the EU has several business advantages. First of all, it makes reviewing of compliance easier for regulatory agencies that operate in different countries at the same time. Above this a harmonized health and safety law on European level would reduce the compliance cost for operating multi-national businesses. On top of this, there is less time needed to achieve compliance and more time left to improve the need for safety.

It was not until 2002 that health and safety at work was encouraged. Member states started to re-launch prevention policies and national action programs focused on reducing the rate of workplace accidents. And it was not until 2007 that the Community strategy maintains the objective of reduction accidents at work and occupational illness through implementation of Community legislation especially in the new Member States (EU health policy trends, LSE health, 2009).

There is a solid legal framework covering the maximum number of risks with the minimum number of regulations, there are still differences between Member States. Penalties for non-compliance of safety and health laws, varies from 55 euros and 819,780 euros which depends on the legislation in that Member State and the seriousness of the violation (Vega & Robert, 2013).

Discussion

People and products travel across borders more frequently than before and therefore a need for a harmonized health and safety law has increased. The EU directives aim is to harmonize the law within EU while at the same time they are letting member states keep their national structures and legislations.

The need for harmonization of health and safety laws and regulations is shifted from governmental bodies to cooperation's. Knauff, one of the biggest European mining companies which have their headquarters in Germany have adopted English as their main language to avoid miscommunication. For companies it gets less complicated to understand and execute well put safety and health laws and regulations.

According to an interview with the manager with an Australia-Asia mining company the harmonization made it easier to work across states.

This due to the common procedures that were set out in their cooperation worldwide. There were none or too little negative effects visible in Australia regarding the harmonisation (Shooks, M., Johansson, B., Andersson, E., & Lööv, J., 2014).

To end this part of the discussion, the national governments of member states are obligated to control and check whether mining companies are following directives that are set out by the European Union. This all regarding the health and safety standards that are put together for the mining and quarrying industry in the European Union.

It is not the obligation or duty of the European Union to visit mine operation or sights to control if mining companies are following the directives and standards.

Health and Safety laws and provisions in European Union

Since the 1980's the European Union has been working on improving health and safety at the workplace. The European act of 1986, which is a single act, was the first act to mention health and safety. Framework directive 89/391/EEC, which concerns the protection of workers with regards to accidents at workplace and occupational disease was published. It forms the basis directive of the other 28 other health and safety directives, which are seen as specific directives.

This section explains the EU health and safety laws and detailed provisions.

Treaty on Health and safety in EU

There were three treaties before Health and Safety at Work was introduced for the first time. The European Economic Community treaty covered it with the adoption of the Single European Act in 1986, in article 118A.

Article 118A of the Single European act of 1986 have been adopted in all the other treaties, like the Amsterdam, Nice and Lisbon treaties. It may have been shifted to other article numbers but the aim was still the same. Protect workers and environment by health and safety regulations.

Article 153 of the treaty on the functioning of the European Union

The objectives and rules that are set out for health and safety are from article 153 of the treaty on the Functioning of the European Union. This section will state article 153 from the <http://eur-lex.europa.eu> website.

1. With a view to achieving the objectives of Article 151, the Union shall support and complement the activities of the Member States in the following fields:

- (a) improvement in particular of the working environment to protect workers' health and safety;
- (b) working conditions;
- (c) social security and social protection of workers;
- (d) protection of workers where their employment contract is terminated;
- (e) the information and consultation of workers;
- (f) representation and collective defence of the interests of workers and employers, including codetermination, subject to paragraph 5;
- (g) conditions of employment for third-country nationals legally residing in Union territory;
- (h) the integration of persons excluded from the labour market, without prejudice to Article 166;
- (i) equality between men and women with regard to labour market opportunities and treatment at work;
- (j) the combating of social exclusion;
- (k) the modernization of social protection systems without prejudice to point (c).

2. To this end, the European Parliament and the Council:

(a) may adopt measures designed to encourage cooperation between Member States through initiatives aimed at improving knowledge, developing exchanges of information and best practices, promoting innovative approaches and evaluating experiences, excluding any harmonisation of the laws and regulations of the Member States;

(b) May adopt, in the fields referred to in paragraph 1(a) to (i), by means of directives, minimum requirements for gradual implementation, having regard to the conditions and technical rules obtaining in each of the Member States. Such directives shall avoid imposing administrative, financial and legal constraints in a way which would hold back the creation and development of small and medium-sized undertakings.

The European Parliament and the Council shall act in accordance with the ordinary legislative procedure after consulting the Economic and Social Committee and the Committee of the Regions. In the fields referred to in paragraph 1(c), (d), (f) and (g), the Council shall act unanimously, in accordance with a special legislative procedure, after consulting the European Parliament and the said Committees.

The Council, acting unanimously on a proposal from the Commission, after consulting the European Parliament, may decide to render the ordinary legislative procedure applicable to paragraph 1(d), (f) and (g).

3. A Member State may entrust management and labour, at their joint request, with the implementation of directives adopted pursuant to paragraph 2, or, where appropriate, with the implementation of a Council decision adopted in accordance with Article 155.

In this case, it shall ensure that, no later than the date on which a directive or a decision must be transposed or implemented, management and labour have introduced the necessary measures by agreement, the Member State concerned being required to take any necessary measure enabling it at any time to be in a position to guarantee the results imposed by that directive or that decision.

4. The provisions adopted pursuant to this Article:

- shall not affect the right of Member States to define the fundamental principles of their social security systems and must not significantly affect the financial equilibrium thereof,
- shall not prevent any Member State from maintaining or introducing more stringent protective measures compatible with the Treaties.

5. The provisions of this Article shall not apply to pay, the right of association, the right to strike or the right to impose lock-outs.

Safety and Health directives

Directives form a binding goal to all European Member States that must be achieved. The main health and safety directive for the EU is the framework directive 89/391/EEC. It forms a basis for the 28 specific directives.

Framework directive 89/391/EEC

This framework directive is designed to improve the protection of workers with regards to occupational accidents at workplace and diseases. It holds principle to prevent risks, assessment of risks and the elimination of risks and accident factors, protection of safety and health, the informing, consultation and balanced participation and training of workers and their representatives.

The full text of the consolidated version of this Framework directive 89/391/EEC from can be reviewed here: <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:01989L0391-20081211>

Specific directives

Framework directive 89/391/EEC form the basis of another 28 specific directives that are split up in six other areas. These are:

- ⌚ Exposure to physical hazards; and
- ⌚ Provision on workload, ergonomic and psychosocial risks;
- ⌚ Exposure to chemical agents and chemical safety;
- ⌚ Exposure to biological agents;
- ⌚ Sector specific and worker related provisions;
- ⌚ Workplace, equipment, signs, and personal protective equipment

A detailed list of all the mentioned areas and the associated directives are listed in table (2). The detailed info will still have to be read in the article itself and this is a direct copy of it.

AREAS DIRECTIVE

EXPOSURE TO PHYSICAL HAZARDS – OHS DIRECTIVES	Directive 2006/25/EC of the European Parliament and the council of 5 April 2006 – on the minimum health and safety requirements regarding the exposure of the workers to risks arising from physical agents (artificial optical radiation)
	Directive 2003/10/EC of the European parliament and of the council – On the minimum health and safety requirements regarding the exposure of workers to the risk arising from physical agents (noise)
	Directive 2002/44/EC of the European parliament and the council – On the minimum health and safety requirements regarding the exposure of workers to the risk arising from physical agents (vibration)
	Council directive 96/29/Euratom-Basic Safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation
	Directive 2004/40/EC of the European Parliament and of the council – On the minimum health and safety requirements regarding the exposure of the workers to risks arising from electromagnetic fields and

PROVISION ON WORKLOAD, ERGONOMIC AND PSYCHOSOCIAL RISKS – OHS DIRECTIVES	<p>waves.</p> <p>Council directive 90/270/EEC - On the minimum safety and health requirements for work with display screen equipment</p>
	<p>Council directive 90/269/EEC - On the maximum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers</p>
EXPOSURE TO CHEMICAL AGENTS AND CHEMICAL SAFETY – OSH DIRECTIVES	<p>Council Directive 83/477/ECC and its amendments – The protection of workers from the risks related to exposure to asbestos at work</p>
	<p>Council Directive 98/24/EC - The protection of the health and safety on workers from the risks related to chemical agents</p>
	<p>Commission directive 91/322/EEC - On establishing indicative limit values by implementing Council Directive 80/1107/EEC on the protection of workers from the risks related to exposure to chemical, physical and biological agents at work</p>
	<p>Commission directive 2000/39/EC - Establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers</p>
	<p>Commission Directive 2006/15/EC - A second list of indicative occupational exposure limit values and amending Directives 91 implementation of Council Directive 98/24/EC</p>
	<p>Directive 2004/37/EC of the European Parliament and the council – The production of workers from the risk related to exposure</p>

	to carcinogens or mutagens.
EXPOSURE TO BIOLOGICAL AGENTS – OHS DIRECTIVES	Directive 2000/54/EC - On the protection of workers from risks related to exposure to biological agents at work
SECTOR SPECIFIC AND WORKER RELATED PROVISIONS – OHS DIRECTIVES	<p>Council Directive 91/383/EEC - Supplementing the measures to encourage improvements in the safety and health at work of workers with a fixed-duration employment relationship or a temporary employment relationship</p> <p>Council Directive 92/104/EEC - On the minimum requirements for improving the safety and health protection of workers in surface and underground mineral-extracting industries</p> <p>Council Directive 92/85/EEC - On the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding</p> <p>Council Directive 92/91/EEC- Concerning the minimum requirements for improving the safety and health protection of workers in the mineral-extracting industries through drilling.</p> <p>Council Directive 92/29/EEC - On the minimum safety and health requirements for improved medical treatment on board vessels</p> <p>Council Directive 92/57/EEC - On the implementation of minimum safety and health requirements at temporary or mobile construction sites</p> <p>Council Directive 93/103/EC - Concerning the minimum safety and health requirements for work on board fishing vessels</p> <p>Council Directive 94/33/EC - On the protection of young people at work</p>

**SECTOR SPECIFIC AND WORKER
RELATED PROVISIONS – OHS
DIRECTIVES**

Council Directive 91/383/ECC -
Supplementing the measures to encourage
improvements in the safety and health at
work of workers with a fixed-duration
employment relationship or a temporary
employment relationship

Council Directive 92/104/EEC - On the
minimum requirements for improving the
safety and health protection of workers in
surface and underground mineral-extracting
industries

Council Directive 92/85/EEC - On the
introduction of measures to encourage
improvements in the safety and health at
work of pregnant workers and workers who
have recently given birth or are breastfeeding

Council Directive 92/91/EEC- Concerning the
minimum requirements for improving the
safety and health protection of workers in the
mineral-extracting industries through drilling.

Council Directive 92/29/EEC - On the
minimum safety and health requirements for
improved medical treatment on board vessels

Council Directive 92/57/EEC - On the
implementation of minimum safety and health
requirements at temporary or mobile
construction sites

Council Directive 93/103/EC - Concerning the
minimum safety and health requirements for
work on board fishing vessels

Council Directive 94/33/EC - On the
protection of young people at work

**WORKPLACES, EQUIPMENT, SIGNS,
PERSONAL PROTECTIVE EQUIPMENT –
OHS DIRECTIVES**

Council Directive 89/656/EEC - Minimum health and safety requirements for the use of work equipment by workers

Council Directive 89/656/EEC - Minimum health and safety requirements for the use by workers of personal protective equipment at the workplace

Council Directive 89/686/EEC - Approximation of the laws of the member states relating to personal protective equipment

Directive 1999/92/EC of the European Parliament and the Council – minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmosphere.

Directive 2006/42/EC of the European Parliament and of the council – On machinery
Directive 2001/95/EC of the European Parliament and of the Council – On general product safety

Table 2

Mining and extracting related and Specific Directives

There are specific directives that are applicable for the mining industry. Directives concerns areas of machine safety, personal protection equipment and pressure equipment. These equipment have also the CE marking. A CE marking proves that a product complies with the EU safety regarding safety, health and environmental requirements.

Two directives which are directly applicable for the mining industry are mentioned here:

- ⌚ Council directive 92/91/EEC - Safety and Health of Workers in the Mineral-Extracting Industries through drilling. This directive can be reviewed by the link below:
 - <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31992L0091>
- ⌚ Council Directive 92/104/EEC Safety and Health Protection of Worker in Surface and Underground Mineral – Extracting industries. Mentioned directive can be seen by link
 - <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A31992L0104%3AEN%3AHTML>

Law and Provisions – European Union Member States

Directives must be incorporated in national law of Member States of the European Union. Each Member States occupational health and safety and mining specific laws and regulations can be seen on the International Labour Organisation (ILO). The International Labour Organisation will not be discussed in this paper. The only thing about ILO is that on their site regulations and laws can be found of member states of the European Union and also for the United States of America.

Discussion

There are only two direct directives that are specific for the mining industry. There are set out health and safety regulations and laws but these are generally applicable in all industries and therefor also applicable in the mining industry.

Which of these directives are of interest for mine operations depends on the type of mine that is being operated and what kind of equipment will be used.

The European Union strives for a zero harm policy. As time passes by health and safety evolves and new directives are formed. Member States are free to adopt stricter rules for the protection of workers when transposing EU directives into national law. It is therefore the legislative requirement in the field of safety and health at work that can vary across EU Member States.

There are several serious mining accidents that hit European Member States. One of them was the Ukrainian coal mine in Zadyasko where there was methane gas explosion. Also in Poland there are several reports of mining accidents of methane gas explosions where many people were killed.

None of the mining companies were fined for a lack of not following health and safety regulations and directives.

To conclude, In Europe there is a lack of supervision on European and National level. The European Commission sets out directives that must be incorporated and implemented by Member States. However, there are no real records of penalties that are given to mining companies that do not follow these set out directives. It is probably hard for governments to set out visits to these mining companies and maybe it is even harder to give cooperation's and operations penalties and financial fines.

Laws and Provision – United States of America

General

The United States of America (US) has a department of labour which runs the Mine Safety and Health Administration (MSHA).

They promote and work to prevent death, illness, and injury from mining and promote safe and healthful workplace for U.S. miners. MSHA carries out the provision of the Mine Act. The Mine Act which is the Federal Mine Safety and Health Act of 1977 as amended by the mine improvement and new emergency response act of 2006 which is called the MINER. More information will follow in this section.

It is the only administration of the United States that regulates mine operations. Agency develops and enforces safety and health rules for all U.S. mines regardless of the operation. On top of that the MSHA provides technical, educational and other types of assistance to mine operators. How they cooperate with the mining industry, labour, and other Federal and state agencies to improve safety and health conditions for all miners in the U.S. will be discussed in this section. After in section 7 of this report there is a discussion between the U.S and the EU.

Progress concerning safety and health is visible in the number of fatalities in U.S. mines. Significant strides are made during the 20th century and over the last several decades in particular. 242 miners died in a mining accident in 1978 after the first year MSHA operated under the Mine act of 1977. This fell to 28 fatalities (not deaths) in 2015, according to the MSHA governmental site.

(<https://www.msha.gov/regulations/laws/mine-safety-health-deskbook>).

U.S. Legal Framework

The U.S. government is divided into legislative, judicial and executive branches. The legislative branch, The U.S. Congress, generally passes macro-level laws. Standard setting, implementation, compliance monitoring and enforcement are typically tasked to the administrative agencies who have specific statutory authorities (A.W. Homer, 2009). Under the Constitution of the United States of America (Article II, § 3), the President, as the head of the Executive branch, is directed to “take care that the laws be faithfully executed.” This has been interpreted as giving the Executive branch control over management and operational procedures and executions over most agencies that are established by Congress.

The Federal Judiciary, operating a system of US Courts, has the power to review the actions of administrative agencies, this to ensure that they comply with the statutory responsibilities and goals. The power of the judicial review for the mine safety legal framework in the USA and EU can be called identical.

Congressional legislation

The first modern attempt to improve the mining safety situation through federal legislation was the Coal Mine Health and Safety Act of 1969 (33 USC. §§ 801 et. Seq.). The Coal acts was an interim measure and Congress amended it with the Federal Mine Safety and Health Act of 1977 which is called the Mine Act. The Mine Acts purpose as stated is to establish and interim mandatory health and safety standards. Congress declares in the findings and purpose in the Act that:

(g) it is the purpose of this Act (1) to establish interim mandatory health and safety standards and to direct the Secretary of Health, Education, and Welfare and the Secretary of Labor to develop and promulgate improved mandatory health or safety standards to protect the health and safety of the Nation's coal or other miners; (2) to require that each operator of a coal or other mine and every miner in such mine comply with such standards; (3) to cooperate with, and provide assistance to, the States in the development and

enforcement of effective State coal or other mine health and safety programs; and (4) to improve and expand, in cooperation with the States and the coal or other mining industry, research and development and training programs aimed at preventing coal or other mine accidents and occupationally caused diseases in the industry.

In addition to dictating some extensive described standards for key aspects of the mine safety (33 USC. §§ 841, et seq.), the mine act established a framework for setting detailed mandatory safety standards on a permanent basis (33 USC. § 811), to set requirements for the inspection, recordkeeping and investigations (33 USC. § 813), set procedures for the issuance of citations and orders (33 USC. §814), and established an enforcement procedure (33 USC. §815). The Mine Act, on the whole, increased significantly the Federal oversight of the mine safety and related enforcement powers (A.W. Homer, 2009). The mine acts remains the most important piece of national legislation when discussing mine safety and coal mine safety specifically.

The Executive branch is tasked to the ongoing establishment and evaluation of detailed standards and day-to-day compliance and enforcement activities (A.W. Homer, 2009)

Administrative Agencies

The Bureau of Mines was founded on May 16, 1910, through the Organic Act (Public law 179) which dealt with a wave of catastrophic mine disasters in the US of Mines, “whose primary roles were to investigate accidents, advice industry, conduct production and safety research and teach courses in accident prevention, first aid and mine rescue” (US Department of Labour, 2007a: 1). There are many accomplished made by the Bureau of mines and of them is the reduction of fatalities in mine disasters by 97% from 3000 in 1907 to 98 in 1993 the Annual report of the US Department of the Interior in 1996.

In 1973, the secretary of the Interior and Congress created the Mining Enforcement and Safety Administration (MESA), which had the obligatory task to govern safety and health enforcement responsibilities which were previously held by the Bureau of Mines. The next step was that MESA was moved from department of Interior to the Department of Labour and congress also changed in 1977 its name to Mine Safety and Health Administration (MSHA).

The MSHA is responsible for implementing and enforcing the Federal Mine Safety and health act of 1977 (Mine Act) and has primary statutory responsibilities as:

“ Investigating mine accidents, complaints of retaliatory discrimination filed by miners, hazardous condition complaints, knowing or wilful (criminal) violations committed by agents of mine operators, and petitions for modification of mandatory safety standards; developing improved mandatory safety and health standards; assessing and collecting civil monetary penalties for violations of mine safety and health standards; and reviewing for approval mine operators' mining plans and education and training programs.”

Other activities of the MSHA includes:

“ maintaining the National Mine Health and Safety Academy to train inspectors, technical support personnel, and mining industry personnel; approving and certifying certain mining products for use in underground coal and gassy metal and non-metal mines to ensure they do not cause a fire or explosion; providing technical assistance to mine operators in meeting the requirements of the Mine Act; providing assistance to mine operators in improving their education and training programs; cooperating with states in the development of mine safety and health programs; making grants to States in which mining takes place; and overseeing rescue and recovery operations. “

The development mine safety policy and standards is the responsibility of the MSHA. Which then enforces them by the direction of the president and confined statutory authorities. Due to different politicians and their different agendas and constituents, administrative agencies tend to vary in their rigour under different ruling presidents of the United States.

Examples are that under the Bush administration representative Major R. Owens criticised them for delaying the passage of new regulations and failing to enforce existing regulations and for reducing MSHA staff and budgets (A.W. Homer, 2009).

The Judiciary

Under the Administrative Procedure Act (APA, 5 USC. §§ 701, et seq.), governs the creation and operation of administrative agencies such as the MSHA. The final agency actions and decisions may be challenged in Federal courts.

Next, Congress passed the Federal Mine Safety and Health Act of 1977 (Mine Act), the legislation which currently governs MSHA's activities. The Mine Act amended the 1969 Coal Act in a number of significant ways, and consolidated all federal health and safety regulations of the mining industry, coal as well as non-coal mining, under a single statutory scheme. The Mine Act strengthened and expanded the rights of miners, and enhanced the protection of miners from retaliation for exercising such rights. Mining fatalities dropped sharply under the Mine Act from 272 in 1977 to 86 in 2000. The Mine Act also transferred responsibility for carrying out its mandates from the Department of the Interior to the Department of Labor, and named the new agency the Mine Safety and Health Administration (MSHA). Additionally, the Mine Act established the independent Federal Mine Safety and Health Review Commission to provide for independent review of the majority of MSHA's enforcement actions.

There are two very important judicial doctrines that developed in recent decades. The first which is commonly referred to as “chevron deference”, it states that where an agency’s statutory authority is not clear, courts should defer to the agency with respect to its interpretation of that authority (Gluck, A.R. 2014). The second doctrine, what is called the “Hard-Look”, states that when reviewing final agency actions or policy making, courts should examine the record underlying the decision. The decision should be examined in close detail to ensure that the agency uses a “reasoned analysis” and did not rely on factors Congress did not intend it to - fail to consider an important aspect of the decision – offer an explanation contrary to the evidence on the record or reach an entirely implausible decision (Motor Vehicle Mfrs. Assn. v. State Farm Mut., 463 U.S. 29 (1983), A. W. Homer 2009).

APA and subsequent Supreme Court jurisprudence established a system whereby the MSHA must and does a careful record of all evidence and factors. The U.S. Mine Safety and Health Administration (MSHA) developed a mine accident database. This forms Part 50 of the Federal Mine Safety Regulations. This database is a valuable resource for keeping track of the numbers, rates and severity of mine accidents in the United States (S. Dessureault, A. Sinuhaji, P. Coleman, 2007). However, since 2008 the database is not further updated. There is chosen for a full detailed report instead of a database. As a result, when the MSHA acts, it must do so cautiously and only after thorough consideration of alternatives to its particular action first (A. W. Homer 2009).

European statistics concerning mine accidents and fatalities

An European Union statistical office was found after a very long search who also reports and shows accident in the mining and quarrying industry. Eurostat is a statistical office of the European Union situated in Luxembourg. Their mission is to provide high quality statistics for Europe. As already stated in the legal framework of the European Union, framework directive 89/391/EEC on measures encourages improvements in the safety and health of workers at work. This is introduced by the obligation for employers to keep a list of occupational accidents resulting in a worker being unfit for work for more than three days and, in accordance with national laws and/or practices, to draw up reports on occupational accidents suffered by their workers (article 9(1), paragraph c) and d)).

On this basis, the European Statistics on Accidents at work (ESAW) project was launched in 1990, to harmonise data on accidents at work for all accidents resulting in more than three days' absence from work.

Main statistical findings

In the main statistical findings, the structural profile, the first two phases of the ESAW project, the third phase of the ESAW project are discussed.

Structural profile

According to Eurostat there were 19 thousand enterprises operating with mining and quarrying as their main activity in the EU-28 in 2013. Together they employed 583 thousand persons, equivalent to 0.4% of all persons employed in the non-financial business economy (M&Q EURSTAT, 2011).

Eur-28 are all European Union member states, (Belgium, Bulgaria, Croatia, Cyprus, Denmark, Germany, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Czech Republic, United Kingdom and Sweden.

To note, despite the ESAW European facet, the methodology that is used are applicable worldwide due to that it is aligned with and very similar to the international system adopted and recommended by the International Labour Organization (ILO) (1998). Survey done by Jacinto and Aspinwall in 2004 summarizes and compares the most relevant aspects of the new development of both the ILO and the ESAW.

The first two phases of the ESAW project

A series of harmonized definitions and a group of 14 common variables, which were gradually adopted by the European Union Member States. The common variables and harmonized definitions were already existing and classical variables but in this way all member states had adopted them into their official systems and a harmonized into a uniform format.

The third Phase of ESAW project

Eight new variables concerning the "causes and circumstances of accidents at work" (EUROSTAT, 2001) and this marked the beginning of a new series of new statistics. With all this the third phase, the reference year of data was 2001, to be summited to the Eurostat in 2003. A reference year is defined as the year of notification of the accident.

14 Classical Variables and 8 New Variables

These variables typify the employers (economic activity and size of enterprise), the victims (age, sex, occupation, occupational status, and nationality), part of the circumstances (geographical location, date and time of the accident), and the consequences (type of injury, part of body injured, and lost days).

The other 8 new variables, which are implemented in 2001 – which were designed to elicit information on the accident itself (sequence of events) and the circumstances of its occurrence, are named respectively: working environment, working process, specific physical activity, material agent of physical activity, deviation, material agent of deviation, contact-mode of injury and the material agent of contact mode of injury (EUROSTAT, 2001). Of these 8 new variables each Member state had to select and implement a minimum of four variables in 2001). Currently, two more variables are being implemented with accident data of 2005, which are: the specific physical activity and the material agent of deviation (C. Jacinto, C.G. Soares, 2008).

Statistical data concerning accidents in Mining and Quarrying Industry Europe

Accidents are reported and are coded and labelled with: 4 days or over, fatal and total. Total covers the summation of 4 days or over and fatal. Four days and over means worker has an injury that took four days or over to recover from it and fatal leads to death. As can be seen from the graph Poland and Spain have the highest amount of accidents and the rate is not yet decreasing since 2012.

Looking at Germany, which does a great job, had the highest drop in the total amount of incidents with 35.4%.

Not only Germany does a good job, looking at the total amount of incidents over the whole of the European Union incidents dropped by 16.5%, which is not even close to the zero harm policy but it is definitely a step in the good direction and even looking at the amount of employees working in this sector which is 583 thousand people active.

The European Union database divides the severity rate into two categories as said before. Incidents are reported to authorities when an employer dies or when an employer is injured for a period of four days or more. The place of where the accident happened must also be reported, these are categorised into:

- └ Usual workstation or within the usual local unit of work,
- └ Occasional or mobile workstation or in a journey on behalf of the employer
- └ Other workstation.
- └ Not specified

However, the place where the injury happened is not further discussed in this report. All these data are reported from 2014 and onwards, from previous years there is no reported data that can be retrieved from EUROSTAT. In this section 2014 will be discussed due to the fact that all numbers are known for that year. Both the fatal and the non-fatal numbers will be plotted in the graphs and a total number will be represented as a line in the graph.

Overall European statistics

Injuries are in most cases caused by a physical activity. The EURSTAT database provides a health and safety at work theme which has the total amount of injuries in the mining and quarrying industry. These injuries are categorised into 7 sections. These sections are: movement, operating machine, working with handheld tools, driving/being on a board a means of transport or handling equipment, presence, handling objects or other specific physical activities not listed in this classification.

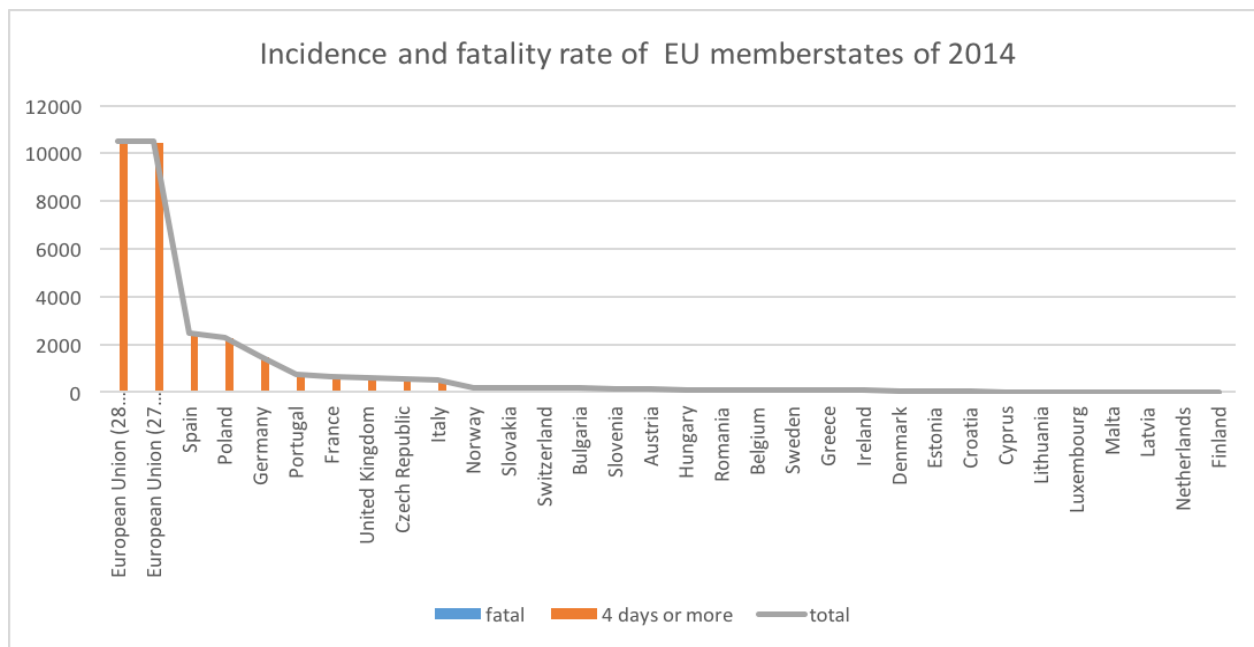


Figure 3, Eurostat data concerning injuries of 2014 from EU mining and quarrying

In this graph there is no distinction between sex, so man and female is considered equal due to that the USA data is discussed in the same way. Looking at the graph there is a huge difference between countries. The highest rate of injuries is in Spain, Poland and Germany. Numbers varying from 2462 for Spain, 2273 for Poland and 1486 for Germany. The amount of workers in Poland is the highest in the EU. There are – on paper – almost 170 thousand active according to a report of EUROSTAT 2014. The amounts are reasonable since the operations in Poland and Spain are not so advanced compared to Germany. In the upcoming subsections there will be discussed in great depth the amount of injuries, the seriousness of the injuries and comparing this to the amount of enterprises and how big the operations are of countries. This will be done for the United Kingdom, Germany, Spain and Poland.

Total injuries

The total amount of injuries by physical activity EU-28 of 2014 is presented below in a pie chart, figure 4. It shows that the most amount of injuries are caused by handling of objects, 38% in total. Injuries categorised as handling of objects occur in all working environments. It can include the injury of lifting boxes, handling construction material or pushing machinery to give examples.

The lowest amount injuries are visible in the section of presence. The presence code is used only when the injured person was physically doing nothing other than being present at the work situation. In the mining industry, presence injuries are electrical, fire, entrapment, exploding vessels under pressure and explosives and breaking agents related. These are injuries that are also operationally controlled and not by one person. Means that there is thought about it in more depth and therefore the injury amount is much lower comparing it to handling of objects and for instance movement.

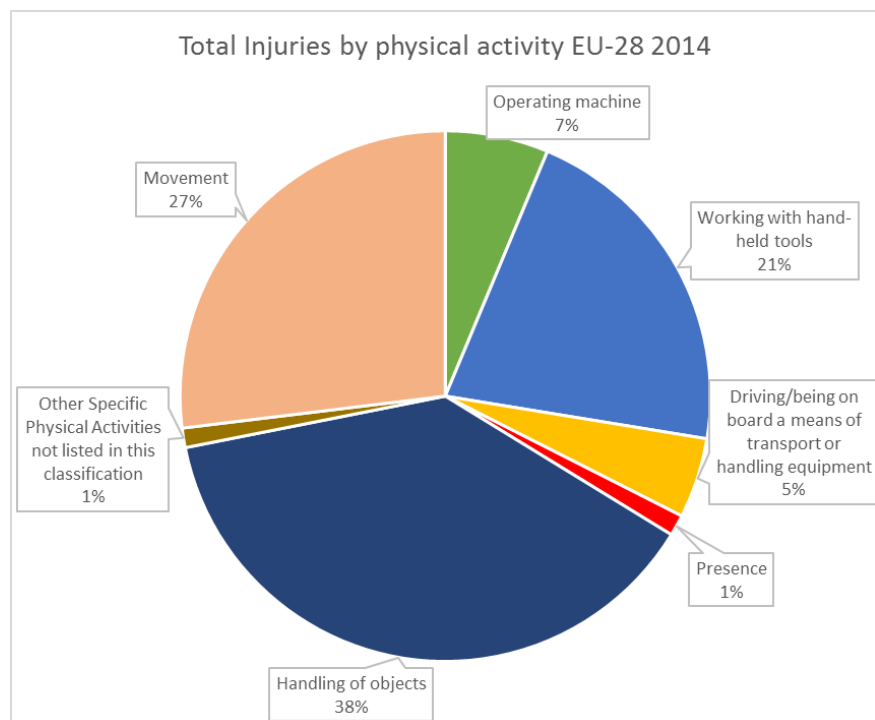


Figure 4, total injuries by physical activity EU-28 of 2014

Poland

According to Eurocoal (hard) coal and lignite are of great strategic importance for the country. Comparing it to other European Union member states, Poland has substantially larger reserves of hard coal and lignite and uses this for electricity production. Hard coal reserves total of 21.1 billion tonnes, located mostly in the Upper Silesian and Lublin coal basins, while lignite reserves amount to 1.4 billion tonnes with further 22.1 billion tonnes of economic resources (Państwowy Instytut Geologiczny, 2015). Due to the low potential of replacing coal for other greener energy sources. Forecast show that coal will retain a major role in Polish energy mix for many years (EUROCOAL, 2015).

Amount of enterprises

The total amount of enterprises active in the mining and quarrying industry is 19,282. In the graph below there is an overview.

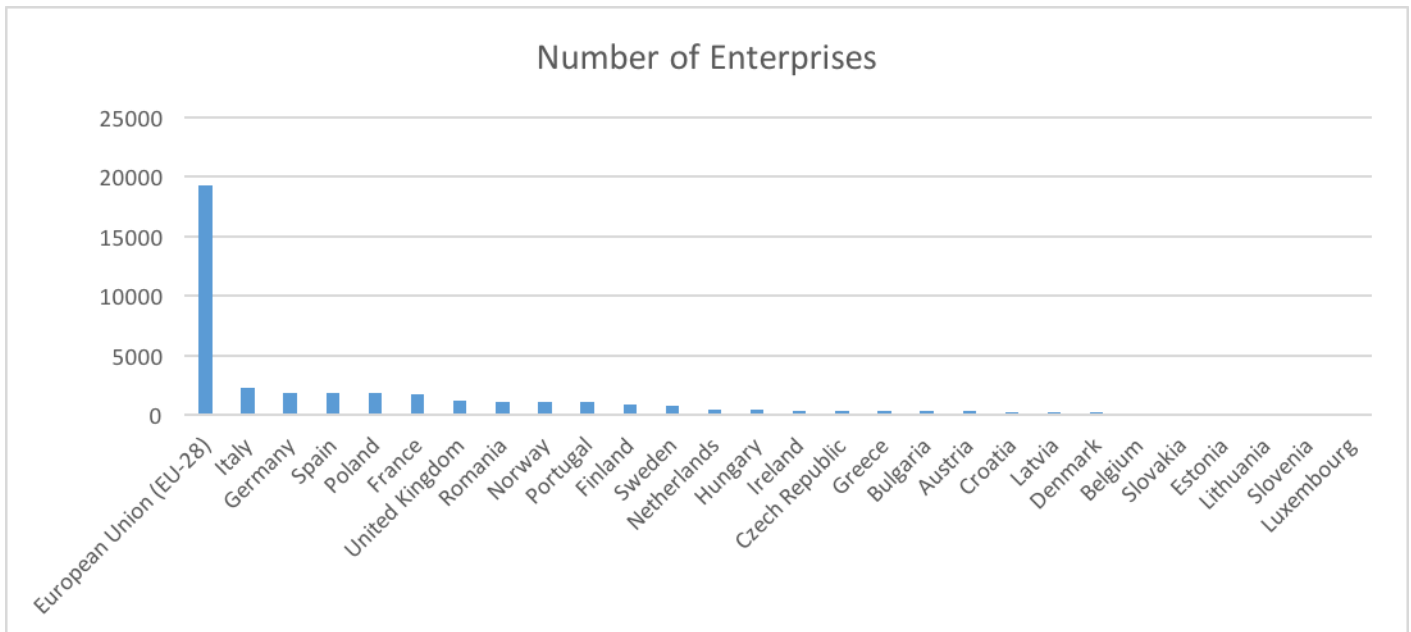


Figure 5. Amount of Mining and Quarrying Enterprises in EU

As can be seen from the graph Germany, Spain, Poland and United Kingdom are one of the greater countries with the highest amount of enterprises. Poland has an amount of 1852 enterprises active in the mining and quarrying sector.

Size of enterprises

From the Eurostat dataset there is a possibility to sort the amount for size per enterprise type. There are

- From 1 to 9 employees
- From 10 to 19 employees
- From 20 to 49 employees
- From 50 to 249 employees
- 250 employees and more

There is a total of 5 classes where enterprises are sorted in. Looking to the table below there is an indication of how big the enterprises are.

<i>Amount of employers</i>	Number of Enterprises
<i>from 1 to 9 employees</i>	1456
<i>from 10 to 19 employees</i>	143
<i>from 20 to 49 employees</i>	102
<i>from 50 to 249 employees</i>	111
<i>250 employees and more</i>	40
total	1852

Table 3 Amount and size of enterprises active in Poland 2014

From the table it can be calculated that the bigger part is made of smaller enterprises. Not to forget there are almost 170 thousand people active in the mining and quarrying industry.

Amount of injuries

From the Eurostat dataset there is a possibility to sort the amount for injuries per enterprise type. The categorisation is different than used for the type of enterprises. There are five types of size classes stated below for this section.

- └ From 1 to 9 employees
- └ From 10 to 49 employees
- └ From 50 to 249 employees
- └ From 250 to 499 employees
- └ 500 employees and more

And also looking at the severity there are 3 size classes, which is already stated before in the first part of this chapter. These are:

- └ Total
- └ 4 days or over
- └ Fatal

When mentioning the four days and over part, this means that there is no database that states injuries which are less than 4 days, so keep this in mind.

	1-9	10-49	50-249	250-499	500+	total
Poland	11	81	183	131	1867	2273

Table 4 Amount of injuries in Poland per enterprise size 2014

As can be seen from the table the amount of injuries is the most in the enterprises that hold more than 500 employees. This could be best explained by the fact that smaller enterprises do not report.

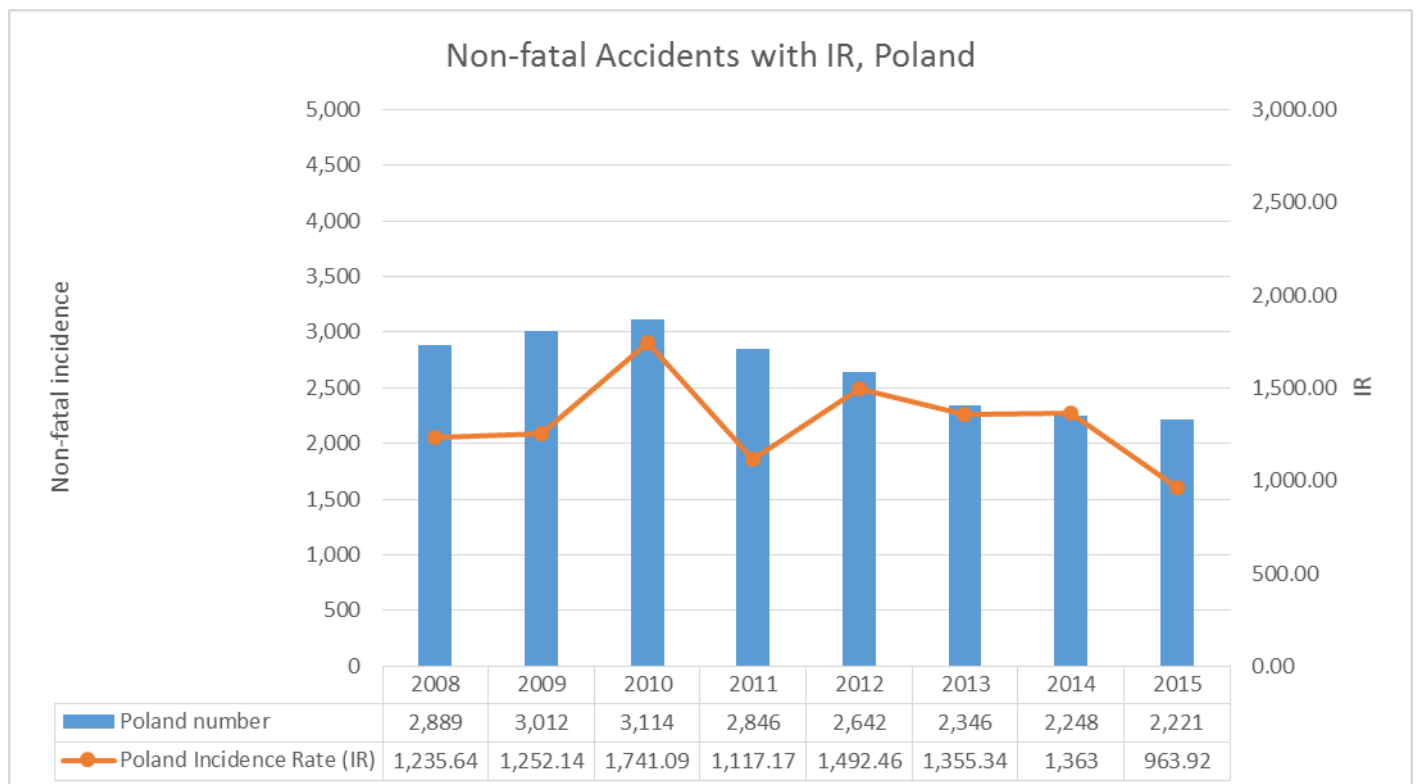


Figure 6. Poland injury statistics

From figure 6 there is seen an annual decrease in the amount of non-fatal accidents in Poland. Also the amount of IR is decreasing. This could be best described by efficient way of working at the workplace. The amount of fatal accidents and the corresponding IR is seen in figure 7.

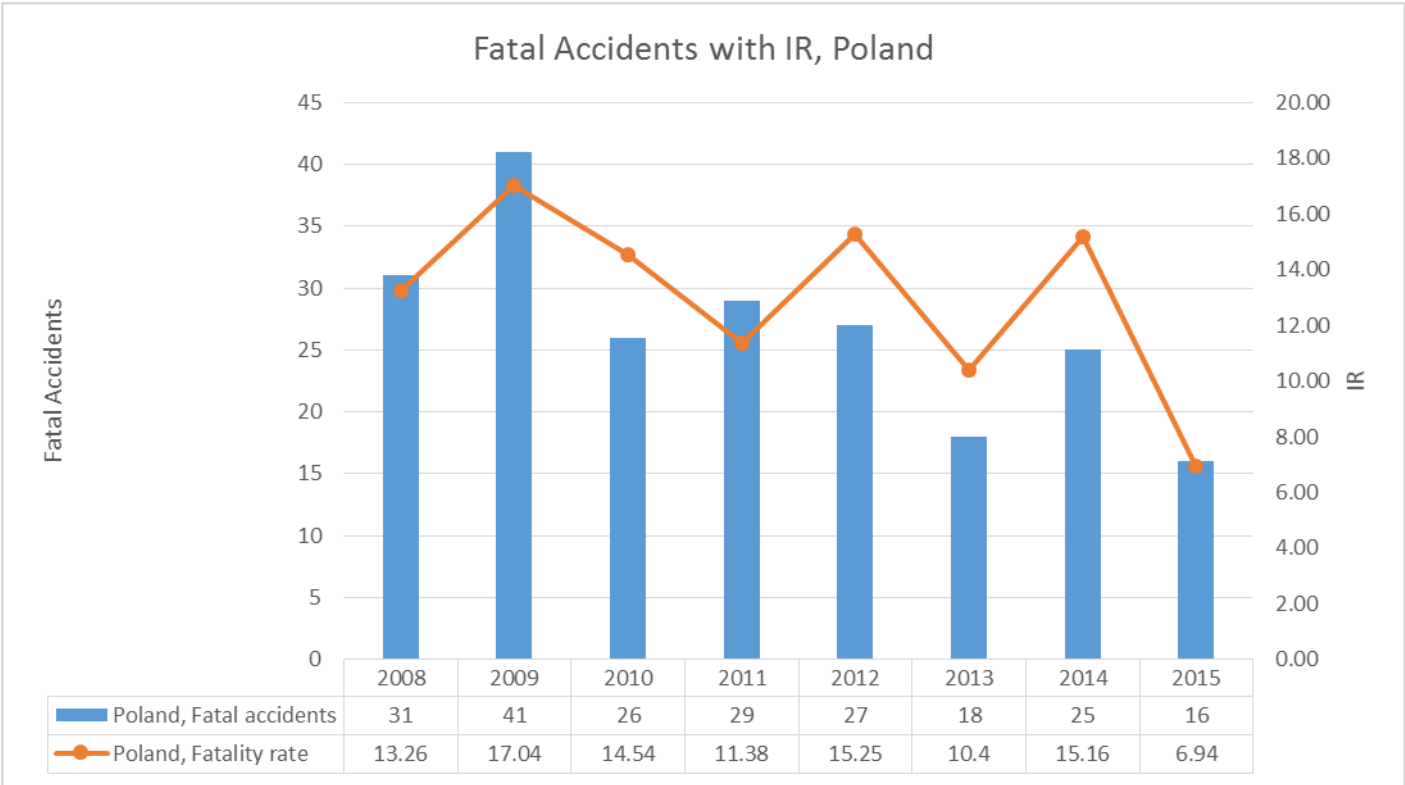


Figure 7, Poland fatal accidents over period 2008-2015

The highest fatality rate is reported in 2009 and the lowest in 2015. There is an overall decrease in the amount of fatalities.

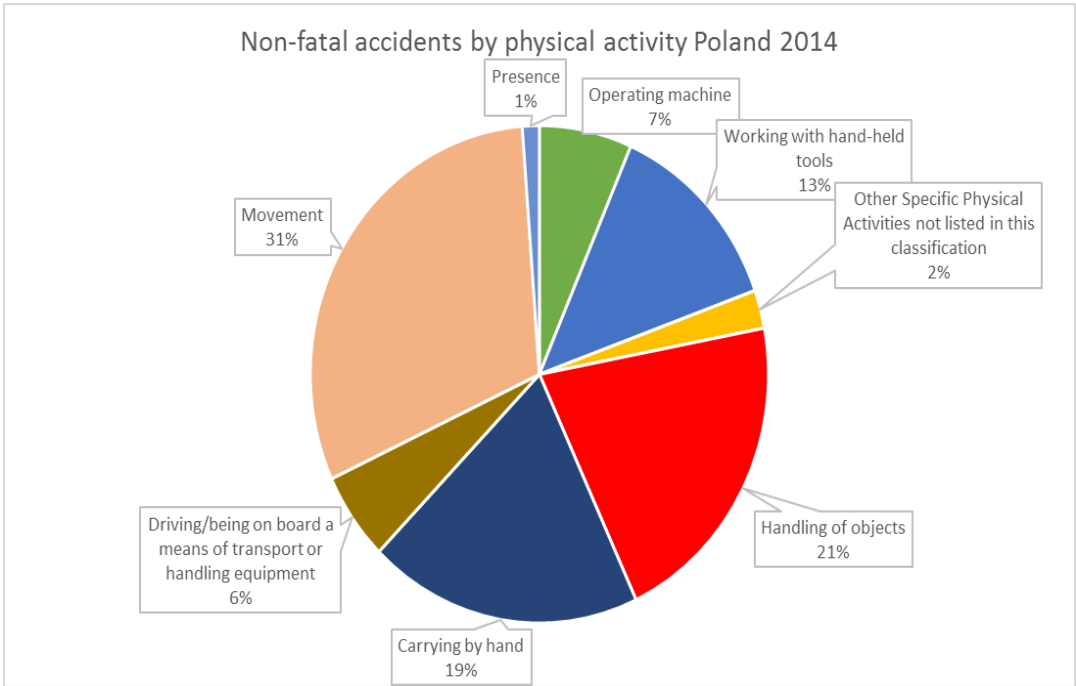


Figure 8. Non-fatal accidents by physical activity Poland 2014.

To understand how accidents are caused there is made of the EUROSTAT database to make the pie chart in figure 8. As can be seen from the pie chart, the most amount of non-fatal accidents occur by movement and the least amount of accident are by presence.

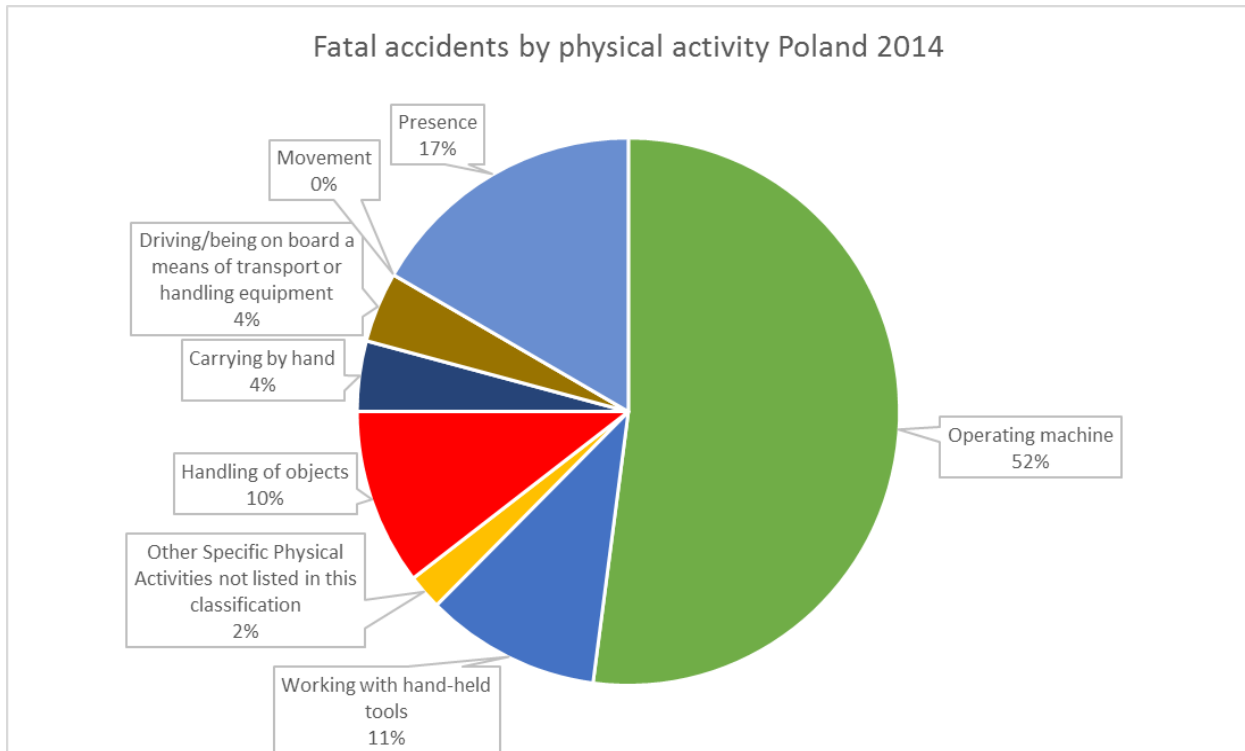


Figure 9. Fatal accidents by physical activity Poland 2014

However, another interesting aspect is to know how fatal accidents happen in Polish mine operations. This can be seen in figure 9. The most amount of fatal accidents is caused by operating machinery. And the most amount of non-fatal accidents do not cause any fatal accidents. From these data it can be best concluded that Polish mine operations operationally wise are not safe.

Spain

The mining sector in Spain, including the coal-mining industry, employed only 80,000 persons and was responsible for only 1 percent of the country's GDP in the late 1980s (E.F. Marina, 1987). Spain possesses coal, which is according to EUROCOAL 4,500 million tonnes. This amount also includes the accessible reserves of 1,156 million tonnes. In 2015, coal met 10,9% of the country's energy demand through a combination of imported and domestic coal which are 19 million tonnes and 3.0 million tonnes.

Amount of enterprises

Looking at figure 4, it can be seen that the number of enterprises active in the mining industry is 1911.

Size of enterprises

As indicated in section size of enterprises, Poland, there is made use of table 3. This table is also used in this section to point out the sizes of the enterprises active in Spain.

Amount of employers	Number of Enterprises
from 1 to 9 employees	1495
from 10 to 19 employees	238
from 20 to 49 employees	130
from 50 to 249 employees	37
250 employees and more	11
total	1911

Table 5 Amount and size of enterprises active in Spain 2014

From the table it can be concluded that most enterprises are working with less people and that there are more than 10 relative big enterprises who have more than 250 employees.

Amount of injuries

The same categorisation for size class of employees and severity class will be used in this section as well. The numbers are listed below in the table.

	1-9	10-49	50-249	250-499	500+	total
Spain	263	505	607	290	791	2462

Table 6 amount of injuries in Spain per enterprise size 2014

The most type of injuries are again in the section with the most employees active. It can be concluded again that biggest enterprises are reporting the highest amount of injuries. Which is logical, it can however also mean that the smallest enterprises do not report any injuries until it is fatal. The severity of the injuries and the amount is also plotted in a graph which can be seen below.

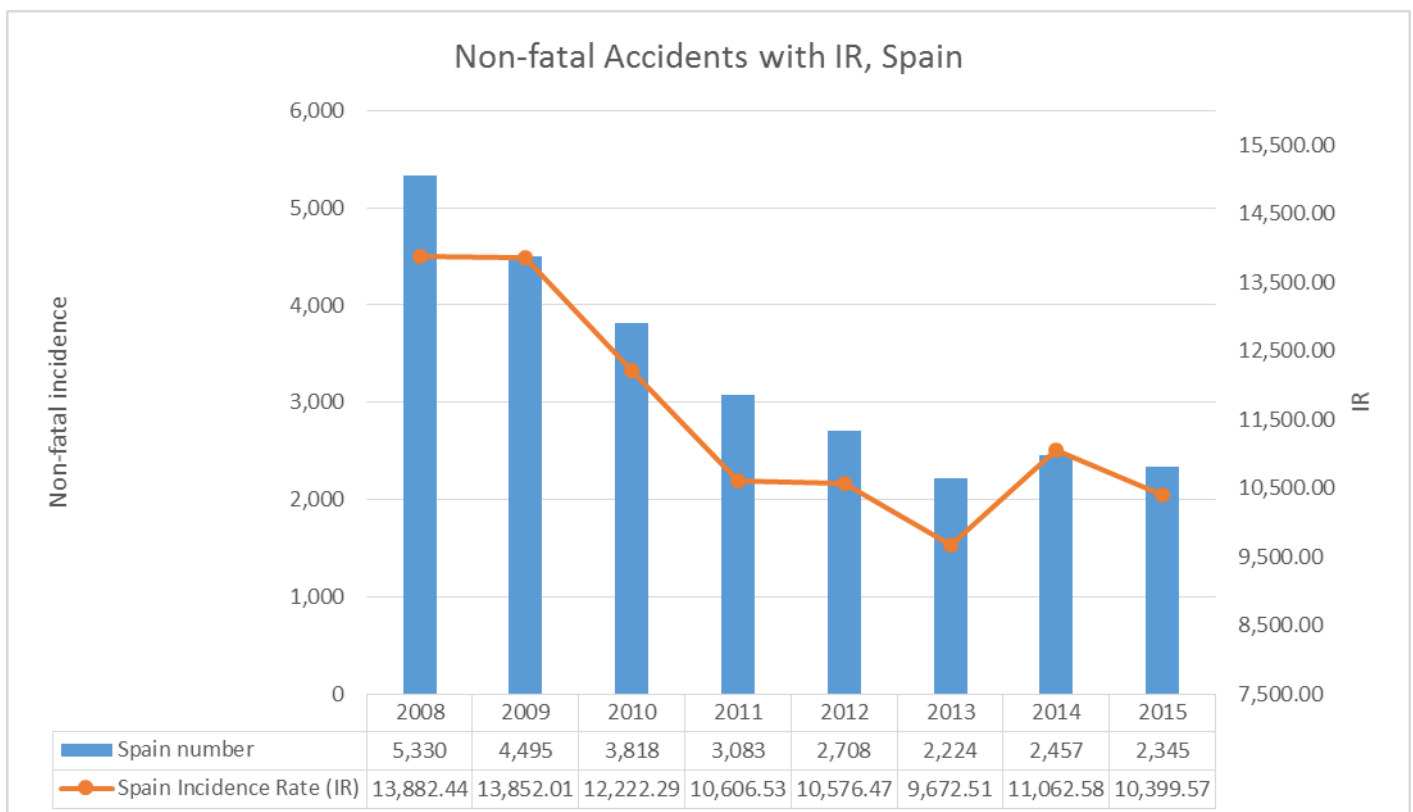


Figure 10. Spain injury statistics

These are the total amount of injuries for both fatal and 4 days or over. It can be seen that there is an increase in the amount of injuries from 2014 to 2015. This is the cause that there are more enterprises starting in this sector in Spain. It was 1911 in 2014 and 2219 in 2015 according to EUROSTAT data.

The amount of fatal accidents in the Spanish mining industry with corresponding fatal IR, is seen in figure 11.

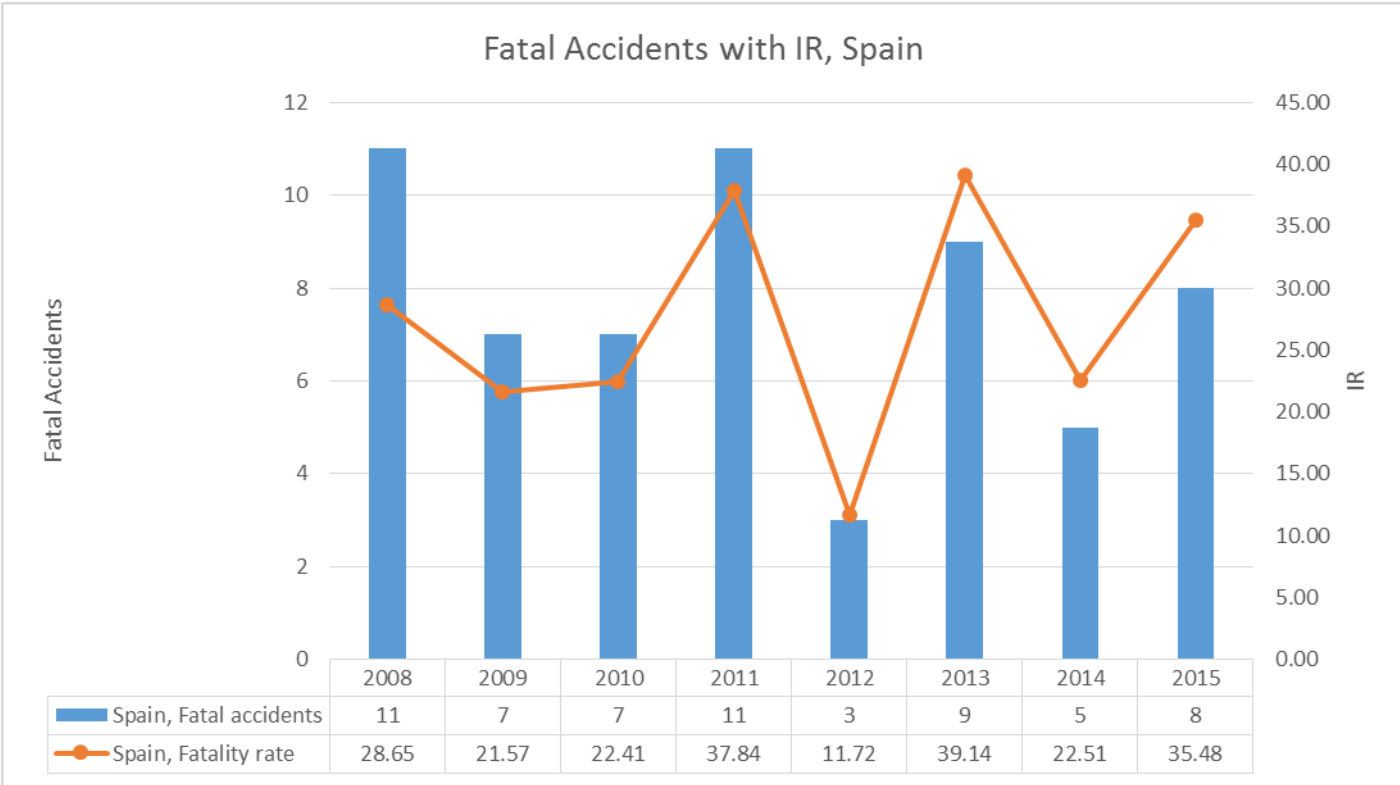


Figure 11. Spain injury statistics

The graph shows no overall progress in the safety measurements of the Spanish mining industry. There are some really low values (3 fatal incidents), and some really high values (11 fatal incidents). There is made a pie chart of how non-fatal and fatal accidents are caused in the Spanish mining industry which are seen figure 12 and figure 13.

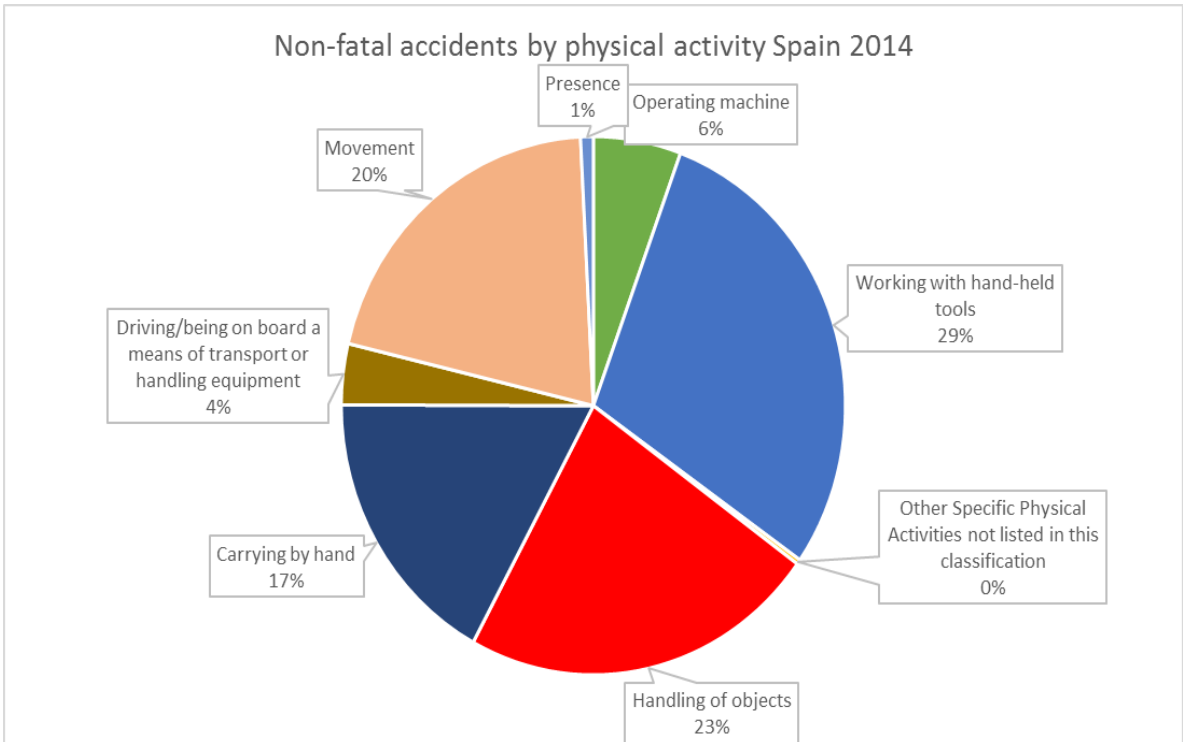


Figure 12. Spain injury statistics

The most amount of accidents are caused by working with hand held tools and handling of objects. The least amount of non-fatal accident causing is by presence. From these measurements it can be possibly concluded that Spanish mining operations have employees that are not skilled enough to operate in the mine on personal level. Accidents caused by presence is only 1%, which means that operationally wise it was all planned out. In figure 12, there the fatal accidents caused by activity is plotted.

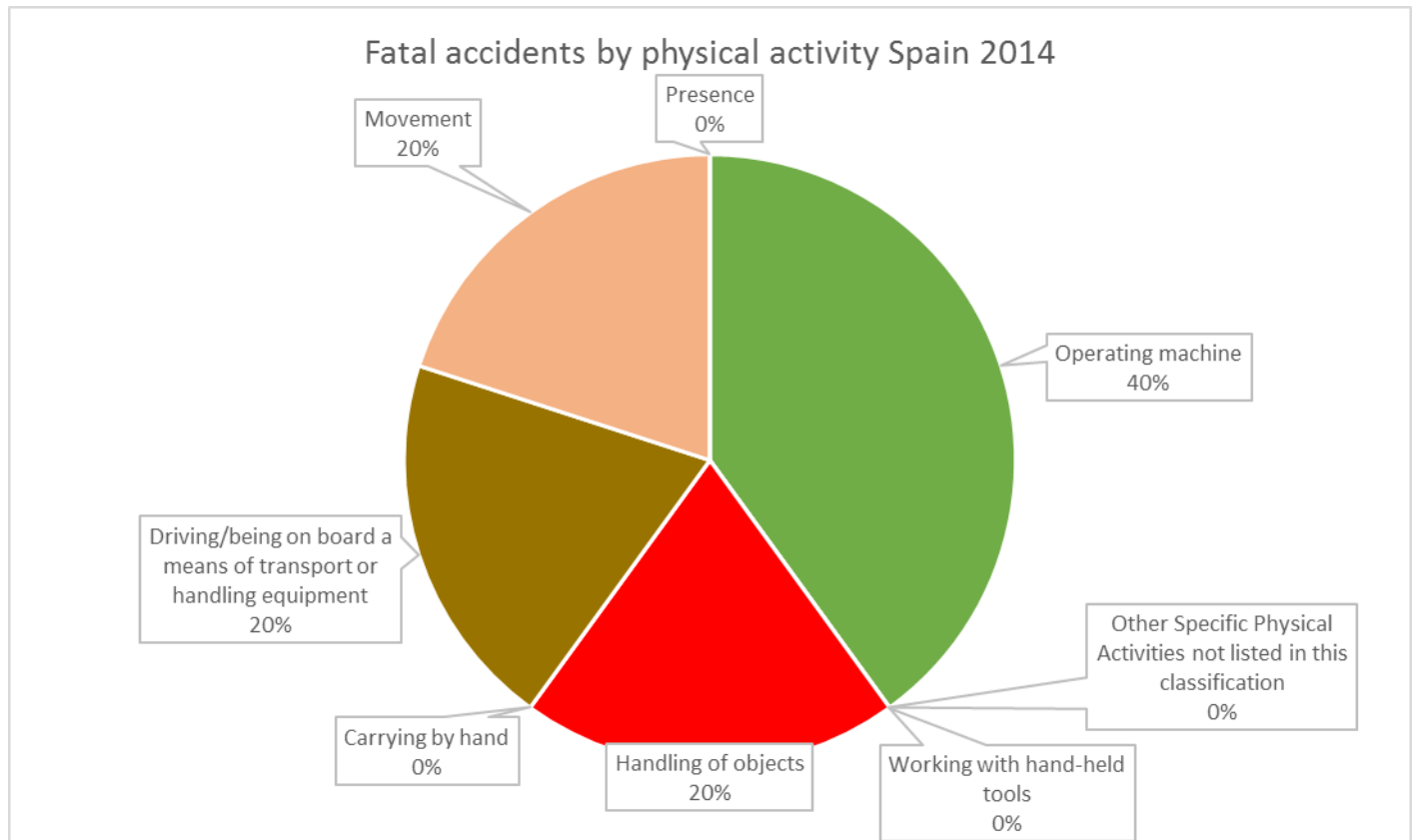


Figure 12. Spain injury statistics

Fatal accidents are caused by only four activities. These are operating machine, movement, driving/being on board a means of transport or handling equipment and handling of objects. The most amount of deaths are caused by operating machines.

Germany

General

In Germany a total of approximately 800 million tonnes of products are mine annually. The biggest part consists of sand and gravel, aggregates ad rock. Lignite mining is predominant in the mining of fuels with 185 million tonnes. The mining of hard coal is declining for years; the industry is heavily dependent on subsidiaries of the government. A phase out is planned by the end of 2018, which means a collapse. This does not mean the numbers concerning safety are not important to look at. Germany is ranked number eight of the world in means of coal production, 185.8 million tonnes in 2014. The European Union total mine production was 491.5 million tonnes. Poland produced 137.1 million tonnes of coal in 2014. All according to the Statistical Review of World energy report of 2014. Germany also produces potash and salt on a worldwide scale. With a work population of almost 60 thousand people in the mining industry it is an interesting country to investigate.

Amount of enterprises

Looking at figure 4, it can be seen that the number of enterprises active in the mining industry is 1916.

Size of enterprises

As indicated in section size of enterprises, Poland, there is made use of table 3. This table is also used in this section to point out the sizes of the enterprises active in Germany.

<i>Amount of employers</i>	Number of Enterprises
<i>from 1 to 9 employees</i>	1029
<i>from 10 to 19 employees</i>	471
<i>from 20 to 49 employees</i>	271
<i>from 50 to 249 employees</i>	123
<i>250 employees and more</i>	22
total	1916

Table 7 Amount and size of enterprises active in Germany 2014

From the table it can be concluded that most enterprises are working with less people, in the range of 1 to 9 employees, and that there are more than 20 relative big enterprises who have more than 250 employees actively working for them.

Amount of injuries

The same categorisation for size class of employees and severity class will be used in this section as well. The numbers are listed below in the table.

	1-9	10-49	50-249	250-499	500+	total
<i>Germany</i>	199	342	407	137	259	1486

Table 8 amount of injuries in Germany per enterprise size 2014

The most interesting part of this investigation is that the amount of enterprises are equivalent to the amount of enterprises of Poland. However, the injuries reported from small scale enterprises are high compared to Poland. On the other hand the safety in German mines are compared to Poland relatively high.

The severity and the type of injuries can be seen from the figure below.

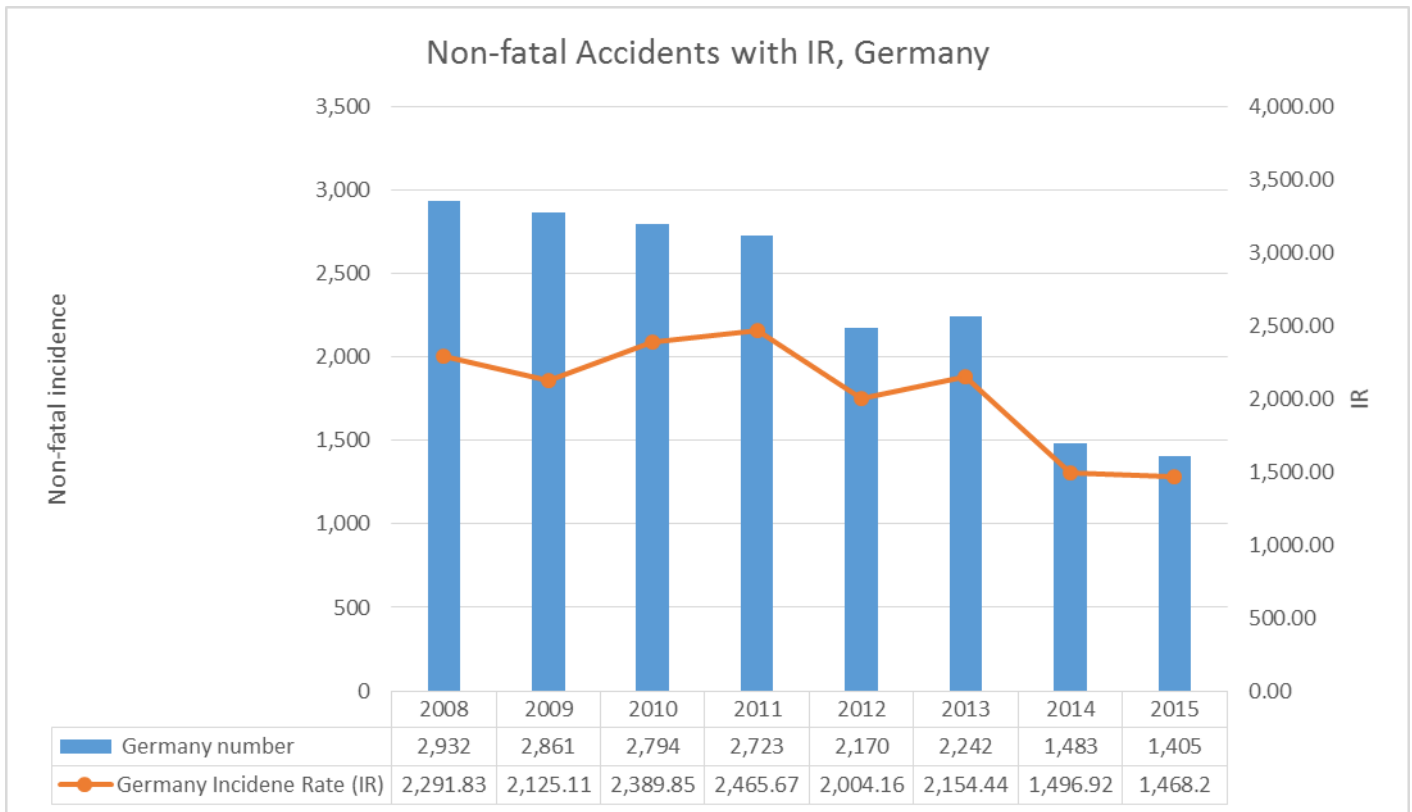


Figure 13. Germany injury statistics

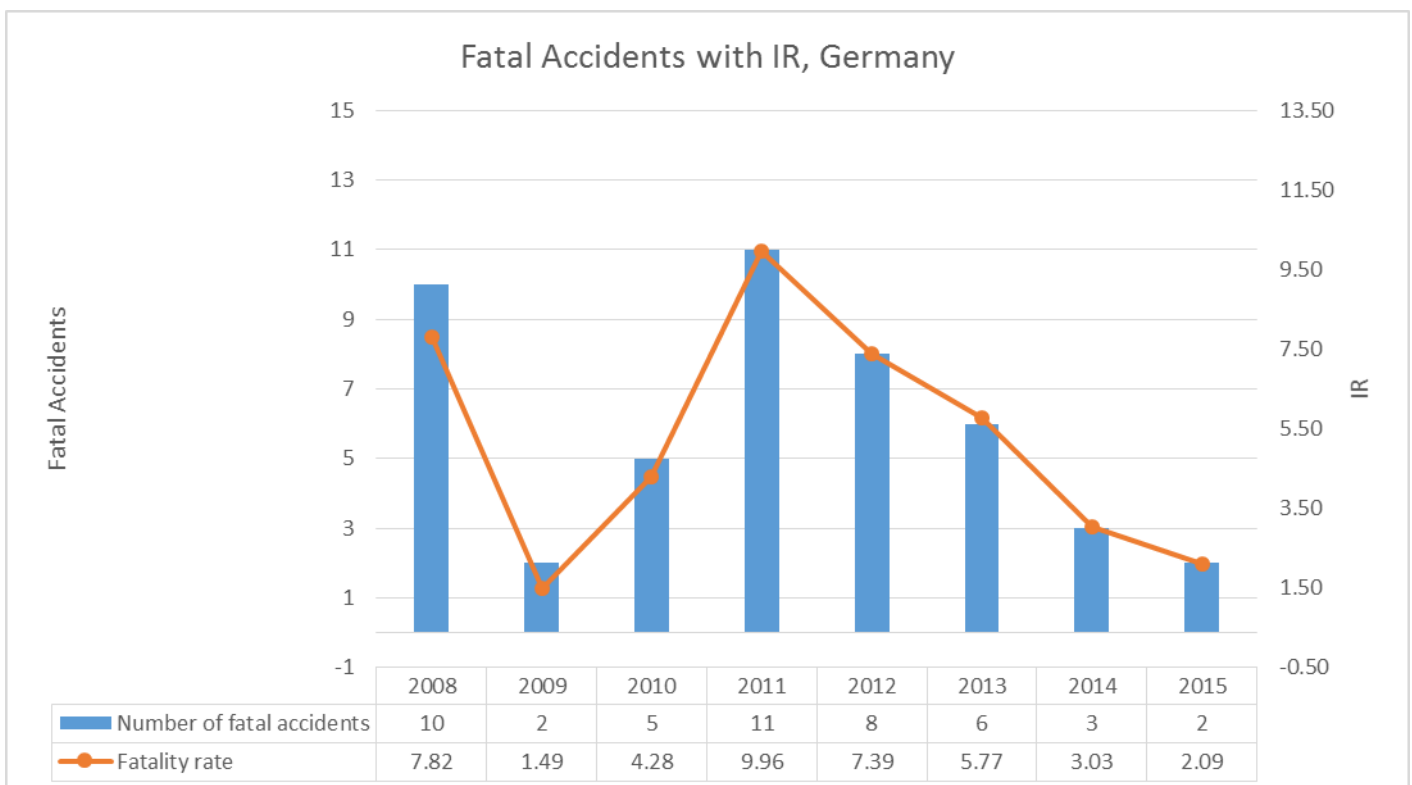


Figure 14. Germany injury statistics

Amount of injuries are decreasing due to German policies that are incorporated into mine operations. The German system for safety and health at the workplace has a dual structure which encompasses state, both Federal and Land level, safety and health provisions and the autonomous accident insurance institutions. Both the state and accident insurance institutions release their own accident prevention rules based on each other reports. This all to improve the health and safety at workplace sight. The federal and land governments and the accident insurance institutions developed together the GDA which is the Joint German Health and Safety Strategy. This to maintain order, improve and develop the safety and health of people at work. This is all achieved through an agreed and systematically applied safety and health policy. As can be seen it is decreasing with years and the Germans try to achieve the zero harm policy.

Germany and the United Kingdom did not report the activity that made non-fatal and fatal incidences occur.

United Kingdom

General

The easy accessibility and availability of coal and iron was of great importance for the Industrial Revolution in Europe. This took place in the late 18th and early 19th century (Bide, T. Brown, T.J. 2014). The amount of mined coal and iron ore is decreasing compared to those time eras (Newman, Harold R. 1994). In the 20th century the production of coal and metals decreased to cheap foreign competition. It does not mean the United Kingdom is not active in the mining industry. The operation concerning safety is a bit different than in Germany. The risks from the identified major hazards are minimised through continued work between Her Majesty's Inspectorate of Mines (HMIM) and the mine operators. Which is a dual structure like in Germany. However, England does not cooperate with incident insurance institutions to improve health and safety, the HMIM works together with a number of committees involving Mine Operators, Unions, Equipment Manufacturers and Consultants, plus other interested parties, to improve the health and safety of workers in the mining industry (n.d. HSE, 2017). Due to a lot of parties active in maintaining the health and safety in this sector a relative low accident and injury amount is expected.

Amount of enterprises

Looking at figure 4, it can be seen that the number of enterprises active in the mining industry is 1263.

Size of enterprises

As indicated in section size of enterprises, Poland, there is made use of table 3. This table is also used in this section to point out the sizes of the enterprises active in United Kingdom.

<i>Amount of employers</i>	<i>Number of Enterprises</i>
<i>from 1 to 9 employees</i>	904
<i>from 10 to 19 employees</i>	116
<i>from 20 to 49 employees</i>	109
<i>from 50 to 249 employees</i>	86
<i>250 employees and more</i>	48
total	1263

Table 9 Amount and size of enterprises active in United Kingdom 2014

From the table it can be concluded that most enterprises are working with less people, in the range of 1 to 9 employees, and that there are more than 48 relative big enterprises who have more than 250 employees actively working for them. This is for all the countries that are taken into investigation the same.

Amount of injuries

The same categorisation for size class of employees and severity class will be used in this section as well. The numbers are listed below in the table.

	1-9	10-49	50-249	250-499	500+	total
United Kingdom	2	10	190	200	200	602

Table 10 Amount of injuries in United Kingdom per enterprise size 2014

The amount of injuries is the lowest in the United Kingdom compared to all the other countries. There are 66,567 people active in this sector. The injury rate is the lowest compared to Germany, Poland and Spain. Looking at the graph below the amount of injuries is decreasing and United Kingdom is the closest to a zero harm rate.

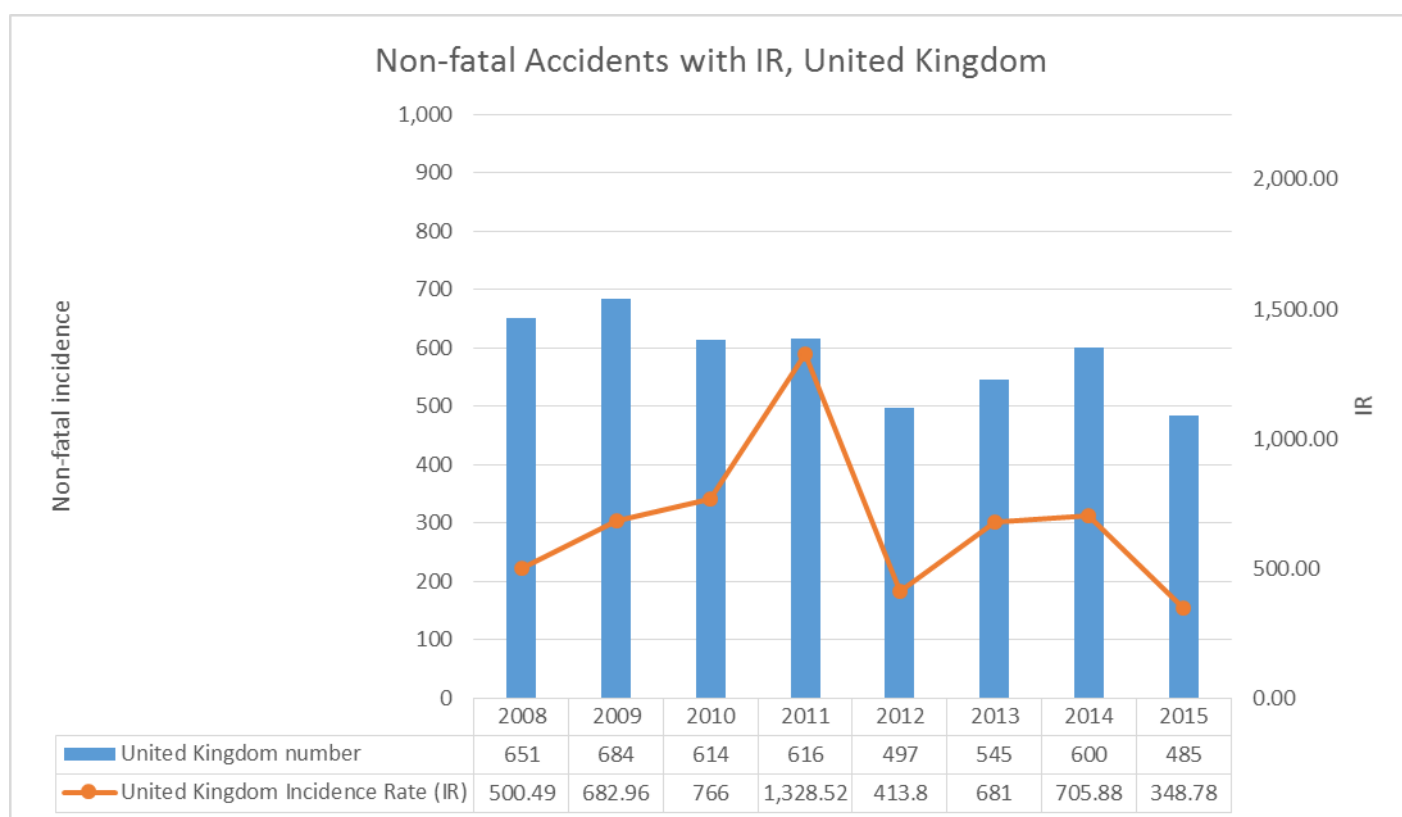


Figure 15. United Kingdom injury statistics

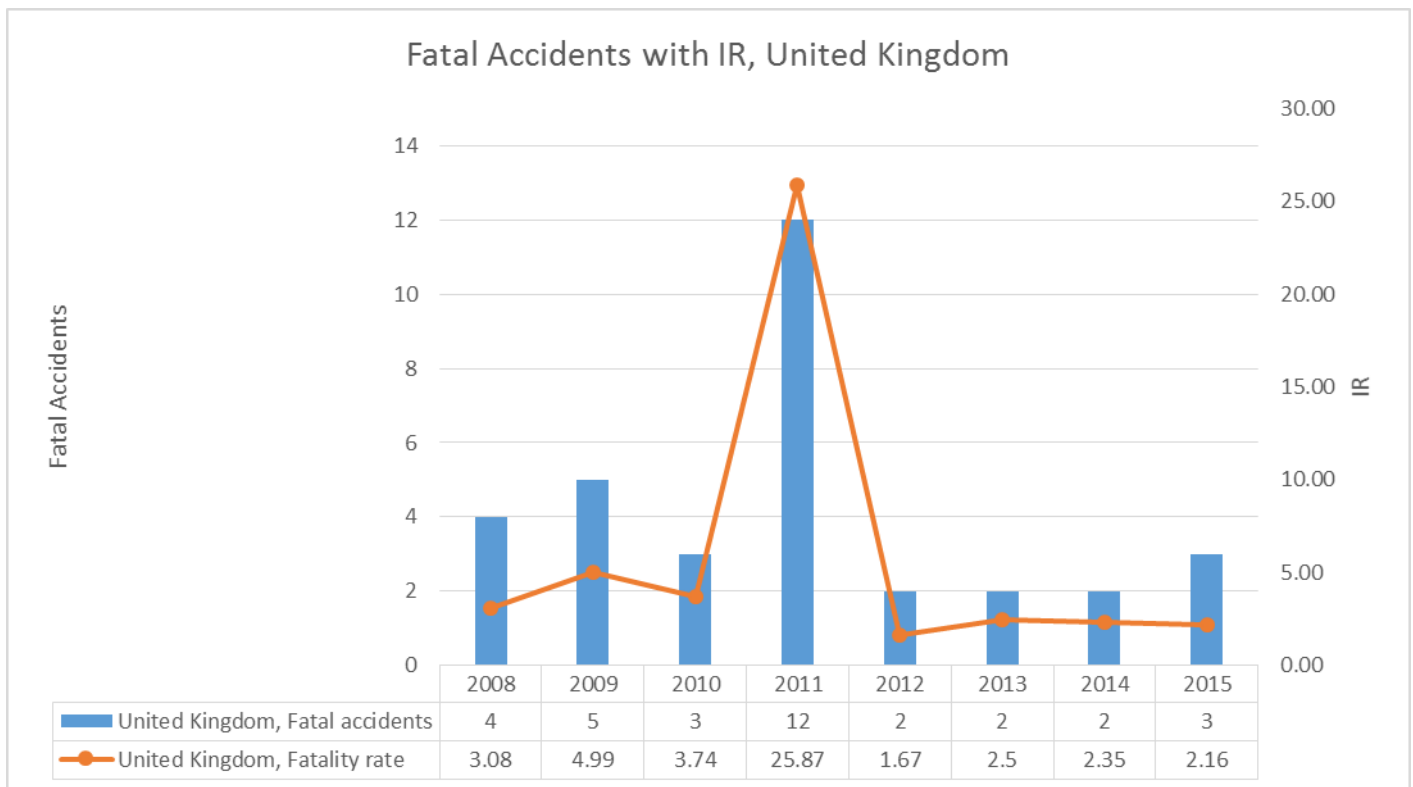


Figure 15. Germany injury statistics

The amount of non-fatal accidents are steady and mostly around 500/600 hundred. The lowest amount of non-fatal accidents are seen in the most recent year, 2015. The most amount of fatalities are reported in 2011.

United States of America statistics concerning mine accidents and fatalities

In the United States the sectors are divided into many segment like: coal, metallic mineral, non-metallic mineral, stone, sand and gravel, and finally, all industries (except coal). For the statistical part there is made use of the classification of the MSHA. They put together mineral mining industry which covers everything except coal, which is in most cases called all industries and the coal mining industry.

Looking at definitions, the term injury”, as used in the publications of MSHA, includes all reportable occupational injuries and those illnesses which result from a work accident or from exposure involving a single incident in the work environment.

Reportable injuries are an injury to an individual, occurring at a mining operation. “injury that requires medical treatment or results in death or loss of consciousness or inability to perform all job duties on any workday after the injury or temporary assignment to other duties or transfer to another job.”

The injury occurrences are classified according to severity as follows”

1. Fatal: Occurrence resulted in death
2. NFDL: Nonfatal occurrence with days lost (lost workdays). That is, nonfatal injury occurrences that results in days away from work or days of restricted work activity.
3. NDL: Occurrences with No Days Lost. That is, nonfatal injury occurrences resulting only in loss of consciousness or medical treatment other than first aid.

The incidence rates represent the amount of the injuries that occurred for each 200.000 employee hours worked and is computed as follows:

$$IR = \frac{\text{Number of Injury Occurences}}{\text{Number of Employee Hours}} * 200.000$$

The IR stands for the incidence rate, and when the rate is lower than 0.005, then the asterisk (*) will be shown instead of a number in the tabular location. When the incidence rate is 999.99 or more, the rate will stay steady on 999.99.

The “average number of workers” is a summary of the average number of persons working at individual mining establishments during periods that are not necessarily continuous but of active operations.

There are many kind of statistics visible in the factsheets of the MSHA. For this report there is made use of the amount of fatalities, fatality rate, NFDL, NDL, total, occupational fatalities and injuries by accident class. There is much data available, however to make a fair judgement on the statistics for the EU and USA there is need of equivalent type of statistics and data.

Statistics

Accident classification MSHA is listed below and also the linked European terminology is used to compare the two datasets. All these data are put together from the MSHA annual report of 2014.

United States	European Union
Electrical	
Entrapment	
Exploding Vessels under pressure	
Explosives and breaking agents	
Falling, rolling, or sliding material	Movement
Fall of face, rib, pillar, side or high wall	
Fall of roof or back	
Fire	Presence
Handling material	Handling of objects
Hand tools	Working with hand-held tools
Non-powered haulage	Driving/being on board a means of transport or handling equipment
Powered haulage	
Hoisting	Carrying by hand
Ignition or explosion	Other Specific Physical Activities not listed in this classification
Impoundment	
Inundation	
Machinery	Operating Machine
Slip or fall of person	Movement
Stepping or kneeling on object	Handling of objects
Striking or bumping	
Other	Other Specific Physical Activities not listed in this classification

Table 11, classification US and EU terminology

Total Occupational Injuries

From the annual report of 2014, the coal, metal, non-metal, stone and sand/gravel are all summed together to get a total value for the occupational injuries. A pie chart below shows the injuries per accident classification.

From the pie chart it can be seen that most occupational injuries occur by handling of objects. The least amount of injuries occur by presence. Which is likely, because not every day there are fires or explosions.

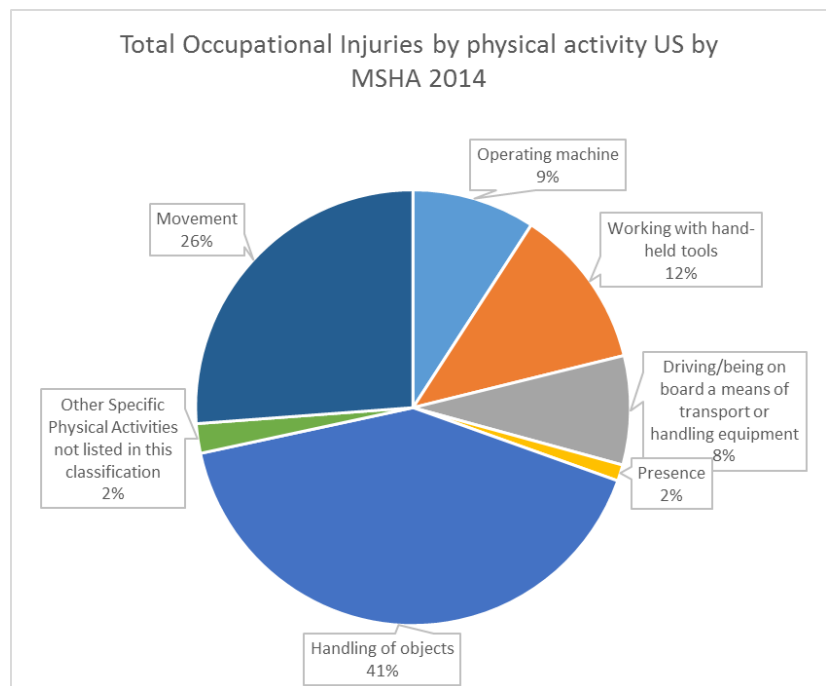


Figure 16. Injury statistics US

The number and rate of mining lost-time injuries can be seen in figure 17. There is seen an overall decrease in the number and rate of mining nonfatal lost-time injuries, excluding office workers. The rate has decreased from 2.6 to 1.7 over a period of 9 years and the amount of injuries has decreased from 7988 to 4517.

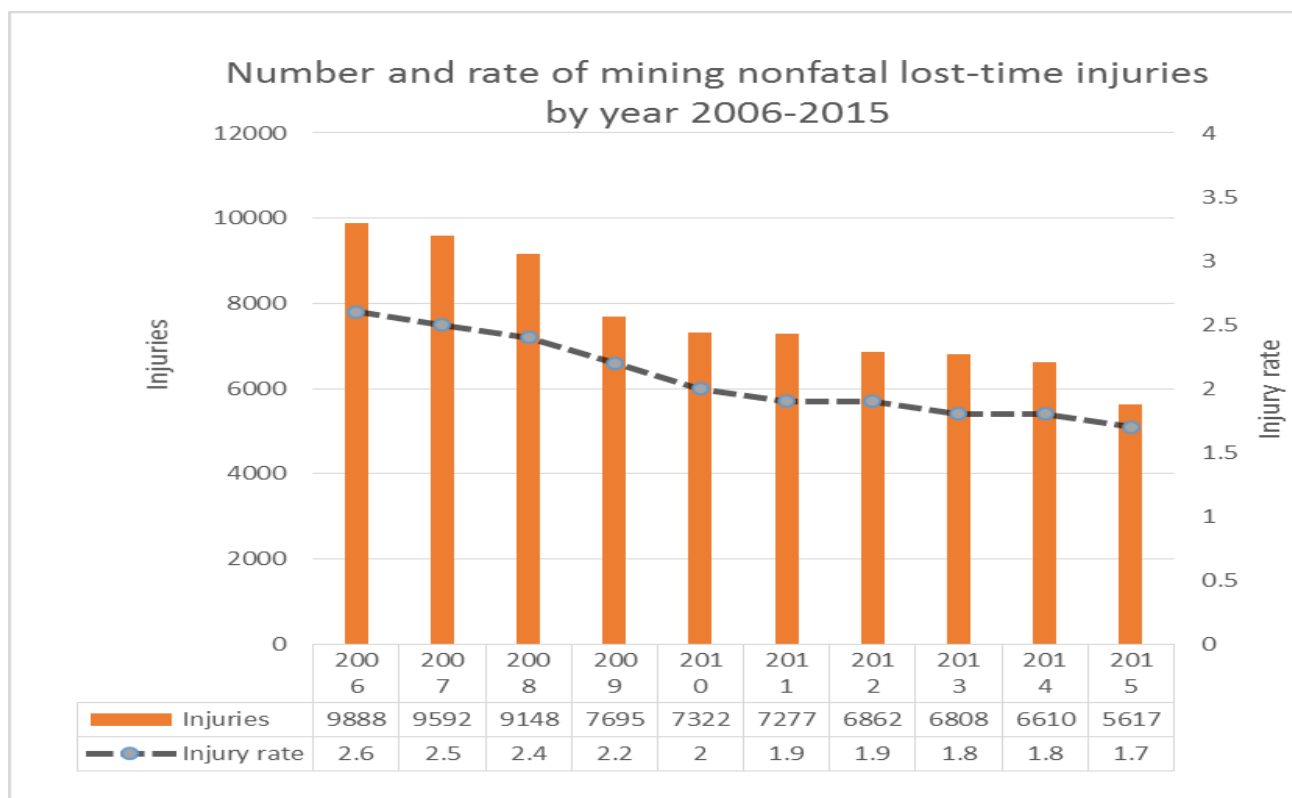


Figure 17. US injury statistics

Fatalities and fatality rate

From the annual report of 2014 there is data gathered of the total amount of fatalities and the fatality rate is calculated. These are shown in figure 18.

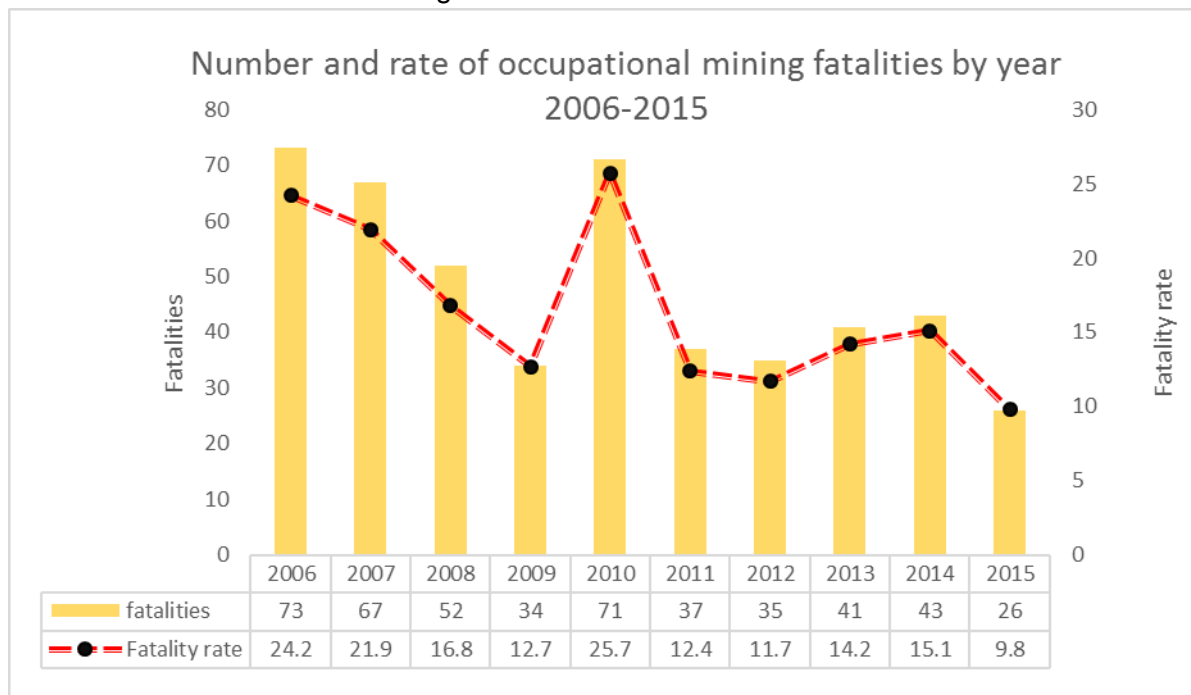


Figure 18, US injury statistics

There is seen an annual decrease in the amount of fatalities and the fatality rate since 2006. However, there is a big increase in the amount of fatalities in 2010. This is due to an ignition or explosion of gas or dust in the Upper Big Branch Mine-South in Montcoal where 29 people were killed. Which is the most recent big mining disaster of the US. The fatality rate was the lowest in 2015, in that year there were 9.8 fatalities per 100.000 full time equivalent.

Discussion

There is an overall decrease in the amount of injuries and fatalities. The fatality rate went from 24.2 in 2006 to 9.8 in 2015. The injuries rate went from 2.6 in 2006 to 1.7 in 2015.

The most amount of injuries are seen the handling of objects which cause 41% of all occupational injuries. This is probably the cause of bad training on how to handle objects. Personal tend to think that they are invincible and forget that they are made of flesh and blood. Looking at operational issues like entrapment, fire and explosion these are never likely to happen according to data, only 2%.

To conclude it can be said that the overall safety of US mine operations are increasing due to an overall decrease of injuries and fatalities.

Conclusion

When talking about the United States, which is 0.97 times as big as the European Union, there are some difference to note. First of all the United States is a country in its whole and the acts, directives and regulations concern all states, specifically for the mining industry. The regulatory agencies have power and the jurisdiction to control the safety in all mines, even if they are state or privately owned. This is controlled by the MSHA.

The European Union, is a union and consist of 28 member states. Acts, directives and regulations do not concern all member states. Regulations are binding and immediately applicable and enforceable in all member states. The only problem is that the EU has no mine safety and health administration to enforce these regulations. This task is obligated to national authorities. Which means that if national authorities do not have a healthy operating mine administration there is no control over mining operations at all.

In the United States there were 366,609 people active and work in the field and a total number of 6610 injuries were reported, according to the MSHA report. In the European Union there are 583 thousand people active in EU-28 in the mining and quarrying industry according to EUROSTAT in 2014. In 2014 there are more than 12,000 incidents reported. The percentage of incidents in the US is 1.81% and in the EU it is 2.00%. There is no significant differences between these numbers.

Looking at the physical activity that causes the injuries in the mining industry in the US and the EU there is also no significant difference. The only notable difference is that in the EU there is a 9% bigger chance that an injury is caused by a hand held tool. Overall looking there is almost no difference.

Coming back to the main question: "Are mine operations in the European Union safer than mine operations in the United States?" the answer is not straightforward. When looking at the EU as a country the safety statistics are almost identical. The answer then would be that no, mine operations in the EU are not safer comparing it to the US. However, looking at it per member state the conclusion can be slightly different. Due to the fact that some member states have low fatality and injury rates – United Kingdom - and some have higher injuries and fatality rates like Poland.

To conclude, it can be said that there is still some space left for improvement for both the European Union and the United States. Every fatality and injury is one too many. Nevertheless, it cannot be neglected that both the EU and US are doing a great job of reducing the amount of injuries and fatalities in the mining industry and this is visible in the numbers.

General discussion

This report identified the health and safety standards for the European Union (EU) and the United States (US). The biggest difference of power between the US and EU agencies is that the MSHA has the power to create laws and levy fines to companies throughout the whole United States. In the EU, each individual member state is responsible for performing workplace inspections, establishing health and safety laws and enforcing these regulations.

As the reporting system for non-fatal incidences and fatal incidences are almost identical, the reporting system of the cause and type of the incidence is different. In this report there is made a classification table to match the cause and type of the incidences to match the EU reporting system. This to make a fair comparison. The table is probably not perfect, but it matches the need of this report to conclude that the causation of incidence are identical.

There are countries that have in depth statistics over the causation of injuries in the mining industry, it should be noted that some countries do not have these statistics listed in the EUROSTAT database. Germany and the United Kingdom, that are included in this report, did not report any causations of non-fatal and fatal incidences. Therefore, there numbers concerning the causation of occupational incidences are not truly representative for the whole EU-28. There should be gathered more information and statistics to conclude fairly if the EU has a healthier and safer mining industry comparing it to the United States.

The US, on the other hand has full reports per state and sector of the mining industry on how incidences and fatalities are caused.

There is no information of the International Labour Organisation (ILO) used in this report due to their database was not available in the time period this report was written or the classification used did not match the needs of this report.

It could not be enough said that health and safety is an important issue in the mining industry. Every incident and every fatality that could be prevented by simple measures is one too much. Employers should take active measures, nevertheless it is also the concern of employees to think about their own health and safety.

Like Mahatma Ghandi says: "It is health that is real wealth and not pieces of gold and silver".

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