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Sustainable Prevention of Resource Conflicts

Risky Raw Materials for the Future? Case study and scenarios: Lithium in Bolivia (Report 3.3)

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Sustainable Prevention of Resource Conflicts

Risky Raw Materials for the Future? Case study and scenarios: Lithium in Bolivia (Report 3.3)

by

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1 Introduction

In Bolivia's western highlands, at an altitude of some 3,600 metres, lie the largest identified reserves of lithium in the world. According to the latest estimates by the United States Geological Survey (USGS), beneath the 10,000 square kilometres of what are the world's most extensive salt flats, the Salar de Uyuni, there are some 6 to 9 million tonnes of lithium (Roskill 2008 nach Angerer, Marscheider-Weidemann, Wendl et al. 2009, Jaskula 2010a). Exploitation of those reserves has not yet begun, though the Bolivian government has constructed a small 6 million US Dollar pilot plant on the edge of the Salar de Uyuni, and has some ambitious plans: "Lithium is the hope not just for Bolivia but for all inhabitants of the planet", stated Bolivia's President Evo Morales in February 2009 (Bajak/Valdez 2009). Bolivia is one of the poorest countries in Latin America. The production of lithium, and the revenues it can generate, represents a major development opportunity for the country. Lithium is a key constituent of lithium-ion batteries. Already in widespread use in mobile phones, camcorders and laptops, they are also increasingly needed to power hybrid and electric vehicles, which is why many analysts regard lithium as one of the key raw materials in the move towards sustainable mobility in the post-oil era (National Research Council (U.S.) 2008, Angerer et al. 2009, Tahil 2007; Chameides 2009).

As the demand for lithium rises and its importance grows, the question arises as to the risks and opportunities associated with it. The resource booms of the past did little to promote Bolivia's development and improve the standard of living of its population. Indeed, Bolivia has a long history of resource-related conflict and political instability. This report (3.3) therefore investigates the risks and opportunities associated with the establishment of industrial-scale lithium production in Bolivia. Its analysis follows on from reports 1 and 2, illustrating and expanding upon their results. Likewise, this empirical case study will feed into the proposed solutions and recommended action to be set out in reports 4 and 5.

This report is divided into a case study and four scenarios. The case study serves as an analysis of the status quo. It sets out potential conflict risks and opportunities arising from the situation as it exists in 2010. The subsequent four scenarios depicted were devised in the course of a Scenario Workshop in conjunction with a group of experts. They make use of the case study depicting the status quo to set forth a range of potential trends through to the year 2030. The opportunities and risks are summarised both according to the structuring of the case study and broken down by the individual scenarios depicted. The conclusions draw together the findings from the case study and scenarios to present the main conflict risks arising in relation to the establishment of industrial-scale lithium production in Bolivia.

2 Case study: Lithium in Bolivia

This case study identifies potential conflict risks in relation to lithium, as well as setting out opportunities for the economic development of Bolivia and to improve security of supply for the consumer countries. The starting point is the situation in 2010. The case study systematically depicts and analyses the supply and demand position, the current market structure and future market trends in lithium, as well as the economic, social and political background conditions in Bolivia. The resource-related conflicts of the present and the past are considered, as are the macro-economic and localised effects of the exploitation of natural resources. With regard to demand for lithium, the focus is placed on the field of electro-mobility. Opportunities and conflict risks are summarised briefly after each subsection and at the end of the study.

2.1 Resource type and strategic relevance

The first part of the case study investigates lithium and its strategic relevance as a raw material. The study systematically depicts and analyses the supply and demand position, the current market structure and future market trends. As future demand depends substantially on trends in the electro-mobility field, particular attention is devoted to the subject. On that basis, opportunities and potential supply and conflict risks are identified.

2.1.1 Supply and market structure

Lithium is primarily extracted from the brine beneath salt flats. Holes are drilled through the salt crust and the brine is pumped to the surface, where it is left to evaporate and concentrate in open pools. The concentrated brine is then turned by chemical processes into lithium carbonate (Romero 2009b, Hykawy/Thomas 2009). Lithium is mostly obtained as a by-product of potassium, which is also in the brine (SQM 2010). Boron and sodium chloride can also be extracted from the brine (Mills 2010). Lithium is produced and used in widely differing forms and compounds depending on application. Lithium carbonate serves mostly as a base material for the production of lithium-ion batteries. As well as being extracted from brine, lithium is also obtained from certain solid minerals – so-called pegmatites. This is more expensive and energy-intensive however (Gaines/Cuenca 2000). The lithium extracted from pegmatites is used mainly in the glass and ceramics sectors, as it is easier to process for those purposes.

82 percent of the world's lithium production is obtained from deposits in Argentina, Australia and Chile. The market is dominated by a small number of companies. Chilean company Sociedad Quimica y Minera (SQM) is the largest manufacturer, followed by Chemetall, a German subsidiary of the US Rockwood Holdings Inc., FMC Lithium, a US

company, and Australian company Talison Minerals.[1] China has been increasing its lithium production at a rate of 15 percent annually since the year 2000 and has emerged as a new leading producer, accounting for 8 percent of global production by 2008 (Roskill 2009). These figures should be viewed with some scepticism, however, as much of Australia's ore production is sent to China for processing, so some of it is recorded twice in the statistics. For an overview of the largest lithium producers and the mining territories see table 1.

Table 1: Overview of leading lithium producers

Company	Headquarters	Mining territories	Lithium extracted from
Sociedad Quimica y Minera (SQM)	Santiago de Chile	Salar de Atacama, Chile	Brine
Chemetall GmbH (subsidiary of Rockwood Holdings Inc, Princeton, USA)	Frankfurt am Main	Salar de Atacama, Chile	Brine
FMC Lithium (subsidiary of FMC Corportation)	Charlotte, NC, USA	Salar de Hombre Muerto, Argentina	Brine
Talison Minerals	Perth, Australia	Greenbushes, Australia	Pegmatites

Risks and opportunities:

A market dominated by such a small number of vendors (a so-called oligopoly) poses an economic risk, at least in theory, to the consumer countries. This market structure might lead to two problems in terms of long-term, assured supply:

1. Price fixing, or formation of cartels: An oligopoly always presents a risk that the dominant companies might explicitly (such as by formal agreement) or implicitly (such as by informal mutual consent not based on a concrete agreement) collude in setting prices and controlling quantities (Gillespie 2007). This might result in artificial shortages and high prices. The oil crisis instigated by OPEC in the 1970s serves as a negative example of this.
2. Ruinous competition: On the other hand, an oligopoly can lead to a situation in which individual companies attempt to drive competitors to ruin by means of an aggressive pricing policy. By setting prices below the actual market price, they seek over the long term to establish a monopoly (Gillespie 2007: 171-180). Accordingly, this entails a long-term risk of higher prices.

Assuming these factors, exploitation of the deposits in Bolivia would present an opportunity to the consumer countries. The market could be diversified further on the

[1] In September 2009 Chemetall was awarded funding by Germany's Federal Environment Ministry (BMU) to establish a pilot plant for recycling of lithium batteries.

supply side, and the oligopoly would be weakened. The consumer countries' security of supply would improve.

Another supply risk is posed by the geographical concentration of the two largest mining companies in one region of Chile – the region around the Salar de Atacama salt flats, which is subject to significant risk of earthquakes. Natural disasters might impede the mining of lithium and damage the infrastructure for transporting it. As 41 percent of the worlds' lithium production in 2009 originated from that region, a loss of it would have a direct impact on lithium supplies (Jaskula 2010a).

2.1.2 Demand and future market trends

As in the case of many other raw materials (see report 2), the enormous economic growth in many emerging economies has seen a surge in demand for lithium over the last 10 years. This was driven, on the one hand, by a rise in consumption in the conventional user industries, such as ceramics, glass, aluminium and lubricants. A much stronger driver of growth, however, was the boom in lithium-ion batteries. Between 2003 and 2007, demand for lithium rose by 8 percent a year. By comparison, the demand generated by lithium-ion batteries increased at a rate of 25 percent a year over the same period (Roskill 2009). By 2009, 23 percent of global lithium production was already being used to make lithium-ion batteries (Jaskula 2010b). This boom in demand, and a relative shortage because production in South America and China could not be increased fast enough, resulted in the price of lithium carbonate doubling to 5,500 US Dollars per tonne between 2004 and 2008 (Anderson 2009, Roskill 2009).

Table 2: Estimated lithium consumption by field of application

Application	2008 (according to SQM)	2008 (according to Roskill)
Ceramics and glass	31%	37%
Batteries	23%	20%
Lubricants	10%	11%
Air conditioning	5%	5%
Continuous casting	4%	5%
Aluminium production	3%	7%
Other	24%	15%
All	100.00%	100.00%

Source: Jaskula 2010b: 44.2

According to estimates by the USGS, some 25,400 tonnes of lithium was produced in 2008 (Jaskula 2010b). The respiratory of growth slowed in the same year to 2-4 percent (Jaskula 2010b). In the view of some analysts, there was oversupply on the market, even though the mines in South America were not working to full capacity (Anderson 2009; Chameides 2009, Jaskula 2010b). This was due to the global economic crisis, and the associated decline in consumption in conventional industrial applications and in sales of mobile electronic devices (Jaskula 2010b). The industry analysts at TRU Group Inc. forecast that oversupply will persist through to at least 2013 (Anderson 2009). This oversupply was also reflected in lower prices: In September 2009 SQM, for example, announced that it was cutting its prices by 20 percent (SQM 2009). Up until October 2009, prices fell generally to around 4,000 US Dollars per tonne (Krauss 2010). Initial estimates for 2009 indicated a reduction in global lithium production to 18,000 tonnes (Jaskula 2010a).

Despite the lower sales volumes and the weak economic climate in 2008, a number of companies started working new deposits (Jaskula 2010a, Jaskula 2010b). Some 60 companies began conducting feasibility studies for new projects amounting to a total value of around 1 billion US Dollars (Krauss 2010). At the same time, SQM, Chemetall and FMC continued to expand their existing capacities (Jaskula 2010b).

Analysts are unanimous in their view that the slower growth in demand and the market oversupply will not last. For batteries in particular, they expect to see above-average growth based on the rise in production of hybrid and electric vehicles, as well as from the growing market in portable electronic devices such as mobile phones and laptops (Roskill 2009, Anderson 2009). They also forecast stable growth rates of around 2-3 percent in the other conventional industrial applications for lithium through to 2050 (Angerer et al. 2009).

How strongly demand for lithium will rise, and to what extent we are likely to see shortages of lithium in future, is the subject of fierce debate. How the demand side for lithium-ion batteries to power hybrid and electric vehicles will develop is uncertain. It is apparent that the major automobile manufacturers are launching, or planning to launch, a rapidly increasing number of such models.[2] To date hybrid and electric vehicles have mostly been powered by non-lithium-based batteries, but most car-makers have announced that they will be using lithium-ion batteries in current or future generations. In order to bring that change about, in recent years more and more car-makers have been entering into long-term partnerships with battery manufacturers (Jaskula 2010b, Calderón 2010, McNulty/Khay 2009). Governments are providing strong backing to this trend. A number of countries have promised to invest considerable sums of public money in electro-mobility: Germany will be providing 500 million Euro of funding through to 2011 as part of its Economic Stimulus Package II; China will be committing some 3 billion Euro likewise through to 2011; Japan has announced funding of approximately 200 million Euro through to 2014; and the USA will be providing some 2 billion Dollars in direct funding and 25 billion Dollars in the form of loans through to 2019 (BMWi et al. 2009). Alongside their partnerships with battery manufacturers, car companies have also started investing in lithium producers and forming joint ventures together with them (Heiny 2010, Krauss 2010).

It is difficult to judge how rapidly the market in these vehicles will grow however. Most analysts regard a 10 percent market share by 2020 as a realistic prospect, with steeply rising growth rates thereafter (The Economist 2010b). Taking the current average of 60 million new car registrations a year as reference, this would mean 6 million hybrid and electric cars a year. The Boston Consulting Group published a study on the subject in 2009 involving three scenarios predicting a market share of 12, 28 or 43 percent respectively for hybrid and electric vehicles in 2020. The study points out that, even if the oil price rises substantially, conventionally powered vehicles will still have a cost advantage by 2020. Consequently, questions of regulation and state subsidy will be key, as will the extent to which awareness of the importance of energy security and the risks of climate change rises (Book et al. 2009). The Fraunhofer Institute for System and Innovation Research (ISI) in its study presenting a forecast of future lithium demand sets out a dominance scenario assuming positive framework conditions and technology trends in the electro-mobility field which puts hybrid and electric vehicles' market share at around 36 percent in 2020. The pluralism scenario depicted in the same study, under less positive framework conditions, predicts the market share to have attained only around 25 percent by 2020.

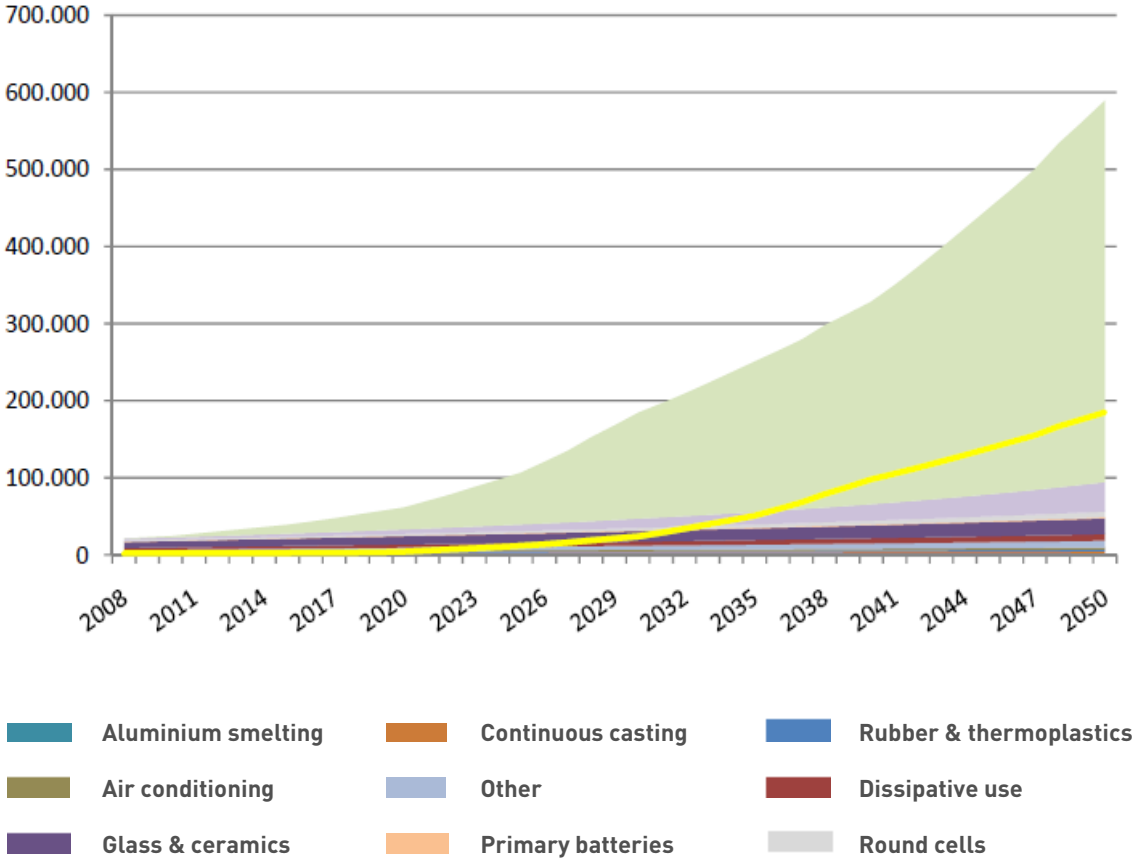
If a 10 percent market share is achieved by 2020, a steep increase to 90 percent in the 10-15 years thereafter is not entirely unrealistic, as is indicated by historical experience in relation to other technologies, such as steam ships, motorised taxis and car emissions control systems (The Economist 2010a). The dominance scenario set

[2] They include newcomers such as Chinese company BYD and US firm Tesla Motors, as well as all the major manufacturers, such as General Motors, Volkswagen, Toyota, Mitsubishi, Mercedes-Benz, Hyundai and Nissan (Jaskula 2010b: 44.5).

forth by the Fraunhofer Institute predicts a 91 percent market share by 2050, while its pluralism scenario foresees a share of around 45 percent. With regard to demand beyond 2050, the key factor will be whether, and when, lithium consumption and recycling will attain a similar level. The strong growth rates would have to decline for this to happen however (Angerer et al. 2009).

So in summary, strong growth in lithium consumption through to 2020 and beyond can be expected (see figure 1). Byron Capital Markets predicts 40 percent growth even by 2014 (Hykawy/Thomas 2009), and Credit Suisse forecasts annual growth of 10.3 percent between 2009 and 2020 (McNulty/Khay 2009). In view of the differing estimates, it is not possible to make a definitive statement here as to how steeply demand will rise, particularly after 2020.

Figure 1: Lithium consumption per year in the dominance scenario



Source: As submitted by Fraunhofer ISI; secondary lithium here refers to lithium obtained from recycling

In assessing the risk of a shortage, the key factor is whether this growth will be matched by corresponding exploitable quantities of lithium. If it is not, the term used is 'absolute shortage'. However, shortages can also result from a lack of mining capacity. This leads to what is termed a 'relative shortage'.

Estimates as to the global lithium resources available in a form and quantity enabling cost-effective exploitation at present or potentially in the future (termed 'resources') are between 25,500,000 and 28,500,000 tonnes (Jaskula 2010a, Evans 2008). Of that total, according to the USGS, 9,900,000 tonnes is economically exploitable based on current technologies and prices (termed 'reserves'), though this does not include Bolivia's lithium, among other locations. Roskill estimates these reserves much higher, at around 25,000,000 tonnes (according to Angerer et al. 2009: 8). Table 3 provides an overview.[3] It must be pointed out, however, that these figures are largely based on estimates made in the 1970s. The estimates drawn up by governments and industry in recent years have been continually adjusted upwards as a result of rising demand and increasing exploration activity. The USGS estimates, for example, doubled between 2009 and 2010 (Jaskula 2009, Jaskula 2010a).

Table 3: Summary of various estimates of reserves and resources by country

Country	Reserves (according to USGS 2010)	Reserves (according to Roskill 2009)	Resources (according to USGS 2010)
Argentina	800,000	6,000,000	2,500,000
Australia	580,000	190,000	No data
Bolivia	No data	5,500,000	9,000,000
Brazil	190,000	50,000	No data
Chile	7,500,000	6,800,000	7,500,000
China	540,000	5,400,000	2,500,000
Canada	180,000	151,000	No data
Austria	No data	113,000	No data
Russia	No data	81,000	No data
Spain	No data	72,000	No data
USA	38,000	No data	2,500,000
Zimbabwe	23,000	No data	No data
Other	No data	No data	1,500,000
Worldwide	9,851,000	24,357,000	25,500,000

[3] These figures include the lithium contained in brine and in pegmatites.

In addition to the quantity of exploitable lithium, another key factor is whether there are any substitutes for lithium in its various applications. In conventional industrial applications lithium might be replaced by potassium. The chance of finding a substitute for use in batteries is likely to be more difficult. The reason is that the high energy and power density of lithium enables the weight of batteries to be minimised[4] (Angerer et al. 2009, National Research Council (U.S.) 2008). In the longer term, if there is strong growth in demand for lithium-ion batteries and they are in widespread use, their recycling will also play a key role (Anderson 2009, Chemetall 2009, National Research Council (U.S.) 2008).

Based on the reserves and resources figures quoted above, most analysts, the industry itself and the US National Research Council predict that there will not be an absolute shortage by 2020. In view of the market oversupply and the expansion of global capacities, there is unlikely to be a relative shortage in the next five years either. However, TRU points out that the industry will need to implement one or two more projects over the coming years, operating at least as economically as the current brine-based producers. This is because between 2015 and 2017 the market will encounter a bottleneck, and production from existing deposits can only be increased slowly, as the brine is subject to complex dynamics beneath the crust of the salt flats (TRU 2009, McNulty/Khay 2009)(Hykawy/Thomas 2009: 2). The European Commission too, in its June 2010 report identifying critical raw materials, warns of a potential imbalance between lithium supply and demand over the next 10 years (European Commission 2010). Some car-makers also appear to have concerns regarding stable supplies of lithium. As one illustration of this, Japanese firms Mitsubishi, Magna and Toyota have announced that they will be participating in various lithium mining projects. The Japanese government is also providing them with backing in those undertakings (Heiny 2010, Oliver et al. 2010).

Any predictions through to 2050 are difficult to make because of the diversity of forecasts and scenarios already mentioned. However, the National Research Council stresses the importance of closely monitoring trends on the lithium market, especially beyond the year 2020. Table 4 presents the forecasts of the Fraunhofer ISI relating to total lithium consumption through to 2050 based on the two scenarios depicted and sets them against the aforementioned pessimistic estimates of reserves and resources put at 9,900,000 and 25,500,000 tonnes respectively. Thus in the dominance scenario, involving a portion of the lithium being recycled, 68 percent of global reserves and 26 percent of global resources will already have been used up by 2050. Consequently, based on those estimates and models no absolute shortage is foreseeable through to 2050 either. However, the increases in consumption in the event of strong growth in hybrid and electric vehicles (dominance scenario) are enormous: from around 25,000 tonnes in 2010 to almost 600,000 tonnes in 2050. There is thus a major need in the long term to find and exploit new resources and to develop existing capacities. It will be equally important to establish a system for recycling lithium batteries.

[4] Lithium is the third-lightest element in the universe.

Table 4: Total lithium consumption through to 2050

Scenario	Lithium consumption in tonnes through to 2050	Share of global reserves	Share of global resources
With recycling			
Dominance scenario	6,750,000	68%	26%
Pluralism scenario	2,824,000	29%	11%
Without recycling			
Dominance scenario	8,950,000	90%	35%
Pluralism scenario	3,570,000	36%	14%

Source: according to Angerer et al. 2009, Jaskula 2010a

With the prospect of rising prices and a major surge in demand, another option which has previously proved uneconomical is now being increasingly discussed: extracting lithium from sea water. Lithium occurs in sea water in a very low concentration of approximately 0.000017 percent. By comparison, the lithium concentration in the Salar de Atacama salt flats in Chile is 0.15 percent (Tahil 2007). The first pilot plants to extract lithium from sea water are currently in the planning phase. As one example, the South Korean government, together with POSCO and the Korea Institute of Geo-Science and Mineral Resources, has decided to invest some 20 million Euros in a pilot plant which is scheduled to reach a capacity of 20,000-100,000 tonnes per year by 2015 (Ministry of Land, Transport and Maritime Affairs 2010). Another option, which is considered by some analysts to be more likely and is currently being tested, is extracting lithium from geothermal sources (Garthwaite 2010, Evans 2008).

Risks and opportunities:

To avert the risk of a short- and medium-term relative shortage for the consumer countries, in the coming years, new lithium deposits must therefore be discovered and exploited and/or existing mining capacities must be developed further. This opens up an opportunity for Bolivia, because the Salar de Uyuni has not so far been developed as a source of lithium, yet it offers enormous potential. That potential is founded, firstly, on the quantity of lithium to be found there and, secondly, on the fact that it might be produced in a similarly cost-effective way to the brine-based production in Argentina and Chile.

If hybrid and electric powered vehicles become established, and attain a market share heading towards 90 percent, geopolitical risks might arise for the consumer countries in addition to the supply risks. If this were to happen, lithium might then replace oil as a strategically vital raw material in meeting individual transportation needs.[5] In theory at least, a cause for concern in this context would be that the identified lithium

[5] The comparison with oil in this context should not be taken too far, because oil has a number of characteristic features as a raw material which differs widely from those of lithium. Oil is consumed, for example, whereas the lithium in batteries is not, and so can be re-used.

reserves are concentrated on a small number of countries: Bolivia (about 35 percent), Chile (about 15 percent), Argentina (about 10 percent), the USA (about 10 percent) and China (about 10 percent). Regardless of whether or not an absolute shortage occurs in future, each of those countries would enjoy a dominant position of power on the market and could make use of that power in order to impose its own interests or in conflict situations. Such a position of power and the ability to use power to impose a country's own interests would not arise, however, if lithium extraction from sea water could be established as an economically viable alternative.

Finally, it must also be pointed out that – in contrast to supply bottlenecks – the risks arising due to price rises would most likely pose only limit problems to the consumers. This is because the cost of lithium in industrial processes and in battery manufactures accounts for only a very small percentage of the total production cost (Hykawy/Thomas 2009).[6] On the other hand, a price hike would mean that larger quantities of lithium could be mined cost-effectively.

2.2 Political, social and economic conditions

The second part of the case study considers the political, social and economic conditions prevailing in Bolivia. This analysis allows an estimate to be made of the opportunities and conflict risks linked to lithium mining in Bolivia. In this, the political, social and economic conditions are depicted on various levels. First the major conflict structures are introduced, and then the economic significance of raw materials in Bolivia is considered. Then an example is presented illustrating how the general conflict structures are manifested at regional and local level. Finally, the potential mining territory in the Salar de Uyuni salt flats and the local populace there are investigated.

[6] According to Byron Capital Markets, lithium currently accounts for about 1 percent of the total price of a battery (Hykawy /Thomas 2009: 10). However, if battery prices fall, as many analysts predict would happen in the course of a boom in electro-mobility, while at the same time lithium prices increase, price rises might become more problematic for consumers.

2.2.1 Bolivia: a divided land

Bolivia is one of the least developed and poorest countries in Latin America. 65 percent of its population lives below the national poverty line, with 40 percent living in extreme poverty[7] (World Bank 2008, World Bank 2005). It is also among the worst-performing countries in Latin America in terms of the disparity of income and personal development opportunities (World Bank 2005). The most disadvantaged groups in Bolivia are its indigenous peoples, who make up a majority of the population (Klein 2003). This discrimination has a long history, and has often been linked to conflicts concerning land rights, natural resources and illegal drug cultivation.

Bolivia is, and has historically been, a deeply divided land – geographically, economically, socially, politically, and in terms of ethnicity and culture. Today the divisions are between the provinces of the western highlands on one side and those of the eastern planes on the other. The highlands comprise two ranges of the Andes mountains with a huge high plateau (Altiplano), and incorporate the provinces of La Paz, Cochabamba, Oruro, Chuquisaca and Potosí. Mining has been the main economic activity in the region for centuries. The land there is of only limited use for agriculture. The planes (Llanos) extend north and east from the western highlands, and account for two thirds of Bolivia's total land area. They comprise the provinces of Santa Cruz, Beni, Pando and Tarija, and are also called the "Media Luna" (Half Moon).[8] Up until the 1980s, the mining industry in the west was the main driver of the Bolivian economy, but it was then overtaken by agriculture and by the oil and gas industry in the east (International Crisis Group 2007: 2, Klein 2003). The distribution of oil and gas revenues to the provinces is very much skewed in favour of the eastern ones (see tables 5 and 6) (Velasquez-Donaldson 2007).

[7] Extreme poverty means that the household income is too low to meet the family's calorie needs.

[8] The provinces of Cochabamba and Chuquisaca are internally divided. While the rural population in political, social, economic and ethno-cultural terms identifies closely with the western provinces, the people in the respective two main cities feel more closely linked to the eastern "Media Luna".

Table 6: Oil and gas revenues in the provinces of Bolivia

Western provinces	Per capita income in US Dollars
La Paz	27
Cochabamba	49.6
Oruro	104.7
Potosi	59.4
Chuquisaca	93.4

Table 5: Oil and gas revenues in the western the eastern provinces of Bolivia

Eastern provinces	Per capita income in US Dollars
Pando	751.3
Beni	147.7
Santa Cruz	46.4
Tarija	491.1

Source: according to Weisbrot und Sandoval 2008

In the heavily populated western provinces the indigenous peoples make up the majority:[9] from 67 percent in Chuquisaca to 84 percent in Potosí. By contrast, in the eastern provinces the indigenous peoples account for 34 percent of the total population on average. The indigenous peoples are economically disadvantaged, suffering from higher poverty rates, lower levels of education and higher rates of malnutrition (World Bank 2005). Consequently, the poverty rate in the western provinces is some 20 percent above that in the eastern provinces, and per capita GDP in the western provinces is around 400 US Dollars below that in the east.

With a poverty rate of 76.5 percent on the land and 39.5 percent among the population working in agriculture, one of Bolivia's main social problems is the uneven distribution of land rights. Bolivia has the second highest concentration of land ownership in the world, with 0.63 percent of landowners owning 66.4 percent of the land. The consequence of this is that most of the rural population either owns land which is too small to permit anything other than subsistence farming, or does not own any land at all (Weisbrot/Sandoval 2008: 1-3). Whereas in the western provinces high population growth has resulted in the already short supply of agricultural land being divided up, in the eastern provinces land ownership is very heavily concentrated (International Crisis Group 2007). That is also where the large export-driven agri-businesses are located (Weisbrot/Sandoval 2008).

[9] The term 'indigenous' in this context relates to ethnic origin, though it needs to be considered that the term usually designates more than that, and is often linked to factors relating to socio-economic class, regional origins and political stance. Perrault summarises this as follows: "Thus, identifying exactly who is indigenous, and what the term means in Bolivia, is far from straightforward" (Perreault 2008: 2ff).

Table 7: Western provinces

Western provinces	Population	Percentage indigenous peoples	Per capita GDP in US $	Poverty rate	Nominal GDP in percent
La Paz	2,715,000	77.5	1,212.2	66.3	24.6
Cochabamba	1,747,900	74.4	1,217.8	54.9	15.9
Oruro	440,700	73.9	1,511.6	67.8	5.0
Potosi	776,600	83.9	933.9	79.7	5.4
Chuquisaca	621,400	65.6	957.5	70.1	4.4
Total	**6,301,600**	**76.0**	**1.175,3**	**65.3**	**55.3**

Source: according to Weisbrot/Sandoval 2008

Table 8: Eastern provinces

Eastern provinces	Population	Percentage indigenous peoples	Per capita GDP in US $	Poverty rate	Nominal GDP in percent
Pando	72,400	16.2	1,791.8	72.5	1.0
Beni	422,400	32.8	877.3	76.1	2.8
Santa Cruz	2,546,900	37.5	1,484.1	38.1	28.2
Tarija	484,200	19.7	3,529.0	50.8	12.8
Total	**3,525,900**	**34.1**	**1,698.5**	**45.1**	**44.8**

Source: according to Weisbrot/Sandoval 2008

The division between the two halves of the country is expressed at political level primarily in the form of conflicts relating to land rights and the distribution of oil and gas revenues. In fact, the power in Bolivia's political system has shifted since 2005: Evo Morales, the first indigenous president of the country, won the presidential election against the old conservative elites of the eastern provinces based on two key promises (The Democracy Center 2007): to end discrimination against the indigenous peoples and to utilise revenues from the country's natural resources to the benefit of the population as a whole. The key project in seeking to attain those goals was a new constitution.[10] To frame it, the new president convened a constitutional assembly. He also instigated land reform and began to nationalise the oil and gas sector as well as parts of the mining industry (Gamarra 2007, International Crisis Group 2007).

[10] The framing of a new constitution was a long-standing demand of the indigenous groupings and ethnic organisations in Bolivia.

During the Morales presidency, and as his reform projects were implemented, conflicts were intensified and became interwoven with separatist movements in the eastern provinces. They began to demand more autonomy from the central government based in La Paz in the west (International Crisis Group 2007: 2-3, Velasquez-Donaldson 2007). The striving for autonomy went hand-in-hand with efforts of the political elites in the eastern provinces, particularly in the economically most powerful province of Santa Cruz, to establish their own *Cruceños* identity – in some cases including open racism against the indigenous population (Hertzler 2010a, 2010b).

The land reform and the new constitution were the major factors in a rise in tensions between the central government and the western provinces on the one hand and the opposition and the eastern provinces on the other (Caroll 2009, International Crisis Group 2007). The tensions regularly escalated into violent protests. In 2007, for example, Morales supporters protested against the pro-autonomy provincial governor of Cochabamba. Street battles erupted with opposition supporters, resulting in two fatalities (Reuters 2007). Following riots between his supporters and opposition elements which resulted in some 30 people being killed, in 2008 Morales declared a state of emergency in the province of Pando and sent in the army (Romero 2008, Human Rights Watch 2009).

Despite these conflicts, the new constitution successfully passed a referendum in 2009, and Morales won the subsequent presidential election. However, in the provinces of the "Media Luna" Morales was unable to win a majority either for the constitution or for himself, despite making substantial voting gains. So the country's political divisions remained. It is to be expected that the eastern provinces will continue opposing Morales and his projects. The possibilities for them to do so are numerous. In order to implement the constitution, for example, initial estimates indicate that it will need some 100 individual laws to be passed. It therefore seems that the conflicts at national level will persist, and that unrest in Bolivia will not be eliminated over the coming years (Romero 2009a; Crabtree 2009). Box 1 presents an overview of the key indices of political stability and economic development in the country.

Box 1: Assessment of the political, social and economic conditions in Bolivia by index

Failed State Index 2009[11] Rank **51 of 177** States
Rank 1 = Most fragile state

The Worldwide Governance Indicators Project 2008[12]

- Voice and Accountability **48.1**
- Political Stability **14.8**
- Government Effectiveness **19.0**
- Regulatory Quality **15.9**
- Rule of Law **12.0**
- Control of Corruption **38.2**

Ratings in percent. 100% = Best rating

Freedom House 2010[13]

- Political Rights Score **3**
- Civil Liberties Score **3**
- Status **Partly Free**

Score from 1-7. Score 1 = Highest level of freedom

Human Development Index 2009[14] Rank **113 of 182** States
Rank 1 = Highest development

Corruption Perceptions Index 2009[15] Rank **120 of 180** States
Rank 1 = Lowest corruption

Doing Business 2010[16] Rank **161 of 181** States
Rank 1 = Best business environment

[11] Indicators: Social Indicators (Mounting Demographic Pressures, Massive Movement of Refugees or Internally Displaced Persons creating Complex Humanitarian Emergencies, Legacy of Vengeance-Seeking Group Grievance or Group Paranoia, Chronic and Sustained Human Flight); Economic Indicators (Uneven Economic Development along Group Lines, Sharp and/or Severe Economic Decline); Political Indicators (Criminalization and/or Delegitimization of the State, Progressive Deterioration of Public Services, Suspension or Arbitrary Application of the Rule of Law and Widespread, Violation of Human Rights, Security Apparatus Operates as a "State Within a State", Rise of Factionalized Elites, Intervention of Other States or External Political Actors) (Foreign Policy/ Fund for Peace 2008)

[12] (World Bank Group 2008)

[13] Indicators: Political rights (Electoral Process, Political Pluralism and Participation, Functioning of Government); civil liberties (Freedom of Expression and Belief), Associational and Organizational Rights, Rule of Law, Personal Autonomy and Individual Rights) (Freedom House 2008).

[14] The rankings relate to data from 2007. Indicators: HDI value; Life expectancy at birth; Adult literacy rate; Combined primary; secondary and tertiary gross enrolment ratio; GDP per capita (UNDP 2008).

[15] cf. Transparency International 2009.

[16] Indicators: Starting a business; Dealing with construction permits; Employing workers; Registering property; Getting credit; Protecting investors; Paying taxes; Trading across borders; Enforcing contracts; Closing a business (International Bank for Reconstruction and Development / The World Bank 2009.

Risks and opportunities:

The Salar de Uyuni salt flats and the lithium deposits contained in them are located in the western provinces of Potosí and Oruro. Establishing lithium production facilities could thus counteract the economic disparity between the western and eastern provinces. Whether this represents an opportunity or a risk is difficult to judge. A rise in the proportion of total revenues generated in the western provinces might strengthen their position in the dispute with the eastern provinces and weaken the campaign for autonomy. However, the elite in the eastern provinces might also see their economic power as being even more under threat, and resort to more radical means. A conflict-sensitive approach to the exploitation of lithium and the distribution of revenues from it at national level, as well as to the ongoing development of the conflict between the western and eastern provinces, is therefore of vital importance.

2.2.2 On the way to the 'resource curse'?

The nationalisation of the oil and gas industry resulted in an enormous rise in government oil and gas revenues: from 173 million US Dollars in 2002 to around 1.57 billion US Dollars in 2007 (Hodges 2008). That rise represents almost 10 percent of total GDP (Weisbrot/Sandoval 2008). As a result, Bolivian government revenues doubled between 2005 and 2008 (Economic Commission for Latin America and the Caribbean 2009). A special feature in the case of Bolivia is that most of the revenues – 49.7 percent – go to sub-state units: provinces, local authorities and universities. 25 percent go to central government, and 25.2 percent to the state-owned oil and gas corporation (Weisbrot/Sandoval 2008).

The increase in government revenues from natural resources may lead to wide-ranging problems. For example, the enormous amounts of money involved may incite patronage and corruption. Systemic corruption at all levels of state institutions and in relation to the award of concessions for the oil and gas industry has been widespread for a long time in Bolivia. President Morales has made the fight against corruption and for transparency in the oil and gas sector a central pillar of his government policy, but the challenges are massive – as illustrated by the frequent accusations of corruption and changes in management at the top level of the state-owned oil and gas corporations (Ledebur 2007)(The Democracy Center 2007).

Since public debate has to date been focused on the issue of distribution, there has been little consideration of how revenues are appropriated. The law stipulates that revenues from taxes on oil and gas extraction must be invested in education, health, roads and economic development, including job creation, but there is a lack of any unified plan to do so. At national level, the increased revenues have been invested primarily in three programmes: the development of primary education; social provision for the elderly; and a programme to promote the health of young mothers and new-born babies. Apart from these three programmes, there is no transparency as to where the remaining oil and gas revenues have gone (Hodges 2008, Weisbrot et al. 2009: 15, Mähler 2007). Analysts are agreed that the participation of civil society and the degree

of transparency needs to be improved further in this respect (Velasquez-Donaldson 2007; Hodges 2008, Ledebur 2007).

At provincial and local authority level, there appeared to be a lack of absorption capacity to utilise the enormously increased revenues and translate them into projects. Illustrating this, according to Hodges (2008) a sum of 700 million US Dollars was left lying unused in the bank accounts of the provinces, local authorities and universities. Moreover, there are also issues at this level, too, surrounding corruption and misappropriation of funds (Velasquez-Donaldson 2007).

In macro-economic terms, the increased revenues have not resulted in any destabilisation so far. Growth rates since 2005 are the highest of the last 30 years, and the government has demonstrated financial policy restraint in spite of the rising revenues. During the global economic boom it created substantial currency reserves and restricted public-sector salaries.[17] The revenues could then be of use during the global economic crisis to stimulate the economy. This proved successful: In 2009 Bolivia achieved the highest economic growth in Latin America (Weisbrot et al. 2009). Despite these positive trends, the high proportion of Bolivia's raw material exports relative to its total economic output made it susceptible to external price shocks. As not only the central government but also the provinces, local authorities and universities receive significant amounts of the raw material revenues, they too are susceptible to price shocks. Another factor to consider is the long-term impact of *dutch disease* on other manufacturing sectors of the economy, which might be rendered less competitive by a potential currency appreciation (Velasquez-Donaldson 2007).

Risks and opportunities:

Without the participation of civil society and transparency with regard to the distribution and appropriation of revenues from lithium extraction, risks in the form of corruption and distribution conflicts would intensify. This applies to central government as well as to the local authority and provincial levels. Based on the healthy macro-economic performance of the Bolivian government in recent years, the risk of destabilisation of the economy appears low. The risks arising from volatility in oil and gas prices might be reduced by diversifying raw material exports. However, it does remain to be seen in this regard how much oil and lithium prices may mutually influence each other. All in all, Bolivia remains susceptible to price shocks.

[17] Bolivia has higher currency reserves than China as a percentage of its economic output (Weisbrot et al. 2009).

2.2.3 Resource conflicts and violent protests

After having outlined the general conflict structures in Bolivia and the resultant risks, the following presents a closer consideration of the form in which those conflicts might be manifested. Bolivia's very strong, well organised and active civil society is a key factor in this (Ledebur 2007). Conflicts relating to revenues from natural resources, illegal drug cultivation, jobs and land rights regularly culminate in violent protests by various mass social movements. The International Crisis Group describes this as a "culture" of violent protest, while other observers (Evia et al. 2008) see economic motives behind the protests, particularly in view of their frequency (International Crisis Group 2004). In order to provide a better understanding of this kind of conflict, by way of example one conflict is considered in more detail here: the "Gas War" of 2003, a violent protest against the privatisation of the oil and gas industry.

The background to this conflict was Bolivia's long-standing history as an exporter of natural resources, extending from silver in the 16th century, through tin in the late 19th and 20th century, to oil and gas in the 20th century and through to the present (Hodges 2008, Weisbrot et al. 2009). The extraction and export of these resources has not brought Bolivia sustained economic development, and large parts of its population have remained poor. A symbol of this is the famous Cerro de Potosí mountain in the province of Potosí. This one mountain, and the gigantic silver deposits it contained, financed most of Spain's public spending in the 16th and 17th centuries. Today Potosí is the poorest province in Bolivia. These historical injustices are deeply embedded in the collective memory of the poor and indigenous peoples (The Democracy Center 2007, Wright 2010).

The role of the state has fluctuated widely in exploiting Bolivia's natural resources. Privatisation and (re)nationalisation have regularly alternated, bringing about conflict time and again. One such reversal took place in the mid-1980s. At the time the Bolivian government was subjecting the country to a neo-liberal shock therapy in implementing structural adjustments imposed by the International Monetary Fund (IMF) and the World Bank. Direct foreign investment increased as a result, though it had little effect on unemployment and poverty. In fact, the economic condition of the poor even deteriorated initially. At the same time, the political structures did not allow for participation of the poor and indigenous peoples. The extensive system of patronage favouring the existing elites, and the resultant inequalities, led to mounting social tensions (Gamarra 2007, Velasquez-Donaldson 2007).

Then, in the course of economic reforms in the mid-1990s, the oil and gas sector was also privatised. The resistance of civil society to this privatisation threw the Bolivian state into a deep political crisis between 2002 and 2006. Four presidents were forced to resign in four years. Protests against the privatisation and the involvement of foreign firms escalated in late 2003 into the so-called "Gas War".

Protests erupted in response to the Bolivian government's decision to export liquid petroleum gas through a port in Chile. Chile has been seen as a traditional arch-enemy ever since it blocked Bolivia's access to the Pacific during a war between the two

countries in the late 19th century. Protests were made by farmers, students, intellectuals and mine and factory workers primarily in the Andean towns and cities of the western provinces. The protest movement was unified by the shared indigenous origins of those taking part (Velasquez-Donaldson 2007). Perrault points out that these protests were led not by the people in the eastern oil and gas producing provinces but by those of the western provinces. This demonstrates that the issue at hand was not the direct negative social and environmental impact of oil and gas production, but rather the distribution of revenues, corruption and questions of national development. Another factor in this is that the indigenous population groups directly affected by the oil and gas industry are too small and disparate, and are poorly organised. By contrast, the population of the western highlands is large and well organised (Perreault 2008).

In addition to the nationalisation of the oil and gas sector, the protesters were demanding major and wide-ranging reform of the state in order to end discrimination against the indigenous population. The army and police met the protests with brutal force, and 67 people died. This incited the protests further, and the president at the time, Sánchez de Lozada, was forced to resign. The next president too, Carlos Mesa, was brought down by the industry reform and the protests (Ledebur 2007, Perreault 2008).

Only when Evo Morales entered office could the protest movement be pacified by his "nationalisation" of the oil and gas sector. Despite official propaganda, and the impact on public perception caused by the sight of oil fields and refineries being occupied by the Bolivian military, this was not a nationalisation according to international standards, as the assets of the foreign firms were not expropriated. Instead, the state-owned oil and gas corporation acquired majority shares in the firms concerned, and taxes on oil and gas revenues were increased (Hodges 2008; Velasquez-Donaldson 2007).

As well as nationalising the oil and gas sector, in the new constitution Morales also attempted to deal with the long-standing discrimination against the indigenous population and the distribution conflicts of the past. As a consequence, the autonomous status of the various sub-national units of the Bolivian state was redefined. Now beneath the central government level there are four units, or self-governing administrations, possessing their own separate rights: indigenous, regional, provincial and local (International Crisis Group 2007, Whitelegg 2009). How this multi-layered system will look and work in practice is unclear so far (Crabtree 2009). It does, however, provide the local indigenous population with extensive rights of co-determination with regard to the award of concessions (Romero 2009b).

Risks and opportunities:

With regard to the exploitation of lithium reserves in Potosí, the history of resource conflict in Bolivia indicates strongly that the potential for conflict is indeed major. The local indigenous population in Potosí is well organised. Mine workers were not only a driving force in the protests of the "Gas War", but have also regularly played a key role in the many social conflicts and state crises which Bolivia has undergone.

Consequently, an approach embodying a high degree of conflict sensitivity is essential. If the local population is not involved from an early stage in the exploitation of lithium

reserves and their interests are not taken seriously, perceived injustices and discrimination will very likely lead to conflicts which might also escalate into violence. Moreover, the new constitution and the rhetoric of the Morales government in particular have raised the expectations of the indigenous population that they will be allowed to participate in the exploitation of natural resources and share in the profits generated.

For the Morales government, establishing Bolivian lithium production entails both an opportunity and a risk. It could demonstrate on the basis of an entirely new resource and business sector that it is able and willing to utilise the natural resources of Bolivia for the benefit of its indigenous population. On the other hand, failure might cause disillusion among that very indigenous population and Morales's electoral base.

2.2.4 Potosí – the poorhouse of Bolivia

The province of Potosí and the region of the Salar de Uyuni salt flats is particularly suitable for analysis of the risks of resource conflict arising from the local, political, social and economic conditions prevailing in Bolivia in relation to lithium. Bolivia has other salt flats in addition to the Salar de Uyuni which might potentially be used for lithium mining. They are many times smaller than the Salar de Uyuni, however, and there are so far no concrete plans to develop lithium mining in them.

The province of Potosí has the highest poverty rate and the highest proportionate indigenous population in Bolivia. This was where most jobs were lost when the mining industry collapsed (Klein 2003). Potosí is symbolic of how the resource booms of the past (in silver and tin) did not bring sustained economic development to the local populace. Most of the population living around the Salar de Uyuni salt flats depend on them directly and indirectly for their livelihoods.

Some 46 percent of the local population works in agriculture and cattle-rearing. For them the Salar de Uyuni is a vital resource, because it is one of the most important water catchment areas in the region. Local agriculture and cattle-rearing is dependent on this functional eco-system for its water supply. Moreover, the Salar de Uyuni is one of Bolivia's main tourist centres, attracting some 50,000 visitors a year, as well as being a fragile eco-system with many indigenous species (Romero 2009b)(Revenga und Kura 2003).[18] For example, the Rio Grande, the largest river in the region, forms a lagoon on the most lithium-rich parts of the salt flats which is an important habitat for many birds. Tourism, which provides a living for 23 percent of the population, is reliant on these untouched landscapes. In addition, a further 12 percent of the population makes a living directly from the salt harvest. The effects of lithium production on the eco-system, apart from the destruction of natural habitats, would be primarily in the form of water consumption (due to the creation of evaporation pools) and pollution of water and air by the chemical processing of the lithium. The water reserves of the

[18] The Salar de Uyuni is on the RAMSAR List of Wetlands of International Importance.

Salar de Uyuni are classed as non-renewable, as the ground-water regenerates only extremely slowly. Moreover, there is already a shortage of water in the region today (Aguilar-Fernandez 2009; Hollender/Shulz 2010).

So far there is just one small pilot plant run by state-owned mining company COMIBOL for the extraction of lithium, potassium, boron and magnesium.[19] As the region is structurally very weak, there is a lack of fundamental infrastructure, such as roads, power and water. However, the government is planning further investment totalling some 350 to 450 million US Dollars to establish a large industrial plant capable of producing 30,000 to 40,000 tonnes of lithium carbonate a year. There are even plans, in a next step, to set up a battery factory (Bajak/Valdez 2009). Bolivia lacks the know-how to do that at present however. There also appear to be technical problems, such as with the high magnesium content of the brine, which makes the extraction process more expensive (Evans 2008, Kahya 2008, Hykawy/Thomas 2009, Calderón 2010). For those reasons, the Bolivian government has begun holding consultations with foreign firms from France, South Korea, China and Japan (LAHT 2010a). Companies and research organisations from those countries have already received initial brine samples from the Bolivian government. Furthermore, Japan has announced that it will be increasing its development aid (Hyun-cheol 2010, COMTEX 2010).

As far back as 1990, a US firm, Lithium Corporation of America (today FMC Corporation) attempted to enter into a contract with the Bolivian government to extract lithium in the Salar de Uyuni. Although the president at the time supported the project, the attempt failed due to protests by the local populace, who believed the 8 percent tax on the company's revenues too low (Christian 1990, Wright 2010). Still today, the mistrust of foreign firms on the part of the local populace appears to be considerable. It is so great, in fact, that many local groups categorically reject any investment by international business (Kahya 2008, Romero 2009b, Hollender/Shulz 2010). Mistrust of their own government is also pronounced, however. As one example, the government was forced to rescind a decree establishing a state-owned lithium mining corporation after locals who felt they had been bypassed by the decision threatened protests and road blocks (LAHT 2010b). Furthermore, Hollender and Shulz (2010) judge that the will and capacity of the government to control the negative environmental effects of lithium production can at best be described as inadequate.

Further potential for conflict arises from the lack of clarity regarding land rights around the Salar de Uyuni. The Bolivian government has owned the salt flats since 1974, but their area has been expanded five times in the meantime. The new boundaries of the Salar are not accepted by all the local authorities in the region, particularly since the authorities in question have been strengthened by the new constitution in terms of their title to land and their right to share in profits from the natural resources of the salt flats (Hollender/Shulz 2010).

[19] Brazil has declared its interest in developing industrial potassium production in order to meet the demand of its own agriculture (Hollender/Shulz 2010).

Risks and opportunities:

The poverty and direct dependency of the local populace on the Salar de Uyuni for its livelihood increases the aforementioned conflict risks relating to the exploitation of lithium reserves. However, they also illustrate the great development opportunity offered by lithium production for the poorest region of Bolivia. That opportunity can thus only be taken if the mining and production process is approached in a conflict-sensitive manner and the interests of the local populace are taken seriously. In particular, impact on the environment and the local populace must be taken into consideration at an early stage and prevented or balanced-out as appropriate. Government rhetoric regarding the project demonstrates that it is at least aware of these risks (COMIBOL 2010). Early conflicts relating to the establishment of a state-owned lithium exploration company have already illustrated how important it is to follow up this rhetoric with action (LAHT 2010).

Consideration also needs to be given to the resentment of the local populace against foreign firms. Evo Morales has demonstrated a certain pragmatism and sensitivity to these issues in the course of his "nationalisation" of the oil and gas industry however. Nevertheless, the question remains as to whether the elements of the population who categorically reject any involvement of international companies will accept even a minority share being held by them. Without international assistance, Bolivia would certainly find it difficult to develop the necessary know-how and technical expertise.

2.3 Interim conclusion

The rising demand for lithium is being driven primarily by lithium-ion batteries. How this trend will develop depends above all on the extent to which electric powered and hybrid vehicles become established on the market. Most forecasts currently predict stable growth in demand through to 2020. If electric and hybrid vehicles were to establish themselves as the dominant technology in meeting the needs of individual transportation beyond 2020, demand would rise significantly further.

If this were to happen, lithium might then replace oil as a strategically vital raw material in meeting individual transportation needs. In geo-strategic terms, this might theoretically provide the small number of countries in which the world's main lithium reserves are located with a powerful means of exerting pressure. This would not be the case if the extraction of lithium from sea water were to become established as an economically viable alternative.

The first potential for conflict might arise in the near future however. It is possible that the aforementioned trends in demand might lead to relative shortages – the first occurring as early as between 2015 and 2017. In order to safeguard security of supply, it therefore appears essential to increase mining capacities. This would present a development opportunity for Bolivia, one of the poorest countries in Latin America. Its enormous lithium deposits have so far not been exploited. However, the long history of resource conflicts in Bolivia demonstrates clearly how important it is to adopt a conflict-sensitive approach. Furthermore, past experience and conflicts in the oil and gas sector should be taken seriously, particularly with regard to good governance and corruption, the distribution of revenues from the exploitation of natural raw materials, and the destruction of income sources and livelihoods (such as in agriculture and tourism) by the environmental impact of the mining. The strong civil society in Bolivia and the approach of the Morales government provide indications of possible solutions. As lithium extraction is in its early stages, there is for the first time in the history of Bolivia an opportunity to exploit the natural resources from the very beginning with the involvement of, and to the benefit of, the country's population. The international community can support the success of this undertaking by placing its expertise, experience and instruments at Bolivia's disposal.

For the consumer countries, a diversification of producers beyond Chile, Argentina and Australia might likewise have positive effects: As well as increasing the supply of lithium, it would reduce the oligopoly-style market structure and the geographic concentration of mining locations. In addition, however, as consumption continues to rise the consumer countries should establish recycling systems for lithium in order to reduce their own dependence on imports.

3 Scenarios for future raw material conflicts: Bolivia and lithium

The following scenarios were drawn up on May 31, 2010 and June 1, 2010 in the course of a Scenario Workshop conducted by adelphi and the Wuppertal Institute at the representative office of the German Society for Technical Cooperation (GTZ) in Berlin.

The following persons contributed to the devising of scenarios relating to Bolivia and lithium: Hans-Joachim Hermann (German Federal Environmental Agency), Julia Iversen (German Society for Technical Cooperation), Annegret Mähler (German Institute of Global and Area Studies), Michael Ritthoff (Wuppertal Institute for Climate, Environment and Energy), Prof. Jürgen Scheffran (University of Hamburg), Dr. Henrike Sievers (German Federal Institute for Geosciences and Natural Resources) and Dr. Eckhard Schüler-Hainsch (Daimler Research Group on Society and Technology). The Scenario Workshop was moderated and summarised by Lukas Rüttinger (adelphi) and Dennis Tänzler (adelphi).

Box 2: Scenario development

Scope and constraints of scenario development:

The purpose of scenario development is not to predict the future as accurately as possible. Rather, it represents a method of managing the uncertainty of long-term forecasting. The starting point for scenario development is thus the insight that the future of complex systems is, as a matter of principle, almost impossible to predict. From the various directions in which certain critical trends and key factors may develop, intrinsically coherent and plausible narrative scenarios are devised. They describe specific possible states in the future, as well as setting out the trends, events and key players involved in attaining those states. All scenarios developed are equal; no probability is assigned to them (Schwarz 1996; Willmore 2001).

Each scenario describes a possible future development through to 2030, and begins with a description of the global trends exerting a major influence on lithium supply and demand and on Bolivia. Then the specific trends in Bolivia are described. At the end of each case study, following the summary an info-box sets out key risks and conflict scenarios. These are based on the analysis matrix underlying the project, and represent links to reports 1, 4 and 5. These boxes also contain a number of pointers, indicating the direction in which the world is developing.

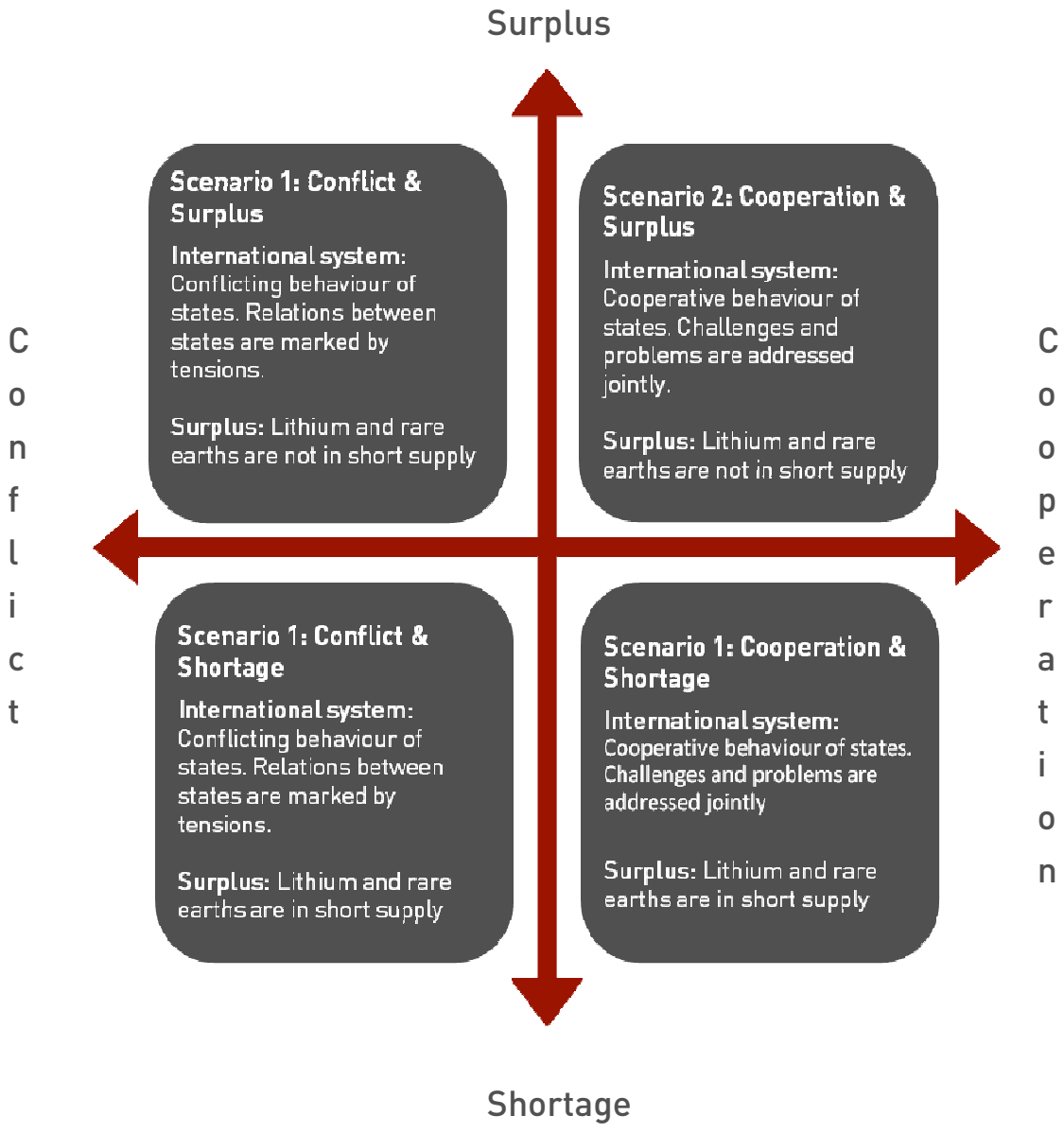
Method:

As an aid to orientation for the projection and analysis at the global level a coordinates system with two axes, encompassing four scenario spaces, was used. The axes were:

- cooperation-conflict and
- surplus-shortage.

These axes were identified in the course of the project. They formed the basic framework for development of the most closely targeted scenarios possible, which could subsequently serve as jumping-off points for conflict prevention measures and strategies. An important aspect is that these axes are merely basic alignments, into which the complex system of states can move. Trends within this system do not always progress in a linear manner; there are setbacks, opposing reactions, and transitions from one scenario space to another.

Figure 2: Coordinates system for projection at global level



The following trends and descriptors served as the basis for scenario development:

Global trends:

1. **Economy: Economic growth and increasing energy consumption:**
    a. Growth rate
    b. Development of emerging economies
    c. Price rises in other raw materials, such as oil and gas
    d. Growth fluctuations

    This trend depicts global economic development and global energy consumption through to 2030. As well as the question of how strongly the economy will grow and how sharply energy consumption will rise, it also considers how these trends will impact on the emerging economies and whether this trend is subject to fluctuations in growth.

2. **Technology: Technological development possibilities:**
    a. Market penetration by key technologies, primarily green-tech
    b. Recycling rate, efficiency gains, substitution technologies
    c. Subsidies, regulation, etc.

    This trend depicts the extent to which key technologies for which lithium is an important raw material will become established. It also considers the extent to which other technological trends influencing the consumption of this raw material will develop: e.g. recycling, efficiency gains and substitution technologies. This is in most cases also subject to the influence of framework conditions such as subsidies and regulation.

3. **Socio-political framework: Global governance**
    a. Climate and biodiversity debate (development of standards, public opinion)
    b. International initiatives (e.g. WTO rules, standardisation for business, Kyoto Protocol, etc.)

    This trend depicts the development of standards and public opinion at global level in relation to key issues such as climate and biodiversity, as well as considering the extent to which international initiatives (e.g. WTO rules and the Kyoto Protocol) develop and have an effect.

4. **Raw material production: Change in global production**
    a. Investment
    b. Diversification of producers

    This trend relates *only* to the global mining/production of lithium. It depicts the extent to which investments are being made globally in developing mining and production, and whether this is leading to a diversification of producers.

Descriptors at national level:

1. **Change in extraction and/or production volume:**
   To what extent are investments being made *nationally* in mining and/or production capacities, and how are production and/or extraction volumes changing at national level?
2. **Corruption / Crime / Informality / Good governance:**
   To what extent is raw material production/mining characterised by corruption, crime, informality or good governance?
3. **Environmental changes with consequences for the local populace:**
   Does the mining/production of the raw material have negative effects on the environment, and does this have consequences for the local populace?
4. **State provision of safety, security, well-being and rule of law:**
   To what extent is the state fulfilling its basic functions?
5. **Economic development (growth, diversification, etc.)**
   How is the national economy developing? Alongside growth, aspects such as diversification of the economy, or 'Dutch disease', may also be of significance in this.
6. **Political freedoms / Democratisation / Autocratic trends:**
   In what direction is political freedom developing? Are there democratic or autocratic trends, and how are they affecting stability?
7. **Distribution of profits and losses (overall state level):**
   How are profits and losses from production/mining distributed at overall state level? Are certain social groupings/regions being neglected or favoured?
8. **Raw materials foreign policy**
   Is the country exploiting its position of power with regard to raw materials in order to impose its foreign policy interests?

3.1 Scenario 1: Fragmentation and fragility: (Conflict and surplus)

The global economy was no longer able to sustain continuously high growth rates following the 2008/2009 crisis and was subject to severe fluctuation. The initially better growth rates among emerging economies could not be maintained. A globally low level of economic growth became established as the norm. One reason for this low global growth was a general volatility on unregulated markets – a trend also reflected in fluctuations in the price of raw materials, including lithium. The nervy and sensitive markets, the low levels of government revenues resulting from low economic growth and the unstable economic climate meant that there was a shortage of major subsidy and investment in the green-tech sector, which was restricted in its growth as a result. Demand for lithium was consequently also limited. The lack of demand and the unstable investment climate meant that investments in exploiting new lithium deposits were kept low.

In 2010 future prospects were still hopeful: The global economy appeared to be slowly recovering. The emerging economies, especially, seemed to have withstood the economic crisis well. Green-tech was on the up, and there seemed to be no impediments to stable growth in the sector. The government of Bolivia saw lithium as a development opportunity, and the government became involved in lithium production through a state-owned corporation and with the aid of direct investment by private foreign firms. However, the instability of the global economy soon had a negative impact on Bolivia too. In the years between 2010 and 2020, Bolivia's dependence on global raw material markets was all too plain to see. Severe fluctuations in the price of gas resulted in a collapse in revenues which could not be balanced-out from elsewhere. This increasingly restricted the government's capacity to act. A further factor was that the lack of demand for lithium on a global level set back the Bolivian government's plans to establish lithium production in the country, causing the project to fail.

Although the MAS succeeded in being re-elected in 2014, the shortfall in revenues meant that the government had to introduce spending cuts. Painful cuts were made particularly in social security, which had been heavily dependent on the gas revenues. This angered and disappointed large sections of the government's support base. As a consequence, the government fragmented. The opposition exploited the government's weakness, citing the failure to develop lithium production as an example of the failings of the government and the state. For MAS supporters, too, the failure to develop lithium production is symbolic of their unfulfilled expectations. While visible inroads were already being made into the Salar de Uyuni salt flats, the local populace enjoyed no positive effects. There were repeated protests by the opposition, and by disappointed MAS supporters, in Potosí and Oruro, as well as around the rest of the country. The government initially responded to these protests and to the strengthened opposition with autocratic tendencies, but it was unable to avoid being removed from office at the next elections. In the course of the protests the differing socio-economic interests of the various groups became more and more marked. Many of the protest

groups primarily represented specific interests. This led to an increasing fragmentation and polarisation of the political spectrum, especially within the MAS. The opposition, on the other hand, was able to make ground more on the basis of an anti-government approach than by its own soundly based policies.

On taking office, the new government instigated a widespread programme of liberalisation in its economic policy, in order to attract foreign investment to the country. As one of its first steps, it opened up the lithium sector to foreign investors, and the state increasingly withdrew. However, fluctuations on international markets and low profit margins principally boosted short-term and speculative investments. In combination with the low level of state regulation, this meant that the companies involved paid little attention to the environment in mining lithium, entailing negative effects for the local populace. While the environmental management systems employed by some multinational corporations did dampen some of the impact, accidents repeatedly occurred, and smaller companies were able to exploit loopholes in environmental legislation and the implementation of it. Corruption as a means of protecting selling markets is widespread. As the world market's basic demand could be largely met by existing capacities in Argentina and Chile, Bolivian production remained small-scale and highly susceptible to fluctuations on international markets.

Yet the economic policy of the new government, too, proved largely ineffective in the face of weak and fluctuating global economic growth, and the government came under increasing pressure. The policy of liberalisation resulted in the social movements regaining strength, yet – because of their disappointment with the previous government regime – this time around they did not all organise within the MAS. The tendency of social interest groups to stand up for particular interests remained. The political system fragmented further. The MAS was unable to regain its former strength. Moreover, by this point it was almost impossible to exploit the conflict between the gas-rich regions and the poorer highlands as a mobilisation strategy, firstly because the revenues available for distribution were becoming ever smaller, and secondly because the social groups concerned had long since stopped thinking of themselves as belonging to those categories. The political situation inside the country in 2030 is unstable. Individual groups regularly exploit their power on the streets to impose specific interests, including by means of violence and by strikes which paralyse entire cities and regions.

Summary

Thus, between 2010 and 2030 Bolivia underwent a period of instability which was exacerbated by the economic volatility at international level. Whereas Bolivia had still had a positive outlook on the future back in 2010, in 2030 it is a country with a disappointed people who have lost confidence in their politicians. Fragmented social groups attempt to impose their particular interests, primarily on the streets. The development of lithium production is symptomatic of this period.

Risks in terms of:

- Raw material supply:
  Instability and fluctuations in demand causing collapses in revenues bring about economic problems and resultant cuts in state provision which have a destabilising effect on Bolivia as a producer land.
  (Time frame: short medium term; level: national)
- Crises and conflicts:
  Isolated outbreaks of violence and strikes by disappointed particular interest groups.
  (Time frame: medium term; *level*: national and local)

Conflicts and parties involved:

Conflicts are restricted to those between players within Bolivia: However, the precise conflict structures are diverse, as the internal political landscape is fragmented into large numbers of special interest groups.

Pointers:

- Global economy does not stabilise and remains subject to severe fluctuation.
- MAS loses support, culminating in being voted out of office.
- Lithium sector is opened up to private investors across the board.
- Problems providing basic state provision.

3.2 Scenario 2: Long-term dependence (Cooperation and surplus)

The economy has undergone stable growth in the last 20 years. The much more important factor, however, was the profound structural change in industrial nations and emerging economies. The shift to a sustainable economy and system of consumption has been undertaken across a broad scope. International environmental treaties were backed by ambitious national implementation strategies. Growth in the green-tech sector was correspondingly strong. The resultant boom in demand for lithium initially led to major investment in new mining and production capacities. In doing so, however, care was taken by means of international regulation to incorporate external costs into raw material production (such as based on certification systems), thereby minimising negative external factors. Success in implementing sustainable approaches led in the long term to substantial gains in efficiency and the development of extensive recycling systems. As a consequence, in 2030 there was a surplus of

lithium and the mining and production capacities previously built-up were no longer being utilised.

Bolivia played a key role in building up global lithium production. The government developed a flourishing sector in collaboration with international investors and backed by international support. Driven and supported by international treaties and the commitment of key investors, all parties involved took seriously the fundamental aim of sustainable development. Consequently, the environmental impact of mining and production was minimised. However, this could not prevent industrial lithium mining from have visible effects on the Salar de Uyuni salt flats. These negative effects on the local populace were, however, balanced-out by compensation schemes and the creation of alternative sources of income. Corruption was likewise kept under control, with the Extractive Industries Transparency Initiative (EITI) serving as a model in the process.

Nevertheless, the collapse in demand brought about by the establishment of effective recycling systems and substantial gains in efficiency, allied to significant overcapacities in global lithium production, posed new challenges for Bolivia. Production capacities could no longer be fully utilised, and jobs and revenues were under threat. The international community, in the form of major investors, responded rapidly and comprehensively. This response was founded on the partnerships and trust which had been built up during the period of successful development of sustainable lithium production. Extensive long-term transfer contracts were negotiated in order to cushion the impact of the collapse in demand. Alternative business sectors were identified and promoted. The chemical processing plants for lithium served as the starting point for the development of other chemical industries. Also, additional process engineering expertise was imported to enable the downstream processing steps to be carried out in Bolivia, culminating in the production of lithium batteries. Furthermore, in 2030 a number of lithium producing countries began consultations aimed at adopting a joint approach to permanently low lithium prices and overcapacities. The discussions also encompass the establishment of a lithium cartel, called LIPEC (Lithium Producing and Exporting Countries), to stabilise global lithium prices.

These developments went hand-in-hand with problems of early industrialisation and modernisation. The process of change engendered uncertainty among increasing sections of the rural population. The country's strong civil society observed these developments nervously, although the negative effects of the modernisation process were largely cushioned with international assistance. Nevertheless, the situation in 2030 is characterised by a degree of instability, because beneath the surface of a hopeful, modernising society there are signs of increasing tensions and uncertainties. Alongside this process of change, there is another issue which is dominating debate in Bolivia. Towards the end of the 2020s, the substantial transfer transactions and the country's high degree of dependence on investors led to doubts arising as to the sustainability of these developments. Some players across the political spectrum began protesting against this high level of dependence, demanding that Bolivia reclaim its sovereignty. A further factor, despite the early efforts to diversify the economy, was the still high level of dependence on raw material exports.

Summary

Thus in 2030 Bolivia, with considerable international assistance, has succeeded in developing lithium production. Sustainability aspects played a major role in this, firstly in that lithium was a key raw material in the process of structural change to turn the industrialised and emerging nations into sustainable economies; and secondly in minimising the negative ecological, economic and social effects. However, the process of modernisation instigated also brought new uncertainties and tensions for Bolivian society. The high level of dependence on transfers from investor countries at the same time fed concerns as to the stability and sustainability of these developments.

Risks in terms of:

- Raw material supply:
  Build-up of overcapacities creates risks on the producer country side.
  (Time frame: medium to long term; level: national)
- Crises and conflicts:
  Corruption risks relating to the award of concessions and resulting from increased revenues.
  (Time frame: short, medium and long term; level: national)
- Crises and conflicts:
  New social tensions and conflict risks arising from modernisation processes in early industrialisation.
  (Time frame: long term; level: national)
- Ecological impact:
  Developing industrial lithium production entails substantial environmental impact, with negative consequences for some sections of the local populace.
  (Time frame: short, medium and long term; level: local)

Conflicts and parties involved:

Conflicts are restricted to those between players within Bolivia:

- Conflicts between losers and winners in the development process.
- Conflicts between the local populace affected by the negative environmental impact and the production companies/government.

Pointers:

- Extensive measures and initiatives at international and national level aimed at bringing about structural change in the economy to realise the goal of sustainable development.
- Build-up of major mining and production capacities while at the same time developing extensive recycling systems.
- Establishment of industrial production in Bolivia.

3.3 Scenario 3: On the gas tap (Conflict and shortage)

Following the global economic crisis of 2008/2009, the emerging economies recovered more rapidly than the established industrial nations, and resumed their robust rate of growth. Developing countries likewise recorded high growth rates. The green-tech sector initially rose, but soon encountered a bottleneck in supplies of lithium, as new resources were not being worked fast enough and there was no diversification of producers taking place. As a result, the use of fossil fuels continued to predominate, and even increased further. There was no structural shift towards low-carbon technologies and electro-mobility. After the initial boom, demand for lithium grew only modestly. As a result, little investment was made in lithium recycling. The price of conventional energy sources rose dramatically over the entire period, though – as at the start of the 21st century – it remained subject major fluctuation, among other

reasons due to a lack of global regulation. These price fluctuations also regularly stimulated discussions on forming a cartel of gas-producing countries.

In 2030 Bolivia still has no industrial lithium production capacity. This was one reason for the bottleneck in lithium supplies on the international market. In 2010, hopes had still been high; consultations with foreign investors had begun; a state-run pilot plant was under construction. But those expectations remained unfulfilled. The Bolivian government did not succeed in building up dedicated capacities in the form of well-trained specialist personnel and lithium know-how. There were also corruption problems. The foreign investors were unable to compensate for these problems even by deploying their own personnel and know-how. An exacerbating factor in this was that the Bolivian government often blocked foreign investors by its tight controls and extensive regulation. At the same time, pressure from the local populace was rising. They saw their hopes as being unfulfilled, and indeed had been suspicious of the project from the very beginning based on their fear of its ecological impact and the involvement of foreign firms. A number of protests, some of them violent, eventually provided the foreign investors with the reason they needed to pull out of Bolivia altogether.

Having encountered problems early on in its attempts to build up lithium production, and driven by rising gas prices, the government decided to focus entirely on developing the gas sector. It effectively retained the development model already in place back in 2010. As a result, Bolivia's dependence on gas increased further and the country slid ever further into a rent-seeking economy. Corruption in the gas sector could not be brought under control, and remained at high levels. At the same time, gas revenues enabled the government to increase state provision, particularly social security benefits. This had little effect on the labour market however, and the high expectations of the poor in society of finally being able to emerge from their poverty could not be met.

The internal political debate in the country regarding the distribution of profits from the gas sector increased in vehemence as gas revenues rose and the importance of the sector grew, and became one of the defining elements of Bolivia's political system through to 2030. At the same time, the disappointment of the various indigenous movements with the government's inability to translate rising profits into sustainable economic development turned into increasing power struggles within the MAS, as well as within the opposition too. This is an example of the generally fragmenting political landscape in Bolivia during this period. Some political decision-makers are attempting to counteract the fragmentation by stirring up the conflict between gas-rich and gas-poor provinces and exploiting the arguments regarding gas revenues. The price fluctuations on international markets repeatedly led to shortfalls in government revenues, and had an impact on wide areas of the social system, which was primarily funded by those revenues. The attempts at polarisation by some political leaders, the rhetoric aimed at stirring up the distribution conflict and the price fluctuations on international markets regularly erupt into protests and violence.

The instability of Bolivia was a cause of concern to its neighbours. The pressure on Bolivia from external sources as well as internally increased particularly when new governments in Brazil and Argentina shifted those countries in a more conservative

direction. Relations, which at the beginning of the second decade had still been based on cooperation, turned more confrontational. Brazil was nervous, and wanted to ensure that its investments in the Bolivian state sector were not being threatened by internal instability and corruption. Since Bolivia is dependent on these export markets, the pressure certainly has an effect. The Bolivian government tries to ensure that internal instability does not have too big an impact on gas supplies and on the economic interests of its neighbours.

Summary

Thus, in this scenario Bolivia definitely has no significant lithium production in 2030, and is even more dependent on profits from the gas sector: Bolivia is economically hanging on the gas tap. As in other rent-seeking economies, levels of corruption are high and revenues from raw material production are used little in trying to achieve sustainable development. This is also reflected in internal political instability. The political system was dominated by the debate surrounding distribution of revenues from raw material production, which is dictated by populist leaders seeking to counteract the increasing political fragmentation by means of polarisation. The external pressure on Bolivia also rises: on the one hand due to fluctuations in gas prices on international markets, and on the other from neighbouring countries concerned at Bolivia's domestic instability.

Risks in terms of:

- *Raw material supply:*
  Dependence on gas exports continues to rise, increasing susceptibility to price shocks.
  (*Time frame*: short, long and medium term; *level*: national)
- *Crises and conflicts*.
  Slide into a rent-seeking economy, with concomitant corruption problems.
  (*Time frame*: short, long and medium term; *level*: national)
- *Crises and conflicts*:
  Increasing conflicts relating to revenues from the gas sector are stirred up by attempts at polarisation. Protests and outbreaks of violence follow.
  (*Time frame*: medium term; *level*: national)

Conflicts and parties involved:

- Various political players within Bolivia struggle for control of the revenues from the gas sector.
- Neighbouring countries exert pressure on the Bolivian government because of its domestic instability.

Pointers:

- Strong global economic growth without major investment in new mining and production capacities.
- Severe price fluctuations on international markets.
- Rising dependence of the state on revenues from gas exports.
- Increase in aggressive rhetoric in Bolivia's political discourse.

3.4 Scenario 4: A stony path (Cooperation and shortage)

The global economy strongly and in a stable manner up to 2030. Raw material prices rose correspondingly. The green-tech sector was one of the key pillars of that growth. This led to massive investment in the mining and production of lithium. Yet even those high levels of investment were not sufficient, and demand for lithium exceeded supply. Nor could the creation of recycling systems for lithium or gains in efficiency relieve the strain on supplies. There were no major tensions at international level however. Most countries saw cooperation as their best chance of solving shared problems.

Bolivia was part of the 'lithium rush' from the very beginning, and with the aid of international joint ventures, in which state-owned company COMIBOL held the majority share, succeeded in establishing industrial-scale lithium mining and production by 2030. This development was not without its obstacles and problems however. The very high levels of investment for Bolivia could initially only be absorbed and managed to a limited extent. Corruption initially increased as revenues rose. Irregularities occurred in relation to the awarding of concessions especially. The capacities of COMIBOL and of the relevant Bolivian ministries were overcome by the enormity of the planning needed in the early years. However, with international assistance, the country gradually

succeeded in building up the necessary long-term planning capacities. The government's anti-corruption campaigns also began to enjoy some successes. There was also backing from Bolivia's neighbours, who shared their experience in lithium mining.

There were problems in the environmental sphere too. The industrial scale of the mining and production operations had far-reaching effects on the environment of the Salar de Uyuni. The tourism sector was hit most, and suffered major losses. Some alternative employment was created in developing the infrastructure (roads, electric power, etc.) for the lithium mining and production operations. Nevertheless, some sections of the population remained who were initially confronted solely with the negative effects, without receiving any compensation or being offered any alternatives. This repeatedly resulted in protests, involving violence against people and infrastructure. Once production had started, however, funds were available to make short-term compensation payments and to instigate longer-term retraining measures for the locals, as a result of which the tensions eased.

There were also tensions at national level. The negotiations as to how the revenues from lithium production should be distributed resulted initially in disputes between the western and eastern provinces. The eastern provinces demanded compensation for having had revenues from "their" natural resource appropriated to the western provinces over a period of many years. The argument put forth by the western provinces was founded on the unequal distribution of the profits and on their own poverty. This proved successful: Ultimately, the western provinces – especially Potosì – were allocated the largest share of the lithium revenues. Economically, this is beneficial to Bolivia mainly by virtue of additional revenues. Gradually, the government also began investing those revenues in the economic development of other sectors. However, in 2030 Bolivia is still heavily dependent on raw material exports.

At international level in 2030, Bolivia is happy to be accepted as a partner, though it has little real influence.

Summary

In this scenario Bolivia thus looks back on 20 turbulent years. The establishment of lithium mining and production entailed many problems and conflicts, though most of them were successfully negotiated. In 2030 Bolivia can thus look to the future with confidence.

Risks in terms of:

- Raw material supply:
  Increasing susceptibility to price shocks
  (Time frame: medium to long term; level: national)
- Crises and conflicts:
  Corruption risks increase.
  (Time frame: medium to long term; level: national)
- Crises and conflicts:
  Increasing lithium revenues lead to conflicts relating to their distribution.
  (Time frame: medium to long term; level: national)
- Ecological impact:
  Severe environmental impact from industrial lithium production, with negative effects for sections of the local populace.
  (Time frame: short, medium and long term; level: local)

Conflicts and parties involved:

Conflicts are restricted to those between players within Bolivia:

- Conflicts between the eastern and western provinces.
- Conflicts between the local populace affected by the negative environmental impact and the production companies/government.

Pointers:

- Strong global economic growth and major investment in green-tech and in lithium ('lithium rush').
- Wide-ranging expansion of capacities, anti-corruption and environmental protection measures are taken and compensation is paid.
- Tensions between eastern and western provinces are constructively managed.

4 Conclusion

In der Zusammenschau der Fallstudie und der entwickelten Szenarien stechen zwei Risikolinien besonders heraus. Diese wurden zum einen als potentielle Hauptrisiken in der Fallstudie identifiziert, zum anderen tauchen sie in fast allen Szenarien auf, unabhängig davon in welche Richtung sich die Welt bis 2030 entwickelt. Als erstes sind hier die Risiken ökologischer Auswirkungen zu nennen, die beim Aufbau einer industriellen Lithiumproduktion entstehen würden. Umweltauswirkungen, wie Habitatzerstörung, Emissionen und Wasserverbrauch, haben erhebliche Auswirkungen auf die Lebensgrundlage der lokalen Bevölkerung, die größtenteils von der Landwirtschaft, dem Tourismus und der Salzernte abhängt. Die lange Geschichte von Protesten in Potosí macht deutlich, dass die lokale indigene Bevölkerung gut organisiert und bereit ist Konflikte auszutragen, falls ihre Interessen und Befürchtungen nicht berücksichtigt werden. Dabei besteht auch die Gefahr einer gewalttätigen Eskalation der Konflikte. Diese Punkte spiegeln sich auch in den Szenarien wieder, die sich nur darin unterscheiden inwieweit die ökologischen Auswirkungen einer industriellen Lithiumproduktion durch entsprechende Gegenmaßnahmen und Kompensation für Beschädigte ausgeglichen werden – also wie gut diese Risiken bearbeitet werden.

Als zweite Gemeinsamkeit ergibt sich die Rohstoffabhängigkeit der bolivianischen Wirtschaft. Diese macht das Land anfällig für mögliche Preisschocks. In allen Szenarien zeigen sich Risiken durch die starke Abhängigkeit von Rohstoffexporten. In zwei Szenarien führen diese Abhängigkeit und starke Preisschwankungen auf den internationalen Märkten zur Destabilisierung des politischen Systems Boliviens. Der Staat ist durch die sinkenden staatlichen Einnahmen aus dem Rohstoffexport nicht mehr in der Lage seine Leistungen in ausreichendem Maße zu erfüllen.

Rohstoffabhängigkeit und ökologische Auswirkungen stellen beide ein beachtliches Risikopotential, sowohl für lokale Konflikte mit der Bevölkerung als auch einer generellen Destabilisierung auf der nationalen Ebene. Damit bleiben diese Risiken aber auch in ihren direkten Auswirkungen auf das Produzentenland Bolivien beschränkt. Erst in einem zweiten Schritt wirken diese Risiken auf die Verbraucherländer und stellen hier vor allem potentielle Versorgungsrisiken dar, wenn die Versorgung durch lokale Proteste oder eine nationale Destabilisierung unterbrochen werden würde.

Zusammenfassend ist zu sagen, dass, auch wenn der Aufbau einer Lithiumproduktion eine große Entwicklungschance für Bolivien darstellt, es sich auch neuen Risiken aussetzt. Zum einen durch eine erhöhte Abhängigkeit von Rohstoffexporten, aber auch durch die Erwartungen, die bei der lokalen Bevölkerung geschaffen werden. Diese Erwartungen könnten durch eine ausbleibende oder einbrechende Lithiumnachfrage, dem Scheitern des Aufbaus einer industriellen Produktion sowie durch primär negative Auswirkungen bei ausbleibenden positiven Entwicklungseffekten enttäuscht werden. Diesen Risiken sollten sich alle Akteure bewusst sein, um ihnen proaktiv zu entgegen wirken zu können, sonst könnte Lithium nur ein weiteres Kapitel in der langen

Geschichte vergebener Entwicklungschancen und Ressourcenkonflikten in Bolivien werden.

The case study, scenario analyses and considerations of existing risk reduction approaches (report 5) result in a number of recommendations for action in relation to Bolivia and lithium:

- *Build bilateral and multilateral technology cooperation*. For example, Bolivia might be affiliated to IRENA. This could enable Bolivia to profit from relevant financial assistance and technical expertise, and be more closely involved in international political dialogue.
- *Develop recycling systems for lithium in the consumer countries.* Germany is already gathering early experience in the Lithorec project (http://www.lithorec.de/) sponsored by the Federal Environment Ministry (BMU), which should be funded further and integrated into international cooperation agreements. The private sector should also be included in such undertakings.
- *Ensure a conflict-sensitive approach to exploitation.* There is extensive research and experience available relating to the potential for conflict arising from the exploitation of new raw material deposits, and a wide range of methods and instruments have been derived from it. The experience gained in bilateral and multilateral development cooperation, public-private partnerships etc. should be placed at Bolivia's disposal unconditionally right from the strategic planning phase.
- *Anti-corruption measures and good governance in the raw materials sector.* In this area, too, there are measures and policies in place both internationally and also nationally (such as a new law in 2005 and the creation of the Ministry for Institutional Transparency and the Fight Against Corruption). They should be supported by international investors and expertise, in order to minimise conflict risks and to make full use of Bolivia's lithium development potential.
- *Enable utilisation of experience from lithium production in Chile and Argentina.* This might not only promote south/south cooperation and increase capacities in that context, but also generally contribute to regional cooperation and help dispel hostile perceptions among the population at large.

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