Environmental Research of the
Federal Ministry for the
Environment, Nature Conservation and Nuclear Safety

Project number: 3715 32 3100

Report number: FB000275/ANH,5,3,ENG

OekoRess II: Country Case Study IV

Democratic Republic of the Congo: Copper-Cobalt (Kamoto mining complex)

by

Rüttinger, Lukas; Scholl, Christine; Andreeva, Tatiana; adelphi

Dolega, Peter; Rechlin, Aissa; Projekt-Consult

On behalf of the German Environment Agency

Completion date July 2017

Abstract

The project "Further development of policy options for an ecological raw materials policy" (OekoRess II) builds on the results of two preceding research projects, UmSoRess and OekoRess I. It links experiences gained in the analysis of environmental and social standards with the assessment of environmental risks in the mineral resources sector. The project team conducts 10 case studies to evaluate and refine the method to assess site-related environmental hazard potentials posed by mining operations, which was developed in the OekoRess I project. The focus is on improving the indicator for environmental sector governance, by comparing the assessed environmental hazard potentials, the observed environmental impacts and the governance analysis with existing governance indicators. The aim is to answer the questions whether existing governance indices and indicators are able to adequately reflect the capacity of governments, companies and civil society to manage potential environmental hazards and avoid or reduce environmental impacts of mining.

This case study analyses the environmental hazard potentials and the environmental impacts of the Kamoto mining complex in the Democratic Republic of the Congo (DRC), one of the largest copper and cobalt mines in the DRC. The mining operations, including both highly mechanised processes and artisanal and small-scale mining (ASM), have led to the pollution of ground water and rivers as well as air pollution, high noise levels, loss of biodiversity and impacts on people's health. The site-related environmental hazard potentials, identified by the OekoRess methodology, pointed quite well to the actual environmental impacts.

Most of the analysed governance indicators included in this study adequately reflect the very limited capacity of government authorities to manage potential environmental hazards and avoid or reduce negative environmental impacts of the mining operations. The DRC's weak governance capacities are captured by the Worldwide Governance Indicators and the weak implementation of environmental regulations is mirrored by the low rank in the Environmental Performance Index. The Fraser Policy Perception Index reflects both the government's attempts to attract investors and the omnipresent corruption very well. In general, most of the analysed indicators help shed light on the context in which environmental damages in the Kamoto mining complex take place.

Kurzbeschreibung

Das Vorhaben „Weiterentwicklung von Handlungsoptionen einer ökologischen Rohstoffpolitik" (ÖkoRess II), welches auf den Ergebnissen zweier vorangegangener Forschungsprojekte (UmSoRess und ÖkoRess I) aufbaut, verbindet Erfahrungen aus der Analyse von Umwelt- und Sozialstandards mit der Bewertung von Umweltrisiken im Rohstoffsektor. Das Projektteam führte 10 Fallstudien durch, um die im Rahmen des ÖkoRess-I-Projekts entwickelte Methode zur Bewertung standortspezifischer Umweltgefährdungspotenziale im Bergbau zu evaluieren und weiterzuentwickeln. Der Fokus liegt auf der Verbesserung des Indikators für Umwelt-Governance, indem die bewerteten Umweltgefährdungspotenziale, die tatsächlichen Umweltauswirkungen und die Governance-Analyse mit vorhandenen Governance-Indikatoren verglichen werden. Ziel ist es, die Frage zu beantworten, ob die Governance-Indikatoren in der Lage sind widerzuspiegeln, inwiefern relevante Akteure (Regierungen, Unternehmen und Zivilgesellschaft) potentielle Umweltgefährdungen bewältigen und Umweltauswirkungen des Bergbaus vermeiden oder reduzieren können.

In dieser Fallstudie werden die Umweltgefährdungspotenziale und die Umweltauswirkungen des Kamoto-Bergbaukomplexes in der Demokratischen Republik Kongo (DR Kongo), einer der größten Kupfer- und Kobaltminen in der DR Kongo analysiert. Die Bergbauoperationen, die sowohl hochmechanisierte Industrie- als auch Kleinbergbauprojekte umfassen, haben zu Luftverschmutzung sowie zur Verschmutzung von Grundwasser und Flüssen, einem hohen Geräuschpegel sowie einem Verlust an biologischer Vielfalt geführt, und sich negativ auf die Gesundheit der Menschen ausgewirkt. Die mit der

ÖkoRess-Methodik identifizierten standortbezogenen Umweltgefährdungspotentiale decken sich überwiegend mit den tatsächlichen Umweltauswirkungen.

Die meisten der in dieser Studie analysierten Governance-Indikatoren spiegeln die stark eingeschränkte Fähigkeit der Regierungsbehörden, potenzielle Umweltgefahren zu bewältigen und Umweltauswirkungen des Bergbaus zu vermeiden oder zu verringern, angemessen wider. Die schwachen Governance-Kapazitäten der DR Kongo werden von den Worldwide Governance Indicators erfasst, und die schwache Umsetzung der Umweltvorschriften spiegelt sich im niedrigen Rang des Environmental Performance Index wider. Der Fraser Policy Perception Index spiegelt sowohl die Bemühungen der Regierung, Investoren anzuziehen, als auch die allgegenwärtige Korruption sehr gut wider. Im Allgemeinen helfen die meisten analysierten Indikatoren dabei, den Kontext zu beleuchten, in dem Umweltschäden im Kamoto-Bergbaukomplex auftreten.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AECP	Permanent Rights for Quarry Exploitation
ASM	Artisanal and small-scale mining
CAMI	Mining Cadastre Agency
CEEC	The Centre of Expertise, Evaluation and Certification
CSR	Corporate Sustainability Performance
CTCPM	Technical Cell of Coordination and Mining Planning
DPEM	Department for the Protection of the Mining Environment
DRC	Democratic Republic of the Congo
EC	European Commission
EDI	Environmental Democracy Index
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMPP	Environmental Management Plan Of The Project
EPA	Environmental Protection Act
EPI	Environmental Performance Index
FARDC	Congolese Army
GDP	Gross domestic Product
Gécamines	La Générale des Carrières et des Mines SARL
HDI	Human Development Index
ICOLD	International Commission on Large Dams
KCC	Kamoto Copper Company
KML	Katanga Mining Limited
KOV	Kamoto Oliveira Virgule (Kamoto Open Pit)
KTO	Kamoto Underground Mine
MECN-T	Ministry of Environment, Nature and Tourism
MRP	Mitigation and Rehabilitation Plan
MUMI	Mutanda Mining Limited
NGO	Non-governmental Organization
PE	Exploitation Permit
PEPM	Small-scale Mining Exploitation Permit
PER	Tailings Processing Permit
pH	Potential of Hydrogen
PPI	Fraser Policy Perception Index
PR	Exploration Permit

RMG	Militia Groups in DRC
SAESSCAM	Support Service And Management Of Small Scale Mining
SSF	State Security Forces
SX-EW	Solvent Extraction-Electrowinning
TSF	Tailings Storage Facilities
U.S.	United States (of America)
UNDRIP	UN Declaration on the Rights of Indigenous Peoples
WGI	Worldwide Governance Indicators
WHO	World Health Organization
WOL	Whole Ore Leaching
ZEA	Authorized Artisanal Mining Area

1 Focus of the study and relevance

The following case study is the fourth of ten case studies that are being prepared as part of the project "Further development of policy options for an ecological raw materials policy" (OekoRess II) commissioned by the German Federal Environment Agency. The case studies build on the results of two research projects, the UmSoRess[1] project and the OekoRess I[2] project. In UmSoRess, the impacts of raw material production on the environment, society and the economy were analyzed in 13 different case studies.[3] The goal of these case studies was to gain a better understanding of the connections between the environmental and social impacts of mining in the context of various countries with different problems and governance contexts. In OekoRess I, a method to evaluate the ecological availability of raw materials and the site-related environmental hazard potentials posed by mining operations was developed with the aim to further develop the criticality concept.

As part of the follow-up project, OekoRess II, 10 additional case studies will be conducted that combine the analytical approaches of UmSoRess and OekoRess I in order to evaluate and further develop the method to assess site-related environmental hazard potentials posed by mining operations that was developed in the OekoRess I project. This effort will particularly focus on improving the governance and social indicators used in the methodology by comparing the assessed environmental hazard potentials, the observed environmental impacts and the governance analysis with existing governance indicators. The aim of the case studies is to evaluate if existing governance indices and indicators adequately reflect the capability of governments, companies and civil society to manage potential environmental hazards and avoid or reduce environmental impacts of mining. The results of the 10 case studies will be compared and a set of governance indicators will be identified that can be used to improve the raw-material-related assessment approach developed as part of the OekoRess I project.

This case study analyses the environmental hazard potentials and the environmental impacts of the Kamoto mining complex in the Democratic Republic of the Congo (DRC) and the country's mining governance. The Kamoto mining complex is one of the largest copper and cobalt mines in the DRC and operates in a highly mechanized way. The mining operations have led to pollution of groundwater and rivers, high noise levels and impacts on people's health. Since many mining operations in the DRC are closely linked with and accompanied by artisanal and small-scale mining (ASM), ASM is analysed in the sections on macroeconomic relevance, environmental impacts, and governance and conflicts.

The case study is structured in four parts: First, the structure of the DRC's mining sector and its contribution to the national economy is analysed (chapter 2). Second, a brief overview of the Kamoto mining complex is given. The geographic and geologic context is analysed followed by an overview of the applied mining and processing methods (chapter 3). Third, the environmental hazard potentials posed by the mining operation are discussed using the OekoRess I methodology and selected environmental impacts and reactions to these are described using the DPSIR framework that was also used in the UmSoRess case studies (chapter 4).[4] Fourth, the governance of the DRC's mining sector is analysed (chapter 5) and last, the findings of the assessment of the potentials for environmental hazards and environmental impacts and the governance analysis are compared to existing governance indicators and indices and first conclusions for the methodology development are drawn (chapter 6).

[1] Approaches to reducing negative environmental and social impacts in the production of metal raw materials. For more information see https://www.umweltbundesamt.de/umweltfragen-umsoress.

[2] Discussion of ecological limits of raw materials production and development of a method to evaluate the ecological availability of raw materials with the aim of further developing the criticality concept. For more information see https://www.umweltbundesamt.de/umweltfragen-oekoress.

[3] The case studies and fact sheets on the standards and approaches analysed can be accessed here: https://www.umweltbundesamt.de/umweltfragen-umsoress.

[4] The DPSIR framework comprehensively accounts and visualizes the causal connection between environmental issues, their origin, their impacts and the responses taken. The model consists of driving forces, pressures, state, impacts and responses. For further information see e.g. Kristensen (2004).

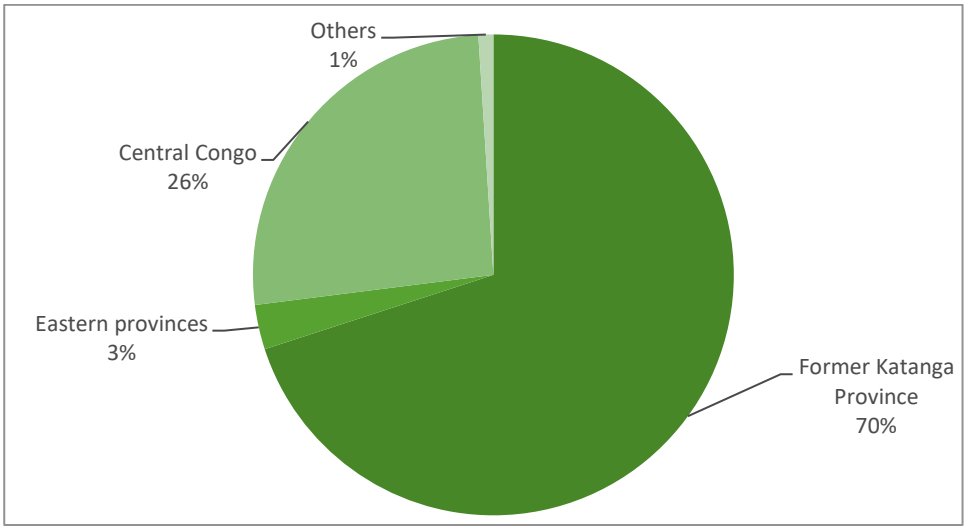
2 Structure and macroeconomic relevance of DRC mining sector

The mining sector plays a key role in the DRC, as a main driver of economic growth, as a source of employment and as the sector responsible for a major part of the country's exports (PwC 2017; World Bank 2017).

Currently, the mining sector annually contributes 22-24 % of the country's GDP[5] (a 10 % increase from 2011), and comprises about 85 % of overall revenue from exports (EITI 2017; WTO 2016; African Economic Outlook 2012). Before 2004, oil was a major export from the DRC; in 2004, cobalt ore surpassed oil and became a leading exported good until 2010 when it was surpassed by copper (also due to the Dodd Frank Act's enforcement, see section "Governance") (OECD 2017; DRC Data Portal 2017). In 2015, copper accounted for over a half of exported goods, while cobalt accounted for approximately 18.3 % (OECD 2017; WTO 2016).

The former Katanga province[6], where the Kamoto mine is located, was responsible for 70 % of overall payments from mining industries to the state in 2013. Based on this, the province contributes more to the DRC's income from mining than any other province: nearly $1billion annually (see Figure 2-1; COSOC-Gl 2015; African Independent 2016).

Figure 2-1: Contribution of different provinces of the DRC to State's revenue from mining sector in 2013



Source: Own graphic based on data from COSOC-GI (2015).

The DRC's mining sector creates a large number of jobs. In 2014, extractive industries are estimated at employing 11 % of the overall work force of the country (EITI 2017). The industrial mining sector employs from 200,000 to 375,000 people, of which around 50,000 are direct jobs (WTO 2016; The Chamber of Mines 2015). Small-scale mining employs a range of 0.5 to 2 million[7] people (ibid.). Moreover, the Chamber of Mines estimates, that each officially employed miner supports 5 other people (e.g. family members or by providing other indirectly connected jobs), which suggests that up to 1.9 million people rely on mining (Mining Weekly 2016). There are an estimated minimum of 100,000 artisanal miners working exclusively in the cobalt extraction industry in the DRC, which is around 8 % of all artisanal miners in the country (MINING.com 2017a; Amnesty International 2016; The Chamber of

[5] According to the International Monetary Fund, contribution of mining sector to the GDP of the country in 2014 resulted into 19% (IMF 2015, p.27)

[6] After an administrative change in 2015, the former province of Katanga was divided into four new provinces: Haut-Katanga, Haut-Lomami, Lualaba and Tanganyika.

[7] African Mining Brief states that about 12.5 million people in the DRC are employed in small-scale and artisanal mining together (African Mining Brief 2016)

Mines 2015). The major state-owned company La Générale des Carrières et des Mines SARL (Gécamines) is the largest employer in the DRC's mining sector (COSOC-Gl 2015a).

The DCR is extremely rich in natural resources with more than 1,000 mineral substances, of which 22 are considered valuable and beneficial for the country's economic growth (EITI 2014). The subsoils of the DRC contain 45 % of global cobalt reserves (56,000 million tons, the largest in the world), 25 % of global diamond reserves and approximately 3 % of global copper reserves (USGS 2016, 2017).

Numbers related to cobalt production in the DRC vary. According to estimates by USGS, 63,000 tons of cobalt were produced in the country in 2015 (USGS 2016), whereas the Ministry of Mines of the DRC (2016) and the British Geological Society (BGS 2017) state a production of around 84,000 tons in 2015. With these production numbers, the DRC is the "world's leading source in mined cobalt", with a supply of more than half of the world production (USGS 2016). According to research by BMI Research, cobalt output in the DRC is expected to increase approximately 4.6 % per annum until 2020 (MINING.com 2016). Additionally, an increase in the amount of foreign investments in cobalt production is expected in the coming years (INN 2017c; KPMG 2016), which would lead to stable growth in cobalt extraction. The DRC's cobalt is essential for various Chinese industries, and therefore also for international companies that have production branches in China or using materials produced there (Bloomberg Technology 2016). Around 90 % of refined cobalt exported by China for the production of electronics and batteries originates from the DRC (The Washington Post 2016, USGS 2016).

In regard to copper, the DRC ranked fifth out of the top ten global producers of copper in 2015 (USGS 2016). The DRC's total copper production in 2015 amounted to 990,000 tons (USGS 2016) worth nearly $5.1 billion (MINING.com 2016). However, the suspension of Glencore's mining project in Katanga since September of 2015 has caused a decrease in the total copper production of the DRC (Reuters 2017). Table 2-1 gives an overview of DRC's production of cobalt, copper, and other minerals and their importance for the global market.

Table 2-1: The DRC's Mineral Production in 2015

Mineral [*= critical according to EC 2014]	Production 2015 (unless otherwise noted)		
	Volume [t] (unless otherwise noted)	% of ∑ World	Rank
Cobalt* (tons of metal content)	83,529	56.4	1
Copper	1,039,007	5.4	5
Diamonds (carats)	14,284,000	11.3	2
Graphite*	10,000	0.5	9
Magnesite*	250,000	0.6	13
Tantalum & Niobium (in the DRC – from Columbite-tantalite)*	2,102	0.6	5
Tungsten*	55	0.007	17
Zinc	6,301	0.05	41

Based on: BGS (2017); selected critical minerals (according to EC 2014) are marked with *.

There is a wide variety of international mining companies in the country. In 2014, there were 260 mining companies operating in the DRC (WTO 2016); in 2011, the majority of foreign companies were Canadian-based (GBR 2013). Many of the operating international companies have the Congolese State as shareholder due to specific peculiarities of the permission process for mining activities (s. chapter

"Governance"). Additionally, there are eight fully state-owned companies in the country: Gécamines, MIBA, SOMIKO, Cominiere, SODIMICO, EMK-MN, Somika and SACIM (Ministry of Mines 2017). Gécamines is a large company with shares in the majority of foreign mining entities active in the country (EITI 2014). According to the DRC's Mining Cadastre Agency's (CAMI) data, exploration activities in the DRC cover over 30 % of the country's territory. Large and small-scale mining runs on over 2 % of the Congolese territory, while artisanal mining is conducted on less than 0.1 % of the land (The Mining Law Review 2012).

In the DRC, cobalt is being mined by both state-owned and foreign mining companies, and around 20 to 40 % of the mineral has an artisanal origin (USGS 2016a; Amnesty International 2016; The Washington Post 2016). The Kamoto mining complex is of particular importance for the DRC, as it is one of the largest copper and cobalt mines in the country. A temporary shutdown of the mine due to decreased copper prices has for example led to over 1,000 employees losing their job (Bohlsen 2017a; Mining weekly 2016). Besides industrial mining, ASM is an important provider of jobs. In the area, ASM represents an essential livelihood to many people.

3 Overview of the Kamoto mining operation and geology

The Kamoto copper and cobalt mining complex is a large-scale mining operation in the DRC. Since the beginning of the 20th century, the area around Kolwezi has been used for mining (Straskraba et al. 1985: 127). The deposits within the complex were first mined by the state-owned mining company Gécamines between 1969 and 1990 (Katanga Mining Limited 2017). In 2007, the mines were reopened by the Kamoto Copper Company, whose stakes are held by Katanga Mining Limited (75 %), and Gécamines and SIMCO (25 %, also a state-owned company). Katanga Mining Limited in turn is a subsidiary of the Swiss company Glencore (ITIE 2017). In September 2015, the operations were suspended due to low metal prices. During the care and maintenance, the construction of the Whole Ore Leach Project (WOL Project) was started which will increase recovery rates and reduce operating costs. The production is expected to restart in the second half of 2017 (Katanga Mining Limited 2017). Besides industrial mining, ASM is very common in the area and takes place around and at (abandoned) sites of the Kamoto mining complex and at other (designated) ASM sites in the area.

3.1 Geography

The mines are located in the south of the province Katanga, bordering the western part of the town Kolwezi (compare Figure 3-1). The mining area Kolwezi is located on the Manika plateau with an average height between 1,400 and 1,450 meters above sea level.

Figure 3-1: Location of Mine

Source: OpenStreetMap (2019)

The concession is located within the Zambian copperbelt. The copperbelt has a width of approximately 250 kilometres and starts at the centre of Zambia in Luanshya and extends in a north-west direction for a distance of 800 kilometres to the south of the Democratic Republic of the Congo (Ksiezniakand Stucchi 2013: 59). The copper deposits within the Zambian copperbelt are some of the richest and largest in the world, moreover the region shows the highest concentrations of cobalt in the world. The

deposits are copper-rich shales which are similar to the European Kupferschiefer – sediment-hosted, stratiform copper deposits of late Permian age located in central Europe (Okrusch and Matthes 2005: 296; Stosch 2014: 271; Milesi et al. 2006: 584).

The Kamoto Copper Company (KCC), owns six mining assets in total (referred to hereafter as the Kamoto mining complex): Kamoto, Mashamba East, Kananga, T-17, Kamoto Oliveira Virgule (KOV) and Tilwezembe (located approximately 40 kilometers west of the Kamoto complex).

The climate is dominated by a rain and a dry period. Within the 210 to 240 days long raining season between September and April precipitation amounts to 1,200 mm. Between May and September there is little to no precipitation. Average annual temperature is 20.2°C with October being the warmest month and June the coldest (Climate data n.d.; de Dapper 1991).

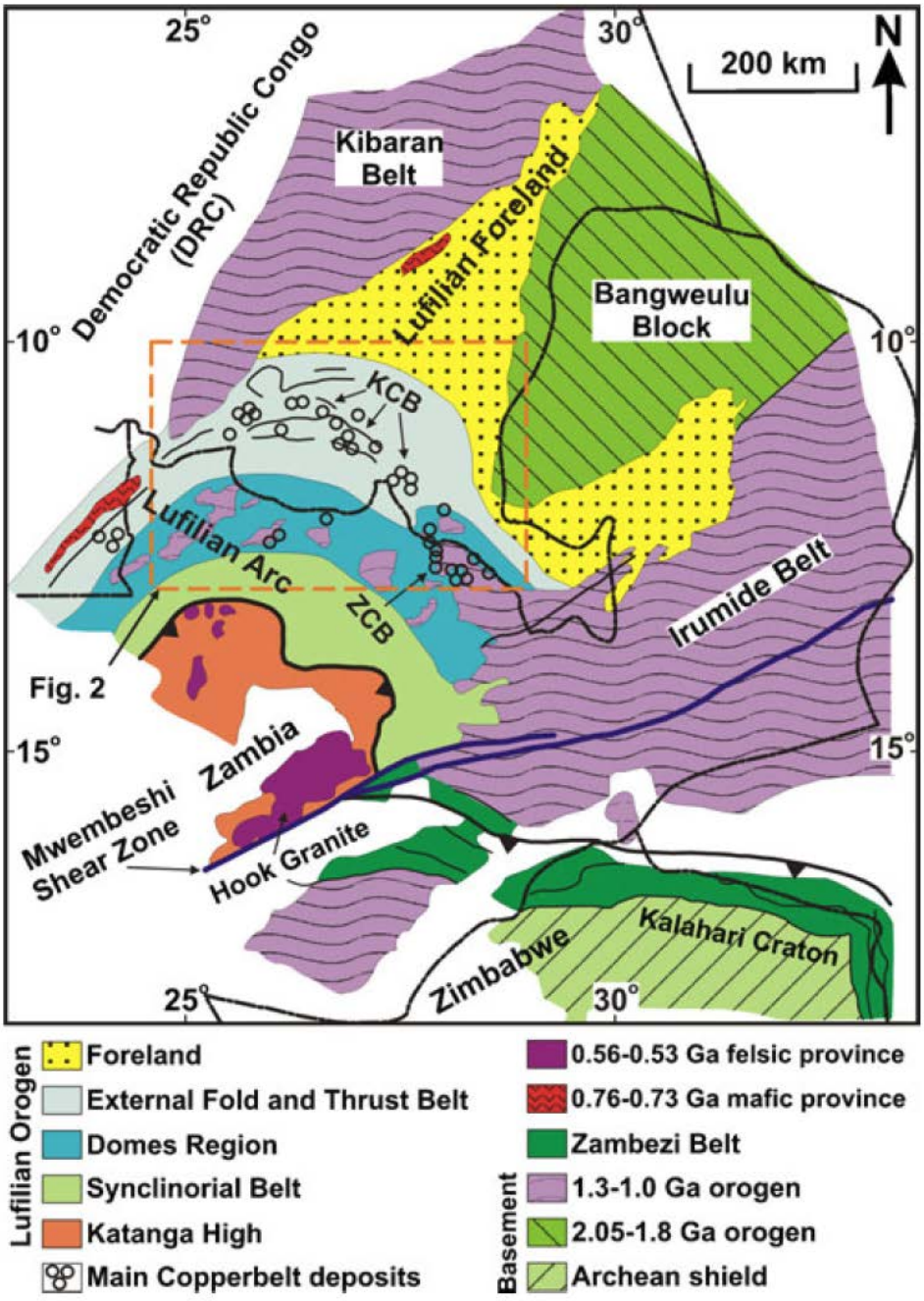
The principal vegetation type in the region is the miombo woodland which is a dry type savannah-like vegetation. Also steppic grassland formations are very common (de Dapper 1991).

3.2 Geological context and ore deposit formation

The mines are located in the western end of the Katangan Copperbelt, which is the largest and richest sediment-hosted stratiform copper–cobalt region in the world, moreover it contains some of the richest uranium deposits in the world (El Desouky et al. 2010; Katanga Mining Limited 2017).

The tectonical and depositional development of the Katangan Copperbelt is related to the separation of the Congo Craton from the Rodinian supercontinent and its integration to Gondwana. This formed collisional terranes along the eastern and northern as well as accretionary belts in the south and west of the margins of the Congo Craton resulting in the Pan African (Neoproterozoic) Orogen. The Lufilian Orogen, which is part of the Pan African Orogen, mainly affected the formation of sedimentary copper and cobalt deposits in Katanga (Zientek et al. 2014). The Lufilian Orogen is composed of the Lufilian Arc and the Lufilian Foreland. The deposits of Kamoto are located in the Northern part of the Arc within the External Fold-and-Thrust Belt region (compare Figure 3-2).

Figure 3-2: Geologic map of the Lufilian Orogen



Source: El Desouky et al (2010).

The deposits are hosted in a 7 kilometres thick succession of sediments with minor volcanic and intrusive rocks (Katanga Mining Limted 2017). This type of deposit constits of fine-grained minerals that form stratabound disseminations in siliclastic and dolomitisc sedimentary rocks (Zientek et al. 2014).

3.3 Mining and Processing

The operation consists of four mines which are exploited in both open-pit and underground mining and two processing sites – the Kamoto concentrator and the Luilu metallurgical plant (compare Table 3-1).

Table 3-1: List of mines at the Kamoto mining complex and type of mining

Mine name	Type
Kamoto (KTO)	underground
Mashamba East	open-pit
T-17	underground / open-pit
KOV (Kamoto Oliveira Virgule)	underground / open-pit

Source: Katanga Mining Limited (2017).

The Kamoto underground mine is the company's main source of sulphide ore. With a production shaft for 11,000 t/day, the mine is the company's main source of sulphide ore. The facility moreover includes a service shaft and two 6.5 by 6 meter ramp declines (Katanga Mining Limited, 2019).

The sulphide ore from the Kamoto underground mine is crushed underground and transported via conveyor belts to the Kamoto concentrator. The mixed ore from the KOV is transported by trucks to a crusher and afterwards it is also transported to the concentrator.

The Kamoto concentrator facility consists of four mills and four flotation sections which have a capacity of processing 7.5 million tons of ore per year. The ore from the mines is first grinded and afterwards the minerals are separated from the ground ore by a froth flotation process. Slightly different processes are applied for sulphide and oxide ore (Katanga Mining Limited 2017; Lydall and Auchterlonie 2011). After processing the residues are stored in tailing storage facilities and are partially used for backfilling the Kamoto underground mine (Katanga Mining Limited 2017).

The concentrate is further processed at the Luilu metallurgical plant, where it is roasted (only sulphidic ore) and leached adding diluted sulphuric acid. The solvent extraction / electro-winning (SX-EW) process is applied to extract metallic copper. Cobalt is also extracted by electro-winning. Through electrolysis, the respective elements precipitated at the cathode blanks. The plated copper and cobalt will be stripped of and stockpiled before being sold on the international market (Katanga Mining Limited, 2016). Smelting of these metals does not take place at Luilu metallurgical plant. The Luilu plant has capacity of producing 175,000 tons of copper and 8,000 tons of cobalt annually (Market Line 2016).

The company currently expands their processing infrastructure to establish a Whole Ore Leaching project (WOL). The new process will increase the production to 300,000 tons Cu and 22,000 tons Co per annum; also the recovery rates will increase (Katanga Mining Limited 2016).

Currently the only deposits that have proven reserves are Kamoto and T17 that are adding up to a total of 10.4 Mt grading at 3.62 % Cu and 0.40 % Co on average (see Table 3-2). The probable mineral reserves are much greater adding up to a total of 114.3 Mt with average ore grades of 3.50 % Cu and 0.53 % Co.

Table 3-2: Annual copper and cobalt production from 2011 to 2015

	Unit	2011	2012	2013	2014	2015
Mashamba East OP						
Mined ore	Mt	0	0	0	0	0.004
Cu grade	%	0	0	0	0	3.42
Co grade	%	0	0	0	0	0.42
KTO						
Mined ore	Mt	1.61	1.84	1.74	1.94	1,48
Cu grade	%	3.71	3.6	3.35	3.42	3.22
Co grade	%	0.53	0.57	0.5	0.46	0.36
KOV OP						
Mined ore	Mt	2.52	3.71	4.39	5.38	4.55
Cu grade	%	4.98	4.38	4.35	4.1	3.93
Co grade	%	0.3	0.38	0.37	0.41	0.47
T17 OP						
Mined ore	Mt	0.4	0	0.11	0.11	0
Cu grade	%	3.32	0	3.48	3.3	0
Co grade	%	1.01	0	0.72	0.88	0
Tilwezembe OP						
Mined ore	Mt	0	0	0	0	0
Cu grade	%	0	0	0	0	0
Co grade	%	0	0	0	0	0
KTC						
Milled ore	Mt	4.10	4.61	5.6	6.31	5.46
Concentrate produced	Kt	480	500	710	910	860
Lullu						
Concentrate fed	Kt	300	360	490	1,110	840
Copper produced	Kt	57.61	61.44	87.48	157.02	106.8
Cobalt produced	Kt	2.43	2.13	2.3	2.78	2.9

Based on: Katanga Mining Limited (2017).

In terms of production volumes the KOV open pit mine is the most important deposit (see Table 3-2). In 2015, 4.55 Mt of ore was mined, representing more than three quarters of the total production in

that year. Another quarter was produced by the Kamoto underground mine. The other deposits have currently not been mined but will probably be exploited in the future.

4 Overview of environmental hazard potentials and environmental impacts

4.1 Environmental hazard potentials

As part of the OekoRess I research project an evaluation scheme for assessing the environmental hazard potentials (EHPs) of the extraction of primary abiotic raw materials was developed. This evaluation scheme is based on indicators, which are assigned to three levels of consideration. These levels are geology, technology and site surroundings. The level "Geology" comprises five indicators, which include environmental factors inherent to the geology on site. These key influencing factors are "precondition for acid mine drainage (AMD)", "paragenesis with heavy metals", "paragenesis with radioactive components", "deposit size" and "specific ore grade". The second level is "Technology" and includes the indicators "mine type", "use of auxiliary substances", "mine waste management" and "remediation measures". The third level "Site (surroundings)" comprises the indicators "natural accident hazard due to floods, earthquakes, storms, landslides", "Water Stress Index (WSI) and desert areas", and "protected areas and Alliance for Zero Extinction (AZE) sites". Furthermore, the indicator "conflict potential with local population" focusses on the social context. The latter indicator is further developed by analysing ten case studies of which the present case study is one.

The environmental hazard potential for each indicator can be rated as low (green), medium (yellow) or high (red) (for detailed information on the method see Dehoust et al. 2017b). Table 4 1 shows the evaluation of the EHPs of the Kamoto mining complex, which are described in detail below.

The assessment of the EHPs of the Kamoto mining complex is followed by an analysis of the actual situation and impacts of the mining activities on the environment as well as the responses from the mine site operator, the responsible authorities as well as the local communities, using the DPSIR framework (Chapter 4.2).

Table 4-1: Site-related OekoRess assessment

Level of consideration	Indicator	Environmental hazard potential		
		low	medium	high
Geology	Preconditions for acid mine drainage (AMD)			X
	Paragenesis with heavy metals			X
	Paragenesis with radioactive components			X
	Deposit size			X
	Specific ore grade	X		
Technology	Mine type		X	
	Use of auxiliary substances			X
	Mining waste management			X
	Remediation measures		X	
Site (surroundings)	Natural accident hazard due to floods, earthquakes, storms, landslides	X		
	Water Stress Index (WSI) and desert areas	X		

Level of consideration	Indicator	Environmental hazard potential		
		low	medium	high
	Protected areas and Alliance for Zero Extinction (AZE) sites	X		
	Conflict potential with local population			X

4.1.1 Geology

Preconditions for acid mine drainage (AMD)

Copper is a chalcophile and cobalt a siderophile element; accordingly, copper is mostly mined from sulphide ores. Cobalt is also mined from sulphide ores but oxide ores are also common. The Kamoto operation extracts both sulphide and oxide ore. Hence the potential for the development of acid mine drainage is high (*high environmental hazard potential*).

Paragenesis with heavy metals

Copper itself is defined as a heavy metal. Moreover assessments of soil metal distribution indicate a strong correlation between mining and elevated levels of heavy metals in the soil. The elevated levels are also naturally connected to the geology; however, mining and smelting activities support the distribution of metals to the environment (Pourret et al. 2016). Accordingly, the geological risk for contamination is high and is further increased by the mining operation (*high environmental hazard potential*).

Paragenesis with radioactive components

The region hosts some of the richest uranium deposits in the world. Over the last decades many of them have been mined. According to a report from the Ecumenical Network Central Africa (2011) that refers to a UN document, which is not publically available, the radiation at Kamoto shows extremely elevated levels. Accordingly, the potential for environmental hazards due to radioactivity is high (*high environmental hazard potential*).

Deposit size

The total estimated reserves at the Kamoto complex are 124.7 Mt tons of ore grading at 3.50 % Cu and 0.53 % Co on average. This amounts to a total of approximately 4.36 Mt of copper and 0.66 Mt of Cobalt. Accordingly, the complex can be categorized as a large copper deposit and a very large cobalt deposit. Therefore the deposit size poses a significant potential for environmental hazards (*high environmental hazard potential*).

Specific ore grade

The average ore grade varies depending on the source. Mudd et al. (2013) estimates the average grade to be 3.36 % Cu and 0.41 % Co, very similar to Katanga Mining Limited (2017) with estimated of 3.50 % Cu and 0.53 % Co content in their latest technical report.

The copper grade is significantly higher compared to other large deposits such as the largest copper mine by production Chuquicamata in Chile with grades around 1 % Cu. Matching this observation, results from Priester et al (2019) indicate that deposits with >3% copper content can be regarded as high grade deposits. Furthermore, also the cobalt grade at Kamoto underground mine is very high. Therefore, production of waste material and energy cost for processing are rather low resulting in a low potential for environmental hazards (*low environmental hazard potential*).

4.1.2 Technology

Mine type

The mining complex consists of four separate mines that are mined in different ways. Currently only the KOV open-pit and the Kamoto underground mine are in operation. Hard rock open pit mining disturbs the surface to a much larger extent than underground mining. In contrast to open pit mining in alluvial or unconsolidated sediment, the disturbance only extents to the size of the ore body. Accordingly, the applied mining method poses a medium potential for environmental hazards (*medium environmental hazard potential*).

Use of auxiliary substances

The ore processing of predominately sulphidic copper-cobalt ores involves several complex processing stages, in which chemical reagents are utilized: (I) Flotation: Multitude of chemicals, which modify the specific properties of the flotation solution and bubbles. (II) Leaching: Ore concentrates are leached with dilute sulphidic acid. Additionally sodium metabisulphite is added to improve the dissolution of cobalt. The residues are neutralized with lime milk before dumping. (III) Within the cobalt SX-EW process, the pH-value is adjusted by adding lime milk to remove impurities of iron, manganese, aluminum and coppers (Katanga Mining Limited 2016). The processing involves the usage of chemical reagents for the flotation, acids and alkaline fluids, which pose a high potential for environmental hazards (*high environmental hazard potential*).

Mining waste management

Only little information can be found concerning the waste material management. However, the technical report mentions a number of different Tailings Storage Facilities (TSF) without giving precise information on size and location. The TSFs can be identified in aerial photographs.

Their total surface can be roughly estimated to be 4-5 square kilometers. Moreover waste is dumped on heaps; at least one large heap can be identified in aerial photographs. The large surface of the TSFs in combination with the dry climate between May and September can lead to the transport of significant amounts of dust via wind erosion.

According to the International Commission on Large Dams (ICOLD), a large dam is defined by a height of at least 15 meters or a volume of at least 3 million cubic meters (ICOLD 2018). Assuming that one of the TSFs could have a roughly estimated surface of 1 square kilometers (1 million square meters) a dam height of 3 meters would be sufficient to be rated as a large dam. It is very probable that the dams are rather higher; therefore, it can be assumed that some of the TSFs visible in the aerial photograph are large dams by definition. Accordingly, the applied waste material management strategies pose a high potential for environmental hazards (*high environmental hazard potential*).

Remediation measures

According to Katanga Mining Limited's technical report the main part of rehabilitation will be done after the mine is closed. The report contains a detailed plan for rehabilitation and the associated costs (Katanga Mining Limited 2017). Accordingly, the potential for environmental hazards caused by insufficient rehabilitation plans is medium *(medium environmental hazard potential).*

4.1.3 Site (surroundings)

Natural accident hazard due to floods, earthquakes, storms, landslides

The total natural disaster risk is assessed by analyzing four individual sub-indicators:

- The risk for earthquakes is rather low; the mine is not located within a seismically active zone.
- The risk for floods is low; no floods have been reported in the last 100 years.

- The risk for tropical storms is low; the operation is located in the center of the continent with no connection to the coast.
- The risk for landslides is low; due to the region's geomorphology there are rather low slope angles; combined with the climate conditions the risk for landslides is rather low.

The evaluation is carried out in accordance with the measurement instructions, which suggest to use georeferenced data from publicly available risk maps. The results are taken directly from the given risk assessment. The indicator total is derived by the highest hazard potential of the sub-indicators.

Because none of the sub-indicators has revealed an increased risk, the total natural disaster risk is low (*low environmental hazard potential*).

Water Stress Index (WSI) and desert areas

The WSI by Pfister et al. (2009) provides characterization factors on the relative water availability at watershed level. The indicator combines this information with an evaluation whether the site is located in a desert area. Mining operations often need large amounts of water for the operation. Depending on the hydrological situation, a competition for water between the different users can occur. The evaluation was carried out in accordance with the procedure described in the measurement instructions (Dehoust et al. 2017a). However, Kamoto is located in a region without increased water stress. Accordingly potential for environmental hazards caused by water stress is low (*low environmental hazard potential*).

Protected areas and Alliance for Zero Extinction (AZE) sites

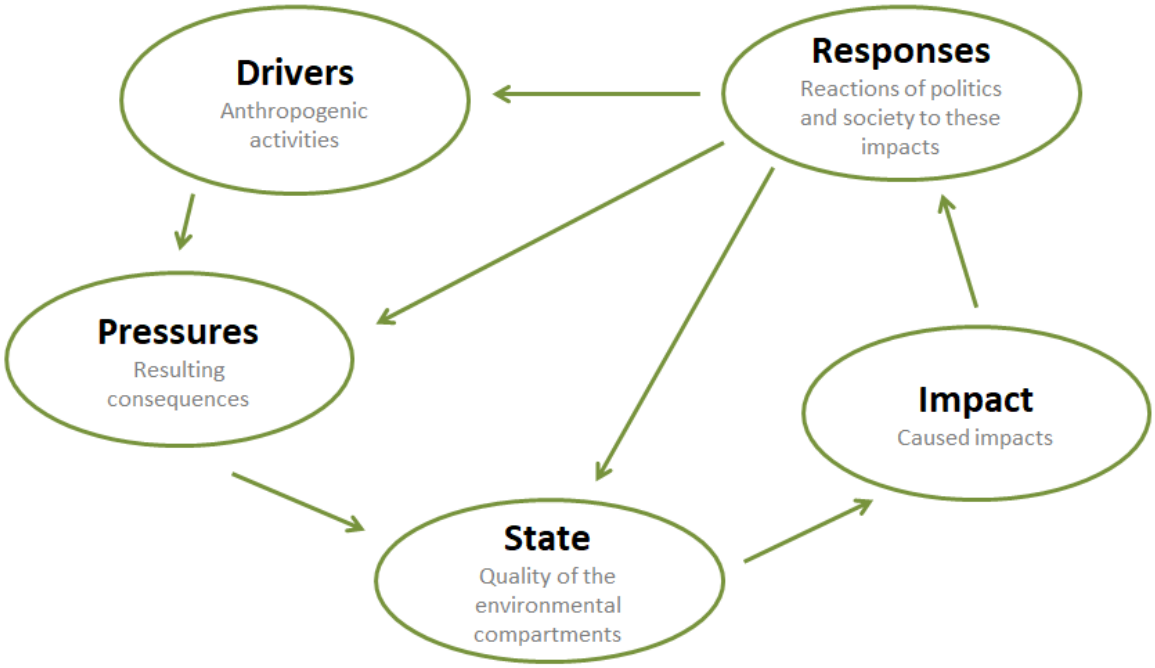
Georeferenced data for designated protected areas are used to assess hazards posed by mining extraction. The metric to evaluate EHPs corresponds to the method first described in the draft standard of the Initiative for Responsible Mining Assurance (IRMA 2014). The mine is not located within protected, highly protected areas or at "Alliance for Zero Extinction"-sites. Accordingly the potential for environmental hazards caused by an operation in protected areas is low *(low environmental hazard potential).*

Conflict potential with local population

The sub-indicators "Voice and Accountability" and "Control of Corruption" are very low having a percentile rank of 12.81 and 9.13 respectively (World Bank 2017). Accordingly the potential for environmental hazards related to weak governance is high (*high environmental hazard potential*).

4.2 Environmental impacts

Figure 4-1: DPSIR-Framework



Source: Own preparation, based on Kristensen (2004).

The DPSIR framework is a systemic analytical approach to better understand the interaction of humans and their environment in order to derive adequate policy measures. It comprehensively accounts for and visualizes the causal connections between human activities, the resulting consequences for the environment and the responses of humans. The model consists of driving forces, pressures, state, impacts and responses.[8]

This chapter mainly focuses on environmental impacts of mining and ore processing at the Kamoto mine complex near Kolwezi town in the former Katanga province. The focus lies on the impacts on air, waterbodies and biodiversity and the negative effects on local communities and includes a description of the negative impacts of cobalt on human health.

4.2.1 Pressure

Main pressures in the area stem from the Kamoto Open Pit Mine (KOV) and the Kamoto Underground Mine (KTO) as well as from the refinery facility and metallurgical plant, located in Luilu, Kamoto Concentrator (circa 4 kilometers from Kolowezi).

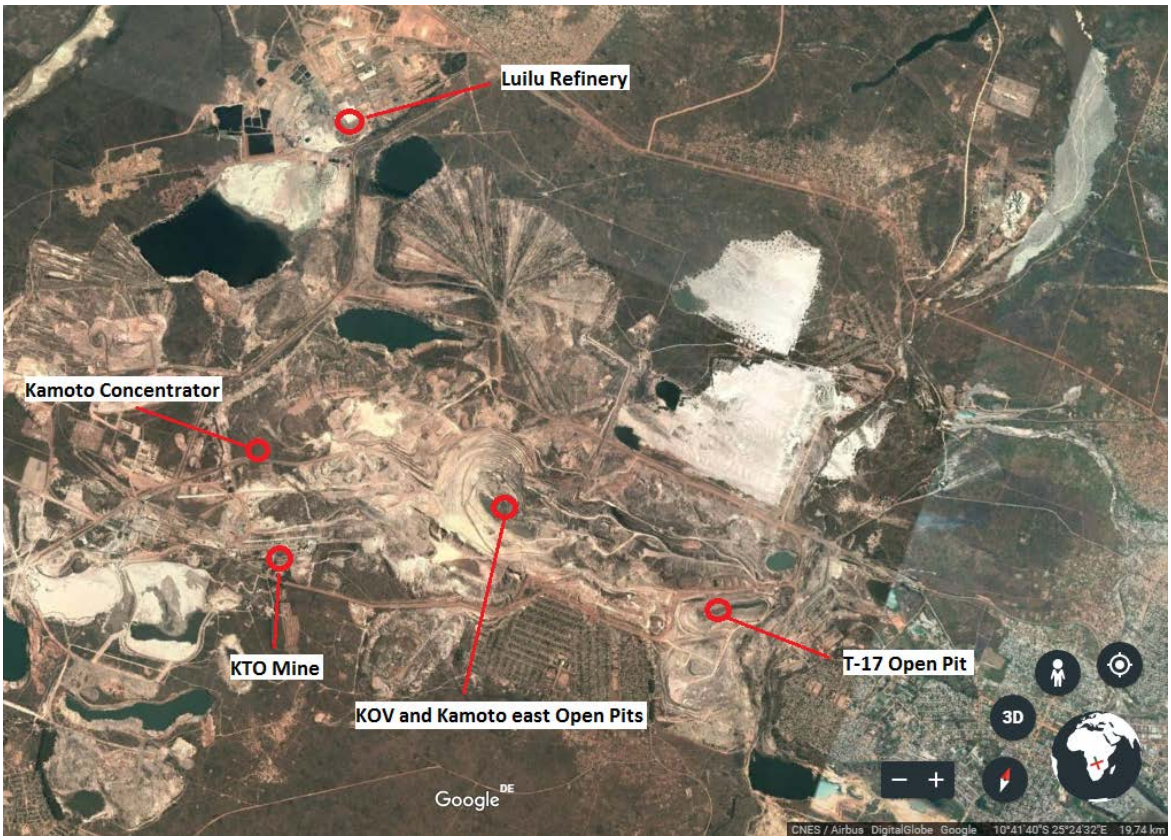
The first mining site in the area, KOV, opened in 1960 along with the Luilu refinery plant (Katanga Mining Ltd. 2017b). The environment has been affected by the operations for 57 years, and current

[8] For further information on the DPSIR framework and its elements see Kristensen (2004).

mining operations are expected to proceed until 2024 (Katanga Mining Ltd. 2016). Areas affected exceed 19.5 square kilometers for the mentioned mining sites and Luilu plant including its tailing ponds. Close to the Luilu Plant there is Luilu town (38,500 inhabitants); Kolwezi town is between 2 to 12 kilometers away from different mining sites and facilities of the mining area; Musonoi town (part of Kolwezi) is close to T17 pit (40,000 inhabitants) (KCC 2006; Bread for All, RAID and Fastenopfer 2014).

The activities in the mines and the refinery plant have led to contamination of ground waters and the Luilu River and have caused air pollution (Environmental Justice Atlas 2015). Pollution and disturbance of the environment are linked to both industrial mining and ASM, as the Kamoto mining complex is surrounded by ASM miners, working on abandoned mine sites from industrial mining and around the mines in use. ASM quantitatively is a lesser source of environmental pressures as it is usually smaller in scale, however, as it concerns a large part of the society and as particularly the health impacts are severe, the impacts of ASM are also described in this part of the study.

Figure 4-2: Different mine sites and the refinery in the area (Glencore, under KCC management), view 2017



Source: Google Earth (2017) and Kamoto Copper SARL (2012).

4.2.2 State and Impacts

Pressures | State | Impact | Responses

Water contamination and water shortage

The population of the DRC has one of the lowest rates of access to water globally; only 26 % of the Congolese population is able to access drinking water. This share is decreasing due to land use changes, such as expanding agriculture, deforestation, unsustainable mining practices and lack of infrastructure and sanitation (Montejano 2013; UNEP 2011a).

The daily water consumption of the Kamoto mine is approximately 60,000 cubic meters, with 19,000 of those being used by metallurgical processes in the Kamoto concentrator (KCC 2006). The region theoretically has good access to water sources (e.g. the Luilu river), however, there are cases reported where the water supply of towns and villages was shortened due to the mining activities and their significant withdrawal of water. For instance, Bread for All and Catholic Lenten Fund (2012) reported that in the town of Musonoi, villagers were left without safe water supply for several years as the two wells and pumps that supplied the village were either deviated and then blocked by the mining company in order to use the water permanently or contaminated with chemical waste from the mines.

In addition to the withdrawals of water and the contamination of ground water and wells, the nearby surface waters, and in particularly the Luilu River, are contaminated, with Luilu metallurgical plant being one of the main polluters. The mining company released wastewaters from the plant containing sulfuric acid, which caused elevated levels of lead, zinc, copper and a pH value of 3.37 (with 6.5-9.0 required) (Bread for All and Catholic Lenten Fund 2012). Despite the fact that KCC stated that the pollution had stopped in 2012, collected water samples and visual checks show ongoing contamination of the river (Bread for All, RAID and Fastenopfer 2014; Asongu and Nwachukwu 2016). This is also underlined by an academic study, which revealed that the mining effluent and the river waters "exceed largely the World Health Organization and the Aquatic Quality Guidelines for the Protection of Aquatic Life recommendation limits" (Atibu et al. 2013: 26) .The polluted water is unsuitable for any type of usage, including irrigation, which has led to a loss of revenue for local communities due to difficulties in agricultural activities; a shortage of drinking water and an increasing number of sicknesses from contaminated water (see section on health impacts). The contamination forced people to dig their own wells; however, these wells are at risk from drying out in the dry season (Bread for All and Catholic Lenten Fund 2012).

Besides industrial mining and ore processing, ASM also significantly contributes to water pollution, mainly to the pollution of surface water bodies. Mineral washing usually occurs directly in rivers, which leads to a significant amount of dust and ore particles getting washed out into the water (Atibu et al. 2013). Furthermore, rainfall regularly washes the dusts and waste down from the small-scale mining sites and the deposits into surface water bodies. At the same time, many miners dispose their domestic waste directly into the water bodies.

The area affected by the Kamoto mining complex exceeds 19.5 square kilometers (Katanga Mining Ltd. 2016). However, the overall mining activities in the Kolwezi region affect an area of around 50 square kilometers (observations and measurements based on Google Maps and Google Earth). Due to destruction and degradation of the natural habitats and a contamination of the mining sites, these areas are no longer suitable for agricultural activities (Environmental Justice Atlas 2015).

Furthermore, the large amounts of waste rock and tailings contribute to the degradation in the area: In 2015, 34.7 million tons of waste rock were removed from KOV and 0.2 million tons were removed from KTO (Katanga Mining Ltd. 2016a). In addition, the Kamoto concentrator milled 5.45 million tons of ore and, as a result, produced 4.6 million tons of additional waste rock (Katanga Mining Ltd. 2016b). The waste rock is stored around the pits and mines and, as in case of KOV and T17 pits, forms high heaps around nearby settlements (Bread for All and Catholic Lenten Fund 2012). Tailings from the refinery plant are reported to flow directly from the facility's sites, which leads to a contamination of soils and a pollution of groundwater (Bread for All and Fastenopfer 2014). The KML's annual information form of 2016 highlights the necessity of new management strategies for tailings, however, it also points out an expansion of tailing facilities in the near future (Katanga Mining Ltd. 2016).

Besides this, ASM also brings serious harm to the soils and surface, as no necessary aftercare is conducted (Mining Weekly 2016).

Air pollution and noise

The mining facilities and the linked transport are permanent sources of air pollution. Due to the fact that most of the roads to and near the mines have no asphalt covering, track vehicles pick up dust into the air (Bread for All and Catholic Lenten Fund 2012). Furthermore, the heaps become a source of dust in windy weather (Bread for All and Catholic Lenten Fund 2012). The dust contains ore particles, heavy metals and chemicals that might easily enter people's lungs and can cause serious diseases and breathing problems (Business Day 2016a).

Diesel, used in mining equipment and trucks, makes the air foggy due to high concentration of fumes, while fluids from the tailings evaporate and chemicals are carried by winds (SOMO 2016).

In the case of KOV and T17 mining sites, local inhabitants complain about regular blasting activities damaging their houses (Bread for All 2011; Stock House 2016).

Loss of biodiversity

Due to pollution and contamination, the surface waters of the area became unsuitable for water flora and fauna (Bread for All and Catholic Lenten Fund 2012; Bread for All, RAID and Fastenopfer 2014). Based on this, local communities lose fish as an important source for food and as an additional income (Mining Weekly 2016). These developments were particularly reported for the Luilu river and the river downstream the refinery plant (Bread for All and Catholic Lenten Fund 2012; Bread for All, RAID and Fastenopfer 2014), however, many surface waters and their biological diversity are affected.

Health impacts

The danger of copper and cobalt for human health is mentioned in a range of studies and articles and is highlighted by the World Health Organization (WHO). Particularly, people who are in contact with high concentrations of cobalt particles on a daily basis are prone to serious chronical diseases. According to the WHO, bronchial asthma, skin diseases (incl. eczema, erythema), vision problems and blinding, heart problems and various types of cancer are common for those staying in contact with cobalt without proper protection (Mendy, Gasana and Vieira 2011; WHO 2006). Additionally, it is believed that in the long run, cobalt can damage DNA and chromosomes.

Cobalt particles are very small and can easily enter and accumulate in human and animal bodies, water bodies and soils (Group 2015). People living near mines and refinery facilities complain about numerous health problems, mainly lung diseases, coughs and breathing problems from dust containing heavy metals and cobalt particles from the mines (Amnesty International 2016; Business Day 2016a).

Scientific studies underline these reports, showing that people of the former province of Katanga, living very close to areas of mining or refining had on average a 4-, 43-, 5- and 4-fold higher urinary concentrations of cadmium, cobalt, lead and uranium (Banza et al. 2009), mainly from contaminated food and dust. These are alarming results, as "the urinary Co [cobalt] concentrations found in this population are the highest ever reported for a general population" (Banza et al. 2009).

Particularly the dust and smoke from mining and ore processing activities contains ore particles and heavy metals and other chemical elements that easily enter people's bodies and cause serious diseases and breathing problems, including asthma, impaired lung function and pneumonia (Business Day 2016a; SOMO 2016).

The listed health problems are particularly reported by artisanal miners, as they are not shielded from mining and processing activities (SOMO 2016). However, as the mines and plants are exceptionally close to residential areas, entire communities suffer from pollution and contamination (SOMO 2016; Banza et al. 2009).

4.2.3 Responses

Environmental and social monitoring

As required by the DRC Mining Code (2002) and Mining Regulation (2003), the mining company commissioned several Environmental Impact Statements (EIS) and Social Impact Studies. The latest EIS was conducted in 2014 and approved by the Department for the Protection of the Mining Environment (DPEM). It is valid for five years (Katanga Mining Ltd. 2017). The reports are not available online, however, they are summarised in the company's technical reports, which are published annually. Furthermore, KCC reports internally on the following issues (Katanga Mining Ltd. 2017):

- Corporate Reporting under the Glencore Corporate Policy for Sustainability Metrics: This presents a list of community incidents, complaints, contractor incidents, employee incidents, environmental incidents, environmental non-compliances, sanctions and fines and HSE incidents;
- internal audits and inspection reports; and
- monitoring reports covering surface and ground water, dust fallout, sulphur dioxide and nitrogen dioxide monitoring and surrogate stack emissions estimation.

Official annual reports of Glencore and its subsidiaries imply that they have taken responsibility for the negative environmental and social impacts and have organized mitigation measures to improve the situation. However, various civil society organisations report that measures taken exist on paper only but are not implemented (e.g. Bread for All and Catholic Lenten Fund 2012; Environment Justice Atlas 2017).

Water and tailings management

KCC takes several measures to address potential water pollution and contamination, which includes treatment and neutralisation of effluents and tailings, recirculation of water, monitoring of water use, construction of dams and recycling (Katanga Mining Ltd. 2017). Suspended solids are – according to KCC – treated in a neutralising process. However, they are "eventually discharged" from the plant to offsite (Katanga Mining Ltd. 2017: 250). The discharge is, according to the mining company, monitored in order to ensure compliance with regulations and standards.

Additionally, KML implemented the Water Quality Management Program, Tailing Pipeline Management Program and Tailing Storage Facility Management Program, to target water control and prevent waste from contaminating natural water bodies (ibid.). In 2015, KML also started a cleaning campaign for water infrastructure in Kolwezi, which works to further improve the water supply for Luilu and Musonoi and includes the construction of two water boreholes in Luilu in 2015 and 14 boreholes in different communities in 2012 (Katanga Mining Ltd. 2016; Katanga Mining Ltd. 2013). One of the tailing and water management activities undertaken by the company might also be considered as an air protection measure: in recent years special floating covers are being used on the tailings ponds. These cover surface and reduce evaporation by 65 % (Glencore 2017a).

Further degradation of the surface is not considered in Glencore's large-scale environmental actions, and there is no specific project related to soil degradation in Glencore's annual report (Katanga Mining Ltd. 2016).

Air quality

KCC monitors the air quality and – based on KCC's own statements – results indicate that the company is in compliance with the DRC effluent quality standards (Katanga Mining Ltd. 2017).

Health

KCC states in its 2017 technical report that the company completed a baseline risk assessment for health and safety and trained all employees and contractors in the so called "SafeWork program" (Katanga Mining Ltd. 2017a). The environmental management systems were enhanced through the improvement of various monitoring programs (recycling program and pollution prevention plan) in order to improve the health of the workers and the communities around the mining complex (Katanga Mining Ltd. 2017). Furthermore, KCC states that it collaborates with local health zones in order to develop strategies to address community health risks and concern, and that the company engages in training local medical stuff and building of health infrastructure (ibid.).

Simultaneously, a wide range of international organisations are aware of the hazardous conditions of cobalt mining in the DRC. There has been a lot of research conducted on this topic, and some organisations (e.g. Group One, supported by UNICEF) work in the field in order to help improve the livelihoods of miners (UNICEF 2012).

Artisanal and small-scale mining

As already stated above, many of the health impacts are particularly reported by artisanal miners. The miners are usually operating under unsafe working conditions, as most of them use their bare hands or very basic tools to extract and process the minerals (SOMO 2016). Besides health problems, artisanal and small-scale mining in the DRC is often associated with illegality, poverty, child labour and armed conflicts. For those reasons, several state and civil society organisations are working on the topic in order to improve the situation of ASM workers and to support the legal artisanal exploitation and trade.

In the area around the Kamoto mining complex, a large number of households depend on ASM. Glencore states that it works to reduce ASM by implementing targeted programmes, such as enhancing local employment or by supporting co-operative associations that work in the communities around the mining complex in order to create new income sources and to train the people about possible dangers around ASM (Glencore 2017). However, civil society organisations report that Glencore is also involved in the facilitation of ASM and the trade of ASM products: First, it is stated that ASM takes place in pits, where Glencore's subsidiary, KCC, holds the mining licence. Second, it is stated that KCC buys minerals from artisanal and small-scale miners around the mining complex (Bread for All and Catholic Lenten Fund 2012).

5 Governance

5.1 Sector governance, regulation and effectiveness of national institutions

In the DRC, according to its Constitution of 2005, minerals and fossil resources are the property of the state. Extractive resources are mainly managed by the Ministry of Mines and its subparts. The DRC's mining sector has well formulated laws; however, the compliance with these regulations is very weak. Mismanagement and corruption cause a number of serious problems in the country, which also affect the mining industry (Global Security n.d). The regulatory system of the mining industry does not differentiate between domestic and foreign mining companies, and there are no significant barriers for international companies to start activities in the DRC (African Mining Brief 2016).

Legal and regulatory framework

There are two major regulations for the mining sector: The 2002 Mining Code (Law No. 007/2002 of July 11th 2002; called "The Mining Code") and the attendant "Mining Regulations", which "sets forth the details and terms of enforcement of the Mining Code" and regulates different issues which are not expressly provided in the Mining Code (Decree No. 038/2003 of March 26th 2003) (African Mining Brief 2016; WTO 2016). No further or specific provincial laws exist for the sector (ICLG 2016).

The 2002 Mining Code was developed by the Congolese Government in collaboration with the World Bank in the early 2000s and was adapted and implemented in 2002. The implementation of the Mining Code played a key role in the expansion of the mining industry in the DRC and attracted investors (McGuireWoods 2013a). The Mining Code defines the institutions responsible for various mining activities; lists the requirements needed in order to obtain mining and quarrying permits; covers all stages of mining activities from prospecting to trading as well as all types of mining, including artisanal mining; and sets taxation and royalty rules (The Mining Code 2002). The Mining Code is only applicable to solid mineral resources; gaseous and liquid extractive resources are governed by separate laws. In 2013, a draft of the renewed Mining Code attracted the attention of the media and investors. The draft included a more burdensome process of obtaining mining and quarrying rights for both domestic and foreign companies, which would have led to a complication of receiving mining and quarrying rights, and to higher royalties[9] and taxes for mining companies (McGuireWoods 2013a). The draft is currently being revised by Congolese legislators (Mining Review 2016; MINING.com 2017b).

The Mining Code's provisions are outlined in the Mining Regulations (The Mining Code 2002). The Mining Regulations manage permissions and extraction processes, processing and export of raw materials and the allocation of artisanal mining and trader cards. The Regulations are applicable to industrial, small-scale and artisanal mining (African Law and Business 2016). Additionally, the Regulations partly manage environmental protection issues. For example, they provide detailed information on how to prepare an environmental plan, which is needed in order to get an Exploitation Permit. Moreover, it establishes the necessity of an environmental audit for mining companies (The Mining Law Review 2012).

Various other laws cover different mining related issues: Land rights are covered by The Land Law of 1973 (No.73-021 of July 20, 1972) (CIM n.d.). The preservation and management of forest is regulated by The Forestry Code (Law No. 011/2002) (Katunga 2011). The Environmental Protection Act (Law) (EPA) (Law No. 11/009 of 9 July 2011) outlines environmental regulations and management of water, soil and air, and establishes fundamental mechanisms of environmental protection. Moreover, the law covers financial, institutional and regulatory processes concerning the protection of the environment and climate change issues (Nachmany et al. 2014). The Investment Code (Law No. 004/2002) governs investments and defines rules for the registration of a company (HG.org 2017). The Labour Code (Law No. 015/2002) regulates relationships between an employer and employees. It manages salary issues,

[9] In the DRC mining royalties are based on the adjusted revenue (PwC 2012)

provides legislative framework for setting up safety and workplace conditions, and manages employment of women and underage persons (HG.org 2017a).

Environmental legislation in mining sector

There are three laws that are relevant for environmental protection in the mining sector: The Mining Code, the Mining Regulations and the Environmental Protection Act (EPA) (Law) of 2011 (McGuireWoods 2013; Wentzel 2015).

Before 2011, the Mining Code was the only legislation that included Environmental Impact Assessments (EIAs) for specific operations. The Mining Code includes three environment-related plans: the EIS, the Mitigation and Rehabilitation Plan (MRP) and the Environmental Management Plan of the Project (EMPP). In order to obtain a mining licence, these documents need to be attached to the general application (The Mining Code 2002; The Mining Regulations 2003). As stated in the Mining Code, the EIS should include information on ecosystems in the area of future mining operations, including the surface (water bodies, flora and fauna life, air) and subsurface (ground water, soils). Additionally, it includes a plan to reduce hazardous and environmentally harmful activities (ibid.).

The Mining Regulations further outline environmental protection actions for the mining industry and contain guidelines for the preparation of EIS, MPR and EMPP. They also set specific requirements for proving financial viability for rehabilitation and closure activities, and provide classification for waste generated by mining activities (The Mining Regulations 2003).

The new EPA has significantly changed the legislative framework of environmental protection in 2011, which has led to a range of innovations. The framework addresses principles of sustainable development, transparency, "polluter pays" principles and a range of innovations in the sphere of environmental protection applicable to mining operations (Walmsley and Patel 2011). Before the law came into force, mining companies were for example able to mine without the EIA and Social Impact Assessment (Walmsley and Patel 2011; EMW&A 2013a) as EIS, EIA and EMPP were only required to carry out at the research and exploration steps, at the steps of building infrastructure and facilities and during the development of mines. The start of the core mining (i.e. extracting) operating process did not require an EIA (The Mining Code 2002; EMW&A 2013a). Moreover, numerous mining companies ignored the requirements of the Mining Code and did not have proper EISs (Reuters 2011).

Ownership rights and mining permits

As stated before, natural resources in the DRC are owned by the state. Therefore, the holder of surface rights does not automatically have the right to extract a mineral deposit from the subsoil of the area and, simultaneously, holding the Exploitation Permit does not automatically include a right for activities on the surface (McGuireWoods 2013). Mining permits in the DRC include Exploration Permits (right to explore), Exploitation Permits (right to extract), the Tailings Processing Permit (permission to manage and operate artificial deposits, e.g. tailings) and the Small-scale Mining Exploitation Permit (permission to operate on a specific area with a minimal amount of installations or operations less than $2 million) (The Mining Code 2002).

Exploration and prospection can be conducted throughout the country; however, the following areas are excluded:

- protected areas (e.g. natural reserves);
- restricted areas (e.g. airports and nearby areas, areas close to the national defence installations, motorways and roads, national parks, in some cases – areas around existing perimeters of ongoing mining sites);
- land otherwise prohibited for exploration (i.e. areas, forbidden for mining activities due to national security issues, protection of the population, incongruity of existing activities with exploration and exploitation works, etc.);

- areas already granted to other claimers under Mining Permits (The Mining Code 2002).

Nevertheless, cases of mining in protected areas occur regularly. For example, in 2007, Mutanda Mining, a Glencore subsidiary, was the first company to begin exploitation activities in the game reserve Basse-Kando near Kolwezi (Bread for All, RAID and Fastenopfer 2014). Although the reserve is protected by law which explicitly prohibits industrial and mining activities, the regional government granted mining concessions for the area. These activities led to significant deforestation and noise as well as to air and water pollution in the area. As a result, the Kando and Dikanga rivers were contaminated, and a range of animal species, including elephants and buffalos, lost their habitats (SOMO 2016; Bread for All, RAID and Fastenopfer 2014). In its sustainability report, Glencore highlights its operation in the Basse Kando hunting reserve and underlines that the company "seeks to limit any impact of its operations through diligent environmental management and developing and implementing progressive rehabilitation plans" (Glencore 2016: 60). However, the company never took responsibility for violating laws, arguing that the permission for mining was given by the Congolese authorities and therefore, the responsibility for the case lies with them (Glencore 2014). The case was taken up by several NGOs and media sources criticising Glencore for its offences, however, there was no up-to-date information on further developments.

Mining revenues, duties, royalties and taxation

The mining industry of the DRC accounts for a major part of the state's revenues. Taxation as well as mining royalties and duties are regulated by the Mining Code and the Mining Regulations. The DRC's mining revenues have three major origins: taxes on wages, customs duties and royalties, and additional sources, such as payments to provincial governments and fees for services for tax authorities (IMF 2015). Nearly $700 million came from mining companies, and more than $25 million came from mining Public Entities in the year 2012 (EITI 2014),

Mining royalties are an important source of income for the state[10]. According to the Mining Code, the royalties are shared between the central government (60 %), the provincial administration in which the mining activity takes place (25 %) and the administrative territory or the town where the mining activity takes place (15 %) in order to "build basic infrastructure in the interest of the community" (The Mining Code 2002: art.242). The new draft of the Mining Code (s. section "Legal and regulatory framework") contains an increase of the mining royalties as well as other fees.

Most provinces lack sufficient capacities and institutions for administration and tax-collection, for properly preparing revenue-collectors or even simple offices for state workers (Africa Independent 2016). These factors cause serious uncertainties in taxation of mining industry and financial losses for the state (All Africa 2016).

Artisanal mining governance

The Mining Code defines an artisanal miner as a person of Congolese nationality who holds an artisanal miner's card and conducts mining activities (extraction and processing) in artisanal mining areas (not deeper than 30 meters) using artisanal tools. An artisanal mining card gives its holder a right to conduct mining activities as well as to use other resources needed for mining, such as timber and water (The Mining Regulations: art. 223). In order to become an artisanal miner, a person can get authorization by obtaining a renewable artisanal miner's card for an annual fee, which in 2009 was equivalent to $25 (The Mining Code 2002: Title IX; Nest 2011: 43). For an artisanal miner, according to the legislations, it is possible to receive technical training and learn the basics of ASM from the Specialised Technical Services (Departments) of the Ministry of Mines (The Mining Regulations: art.232).

[10] Rayalities are "calculated on the basis of the amount of sales minus the costs of transport, analysis concerning the quality control of the commercial product for sale, insurance, and costs relating to the sale transaction" (The Mining Code 2002: art.240). The rate of the mining royalty is 0.5% for iron or ferrous metals, 2% for non-ferrous metals and 2.5% for precious metals (Katanga Mining Ltd. 2017a; The Mining Code 2002: art.241).

Minerals extracted by an artisanal miner can be sold to traders or trading houses, exchange markets and companies recognized by the State. Traders are private persons of Congolese nationality who own a trader's card, which gives them the right to buy any type of mineral extracted and sold by holders of an artisanal miner's card (The Mining Code 2002: art.117). Artisanal traders are obliged to submit reports of their trading activity to the state.

Even though actual regulations for ASM exist, reports state that in particular ASM often takes place in illegality and is frequently associated with very poor working and health conditions for the miners (see section on environmental impacts and the next paragraph). Furthermore, ASM is a source of conflict financing and of financing rebel groups.

Illegal mining, trading and corruption

Illegal mining and trading is one major problem of the DRC's mining sector, particularly with regard to ASM. Despite the existence of clear rules and requirements, most of ASM in the country is done illegally, without permissions and beyond registered artisanal mining areas (The Chamber of Mines 2015). In Eastern Congo, there are around 1,088 artisanal mining areas, only 64 of which are officially registered (Enough 2015). Minerals extracted without licences cannot be properly estimated and registered and do often turn into revenues of armed groups and smugglers. At the same time, the state's treasury loses revenue from taxes, fees (e.g. costs of licences and ASM cards) and royalties (Mining Weekly 2016). According to estimates made by the Institute for Security Studies (ISS), 98 % of gold dug from Congolese land is currently being smuggled, and money loss due to mineral under-pricing and other illegal activities amounts to over $63 billion annually (ISS 2016).

Furthermore, there are huge revenue losses due to corruption and illegal trading in the country. The DRC is known to be the 20th most corrupt country in the world; all of its sectors are affected and few actions or business deals happen without gifts to the administrative bodies or unfair increases in or under-pricing of costs of services (Transparency International 2017; Business Anti-Corruption Portal 2016). In the mining sector, those revenues which are still generated by official businesses are often reported to enrich an enclave close to the president of the DRC instead of being reallocated back to provinces and local authorities (Business Anti-Corruption Portal 2016; U.S. Department of State 2015). It is estimated that 20 % of the country's GDP is laundered annually from Congolese budget and fed to superior officials in the DRC's government (The Sentry 2015).

5.2 Social context of mining and conflicts

Overview

The DRC has a long history of conflicts: during the 1994 Rwandan Genocide millions of refugees fled to the eastern parts of the country, followed by the first (1996-1997) and second (1998-2003) Congo War. Since then, different non-state armed groups have been operating in the DRC, particularly in the eastern provinces, intimidating civilians and blocking long-term peace processes (Eastern Congo Initiative 2017). These armed groups are involved in the mining sector, as they – at least partly – financially rely on the exploitation and trade of minerals. Their illegal profit from illegal taxation, illegal mineral extraction and mineral smuggling is estimated at $13.2 million per year (UNEP-UN - Great Lakes - MONUSCO 2015). In addition to non-state armed groups, also state actors such as the Congolese military are involved in the mining sector, controlling several mines and being involved in corruption, illegal mineral trading and violence against miners and civilians (The Sentry 2015).

In this context, violations of human rights are widespread. One example is child labour, which is – even though legislative initiatives exist – still pervasive in the DRC. For example in former Katanga, in 2014, 40 % of ASM workers were children under 18 and, according to UNICEF, around 40,000 children were involved in mining activities (Amnesty International 2016; World Vision 2013). In addition, slavery and human trafficking are widespread in the country. The DRC is ranked fourth among the countries with the "Extreme" risk category in the Modern Slavery Index (Verisk Maplecroft 2017). Forced labour

occurs on artisanal mining sites; people work under poor conditions and under the control of the Congolese army and non-state armed groups (U.S. Department of State 2015, FTS 2011). Local communities are commonly forced to resettle (Forest Peoples Programme 2015). One example is a reallocation of the Mulumbu village. Here, inhabitants were forced to relocated to make room for the construction of Tenke Fungurume Mining SARL's copper and cobalt processing plant. Resettled villagers had to spend two years in tents before they were compensated with $200 (SOMO 2011).

Mining conflicts and violation of human rights around the Kamoto mining complex

At and around the Kamoto mining complex, several conflicts and human rights violations are reported. For example, Bread for All describes a case of 10,000 artisanal miners who lost their livelihood when being displaced from the surrounding areas of the Kamoto mining complex by KCC in 2010-2011. At the same time, minerals dug by artisanal miners were reported to being sold to the same company and other Glencore's subsidiaries by second-hand dealers at unfairly low prices (Bread for All 2011).

Furthermore, KCC has its own security corps in addition to the regular mining police. Both forces demonstrate an elevated level of violence towards artisanal miners coming to the mine sites; conflicts sometimes had lethal outcomes for the miners that were caught extracting minerals on (abandoned) mining sites owned by KCC (Bread for All, RAID and Fastenopfer 2014).

In addition, working conditions in the Kamoto mine are considered the worst of all underground mines of the former Katanga province: safety measures are reported being usually disregarded, which sometimes results in the deaths of miners (Bread for All 2011). Simultaneously, the Kamoto open pit mine is reported as being unsafe and lacking technical control: In 2016, one of the mining pit's walls collapsed and buried seven employees, leading to their death (The Telegraph 2016). In addition, child labour is reported at the sites belonging to Glencore and its subsidiaries, with some children being 10 years and younger. However, the company denied employing children in underground mines, stating that they belonged to artisanal mining communities that had invaded the mining sites illegally (BBC 2012). Besides these violations of human rights, Glencore is also accused of fraud and corruption, particularly concerning smuggling of materials and profits outside the country (Environment Justice Atlas 2017)

Conflict management and peacebuilding

In the DRC, several programs were established in order to address conflict issues and support long-term peacebuilding: The Amani program, which was completed in 2009, focused on "disarmament, demobilization, and the reintegration of armed groups of North and South Kivu". It was followed by the Stabilization Program for Eastern DRC (STAREC) which was completed in 2012 and focused on education, health, infrastructure development, and the reintegration of soldiers to their communities. The latest program started in 2015 as part of which the Congolese government approved a new plan to stabilize North Kivu (Eastern Congo Initiative 2017).

With regard to the conflicts around the Kamoto mining complex, "affected communities have experienced difficulties in accessing justice" (Environment Justice Atlas 2017): One reason is that communities lack knowledge about their rights, and activists are reported to being intimidated by government officials and by other corrupted actors. Furthermore, some of the mine workers are (illegal) expatriates which do not have the same rights as Congolese citizens and are less likely to report abuses. In addition, the DRC is lacking a functioning justice system, in particularly in remote mining areas, which allows companies to act outside the law (Environment Justice Atlas 2017). In most of the cases where Glencore or its subsidiaries were accused of breaking the law, they denied the accusations.

6 Conclusion and comparison of the analysis with existing governance indices

In this final chapter, the findings of chapter 4 (environmental hazard potentials and environmental impacts) and chapter 5 (governance analysis) are analysed to answer the following research questions:

- Does the assessment of the environmental hazard potentials adequately point to the actual environmental impacts?
- Are existing governance indices and indicators able to adequately reflect the governance capability to cope with the challenges arising around the environmental hazard potentials and environmental impacts of mining? In other words, are the identified governance gaps reflected in existing governance indices and indicators?

In order to answer the second question, a number of indices and indicators (see Table 6-1) were chosen based on a screening of a wide range of existing governance, environmental governance, and peace and conflict indices.

The results of this case study will be compared with the results of nine additional case studies that are conducted as part of this project as well as the case studies conducted in UmSoRess and OekoRess I. By comparing the findings of the case studies, a set of governance indicators will be identified that can be used to improve the assessment approach to analyse the environmental hazard potentials of the OekoRess I project.

Does the assessment of the potentials for environmental hazards adequately point to the actual environmental impacts?

The environmental impacts of cobalt and copper mining at the Kamoto mining complex are severe. The main environmental impacts are the use of land, as mining and processing directly and indirectly affect an area of 19.5 square kilometres, the loss of biodiversity, the contamination of ground and surface waters accompanied with water shortages, air and noise pollution and severe health impacts on miners and local communities.

The OekoRess methodology points towards a high number of environmental hazard potentials at the Kamoto mining complex: The indicators on “preconditions for acid mine drainage (AMD)”, “paragenesis with heavy metals”, “paragenesis with radioactive components”, “size of deposit size”, “use of auxiliary substances”, “mining waste management” and “conflict potential with local population” show high environmental hazard potentials.

All of the environmental hazard potentials highlighted by the OekoRess methodology, except “preconditions for acid mine drainage (AMD)” and “paragenesis with radioactive components”, could be verified in the analysis of environmental impacts.

Main findings of the governance analysis

The governance analysis highlights the well formulated laws of the DRC’s mining sector. However, due to various factors, the compliance with these regulations is very weak and regulations are neither implemented, nor is the violation of laws generally penalised: the DRC was shaken by various conflicts and wars during the last decades, and conflicts are still ongoing. The presence of state and non-state armed groups who profit from illegal taxation, illegal mineral extraction and mineral smuggling combined with mismanagement and corruption causes a number of serious problems in the country. The violation of human rights and negative impacts to the environment and therefore to local communities, particularly in the mining sector, are two of the major challenges.

In case of the Kamoto mining complex, this weak compliance with regulations could also be identified. Even though a large multinational company is maintaining the mining sites, severe environmental impacts and the infringement of human rights are reported. It is reported that the mining company breaks the law, and that the affected communities have experienced difficulties in accessing justice.

Do existing governance indicators reflect DRC's governance gaps and challenges?

The DRC's overall weak sector governance is well reflected in key governance and development indices. The DRC's Human Development Index (HDI) is very low, showing the country's low level in key dimensions of human development. The country ranks 178 out of 188 countries (HDR 2017). In addition, all of the Worldwide Governance Indicators (WGI) reflect the country's very weak governance: The indices for "Rule of Law", "Government Effectiveness", "Regulatory Quality", "Political Stability and Absence of Violence" and "Control of Corruption" rank the DRC around the 5th percentile, only the index for "Voice and Accountability," is at a percentile of 12.8 (World Bank 2017b). These scores reflect the political instability and the various problems the country is facing in all of the six categories of governance, making it one of the countries with the weakest governance in the world.

The country's mining industry is still rather attractive for foreign investors. The Fraser Investment Attractiveness Index ranks the DRC 29th out of 104 countries, which is an above average value; however, this rank is mainly based on its geological attractiveness (rank 7 out of 104 countries). Focusing only on policy attractiveness, the country improved its rank from 107 (out of 112) in 2013 to 70 (out of 104) based on miners perception of policy; however, the country still ranks in the lower third of all countries assessed, which is mainly due to corruption, political instability, uncertain land tenure, the DRC's legal system and administration, in particular the interpretation and enforcement of existing regulations, overall security, the quality of infrastructure, and existing trade barriers (Fraser Institute 2017).

The overall weak governance is also reflected in the DRC's very low scores in the Environmental Performance Index (EPI), which displays the country's performance regarding the protection of human health and protection of ecosystems; here, the DRC ranks 170th out of 178, scoring only 25.01 out of 100 (EPI 2017). The indicator seems to also reflect well the specific challenges of the mining sector, such as the observed pollution of water and air, and the impacts on human health through mining activities. The indicators for water resources, sanitation and human health are particularly low. These topics were also highlighted as a major concern within the environmental impact analysis (see chapter 4.2).

The Environmental Democracy Index (EDI) indicates the "degree to which countries have enacted legally binding rules that provide for environmental information collection and disclosure, public participation across a range of environmental decisions, and fair, affordable, and independent avenues for seeking justice and challenging decisions that impact the environment." The DRC received a "fair" EDI score, ranking 53rd of 70. The DRC received "fair" scores on participation and justice, and a "poor" score with regard to transparency (EDI 2017a). With regard to general environmental governance, this indicator does not accurately reflect the state of the DRC, as the governance analysis clearly showed that participation and seeking of justice is for most Congolese people not possible in the context of ongoing conflicts, corruption and violations of human rights.

The Global Peace Index (GPI) displays a country's level of peacefulness according to a ranking in three domains: ongoing and internal conflicts, levels of harmony or discord within a nation and a country's militarisation. The DRC has a very low rating (on a scale from very high to very low) and ranks 152 out of 162 countries within the GPI, due to ongoing conflicts, political terror, political instability, homicides and the easy access to weapons (Institute for Economics & Peace 2016). It reflects the general situation around peace and conflicts and the specific situation in the mining sector very well.

Conclusion

The DRC's overall very weak governance is well reflected in key governance and development indices such as the HDI or the WGIs. All the existing indices and indicators but the EDI show a very good ability to also reflect the specific governance challenges of the mining sector. This might be the case because the whole country and all sectors are affected by the same challenges such as ongoing conflicts, the influence of non-state and state armed groups, corruption and the violation of human rights.

With regard to the Fraser Indices it became clear that particularly the Policy Perception Index, which focuses on the effects of government policy on attitudes toward exploration investment, reflects the DRC's sector governance very well, whereas the overall Investment Attractiveness Index, a combination of the Policy Perception Index and of an indicator for geological attractiveness overrated the country's performance due to the DRC's very high geological attractiveness.

The EDI does only reflect the legislations in place, but not their implementation. Thus, it does not reflect that the implementation of laws is deficient in the current context. Therefore, the indicator overestimates the DRC's capacities.

Furthermore, the case study shows that the negative social and environmental impacts of the Kamoto mining complex are high, even though the mine is owned by a multinational company, which are often said to have better social and environmental standards. The case study shows that due to the DRC's very weak governance and the lack of a functioning justice system, compliance with regulations cannot be ensured, allowing companies to act outside the law.

Table 6-1: Governance indicators DRC

Index/Indicator	DRC	Year	Index/Indicator	Applicability
Human Development Index (HDI)	0.435 (low human development, rank 178)	2015	The HDI measures the "average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions" (HDR 2017)	Reflects well the overall rather low development and standard of living in the DRC.
Environmental Performance Index (EPI)	Rank 170 of 178, Score 25.01 of 100	2016	The EPI measures the performance of countries on high priority environmental issues in two areas: protection of human health and protection of ecosystems (EPI 2017, 2017a).	DRC has one of the lowest EPI in the world. In 2012 the worst ranking was for Health Impact section (score 11.04 of 100) and water and sanitation (score 4.39 of 100). The Index value reflects the overall very weak governance of environmental sector.
Fraser Investment Attractiveness Index	Rather attractive for Investments, 72.8 (rank 29 out of 104)	2016	The index measures "the overall investment attractiveness which is based on a country's geologic attractiveness and a measurement of the effects of government policy on attitudes towards exploration investment (Fraser Institute 2017).	The value of the Index shows an above average attractiveness of the country for foreign investments. Due to the DRC's very high geological attractiveness, the indicator overrates the country's performance and does not reflect the weak sector-specific governance adequately.
Policy Perception Index (PPI)	60.58 (rank 35 out of 104, rather low PPI)	2016	The Policy Perception Index (PPI) is a composite index that measures the overall policy attractiveness of the country. The index is composed of survey responses to policy factors that affect investment decisions. Policy factors include uncertainty concerning	Reflects very well the overall weak governance in the mining sector. It has a high granularity and reflects well the actual situation in the DRC's mining sector. It particularly points to-wards weaknesses, which were identified in the governance analysis.

Index/Indicator	DRC	Year	Index/Indicator	Applicability
			the administration of current regulations, environmental regulations, regulatory duplication, the legal system and taxation regime, uncertainty concerning protected areas and disputed land claims, infrastructure, socioeconomic and community development conditions, trade barriers, political stability, labor regulations, quality of the geological database, security, and labor and skills availability." (Fraser Institute 2017)	
Environmental Democracy Index (EDI)	Rank 53 of 70, Score 1.07 (fair/limited)	2016	EDI measures the degree to which countries have enacted legally binding rules that provide for environmental information collection and disclosure, public participation across a range of environmental decisions, and fair, affordable, and independent avenues for seeking justice and challenging decisions that impact the environment. (EDI 2017; 2017a)	Does not reflect the specific challenges in the mining sector. The overall score for the country seems to overrate the DRC's performance by far.
Voice and Accountability (WGI)	-1.3 (estimate between -2.5 and 2.5); 12.8 (percentile rank terms from 0 to 100, with higher values corresponding to better outcomes)	2015	Voice and Accountability captures "perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media" (World Bank 2010; 2017b).	Reflects well the governance performance in this specific area. However, the indicator does not reflect the very specific challenges around the participation of citizens in decision-making processes in the mining sector.
Political Stability and Absence of Violence (WGI)	-2.2 (estimate between -2.5 and 2.5) 3.8 (percentile rank terms from 0 to 100, with higher values corresponding to better outcomes)	2015	Political Stability and Absence of Violence/Terrorism measures "perceptions of the likelihood of political insta-	Reflects well the overall weak governance and DRC's political instability and violence, also in the mining sector.

Index/Indicator	DRC	Year	Index/Indicator	Applicability
			bility and/or politically-motivated violence, including terrorism" (World Bank 2010; 2017b).	
Government Effectiveness (WGI)	-1.6 (estimate between -2.5 and 2.5) 3.8 (percentile rank terms from 0 to 100, with higher values corresponding to better outcomes)	2015	Government Effectiveness captures "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies" (World Bank 2010; 2017b).	Reflects well the overall very weak governance.
Regulatory Quality (WGI)	-1.3 (estimate between -2.5 and 2.5) 6.3 (percentile rank terms from 0 to 100, with higher values corresponding to better outcomes)	2015	Regulatory Quality captures "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development" (World Bank 2010; 2017b).	Reflects well the overall very weak governance.
Rule of Law (WGI)	-1.6 (estimate between -2.5 and 2.5) 3.4 (percentile rank terms from 0 to 100, with higher values corresponding to better outcomes)	2015	Rule of Law captures "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" (World Bank 2010; 2017b).	Reflects well the overall very weak governance.
Control of Corruption (WGI)	-1.3 (estimate between -2.5 and 2.5); 9.1 (percentile rank terms from 0 to 100, with higher values corresponding to better outcomes)	2015	Control of Corruption captures "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests" (World Bank 2010; 2017b).	Reflects well the overall very weak governance.

Index/Indicator	DRC	Year	Index/Indicator	Applicability
Global Peace Index (GPI)	3.112 (very low, scale of -1.5, overall rank 152)	2016	Countries' level of peacefulness (Institute for Economics & Peace 2016).	Reflects well the overall very weak governance and the numerous conflicts in the country.

7 References

African Economic Outlook (2012): African Economic Outlook . Online: https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Congo20Democratic%20Republic%20Full%20PDF%20Country%20Note.pdf (30.06.2017).

African Independent (2016): Playing Pocker With Provinces. – Afriocan Independent. By: Misser, F., June 10th 2016.Online: https://www.africanindy.com/southern-africa/playing-poker-with-provinces-5244473 (01.06.2017).

African Law and Business (2016): Congo – D.R. Mining Law 2017. – ALB - African Law & Business. September 5th 2016. Online: https://www.africanlawbusiness.com/publications/mining-law/mining-law-2017/congo---d.r./overview (26.05.2017).

African Mining Brief (2016): Mining in the DRC, a palatable endeavour? – African Mining Brief. By: Mthethwa, N. February 29th 2016. Online: http://ambriefonline.com/mining-in-the-drc-a-palatable-endeavour/ (22.05.2017).

All Africa (2016): Congo-Kinshasa: More Haste, Less Speed.- All Africa. By: Misser, F. February 29th 2016. Online: http://allafrica.com/stories/201603050007.html (26.06.2017).

Amnesty International (2013): Profits and Loss. Mining and Human Rights in Katanga, Democratic Republic of the Congo. – Amnesty International Report. London, U.K., 2013. Online: http://www.amnestyusa.org/sites/default/files/afr620012013en.pdf (12.05.2017).

Amnesty International (2013a): Inside the DRC's Artisanal Mining Industry. – Amnesty International. August 16th 2013. Online: http://blog.amnestyusa.org/africa/inside-the-drcs-artisinal-mining-industry/ (16.06.2017).

Amnesty international (2014): Bulldozed: How a Mining Company Buried the Truth About Forced Evictions in the Democratic Republic of the Congo. – Amnesty International .- UK 2014. Index: AFR 62/003/2014. Online: https://www.amnesty.org/en/documents/afr62/003/2014/en/ (06.06.2017).

Amnesty International (2016): „This is What We Die for" – Human Rights Abuses in the Democratic Republic of the Congo Power the Global Trade in Cobalt. – Amnesty International Report on Cobalt. London, UK, 2016. Online: https://de.scribd.com/doc/295952552/Amnesty-International-report-on-cobalt (03.05.2017).

Asongu, S. and J. Nwachukwu (2016): Transfer Mispricing as an Argument for Corporate Social Responsibility. – Working Paper, No. WP/16/031. ECONSTOR and AGDI – African Governance and Development Institute, Cameroon. By: Asongu,S. and Mwachukwu, J. August 2016. Online: https://www.econstor.eu/bitstream/10419/149955/1/agdi-wp16-031.pdf (16.06.2017).

Atibu et al. (2013): Concentration Of Metals In Surface Water And Sediment Of Luilu and Musonoie Rivers, Kolwezi-Katanga, Democratic Republic of Congo. In: Applied Geochemistry 39 (2013) 26-32. By: Atiby, E.K., Devarajan, N., Thevenon, F., Mwanamoki, P.M., Tshibanda, J.B., Mpiana, P.T., Prabakar, K., Mubedi, J.I., Wildi, W., and Pote, J. October 4th 2013. Online: https://www.academia.edu/23042799/Concentration_of_metals_in_surface_water_and_sediment_of_Luilu_and_Musonoie_Rivers_Kolwezi-Katanga_Democratic_Republic_of_Congo?auto=download (16.06.2017).

Banza et al. (2009): High human exposure to cobalt and other metals in Katanga, a mining area of the Democratic Republic of Congo. In: Environmental Research, Vol.109, issue 6, August 2009, pp.745-752.

BBC (2012): Panorama Questions Over Glencore Mines. – BBC Panorama. By: Sweeney, J. April 16th 2012. Online: http://www.bbc.com/news/17702487 (14.06.2017).

BGS (2017): World mineral production 2011-15. By: Brown, T.J., N.E. Idoine; E.R. Raycraft; R.A. Shaw; E.A. Deady; S.F. Hobbs and T. Bide - British Geological Survey. ISBN 978-0-85272-867-3. Online: file://dc1.intern.adelphi.de/Home$/andreeva/Downloads/WMP_2011_2015.pdf (03.05.2017).

Bikaba (2013): Indigenous Peoples, Local Communities and National Policy Towards The CBD Aichi Targets in The Democratic Republic of Congo. – The ICCA Consortium. By: Bikaba, D. June 2013. Online: https://www.iccaconsortium.org/wp-content/uploads/IPs-LCs-and-ICCA-Policy-in-RDC-English1.pdf (28.06.2017).

Bloomberg (n.d.): Metals and Mining – Company Overview of Boss Mining SPRL. – Bloomberg Snapshot. Online: http://www.bloomberg.com/research/stocks/private/snapshot.asp?privcapId=32945913 (12.05.2017).

Bloomberg Markets (2017): Glencore Buys Out Billionaire With $1 Billion Congo Mining Deal. – Bloomberg Markets. By: Wild, F., Riseborough, j., and Wilson, T. February 14th 2017. Online: https://www.bloomberg.com/news/articles/2017-02-13/glencore-said-to-agree-on-gertler-buyout-in-960-million-deal (02.06.2017).

Bloomberg Technology (2016): Tech Giants Accused by Amnesty of Using Cobalt Dug by Children. – Bloomberg Technology. By: Wilson, T. January 19th 2016. Online: https://www.bloomberg.com/news/articles/2016-01-19/apple-may-be-using-congo-cobalt-mined-by-children-amnesty-says (24.05.2017).

Bohlsen (2017): An Update on Katanga Mining. – Seeking Alpha. By: Bohlsen, M. April 24th 2017. Online: https://seekingalpha.com/article/4063861-update-katanga-mining (22.05.2017).

Bohlsen (2017a): Top 3Cobalt Miners to Accumulate. – Seeking Alpha. By: Bohlsen, M. May 16th 2017. Online: https://seekingalpha.com/article/4073615-top-3-cobalt-miners-accumulate (22.05.2017).

Bread for All (2011): Contracts, Human Rights And Taxation: How A Company Exploits A Country. The case of Glencore in the Democratic Republic of Congo. – Bread for All and Catholic Lenten Fund. By: Payer, C., Maillard, Y., Cronje, F., Losamgo Nzinga, J-D., Bester, V. and van Wyk, D. March 2011. Online: http://www.facing-finance.org/wp-content/blogs.dir/16/files/2012/03/study_glencore_summary.pdf (07.06.2017).

Bread for All and Catholic Lenten Fund (2012): Glencore in the Democratic Republic of Congo: Profit Before Human Rights and the Environment. In collaboration with: "Commission épiscopale pour les ressources naturelles (CERN)" and "Action contre l'impunité pour les droits humains (ACIDH – Emmanuel Umpula)", and Muteba, J-P. By: Peyer, C., Mercier, F. April 2012. Online: http://www.cidse.org/publications/business-and-human-rights/glencore-in-the-drc-profit-before-hr--environment.html (16.06.2017).

Bread for All, RAID and Fastenopfer (2014): PR or Progress? Glencore's Corporate Responsibility in the Democratic Republic of the Congo. - Bread for All, RAID and Fastenopfer by: Peyer, C., Feeney, P and Mercier, F. June 2014 Online: http://mining-watch.ca/sites/default/files/bfa-fo-raid_glencore_study_june_2014.pdf (07.06.2017).

Business Anti-Corruption Portal (2016): DR Congo Corruption Report – GAN Business Anti-Corruption Portal. August 2016. Online: http://www.business-anti-corruption.com/country-profiles/democratic-republic-of-the-congo (02.06.2017).

Business Day (2016): DRC State Mining Royalties "Goes to Friends of President". –Business Day. November 17th 2016. Online: https://www.businesslive.co.za/bd/world/africa/2016-11-17-drc-state-mining-royalties-goes-to-friends-of-president/ (02.06.2017).

Business Day (2016a): DRC Mines Cause Toxic Damage. – Business Day. August 23rd 2016. Online: https://www.businesslive.co.za/bd/world/africa/2016-08-23-drc-mines-cause-toxic-damage/ (16.06.2017).

CIFOR (2012): The formalisation of artisanal mining in the Democratic Republic of the Congo and Rwanda. – Report. CIFOR – Center for International Forestry Research. IPIS, European Union, CIFOR. Bogor, Indonesia. December 2012. Online: http://www.cifor.org/fileadmin/subsites/proformal/PDF/RIPIS1212.pdf (26.06.2017).

CIM (n.d.): DRC Laws and Regulations. – CIM – Centre for Excellence in CSR. Online: http://www.cim.org/en/CIMSubSites/CentreForExcellence/Country-profiles/Congo/DRC-laws-regulations (26.05.2017).

Climate data (n.d.): Klima Kolwezi. Online: https://de.climate-data.org/afrika/demokratische-republik-kongo/katanga/kolwezi-4593/ (06.01.2020).

Coface (2017): Congo, the Democratic Republic of the. – Coface assessment. January 2017. Online: http://coface.com/Economic-Studies-and-Country-Risks/Congo-The-Democratic-Republic-Of-The (22.06.2017).

Congo Bongo (2010): Pygmies – DRC Forest People. – American Embassy Kinshasa Newsletter. August 26th 2010. Online: https://issuu.com/nelsonarias9/docs/congobongoo_082610pub (08.06.2017).

COSOC-Gl (2015): Receipts From Industrial Mining 2013 – Cosoc-Gl - Coalition of Civil Society Organizations in the African Great Lakes Region against the Illegal Exploitation of Natural Resources. Online: http://cosoc-gl.org/2015/recettes-du-secteur-industriel-2013/ (12.05.2017).

COSOC-Gl (2015a): Number of Employees and Subcontractors per Mining Corporation. - Cosoc-Gl - Coalition of Civil Society Organizations in the African Great Lakes Region against the Illegal Exploitation of Natural Resources. Online: http://cosoc-gl.org/2015/nombre-demployes-et-sous-traitants-par-societe-miniere/ (12.05.2017).

CSR Hub (2017): Glencore International PLC CRS Ratings - CSRHub Schema Description. – Corporate Sustainability Performance database and tool. Online: https://www.csrhub.com/CSR_and_sustainability_information/GLENCORE-INTERNATIONAL-PLC (07.06.2017).

CSR Hub (2107a):The CSRHub Data Description. CSRHub Schema Description. – Corporate Sustainability Performnance database and tool. Online: https://www.csrhub.com/content/csrhub-data-schema/ (07.06.2017).

Daily Mail Online (2015): EXCLUSIVE Picks, Pans And Bare Hands: How Miners In The Heart Of Africa Toil In Terrible Conditions To Extract The Rare Minerals That Power Your Iphone. – Daily Mail Online News. By: Fagge, N. for: mail Online in DRC. October 22nd 2015. Online: http://www.dailymail.co.uk/news/article-3280872/iPhone-mineral-miners-Africa-use-bare-hands-coltan.html (01.06.2017).

De Dapper, M. (1991): Late Quaternary geomorphological evolution of the sand-covered plateaus near Kolwezi, Southern Shaba, Zaïre. Bulletin de la Société géographique de Liège, 27, 1991, 157-173. Online: https://popups.uliege.be/0770-7576/index.php?id=3630&file=1 (18.12.2019).

Dehoust, G.; Manhart, A.; Möck, A.; Kießling, L.; Vogt, R.; Kämper, C.; Giegrich, J.; Auberger, A.; Priester, M.; Rechlin, A.; Dolega, P. (2017a): Erörterung ökologischer Grenzen der Primärrohstoffgewinnung und Entwicklung einer Methode zur Bewertung der ökologischen Rohstoffverfügbarkeit zur Weiterentwicklung des Kritikalitätskonzeptes (OekoRess I) - Methode für einen standortbezogenen Ansatz. Umweltbundesamt, Dessau-Roßlau.

Dehoust, G.; Manhart, A.; Möck, A.; Kießling, L.; Vogt, R.; Kämper, C.; Giegrich, J.; Auberger, A.; Priester, M.; Rechlin, A.; Dolega, P. (2017b): Discussion of the environmental limits of primary raw material extraction and development of a method for assessing the environmental availability of raw materials to further develop the criticality concept (OekoRess I). Umweltbundesamt. Dessau-Roßlau.

DRC Data Portal (2017): Democratic Republic of the Congo, Data Portal. Data From "Democratic Republic of the Congo, Regional Statistics, 2017". Online: http://drcongo.opendataforafrica.org/ (22.06.2017).

DRCmining (2012): CAMI in Short… - DRCmining – Democratic Republic of Congo – The Network for the Geological and Mining references. Online: http://www.drcmining.org/en/cami/presentation.htm (25.05.2017).

DRCmining (2015): History of the Project. - DRCmining – Democratic Republic of Congo – The Network for the Geological and Mining references. Online: http://www.drcmining.org/en/history (25.05.2017).

Eastern Congo Initiative (2017): History of the conflict. Online: http://www.easterncongo.org/about-drc/history-of-the-conflict (16.07.2017).

EC – European Commission (2014): Report on critical raw materials for the EU. Online: https://ec.europa.eu/docs-room/documents/10010/attachments/1/translations/en/renditions/pdf (18.12.2019).

ECDPM (2014): Legitimacy of Small-scale and Artisanal Mining in DR Congo: The Case of Kivu. – ECDPM - The European Centre for Development Policy Management. July 24th 2014. Online: http://ecdpm.org/great-insights/extractive-sector-african-perspectives/small-scale-mining-drc-kivu/ (30.05.2017).

Ecumenical Network Central Africa (2011): Uranium Mining in the DR Congo. A Radiant Business for European Nuclear Companies? Online: https://www.sortirdunucleaire.org/IMG/pdf/ecumenicalnetworkcentralafrica-2011-uranium_mining_in_the_dr_congo-a_radiant_business_for_european_nuclear_companies_.pdf.

EDI (2017): Environmental Democracy Index. - Background and Methodology. Online: http://www.environmentaldemocracyindex.org/about/background_and_methodology (09.06.2017).

EDI (2017a): Environmental Democracy Index – Democratic Republic of the Congo. Online: http://www.environmentaldemocracyindex.org/country/cod (09.06.2017).

EITI (2014): Democratic Republic Of Congo. Executive Committee of The Extractive Industries Transparency Initiative. Reconciliation Report For The Year 2012.- EITI: The Extractive Industries Transparency Initiative. December 2014. Online: https://eiti.org/sites/default/files/documents/2012_drc_eiti_report_en.pdf (23.05.2017).

EITI (2017): Democratic Republic of Congo – EITI: The Extractive Industries Transparency Initiative. Online: https://eiti.org/DRCongo (02.05.2017).

El Desouky, H. A. & Muchez P., Boyce, A. J. Schneider, J, Cailteux, J. L. H., Dewaele S., & Quadt, A. von (2010): Genesis of sediment-hosted stratiform copper–cobalt mineralization at Luiswishi and Kamoto, Katanga Copperbelt (Democratic Republic of Congo), Miner Deposita (2010) 45:735–763, Springer-Verlag, DOI 10.1007/s00126-010-0298-3. Online: https://www.researchgate.net/publication/226190540_Genesis_of_sediment-hosted_stratiform_copper-cobalt_mineralization_at_Luiswishi_and_Kamoto_Katanga_Copperbelt_Democratic_Republic_of_Congo (18.12.2019).

Elenge et al. (2013): Occupational Accidents in Artisanal Mining in Katanga, D.R.C. – in: International Journal of Occupational Medicine and Environmental Health 2013; 26 (2):265–274. By: Elenge, M., Leveque, A. and De Brouwer, Christophe.

EMW&A (2012): DRC: The Ownership of A Mine After Termination Of Mining And Quarry Rights. - Emery Mukendi Wafwana and Sancy Lenoble Matschinga - International Law Firm. By: Elanga Monkango, E. November 1st 2012. Online: http://www.cabemery.org/2012/11/01/the-ownership-of-a-mine-after-termination-of-mining-and-quarry-rights-by-eugenie-elanga-monkango/#.WSQKJLGg9pg (23.05.2017).

EMW&A (2013): Mining Legislation in the Republic of the Congo. – Emery Mukendi Wafwana and Sancy Lenoble Matschinga - International Law Firm. October 14th 2013. Online: http://www.cabemery.org/2013/10/14/mining-legislation-in-the-republic-of-the-congo/#.WSQEVrGg9pg (23.05.2017).

EMW&A (2013a): New Exploitation License for Mining Operators in the DRC. - Emery Mukendi Wafwana and Sancy Lenoble Matschinga - International Law Firm. By: Lufuta Biduaya, E-R. and Tshimanga Mukendi, E. August 29th 2013. Online: http://www.cabemery.org/2013/08/29/new-exploitation-license-environmental-new-requirement-for-mining-operators-in-the-drc/#.WSvUUrGg9pg (29.05.2017).

Enough (2015): Congo's Conflict Gold Rush. Bringing Gold into the Legal trade in the Democratic Republic of Congo. – Enough! Project. By: Bafilemba, F. and Lezhnev, S. April 2015. Online: http://www.enoughproject.org/files/April%2029%202015%20Congo%20Conflict%20Gold%20Rush%20reduced.pdf (06.06.2017).

Enough (2016): Point of Origin. Status Report on the Impact of Dodd-Frank 1520 in Congo. – Enough! Project. By: Dranginis, H., February 2016. Online: http://enoughproject.org/files/DRC_PointofOrigin_022016.pdf (01.06.2017).

Enough (2017): 11 Letters From Congolese Civil Society Groups in Support of the U.S. Conflict Minerals Law. – Enough! Project. Posted by: Enough Team. April 4th 2017. Online: http://enoughproject.org/blog/seven-letters-congolese-groups-support-us-conflict-minerals-law (01.06.2017).

Environmental Justice Atlas (2015): PPT Case: Glencore-Katanga Mining Ltd., Democratic Republic of Congo (DRC). – Environmetal Justice Atlas. Contributors: Global Campaign to Dismantle Corporate Power, Transnational Institute - TNI, Friends of the Earth International. July 02nd 2015. Online: https://ejatlas.org/conflict/glencore-katanga-mining-ltd-in-the-democratic-republic-of-congo-drc (14.06.2017).

Environmental Justice Atlas (2017): PPT case: Glencore-Katanga Mining Ltd., Democratic Republic of Congo (DRC). Online: https://ejatlas.org/conflict/glencore-katanga-mining-ltd-in-the-democratic-republic-of-congo-drc (17.07.2017).

EPI (2017): FAQs – Environmental Performance Index. Online: http://archive.epi.yale.edu/faqs#What%20is%20the%20EPI? (09.06.2017).

EPI (2017a): Global Metrics for the Environment. 2016 Report. - Yale University, Columbia University. Online: http://epi.yale.edu/sites/default/files/2016EPI_Full_Report_opt.pdf (09.06.2017).

Euronews (2014): Belgian Firm Accused of Lying Over Bulldozing of Homes. – Euronews. – By: Gayle, E. November 14th 2014. Online: http://www.euronews.com/2014/11/24/belgian-firm-accused-of-lying-over-bulldozing-of-homes (06.06.2017).

Euronews (2017): The Human Cost of Our Obsession With Smartphones. – Euronews. By: Velazquez, J. March 09th 2107. Online: http://www.euronews.com/2017/03/09/the-human-cost-of-our-obsession-with-smartphones (09.06.2017).

Fairphone (2017): On-site Visit to Cobalt Mines in Congo, April 2017. – FAIRPHONE. By: Laura. June 7th 2017 Online: https://www.fairphone.com/de/2017/06/06/on-site-visit-to-cobalt-mines-in-congo-april-2017/ (16.06.2017).

Finnwatch and Swedwatch (2012): From Congo With (no) Blood: Recent Developments Relating to the Sourcing of Cinflict-free Minerals From the Democratic Republic of Congo. – Finnwatch; Swedwatch. By: Areskog,K.B., Ewing, J., and Purje, H. 2012. Online: ,https://www.somo.nl/wp-content/uploads/2012/12/From-Congo-with-no-blood-2.pdf (06.06.2017).

Fleurette (2015): Mutanda Mining – A High Grade Copper and Cobalt Producer in Katanga. – Flourette Group. Online: http://fleurettegroup.com/business-projects/copper-and-cobalt/mutanda-mining (12.05.2017).

Forbes (2017): With a Stroke Of The Pen, Donald Trump Aims To Wave Goodbye To the Dodd Frank Act. – Forbes. By: Gara, A. February 3rd 2017. Online: https://www.forbes.com/sites/antoinegara/2017/02/03/with-a-stroke-of-the-pen-donald-trump-will-wave-goodbye-to-the-dodd-frank-act/#7ebd3fe91148 (01.06.2017).

Forbes (2017a): Trump's Executive Order To Repeal The Worst Law Of The Year. – Forbes. By: Worstall, T. February 9th 2017. Online: https://www.forbes.com/sites/timworstall/2017/02/09/trumps-xo-to-repeal-the-worst-law-of-the-year-section-1502-of-dodd-frank-on-conflict-minerals/#3f6b6ca047f5 (01.06.2017).

Foreign Policy (2015): How Dodd-Frank is Failing Congo. – Foreign Policy. By: Wolfe, L. February 2nd 2015. Online: http://foreignpolicy.com/2015/02/02/how-dodd-frank-is-failing-congo-mining-conflict-minerals/ (31.05.2017).

Forest Peoples Programme (2015): Extractive Industries and Human Rights in Central Africa. – FPP Forest Peoples Programme. Septemer 29th 2015. Online: http://www.forestpeoples.org/fr/node/5883 (08.06.2017).

Forest Peoples Programme (2016): Securing Forest Peoples' Rights and Tackling Deforestation in the Democratic Republic Of Congo. Deforestation Drivers, Local Impacts And Rights-Based Solutions. – FPP- Forest Peoples Programme. By: Kipalu, P., Kone, L., Bouchra, S., Vig, S., Loyombo, W. Edt.: Litvinoff, M. March 2016. ISBN 978-0-9935190-0-0 Online: http://www.forestpeoples.org/sites/fpp/files/publication/2016/05/fppdrcreportinternet-2.pdf (08.06.2017).

Forrest Groupe (2012): History. Groupe Forrest International. – 2012. Online: http://www.forrestgroup.com/en/history.html (08.06.2017).

Fraser Institute (2017): New Release. – For Immediate Release. February 2nd 2017. https://www.fraserinstitute.org/sites/default/files/survey-of-mining-companies-2016-newsrelease-INTL.pdf (09.06.2017).

Freudenberger et al. (2015): Property Rights Conundrums In Artisanal And Small-Scale Mining:Experiences From Usaid Projects In Côte D'ivoire. – Paper prepared for presentation at the "2015 World Bank Conference On Land And Poverty" The World Bank - Washington DC, March 23-27, 2015. By: Freudenberger, M., Thiam, B., Picard, C., Jiekak, S. and DeJong, T. Online: http://www.landlinks.org/wp-content/uploads/2016/09/Property_Rights_Conundrums_Artisanal_Small-Scale_Mining.pdf (30.05.2017).

FTS (2011): The Congo Report. Slavery in Conflict Minerals. – Free The Slaves. June 2011. Online: https://www.freetheslaves.net/wp-content/uploads/2015/03/The-Congo-Report-English.pdf (09.06.2017).

FTS (2013): Congo's Mining Slaves – Enslavement at South Kivu Mining Sites. Investigate Field Report. FTS – Free The Slaves NGO. June 2013. Online: https://www.freetheslaves.net/wp-content/uploads/2015/03/Congos-Mining-Slaves-web-130622.pdf (09.06.2017).

FTS (2013a): Wives in Slavery. Forced Marriage in the Congo. A Free the Slaves Field Research Expose. June 2013. Online: https://www.freetheslaves.net/wp-content/uploads/2015/03/FTS-ForcedMarriage-201306-V1-web.pdf (09.06.2017).

GBR (2013): Mining in Democratic Republic of Congo. A Journey to Africa's Mineral Heartland. – GBR – Global Business Reports. In: E&Mj – Engineering and Mining Journal, Number 9, January 2013. Online: http://gbreports.com/wp-content/uploads/2014/09/DRC_Mining2013.pdf (24.05.2017).

Geenen and Marysse (2016): Democratic Republic of the Congo: Mining Sector. By: Geenen, S. and Marysse, S. November 01st 2016. In: Encyclopedia of Mineral and Energy Policy, Springer Link, p.1-6 doi: 10.1007/978-3-642-40871-7_112-1. Online: https://www.researchgate.net/publication/307795456_Democratic_Republic_of_the_Congo_Mining_Sector (30.05.2017).

Genderforce (2014): Gender Country Profile DRC 2014. – Genderforce NGO. By: Illot Alphonse, M. February 7th 2014. Online: http://www.genderforce.com/?p=3937 (09.06.2017).

Glencore (2014): Glencore response to Key Findings and Questions, presented by Bread for All, the Swiss Catholic Lenten Fund and RAID. – Glencore. June 17th 2014. Online: http://www.glencore.com/assets/media/doc/news/2014/201406170700-Response%20to%20BFA,%20RAID%20and%20Fastenopfer,%20June%202014.pdf (16.06.2017).

Glencore (2016): Sustainability Report. Online: http://www.glencore.com/assets/sustainability/doc/sd_reports/2015-sd-print-basket/2015-Sustainability-report-environment.pdf (18.07.2017).

Glencore (2017): Glencore Purchases Stakes in Mutanda and Katanga. – Glencore. February 13th 2017, baar, Switzerland. Online: http://www.glencore.com/assets/media/doc/news/2017/20170213-Glencore-purchases-stakes-in-Mutanda-and-Katanga.pdf (22.05.2017).

Glencore (2017a): Glencore Sustainability Report 2016. – May 8th 2017. Glencore. Online: http://www.glencore.com/assets/sustainability/doc/sd_reports/2016-Glencore-Sustainabilty-Report.pdf (27.06.2017)

Global Forest Coalition (2013): NGO Report on Indigenous Pygmy Peoples - Universal Periodic Review of the Democratic Republic of Congo (2014).- Indigenous Peoples In The DRC: The Injustice Of Multiple Forms Of Discrimination. By: NGOs: FDAPYD – Hope Indigenous peoples; LYNAPICO; OSAPY; PIDP SHIRIKA LA BAMBUTI; PREPPYG; REPALEF/RDC; UEFA. September 2013. Online: http://globalforestcoalition.org/wp-content/uploads/2014/04/RAPPORT-ALTERNATIF-UPR-ONG-PEUPLES-AUTOCHTONES-RDC-_ANGLAIS.pdf (31.05.2017).

Global Security (n.d.): DR Congo – Corruption. – Global Security Org. Online: http://www.globalsecurity.org/military/world/congo/corruption.htm (02.06.2017).

Global Witness (2012): Artisanal Mining Communities In Eastern DRC: Seven Baseline Studies In the Kivus. – Global Witness Org. June 2012. Online: https://www.globalwitness.org/en/archive/artisanal-mining-communities-eastern-drc-seven-baseline-studies-kivus/ (31.05.2017).

Global Witness (2017): Glencore Redirected Over $75 Million In Mining Payments To Scandal-Hit Friend Of Congolese President, Global Witness Reveals. – Global Witness. March 3rd 2017. Online: https://www.globalwitness.org/en/press-releases/glencore-redirected-over-75-million-mining-payments-scandal-hit-friend-president-global-witness-reveals/ (02.06.2017).

Google Earth (2017): Google Earth Web Site, Search: Kolowezi. Online: https://earth.google.com/web/@-10.69715968,25.41084008,1461.06970082a,18277.64570046d,35y,339.76477961h,0t,0r (14.06.2017).

Grantham (2015): Dodd-Frank in the Congo. By: Grantham, D. NCPA - National Centre for policy Analysis., Issue Brief No. 176. November 2015. Online: http://www.ncpa.org/pdfs/ib176.pdf (01.06.2017).

Group (2015): Toxic Metal: The Health Dangers of Cobalt. – Global Healing Center. By: Dr. Group, E. May 29th 2015. Online: https://www.globalhealingcenter.com/natural-health/toxic-metal-health-dangers-cobalt/ (16.06.2017).

HCSS Report (2013): Coltan, Congo and Conflict. Polinares Case Study. HCSS - The Haague Centre for Strategic Studies No 20/03/13. By: Usanov, A., de Ridder, M., Auping, W. und Lingemann, S. (HCSS), Tercero Espinoza, L (Fraunhofer ISI); Ericsson, M., Farooki, M. (Raw Materials Group) and Sievers, H., Liedtke, M. (BGR) ISBN/EAN: 978-94-91040-81-8. Online: http://hcss.nl/sites/default/files/files/reports/HCSS_21_05_13_Coltan_Congo_Conflict_web.pdf (09.06.2017).

HDR (2017): Human Development Index (HDI) – United Nations Development Reports. Online: http://hdr.undp.org/en/content/human-development-index-hdi (09.06.2017).

Hear Congo (n.d.): Natural Resources in the Democratic Republic of Congo: A Cursed Blessing. – Hear Congo Blog. Online: http://www.hearcongo.org/natural-resources-in-the-democratic-republic-of-congo/ (22.05.2017).

HG.org (2017): Access and Admission of Foreign Investors in the Democratic Republic of Congo. – HG.org – Legal Resources. By: prof. Dr. Yav Katshung, J. (Yav and Associates). Online: http://www.hg.org/article.asp?id=24214 (26.05.2017).

HG.org (2017a): The Foreign Investment Operations in the Democratic Republic of Congo. – HG.org – Legal Resources. By: prof. Dr. Yav Katshung, J.(Yav and Associates). Online: https://www.hg.org/article.asp?id=24215 (29.05.2017).

HG.org (2017b): Environmental Audit, One of the Conditions for Mining Operations in the democratic Republic of Congo. – HG.org – Legal Resources. By: prof. Dr. Yav Katshung, J.(Yav and Associates). Online: https://www.hg.org/article.asp?id=27353 (29.05.2017).

ICLG (2016): Congo – D.R. – Mining Law 2017. ICLG- International Comparative Legal Guides. By: Tshibangu Ilunga, B., Tula,D. September 5th 2016. Online: https://iclg.com/practice-areas/mining-law/mining-law-2017/congo---d.r.#chaptercontent2 (23.05.2017).

ICOLD (2018): World Register of Dams - General Synthesis. In: International Commission on Large Dams (ICOLD).Online: https://www.icold-cigb.org/GB/World_register/general_synthesis.asp (18.12.2019).

IMF (2015): Democratic Republic of the Congo: Selected Issues – IMF – International Monetary Fund. African dept. Country Report No.15/281. October 13th 2015. Online: http://www.imf.org/en/Publications/CR/Issues/2016/12/31/Democratic-Republic-of-the-Congo-Selected-Issues-43336 (02.05.2017).

INN (2016): What is Colton? 5 Facts You Should Know. – Tantalum. - Investing News Network. By: Matich, T. June 1st 2016. Online: http://investingnews.com/daily/resource-investing/critical-metals-investing/tantalum-investing/coltan-facts/ (03.05.2017).

INN (2017): 5 Top Tantalum-producing Countries. – Tantalum. – Investing News Network. By: Barrera, P. March 6th 2017. Online: http://investingnews.com/daily/resource-investing/critical-metals-investing/tantalum-investing/2013-top-tantalum-producers-rwanda-brazil-drc-canada/ (03.05.2017).

INN (2017a): 5 Top Industrial Diamond-producing Countries. - Diamond. - Investing News Network. By: Barrera, P. February 28th 2017. Online: http://investingnews.com/daily/resource-investing/gem-investing/diamond-investing/top-industrial-diamond-producing-countries-drc-russia-australia/ (03.05.2017).

INN (2017b): Copper Production by Country. – Copper. - Investing News Network. By: Barrera, P. February 16th 2017. Online: http://investingnews.com/daily/resource-investing/base-metals-investing/copper-investing/copper-production-country/ (03.05.2017).

INN (2017c): 10 Top Cobalt-mining Countries by Production. – Cobalt. -- Investing News Network. By: Barrera, P. March 13th 2017. Online: http://investingnews.com/daily/resource-investing/critical-metals-investing/cobalt-investing/top-cobalt-producing-countries-congo-china-canada-russia-australia/ (03.05.2017).

Institute for Economics & Peace (2016): Global Peace Index 2016. – Institute for Economics & Peace. June 2016. Online: http://economicsandpeace.org/wp-content/uploads/2016/06/GPI-2016-Report_2.pdf (09.06.2017).

Investopedia (2017): Dodd-Frank Wall Street Reform and Consumer Protection Act. – Investopedia. 2017. Online: http://www.investopedia.com/terms/d/dodd-frank-financial-regulatory-reform-bill.asp (31.05.2017).

IRIN (2017): Who Pays the Hidden Price for Congo's Conflict-Free Minerals? – IRIN News. By: Freudenthal, E. February 14th 2017. Online: http://www.irinnews.org/investigations/2017/02/14/who-pays-hidden-price-congo%E2%80%99s-conflict-free-minerals (01.06.2017).

IRMA – Initiative for Responsible Mining Assurance (2014): Standard for Responsible Mining Draft v1.0. Online: https://responsiblemining.net/wp-content/uploads/2018/09/IRMA_Standard_Draft_v1.007-14.pdf (09.12.2019).
ISS (2016): The True Cost of Mineral Smuggling in the DRC. – ISS – Institute for Security Studies. By: Gatimu, S. January 11th 2016. Online: https://issafrica.org/iss-today/the-true-cost-of-mineral-smuggling-in-the-drc (02.06.2017).

ITIE (2017): Rapport ITIE RDC 2015. Online : https://eiti.org/document/2015-democratic-republic-of-congo-eiti-report (18.12.2019).

IWGIA (2016): The Indigenous World 2016 – The democratic Republic of Congo. (pp. 387-393). Editors: Vinding, D. and Mikkelsen, C. – IWGIA – International Work Group for Indigenous Affairs. Copenhagen. April 2016. Online: http://www.iwgia.org/iwgia_files_publications_files/0740_THE_INDIGENOUS_ORLD_2016_final_eb.pdf (31.05.2017).

IWGIA (2016a): Indigenous Peoples in the democratic Republic of Congo. - IWGIA – International Work Group for Indigenous Affairs. Online: http://www.iwgia.org/regions/africa/democratic-republic-of-congo (31.05.2017).

Jinchuan (2016): Company Background. - Jinchuan Group International Resources Co. Ltd. Online: http://jinchuan-intl.com/en/about_us/company_background.php (12.05.2017).

Kamoto Copper SARL (2012): Industrial Mining and Social Development: The Case of Kamoto Copper Company (KCC). – Kamoto Copper Company SARL Speaker: Nzeng, G. Online: https://www.miningreview.com/wp-content/uploads/Gustave_NZENG.pdf (14.06.2017).

Katanga Calling (2015): Congolese Cobalt and Consumer Electronics. Katanga Calling. – By: Friends of the Earth Netherlands, SOMO - Stichting Onderzoek Multinationale Ondernemingen, The GoodElectronics Network. – May 2015. Online: https://milieudefensie.nl/publicaties/brochures-folders/katanga-calling-congolese-cobalt-and-consumer-electronics (01.06.2017).

Katanga Mining Ltd. (2013): Katanga. Sell-Side Analysis Visit – November 2013. – Glencore, KML. November 2013. Online: http://www.glencore.com/assets/media/doc/speeches_and_presentations/glencore/2013/Glencore-Sell-Side-Analyst-Visit-Katanga-201311.pdf (16.06.2017).

Katanga Mining Ltd. (2016): Katanga Mining Limited. Annual Information Form For the Year Ended December 31st 2015. March 30th 2016. Online: http://www.katangamining.com/~/media/Files/K/Katanga-mining-v2/investor_relations/annual-info-forms/aif-2015/aif-2015.pdf (14.06.2017).

Katanga Mining Ltd. (2016a): Katanga Mining Limited Management's Discussion and Analysis for the Three and Nine Months Ended September 30th 2016 and 2015. Online: http://www.katangamining.com/~/media/Files/K/Katanga-mining-v2/reports-and-presentations/2016-09-kml-mda.pdf (16.06.2017).

Katanga Mining Ltd. (2016b): Investors Presentation. Katanga Mining Limited. May 13th 2016. Online: http://www.katangamining.com/~/media/Files/K/Katanga-mining-v2/reports-and-presentations/2016-katanga-investors-presentation-20160513.pdf (16.06.2017).

Katanga Mining Ltd. (2017): Company Profile. – Katanga Mining Limited. Online: http://www.katangamining.com/about-us/company-profile.aspx (12.05.2017).

Katanga Mining Ltd. (2017a): Katanga Mining Limited, NI 43-101 Technical Report On The Material Assets Of Katanga Mining Limited, Lualaba Province,Democratic Republic Of Congo. Katanga Mining Ltd. And Kamoto Copper Company S.A. By: Usmanl, T., Santos, C., Dempers, N., Ameen, A.M. and O'Brien, C. March 31st 2017. Online: http://www.katangamining.com/~/media/Files/K/Katanga-mining-v2/operations/reportsoperational/technical-report-march-2017.pdf (12.05.2017).

Katanga Mining Ltd. (2017b): Kamoto Underground Mine. Katanga Mining Limited. Online: http://www.katangamining.com/operations/key-assets/kamota-underground.aspx (22.05.2017).

Katanga Mining Ltd. (2019): Kamoto Underground Mine, http://www.katangamining.com/operations/key-assets/kamota-underground.aspx (17.01.2019)

Katunga, J. (2011): Minerals, Forests, and Violent Conflict in the Democratic Republic of the Congo. – Wilson Center. By: Katunga, J. July 7th 2011 Online: https://www.wilsoncenter.org/publication/minerals-forests-and-violent-conflict-the-democratic-republic-the-congo (26.06.2017).

KCC (2006): Amended Technical Report for Kamoto Copper Company. Kolwezi, Katanga Province, Democratic Republic of the Congo. Prepared for Katanga Mining Limited. Complied by: Mclntosh RSV LLC. Kamoto Copper Company. June 23rd 2006. Online: http://www.katangamining.com/~/media/Files/K/Katanga-mining-v2/operations/reportsoperational/kcc_techreport_06_06_23.pdf (16.06.2017).

KPMG (2016): Economic Spapshot H2, 2016 – Democratic Republic of the Congo. – KPMG. Online: https://home.kpmg.com/content/dam/kpmg/za/pdf/2016/10/KPMG-DRC-2016-Snapshot.pdf (03.05.2017).

Ksiezniak, J., Stucchi, A. (2013): Mining in Democratic Republic of Congo. In: Engineering and Mining Journal (E & MJ), January 2013.

Lundin Mining (n.d.): Tenke Fungurume, DRC. Copper/ Cobalt Mine. Lundin Mining Company. - Operations&Development. Online: http://www.lundinmining.com/new/TenkeFungurume.asp (12.05.2017).

Lydall, M. I.; Auchterlonie, A. (2011): The Democratic Republic of Congo and Zambia: A growing global 'Hotspot' for copper-cobalt mineral investment and exploitation, In: The Southern African Institute of Mining and Metallurgy (2011): 6th Southern Africa Base Metals Conference, Johannesburg, p. 25-38. Online: https://www.saimm.co.za/Conferences/BM2011/025-Auchterlonie.pdf (18.12.2019).

Mbala, M.S. and A. Karsenty (2010): Forest Revenue Decentralization and Profits Redistribution in the Democratic Republic of Congo. In: Governing Africa's Forests in a Globalized World. Chapter 8. Eds: German, L.A., Karsenty, A. and Tiani, A.M. The Earthscan Forest Library, London. ISBN: 978-1-84407-756-4. 2010.

McGuireWoods (2013): Mining in 31 Jurisdictions Worldwide 2013. – Democratic Republic of the Congo. - Contr.Editors: Bourassa,M. and Turner, J. – Getting The Deal Through. – Law Business Research. McGuireWoods, By: Andre-Dumont, H. ISSN 1748-3085. 2013. Online: https://www.mcguirewoods.com/news-resources/publications/international/mining-drcongo.pdf (23.05.2017).

McGuireWoods (2013a): Current DR Congo Mining Code under Revision. – McGuireWoods. May 30th 2013. Online: https://www.mcguirewoods.com/Client-Resources/Alerts/2013/5/Current-DR-Congo-Mining-Code-Being-Revised.aspx (25.05.2017).

Mendy, Gasana and Vieira (2011): Urinary heavy metals and associated medical conditions in the US adult population. In: International Journal of Environmental Health Research 22 (2): 105-18. August 2011. By: Mendy,A., Gasana, J. and Vieira, E.R.

Metorex (2013): Ruashi Mining. – Metorex Official web page. Online: http://www.metorexgroup.com/mine/ruashi-mining/ (12.05.2017).

Milesi, J.P.; Toteu, S.F.; Deschamps, Y.; Feybesse, J.L.; Lerouge, C.; Cocherie, A.; Penaye, J.; Tchameni, R.; Moloto-A-Kenguemba, G.; Kampunzu, H.A.B.; Nicol, N.; Duguey, E.; Leistel, J.M.; Saint-Martin, M.; Ralay, F.; Heinry, C.; Bouchot, V.; Doumnang Mbaigane, J.C.; Kanda Kula, V.; Chene, F.; Monthel, J.; Boutin, P.; Cailteux, J. (2006): An overview of the geology and major ore deposits of Central Africa: Explanatory note for the 1:4,000,000 map "Geology and major ore deposits of Central Africa." In: Journal of African Earth Sciences, Volume 44, Issues 4–5, 571-595. Online: https://www.sciencedirect.com/science/article/pii/S1464343X05002207?via%3Dihub (18.12.2019)

Mining Review (2015): DRC Mining Code: Propodes Changes Will Ruin the Industry. - Mining Review Africa. March 27th 2015. Online: https://www.miningreview.com/news/drc-mining-code-proposed-changes-will-ruin-the-industry/ (26.05.2017).

Mining Review (2016): DRC Government Drops Plans to Amend Mining Code. – Mining Review Africa. February 10th 2016. Online: https://www.miningreview.com/news/drc-government-drops-plans-to-amend-mining-code/ (25.05.2017).

Mining Weekly (2016): Importance of Artisanal Mining Increases in DRC. – Mining Weekly – Creamer Media. By: Hancock, T. December 2nd 2016. Online: http://www.miningweekly.com/article/importance-of-artisanal-mining-increases-in-drc-2016-11-17 (02.06.2017).

MINING.com (2016): Congo's Cobalt Production Set to Soar Despite Claims of Children Labour. By: Jamasmie, C. October18th 2016. Online: http://www.mining.com/congos-cobalt-production-set-soar-despite-claims-child-labour/ (22.05.2017).

MINING.com (2017): Top 50 Biggest Mining Companies. By: Els, F. April 3rd 2017. Online: http://www.mining.com/top-50-biggest-mining-companies/ (12.05.2017).

MINING.com (2017a): Infographic. Cobalt: The Energy Metal With a Very Precarious Supply Chain. By: Dejardins, J. January 9th 2017. Online: http://www.mining.com/web/infographic-cobalt-the-energy-metal-with-a-very-precarious-supply-chain/ (22.05.2017).

MINING.com (2017b): Congo To Re-Evaluate New Mining Code Next Week. By: Jamasmie, C. May 19th 2017. Online: http://www.mining.com/congo-re-evaluate-new-mining-code-next-week/ (25.05.2017).

Miningne.ws (2017): Glencore Cobalt Supplies In Congo Face Hold Up Over Mine Row. By: Mzamo, P. April 19th 2017. Online: https://www.miningne.ws/2017/04/19/glencore-cobalt-supplies-in-congo-face-hold-up-over-mine-row/ (12.05.2017).

Ministry of Mines (2003): Guide of Mining Investor. – Democratic Republic of Congo Ministry of Mines. June 2003. Online: http://miningcongo.cd/pdf_divers/guide_of_mining_investor.pdf (24.05.2017).

Ministry of Mines (2016): Statistiques Minieres Annee 2015 – Democratic Republic of Congo Ministry of Mines. March 2016. Online: http://mines-rdc.cd/fr/documents/Statistiques/2015/Statistiques_minieres_annee_2015.pdf (02.05.2017).

Ministry of Mines (2017): Mining Enterprises. - Democratic Republic of Congo Ministry of Mines. Online: http://www.mines-rdc.cd/fr/index.php/ministere/entreprises-minieres (23.05.2017).

Montejano, A. Z. (2013): In search of clean water: human rights and the mining industry in Katanga, DRC. In: International Peace Informations Service (IPIS).

Mudd, G, Weng, Z, Jowitt, S, Turnbull, I and Graedel, T (2013): Quantifying the recoverable resources of by-product metals: The case of cobalt', Ore Geology Reviews, vol. 55, no. C, pp. 87-98.

Nachmany et al. (2014): "The GLOBE Climate Legislation Study: A Review of Climate Change Legislation in 66 Countries. Fourth Edition – Democratic Republic of Congo.- London: GLOBE International and the Grantham Research Institute, London School of Economics. By: Nachmany, M., Fankhauser, S., Townshend, T., Collins, M. Landesman, T., Matthews, A., Pavese, C., Rietig, K., Schleifer,

P. and Setzer, J. 2014. Online: http://climateobserver.org/wp-content/uploads/2014/07/Globe-Climate-Legislation-Study-GLOBE-International-Graham-Research-Institute-London-School-of-Economics-2014.pdf (29.05.2017).

Nest (2011): Coltan. By: Michael Nest. Publisher: Polity Press 2011, Malden, USA; Cambridge, UK. ISBN: 978-0-7456-4931-3. Online: https://books.google.de/books?id=mTalPKBRY4IC&printsec=frontcover&hl=de#v=onepage&q&f=false (30.05.2017).

New Vision (2016): DR Congo "Transfers Mining Royalties to Kabila Ally" – New Vision – Uganda's Leading Daily. By: AFP. November 16th 2016. Online: http://www.newvision.co.ug/new_vision/news/1440184/dr-congo-transfers-mining-royalties-kabila-ally (02.06.2017).

Norton Rose Fulbright (2015): Conflict Minerals: How Dodd-Frank Is Affecting Mining In The DRC. – Norton Rose Fulbright – Inside Africa. By: Koch, L. November 24th 2015. Online: http://www.insideafricalaw.com/blog/conflict-minerals-how-dodd-frank-is-affecting-mining-in-the-drc (01.06.2017).

OECD (2014): Gold Baseline Study One: Musebe Artisanal Mine, katanga, Democratic Republic of Congo. OECD. By: Mthembu-Salter, G. The study served as background material for the 7th ICGLR-OECD-UN GoE Forum on Responsible Mineral Supply Chains in Paris on 26-28 May 2014. Online: https://www.oecd.org/countries/democraticrepublicofthecongo/Gold-Baseline-Study-1.pdf (07.06.2017).

OECD (2017): Democratic Republic of the Congo. – OEC: Observatory of Economic Complexity. Online: http://atlas.media.mit.edu/en/profile/country/cod/ (02.05.2017).

Oil Trading News (2017): Mines: the Reasons for the Divorce Between Glencore and Dan Gertler in DR Congo. – Oil Trade News. April 9th 2017. Online: http://www.oiltradingnews.com/single-post/2017/04/09/Mines-the-reasons-for-the-divorce-between-Glencore-and-Dan-Gertler-in-DR-Congo (02.06.2017).

Okrusch, M.; Matthes, S. (2005): Mineralogie: Eine Einführung in die spezielle Mineralogie, Petrologie und Lagerstättenkunde, 7. Auflage, Springer-Verlag Berlin Heidelberg.

OpenStreetMap (2019: Online: https://www.openstreetmap.de/karte.html

PACT (2010): Promines Study: Artisanal Mining in the Democratic Republic of Congo. – Pact Inc. June 2010 Online: http://www.congomines.org/system/attachments/assets/000/000/349/original/PACT-2010-ProminesStudyArtisanalMiningDRC.pdf?1430928581 (31.05.2017).

PACT (2012): Women in Artisanal Mining in the Democratic Republic of Congo. PACT 2012. Online: http://www.kilogoldmines.com/wp-content/uploads/2012/10/Pact-Congo-DRC-Women-in-Artisanal-Mining-in-the-DRC-.pdf (09.06.2017).

Parker and Vadheim (2016): Resource Cursed or Policy Cursed? US Regulation of Conflict Minerals and Violence in the Congo. – By: Parker, Dominic P. (the University of Wisconsin), and Vadheim, B. (Vivid Economics). In: JAERE, vol.4 No.1 by: The Association of Environmental and Resource Economists. December 7th 2016. Online: http://www.journals.uchicago.edu/doi/pdfplus/10.1086/689865 (01.06.2017).

Pfister, S., Koehler, A., Hellweg, S. (2009): Assessing the Environmental Impacts of Freshwater Consumption in LCA. In: Environmental Science & Technology. Vol. 43, No. 11, pp. 4098–104.

Pourret, O.; Lange, B.; Bonhoure, J.; Colinet, G.; Decree, S.; Mahy, G.; Seleck, M.; Shutcha, M.; Faucon, M.-P. (2016): Assessment of soil metal distribution and environmental impact of mining in Katanga (Democratic Republic of Congo). In: Applied Geochemistry, 64, 43-55. Online: https://www.researchgate.net/publication/280577884 (18.12.2019).

PPA (2013): Tracking, Certifying and Exporting Artisanal Gold from Eastern DRC. – Interim Report to the Public-Private Alliance for Responsible Minerals Trade (PPA) – February 15th 2013 to June 30th 2013. Partnership Africa Canada. Online: http://www.resolv.org/site-ppa/files/2013/02/Report-2-PAC-Phase-I-November-4-final-clean.pdf (08.06.2017).

Practical Law Company (2016): Investing in Demicratic Republic of Congo (DRC). – Practical Law Company. By: Bavon M., K. Online: https://content.next.westlaw.com/6-600-2368?transitionType=Default&contextData=(sc.Default)&__lrTS=20170623100511186&firstPage=true&bhcp=1 (26.05.2017).

Priester, M.; Ericsson, M.; Dolega, P.; Löf, O. (2019): Mineral grades: An important indicator for environmental impact of mineral exploitation, Mineral Economics, Springer Nature.

PwC (2012): Congo, Democratic Republic of. – Corporate Income taxes, Mining Royalties and Other Mining Taxes – 2012 Update. – PwC - PricewaterhouseCoopers International Limited. June 2012 Online: https://www.pwc.com/gx/en/energy-utilities-mining/publications/pdf/pwc-gx-miining-taxes-and-royalties.pdf (26.06.2017).

PwC (2017): Congo, Democratic Republic of the. – Overview. – PwC - PricewaterhouseCoopers International Limited. January 31st 2017. Online: http://taxsummaries.pwc.com/uk/taxsummaries/wwts.nsf/ID/Democratic-Republic-of-Congo-Overview (02.05.2017).

Reporters Without Borders (2016): DRC Ranked 152nd in World Press Freedom Index. – Reporters Without Borders. April 21st 2016. Online: https://rsf.org/en/news/drc-ranked-152nd-world-press-freedom-index (22.06.2017).

Reuters (2011): new Congo Law Demands Environmental Impact Studies. – Reuters. – Environment. By: Kinshasa, J.H. June 21st 2011. Online: http://www.reuters.com/article/us-congo-democratic-environment-idUSTRE75K5Q120110621 (29.05.2017).

Reuters (2017): Congo expected to produce 1.5 million tonnes of copper in 2018. Online: http://af.reuters.com/article/investingNews/idAFKBN15N0V1 (17.08.2017).

Reuters (2017): White House Plans Directive targeting „Conflict Minerals" Rule: Sources. – Reuters – Business news. By: Lynch, Sarah N., Stephenson, E. Washington. February 8th 2017. Online: http://www.reuters.com/article/us-usa-trump-conflictminerals-idUSKBN15N06N?feedType=RSS&feedName=businessNews&utm_source=Twitter&utm_medium=Social&utm_campaign=Feed%3A+reuters%2FbusinessNews+%28Business+News%29 (01.06.2017).

SARW (2012): Conflict Gold to Criminal Gold: The New Face of Artisanal Gold Mining in Congo. – SARW – Southern Africa Resource Watch. Online: http://www.osisa.org/sites/default/files/from_conflict_gold_to_criminal_gold.pdf (24.04.2017).

SARW (2012a): Democratic Republic of the Congo. - SARW – Southern Africa Resource Watch. By: Thoke, M. August 24th 2012. Online: http://www.sarwatch.org/pt-pt/node/316 (25.05.2017).

Shalina (n.d.): About Us. – Shalina Resources. Online: http://www.shalinaresources.com/aboutus.html (12.05.2017).

Sky News (2017): Meet Dorsen, 8, Who Mines Cobalt to Make Your Smartphone Work. By: Crawford, A. Online: http://news.sky.com/story/meet-dorsen-8-who-mines-cobalt-to-make-your-smartphone-work-10784120 (16.06.2017).

SOMO (2011): Unheard Voices. Mining Activities in the Katanga Province and Impact on Local Communities. – SOMO - Centre for Research on Multinational Corporations. By: ACIDH (Action Against Impunity for Human Rights). November 2011. Online: https://www.somo.nl/unheard-voices/ (06.06.2017).

SOMO (2016): Cobalt Blues. Environmental Pollution and Human Rights Violations in Katanga's Copper and Cobalt Mines. – SOMO - Stichting Onderzoek Multinationale Ondernemingen, Good Electronics. – By: Scheele, F. and de Haan en Vincent Kiezebrink, E., with the help of: Umpula Nkumba, E., Ben-Bellah, D., Bwenda, C.April 2016. ISBN: 978-94-6207-094-3 Online: https://www.somo.nl/cobalt-blues/ (06.06.2017).

Stock House (2016): Katanga Mining (T.KAT) Accident Claims Three Lives; Four Missing, Presumed Dead. – Stock House. By: Engen, G. March 17th 2016. Online: http://www.stockhouse.com/news/newswire/2016/03/17/katanga-mining-t-kat-accident-claims-three-lives;-four-missing-presumed-dead (27.06.2017):

Stosch, H.-G. (2014): Einführung in die Gesteins- und Lagerstättenkunde, Karlsruher Institut für Technologie (KIT). Online: https://www.agw.kit.edu/downloads/Studiengang/Gesteins_und_Lagerstaettenkunde.pdf (18.12.2019).

Straskraba, V., Placet, J. and Holubec, M. (1985): Hydrogeology and drainage of copper-cobalt mines in the Kolwezi area of Shaba, Republic of Zaire. In: International Mine Water Association, pp. 125-139.

Swiss Info (2014): NGOs Accuse Glencore of Human Rights Violations. –Congolese Copper - SWI Swiss Info. June 17th 2014. Online: http://www.swissinfo.ch/eng/ngos-accuse-glencore-of-human-rights-violations/38800880 (07.06.2017)

Tech Crunch (2017): No Cobalt, no Tesla? – TC – Tech Crunch. By: Gandon, S. January 1st 2017. Online: https://tech-crunch.com/2017/01/01/no-cobalt-no-tesla/ (09.06.2017).

The Chamber of Mines (2015): 2015 DRC Mining Industry Annual Report – Chambre des Mines (Fédération des Entreprises du Congo). Online: http://www.congomines.org/system/attachments/assets/000/001/087/original/CdM_annual_Report_2015_EN_-_0402_2016.pdf?1455112232 (30.05.2017).

The Guardian (2014): Obama's Conflict Minerals Law Has Destroyed Everything, Say Congo Miners. – The Guardia. By: Raghavan, S. December 02nd 2014. Online: https://www.theguardian.com/world/2014/dec/02/conflict-minerals-law-congo-poverty (26.06.2017).

The Guardian (2016): Fairphone: One Smartphone Company's Search für Conflict-free Gold. – The Guardian. By: Cahalane, C. April 29th 2016. Online: https://www.theguardian.com/sustainable-business/2016/apr/29/fairphone-smartphone-company-search-conflict-free-gold#img-2 (01.06.2017).

The Mining Code (2002): Law No. 007/2002 Of July 11, 2002 Relating To The Mining Code. The Constituent And Legislative Assembly, Transition Parliament Has Adopted, The President Of The Republic Enacts The Law Whose Contents Are As Follows. Online: http://www.mines-rdc.cd/fr/documents/codeminier_eng.pdf (23.05.2017).

The Mining law Review (2012): The Mining Law Review – First Edition; Chapter 5. – Democratic Rebublic of the Congo. By:Mukendi Wafwana, E., Cibamba Diata, E., Mayifuila, N., V.Kempen, J., Mumwena Kasonga, E. and EMW&A. Law Business research Ltd., Editor: La Fleche, E.R., U.K., London. ISBN 978-1-907606-46-5. Online: http://www.cabemery.org/wp-content/uploads/The_Mining_Law_Review_DRC_Chapter.pdf (23.05.2017).

The Mining Regulations (2003): Democratic republic of Congo. Decree No. 038/2003_OF 26 March 2003. – Mining Regulation. Kinshasa, March 26th 2003. Online: http://www.congomines.org/system/attachments/assets/000/000/101/original/GOVRDC-2003-ReglementMinier-EN.pdf?1430927814 (29.05.2017).

The New York Times (2011): How Congress Devastated Congo. – The new York Times. By: Aronson, D. August 7th 2011. Online: http://www.nytimes.com/2011/08/08/opinion/how-congress-devastated-congo.html (26.06.2017).

The Sentry (2015): Country brief: Democratic Republic of Congo. – The Sentry – an initiative of the Enough Project. July 2015. Online: https://thesentry.org/wp-content/uploads/2015/07/19103553/Country-Brief_DRC.pdf (02.06.2017).

The Telegraph (2016): Tho Dead and Five Missing After Wall Collapsed at Glencore Katanga Mine in DRC. – The Telegraph. By: Yeomans, J. March 8th 2016. Online: http://www.telegraph.co.uk/business/2016/03/08/seven-missing-after-wall-collapse-at-glencores-katanga-mine-in-d/ (27.06.2017).

The Washington Post (2014): How a Well-intentioned U.S. Law Left Congolese Miners Jobless. – The Washington Post. By: Raghavan, S. November 30th 2014. Online: https://www.washingtonpost.com/world/africa/how-a-well-intentioned-us-law-left-

congolese-miners-jobless/2014/11/30/14b5924e-69d3-11e4-9fb4-a622dae742a2_story.html?utm_term=.221d7bebf611 (26.06.2017).

The Washington Post (2016): The Cobalt Pipeline. Tracing the Path From Deadly Hand-dug Mines in Congo to Consumers' Phones and Laptops. – The Washington Post. By: Frankel, T.C. September 30th 2016. Online: https://www.washingtonpost.com/graphics/business/batteries/congo-cobalt-mining-for-lithium-ion-battery/ (22.05.2017).

The Washington Post (2017): Apple Cracks Down Further on Cobalt Supplier in Congo as Child Labor Persists. – The Washington post. By: C.Frankel, T. March 3rd 2017. Online: https://www.washingtonpost.com/news/the-switch/wp/2017/03/03/apple-cracks-down-further-on-cobalt-supplier-in-congo-as-child-labor-persists/?utm_term=.6db01b059659 (09.06.2017).

Transparency International (2017): Corruption Perception Index 2016. – Transparency International – The Global Coalition Against Corruption – January 25th 2017. Online: https://www.transparency.org/news/feature/corruption_perceptions_index_2016 (02.06.2017).

U.S. Department of State (2015): 2015 Trafficking in Persons Report– United States Department of State. June 30th 2016. Online: http://www.refworld.org/docid/577f961c15.html (09.06.2017).

UN General Assembly (2002): Fifty-seventh Session, Item 109 of the agenda. Human Rights Questions: Human Rights Situations And Reports Of Special Rapporteurs And Representatives. Situation of human rights in the Democratic Republic of the Congo.- September 26th 2002. Online: http://www.refworld.org/pdfid/3deb35f14.pdf (08.06.2017).

UNDP (2016): Table 5: gender Inequality Index. "Human Development Report 2016: human Development For Everyone". Online: http://hdr.undp.org/en/composite/GII (09.06.2017).

UNDRIP (2007): United Nations Declaration on the Rights of indigenous Peoples. – United Nations. Online: http://www.iwgia.org/iwgia_files_publications_files/UNDRIP.pdf (31.05.2017).

UNEP - UN Great Lakes - MONUSCO (2015): Experts' Background Report On Illegal Exploitation And Trade In Natural Resources Benefitting Organized Criminal Groups And Recommendations On MONUSCO's Role In Fostering Stability And Peace In Eastern DR Congo. Final Report April 15th 2015. Online: http://postconflict.unep.ch/publications/UNEP_DRCongo_MONUSCO_OSESG_final_report.pdf (09.06.2017).

UNEP (2011): Towards a Life Cycle Sustainability Assessment – UNEP. Edit.: Valdivia, S., Lie Ugaya, C.M., Sonnemann, G. and Hidenbrand, J. By: Ciroth, A., Finkbeiner, M., Hildenbrand, J., Klöpffer, W., Mazjin, B. et al. ISBN: 978-92-807-3175-0. Online: http://www.uncclearn.org/sites/default/files/unep_lifecycleinit_dec_final_1.pdf (31.05.2017).

UNEP (2011a): Water issues in the Democratic Republic of the Congo. Challenges and Opportunities. – Technical report. – UNEP United nations Environment Programme. By: Partow, H. 2011. Online: http://regulationbodyofknowledge.org/wp-content/uploads/2016/08/Water-Issues-in-the-Democratic-Republic-of-the-Congo_United-Nations-Environment-Programme_2011.pdf (22.06.2017).

UNICEF (2012): In DR Congo, UNICEF Supports Efforts to Help Child Labourers Return to School. By: Walther, C. June 13th 2012. Online: https://www.unicef.org/childsurvival/drcongo_62627.html (16.06.2017).

United Nations (2004): The Concept of Indigenous Peoples. – Background Apper Prepared by the Secretariat of the Permanent Forum on Indigenous Issues. Workshop On Data Collection And Disaggregation For Indigenous Peoples (New York, 19-21 January 2004). Department Of Economic And Social Affairs, Division for Social Policy and Development Secretariat of the Permanent Forum on Indigenous Issues. United Nations. Online: http://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf (20.06.2017).

USAID (2014): Assessment of Human Trafficking in Artisanal Mining Towns in Eastern Democratic Republic of the Congo. US AID August 2014. Task Order No. AID-OAA-TO-11-00057 Online: http://pdf.usaid.gov/pdf_docs/PA00K5R1.pdf (09.06.2017).

USGS (2016): Mineral Commodity Summaries 2016. – U.S. Department of the Interior; U.S. Geological Survey., USA, Reston, Virginia. ISBN 978–1–4113–4011–4. Online: https://minerals.usgs.gov/minerals/pubs/mcs/2016/mcs2016.pdf (03.05.2017).

USGS (2016a): 2014 Minerals Yearbook. Cobalt (Advanced Release). – U.S. Department of the Interior; U.S. Geological Survey., USA. By: Shedd, Kim B. October 2014. Online: https://minerals.usgs.gov/minerals/pubs/commodity/cobalt/myb1-2014-cobal.pdf (03.05.2017).

USGS (2017): Mineral Commodity Summaries 2017. – U.S. Department of the Interior; U.S. Geological Survey., USA, Reston, Virginia. ISBN 978-1-4113-4104-3. Online: https://minerals.usgs.gov/minerals/pubs/mcs/2017/mcs2017.pdf (03.05.2017).

Verisk Maplecroft (2017): Latest Products and Reports. – Verisk Maplecroft. Online: https://maplecroft.com/portfolio/new-analysis/2016/08/12/modern-slavery-rife-58-countries-china-india-among-25-economies-posing-extreme-supply-chain-risks-global-index/ (22.05.2017).

VOA News (2013): Report. DRC Mining Deals Highlight Resource Corruption. – VOA news. By: Long, N. may 14th 2013. Online: https://www.voanews.com/a/experts-dc-mining-deals-highlight-resource--corruption/1660958.html (02.06.2017).

Walmsley and Patel (2011): Handbook on environmental assessment legislation in the SADC region. 3rd edition. Pretoria: Development Bank of Southern Africa (DBSA) in collaboration with the Southern African Institute for Environmental Assessment (SAIEA). – Chapter 5 - DRC. By: Walmsley, B and Patel, S. Published by: Development Bank of Southern Africa (DBSA). Online: http://www.saiea.com/dbsa_handbook_update2012/dbsaFrameSet.html (29.05.2017).

Wentzel (2015): mining Law Survey. – Democratic Republic of Congo. By: Wentzel, W. in alliance with Linklaters. Online: http://www.lexology.com/(F(5PSGzUey_nMf0PFXXhrCasmdH1rc8s71-tkIKmtbmvd1YeXA27cwG3EGvam-lgliK_DdChYkp_geVT37Vjag6GPUwBBCM24EctjUBaXUFSx1CNRdP8MHwhtbbcDS8CX0YOku2uF2FQMwekh82bdWl3YiCff2CIF-BOPA3bp7es35NM7Eg0BuJSrRBgDHSStkVdwsCRIH1yO9GACQtDaMqWPeu39Es1))/library/document.ashx?g=f862785c-42d7-43aa-a026-e7762164537f&b=4UJQ0r0PbOPA0IFQMYPhZHl4xhM90RTPulWPfYj42Lc%3D&bt=2015-03-05T03%3A28%3A29.0674848%2B00%3A00&noredirect=1 (29.05.2017).

WHO (2006): Concise International Chemical Assessment Document 69. – Cobalt and Inorganic Cobalt Compounds. – World Health Organization. By: Kim, J.K., Gibb, H.J., and Howe, P.D.. Published under the joint sponsorship of the United Nations Environment Programme, the International Labour Organization, and the World Health Organization, and produced within the framework of the Inter-Organization Programme for the Sound Management of Chemicals. ISBN 978 92 4 153069 9 Online: http://www.who.int/ipcs/publications/cicad/cicad69%20.pdf (16.06.2017).

WILPF (2016): Life at the Bottom of the Chain: Women in Artisanal Mines in DRC. – WILPF Women's International League for Peace & Freedom. In Partnership with Channel Foundation. By: Matundi Mbambi, A & Kandolo, L. Edt.: M.Maraver, M. August 2016. 1st edition. Online: http://wilpf.org/wp-content/uploads/2016/10/WomenInArtisanalMinesInDRC_web.pdf (09.08.2017).

World Atlas (2017): The Poorest Countries in the World. – World Atlas. By: Dillinger, J. March 21st 2017. Online: http://www.worldatlas.com/articles/the-poorest-countries-in-the-world.html (22.05.2017).

World Bank (2010): The Worldwide Governance Indicators: Methodology and Analytical Issues. – World Bank and Brookings Institutions. By: Kaufmann, D., Kraay, A. and Mastruzzi, M. September 2010. Online: http://info.worldbank.org/governance/wgi/pdf/wgi.pdf (09.06.2017).

World Bank (2013): Artisanal and Small-Scale Mining. – World bank Brief. November 21st 2013. Online: http://www.worldbank.org/en/topic/extractiveindustries/brief/artisanal-and-small-scale-mining (30.05.2017).

World Bank (2017): Where We work – Democratic Republic of Congo. – Country Overview. – The World Bank. April 19th 2017 Online: http://www.worldbank.org/en/country/drc/overview (02.05.2017).

World Bank (2017a): Total Natural Resources Rents (% of GDP). – The World bank. Online: http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS (02.05.2017).

World Bank (2017b): Worldwide Governance Indicators. – The World Bank. Online: http://databank.worldbank.org/data/reports.aspx?source=worldwide-governance-indicators (09.06.2017)

World Economic Forum (2015): How Mining Affects Women in the Democratic Republic of Congo. – World Economic Forum. Washington DC. By: Growth, C. September 23rd 2015. Online: https://www.weforum.org/agenda/2015/09/how-mining-affects-women-in-the-democratic-republic-of-congo/ (09.06.2017).

World Social Web Site (2017): Reports Expose Widespread Use of Child Labor in the Congo. – World Social Web Site. By: Haywood, E. March 23rd 2017. Online: https://www.wsws.org/en/articles/2017/03/23/cong-m23.html (09.06.2017).

World Vision (2013): Child Miners Speak. Key Findings on Children and Artisanal Mining in Kambove DRC. – World Vision . March 2013. Online: http://www.wvi.org/sites/default/files/Child%20Miners%20Speak_WEB%20Version_0.pdf (09.06.2017).

WTO (2016): Trade Policy Review – Report by the Secretariat. Democratic Republic of the Congo. – World Trade Organization. WT/TPR/S/339. May 11th 2016. Online: https://www.wto.org/english/tratop_e/tpr_e/s339_e.pdf (29.05.2017).

Zientek, M.L., Bliss, J.D., Broughton, D.W., Christie, Michael, Denning, P.D., Hayes, T.S., Hitzman, M.W., Horton, J.D., Frost-Killian, Susan, Jack, D.J., Master, Sharad, Parks, H.L., Taylor, C.D., Wilson, A.B., Wintzer, N.E., and Woodhead, Jon (2014): Sediment-Hosted stratabound copper assessment of the Neoproterozoic Roan Group, Central African Copperbelt, Katanga Basin, Democratic Republic of the Congo and Zambia. In: U.S. Geological Survey Scientific Investigations Report 2010–5090–T, 162 p., and spatial data. Online: http://dx.doi.org/10.3133/sir20105090T (18.12.2019).