Unfair Connections?

Tantalum for the high-tech-industries and the consequences of its extraction in Bolivia

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Introduction

Most people will probably only remember terms such as “tantalum“, “tungsten” or “lithium” from chemistry lessons in school. In recent years, however, awareness of these and other mineral resources[1] has risen sharply, due primarily to the rapid development of industries such as electronics and renewable energy production, which have drastically increased demand for certain raw materials. A smartphone, for example, can contain up to fifty different metals, and wind turbines, electric cars, solar panels and LED lamps all contain a myriad of mineral components. Many of these materials are difficult if not impossible to substitute, and are currently being mined in only a handful of countries.

The growing demand for natural resources has put the subject of raw materials back onto the international political agenda. On the one hand, increased competition over access to and control of these resources has led a number of industrialized countries as well as the European Union to formulate specific raw material strategies (Küblböck 2013). On the other hand, some resource-rich countries have taken measures to increase earnings from the extractive sector in order to promote the development of their own local and national economies. On the international level, a number of initiatives has arisen to increase transparency and accountability in the sector (Küblböck/Pinter 2015).

At the same time, criticism of and resistance to mining projects continues to increase in many regions. In this context, most notably in Latin America, a debate concerning social and economic alternatives to resource extraction has developed in the last decade (Heinrich Böll Stiftung 2015, Brand/Dietz 2014). In 38 countries worldwide the extractive sector is of such high importance that it represents more than 25% of export revenues, or at least 20% of the gross domestic product (GDP). 31 of these countries fall into the two lowest income groups (“low income country” or “least developed country”).

Bolivia, a priority country for the work of DKA Austria, has been classified by the World Bank as a "lower middle income country"; here, too, the extractive sector is one of the most important economic branches. In 2015, nearly 20% of export revenues arose from this sector (INE 2015). Bolivia provides an interesting example of a resource-rich country which is increasingly seeking to use raw material revenues to further local and national development; since 2006 the Bolivian president Evo Morales and his national government have significantly expanded Bolivia's mining sector in order to finance social and economic development. Through nationalization and new legislation relevant to the mining sector, the government is attempting to retain a larger portion of value generated within the country. However, the limitations of Bolivia’s plurinational state model, including the new constitution of 2009 and the project of indigenous autonomy,

1 A ‘mineral resource’ is usually defined as a metal, industrial mineral, rock or soil that has been created through geological processes in the Earth’s crust and for which a demand exists. This widely-used definition excludes the products of agriculture and forestry (agricultural commodities) as well as fossil energy resources (coal, oil and natural gas), and will be used as such in this publication.

come into focus when confronted with the issues surrounding the extraction of mineral resources. On the national level, the centralization and concentration of political competences in this area are creating conflict and societal divisions, ultimately hindering further democratization.

Taking into consideration the significance of tantalum extraction for materials engineering and the electronics industry, this study will address the following questions:

- How are global value chains organized within this sector?
- Who are the most important actors and stakeholders?
- Who benefits from the extraction of tantalum in Bolivia and who carries the costs?
- What is the impact of resource extraction on different social groups?
- Which national and international regulations would be necessary to redistribute revenues from tantalum extraction in a more just and equal way while minimizing negative ecological and social impacts?

The first section of this study provides basic information about the element tantalum, its extraction and uses as well as the most important actors in these processes. In part two we will give an overview of the history and present context of mining in Bolivia in general and of tantalum mining in particular. In part three we will sketch out a chosen number of international regulative initiatives.

Global production networks[2] and corporate accountability

The production process of consumer goods containing extracted mineral resources is in most cases difficult to reconstruct. Reasons for this include the vastness of the global economic networks involved, the multitude of steps involved in the production process, and a lack of applicable regulations and transparency requirements. The extraction of mineral raw materials is often accompanied by drastic social and environmental consequences which impact different societal groups in different ways. The central economic actors in the mining sector are transnational mining companies and other enterprises involved in the trade and processing of the minerals. The majority of the profits derived from resource processing are both generated and skimmed outside the country where the raw material was originally extracted; even so,

2 The research perspective of “global production networks” examines corporate activities as dynamically and spatially situated within their economic relationship networks, taking into account their embeddedness in wider political and economic contexts. This approach takes a significantly broader perspective than studies which focus solely on “global supply chains”.

resource extraction projects are often pushed through by governments in spite of local resistance (Andreucci/Radhuber 2015; Brand/Dietz 2014).

Research on production networks has shown that it is not only companies that play a role in supply chains; actors such as governments, states, supranational organizations, non-governmental organizations (NGOs), trade unions, consumers, social organizations and specific segments of the local population play an important role too. The supply chain specific to tantalum shows that European consumers at the end of the chain are just as involved as peoples impacted by mineral extraction taking place in Bolivia. The current distribution of benefits versus social and ecological costs is highly unequal.

The organization of a supply chain and the distribution of costs and benefits always depends on the political and economic contexts in which it develops, specifically in relation to existing power relations and related legal frameworks (Henderson et al. 2002; Coe 2011).

Changes within these contexts can force companies to alter supply chain design. Such changes may come about through the election of a new government and the subsequent alteration the legal framework. International regulation initiatives or campaigns that address the issue of production conditions can also force companies to alter how they conduct business. The fact that international actors play such a significant role in the mining sector makes clear their global responsibility for the effects of resource extraction and extractivism as currently practiced.[3] However, the insufficient nature of current transparency regulations, combined with a lack of binding human rights norms among other factors, contributes to an environment in which corporations often fail to assume these responsibilities.

3 The terms extractivism (Spanish: extractivismo) and neo-extractivism have in recent years been used to describe a form of national economy built on raw materials extraction and export, particularly in Latin America. Compared to the term “extractivism”, which describes a model based on extraction and export of natural resources and appropriation of rents by international investors, the term “neo-extractivism” defines a model that is also based on extensive resource extraction and export, but where the generated income is used for public expenditure, especially in the social sector (see for example Eduardo Gudynas Extractivismos. Ecología, economía y política de un modo de entender el desarrollo y la Naturaleza, Bolivia, Cochabamba, CEDIB y CLAES, 2015).

Chapter 1
Tantalum

1 Tantalum

1.1 Properties, usage and significance

Until the beginning of the millennium, the term tantalum[4] was known only to specialists. Since that time the public has become increasingly aware of both the metal tantalum and coltan, the most commonly found tantalum-containing ore. This new awareness is linked to the fact that tantalum is among the raw materials necessary for the creation of high-tech products such as smartphones; coltan has also grown in notoriety owing to the role it has played in financing of the ongoing civil war in the Democratic Republic of Congo.

Properties and uses

Tantalum has many attributes that make it interesting for a wide range of applications. What particularly distinguishes tantalum is its ability to store a high amount of electrical charge within a comparably small volume. For this reason, about half of global tantalum production is used for the electronics industry, mostly for capacitors and in particular for products where low weight and volume are of importance. A mobile phone contains an average of 40 milligrams of tantalum (Usanov et al. 2013). The metal is also highly conductive, heat-resistant, and bio-compatible; it has a high degree of hardness, and is highly resistant to corrosion. It is often used as an alloy in order to improve the properties of base materials. Within the field of medicine, tantalum's high bio-compatibility makes it useful as a component for prostheses and pacemakers. Its resistance to corrosion leads to the use of tantalum alloys for pipes and tanks, and its hardness makes it interesting for cutting tools and similar technical equipment. Due to this combination of special properties, tantalum is difficult to substitute with other materials without a decrease in product quality.

"Conflict mineral"

Tantalum in its pure form is rare in nature; it is usually found together with other metals and minerals, particularly niobium (columbium). Coltan is a specific tantalum-niobium ore, and the world's main coltan deposits are to be found in central Africa (British Geological Survey 2011; Soto-Viruet et al. 2013). As previously mentioned, the extraction of coltan has played a role in the financing of various actors in the Congolese civil war; for this reason tantalum, alongside tungsten, tin and gold, has been declared a „conflict mineral" (for details see Küblböck/Pinter 2016).

"Critical raw materials" and demand

Until early 2014 tantalum was also listed as a critical raw material[5] in accordance with the EU Raw Materials Initiative[6]. Due to the discovery of new deposits, tantalum has not been on this list since 2014. At present it is estimated that global tantalum reserves will be sufficient to cover demand for the foreseeable

4 The metal tantalum is a chemical element with the symbol Ta and the atomic number 73.
5 The European Commission published a list of "critical raw materials" for the first time in February 2011. Raw materials are defined as "critical" if their occurrence is limited to a few countries, if they are difficult to substitute, if they have a low recycling quota and if they are of high economic relevance. Further information as well as links to the complete list for 2014 can be found here: http://europa.eu/rapid/press-release_IP-14-599_en.htm
6 See Küblböck 2013 for details.

future.[7]

Technological innovations within the electronics industry have reduced the amount of tantalum-powder necessary for capacitor production, and substitutes using other metals have also been developed. It is estimated that in certain sectors the demand for tantalum will increase, particularly in the area of 'superalloys' which due to their composition are extremely heat-resistant and thus particularly useful for applications such as gas turbines and space technology.[8]

1.2 Tantalum deposits

Tantalum extraction has undergone many changes in the last 15 years. Until 2008 the main tantalum-mining countries were Australia, Brazil, Canada, Ethiopia and Mozambique. Due to the world economic crisis and the resulting fall in prices, mining activities were discontinued in Australia[9], Canada, Mozambique and Ethiopia. In 2014 the main producing countries were Rwanda, the Democratic Republic of Congo (DRC), Ethiopia, Brazil and Nigeria. These numbers, however, are to be treated with caution, as tantalum is for example often smuggled from the DRC over the border to Rwanda, where it is then officially exported (Küblböck/Pinter 2016). Bolivia is ranked 9th place of tantalum-producing countries worldwide; from 2010 to 2013, extraction in Bolivia increased by volume from one to fourteen tons per year (World Mining Data 2015). These figures, however, have limited reliability (see section 1.5).

Global tantalum reserves

It is estimated that 40 % of all tantalum reserves are to be found in South America, first and foremost in Brazil. 20 % of reserves are located in Australia, and remaining deposits are to be found in Asia (particularly in China) and in Africa. Table 1 shows the production of tantalum in different countries in 2014 and each country's share of world production in that year. The geographical distribution of global tantalum production is shown in Table 2.

7 It is estimated that tantalum reserves will last for another 130 years, longer than for many other mineral resources (Usanov et al 2013: 20).
8 Minor Metals Trade Association - http://www.mmta.co.uk/tantalum-market-overview
9 Until the mid-2000s, 60 % of tantalum worldwide came from the Australian mining company SOG (Sons of Gwalia), which had long-term contracts with the two most important tantalum processing firms, H.C. Starck and Cabot Corporation. The SOG group was forced to declare bankruptcy in the mid-2000s due to declining commodity prices, failed speculations, and other factors.

Table 1: Top tantalum-producers in 2014

Rank 2014	Country	Production in 2014 (tons)	Percentage (%)
1	Ruanda	530	35,2
2	Congo D.R.	399	26,5
3	Brazil	190	12,6
4	Ethiopia	90	6,0
5	Nigeria	75	5,0
6	China	60	4,0
7	Mozambique	50	3,3
8	Russia	40	2,7
9	Burundi	37	2,5
10	Malaysia	26	1,7
11	Bolivia	7	0,5
	Total	**1504**	**100**

Source: World Mining Data 2016

Table 2: Geographical distribution of tantalum production (Ta2O2 content) in tons, 2010-2014

Country	2010	2011	2012	2013	2014
Australia	0	7	0	0	0
Bolivia	1	5	13	14	7
Brazil	176	136	118	185	190
Burundi	24	56	80	1	37
Canada	0	0	0	40	40
Congo D.R.	98	134	205	244	399
Ethiopia	109	116	118	29	90
Malaysia	8	11	26	19	26
Mozambique	40	38	24	20	50
Nigeria	70	78	78	78	75
Russia	31	27	31	32	40
Ruanda	172	205	263	567	530
Total	**729**	**813**	**956**	**1229**	**1504**

Source: World Mining Data 2016

1.3 Volatility of prices

In contrast to other metals such as copper, lead or aluminium, tantalum is not traded as a raw material on the London Metal Exchange (LME), but is most often traded via long-term contracts between mining companies and processing operations (Schwela, 2010). The conditions of these contracts as well as pricing agreements are in most cases confidential.

Price spikes in world markets

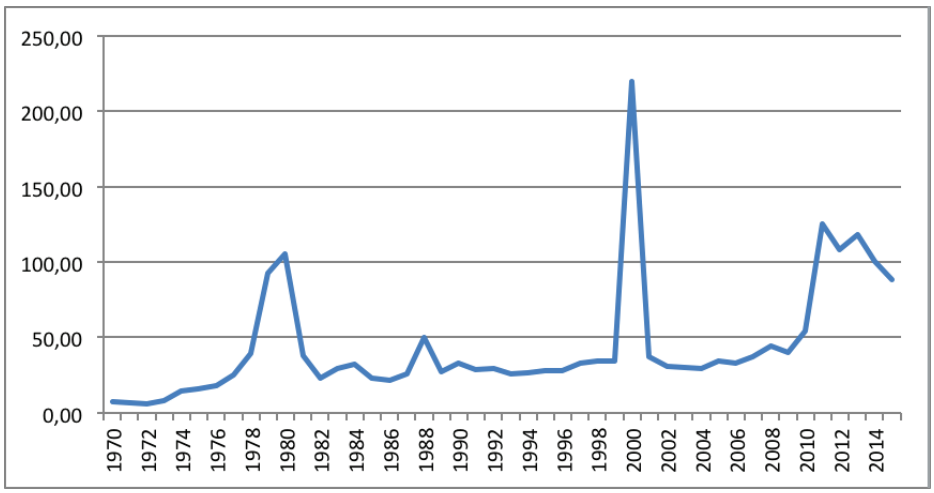
Tantalum's global market price is derived from the valuation of existing tantalum stocks in the USA (Hayes/Burge 2003; Polyakov/ Polyakova 2003). The

price of tantalum has undergone several phases of dramatic fluctuation in the past years.

The first price spike was recorded in 1979/1980, and can be attributed to an increased demand for electronic products (Bräuninger/Leschus/Rossen 2013; Hayes/Burge 2003). This sharp rise in prices drove producers to substitute tantalum with other commodities (for example with aluminium) and/or to increase recycling efforts, thus lowering demand. Another spike took place in the year 2000 when the market price of tantalum suddenly increased tenfold.[10] This sudden development can be attributed to rapid expansion within the electronics sector, which lead to fears of potential supply shortages and "panic buying" (Hayes/Burge 2003:11); when these fears were shown to be baseless, tantalum stockpiles were again sold and the price of tantalum sank to its original level. Then as of 2005 the market value of tantalum again fell due to the availability of cheap tantalum from Central Africa among other factors. As a result of this low market value, approximately 40 % of global tantalum production was put on hold in the years 2008 and 2009. This affected mines in Australia, Canada and Mozambique, among others (USGS 2012).

As of 2010 prices began to rise again, and in the beginning of 2011 the tantalum market value had tripled since the previous year. This prompted a number of companies to resume production. By the end of 2011 prices had once again dropped, and a portion of production was once again discontinued. Fighting once again broke out in the DRC in 2012, resulting in a renewed price increase (USGS 2012), followed by another price drop in 2014.[11] Overall, the official quantity of extracted tantalum has declined since 2008/2009. It is therefore likely that a significant proportion of production stems from undocumented sources and/or the reduction of stockpiles (USGS 2015a).

Figure 1: Price development of tantalum, 1970-2015



Source: USGS 2010, 2013, 2015[12]

10 However, this price increase only applied to a small portion of transactions, as most companies secure their supply through direct and long-term contracts (Jeangrand 2005), as mentioned above.
11 Three companies have halted tantalum production since 2008/2009: Morropino (Mozambique), Tanco (Canada) and Wodgina (Australia). Additionally, the Kenticha Mine in Ethiopia has temporarily stopped production, but is currently preparing to reopen (USGS 2015).
12 USGS: https://datamarket.com/de/data/set/17cw/tantalum-statistics#!ds=17cw!j3b=3&display=line

1.4 The value chain and major companies

Tantalum can be derived from primary as well as secondary material (residues), as a by-product of tin mining, and through extraction from tin slag. It can also be recovered through scrap metal recycling. According to the Tantalum-Niobium International Study Center, the amount of primary material has decreased from 60 to 40 % between 2008 and 2012, while the amount of recycled material rose from 20 to 30 % (see Table 3).

Table 3: Global tantalum supply, 2008 and 2012

Source	Percentage 2008	Percentage 2012
Primary material	60 %	40 %
Secondary material	10 %	10 %
Tin slag	10 %	20 %
Recycling of waste metal, synthetic concentrate	20 %	30 %

Source: http://tanb.org/tantalum

The value chain

The tantalum value chain can be divided into the following steps:

- Extraction
- Processing (Concentration into oxides or metals)
- Production (e.g. alloys, capacitors,...)
- Assembling/manufacturing
- Recycling

The tantalum value chain lacks transparency. The number of extraction sites is limited, and the number of production facilities increases with the stage of processing. After the raw material is mined, the ore is concentrated through mechanical processes (for example in centrifuges) and is then brought – either directly or via traders – to smelters and refineries, where it is further processed into metals, oxides or tantalum powder (Soto-Viruet et al. 2013). These materials are then used in the production of components and advanced materials such as capacitors and high performance powders.

Market concentration and integration

The tantalum processing industry displays a high and continually increasing degree of concentration. In recent years there has been a number of corporate mergers and acquisitions in this sector with a trend towards vertical integration, i.e. the integration of various processing stages within a single company[13]. In 2012, the two companies Cabot und H.C. Starck jointly controlled 80-90% of the world's supply of tantalum powders, which are used mainly in the electronics industry (EC 2012). The current market leader in the production and processing of tantalum is Global Advanced Metals (GAM), an Australian mining company

13 A significant percentage of corporate mergers taking place between 1990 and 2014 were connected to tantalum processing, especially in the capacitor-producing sector but also in electronic component production. (http://www.ttiinc.com/object/me-zogbi-20140731.html)

that bought Cabot Corporation's subdivision Cabot Supermetals (CS) in the year 2011. Due to this acquisition GAM is today a vertically integrated corporation, from the mine to the production of materials that are necessary for building end products[14]. Tantalum-processing companies in China and Russia have also merged with mines.[15]

Tantalum powders are sold to capacitor manufacturers. An increase in corporate concentration is evident in this area as well. The most important capacitor producers are the US-American companies AVS, KEMET and Vishay;[16] in recent years these three firms have bought a number of other companies within the sector.[17] At the same time the significance of Chinese companies has increased, both on the level of smelting as well as in capacitor production (Soto, Viruet et al 2013).[18]

The capacitors are fitted onto printed circuit boards or used in other electronic components and are then sold to manufacturers of electronic devices such as Apple, Alcatel, Hewlett Packard, IBM, and so on.

Austrian companies

As mentioned above, tantalum is not used solely for the production of capacitors, but for a wide range of other products, particularly those with high material requirements for hardness or heat resistance. Austrian companies are counted among the leading producers within this market segment, particularly Plansee SE and Treibacher Industrie AG, both of which produce high performance materials for various industries.

1.5 The limited informative value of trade statistics

Tantalum is traded in various forms and at different stages of processing (as ore, concentrate, slag, metal, etc.). Official trade statistics only provide limited information about tantalum exports and imports. One important reason for this is the existence of confidentiality clauses;[19] these clauses have been put in place in order to prevent specific companies from being linked to specific imports. Furthermore, small-scale artisanal mining in particular is characterized by informal trade routes.

14 More information: http://www.ttiinc.com/object/me-zogbi-20110907.html
15 Mine Nanping/ Prozessor Ningxia Orient, Lovozero Mine in Russland/Prozessor Solikamsk.
16 More information: http://ttieurope.com/object/articleID-162.html
17 In 2012, KEMET purchased the tantalum powder producer Niotan as well as the largest Asian capacitors manufacturer NEC Tokin. In the same year, AVX purchased capacitor production from Nichicon (formerly Panasonic). Vishay purchased HolySone Polytech Company (former capacitor manufacturer Hitachi AIG) in 2014. (http://www.ttiinc.com/object/me-zogbi-20140731.html)
18 See here for information concerning Chinese tantalum trade in the period 2013-2017: http://www.report-linker.com/p01557296/In-depth-Research-on-China-Tantalum-Market-2013-2017.html#utm_source=prnews-wire&utm_medium=pr&utm_campaign=Metal_Mining
19 In 2008, confidentiality clauses concerning the country of origin applied to 11 % of imports from outside the EU to Austria.

Non-transparent trade

Because of the many different steps of processing along the production chain, including trade through intermediaries and the aforementioned confidentiality clauses, it is very difficult to retrace the original source of tantalum as a raw material. For instance, according to European Union external trade statistics, Austria imported tantalum from four countries in the period 2009 – 2011; 71 % came from Germany, and the rest was imported from Japan, the USA and the United Kingdom. However, according to UN-Comtrade statistics Brazil also exported tantalum to Austria in 2008 and 2009, and was according to this source Austria's fourth most important partner in tantalum trade. In 2011, 50% of tantalum imports into Austria's primary trade partner Germany came from the USA, while the rest of its imports came from countries such as the United Kingdom, Austria, Kazakhstan and China. Apart from China, none of these countries mine tantalum.

Chapter 2
Tantalum mining in Bolivia

2 Tantalum mining in Bolivia

Bolivia - a brief portrait

With a surface area of roughly one million square kilometers, Bolivia is about thirteen times as large as Austria and almost three times the size of Germany. It has 10.6 million inhabitants and is one of two landlocked countries in South America. Bolivia can be divided into three physiographic regions: The Andean region (highlands) in the southwest, the Sub-Andean region in the center and south of the country and finally the Llanos region (howlands) in the northeast. The country is in many respects a multifaceted place, home to a diversity of ethnicities and highly self-organized indigenous peoples as well as a multitude of natural resources, flora and fauna. The Bolivian constitution recognizes thirty-seven official languages which are an indicator of the existing diversity of indigenous peoples[20]. Bolivia has been designated as one of sixteen "mega-diverse" countries worldwide, which together constitute the habitat of about 70 % of global biodiversity.[21] This diversity is unfortunately threatened by deforestation, logging activities, soil and water pollution and other environmental damage.

2.1 2.1 The socio-economic context

A history of extraction

Bolivia's economic history is characterized by resource-based, outward-oriented development dependent on foreign investment. In different historical periods the country has been exploited for export of various commodities. From the 16th to the 19th century silver exports helped drive European industrialization; in the 19th and 20th centuries the Bolivian national economy was built primarily on the mining and export of silver, tin and saltpeter, as well as rubber exports as of beginning of the 20th century (Galeano 2004). Today natural gas is Bolivia's most important export product; its sales amounted to 43 % of the country's export earnings in 2015 despite the decline in world market price. In the same year mineral raw materials amounted to almost 20 % of the country's total exports.[22]

Between nationalization and liberalization

The mining sector in Bolivia was marked by two major upheavals in the 20th century. In the course of the Bolivian revolution in 1952, the mining sector was nationalized and the state mining company COMIBOL[23] was founded. The counter-revolution was not long in coming; already as of the year 1955 a wave of liberalization was taking place. During the neo-liberal phase in the 1980s and 1990s privatizations were intensified and COMIBOL was (after the abatement of public protests) almost completely dismantled. This led to a weakening of the Bolivian Trade Union Federation („Central Obrera Boliviana"), which until that time had been dominated by mine workers. In total more than 20,000 miners were dismissed; many of them joined mining cooperatives („cooperativas

20 The indigenous peoples of Bolivia include the Quechua, Aymara, Chiquitano, Guaraní, Mojeño, Yuqui, Ayoreo, Tsimane, Leco and Uru, among others.
21 More than 1,400 bird species, 250 amphibians and 300 reptile species have been identified in Bolivia's various ecosystems, as well as approximately 20,000 vascular plants and more than 850 different varieties of orchid.
22 Instituto Nacional de Estadística de Bolivia: http://www.ine.gob.bo/pdf/Resumenes/RES_2016_48.pdf
23 COMIBOL: Corporación Minera de Bolivia.

mineras“), a heterogeneous a legal construction of small businesses often characterized by strong internal hierarchies and often environmentally devastating mining practices.

At the same time foreign investment increased significantly under the Bolivian president Gonzalo Sánchez de Lozada (1993-1997). In 1997 a new mining law[24] was adopted which favored private and transnational corporations. This legislation implemented a World Bank strategy (associated with loans from the bank) towards a neo-liberal transformation of the Bolivian mining sector (Gandarillas/Tahbub/Rodríguez 2008; Almaráz 2010; World Bank 1996; 1997; 1989).

Morales' government

The massive political upheavals from 2006 onward again led to significant changes in the regulation of the resource sector. Massive social protest, beginning in the late 1990s and intensifying after the year 2000, led to changes in the balance of power which in the end enabled the current president Evo Morales and his party („Movimiento al Socialismo“, or MAS) to take political power. Mobilization for change was driven primarily by indigenous groups and peasants organizations,[25] and the nationalization of strategic resource sectors as well as the democratic introduction of a plurinational state model were among the central demands of these protests.

In 2006 the MAS government began to nationalize the crude oil and natural gas sector. Nationalization also took place in the mining sector, though not to the same extent.

The plurinational state model

In 2009´s national referendum, the Bolivian population approved a new constitution[26] elaborated by a Constitutional Assembly (“Asamblea Constituyente”) composed of 255 directly elected members, which envisioned the transformation of Bolivia into a plurinational state. It was intended to strengthen the diverse and above all indigenous lifeways found in Bolivia and the particular political, economic and judicial framework surrounding them, thus forming the state anew. For example, the new constitution recognizes four different forms of economy: private economy, state economy, social-cooperative economy, and indigenous-communitarian economy (§ 306, II). It emphasizes the political goal of resource sovereignty, acknowledges indigenous rights, and demands that mining activities be accompanied by socio-economic benefits to surrounding communities and the state (§ 307, III).

The importance of the mineral resource sector for the Bolivian state and the most recent nationalization of the extractive sector are also reflected in Bolivia's state budget,[27] which has more than quadrupled between 2001 and 2011 from approximately 4 billion to 16.9 billion US dollars.[28]

24 Bill Nr. 1777 from March 17th 1997, published as the „Code of Mining“ (Código de Minería).
25 In the 2001 census, 62.2% of the Bolivian population identified themselves as part of an indigenous people. However, in the most recent census of 2012, 69% of the population replied 'no' when asked if they belong to an indigenous nation or people.
26 The Political Constitution of the plurinational state of Bolivia (Constitución Política del Estado Plurinacional de Bolivia) was announced in February 2009 by the President Evo Morales.
27 The following data were provided by the Bolivian Ministry of Economic Affairs and further developed for this analysis.
28 According to the Bolivian Ministry of Economics the state budget amounted to 27,598 million Bolivianos

Nationalization of the oil and natural gas sector

An important factor in this development was the nationalization of the natural gas and oil sector. The state did not claim complete control over the industry, but state involvement in production processes did increase along with the state's share of profits.[29] Export prices were also renegotiated and raised: for instance gas prices with Brazil increased from 1.7 USD/MMBTU[30] (1999-2005) to 5.5 USD (2008), and from 2.1 to 7.9 USD with Argentina. According to the Bolivian Ministry of Economics, production per day increased from 8.92 million m³ in the year 2000 to 37.93 million m³ by 2007, and to 56 million m³ by 2013. The Ministry for Energy projected a daily production of 103 million m³ by the year 2025 (Ministerio de Hidrocarburos y Energía 2009; Estado Plurinacional de Bolivia 2013).

In the meanwhile however there was a significant market slump. In 2014/2015 the value of Bolivia's natural gas exports was reduced by a third, which can be directly linked to falling export prices. Average Bolivian natural gas export prices to Brazil and Argentina, for example, went from 9.9824 USD per 1,000 m³ in 2012 to 12.7095 USD in 2013, and dropped again to 8.9820 USD in 2014 and 6.3575 USD in 2015.[31]

Within the mining sector, comprehensive nationalization has only taken place in three geographic areas: in Huanuni, in Colquiri and at the Vinto site, where primarily tin is mined and smelted. In addition, a number of joint venture agreements (otherwise known as "contracts of association") have been signed.

Partial nationalization of the mining sector

Correspondingly, 17.5% of total state income came from publicly-owned companies in 2005, compared to 48.4% in 2011,[32] while 35% of expenditures went to publicly-owned companies in the same year: 89.9% to the crude oil and natural gas sector, followed by the mining sector with 6.2% (2011)[33] (Radhuber 2013). The majority of mined resources are exported as primary commodities; in the mining sector, export value increased from 412 million between 1999 and 2005 to nearly 2.3 billion USD (2006-2012; CEDIB 2013:26; Andreucci/Radhuber 2015). This is situated within a general tendency towards re-primarization[34] lwithin Latin American economies; in 2008 the percentage of unprocessed resources for total exports was 55.4% in Brazil, 92.8% in Venezuela, 92,8% in Bolivia, 91.7% in Ecuador, 88% in Chile, 86,6% in Peru, and 68.5% in Columbia (Gudynas 2011, figures based on CEPAL Data).

The lesser degree of nationalization in the mining sector (in comparison with crude oil or natural gas) can be attributed to unique power relations within that sector, as can the relative increase in transnational control. Such tendencies are

(BOB) in the year 2001 and to 119,471.3 million BOB in the year 2011. These numbers were converted by the authors to US dollars using the average yearly exchange rates provided by the Bolivian Central Bank.
29 Law Nr. 3058 (2005) raised state shares in natural gas earnings from 18 to 50 %, although critics have argued that the state's share was already above 18 % before the enactment of this law. In 2006, presidential decree Nr. 28701 raised the shares held by the state to 82 % for the largest mining sites.
30 Million British Thermal Unit.
31 Banco Central de Bolivia, www.bcb.gob.bo
32 This applies to operating costs; the tendency is however also reflected in investments. See Radhuber 2013.
33 In comparison, the mining sector in 2006 accounted for only 2.5%.
34 The term 're-primarization' refers to the reorientation of the economy towards the extraction and export of raw materials (primary resources) in combination with a resource-based strategy for growth.

Contradictions in Bolivia's resource extraction policies

also reflected in Bolivia's mining code, enacted in 2014.[35]

While the Bolivian constitution of 2009 establishes indigenous rights to autonomous territorial administration, a healthy environment and the unhindered practice of their own lifeways, the mining code only partially recognizes these rights. It stipulates a stronger presence of the state, as well as the goal of reorienting Bolivia's economy away from primary goods export; at the same time it seeks to establish favorable conditions for foreign investments through legal certainty and a "competitive" taxing regime. Mining cooperatives are also warranted many benefits. This trend, begun in the 1980s and 90s, has been perpetuated by President Morales' government.

State revenue from the mining sector

In total, state revenue from the mining sector accounted for 32 million US dollars in the year 2005; this figure rose to 290 million by 2010. But despite this drastic increase in absolute numbers, the tax and contribution ratio remained low; from 2006 to 2011, taxes and licensing duties accounted on average for only 8 % of total export value (CEDIB 2013). One exception to this trend was the introduction of an additional tax of 12.5 percent on company profits (Law Nr. 3787 from 2007; Andreucci/Radhuber 2015). Because of sinking raw materials prices, the Bolivian government is currently planning new exploration and extraction projects (primarily tantalum, gold, silver, tin, tungsten and copper) under the official Motto "New Mining in Bolivia".[36]

Lack of participation for indigenous peoples

Contrary to provisions of the national constitution, indigenous peoples are once again increasingly excluded from political processes. This also applies to the regulation and organization of mining activities. Indigenous organizations were excluded from the development of the 2014 mining code, resulting in the fact that affected indigenous communities' concerns were neither heard nor integrated. The code determines that mining activities are in the "national interest", and are therefore of higher priority than other forms of land use, such as agriculture. Possibilities for participation by indigenous peoples were limited to non-binding consultations („consulta previa") and affected communities were granted minimal shares of the profit made through mining activities on their land. The code does not recognize local peoples as actors in the mining sector, despite the existence of a proposal for an indigenous-communal organization of that sector. Indigenous peoples have little opportunity to contribute to the design of mining policies, in contrast to the vision put forth in the 2009 constitution.

Divisions within indigenous organizations

Since 2009 indigenous organizations have weakened. The umbrella organizations of the highlands (CONAMAQ[37]) and lowlands (CIDOB[38]) were both split in part as the result of interference by state actors who financially supported internal groups that were sympathetic to government interests. The original organizations had opposed the government's exploration and extraction plans through their adherence to the idea of self-government and territorial

35 Law Nr. 535 on mining and metallurgy ("Ley de Minería y Metalurgia"), enacted on May 19th 2014.
36 Diario La Razón: http://www.la-razon.com/economia/record-mineria-inversion_publica_0_2418358220.html
37 CONAMAQ: Consejo Nacional de Ayllus y Marcas del Qullasuyu – National Council of Qullasuyu Ayllus and Markos.
38 CIDOB: Confederación de Pueblos Indígenas de Bolivia – Confederation of Indigenous People of Bolivia.

autonomy (as part of the overall state system).

The balance of power in the extractive sector is in many cases not in favor of indigenous groups. The majority of mining workers are members of cooperatives (see next section). Even though many indigenous miners are cooperative members themselves, the cooperatives tend to have little interest in the social and ecological consequences of their activities on surrounding indigenous communities, nor in the participation of these communities in mining activities.

The role of mining cooperatives in Bolivia

Generally speaking, a cooperative is an association of general benefit that is voluntarily formed by legal or natural persons. Cooperatives in practice rather correspond to small business units than to what a cooperative should be in theory (having an autonomous and democratic structure[39], and being dependent on solidarity and collaboration in order to cover its productive and service needs). The first mining cooperatives were founded after the initiation of the 1958 "General Law for Cooperative Entities".[40] From 1952 until 1985 the state mining company COMIBOL organized and administrated all state-owned mines, despite the fact that a statutory provision[41] required a transfer of administrative duties to the cooperatives as of 1958 (Michard/CEDIB 2008:12).

The tin crisis of 1985, combined with the previously discussed neoliberal turn in state economic politics, lead to the closure of many of COMIBOL's mines and the dismissal of tens of thousands of workers. 35,198 people lost their jobs in medium and small scale mines alone (Maturana in SPDA 2014: 27-73). After trying and failing to find work in cities, many of these workers then returned to the mines. They formed cooperatives and continued to work on a self-organized basis, thus securing an income for themselves and their families (Michard/CEDIB 2008:12).

In order to obtain the right to continue excavations in the closed mines, the newly formed cooperatives had to sign leasing agreements with COMIBOL. Although there is variation between cooperatives, generally the level of mechanization is lower than that of private enterprises. Often the members of a cooperative (ranging from 25 to 5,000 people) work in the mines themselves. However, cooperatives also employ workers (both men and women) who are not members. Mining activities are also frequently carried out by "voluntary" workers whose compensation consists of the right to mine minerals for their own use at certain fixed locations and times. Members of cooperatives have in the meantime become a powerful factor in regional and central state politics. Since they are treated as non-profit businesses, they pay no corporate tax and only low licensing fees.

In order to operate legally, these cooperatives are required to register in the Federation of Mining Cooperatives („Federación de Cooperativas Mineras"). There are currently between 1,000 and 4,000 mining cooperatives in operation in Bolivia, but only around 500 of these are officially registered (Silva/Tejada/Robles in SPDA 2014: 27-30). This means that the majority of Bolivian mining cooperatives operate on an illegal basis without the necessary environmental or extraction licenses. Many do not obtain these licenses due to both the enormous expense and the time required to navigate the complicated bureaucratic process of application. The lack of controls as well as effective law enforcement measures result in the fact that many mining cooperatives are responsible for serious environmental damage and human rights abuses.

39 Law Nr. 356 § 4 (Ley General de Cooperativas) from April 11th 2013.
40 Law Nr. 5035 (Ley General de Sociedades Cooperativas) from September 13th 1958. The bill was replaced by a new "General Law for Cooperatives" in 2013 (see above).
41 Law Nr. 5035, Article 34.

2.2 Illegal mining in Bolivia

Legal and formal mining

Some Latin American countries such as Colombia and Peru differentiate between legal and illegal, formal and informal mining. Mining activities are considered legal and formal if all legal requirements necessary for such activities have been fulfilled: concessional rights as well as a social license must be secured; permission for land and water usage must be obtained; the project must have undergone an environmental impact assessment (EIA); and, finally, a permit allowing for the commencement of mining activities must have been issued.

Illegal versus informal mining

Mining is considered illegal if it takes place in a nature reserve or other ecologically sensitive area from which such activities have been banned; if its activities involve the uncontrolled deployment of toxic substances such as mercury or cyanide; or if its operations involve child labor, forced labor, or human trafficking. Illegal mining often involves the usage of heavy machinery. In contrast, mining is considered 'informal' if the necessary concessional rights, licenses and/or permissions have not been obtained, but otherwise no legality issues such as those described above exist. These mining operations can be formalized through acquisition of the necessary authorizations; illegal mining, in contrast, can never become legal.

The legal situation in Bolivia

The Bolivian legal system differentiates only between legal and illegal mining. According to the penal code, illegal mining activities are punishable in cases where „mineral resources are extracted without previously obtained license or authorization within the framework of the existing rule of law". The degree of penalty ranges from four to eight years imprisonment; the trade of illegally mined metals and minerals can also result in sentencing.[42] In short, the lack of official permits such as concessional rights or ecological licenses is enough to qualify mining activities as illegal, regardless of the involvement of child labor, or the location of the mine in a designated mining area versus a nature preserve. According to the Bolivian code of law, all informal mining activities are by definition also illegal.

Illegal small-scale mining

Artisanal miners usually dig for minerals or metals in small (family) groups without any administrative permits or licenses. For example, such a group may pick through mining waste heaps in search of valuable ore, or they may comb the edges of (often polluted) rivers in mining areas, where valuable minerals, most often gold, collect in small amounts. These activities are considered informal and hence also illegal according to the judicial criteria described above.

Small-scale mining in the Amazon basin

In the past decades illegal mining has reached the Bolivian lowlands in the Amazon basin. The layoff of tens of thousands of people due to the neoliberal reforms described above lead to a wave of migrants from the highlands. Some found work in agricultural production, but other former miners began to dig for valuable ore without permits or licenses, and continue to do so to this day. These activities are beneath the scope of any form of state surveillance, and thus there are no reliable statistics available as to the extent of illegal mining in the region.

42 Nr. 367 from May 1st 2013, extension of the Bolivian Penal Code.

2.3 Tantalum from Eastern Bolivia[43]

Tantalum, a metal with high export potential, has been mined in Eastern Bolivia since the 1980s.

Deposits of tantalum-containing ore in Eastern Bolivia

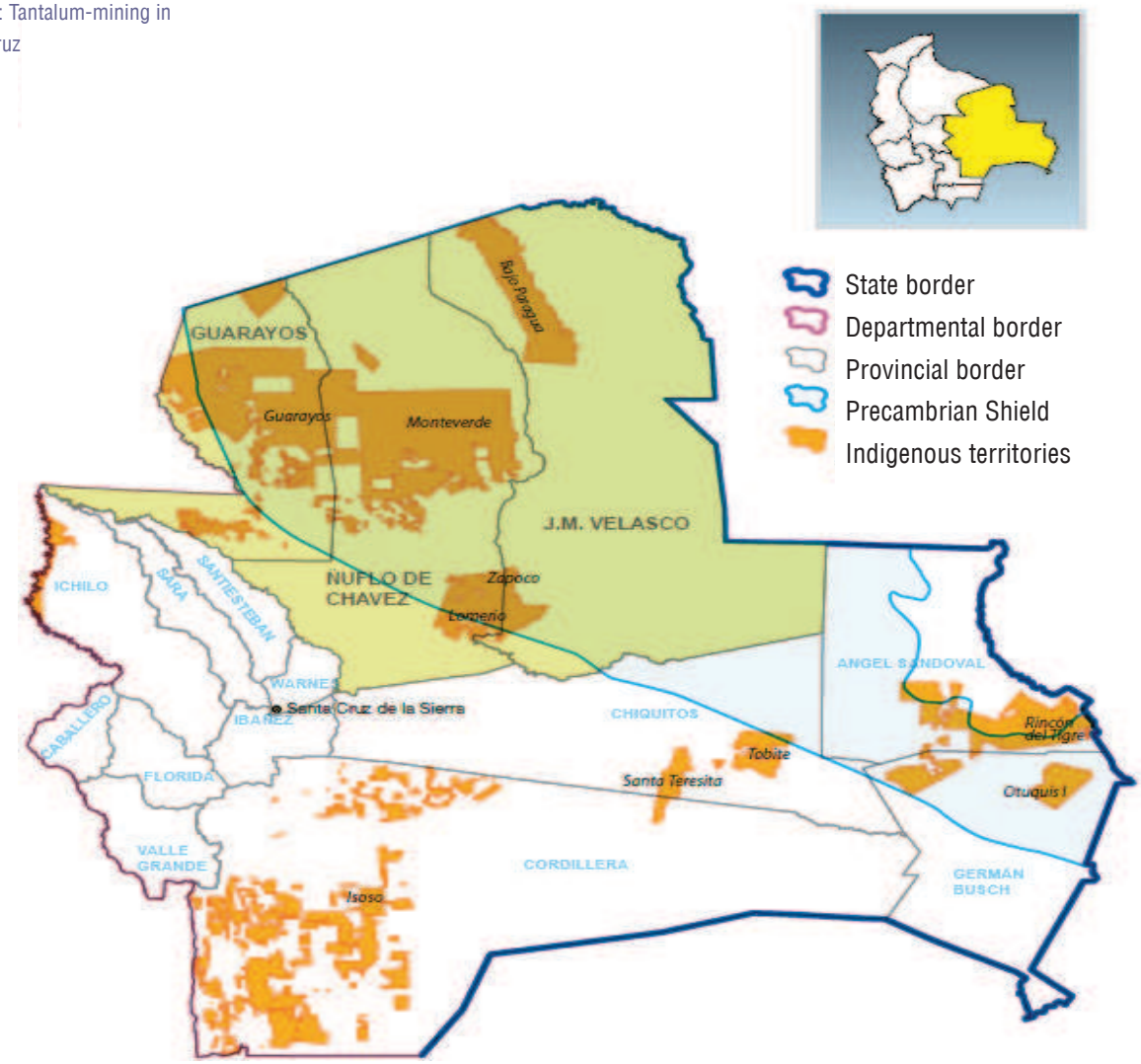
Approximately 18 % of Bolivian state territory - the east of the country - is geologically situated on what's known as the Brazilian Precambrian Shield. This region, located in the Amazon basin and spread across the departments[44] of Beni, Pando and Santa Cruz, is rich in mineral resources. Approximately one hundred geological surveys in search of deposits of marketable minerals have already been carried out in the region. Unlike gold, tantalum cannot be found in its pure form in nature, but only in combination with other minerals. Because of certain chemical similarities tantalum ore always contains niobium and vice versa. Other strategically significant minerals[45] such as gold, thorium, uranium, tin and tungsten can also be found in this region, and in most cases tantalum is mined in conjunction with these other minerals.

Tantalum in indigenous territories in Santa Cruz

Of the three departments named above, Santa Cruz is the most significant for tantalum mining. Most tantalum is obtained in the Santa Cruz provinces of José Miguel de Velasco, Guarayos, Chiquitos and Ñuflo de Chávez (see Figure 2); these provinces also contain environmentally sensitive areas such as dry forests and other ecologically transitional regions („ecoregión de transición"). The ancestral territories of the indigenous Guarayo and the Chiquitano in Santa Cruz[46] are especially attractive to international mining corporations. These companies have found in Bolivia an alternative source of tantalum in light of US conflict mineral regulations complicating imports from the Democratic Republic of Congo and neighboring countries (see part 3.1). The ore found in Bolivia has relatively high contents of tantalum in comparison to other regions (approx. 60 % tantalum).

43 The following section is based on research conducted by CEDIB (Centro de Documentación e Información Bolivia).
44 The state of Bolivia is divided into nine 'departamentos' or departments, and each department is subdivided into provinces.
45 According to §8 of Nr 535, certain minerals and their extraction are of strategic significance for the development of the country and the Bolivian people. Milestone 7 of the "Patriotic Agenda" (Agenda Patriótica 2025) lists natural gas, lithium, certain minerals and rare earth metals as strategic natural resources. Niobium, tantalum, platinum, silver etc. are considered strategic minerals.
46 Approximately ten different indigenous peoples live in Santa Cruz (including the Ayoreo, Chiquitano, Guaraní, Yuracaré, Mojeño, Guarayo, Siriono, Yuqui, Isoceño and Guarasugwe). Most of these peoples are organized in indigenous communities, representing about 22 % of the total indigenous population of circa 8.3 million in Bolivia.

Figure 2: Tantalum-mining in Santa Cruz



Source: CEDIB

The search for tantalum deposits

Mining companies and small-scale miners (known as „Garimpeiros“) penetrate indigenous territories where tantalum deposits are suspected to exist. Gravel roads have been put in place for large agricultural enterprises, making the region more accessible to such mining operations. The indigenous communities' knowledge of the whereabouts of mineral deposits is often “bought” with promises of road improvements, the construction of bridges and dams, and so on. In the exploratory phase, forest areas are cleared in order to allow for test drilling. Members of indigenous communities are often employed as unskilled labor, for example for clear-cutting or for preparing the roads for the mining company's vehicles and machinery; jobs like these are rarely formalized through labor contracts.

Photo 1: Forest clearance for tantalum mining in Guarayo (Urubichá) territory

Photo: CEDIB, 2014

Actors

Tantalum mining activities in Santa Cruz are in most cases informal and illegal (see section 2.2). Both independent small-scale miners as well as large mining companies are active in the region; the large companies, often gold mining firms, have the advantage of access to specialized equipment, for instance spectrometers for sample analysis. Tantalum is mined either in opencast pits or in abandoned gold mines, where previous mining activities have left behind high concentrations of mercury and other heavy metals.

Photo 2: Mining for tantalum in an abandoned gold mine in the province of Guarayos

Photo: CEDIB, 2014

Cooperation of mining companies and small-scale minersn

Some formal gold-mining enterprises mine for tantalum although they only hold official licenses for gold extraction. These unlicensed activities often take place also outside the area of their concession, and frequently use groups of small-scale miners for excavation and separation of the minerals. While the

mining companies' foremen and supervisors are often Brazilians, the small-scale miners are usually from poorer regions in the Andean highlands or from nearby indigenous communities. These artisanal miners often work day and night as family groups, including children; they can produce roughly 1.5 to 2 kilograms of tantalum in a day of hard labor.

According to statements by mine operators, an abandoned gold mine can still produce approximately four tons of tantalum through artisanal efforts. This material is then sold to the owner of the mine at a price dictated by that owner. In short, illegally active „Garimpeiros“ are entirely at the mercy of mine owners. Formalization of their activities is nearly impossible due to the bureaucratic obstacles involved, and is also of low priority as tantalum mining is seen as a way to earn money quickly.

Photo 3: Raw tantalum from the province of Guarayos

Photo: CEDIB, 2014

Despite the national constitution, which declares mineral raw materials of strategic significance to development to be the property of the Bolivian people to be administered by the state, there is no monitoring of tantalum mining activities in Eastern Bolivia.[47] The authorities responsible for such surveillance are simply not present in the region, and are thus unable to carry out inspections, environmental impact assessments, or any other form of monitoring.

47 §§ 348 (I, II), 349, 369 (IV) of the Bolivian constitution.

2.4 Tantalum exports and profits

Official statistics indicate that between the late 1980s and 2012 Bolivia exported approximately 474 tons of tantalum.[48] However, these statistics only reflect legal trade, and the underreporting of illegal tantalum trade has always been significant. Tantalum didn't even appear on the official list of Bolivian export products in 2014 and 2015. Although one might assume that this was due to the international crash in tantalum market value, it is far more likely that tantalum is simply being exported illegally.

Tantalum is normally transported via ports in neighboring countries (Peru, Chile, Brazil and Argentina) to Asia, Europe and North America.

Legal tantalum exports

According to research by CEDIB, most legal tantalum exports used to pass through Chile; from there Bolivian tantalum was exported to the USA, Germany, South Korea, India, the United Kingdom, the Netherlands, Thailand, Brazil and China. Austria does not appear in the official statistics from the Bolivian National Statistics Institute (INE), which means that there were no official exports of tantalum from Bolivia to Austria at that time.[49]

Illegal export through intermediaries

The city of Santa Cruz acts as a collecting and processing center where illegal tantalum is concentrated: the raw ore is crushed and ground, and tantalum is separated from the surrounding minerals.[50]

Regardless of whether the original ore was extracted through their own gold concessions or was purchased from "garimpeiros", mining companies cannot take the product directly to the international market; instead the concentrated material is sold to middlemen, or "brokers", who then sell the product (legally or illegally) to international companies abroad, where the material is further processed. According to research conducted by CEDIB, mining companies can also chose to circumvent intermediaries and deliver the illegally extracted tantalum directly to Brazilian companies such as Companhia Industrial Fluminense or Sojen.

When prices are high, mining companies pull in approximately 35,000 US dollars for one ton of tantalum; middlemen earn nearly double that amount through re-sale (approx. 65,000 USD). The number of intermediaries in Bolivia has risen in recent decades; one such broker can arrange within a week the (illegal) export of an amount of tantalum that would take over 6 months to export via formal means.

Brokers usually transport the metal into Brazil and Peru illegally; there is for example a large informal market for mining products in southern Peru. At some point the illegally imported Bolivian tantalum is formalized.

It is then purchased and processed into valuable products by international

48 Data provided by CEDIB.
49 According to INE, total Bolivian exports of the minerals niobium, tantalum, vanadium, zirconium and their concentrates amount to about 100,000 tons per year. This group of metals carry the group designation number 2615900000 in INE statistics.
50 Minería Boliviana (24.1.2014): http://boliviaminera.blogspot.co.at/2014/01/aduana-nacional-decomisa-6500-kilos-de.html

corporations (see sections 1.1 and 1.4). However, beyond Bolivian borders it becomes increasingly difficult to trace tantalum as it makes its way to Europe.

2.5 Consequences for the environment, society and human rights

Environmental consequences

The exploitation of tantalum changes the natural landscape, destroys the environment, and leaves toxic residues (CEDIB, 2012:77,82).

In Santa Cruz tantalum mining is most associated with gold mining. Open pit mining activities generally result in serious environmental damage. The extraction of gold, tantalum and other metals releases heavy metals, and often necessitates the use of highly toxic chemicals such as cyanide. Large amounts of fuel are needed to drive the pumps, some of which also finds its way into the environment. All these factors result in the pollution of the soil, air and water. Forests are cut down or destroyed, land use is altered, and biodiversity is drastically reduced.

Photo 4: Forest destruction in the Guarayos province

Photo: CEDIB, 2014

The illegal mining of tantalum has even reached into the nature reserve "Ríos Blanco y Negro".[51] Here both legal and illegal gold miners extract minerals without official permission (Quintanilla 2015: 8), leading to severe pollution

51 Reserva de Vida Silvestre Ríos Blanco y Negro in the provinces Ñuflo de Chávez and Guarayos.

of the surrounding rivers. The environmental agency of the provincial government of Guarayos has made public reference to illegal mining in the area and the resulting environmental damage.[52]

Impact on indigenous peoples

The negative effects of tantalum mining in Santa Cruz have particular impact on the indigenous communities of Guarayo and Chiquitano. The illegal and informal activities of mining companies pollute the rivers, air and soil. They destroy the pristine forests that serve as indigenous hunting, fishing and gathering areas. In addition, both mine employees and artisanal miners hunt and fish for animals that are indispensable to the traditional indigenous diet; the same applies to plants and fruit. Illegal mining activities also affect the unity and inviolability of ancestral territories. The mine operators and artisanal miners utilize large areas of indigenous territory without having to pay a single cent. The affected communities thus lose control of their own territories (including property rights) and natural resources.

Forest destruction and the protection of "Mother Earth"

Every year the Bolivian catchment area of the Amazon loses large areas of forest due to the growth of industrial agriculture as well as diverse mining activities. Between 2005 and 2010 more than 912,000 hectares of forests were lost across the country. Deforestation in Santa Cruz is only getting worse; approximately 155,000 hectares of forest are cleared in this department each year, with indigenous territories worst affected (Fundación Amigos de la Naturaleza 2012).

However, the Bolivian Law of Mother Earth[53] stipulates that the state and its citizens are obligated to protect the environment, biodiversity and human health from damage. Both small-scale miners and mining cooperatives are required to meet this obligation with support of the appropriate authorities (§4, section 4). The law requires the use of appropriate and clean technologies in order to minimize negative impact on the environment and the population (§ 26, section 19).

The Bolivian environmental law[54] further stipulates that activities involving the exploitation of mineral resources should prioritize the comprehensive utilization of raw materials as well as the proper handling of residues and waste materials; erosion and pollution are to be monitored and minimized, during both the actual mining and the subsequent restoration of the degraded area (§ 70, 71). The release of waste or polluted water from gold and silver extraction into ground or surface water is strictly forbidden (§ 43, Amendment to Law 1333 on the pollution of water resources).

52 From "El Deber", a Santa Cruz newspaper (7.10.2014): http://www.eldeber.com.bo/santacruz/hay-actividad-minera-ilegal-guarayos.html
53 Law Nr. 300 (La Ley Marco de la Madre Tierra y Desarrollo Integral para Vivir Bien) from October 15th 2012.
54 Law Nr. 1333 (Ley del Medio Ambiente) from April 27th 1992.

Illegal mining activities also take place in protected areas. The soils, rivers and later of several nature reserves and national parks[55] are being contaminated with mercury, and the forests are being cleared. Unfortunately the extent of environmental destruction and the economic impact of illegal mining in such areas have not yet been officially investigated or quantified.

Mercury use

Illegal mining in the region also has massive social impacts. For example, alcohol consumption and domestic violence are both on the rise in mining areas. Men, women, boys and girls work in the mines under precarious and inhumane conditions. Many indigenous leaders are bribed by mine operators, or are lured into the public acceptance of mining activities (for instance through the promise of the employment of family members). The presence of mining companies and artisanal mining groups gives rise to conflicts and unrest in the communities. Often the absence of adult men, for example when they are away on a hunt, is used as a chance to advance into the villages with heavy machinery and trucks.

From a technological standpoint, the 'amalgam process' is the simplest way to recover and purify gold. Sand or mud which contains gold is mixed with mercury; gold particles combine with the mercury to form a fluid, silvery alloy (amalgam). This amalgam can then easily be separated from the remaining material. It is then heated, vaporizing the mercury and leaving the raw gold behind. Approximately 36 kilograms of mercury are needed in order to recover one kilogram of gold, and the resulting mercury vapor can pose a major health risk if mishandled (Maturana in SPDA 2014: 27-73). Unless the appropriate closed-circuit equipment is used, the highly toxic mercury is released into the environment. In recent times approximately 120 tons of mercury have been used in the mining sector in Bolivia each year (Heck/Ipenza in SPDA 2014:7-24).

Interviews conducted by CEDIB have revealed what can only be described as highly alarming practices involving mercury; members of indigenous communities in Santa Cruz have been reported to impregnate their clothes with mercury in order to introduce the heavy metal into water-filled holes or trenches, largely unaware of the toxicity of the substance. To this day, studies into the health impacts of these activities are lacking, as is a comprehensive analysis of the negative environmental effects of tantalum-extraction in Santa Cruz.[56]

55 "Reserva Amazónica Manuripi Heath", "Área Natural de Manejo Integrado Apolobamba", "Reserva de Biosfera y Tierra Comunitaria de Origen Pilón Lajas", and "Parque Nacional Cotapata", among others.
56 Diario La Patria newspaper: http://lapatriaenlinea.com/?nota=136429, diario La Razón (3.3.2013): http://www.la-razon.com/suplementos/financiero/Extraccion-artesanal-oro-toxica_0_1788421262.html

2.6 Child labor

In Santa Cruz, many poor families illegally excavate tantalum as artisanal miners. Parents generally have no other alternative than to bring their children to work. These children help their parents despite the danger of intoxication through heavy metals.

Child labor in Bolivia

Approximately 848,000 children work in Bolivia under hazardous conditions, 58% of which are under the age of 14.[57] According to the Bolivian Ombudsman, 90% of these children work informally, for example in mining. Many rural families live below the poverty line, and often all family members must contribute to the family income regardless of physical ability or age (Defensoría del Pueblo 2014:26). Poverty, domestic violence, a lack of child protective services, and the general societal tolerance of child labor all serve to create an environment in which this practice is common. Many children from indigenous communities are victims of human trafficking; their labor is used for illegal mining among other things (Defensoría del Pueblo 2014:72).

For many years, the situation of underage mine workers in Bolivia has been becoming progressively worse. According to the International Labour Organisation (ILO) and the Children's Fund of the United Nations (UNICEF), more than 3,800 children were working in small-scale mining in Bolivia's three most important mining regions[58] in 2004; this means that in that year every 10th laborer in small-scale mining was underage. These children were put to work in various areas of the mining process (OIT/UNICEF, 2004:9).

Child labor in the mining sector

The Child and Adolescent Act[59] prohibits twenty-one forms of child labor, including dangerous and hazardous work as well as activities that may harm the dignity of children and adolescents, such as mining (§ 136).

The prohibition of child labor in the mining sector

According to §129 of this law, the general minimum age for employment is 14 years. Exceptions are specified for children 10 to 14 years of age, as long as they are not made to work under dangerous conditions and have received permission from the Child and Adolescent Ombudsman. Nevertheless, thousands of children do work under hazardous conditions, with serious consequences for their safety, health and physical and mental development. During a visit by the Ombudsman to Cerro Rico de Potosi in 2014, 280 children who worked with their mothers[60] were counted. During the same visit the Ombudsman identified 145 children and adolescents working in the mines of which the majority (over 90%) was 15 to 17 years old (Defensoría del Pueblo 2014: 27). Adolescents are often used for drilling and even for the laying of explosives, and they are frequently in contact with the toxic heavy metals such as mercury. Such hazardous work is considered to be among the worst forms of child labor by the ILO Convention 182 (Article 3d) in that it negatively impacts the development and health of

57 According to the UN Convention on the Rights of the Child from 1989, people are defined as 'children' from birth until the age of 18. Bolivian law defines people under 12 years of age as 'children', and 12 to 18 years of age as 'adolescents'.
58 Oruro, Potosí and La Paz
59 Legal Code 548 from July 17th 2014 concerning children and adolescents ("Código Niña, Niño, Adolescente").
60 Many women work in the cooperatives as "palliris" collecting minerals from mining scrap-piles, or as „guardianas" or „guardas" watching over equipment stored at mine entrances for 24 hours per day.

children and adolescents.

Child labor in mining cooperatives

Children and adolescents also work in many mining cooperatives; these child laborers are even put to work underground. Some cooperatives are composed as "squads" of families and relatives, and all family members - including children - are expected to work in the mine. Other forms of cooperatives more closely resemble proper companies. These cooperatives use minors without family ties as temporary labor for the mining of raw materials. Many of these child-workers are originally from rural areas where their families mostly work in agriculture (OIT/UNICEF, 2004: 13-15).

Chapter 3
International regulatory initiatives

3 International regulatory initiatives

Given the difficult conditions that prevail in Bolivia as well as in many other countries in the mining industry, the questions arise: how can international regulation help to minimize the negative social and environmental impacts of mining activities, and what sorts of roles and responsibilities should be delegated to the companies involved?

Transparency initiatives

Many initiatives and regulations have been formulated within the extractive sector in recent years, most aiming to increase the transparency of cash flows and the value chain. Some have emerged at the multilateral level, such as the "Extractive Industries Transparency Initiative"; others have been created by industry within the context of CSR campaigns. NGOs often play an important role in the initiation and development of these initiatives, most of which are voluntary. However, binding legislative proposals based on approximations of OECD guidelines have been formulated in some countries, such as transparency legislation in the USA and the EU (see Küblböck/Pinter 2015). Examples of three different initiatives of relevance to the mining sector in Bolivia are outlined below.

3.1 Initiatives on conflict minerals

Since the 2000s, questions surrounding the origins of raw materials and especially "conflict minerals" have grown in importance due to the use of resource revenues to finance the war in the Democratic Republic of Congo (DRC). The OECD presented guidelines for the performance of due diligence for companies in the extractive sector in 2011 (OECD 2013). Based on these guidelines, the United States adopted a law on conflict minerals which entered into force in 2012 (Section 1502 Dodd Frank Act). The law requires companies that import the raw materials tantalum, tungsten, tin and gold from the DRC and neighboring countries to demonstrate that these raw materials are not used to finance groups involved in civil war. The EU is currently preparing a similar regulation which will, according to the current legislative proposal, apply to areas of conflict as well as high-risk regions in general.

Industry-lead initiatives

Due to increasing controversy and new regulatory initiatives in the extractive sector, the raw materials processing industry has in recent years launched a number of initiatives intended to improve supply chain transparency. Leading companies in the tantalum sector such as H. C. Starck and KEMET have participated in certification processes and have launched "closed pipeline" projects which include the entire supply chain from the mine to the finished product. Due to the complexity of the supply chain these sorts of initiatives are only doable for a few larger companies. Further transparency provisions addressing the origin of raw materials as well as their supply chains would therefore be urgently needed in order to increase pressure on the corporate sector to make supply chains more overseeable. Such provisions could also drive

companies to increase the sustainability of supply chains on both a social and an environmental level, particularly by improving extractive practices and on-site working conditions.

Further regulation necessary

Other instruments and standards for corporate responsibility, such as the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, recommend the comprehensive application of due diligence across the supply chain in order to minimize the negative impacts of a company's activities. Given the diverse negative effects of raw material extraction, regulations addressing conflict minerals should be only the first in a series of steps towards more extensive transparency and due diligence provisions in this sector.

3.2 Initiatives on artisanal and small-scale mining

Artisanal and Small-scale Mining (ASM) is an important part of the international mineral and metal industry. In the year 2002, this sector employed more than 13 million people worldwide, and it is estimated that in 2014 more than 16 million people were working in the gold mining sector alone. In several countries ASM is able to out-produce even large mining companies (Paget 2015: 17).

International efforts such as the "Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development" (IGF) address the often highly precarious working conditions found in the ASM sector. The IGF was established as a network in 2002 after the "World Summit for Sustainable Development" in Johannesburg; it currently has 55 member countries, including Bolivia. In 2010, the IGF formulated the "Mining Policy Framework for Sustainable Development" (MPF).

Guidelines for artisanal and small scale mining

In September 2015, the IGF presented a set of draft guidelines titled "Guidance for Governments on Managing Artisanal and Small-scale Mining".

The guidelines specify several distinct phases, including:
- The collection of relevant data
- The formation of a working group with relevant state and non-state actors, including representatives of the sector as well as affected communities
- The development of a common vision for responsible artisanal and small scale mining
- The formulation of a common strategy for the sector.

This document is intended to assist governments in the assessment of the positive as well as negative effects on human rights, environment, labor standards, health and safety, gender equality, social and economic benefits and sustainable development. It classifies ASM practices into three groups: unacceptable practices, recognized minimum-standard practices, and better practices (Paget 2015:46ff). The document also suggests several measures that governments can take to help ASM businesses realize their full potential, for example through the establishment of clear rules for land use (Paget 2015:61ff).

3.3 The 2030 Agenda for Sustainable Development

In September 2015, the United Nations General Assembly adopted the ambitious 2030 Agenda for Sustainable Development, with the establishment of socially, ecologically and economically sustainable approaches to global development as the stated goal. The agenda includes 17 objectives, many of them relevant to the mining industry. On the one hand, the extractive sector has contributed to many of the problems that are addressed in Agenda 2030, such as for example pollution and armed conflicts. On the other hand, this sector may also provide a basis for local value-creation and innovation.

The extractive sector can potentially work towards several of the Agenda 2030 goals; for example, the industry could help reduce poverty (Goal 1) by increasing both public revenues as well as wages for local workers. The initiation of adequate policies in this sector could also make important contributions towards "decent work and economic growth" (see for example Goal 8.3: "encourage the formalization and growth of micro-, small- and medium-sized enterprises") as well as "infrastructure, innovation and industrialization" (Goal 9).

In addition, actions taken by and/or regulation of the extractive sector will be central to the achievement or non-achievement of the following objectives: "Clean water and sanitation for all" (Goal 6), "Protection of terrestrial ecosystems and forests" (Goal 15), "Access to sustainable energy" (Goal 7), and "Combating climate change" (Goal 13). Other sub-objectives, such as Goal 12.4 ("Environmentally sound management of chemicals"), are also of particular relevance to the extractive sector.

All these objectives are highly relevant to the situation in Bolivia, and each will require a multiplicity of measures as well as political will and economic policy leeway if they are to be achieved.

Conclusions and recommendations

The development of new technologies and the progressive globalization of value chains make the links between everyday consumer products and the environmental and social impacts of resource extraction more and more obvious. Heightened awareness of the responsibilities of businesses as well as consumers has been achieved in recent years through increased media coverage and NGO campaigns. Nevertheless, due to the lack of supply chain transparency it is very difficult to establish concrete links between the places where mining is being done and final consumer products.

In many countries most tantalum is extracted through small-scale mining operations, and is frequently transported to manufacturers via non-transparent means. In Bolivia, tantalum mining is often done illegally, and takes place in environmentally sensitive areas such as dry forests. Illegal mining also comes with social costs. For example in Santa Cruz, where many families live below the poverty line, children are often put to work illegally mining tantalum; like their parents, these children are in constant contact with poisonous chemicals and heavy metals. Illegal tantalum mining destroys not only the natural environment but also the territories and economic structures of the region's indigenous peoples. They are faced with the contamination of their water, the deforestation of their lands and the disappearance of important food sources.

While illegal mining in Bolivia can in theory result in imprisonment, the country lacks an effective mechanism for sanctioning such activities. The major beneficiaries of illegal tantalum mining in Bolivia are Bolivian gold-mining companies and their (often Brazilian) intermediaries, who in turn sell the illegally obtained tantalum concentrate on to international companies.

Currently, the Bolivian government finds itself in a difficult position. Falling commodity prices are now jeopardizing the neo-extractivist financing of (among other things) important social spending through mining revenues. The government's response has been to compensate for falling revenue (itself the result of price erosion) through increases in production volume, sacrificing social and environmental provisions in the process. In the medium term, focus should be placed on the development of economic alternatives to mining, alternatives that will strengthen livelihoods based on subsistence as well es generating value, jobs, and adequate incomes.

If sustained improvements to mining conditions are to be attained, legal and political action on the part of the Bolivian government towards better social and environmental extraction conditions would be needed. But this cannot be achieved without enhancing actions on a global level, where, most urgently, global political economic relations have to be democratized. As we have shown, comprehensive and mandatory transparency and due diligence mandates are important instruments for this endeaver, as they make the supply chain more overseeable and increase the pressure on the corporate sector to improve extraction and production conditions.

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Abbreviations

AGJAM	Autoridad General Jurisdiccional Administrativa Minera
ASM	Artisanal and Small-scale Mining
BOB	Bolivian Bolíviano (currency of Bolivia)
CEDIB	Centro de Documentación e Información Bolivia
CIDOB	Confederación de Pueblos Indígenas de Bolivia
CONAMAQ	Consejo Nacional de Ayllus y Marcas de Qullasuyu
CS	Cabot Supermetals
COMIBOL	Corporación Minera de Bolivia
DRC	Democratic Republic of Congo
EU	European Union
GAM	Global Advanced Metals
IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
ILO	International Labour Organisation
INE	Instituto Nacional de Estadística de Bolivia
LED	Light Emitting Diode
MAS	Movimiento al Socialismo
MMBTU	Million British Thermal Unit
MPF	Mining Policy Framework for Sustainable Development
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
SPDA	Sociedad Peruana de Derecho Ambiental
UNICEF	United Nations Children's Fund
USA	United States of America
USD	United States Dollar

List of figures