



# In Search of Aluminum: China's Role in the Mekong Region

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**In Search of Aluminum:  
China's Role in the Mekong Region**

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## Project Description

This study is part of a research project entitled Understanding China as an Actor in the Mekong Region, jointly implemented by the Heinrich Böll Stiftung, World Wide Fund for Nature (WWF) and the International Institute for Sustainable Development (IISD). The project aims to shed some light on China's economic role in Vietnam, Laos and Cambodia as a basis for constructive dialogue among decision makers and other stakeholders in China and the Mekong countries. This paper builds on a scoping study commissioned for the project which provides an overview of investment, trade and aid flows from China to the three Mekong countries, with a particular focus on the agribusiness, hydropower and mining industries. The scoping study and the executive summary in English, Khmer, Vietnamese, Lao and Chinese are available at [www.boell-cambodia.org](http://www.boell-cambodia.org), [www.tradeknowledgenetwork.net](http://www.tradeknowledgenetwork.net) and [www.wwf.dk](http://www.wwf.dk).

## Abbreviations & Acronyms

ASEAN	Association of South-East Asian Nations
CDC	Council for the Development of Cambodia
Chalco	Aluminium Corporation of China Ltd
Chalieco	China Aluminum International Engineering Corporation Ltd
Chinalco	Aluminium Corporation of China
CIB	Cambodian Investment Board
CNMIM	China Nonferrous Metals International Mining Co. Ltd
DEM	Department of Energy and Mines (Laos)
DGM	Department of Geology and Mines (Laos)
ECC	Environmental Compliance Certificate (Laos)
EIA	environmental impact assessment
EPC	engineering procurement construction
ERW	explosive remnants of war
IEE	initial environmental examination
IISD	International Institute for Sustainable Development
ITD	Italian-Thai Public Company
LSI	Lao Services Co. Ltd
MEM	Ministry of Energy and Mines (Laos)
MIME	Ministry of Industry, Mines and Energy (Cambodia)
MOD	Ministry of Defence (Laos)
MOE	Ministry of the Environment (Cambodia)
MONRE	Ministry of Natural Resources and the Environment (Vietnam)
MOU	memorandum of understanding
MPI	Ministry of Planning and Investment (Laos)
mtpa	million tons per annum
NFC	China Nonferrous Metals Industry's Foreign Engineering and Construction Co. Ltd
NGO	non-governmental organization
ORD	ORD River Resources Ltd
PMO	Prime Minister's Office
RCI	Ruouy Chai International Group
SAETC	Southeast Asia Economic and Technical Cooperation Ltd
Sarco	Sino Australian Resources (Laos) Co.
SEA	strategic environment assessment
Sinoma	Sinoma International Engineering Co. Ltd
Slaco	Sino-Lao Aluminum Corporation Ltd
SOE	state owned enterprise
Vinacomin	Vietnam National Coal, Mineral Industries Group
VND	Vietnamese dong
WWF	World Wide Fund for Nature
WREA	Water Resources and Environment Administration (Laos)
ZGEEA	Zhongfei Geological Engineering Exploration Academy

## Glossary

<b>Alumina</b>	Aluminum oxide refined from bauxite ore; feedstock for the smelting of aluminum metal.
<b>Alumina refining</b>	Bauxite ore is finely crushed and dissolved in a solution of sodium hydroxide (caustic soda, or lye) under high temperature and pressure. Insoluble iron oxide, titanium, sodium, silica and other oxides are filtered out as sludge called 'red mud'. The solution is then clarified and sent to a precipitation tank where a small amount of aluminum hydroxide is added as a 'seed' that facilitates the crystallization of aluminum hydroxide and sodium hydroxide. The crystals are then washed, vacuum dewatered and sent to a rotating kiln. The result is a fine white powder called alumina (aluminum oxide).
<b>Aluminum smelting (primary aluminum)</b>	The strong bonds between aluminum and oxygen in alumina make its refining into aluminum possible only by using enormous amounts of energy, more than that required in the production of any other metal, or in fact in any other industrial process. Through what is termed the Hall-Héroult process, alumina is placed within electrolytic cells, or 'pots', filled with molten cryolite (Na <sub>3</sub> AlF <sub>6</sub> ). Within each pot, a positive electric current is passed through the cryolite by means of a submerged carbon anode at a temperature of over 1,200°C (nearly 2,000°F). The oxygen atoms are attracted to the carbon anodes, and the molten aluminum can then be poured from the bottom of the pot. Primary aluminum processing is the most polluting phase of the aluminum production chain, resulting in air emissions and solid wastes.
<b>Bauxite</b>	Aluminum ore, found principally in tropical and sub-tropical areas.
<b>Bayer process</b>	Procedure used to refine bauxite ore into alumina.
<b>Deposit</b>	Mineralized body that has been physically delineated by sufficient drilling and/or underground work and found in sufficient average grade of metal to warrant further exploitation.
<b>Extraction</b>	The aluminum production cycle begins with the extraction of bauxite ore, which contains 45–60 percent aluminum oxide and is typically mined in open pits, requiring the complete removal of vegetation and topsoil. Four to five tons of bauxite are required to produce two tons of alumina, which in turn can be refined to produce one ton of primary aluminum.
<b>Exploration</b>	The act of searching for the location of undiscovered mineral deposits.
<b>Hall-Héroult electrolytic process</b>	This is the electrolytic process through which molten aluminum is produced from alumina oxide by separating alumina into its component parts of aluminium metal and oxygen gas.
<b>Primary aluminum</b>	Aluminum ingots produced from bauxite or other aluminum ores via a smelting process.
<b>Red mud</b>	Bauxite residue from refining to alumina via the Bayer process. For every ton of alumina produced, between two and three tons of bauxite ore must be processed. The waste remaining after the process is disposed of as red mud.
<b>Refining</b>	The last stage of metal production in which impurities are removed from the molten material.
<b>Smelting</b>	The conversion of alumina to primary aluminium using an electrolytic process.

See Annex 1 for the process of bauxite mining, alumina processing and aluminum refining.

# Executive Summary

China has a huge thirst for natural resources and sources them from across the world. Despite a reduction in economic growth from a high of 13 percent in 2007 to 9 percent in 2008, the lowest rate since 2002, China continues to invest overseas to meet its growing need for natural resources. Cash rich China is currently taking advantage of the global financial crisis by becoming a major force driving new lending and investment. In 2008 China's overseas mergers and acquisitions were worth US\$52.1 billion, and in the first two months of 2009 Chinese companies invested US\$16.3 billion abroad. These investments include those made by both Chinese corporations and the Chinese government, and in many cases include extractive industries for which costs were once prohibitive, but which are now making economic sense. Through these investments, China is playing an important role in providing readily available cash to pull mining companies out of debt around the world. In recent years, China has become the world's largest user of almost all metals. In 2002 it became the world's chief consumer of copper, and it is now one of the largest consumers of alumina, zinc and nickel. As a result, China is playing an increasingly important role in global metals markets by driving demand and boosting global commodity prices (although recently most of these prices have slumped due to the 2008/09 global financial crisis).

China's economic relationship with the world also continues to undergo a rapid transformation. The 10<sup>th</sup> Five Year Plan for National Economic and Social Development (2001–05) set out a strategy for China to proactively make use of overseas natural resources, driven by its 2004 'Going Global' (or 'Going Out') strategy. This strategy, which intends to meet the country's growing demand for natural resources, both regionally and globally, aims to spur outward investment by subsidizing investment by Chinese companies in the acquisition of natural resources overseas.

## China's insufficient domestic mineral resources necessitate overseas investments

Chinese mining firms are strategically looking for opportunities abroad to invest in joint ventures, acquire mining projects and companies, and secure long-term contracts at set price levels. In order for China to maintain a steady supply of mineral and metals for its economy, strong growth in its foreign direct investment is necessary, given that its domestic exploration and expansion of existing mines has not been sufficient to balance depletion and maintain growth. The Chinese government has encouraged the formation of bigger economic corporations through the merger of domestic companies and the acquisition or buying of shares in foreign companies. In the early to late 1990s China began investing in various mining projects overseas, and by the 2000s that investment had increased significantly.

China continued on this path until late 2008, when the government issued a directive to mainland mining and mineral processing companies to freeze all overseas investments until they see a rally in global demand. This move was a response to a rapid deceleration in domestic demand, and the government saw a need to shift the focus to investing in resources domestically. This came at a time when many companies were buying or planning to buy overseas mining assets at top of the market prices. In early 2009, with its longer term need for resource imports barely diminishing, China had once again resumed negotiations for investments in international companies such as Rio Tinto<sup>1</sup> and OZ Minerals.

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<sup>1</sup> The deal between Rio Tinto and Chinalco was called off in June 2009. Rio Tinto announced instead a \$15.2 billion rights offering and a large joint venture with competitor BHP Billiton.

## Bauxite, the source of aluminum

Bauxite, the chief material used in the production of aluminum, is one of the economically most important minerals. According to the U.S. Geological Survey, global bauxite reserves are estimated at about 55–75 billion tons (pure ore), of which South America contains 33 percent, Africa 27 percent, Asia 17 percent, Oceania 13 percent and other areas 10 percent. With the current speed of exploitation, it is expected that bauxite reserves can meet the needs of the aluminum industry for the next 170 years. At present, there are 24 countries exploiting bauxite both locally and in other countries around the world, of which the 12 most productive countries produce 97 percent of total bauxite production. China's alumina<sup>2</sup> output reached 19.46 million tons in 2007, accounting for one fourth of the world's total output; electrolytic aluminum output was 12.56 million tons, 32.8 percent of the world's total; and processed aluminum products were 11.76 million tons. China consumed 26.12 million tons of alumina in 2007, accounting for 35 percent of total world consumption; and 12.1 million tons of electrolytic alumina, 32 percent of the world's total.

Due to the increasing demand for aluminum, the scale of bauxite exploitation globally has grown by 6.5 percent per year in recent years. Presently, the world's aluminum market has been moving to China, where there is high demand for high-tech manufactured goods such as aircrafts and automobiles. Chinese aluminum and alumina consumption has a direct influence on global alumina market trends. In the mid-2000s, the level of China's aluminum use increased, exceeding its domestic production, which resulted in a growing need to import alumina or aluminum. It is also estimated that in the next ten years, with booming construction, transportation and packaging industries in China, demand for aluminum and alumina will increase even more strongly.

In the aluminum sector, the Aluminum Corporation of China (Chinalco) is the largest aluminum company in China and is a financially powerful corporation globally in the mining sector. Chinalco proved its financial potential after merging with and acquiring many domestic companies and expanding into the international market. For example, in 2008 it announced plans to invest US\$19.5 billion in the Rio Tinto Corporation, one of the world's largest mining companies. In 2007 the Aluminum Corporation of China Ltd (Chalco) – a joint stock limited company formed in 2001 – bought 7 percent of the shares in U.S. company Alcoa Corporation. Chinalco also boosted its global expansion by buying some mineral mines in Australia, Canada and Peru, and the Chinese state-owned company Minmetals is purchasing OZ Minerals, which operates the Sepon gold and copper mine in Laos, for US\$1.2 billion.

## The Mekong region: A new source of bauxite

Cambodia, Laos and Vietnam are rich in mineral resources; however, the exploitation of these resources has typically been on a small scale and long delayed due to conflict, lack of foreign investment, and limited capital and capacity to establish extensive mining operations. The regulatory framework in the three countries has also hindered investment because of bureaucratic inefficiency and lack of implementation, which has complicated the process of obtaining concessions and permission for mining operations. Mining laws in the region are generally lacking in terms of clear tax regulations and royalty structures (often these are calculated on a project basis), and regulatory systems are complicated. In part, this is because the region's governments have little experience with foreign investment in this sector: Laos's first mine went into operation at Sepon in 2002; Vietnam's first large scale mine was only recently established; and Cambodia's mineral resources are not well explored and no large scale mining is occurring in the country. Furthermore, in the region's centralized economies, where mineral resources are owned by the state, there is often reluctance to transfer natural resource rights to foreign investors. This has led to a variety of mechanisms for retaining some

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2 Alumina is the product of bauxite processing; aluminum is electrolyzed from alumina.

state control, such as required partnership with state-owned enterprises or government ownership of shares. Vietnam, where state-owned enterprises are expected to be involved in any large-scale resource extraction, is less attractive in this regard for foreign investors than Cambodia and Laos, where there is no competition from government industries.

In all three countries, public disclosure of information is severely lacking, making it difficult to fully assess how companies plan to mitigate the environmental and social impacts of their activities. And where there is a plan, government capacity and will to regulate the industry and ensure compliance by the companies are minimal. The fact that the Government of Laos provided Sino-Lao Corporation Ltd (Slaco) with comments on its environmental impact assessment (EIA), which had raised significant concerns about 50 items, is an improvement in this regard. Sino-Lao Corporation Ltd is registered as a private Lao company currently comprising Chalco (51 percent), Ruouy Chai International Group (RCI)/Italian Thai Public Co. (ITD) (39 percent), and Lao Services Co. Ltd (LSI) (10 percent). How the company is planning to address these concerns is not clear, however. In Vietnam, experience has shown that EIAs carried out are only prepared to meet the minimal government requirements and environmental issues are only mentioned in a general sense, implementation is not monitored closely, and environmental restoration plans and improvement projects do not always accompany the EIA. A clear example of a conflict of interest is the case of the first alumina project in Lam Dong province, where a company controlled by the investor, the Vietnam National Coal, Mineral Industries Group (Vinacomin) (a state-owned Vietnamese company), conducted the EIA.

Current investment trends for the mining industry are improving. Because countries such as Laos and Cambodia rely predominantly on the extraction of natural resources (water, forests, minerals, etc.) for income generation, they have been attempting to make investment in mining more attractive. Recently, Laos has made efforts to improve its regulatory environment with a revised Mineral Law presented to the National Assembly in December 2008, which is expected to be approved in June 2009. Cambodia is also in the process of revising its Mining Law. Investors such as the World Bank and the Asian Development Bank remain cautious about investing in mining, but are making efforts to improve practices in the region. For example, in Laos, the World Bank is developing technical assistance to the Ministry of Energy and Mines to provide capacity and support in a number of areas related to mining.

The Mekong region is becoming a strategic partner for China in terms of mineral investments; however, the full extent of the potential output for and demand by China is difficult to estimate. Vietnam has the largest bauxite potential, estimated at about 5.4 billion tons, with 98 percent concentrated in the Central Highlands region. Based on the value of aluminum in 2007, bauxite resources in the Bolaven plateau in southern Laos were estimated at US\$3,200 million. In Cambodia, there are no official figures on the value of bauxite, which is present in Mondulkiri province in the northeast of the country.

The Mekong region provides opportunities for the exploitation of cheap natural resources and is strategically located close to China, thus providing great opportunities for China to extract the bauxite resources and turn the mineral into alumina and aluminum fairly easily and cheaply. While high quality bauxite deposits are found in Cambodia, Laos and Vietnam, access to these sites, energy availability and likely costs are significant constraints to harnessing the bauxite potential.

## Chinese investors dominate the region

China's relationship with the three Mekong region countries, Cambodia, Laos and Vietnam, is dynamic and complex, and Chinese financiers have moved into the region to take advantage of the favourable investment climate and abundance of natural resources of China's most immediate neighbours. China brings a different kind of investment package to the table that is

built on relationships and friendship. China is also seen as a 'soft power' of culture and ideas, one making friends all across the region, with friendship spearheading business activities. This also holds true for the bauxite industry, where Chinese investors have improved road infrastructure in southern Laos and promised to lobby the Chinese government to provide credit to Vietnam at a preferential rate to build a railway from the Central Highlands to the sea to facilitate the transport of bauxite.

Chinese bauxite investors are present in two of the three study countries. They dominate in Laos by partnering with Lao and Australian companies to form various consortia. In Vietnam, Chinese companies are largely involved in engineering procurement construction bids to build alumina factories, while in Cambodia there are no Chinese bauxite investors. The main Chinese bauxite companies operating in the region are Chalco, China Aluminum International Engineering Corporation Ltd (Chalieco), Chinalco and China Nonferrous Metals International Mining Co. Ltd (CNMIM).

Furthermore, China's proximity to Cambodia, Laos and Vietnam and its potentially numerous investments in transport infrastructure will make it easier to transport alumina or aluminum to factories in China by land, rail and waterways. China borders Laos and Vietnam. The mines in Laos and Cambodia will be strategically located close to Vietnam's railways and ports, once there is a road to Vietnam. Other countries are facilitating the development of important hydropower facilities in Laos, for example.

Politically, only China and Vietnam have publicly presented a common platform for exploiting bauxite in Vietnam. The two countries have emphasized economic cooperation for development and the stability of political relationships. In 2006 high-ranking Chinese and Vietnamese leaders signed a memorandum of understanding (MOU) with Vinacomin to collaborate on bauxite mining in the Central Highlands. The MOU focuses on bauxite mining and aluminum refining plants worth US\$1.3 billion. While Laos has also prioritized bauxite mining, its strategy for exploitation is still emerging as it determines the best options for the country.<sup>3</sup> Cambodia does not currently receive investment from China in bauxite mining.

## Aluminum's thirst for energy

One of the main prohibiting factors of maintaining a full value chain of bauxite mining – alumina refining and finally smelting into aluminum – is the availability of reliable and cheap power. While actual bauxite mining and alumina production do not require significant energy sources – about 200–250 megawatts for one ton of alumina<sup>4</sup> – the aluminum smelter requires a huge amount of cheap energy, which will come mostly from hydropower. With the most modern technology available today, the aluminum smelter requires about 14,000 megawatts to smelt one ton of aluminum. Since Laos and Cambodia will exploit their vast rivers for the development of hydropower to be exported to neighbouring countries,<sup>5</sup> it would seem cost effective for China to use an alumina refinery and aluminum smelter in one (or all) of the three countries. However, in order to make the production of aluminum cost effective, electricity from hydropower needs to be sold at 2.5–3.5 U.S. cents/kilowatt. Currently, Lao is selling electricity at 5–6 U.S. cents/kilowatt. This results in an unviable industry. One path that companies may take is to stop at the alumina stage and sell it directly to the buyer (although alumina is difficult to transport).

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3 In June 2009 the Government of Laos held a seminar with the World Bank to discuss bauxite mining strategies and global lessons.

4 Alumina refining uses coal fired electricity plants that provide both energy and hot air.

5 China is a major investor in hydropower projects in Laos and Cambodia.

## Environmental and social impacts of bauxite mining

Bauxite does not come without side effects, and transboundary impacts are expected to be significant, including loss of fisheries and changes to the hydrology of the rivers and water quality, which will affect the livelihoods of indigenous people living in the mining area. Mining bauxite involves the discharge of toxins that must be stored safely and permanently. There are significant potential impacts beyond the mining site, including contamination of the surrounding and downstream areas. Given the close proximity of the bauxite mining operations in Laos, concerns have already been raised in neighbouring Cambodia, where industrial waste discharge and increased water use of the transboundary Sekong River (part of the 3-S river basins) may cause significant impacts downstream. For example, the generation of large quantities of highly alkaline red mud (and associated contaminants) represents the most significant risk to downstream surface water and groundwater quality. Thousands of people rely on the Sekong River for their local livelihoods and would be adversely affected downstream by contaminated water.

## Towards improved decision-making and environmentally and socially sustainable investment in bauxite mining

Vietnam and Laos, and to a lesser extent Cambodia, are experiencing an unprecedented interest in exploiting their bauxite resources. Much of the demand is driven by China's need to feed its growing industry, and the three Mekong countries are perfectly situated to facilitate the product to the market. While these projects will provide revenue to the governments of Cambodia, Vietnam and Laos, how local communities will benefit is unclear. Unfortunately, most of the bauxite resources found in the triangular region of southern Laos, the Central Highlands of Vietnam and Monduliri province in Cambodia lie in environmentally sensitive areas that are home to a large number of people, in some cases ethnic minority groups. Local communities often appear to bear a disproportionate burden of the costs, both economic and environmental, of such projects.

All three governments have adopted social and environmental laws and regulations for the mining industry, along with other relevant policies such as EIAs. However, in all cases, these sound policies are not being fully implemented. As the bauxite mining industry is just starting to take shape and none of the countries has moved beyond the exploration phase, there is still time to ensure that mining laws are updated and capacity is built to implement policies to ensure the best possible outcome.

China's own environmental and social policies are becoming more progressive, and China could play a leading role in shaping the industry in a more sustainable manner. As many Chinese companies 'go out' to find investment, they will need to comply with their host countries' laws and regulations. However, where these regulations are weaker than China's, an opportunity can be created for China to become a global leader in environmentally and socially sustainable investment in bauxite. This can be achieved by adopting and ensuring compliance with global best practices and principles such as the Equator Principles for banks and the International Council on Mining and Metals Sustainable Development Framework. Additionally, China should carefully monitor Chinese overseas investments and strengthen its own investment regulations. However, the onus cannot be on China alone, and it will be important for China to strategically partner with governments within the countries its companies operate in to help resource providers strengthen their own national regulations and adopt global best practices. This does not necessarily have to come at the expense of investment inflows, but could ensure that high environmental and social standards are met.

In Cambodia, Laos and Vietnam, bauxite mining has been identified as an emerging area of exploration, and investment is being promoted by the national governments. The triangle area of northeastern Cambodia, southern Laos and the Central Highlands of Vietnam has emerged as a strategically important area for cross border bauxite mining. It is also an area undergoing significant development, including road building to facilitate trade, hydropower development within the '3S' – the Sekong, Sesan and Srepok – river basins for electricity and various large scale crop production projects.

Bauxite mining has the potential to become a large-scale mining operation in all three countries, providing much needed income for the host country and important mineral resources for markets, mainly in China. In Vietnam, bauxite mining is a national priority of the government and cooperating with China is seen as an important avenue towards achieving success in this sector. In Laos, the Bolaven plateau has the potential to become one of the largest bauxite deposits in the world, and China is expected to bring the technological know-how and resources to assist in the government's national priority of expanding and improving the mining sector. Finally, Cambodia's northeastern region also provides important bauxite mining resources, with Australian investors dominating the area, while the Chinese are playing an important role in improving road infrastructure that may facilitate the transportation of resources to markets.

While bauxite mining can bring significant economic benefits for enterprises and the state, such as rural infrastructure, the formation of new local industry and the generation of jobs, among others, the negative impacts on the environment and society could seriously undermine these economic potentials. For example, in Cambodia, Laos and Vietnam, the geographic area where bauxite deposits have been located lies on important agricultural and forest lands. In future, there could be conflicts among local communities using the land for their subsistence needs and large-scale mining operators supported by local and national governments. Bauxite mining is accompanied by hydropower development, the damming of reservoirs, pollution, runoff and coal-fired power plants, all leading to significant changes in land, water and livelihoods. Loss of vegetation will reduce forested areas, impact biodiversity (some areas contain rare or endangered animals and plants) and decrease the availability of water resources. Finding suitable environmentally friendly technology is essential if bauxite mining and alumina and aluminum processing are to progress.

This study aims to provide a brief overview of bauxite mining in three key locations in Cambodia, Laos and Vietnam. It takes a deeper look into the role that China is playing in investing in bauxite mining and regional infrastructure to strategically position the country as the main market for bauxite, alumina and aluminum from these three countries. Understanding the regional linkages behind bauxite mining decision-making in Cambodia, Laos and Vietnam is key to recognising the extent of both positive and negative impacts. The study also unpacks the degree to which environmental and social considerations have been taken into account in the decision-making process around bauxite mining projects.

Three national studies, including field visit reports from Mondulkiri province in Cambodia, Champassak and Attapeu provinces in Laos, and Dak Nong province in Vietnam, were analysed and integrated into this regional report. The subject matter of this report is considered sensitive by officials, researchers and civil society actors in the region and much of the information provided was generated through interviews with sources who requested anonymity, and who are thus not cited. Furthermore, business and governance systems in the three countries, despite many improvements, remain opaque. Knowledge about investment actors and investment processes is blurry, and lack of access to relevant documents such as environmental impact assessments (EIAs) has made the conduct of this study extremely difficult.

## 2 Investment in Bauxite Mining in Cambodia, Laos and Vietnam

In the Mekong region, Vietnam has the largest bauxite potential, estimated at about 5.4 billion tons, the vast majority of which is found in the Central Highlands region. Based on the value of aluminum in 2007, bauxite resources in the Bolaven plateau in southern Laos have been estimated at \$3,200 million.<sup>6</sup> In Cambodia, there are no official figures on the value of bauxite reserves.

The following section details the specific location of bauxite mining, major investors and the volume of investment in each of the three countries.

### 2.1 Cambodia

In Cambodia, there is an expectation that the potential for exploitation of large deposits of bauxite that could generate huge revenue for the country is great. However, the nature of this potential is not well understood, as the companies looking to invest in bauxite are all in the exploration phase. The Australian company BHP Billiton, in collaboration with the Japanese company Mitsubishi, is exploring a large area for bauxite mining in Mondulkiri province.<sup>7</sup> Smaller companies are also present. However, there is currently no Chinese investment in bauxite mining in the country.

#### 2.1.1 Mondulkiri province

Mondulkiri province in northeastern Cambodia is one of the poorest in the country. It is located about 521 kilometres northeast of Phnom Penh, the capital city of Cambodia. The total population was nearly 50,000 in 2005, made up of a number of ethnic minorities. Mondulkiri province has four wildlife sanctuaries: Phnom Prich (222,500 hectares), Phnom Namlear (47,500 hectares), Lumphat (250,000 hectares) and Snuol (75,000 hectares). The Ministry of the Environment (MOE) administers these four sanctuaries. There are also two protected forests administered by the Ministry of Agriculture, Forestry and Fishery: the Mondulkiri protected forest and Keo Seima biodiversity conservation area.

The main livelihood activities in the province include farming, fishing and non-timber forest products.<sup>8</sup> However, since 2004 livelihoods have been continually threatened due to the establishment of at least nine economic land concessions for large scale agricultural production (50,000 hectares) and 15 mineral exploration companies.

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<sup>6</sup> Unless otherwise indicated, all \$ amounts are in U.S. dollar.

<sup>7</sup> In mid-2009, rumours circulated that BHP Billiton had pulled out of bauxite exploration in Cambodia. The rumours could be not be substantiated by the time this study was finalised.

<sup>8</sup> WWF, Livelihood sustainability analysis in Mondulkiri province (Phnom Penh: WWF Greater Mekong-Cambodia Country Program, 2008).

Figure 1: Cambodia and Mondulkiri province



Note: Mondulkiri province is outlined in green.

### 2.1.2 Major investors

Between 1994 and 2006 the Ministry of Industry, Mines and Energy (MIME) granted a total of 19 mineral exploration licences to local and foreign companies, of which two were for bauxite. No licences have been granted for the exploitation of bauxite.

Five companies, four local and one international, have obtained licences for bauxite exploration in Mondulkiri province (Table 1). All of the local companies are wholly owned subsidiaries of one Australian and one Australian-Japanese consortium: Transol Corporation Ltd, and BHP Billiton and Mitsubishi Corporation, respectively.<sup>9</sup> The four local companies include Liberty Mining International Pty Ltd (which received a bauxite exploration licence in 2008) and Maxum Metal Pty Ltd (2008) – which now form a 100 percent owned subsidiary of Transol – AZ Distribution Co. Ltd (2005), and Sonuba Paul Cham Co. Ltd (2004), which is owned by BHP Billiton and Mitsubishi (2006).

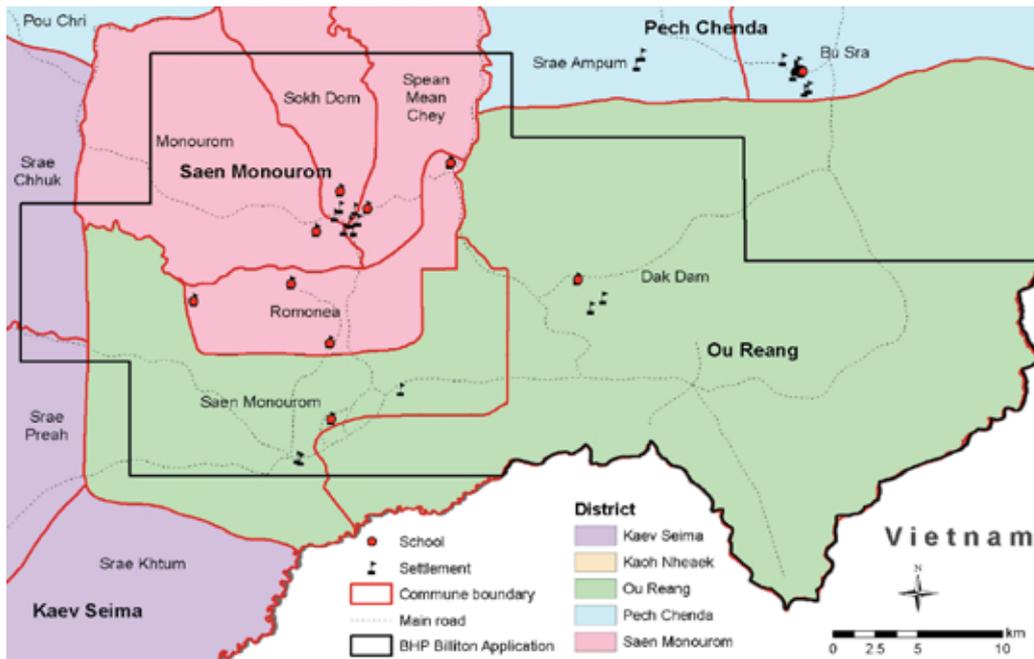
No Chinese companies are currently involved in bauxite mining in Cambodia; however, in Mondulkiri province, several small Chinese companies have been awarded licences to explore for other minerals such as gold, copper and iron ore.

9 BHP Billiton and Mitsubishi are involved in a joint venture for bauxite mining; however, so far only BHP has been involved in exploration activities and has deployed its staff.

### 2.1.3 BHP Billiton and Mitsubishi

A joint venture of BHP Billiton and Mitsubishi signed an agreement with the Government of Cambodia in October 2006 to explore for bauxite in Mondulkiri province. The area of exploration covers approximately 1,000 square kilometres (or 100,000 hectares).<sup>10</sup> The concessionary agreement is worth \$2 billion, which enables the joint venture to investigate the potential for constructing an alumina refinery if bauxite mining proves feasible. The initial plan was to develop a potential slurry pipeline route from Mondulkiri province to Sihanoukville on the coast of Cambodia.<sup>11</sup> Under the agreement, the two companies would have exclusive rights to negotiate a mining agreement with the government once the initial studies and exploration work were completed in 2009.<sup>12</sup>

Figure 2: BHP Billiton application area in Mondulakiri province, Cambodia



Source: BHP Billiton, Administrative Division

Through their studies, the two companies identified 500 drilling sites for analyzing the bauxite deposits. However, the results have not been made public.

Prior to BHP Billiton's exploration activities, an environmental and social impact assessment was commissioned to consult local communities, government authorities and non-governmental organizations (NGOs). The study focused on the health, safety and environmental issues challenging communities in Mondulakiri and how BHP's activities could improve these communities' conditions while limiting adverse impact. The challenges identified and the commitment made by the company after its assessment include:

- reducing risk from explosive remnants of war (ERW) by supporting specialist teams to remove ERW threats to communities and increase community awareness and education (a commitment of \$160,000 to fund the Cambodian Mine Action Centre's work from January 2007 until July 2008);

10 Ian Wood, Cambodia-Mondulakiri bauxite exploration (Melbourne: Forum on Corporate Social Responsibility, 23 November 2006).

11 Ibid.

12 J. C. Wu, "The mineral industry of Cambodia," in 2007 minerals yearbook: Cambodia (Reston: U.S. Geological Survey, 2008).

- strengthening local healthcare services to access impoverished communities as part of sustainable programs to address healthcare needs (a \$80,000 fund for HealthNet International);
- supporting NGOs to provide education and training in healthcare, sustainable agriculture and natural resource management (\$80,000 to fund work by Village Focus International); and
- providing employment and skills training for local people.<sup>13</sup>

Since the licence was awarded to BHP Billiton and Mitsubishi in 2006, several other Cambodian owned companies have also obtained licences for mineral exploration in the area, especially Liberty Mining International and Maxum Metal, which are now a 100 percent owned subsidiary of Australian owned Transol.

**Table 1: Private companies involved in bauxite mining operations in Mondulkiri province, Cambodia**

Company	Group affiliation	Licence no. and date	Area (km <sup>2</sup> )	Location	Status
Liberty Mining International Pty Ltd <sup>(1)</sup>	Transol Corp. (Australia)	No. 530 20 June 2008	62	Prek Te, Keo Seima	Active
Maxum Metal Pty Ltd <sup>(1)</sup>		No. 484 12 June 2008	295.35	O Ry, Pichrea Da, Keo Seima Sen Monorom	
		No. 485 12 June 2008	253	Bou Sra Pichrea Da, Orieng	
		No. 486 12 June 2008	274.6	Bou Sra Pichrea Da, Orieng	
Sonuba Paul Cham Co. Ltd <sup>(2)</sup>	BHP Billiton & Mitsubishi Corp. (Australia-Japan)	20 Dec. 2004	-	Orieng	Active
AZ Distribution Co. Ltd <sup>(2)</sup>		2005	-	Tou Poy, Orieng	
BHP Billiton World Exploration Inc. & Mitsubishi Corp.		No. 1283 14 Dec. 2006	996	Keo Seima, Orieng, Pichrea Da, Sen Monorom	

Notes: (1) These two companies are now a 100 percent owned subsidiary of Transol. (2) These two companies transferred the right of their licence to BHP Billiton and Mitsubishi in 2006. The licence is valid for two years. According to the provincial Department of Industry, Mines and Energy, most expired licences have been renewed.

Sources: Licences for mineral exploration, 2004-08; P. Beaumont, *Extractive industry 'mining' study: Social and environmental impact, Rattanakiri and Mondulkiri (Phnom Penh: Development Partnership in Action, 2008)*

<sup>13</sup> BHP Billiton website, accessed on 20 June 2009, [www.bhpbilliton.com](http://www.bhpbilliton.com).



In terms of biodiversity, the plateau includes two national protected areas, the Duong Hua Sau, covering 910 square kilometres and located 35 kilometres west of Slaco’s planned mine area, and the Xe Pian, covering 2,665 square kilometres and located 3 kilometres west of Slaco’s planned process site and 15 kilometre southwest of the mine area. The Bolaven plateau also contains two provincial protected areas, the Houay Souy in Sanamxay district and the Kong River. There is also a district protected area called Dong Bak, which covers 1,240 hectares, 63 percent of which is located within the boundaries of Slaco’s processing site. Finally, Slaco’s project area is located 6 kilometres from the Laotian–Cambodian border, close to the adjacent Virachey National Park.<sup>17</sup>

Figure 4: Laos, showing the Bolaven plateau

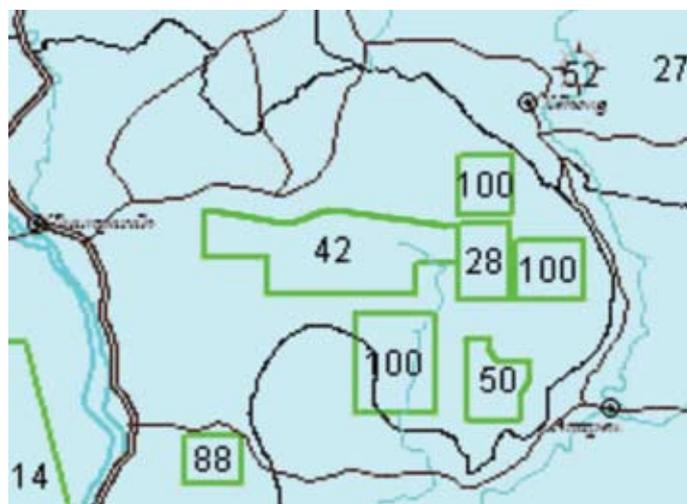


17 ESL (Earth Systems Lao), Environmental and social impact assessment, Sino-Lao Corporation Limited: SLACO Bauxite Project, Champassak and Attapeu provinces, Lao PDR (Vientiane: ESL, 2008, “Executive summary”).

## 2.2.2 Major investors

According to the Department of Energy and Mines (DEM) map of February 2008, there were four concessions on the Bolaven plateau: Sino Australian Resources (Laos) Co. (Sarco) (No. 28 in Figure 5) and Yishida (No. 42); which are surrounded by the concession of Southeast Asia Economic and Technical Cooperation (SAETC), which is split into three different areas (No. 100); and LSI (No. 50), which is the most southern concession on the plateau (Figure 5).

Figure 5: Laos: Geographical location of bauxite prospecting concessions



Note: #28: Sarco; #42: Yishida; #50: LSI; 100: SAETC. According to this map provided by the DEM, there are only four concessions on the plateau. This differs from the map provided by ORD (“ORD River Resources Limited corporate presentation,” November 2007; see Figure 6), which shows that Sarco has agreements over tenements with three local partners, two of which have already been granted (LSI, 138 square kilometres and Yishida, 589 square kilometres), and a third that is under application (Senekham, 599 square kilometres).

Source: AltMapCambodia, Southern Laos proposed and existing mineral concessions (February 2007)

A World Bank report in 2006 indicates that in the past much of the Lao state-owned enterprises (SOEs) activity in the mineral sector was undertaken by the Ministry of Defence (MOD) with the support and guidance of Department of Geology and Mines (DGM). However, a recent decree prohibits the MOD from directly undertaking mining activities through SOEs.<sup>18</sup> The decree specifies that mining activities previously undertaken by the MOD must be undertaken by private companies, and encourages the development of joint ventures with foreign partners, presumably to increase the funds available for private mining activities and to improve the technical capacity of the Lao partner.<sup>19</sup> The World Bank plan for the development of the mineral sector includes restructuring, reform and developing SOEs. The World Bank also mentions that the SOEs will ultimately be privatized and that personnel from existing SOE mineral activities will be seconded (temporarily or permanently) for employment to the central or provincial government.<sup>20</sup>

Based on the value of aluminum in 2007, bauxite resources in the Bolaven plateau have been estimated at \$3,200 million. According to the officially authorized list of projects provided by the Ministry of Planning and Investment (MPI), there are five main companies involved in bauxite mining in the Bolaven plateau, including four Chinese and one Lao company.<sup>21</sup> However, it is believed that other companies are active in the area. According to the Slaco EIA, seven different bauxite mining concessions have been provided to both Lao and foreign companies along the Bolaven plateau.<sup>22</sup>

18 A translated copy of this decree has not been found.

19 Masaharu Marutani, Final report for economic geology, FR-2: Sector Plan for Sustainable Development of the Mining Sector in the Lao PDR: (Vientiane: World Bank Lao PDR Country Office, November 2006).

20 Ibid.

21 Slaco is registered as a Lao company, although it has Chinese and Thai investors/involvement.

22 According to the Slaco EIA, six other concessions (apart from Slaco’s) will be developed simultaneously (ESL, chap. 6, p. 100).

**Table 2: Domestic and foreign companies involved in bauxite mining in Paksong district, Champassak province, Laos**

Name	Type	Stakeholders	Country	Activity	Area (ha)	Date of prospecting contract	Agreement no.
LSI (Slaco) <sup>1</sup>	Joint venture, but registered as Lao private company	LSI	Laos <sup>2</sup>	Prospecting; about to start exploitation <sup>3</sup>	6,600	25/02/2005	708
		Chalco ITD RCI	China Thailand		3,000 15,000 <sup>4</sup>	25/10/2006	708
Sinoma International Engineering Co. Ltd (Sinoma)	-	Zhongfei Geological Engineering Exploration Academy (ZGEEA)	China	Prospecting	7,768	12/05/2006	908
Yishida	Joint venture	Sarco (which includes ORD & China Non-ferrous Metals Industry's Foreign Engineering and Construction Co. Ltd (NFC))	China	Exploration	58,500	08/06/2006	352
China International Alumina Co.	-	-	China	-	3,475	26/01/2007	379
Asia Industrial Aluminum (Lao) Ltd	-	SAETC	Private Laos & China	Prospecting	3,475	26/01/2007	401

<sup>1</sup> As of May 2009 there are unconfirmed reports that the Slaco project has been postponed.

<sup>2</sup> Only Slaco is registered as a Lao company, while all other companies are registered as foreign.

<sup>3</sup> Exploitation can only start upon the issuance of an environment compliance certificate by the Water Resources and Environment Administration (WREA).

<sup>4</sup> This means that LSI has two concessions for prospecting totalling 9,600 hectares. In the case of the 15,000 hectare concession, this area is awaiting government approval in order for exploitation to start.

Source: Interviews with DEM officials, October 2008

## Sino-Lao Aluminum Corporation Limited (Slaco)

Slaco<sup>23</sup> was established as a joint venture in 2007 among LSI (34 percent), ITD<sup>24</sup> (33 percent) and RCI<sup>25</sup> (33 percent). Following the completion and approval of the December 2007 feasibility study,<sup>26</sup> Chalco<sup>27</sup> joined Slaco as the majority stakeholder. Slaco is registered as a private Lao company and currently comprises Chalco with 51 percent, RCI-ITD with 39 percent and LSI with 10 percent.<sup>28</sup>

23 This company is chaired by Saysana Samingvongsa and is involved in many sectors, including import-export.

24 ITD is the largest Thai civil and infrastructure construction contracting firm and has a registered capital of approximately \$122 million and more than 22,000 employees, including 1,102 engineers.

25 RCI is a Chinese foreign trade company whose total investments have reached RMB 6 billion (\$0.82 billion) in China.

26 Slaco engaged Chalico to conduct the feasibility study of the proposed project.

27 Chalco is the world's second largest aluminum producer and China's largest alumina and primary aluminum producer, with a registered capital of over RMB 11 billion (\$1.5 billion).

28 Slaco (2008); Vientiane Times, "Work to start on Attapeu aluminum processing plants," 24 September 2008a.

The Slaco project requires a land area of 246 square kilometres, including construction and excavation areas. The venture will have a 50 year concession period with an option for extension. Out of the 246 square kilometres, an area of 99 square kilometres is still in the exploration phase, while exploitation may start in remaining 147 square kilometres.<sup>29</sup> Slaco plans to exploit 3 million tons of argilliferous bauxite per year, which will be transformed into one million tons of alumina per year and processed into about 500,000 tons of aluminum per year. Currently, the amount of bauxite is estimated at about 316,173,327 tons and the tenement life is around 30 years. Apart from the alumina processing unit and the aluminum smelting unit, the company will build a 116 kilometre road from Pathoumphone district in Champassak province to Samakhixay district in Attapeu province, which will cost roughly \$100 million.

An environmental and social impact assessment was carried out in 2008 by the company and is still awaiting approval by the Water Resources and Environment Administration (WREA). In September 2008 Slaco signed a mining agreement for the bauxite mines and processing plants with the MPI. The plants represent an investment worth \$4 billion, which includes high voltage transmission lines and a power plant with an installed capacity of 1,320 megawatts to generate power for use by the factories. The plants are expected to be completed in 2011. The end products are expected to be exported to Association of Southeast Asian Nations (ASEAN) countries and China. The plants will supply the Lao market if there is a demand.<sup>30</sup>

### Sinoma

Sinoma<sup>31</sup> is based in Beijing, China and was founded in December 2001. It is a public company listed on the Shanghai Stock Exchange and focused mainly on the production of cement. Sinoma International is engaged in domestic and overseas large scale projects ranging from engineering consultancies to engineering design, construction and erection, equipment manufacturing, supply, commissioning, operation and maintenance. In Laos, Sinoma is operating under the ZGEEA and signed an exploration contract on 12 May 2006 for 146.25 square kilometres. The contract includes 12 months of exploration, 24 months of analysis and 12 months for drawing up a financial proposal (botviphaksetakit). The company reported the methodology and technical results of the exploration to the Government of Laos on 8 May 2007. The total cost of the exploration is \$1,803,820. The company is currently exploring another 77.68 square kilometres.

### Yishida Edseperu Group Ltd

Yishida, a Chinese company, has a 588.09 square kilometre concession near Itu village. The exploration and analysis contract was signed on 8 June 2006, and Yishida also signed an agreement with the DEM on 7 September 2006. The company had determined an area of 43.58 square kilometres, scattered into 15 areas with potential reserves totalling 549 million tons. Two hundred and twenty-nine people (223 of them Lao) have been involved in the exploration phase, which will cost \$2,864,865. The company has selected an area of 421 square kilometres and given back to the government 167 square kilometres. Currently, the company is about to pursue the survey. According to the DEM, Yishida<sup>32</sup> has subcontracted Sarco for the exploration of bauxite mining along the Bolaven plateau.<sup>33</sup>

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29 The list provided by the DEM mentioned that the details were discussed during a meeting held at the Don Chan Palace, Vientiane, Laos on 26 February 2008.

30 Vientiane Times (2008a).

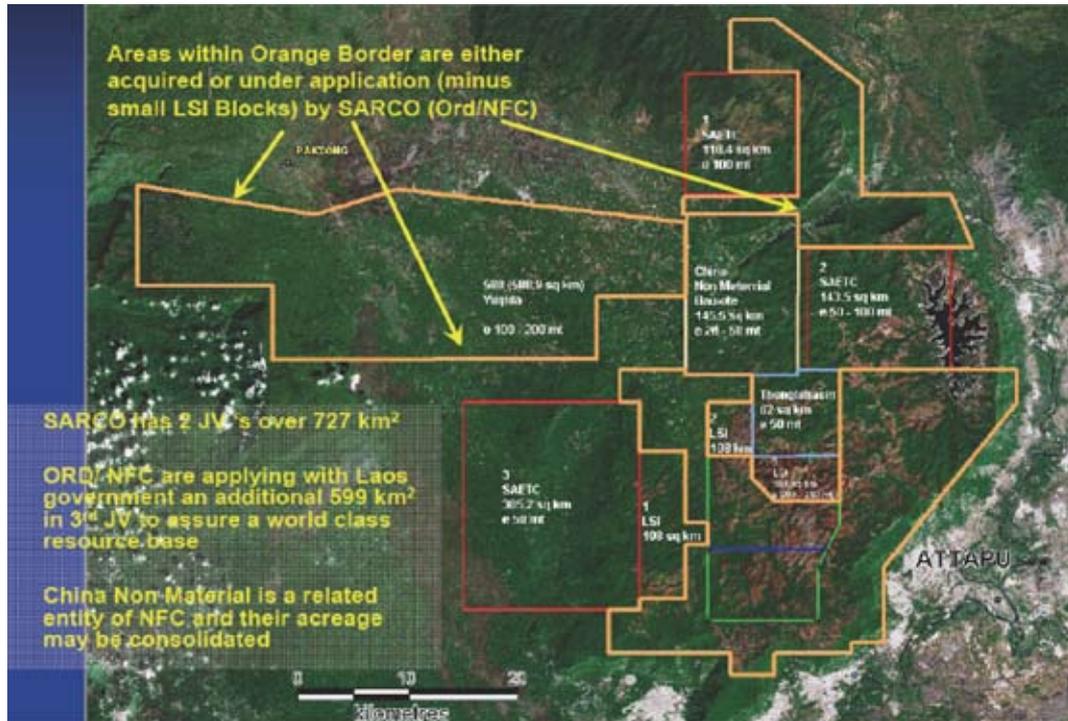
31 For more information on Sinoma, see [www.sinoma.com.cn](http://www.sinoma.com.cn).

32 This is according to Government of Laos Document No. 247, signed 31 March 2008.

33 In the list provided by the DEM, Yishida is registered as a company name, but in Sarco's 2008 documents, it is referred to as a tenement. This suggests that Sarco is moving in the shadow, ensuring access to bauxite deposits under the names of smaller companies.

The map in Figure 6 indicates the location of Sarco's tenements in the Bolaven plateau (i.e. the locations within the orange border). Apart from Sarco's tenements, there are two other tenements: SAETC, with three tenements, and Thonglahasin, with one.<sup>34</sup>

**Figure 6: Sarco's tenement acquisition on the Bolaven plateau**



Source: ORD (2007)

## Sarco

Sarco is a joint venture between ORD of Australia (holding 49 percent) and NFC of China (holding 51 percent). Their joint venture is called Sino-Australian Resources (Laos) Co. (Sarco), which was established in 2007 as a foreign private company in Laos. Sarco (70 percent) has an agreement with LSI (30 percent) to develop a 138 square kilometre tenement on the Bolaven plateau.<sup>35</sup> The bauxite potential in and around the existing tenement is estimated to be 2–2.5 billion tons. ORD has estimated that annual production of up to 20 million tons per annum (mtpa) of bauxite from the Bolaven plateau is possible, which may be refined to 5–8 mtpa of alumina.<sup>36</sup>

ORD's short-term program is to explore the feasibility of mining the outcropping bauxite deposits and establishing an onsite alumina refinery. The project may also include an aluminum smelter.<sup>37</sup> The aluminum is expected to be exported to supply China's industry.<sup>38</sup> The company has been negotiating for a further 84 square kilometres in one adjoining block. ORD has the strategic objectives to secure all available bauxite areas and to secure the rights to potential hydropower sites.<sup>39</sup> But according to ORD (July 2008), Sarco is currently in the final stages of approval for an area covering 867 square kilometres.

34 No information is available concerning the Thonglahasin tenement. In Figure 6 we can also notice what looks like an overlap between Thonglahasin and LSI in the southeastern part of the plateau.

35 ORD, Developing an integrated aluminum industry in Laos policy overview: An evolving document (ORD, 2006b).

36 Ibid.

37 Ibid.

38 Ibid.

39 Ibid.

## China International Alumina Development Co. Ltd

This company signed a contract on 26 January 2007 for a 34.75 square kilometres concession. The company provided a document on the impact of the flooding estimated from the Xepian-Xenamnoy hydropower dam. The company's role in mining is not clear, as it has not provided the DEM with a report on the activities it has implemented. It is currently difficult to confirm whether the company is active in the field.

## Asia Industrial Aluminum (Lao) Ltd (SAETC)

According to the DEM document, the contract signed on 20 December 2006 provides the company with a 30 year concession over 55,500 hectare. The project is in the prospecting phase. The first 12 months were devoted to exploration and the following 24 to analysis; the budget for these two stages totalled \$4 million.

### 2.2.3 Volume of investments

Slaco is the only company that has presented an EIA to the Government of Laos for approval or is ready to start exploitation upon receiving approval. According to the government and Slaco's EIA, the Slaco project is by far the most ambitious because it includes six main components: (1) bauxite extraction; (2) alumina processing; (3) aluminum smelting using the Bayer process unit; (4) 116 kilometres of road construction and improvement from Attapeu province to Champassak province; (5) the construction of three coal fired power plants (1,100 megawatts); and (6) the construction of a red mud reservoir.<sup>40</sup> The project also exceeds the geographical limits of Paksong district and stretches to the foot of the Bolaven plateau in Sanamxay district, Attapeu province. Slaco is the major investor with an overall budget of \$4,178,440,000. \$4 billion will be spent on the bauxite mines and processing plants in Champassak province.<sup>41</sup> The rest of the total investment will be in building a thermal power plant and developing high voltage electricity lines connecting the above provinces.<sup>42</sup> The overall benefits of the project are expected to average \$29 billion, including \$9 billion for the Government of Laos.<sup>43</sup> All other projects seem to only be in the prospecting and exploration phase.

## 2.3 Vietnam

Vietnam is estimated to have up to 8 billion tons of bauxite ore, of which the Government of Vietnam plans to exploit 5.4 billion tons through six projects until 2015. In 2007, out of seven industries, the government prioritized bauxite mining for the period 2007–20.<sup>44</sup> The prime minister has issued a decision on approving planning for zoning, exploring, exploiting, processing and using bauxite ore in the period 2007–15.<sup>45</sup> Currently, two large bauxite mining projects have been started in Lam Dong and Dak Nong provinces in the Central Highlands. The country has estimated that it will need up to \$20 billion in investment by 2025 to make use of the resource.<sup>46</sup>

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40 Aluminium processing requires a tremendous amount of energy, which is unavailable in the area. For the Slaco project alone, 840 megawatts are required, but the local grid can only provides 115 kilowatts. According to the WREA, the initial plan was to extract bauxite, transform it into alumina and send it to China.

41 Vientiane Times (2008a).

42 Bao Vietnam, "USD invested in energy, mining project in Laos," 24 September 2008.

43 Cambodia Daily, "Half-century Lao mining plan threatens rivers," 26 September 2008.

44 Prime Ministerial Decision No. 55/2007/QĐ-TTg, 23 April 2007.

45 Prime Ministerial Decision No. 167/2007/QĐ-TTg, 1 November 2007. See Annex 2 for an elaboration of the features included in this decision.

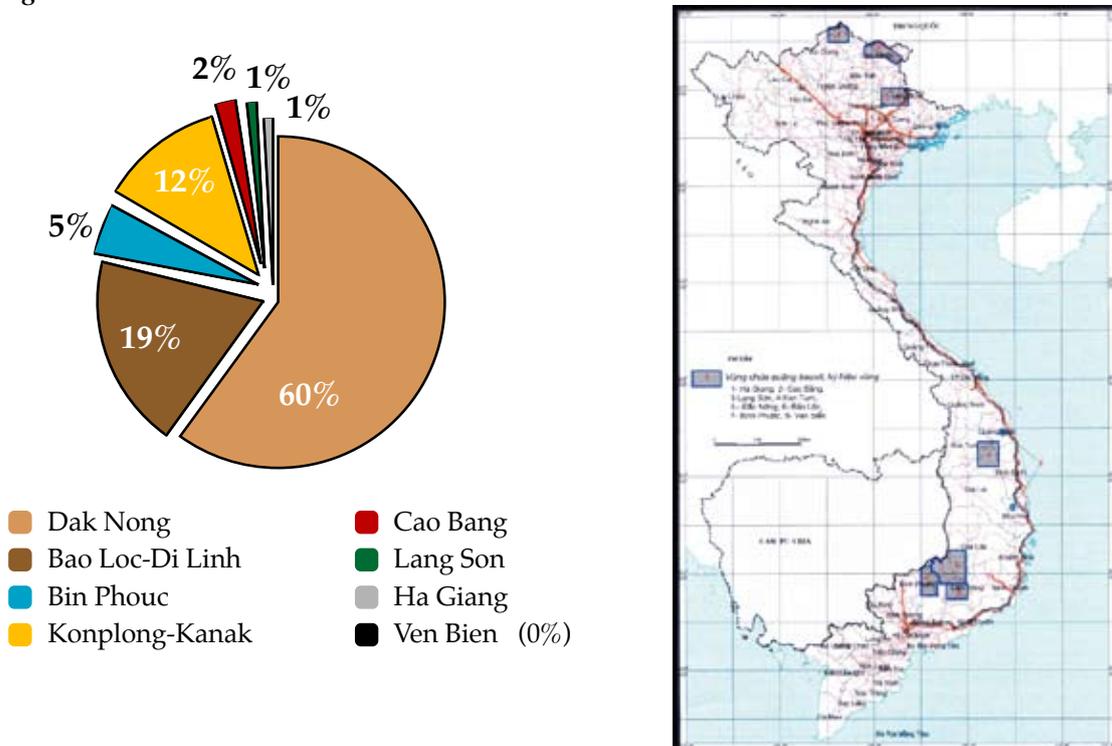
46 Anh Le Tran, "A mining plan tests Vietnam's policymakers," Asia Sentinel, 23 March 2009.

In April 2009 Vietnamese environmentalists and social scientists raised concern over the environmental, social, economic and political implications of the government’s plans to allow Chinese companies to develop massive bauxite mining projects in the Central Highlands. In addition, concerns were raised over the situation in which Chinese companies have won both bids to construct two big alumina plants (costing nearly \$500 million each). Others have also expressed concerns over the presence of Chinese bauxite related workers in a strategic military region. As a result, the prime minister ordered a comprehensive review of the planned bauxite mining. Several government agencies have been requested to be involved in the process. The Ministry of Industry and Trade is required to review the projects, taking into account the influence of the global economic downturn, evaluate their likely environmental impact and suggest possible modifications. The Ministry of Natural Resources and the Environment has been requested to undertake research into the nation’s bauxite reserves and suggest control measures for bauxite mining. The state-owned Vietnam National Coal, Mineral Industries Group (Vinacomin), which is required to adhere strictly to environmental regulations, must draw up detailed plans for land use, mining and post-mining environmental recovery to ensure minimum damage to farms and forests in the region. All plans must be approved by the Ministry of Natural Resources and Environment before they are executed.<sup>47</sup>

### 2.3.1 Bauxite mining in the Central Highlands

The vast majority (ca. 93 percent) of Vietnam’s bauxite ore mines are located in the Central Highlands (Figure 7), of which Dak Nong province contains 60 percent alone. The Central Highlands is a stunningly beautiful and fertile region of Vietnam, and fertile forested mountains, coffee plantations and an enormous ecotourism potential characterize the region. It is home to a large number of ethnic minority communities mostly living around a series of small towns. To the south, Nam Cat Tien National Park is one of the most biologically diverse locations in Indochina.

Figure 7: Distribution of bauxite reserves in Vietnam



Source: Vinacomin website, accessed on 20 June 2009, [www.vinacomin.vn](http://www.vinacomin.vn)

47 Ibid.; Thanh Nien News, “PM orders review of bauxite mining,” 2 May 2009.

## 2.3.2 Major investors

Unlike in Cambodia and Laos, the Government of Vietnam has appointed the SOE Vinacomin (see Box 1, below) to oversee investment and implementation of bauxite mining in the Central Highlands.<sup>48</sup> Vinacomin is also allowed to enter joint ventures with international investors, but only if it maintains the dominant proportion of ownership.

Numerous international investors have shown interest in bauxite mining in Vietnam. These include Daewoo (Korea); Alcoa (U.S.); Pechinery (France); BHP Billiton (Australia); Rusal (Russia); NFC, Chalco and Yunnan Metallurgy Co. (China); and companies from Thailand, Hungary and Japan.

Among these companies, four aluminum industry corporations have recently gained approval from the prime minister of Vietnam<sup>49</sup> to enter into a joint venture with Vinacomin, including Chalco, Alcoa, BHP Billiton and Rusal.

**Table 3: Exploitation and processing of bauxite planned in the Central Highlands, Vietnam**

Plants <sup>1</sup>	Ore sources	Capacity (million tons/year); period	Investor	Status
<b>Lamdong province</b>				
Aluminum hydroxide production plant 1	Nam Phuong, Doi Thang Loi mines	0.1; 2007–10	-	Feasibility study
Aluminum hydroxide production plant 2	-	0.55; 2007–10	South Basic Chemicals Co. (Vietnam)	Planned
Alumina Tan Rai, Baoloc plant	Tan Rai	0.6; 2008–10	Vinacomin	Under construction
<b>Gialai province</b>				
Alumina plant	Mang Den, Kon Ha Nung mines	1.5; 2009–11	Hanoi Trading Co.	Planned
<b>Dak Nong province</b>				
Dak Nong alumina plant 1	Nhan Co and neighbouring mines	0.3–0.6; 2007–15 0.6–1.2; 2016–25	Vinacomin joint venture with a Vietnamese Army company <sup>2</sup>	Under construction
Dak Nong alumina plant 2	1–5 mine	1.5–2.0; 2007–15 3.0–4.0; 2016–25	Vinacomin joint venture with Chalco	Planned
Dak Nong alumina plant 3	Gia Nghia mine	1.5–2.0; 2007–15 3.0–4.0; 2016–25	Vinacomin joint venture with Alcoa	Planned
Dak Nong alumina plant 4	Tuy Duc, Daksong mines	1.5–2.0; 2007–15 3.0–4.0; 2016–25	Vinacomin	Planned
<b>Binh Phuoc province</b>				
Binh Phuoc alumina plant	Mines in Binh Phuoc province	1.5–2.0; 2016–25	Anvien group with Rusal	Planned

<sup>1</sup> The names are descriptive only; official information regarding these plants is difficult to obtain.

<sup>2</sup> The name of this company was unobtainable.

Sources: Prime Ministerial Decision No. 167/2007/QĐ-TTg; Government of Vietnam Announcement No. 2728/VPCP-QHQT

48 Prime Ministerial Decision No. 167/2007/QĐ-TTg, art. 7, clause 2.

49 Government of Vietnam Announcement No. 2728/VPCP-QHQT dated 2 May 2008 elaborates on the prime minister's decision to allow joint ventures between Vinacomin and international companies in bauxite mining.

### **Box 1: The Vietnam National Coal, Mineral Industries Group (Vinacomin)**

Vinacomin is a state owned economic group. It was established by merging the Vietnam Coal Group and the Vietnam Mineral Cooperation, under Prime Ministerial Decision No. 345/2005/QĐ-TTg dated 26 December 2005.

Vinacomin's main function is to manage resources and exploit coal, bauxite and other minerals on behalf of the Government of Vietnam. As an economic group, Vinacomin is allowed to invest in other activities such as the development of electricity power stations (thermal and hydroelectric power) and finance (banking and the stock market).

Vinacomin contains more than a hundred companies, colleges, research institutes and technical schools. According to a survey in 2008, Vinacomin ranked fourth (after three other state owned economic groups) in the 500 biggest domestic companies in Vietnam.

Vinacomin is investing in Cambodia and Laos. In Laos it has several investment projects exploiting and processing coal, bauxite and copper, and especially iron ore in Phunhuon, Xiengkhuang. In Cambodia, Vinacomin is exploring the mining of antimony, chrome, titanium, iron, etc.

Vinacomin plans to become a leading group of Vietnam by 2010, by 2015–20 an important regional economic group, and by 2025–30 a world class transnational group.

*Sources: Vinacomin website, accessed on 20 June 2009, [www.vinacomin.vn](http://www.vinacomin.vn); Prime Ministerial Decision No. 345/2005/QĐ-TTg; Vietnam Business Forum, "VINACOMIN with ambitious development strategy," 20 November 2007, [vibforum.vcci.com.vn](http://vibforum.vcci.com.vn)*

### **Chalco (China)**

In 2006 Chalco signed a principle cooperative agreement for the exploitation of bauxite ore and the establishment of an alumina processing plant with Vinacomin worth \$1.3 billion with a capacity of 1.9 million tons of alumina per year. The originally agreed ratio of investment was 40 percent from Vietnam and 60 percent from China; however, the prime minister of Vietnam later decided that if Chalco were to enter into a joint venture with Vinacomin, it could be only at a maximum of 40 percent.

### **Alcoa (U.S.)**

In mid 2008 Vinacomin and Alcoa signed a cooperative agreement to develop the aluminum industry in Vietnam. According to the agreement, Alcoa will conduct project assessment and possibly contribute 40 percent of the equity of the Nhanco Joint Stock Company with a capacity of 600,000 tons of alumina per year. Vinacomin agreed with Alcoa to jointly carry out a feasibility study for the Gia Nghia alumina-bauxite exploitation project in Dak Nong province, with an expected capacity of 1–1.5 million tons per year in the first phase. Together with this agreement, if Alcoa invests in the Nhanco and Gia Nghia plant projects, it will also participate in railway and sea port infrastructure investment to serve the alumina production plants.

### **BHP Billiton (Australia–UK)**

In mid 2008 Vinacomin and BHP Billiton signed a cooperative agreement on bauxite exploitation and processing in Vietnam worth \$1 billion. The two sides agreed to establish a joint venture company to explore and exploit bauxite and produce alumina at three mines at Dak Song, Tuy Duc and Bac Gia Nghia in Dak Nong province with an equity ratio of Vinacomin holding 51 percent and BHP Billiton 49 percent. This joint venture company is also linked with some other partners to build a railway system from Dak Nong to a sea port. In addition, Vinacomin may contribute to a joint venture company between BHP Billiton (70 percent) and Mitsubishi (30 percent) that will invest in bauxite exploration, exploitation and alumina production in Cambodia.



As illustrated above, northeastern Cambodia, southern Laos and the Central Highlands of Vietnam make up a strategically important area for bauxite mining. This section will explore the regional linkages among the three countries in terms of proximity to and economic relationship with China, transboundary impacts, energy requirements, infrastructural development and joint ventures. In all three countries, there are overlapping issues and regional linkages that need to be further unpacked and explored in order to understand both the positive and negative potential of developing a bauxite industry.

Where China's role begins and ends is important as we look at the physical proximity and economic importance of Cambodia, Laos and Vietnam to China, along with the potential transboundary environmental and social impacts. How the state and national companies in each of the three countries are interlinked shapes the push to secure the bauxite resource and obtain economic benefits drives decision-making.

### 3.1 China's strategy in the Mekong region

China's relationship with the three Mekong region countries Cambodia, Laos and Vietnam is strategic and important in a number of ways. First, China enjoys an important border with Laos and Vietnam facilitating much-needed trade and access to natural resources that can be easily transported by road over relatively short distances (compared to imports from other parts of the world). Furthermore, China has been gaining prominence as an important bilateral trading partner and investor. It has become Vietnam's leading trading partner and is an important donor and foreign investor in Laos and Cambodia.

Chinese financiers have moved into the region to take advantage of the favourable investment climate and the abundance of natural resources of its immediate neighbours. China brings a different kind of investment package to the table that is built on relationships and friendship. China is also seen as a 'soft power' of culture and ideas, and one making friends all across the region, with friendship spearheading business activities. For example, the Chinese government has supported the construction of several important cultural and state buildings, such as the National Cultural Hall in Laos and the new office of the Council of Ministers in Cambodia.

Both Laos and Cambodia are receiving substantial assistance from China in the form of transportation infrastructure and hydropower projects valued at \$178 million (Laos) and economic cooperation at \$45 million (Laos) in 2006, and a \$600 million aid package for road construction, hydropower and other economic and technical cooperation (Cambodia) in 2006. In 2007 there were 236 Chinese investment projects in Laos, with a total value of \$877 million, while in 2008 the value of Chinese investments in Laos was about \$3.5 billion, and this was expected to increase.<sup>51</sup> In Cambodia in 2008 an additional aid package worth \$250 million was granted for the rehabilitation of road infrastructure throughout the country. In Vietnam, trade between the two countries has more than tripled in the past few years, from \$3 billion in 2000 to \$10.4 billion in 2006.

China has also provided Laos with youth scholarship programs to study in Beijing and has been modernizing the Lao military, while Laos and Cambodia enjoy zero tariffs unilaterally offered by China on about 600 tariff lines for agricultural products exported to the Chinese market under the Early Harvest Program, an advanced program of the ASEAN-China Free Trade Area created by the ASEAN-China Free Trade Agreement.<sup>52</sup> Sino-Lao relations have

51 Vientiane Times, "Laos-China trade, investment deepens," 24 October 2008b.

52 People's Daily Online, "China encourages companies to expand investment in Laos, says premier," 30 June 2006.

been successfully reinforced through successive ratifications of bilateral agreements<sup>53</sup> under the Sino-Lao Cooperation Committee.<sup>54</sup> In early 2009 the Cambodia National Assembly adopted a budget guarantee law to secure Chinese investment of more than \$1 billion for two hydropower dams in the Cardamom region (southwest of Phnom Penh). Three more Chinese hydropower projects in the Cardamom region are undergoing feasibility studies.

## 3.2 Physical proximity to the Chinese market

The close proximity of the Mekong countries to China eases trade flows, especially as infrastructure improvements are connecting major regional cities and borders are open for business through international gateways. Most of the bauxite mining in the region is expected to serve the growing Chinese market, which can easily be facilitated by the North-South Economic Corridor, which runs from Kunming to Bangkok, Phnom Penh and Ho Chi Minh City. The full extent of the potential output for and demand by China is difficult to estimate, however. Cambodia, Laos and Vietnam are all strategically placed to meet China's ever increasing demand. The joint border of Laos and Vietnam with China is an important entry point into China for the Mekong region aluminum industry.

## 3.3 Transboundary impacts

Bauxite does not come without side effects, and transboundary impacts are expected to be significant, including loss of fisheries and changes to the hydrology of the river and water quality, which will affect the livelihoods of indigenous people living in the mining area.<sup>55</sup> Mining bauxite involves the discharge of toxins that must be stored safely and permanently. There are significant potential impacts beyond the mining site, including contamination of the surrounding and downstream areas. Given the close proximity of the bauxite mining area in Laos, concerns have already been raised in neighbouring Cambodia, where industrial waste discharge and increased water use of the transboundary Sekong River (part of the 3-S river basins) may cause significant impacts downstream. For example, the generation of high quantities of highly alkaline red mud (and associated contaminants) represents the most significant risk to downstream surface water and groundwater quality. Also, one of the planned projects<sup>56</sup> along the Bolaven plateau is expected to require the consumption of 108,749 cubic meters of water per day, with 1.3 cubic metres per second coming from the Xe Namnoy River, a tributary of the Sekong River, equal to half its peak flow.<sup>57</sup> Thousands of people rely on the Sekong River for their local livelihoods and would be affected downstream from contaminated and a possible lower flows of water.

## 3.4 Thirst for energy

Finding suitable energy sources to support the planned bauxite mining operations provides opportunities for companies to exploit neighbouring country sources. The actual process of bauxite mining and alumina refinery does not require much energy – about 250 megawatts to produce one ton of alumina. This process requires hot air to dry alumina, resulting in the need for a coal-fired power station. One ton of coal is required to dry one ton of alumina. A coal-fired power station can supply both requirements – energy and hot air.

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53 The ratification of bilateral cooperative documents covers economic and technological cooperation, health, power and e-government, and an FM radio station of China Radio International in Vientiane.

54 The Sino-Lao Cooperation Committee, chaired by Vice Prime Minister Lengsavath Sisavath, was initially established in 1997. It has not been possible to find out more about this committee.

55 IR, Power surge: The impacts of rapid dam development in Laos (Berkeley: IR, 2008).

56 As identified earlier, there are a number of potential investors in the Bolaven plateau; however, access to the Slaco EIA has provided substantial details.

57 Cambodia Daily (2008).

The aluminum smelter requires a huge amount of cheap energy, which will come mostly from hydropower. With the most modern technology available today, the aluminum smelter requires about 14,000 megawatts to smelt one ton of aluminum. In the short term, China's power is predominantly coal based. Since Laos and Cambodia will exploit their vast rivers for the development of hydropower to be exported to neighbouring countries<sup>58</sup> and build coal-fired plants along with Vietnam, it may be more cost effective for China to use an alumina refinery and aluminum smelter in one (or all) of the three countries.

Because of this energy need, currently Vietnam only can produce alumina and export it to China. Laos and Cambodia will have an opportunity to smelt into aluminum because of their their hydropower potential, although the current issue is one of finding cheap energy sources. In order to make the production of aluminum cost effective, electricity from hydropower needs to be sold at 2.5–3.5 U.S. cents/kilowatt. Currently Laos is selling electricity at 5–6 U.S. cents/kilowatt, making the industry unviable (at least for the time being). One path that companies may take is to stop at the alumina stage and sell it directly to the buyer; however, alumina is difficult to transport.

In Laos, some investors have plans to secure their own energy resources. For example, Sarco has apparently purchased the rights to build the Xepian-Xenamnoi hydropower plant in Champassak province to provide energy to its mining operation.<sup>59</sup> Furthermore, Slaco, the most ambitious investor in Laos, plans to eventually bring its own coal from Cambodia, where it owns various coal mines, to the refinery in Laos if the company cannot find sufficient alternative energy sources.<sup>60</sup> The Xekatom hydropower project is also being planned on the Bolaven plateau. The dams could eventually provide a considerable amount of energy for bauxite processing. In Cambodia a small-scale hydropower dam has been built with financial assistance from Japan. This dam is located about 10 kilometres from the Monduliri provincial capital, Sen Monroum. Electricity has been generated since November 2008. Additional electricity supplies could be imported from the Srepok River in neighbouring provinces of Vietnam. In addition, a large hydropower dam is being built by the Electricity of Vietnam Company with an estimated capacity of 450 megawatts. This hydropower dam is located at the confluence of the Sesan and Sre Pok Rivers in Strung Treng province of Cambodia (about 200 kilometres from Sen Monorum). A transmission line is planned to supply demand in Cambodia.

### 3.5 Linking the region by railroad and ports

All investment companies will be looking for the cheapest opportunities to transport the alumina or aluminum to the market. In most cases, this will be to China, but may also be to other international markets. For example, the Australian company ORD River Resources has emphasized the proximity of bauxite mining in the Bolaven plateau in southern Laos to the railway station in Ubon Ratchatani, Thailand (50 kilometres away) and the Danang sea port in central Vietnam, which is accessible through Lao road 18B and is 200 kilometres away, as possible transport linkages.<sup>61</sup> The bauxite, alumina or, ultimately, aluminum produced in Laos could be sent by either axis to China or the international market.

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58 China is a major investor in hydropower projects in Laos and Cambodia.

59 I. Baird and B. Shoemaker, *People, livelihoods and development in the Xekong River basin, Laos* (Bangkok: White Lotus Press, 2008); KPL, "Xe Pian-Xe Namnoy hydropower plant approved, 2008-1201," KPL News, 1 December 2008.

60 The Namphak hydropower project (Japan) in Paksong district is currently in the MOU project development stage. The project development agreement is expected to be signed with the Government of Laos as soon as possible. Slaco apparently has offered to purchase the entire electricity production if the dam is built, but there is no formal agreement to provide electricity to Slaco. However, the company undertaking the project met with Slaco last year and is aware that if Slaco builds factories to process aluminum, it will need abundant power.

61 ORD, "Commencement of pre-feasibility study: Bolaven Bauxite Project," 10 July 2008.

In Cambodia, BHP Billiton has identified several options to transport the bauxite to an alumina refinery in a coastal location. The bauxite can be transported by slurry pipeline, where the bauxite is mixed with water to form a slurry that flows through the pipeline. In this case, the construction of a pipeline of at least 650 kilometres from Monduliri to the nearest coastal town of Kampot or Sihanoukville would be a costly and time consuming investment. The bauxite could also be transported by railway. However, the construction of a new railway from Monduliri to Phnom Penh of about 520 kilometres is also expensive and time consuming. Road infrastructure is still in very poor conditions throughout the country and the railway service operated from Phnom Penh to the coastal town of Kampot or Sihanoukville is in a deplorable state. However, the distance from Monduliri to the border of Vietnam is less than 100 kilometres. In Vietnam, BHP Billiton has a joint venture project with Vinacomin to develop railway infrastructure leading from the Central Highlands to the southern central province of Binh Thuan.

A dedicated port in central Binh Thuan province in Vietnam that can load vessels of 50,000 tons will also be built to develop the bauxite industry in the Central Highlands and southern central regions.<sup>62</sup>

In Cambodia, the 2005 sub-decree<sup>63</sup> dealing with guidelines of investment on mineral resources prohibits all export of raw bauxite to other countries. Nevertheless, it is possible that the government could amend the sub-decree to satisfy the possible requirements of BHP Billiton or other mining companies to export raw bauxite to an alumina refinery in Vietnam in case other bauxite transport links are not economically viable.

### 3.6 Joint venturing among regional partners

Major bauxite mining companies operating in the region recognize the opportunities that could be created from partnering and linking together. For example, Chalco, the main investor in Slaco, has an agreement with Vinacomin about bauxite mining and alumina processing in Vietnam. LSI, a Lao company, is involved in joint ventures with both Chalco and CNMIM/NFC for bauxite mining in the Bolaven plateau. Both Vinacomin and Chalco may also be involved in the Sarco project.<sup>64</sup> The opening of an office by Vinacomin in Vientiane, Laos in November 2007 marks an important step in its strategy to expand into Laos. Vinacomin has also discussed the possibility of contributing to the joint venture between BHP Billiton and Mitsubishi in Cambodia for exploration, exploitation and alumina production. Furthermore, in Vietnam, BHP Billiton has a joint venture project with Vinacomin to develop railway infrastructure leading from the Central Highlands to the southern central province of Binh Thuan.

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62 VietnamNet Bridge, "Aluminum processing plants to be built by 2015," 8 November 2007b.

63 Article 1 of Subdecree No. 008 dated 31 January 2005 states: 'All kinds of natural mineral resources are not allowed to be exported. They are to be retained to supply the needs of domestic factories to process finished products. Only finished products are allowed to be exported.' This subdecree was later amended on 29 September 2005 in order to change Article 1 of the procedure to obtain the mineral resources licence. This abrupt change proves that there is room for the government to amend Subdecree No. 008 when mineral processing capacity is unsuitable for the mineral business.

64 Mining Engineering, "Southeast Asia could become a major bauxite mining player," January 2007.

## 4 Environmental, Social and Economic Impacts in Decision-making on Bauxite Mining

### 4.1 Environmental and social regulatory framework in place, but not well implemented

Gaining approval in each of the three Mekong countries often involves a number of key ministries, including planning ministries (e.g. the Council for the Development of Cambodia (CDC) and the MPI in Laos); mining ministries (e.g. the MIME in Cambodia and the Ministry of Energy and Mines – MEM – in Laos); water and environment ministries (the WREA in Laos and the Ministry of Natural Resources and the Environment – MONRE – in Vietnam); the Ministry of Industry and Commerce and Ministry of Finance in Vietnam; and high level decision-making bodies that directly report to the prime minister (e.g. Cambodia’s Council of Ministers). In all three countries, the prime minister makes the final decision and often signs the mineral exploration/exploitation agreements.

Various laws and policies related to the environmental, social and economic impacts of mining activities exist. In some cases, such as in Cambodia, many relevant laws or sub-decrees are still in draft form. However, the likelihood of environmental or social impacts impeding a future investment is minor in all three countries. This is largely based on lack of capacity to implement environmental regulations, unclear processes both by the government and the company investing, and lack of political will to enforce regulations. Furthermore, the lack of disclosure of project documents prevents a full analysis of how companies plan to mitigate environmental and social impacts. While it was found, in the case of Laos, that the government provided comments to Slaco on its EIA, it is not clear how those comments may have changed the implementation plans of the company or the approval process. Furthermore, a full assessment of how environmental and social issues are incorporated into decision-making is difficult to determine because EIAs and other relevant documents in all three countries are not available to the public, despite regulations indicating otherwise. In Vietnam, experience has shown that the EIAs carried out are only prepared to meet the minimal government requirements and environmental issues are only mentioned in a general sense, implementation is not monitored closely, and environmental restoration plans and improvement projects do not always accompany the EIA. In some cases, such as in Vietnam, a clear example of a conflict of interest is the case of the first alumina project in Lam Dong province, where a company controlled by the investor, Vinacomin, conducted the EIA.

#### 4.1.1 Cambodia

In Cambodia, there are two main laws that cover the management and exploitation of mining, including the Law on Mineral Resource Management and Exploitation (2001) and the Law on Environmental Protection and Natural Resources Management (1996). Some relevant decrees that are still in draft form include the Sub-decree on the Rights and Duties of Assigned Officers to Enforce the Law, the Draft Circular on Surface Rental of Mining Concessions and the Draft Circular on Royalties on Mining Products. The Law on Protected Areas was promulgated in early 2008; however, the zoning work has not started to divide the restricted area (core and conservation zone), which would prohibit mining activities. A number of mining activities have recently been permitted in protected areas.

In order for a company to obtain a licence for mineral exploration, it must register with the Ministry of Commerce as a private company and with the Cambodian Investment Board

(CIB) of the CDC as an investment company. The MIME is the executive agency for all mineral resources activities in Cambodia, with authority to deliver licences and agreements for mineral resources exploration or exploitation. The top decision maker in granting permission for mineral resources exploration or exploitation is the prime minister. Circular No. 001 on the Suspension and Revocation of Mineral Resources (25 May 2004) lists breaches of contract that will cause the licence to be suspended and states that if the licensee does not remedy the problem, then the licence will be revoked.<sup>65</sup> The CDC is the one-stop organization responsible for the development and the oversight of investment activities. The CDC comprises two operational boards: the Cambodian Rehabilitation and Development Board, which is in charge of aid coordination and management, and the CIB, which is in charge of the promotion, evaluation, incentives and strategic planning of private sector investments.

In some cases local communities in Cambodia have alleged that there is some exploitation being conducted by companies who only have an exploration licence, which is an activity requiring the licence to be suspended pending investigation. However, Cambodian government officials have strongly indicated that no exploration is occurring. As a provision for any special or urgent project which is approved by the Cambodian Prime Minister, in 2007 the MOE announced that mining companies no longer had to undertake EIAs as a precondition for receiving an exploration licence and that from then on, the zoning of protected areas could only be done once mineral resource 'master plans' had been developed through collaboration among the MOE, the MIME and prospective mining companies.<sup>66</sup> However for general / public projects companies must comply with the EIA regulations.

#### 4.1.2 Laos

In Laos, a regulatory framework exists and is in the process of improvement. The DGM within the new MEM is the agency responsible for the oversight of mining, geological and technical functions. Within the DGM, the Mining Concession Management Division is tasked with drafting mining policy, rules and regulations for prospecting, exploration, mining, environment and environmental protection. It also undertakes the core responsibility to monitor, inspect and promote mining investment activities.

The MPI is responsible for signing all agreements with foreign investors. The Law on the Promotion of Foreign Investment (2004) outlines the application process for foreign investment.

Established in 2007 under the Prime Minister's Office (PMO), the WREA is the main coordinating body for environment planning and management across all sectors. According to the Environmental Protection Law, its responsibilities include the establishment of strategies for implementing environmental policy, the receipt and evaluation of EIAs and other development reports from development actors, and the regulation of agencies that curtail or modify activities that have adverse impacts on the environment. The WREA has developed a range of environmental regulations with regards to EIAs in which line agencies are responsible for developing and implementing EIA guidelines for their respective sectors. For the mining sector, the DEM is responsible for ensuring that all mining projects seek approval through the WREA EIA process and comply with those standards. The Environmental and Social Impact Assessment Department was established in October 2008 and is in charge of both reviewing EIA documents submitted by mining companies and site inspection. Final recommendations will be made to the minister of the WREA for obtaining an Environmental Compliance Certificate (ECC). Acquiring an ECC is often quite a complex process and leaves decision-making to the

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65 NGO Forum on Cambodia, "Environmental and social impacts of expansion of the extractive industries sector," unpublished document, 28 October 2008.

66 Ibid.

implementing agency.<sup>67</sup> A new regulation drafted by the WREA was set to be approved by the Lao National Assembly in December 2008. The new regulation would include a new screening process based on indicators that will determine what kind of assessment is required, based on the size of the project. Instead of a formal EIA, a new initial environmental and examination (IEE)<sup>68</sup> for projects with minor impacts will be required and an environmental and social impact assessment for projects with significant impact. Table 4 shows the indicators used to determine the assessment requirements. Finally, the National Environment Commission within the PMO is the advisory body for approving mining projects proposed to the WREA.

**Table 4: Indicators to determine the type of environmental assessment in Laos**

Mining and extractive industry	Projects that have to undertake an IEE	Projects that have to undertake EIA	Projects that require ECC operating permits
Rock, gravel and sand excavation with excavation capacity	≤ 50 tons/day	> 50 tons/day	Yes
Mining project (not using and using chemicals)	≤ 100,000 m <sup>3</sup> /year	> 100,000 m <sup>3</sup> /year	Yes

Source: WREA, *Draft Regulation on Environmental and Social Impact Assessments, 2008*

Much of the problem with the regulatory framework in Laos lies in its enforcement. Government agencies have a limited capacity to regulate and monitor mining operations and there is a lack of community consultation. The main problem is that almost all information available on mining projects comes either from the mining company itself, or occasionally from the government (although this still often originates with the company). The government also still relies exclusively on company supplied environmental monitoring reports for oversight of environmental impacts. Without any external/independent monitoring or assessment, it is difficult to identify specific negative impacts.

In the past, some projects have signed agreements with provincial governors according to the Foreign Investment Law. This is allowed below a certain level of investment. But in reality, companies can strategically decide to invest less in the exploration phase, allowing them to bypass central government regulations and processes. Central government officials are aware of this and have raised concerns, hence the recent review of the mining process, investment and law.

Through the DGM, a future investor selects the area and presents it to the MPI in the form of an application for a foreign investment licence. Within the MPI, a separate China Office exists that facilitates the investment by Chinese companies,<sup>69</sup> showing the importance of China for Laos. In 2006 ORD reported that concessions are hard to secure without a Chinese partner. This resulted in ORD forming a joint venture with NFC, because the Australian company could not otherwise complete the deal. According to Vinay Inthavong, a Lao entrepreneur and chairman of the Vico Group, the Lao political elite must comply with its two important neighbours' requirements: 'if the leadership wants to stay in power, they have to support China and Vietnam.'<sup>70</sup>

67 Three actors are involved in the issuance of the ECC. (1) For projects with minor impacts, the line ministries with an Environmental Management Unit, such as the MEM, are in charge of reviewing the projects. In theory, the MEM will write to the WREA to recommend issuing an ECC – but in reality, sometimes the WREA does not see the projects. (2) In the case of line ministries without an Environmental Management Unit, the WREA is in charge of conducting the review process for the IEE. (3) There is a special case where the Ministry of Industry and Commerce is in charge both of the review and the issuance of the ECC for IEE level investments for projects that are considered to be small in terms of complexity and extent of impacts. The main problem lies with the implementing agency, the MEM, which is solely responsible for deciding what size of mines need an IEE, an EIA or no assessment.

68 In Laos, as in most countries, the determination of whether or not a project requires an EIA, and if so, the extent of the EIA, is based on the environmental screening and the IEE.

69 No information could be obtained about this office.

70 Financial Times, "Asia: China invests heavily in Vietnam, Cambodia, and Laos," 2 December 2007.

### 4.1.3 Vietnam

In Vietnam, the People's Committee of the province in question grants the investment licence and asks various ministries for comments/opinions on relevant studies and investor information. The Investment Licence Granting Agency makes an assessment, which is sent to the prime minister for approval. The MONRE is responsible for managing mineral resources nationwide.<sup>71</sup> The Ministry of Trade and Industry conducts state management of mineral exploitation, processing and trading. People's committees at all levels manage minerals at the local level, where authorized.

The Mineral Law of Vietnam requires investors to prepare an EIA<sup>72</sup> report in parallel with preparing the investment report. Investment projects in mineral activities are only approved and provided with licences after the EIA has been assessed. Together with the EIA report, a project must prepare an environmental restoration plan and deposit money into a government fund and continue to ensure environmental restoration five years after the project is finished.<sup>73</sup>

Vietnam's ambitious plans for bauxite mining in the Central Highlands have ignored the requirements under the Environmental Protection Law to carry out a strategic environment assessment (SEA)<sup>74</sup> before formulating plans. Similar to the Bolaven plateau in Laos, the Central Highlands is an environmentally and socially sensitive region. Without an SEA, as indicated by experts and scientists at a science seminar in December 2007 in Gia Nghia town, Dak Nong province, the cumulative and interregional impacts on the environment, economy and society could be significant. Even some officials at the Ministry of Trade and Industry and People's Committee of Dak Nong province worry about the future environmental management of these projects<sup>75</sup> if there is no SEA for the planning for bauxite mining.

The absence of an SEA is due to Vietnam's lack of experience in carrying out an SEA, the limited government budget for the implementation of regulations and the urgent need to exploit bauxite to meet market demand.<sup>76</sup>

As of late 2008 only one bauxite-alumina project complex has been assessed (and only the alumina production component of the project) – Lam Dong. The Nhan Co bauxite-alumina project in Dak Nong is being adjusted up to 600,000 tons per year and is waiting for reassessment. EIA reports for ore sifting and exploitation projects to supply bauxite ore for the two projects are in the preparation process. For the investment and EIA reports for these projects, different consultancy companies have been involved to assist the investor (Vinacomin), but in fact most of these institutes belong to Vinacomin, the Ministry of Industry or foreign research institutes that are invited by foreign partners. The process has not yet included social organizations such as technological/scientific organizations and independent consultancy units. The EIA reports for Lam Dong and Nhan Co were prepared by Vinacomin Informatics, Technology, Environment Joint Stock Company, a company controlled by Vinacomin.

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71 Under Article 55 of the 2005 Mineral Law.

72 Prime Ministerial Decision No. 80/2006/NĐ-CP dated 9 August 2008 mapping out the list of 102 types of project that require an EIA, including mining exploitation and processing projects.

73 Prime Ministerial Decision No. 71/2008/QĐ-TTg on depositing money for future environmental responsibility.

74 An SEA is usually carried out at higher levels of decision-making. It is a process of anticipating and addressing the potential environmental consequences at an early phase of a policy, plan or program. An EIA is focused more on a specific development proposal prior to major decisions being taken and commitments made (M. Keskinen and M. Kummu, PN 67 tool review: Cumulative impact assessment (CIA) & strategic environmental assessment (SEA), M-POWER PN 67 Project, draft, 2009).

75 In April 2009 numerous concerns about the bauxite mining projects in Vietnam were reported in a number of newspapers and online publications. The Government of Vietnam seems to have taken note of the various concerns and sent teams to the Central Highland to further study and investigate the impending projects.

76 While Vietnam generally lacks the capacity to carry out SEAs, a recent SEA was carried out for the hydropower sector that could be replicated for the bauxite mining sector.

According to field studies in Lam Dong and Dak Nong provinces, in practice the process for approval of the Lam Dong bauxite-alumina complex project and the Nhan Co alumina project were not implemented as regulated. These projects were carried out when the exploitation process had not yet been carried out and finished (the decision about planning for zoning for exploiting was promulgated in May 2007 under Prime Ministerial Decision 167/2007/QĐ-TTg). As a result, the investment report and implementing plan had to be carried out simultaneously. At the Nhan Co alumina plant, the ground had been cleared since December 2005 to build an alumina factory with an expected capacity of 100,000 tons of alumina per year. However, in the implementing process, this was adjusted to 300,000 tons per year in 2006 and up to 600,000 tons per year in 2008. It is speculated that this may be a strategy by the company to avoid restrictions on big projects by starting small and then scaling up. To date, although the Lam Dong and Nhan Co bauxite-alumina complex was licensed by the People's Committee of Lam Dong and Dak Nong provinces, in fact only the alumina factory component of the projects has been established and implemented. The ore sifting and exploitation plant is currently being established.

**Box 2: Agencies involved in preparing assessments for the Lam Dong bauxite-alumina complex project**

**Investment report:** Construction and Development Investment Consultancy Co.; Ministry of Industry; National Research Institute for Mechanical Engineering; Metallurgy Mine Research Institute; and experts of Pechiny Co. (France).

**EIA report:** (component of the alumina plant project): Metallurgy Mine Research Institute and experts of the MONRE.

**Table 5: Process of establishing and approving investment in the Lam Dong bauxite-alumina complex project**

Investment opportunity established	1997
Exploration licence granted	1998
Pre-feasibility research report and EIA report	1998–99
Feasibility report in (capacity of 300,000 tons alumina per year)	2001
Provision of investment guidelines by the government: No. 808/2005/VPCP	2005
Submission of feasibility report for new alumina factory, which proposes to increase capacity to 600,000 tons alumina per year	2005
7 June 2006 started clearing ground	2006
Investment report bauxite-alumina complex project approved by Vinacomin, Decision No. 1339/QĐ-VINACOMIN dated 7 June 2007	2007
EIA report for processing component submitted in 2006 and assessed in 2007	2007
Government decision about planning for exploiting zoning promulgated May 2007, Prime Ministerial Decision No. 167/2007/QĐ-TTg	2007
Investment licensed in November 2008	2008
14 July 2008 Chalieco wins EPC bid for alumina factory	2008
26 July 2008 Lam Dong bauxite-alumina complex officially started	2008

*Source: Synthesized from interviews with the director of Lam Dong Bauxite-Alumina Co. and officials of the Ministry of Trade and Industry and the MONRE*

## 4.2 Lack of transparency and access to information

In all three countries, the EIAs prepared for the bauxite mining projects are not available to the public, despite regulations indicating that they will be made available or placed in the public domain. In Vietnam, EIAs are often deemed to be too general and SEAs are not yet carried out, despite regulations requiring them. In Laos, EIAs are still not well understood by the government, although new donor money is providing such much needed capacity building for the WREA. In Cambodia, MIME ensures the confidentiality of bauxite mining and all other mineral resources operations throughout Cambodia, as the Mineral Law specifically states that all applications, reports, plans and notices concerning exploration and exploitation are confidential.<sup>77</sup> Public or private institutions and NGOs are consequently not able to access data on licences and agreement on mineral exploration. The annual report of the General Department of Mineral Resources in Cambodia is classified as confidential, and access to mineral operation sites is strictly prohibited. There is limited interaction between MIME and other government offices: the MOE was not consulted in the preparation of the environmental protection clause of the Agreement on Mineral Exploration. However, the Law on Environmental Protection and Natural Resources enables the public to request information on MOE activities and encourages the public to participate in environmental protection and natural resources management.<sup>78</sup> This is an example of overlapping jurisdiction and conflict in the law regarding the disclosure of information.<sup>79</sup>

## 4.3 Licences often granted regardless of environmental and social concerns

While in Cambodia, environmental and social concerns have not played a significant role in the step by step decision-making process on bauxite mining exploration, despite the involvement of the MOE in the process,<sup>80</sup> such a process seems to be developing in Laos with regard to the Slaco project. There, the WREA made a visit to the project site and subsequently sent comments back to the company on the EIA that it had prepared, raising over 50 issues. This includes concerns that the relevant EIA report needs to include an ethnic minorities development plan and/or a land acquisition and compensation report or a resettlement plan in accordance with Decree No. 192 on Compensation and Resettlement of People Affected by Development Projects and Its Implementing Regulations No. 2432. Slaco is currently in the process of providing the Government of Laos with further details based on the government's requirements. However, it should further be noted that construction has already begun at the project site, despite the concerns raised around environmental and social issues and the lack of an ECC.

## 4.4 Uncertain benefits for local communities

While opportunities may exist for local communities to obtain community development funds for rural infrastructure, small industry, agriculture and forestry processing, and the generation of jobs for rural labour, which could lead to positive changes within the community, the overall mining sector requires highly technical skills. There are minimal opportunities for local communities to engage in mining activities and there is uncertainty about the likelihood of

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77 Cambodia, Law on Management and Exploitation of Mineral Resources (Phnom Penh: Government of Cambodia, 2001).

78 Cambodia, Law on Environmental Protection and Natural Resources Management (Phnom Penh: Government of Cambodia, 1996).

79 NGO Forum on Cambodia (2008).

80 Article 6 of the 1996 Law on Environmental Protection and Natural Resource Management in Cambodia states, 'an environmental impact assessment shall be done on every project and activity, private or public, and shall be reviewed and evaluated by the MOE before being submitted to the Royal Government of Cambodia for decision'.

these benefits materializing.<sup>81</sup> All three countries have no experience in bauxite exploitation and processing, so importing appropriate technology, equipment and human resources is required. Furthermore, experience has shown from other Chinese investment schemes that they often bring their own workers to carry out the work. Additionally, the areas for bauxite mining in all three countries includes ethnic minorities whose ancestral forests may be violated, and limited opportunities for work and revenue generation will be available. For example, in Cambodia, local communities and provincial governments rarely see any direct revenue from mining operations, as they do not receive any tax revenue or restoration funds<sup>82</sup> for the rehabilitation of the mining site from the company.

## 4.5 Lack of public consultations

In all three countries, limited or no information has been provided on how and when affected communities have been consulted on mining investments. Therefore, it is difficult to determine the role or input of communities in the development of bauxite mining projects. However, past examples, i.e. in the hydropower sector, have shown that in all three countries, when consultations do occur, they have frequently been held with village chiefs, who often do not represent the communities' concerns. Some communities have alleged that they were ill informed or intimidated or not consulted at all.<sup>83</sup>

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81 It should be noted that several Australian-led mining projects have developed community development projects.

82 Rehabilitation work involves the reforestation of the mining site, depolluting the area, restoring the environment, etc.

83 NGO Forum on Cambodia (2008); IR (2008).

The benefits from bauxite mining in the form of revenue and jobs could be tremendous for Cambodia, Laos and Vietnam. However, this important mineral, which is the source of all things made of aluminum, lies in an environmentally sensitive area of the Mekong region. Mondulhiri province in Cambodia boasts four wildlife refuges and two national protected areas. The Bolaven plateau in Laos is home to vast forests and important agricultural lands, as well as rare and endangered animals and plants. The Central Highlands of Vietnam is an extremely fertile region with vast coffee plantations and an enormous ecotourism potential. In all three localities, ethnic minorities reside and have lived on the land for centuries.

The many concerns about bauxite mining in the Mekong region arise from the tremendous environmental and social consequences of such mining projects. Like most developmental projects, people bear the brunt of the impacts, often having to be resettled from their lands or suffer environmental pollutants and less than ideal living conditions. The environment also experiences adverse consequences, as bauxite mining involves the discharge of toxins that must be stored safely and permanently. With the vast river resources in all three countries, water will be affected both in quality and quantity; also, aluminum smelting requires huge sources of cheap electricity.

Several make or break outcomes are associated with bauxite mining in the region. Firstly, to date, there is no access to cheap available energy sources. So far, hydropower development is not on the same timeline as the proposed bauxite projects and hydropower cannot yet be sold at a cheap enough price to make aluminum smelting cost effective, although preparations are being made to exploit the hydropower resources. Coal-fired electricity plants are used as energy and hot air sources in the bauxite extraction and alumina refining stages, but are said not to be a viable source of energy for smelting. Secondly, few countries in the world export raw bauxite, and while alumina can be transported, it is extremely difficult to do so. It is therefore best that the three countries try to implement the full value chain of bauxite mining, alumina refining and aluminum smelting.

Enter China. Even though China is not the only bauxite mining investor in the region, it is playing a strong role in both Vietnam and Laos. In Vietnam, Chinese companies are involved in the construction of alumina factories, while in Laos, larger Chinese companies are part of the formation of two consortia of investors, while some smaller companies are acting independently. China needs the aluminum to feed its growing automobile and packaging industries and does not have enough resources at home. China is also a risk taker, often entering into highly complex investment deals that may not see fruition.

The bauxite story in the region will continue to take twists and turns, as it already has to date. Several projects are being put on hold as public outcry, in the case of Vietnam, has raised significant concerns about the validity of these projects. In the case of Laos, there appears to be silence, but a growing group of individuals within government are becoming increasingly concerned about the bauxite potential, both positive and negative, and are seeking support to learn more. In Cambodia, rumours have been circulating that BHP Billiton, the main investor in Mondulhiri province, has withdrawn; however, there has been no public acknowledgement of this. In the meantime, the likes of Rio Tinto are making plans to invest in Laos, and others will come and go. In the longer term, how the Chinese will feed their hunger for all things aluminum, specifically as this affects the countries and peoples of the Mekong region, remains to be seen.

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## Annex

### Annex 1: Processes of Bauxite Mining, Alumina Processing and Aluminum Refining

Several steps are involved in the production of aluminum from bauxite (Figure 9):

**Exploiting bauxite:** Several activities need to be done at this stage, which include resettling local people, clearing vegetation, removing topsoil and mining the raw bauxite. After this stage, the raw bauxite is transported by truck to the pure ore selection factory.

**Pure ore selection:** In the factory, high pressure water is used to wash the raw bauxite. This step demands a huge amount of water and releases the water with the mud (without toxic chemicals) into the environment. Then the pure bauxite ore is transported by conveyor belt to the alumina processing factory.

**Alumina processing:** The different components in this stage are (1) the alumina factory; (2) a coal fired thermal energy plant; and (3) red mud and oxalate mud ponds. The steps are as follows.

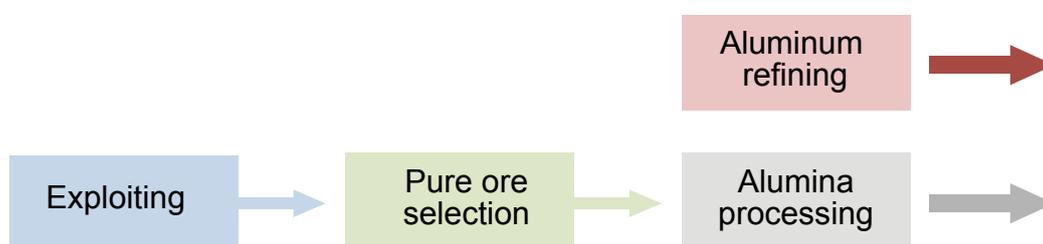
- The pure bauxite ore is ground to powder.
- The bauxite is neutralized with caustic soda.
- The bauxite is dried by hot air using coal fired thermal energy. It is estimated that in order to produce 1 ton of alumina, 1 ton of coal is need to produce the energy needed to release the red mud.<sup>84</sup>

After the alumina is produced, it can be exported to international markets or electrolyzed into aluminum.

**Aluminum refining:** This process requires a huge amount of cheap electricity. Modern technology requires about 14,500 kilowatts hours to refine 1 ton of aluminum. In all three Mekong region countries, given the shortage of electricity, it is not viable to refine aluminum in-country, but only to produce alumina and export it to another country. China is the most likely recipient of the alumina.

In order to produce 1 ton of aluminum, 2–2.5 tons of alumina needs to be refined, which is equivalent to 5 tons of extracted pure bauxite ore, or 10 tons of mined and processed raw bauxite, and involves the release of 3 tons of red mud. One ton of coal is needed to dry 1 ton of alumina.

Figure 9: Processes in the production of aluminum from bauxite



<sup>84</sup> Red mud is produced during the Bayer process. In this process, the aluminum (oxy)hydroxides are extracted from bauxites to produce alumina, which eventually can be smelted and turned into aluminum; see [www.redmud.org/Production.html](http://www.redmud.org/Production.html).

## Annex 2: Vietnam Prime Ministerial Decision No. 167/2007/QĐ-TTg

This is the most important Government of Vietnam document related to bauxite mining. In total it is 20 pages in length; below is an unofficial translation of the key features.

**Principle of bauxite exploitation processing:** Exploiting bauxite has to be in accordance with Vietnam's industrial development planning; with general and specialized planning for the socioeconomic development of the area to ensure economical and ecologically effective production and environmental protection; and in accordance with the requirements of national defence and security, especially in the Central Highlands, by building and developing a bauxite exploitation and processing industry that uses environmentally friendly, modern technology.

**Zoning planning:** Zoning planning to exploit and use the country's bauxite potential includes two regions: an exploitation and processing region of a small and medium scale (which includes the mines of the northern and central coastal provinces); and bauxite exploitation and alumina production on an industrial scale in the Central Highlands.

**Exploration planning in the period 2007–15:** Vinacomin is appointed to manage exploration for all bauxite mines in the Central Highlands and to evaluate reserves as a basis for implementing investment projects in aluminum-alumina-bauxite mining. For those mines in Ha Giang, Cao Bang, Lang Son and other provinces in the central coastal area, Vinacomin and other capable businesses are encouraged to be involved in the exploration process.

**Alumina processing:** Expected total production capacity in the period 2007–15 is about 6.4–8.4 millions tons of alumina and 0.64 million tons of hydroxide aluminum/year, and will reach 12.8–18.0 millions tons of alumina/year in 2016–25. The Central Highlands is the main region of industry scale bauxite exploitation with eight bauxite-alumina complexes. Also according to this decision, the Central Highlands will be divided into three subregions: Bao Loc-Di Linh (Lam Dong) and Konplong (Kon Tum) and Dak Nong province.

**Aluminum refining:** In the period 2007–15 the focus will be on encouraging international partners to enter joint ventures and invest in building synchronous power stations and aluminum refining plants that use Vietnamese alumina, so that aluminum capacity will reach 200,000–400,000 tons/year. Aluminum refining plants may be located at Dak Nong, Lam Dong and Binh Thuan (near the Binh Thuan sea port).

**Other supporting planning:** This will involve building a 270 kilometre double railway line from the Central Highlands to the Binh Thuan sea port, and a special use sea port with a capacity of 50,000 tons in Binh Thuan province.

**Investment capital needed:** Total capital for exploring for, exploiting and processing bauxite in the period 2007–25 is estimated at about VND 189,110–249,420 billion (equivalent to about \$11.1–14.7 billion),<sup>85</sup> including bauxite exploitation and processing projects (alumina producing and aluminum electrolyzing) and infrastructure (railways and ports).

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<sup>85</sup> \$1 = VND 17,000.