



# **In the Valley of the Shadow of Death?**

A Report on Antofagasta Plc, Minera Los  
Pelambres and Los Caimanes

London Mining Network, May 2017

# CONTENTS

<b>Introduction</b>	<b>3</b>
<b>History</b>	<b>4</b>
Copper Mining in Chile, and Minera Los Pelambres	4
Mining and Latin America	4
Who are the Luksics?	5
Fast facts about Minera Los Pelambres/El Mauro tailings-dam	6
Minera Los Pelambres' expansion plans	6
Timeline of the El Mauro dam and the resistance against it	7
The settlement agreement between Minera Los Pelambres and Caimanes residents: Controversies	8
<b>Allegations of corruption</b>	<b>9</b>
The Luksic Group, Antofagasta Minerals and allegations of corruption	9
Beyond legality/illegality: how the Luksic group stay powerful	10
The Glencore-Minera Los Pelambres conflict; a case of déjà vu?	11
<b>Earthquake risks at El Mauro</b>	<b>12</b>
Construction problems with tailings dams	12
Legal cases concerning earthquake risk	13
<b>El Mauro and the water shortage in Chile</b>	<b>13</b>
<b>Water pollution and El Mauro</b>	<b>14</b>
The Tchernitchin report: water pollution	14
Timeline of spillages across Minera Los Pelambres' operations	15
<b>Archaeological damage and Minera Los Pelambres</b>	<b>15</b>
<b>Conclusion</b>	<b>16</b>
<b>Technical appendix: failures of sand tailings dams in Chile</b>	<b>17</b>
Failures of sand tailings dams in a highly seismic country, 2013, Gabriel Villavicencio, Raul Espinace, Juan Palma, Andy Fourie, and Pamela Valenzuela	17
<b>Endnotes</b>	<b>18</b>

# Introduction

London Mining Network is an alliance of human rights, development, environmental and solidarity groups working in support of communities around the world who are badly affected by mining companies based in, or financed from, London.

One such company is Antofagasta plc, one of the larger mining companies listed on the London Stock Exchange. The majority of its operations are in Chile. The most significant shareholders in Antofagasta are members of the Luksic family, a wealthy Chilean family which is also involved in a number of other businesses.

Antofagasta controls the Los Pelambres copper mine in north central Chile. This mine stores its tailings (fine wastes) in water contained by the El Mauro dam, the largest tailings dam in Latin America, which is situated above the small town of Caimanes.

London Mining Network has long been concerned about the potential danger posed by this dam and about the way that community concerns have been dealt with. This report sets these dangers and concerns in the broader context of mining in Chile, the influence of the Luksic family, and the close links between big business and the Chilean political establishment.

But we need to keep constantly in mind that the problems and shortcomings noted in this report are linked to London: London is the world's biggest centre for investment in the minerals industry, and the lack of oversight of mining companies raising funds in the city allows bad practices to continue.



# History

## Copper Mining in Chile, and Minera Los Pelambres

Copper has been central to the Chilean economy since copper mining began on an industrial scale in the country in the early twentieth century. Around 40% of the world's copper is produced in Chile, accounting for around half the country's exports. The world's largest copper mine, Escondida, is located in Chile.

Chile has one of the highest number of recorded conflicts related to mining in Latin America. As an economic activity mining generates conflicts with those negatively affected by environmental damage caused by mining, those who occupy land on which mines are located, with mining workers and others.

Control over Chilean copper reserves is central to Chilean politics. When Salvador Allende, a left-wing president supported by large social movements and unions, came to power in 1970 one key policy was a publicly-owned copper industry. This policy was reversed following a military coup which brought dictator Augusto Pinochet to power, when private companies became able to buy and sell mining concessions, following the passing of the Organic Constitutional Law on Mining Concessions (1982) and the Mining Code (1983). These two laws remain intact today.

Based on production and estimated reserves, the Los Pelambres mine is one of the world's largest copper reserves. The mine was first bought from Enami, a state mining company, during a wave of privatisations in the 1970s following the military coup.

The main current shareholders of Los Pelambres are Antofagasta Minerals (60%), owned by the Luksic Group. The remaining 40% of ownership is split between Japanese companies: Nippon Mining and Metals Co. Ltd. (15%), Marubeni Corp (8.75%), Mitsui & Co. Ltd. (1.25%), Mitsubishi Corp. (5%).

The power of big business over mining regulation is evident in its influence over successive governments' approach to mining regulation from the 1980s onwards in Chile. A high number of free trade agreements attract foreign investment in a climate of low accountability; businesses can operate for lengthy periods before beginning to pay low tax rates on mining operations; for a long time labour laws weakened the hand of organised labour, and protective environmental regulation is often not enforced. As other sections of this report detail, there are numerous cases of 'revolving-door' practice in the mining and other industries. Individuals oscillate between the Boards of Directors of private companies, government ministries and regulatory bodies. Within this context, companies such as Minera Los Pelambres are able to carry out their activities despite wide-ranging problems and resistance.

However, the tide may be changing; recent years have seen significant rulings by Chilean regulatory bodies against mining multinationals for failure to comply with environmental regulations. In 2013 the largest gold-mining company in the world, Barrick Gold Corporation, was fined for water pollution and other violations at their Pascua Lama mine on the Chilean-Argentinian border. Operations were immediately suspended and the fine amount has yet to be settled. The same year, Anglo American was fined for deforestation at their El Soldado mine. Antofagasta Minerals was fined US\$2.3 million for damage to archaeological heritage. Two Supreme Court rulings were issued against the company in 2013 and 2014, but these were subsequently overturned on appeal.

## Mining and Latin America

As a region Latin America receives the highest amount of Foreign Direct Investment into the mining industry in the world. In the first half of 2015 Foreign Direct Investment to Latin America fell by 21%, due to an ongoing decrease in investments in mining and hydrocarbons. Mineral prices began to fall globally in 2012, shortly before oil prices did the same, contributing to economic downturn to the region. The downturn in the mining sector in Chile was due to a convergence of the economic slowdown of China – 40% of Chilean exports go to

China and other Asian countries – increased operating costs, and opposition to mining projects by social movements and organised workers.

In Chile, the decrease in Foreign Direct Investment has been concentrated in the mining sector. Between 2011 and 2015 the price of copper fell 43% in four years. In 2015, Antofagasta Minerals' profits fell by 33%. However 2016 saw a change in trends with global copper prices rising significantly in the last quarter of the year, and remaining higher at the time of writing of this report.

## Who are the Luksics?

The Luksic Group is currently owned by the Luksic brothers, Andronico and Jean-Paul and was founded by their father, Andronico Luksic Abaroa. The group is one of Chile's most powerful business conglomerates. Their business dealings date back to the mining sector in the 1950s, but their reach now goes well beyond this sector. They now own companies across sectors including telecommunications, rail transportation, water and agriculture.

The Chilean economy is extremely concentrated in the hands of a few. In 2002, for example, the largest 25 business conglomerates controlled over 90% of the assets of the largest companies operating in the country, a proportion which has remained stable since 1990. In the same year the five largest business groups controlled almost 50% of total assets of companies listed on the country's stock exchange.

The Luksic family is unusual amidst the wealthiest families in Chile in that their wealth does not date back to the old, post-colonial order linked to land possession and later commerce. Andronico Luksic Abaroa, the founder of Grupo Luksic and father of the current Luksic generation, Andronico II, Jean-Paul and Guillermo Luksic, who died in 2013, was the son of a Croatian migrant who arrived in Chile in the early 1900s. Andronico I began business with a Ford dealership in the region of Antofagasta, later using money from the Ford dealership to venture into mining. Since Andronico I died in 2005 his widow, Iris Fontbona, has been the richest person in the country. The Luksic brothers are also on the Forbes list of the world's wealthiest people. Their net wealth almost doubled between 2009 and 2010, but fell in recent years.

The history of Andronico Luksic I's wealth and business accumulation is contoured by the tumultuous transformation of Chilean capitalism since the 1970s. When Salvador Allende was brought to power in 1970 the Luksics sold some businesses to the state in exchange for holding onto others in the agriculture and food sectors. Subsequently they were branded as traitors by some figures in business and government, who were more sympathetic to Pinochet after Augusto Pinochet's military coup. They left Chile for London, where they remained for several years, before returning in the 1980s during an economic crisis. Unlike other companies who had been buying assets in the surge after the coup, the Luksics did not get into debt during the early 1980s. They took advantage of this economic crisis to buy up insolvent or indebted companies at a low cost, many of which had been privatised shortly after the coup in a climate of extreme repression.

This report focuses on the El Mauro tailings dam, which serves the Los Pelambres mine, the crown jewel of the Luksic Group's company Antofagasta Minerals. The Los Pelambres mine delivers its largest profits. In 1985 the Luksic group purchased Anaconda Chile and Anaconda International, owners of the Los Pelambres mine. Anaconda had bought it from Enami, the state mining company, in 1978 during the first privatisations following the coup. Los Pelambres expanded after investment by the Japanese consortium Nippon mines, the same investors who first invested in Andronico Luksic I's mines. During the 1990s Grupo Luksic expanded into a sectors including telecommunications, finance, alcohol and transport.

The Luksic Group's key period of growth has been since 2002, when the group's estimated value was US\$1.9 billion, including during two Concertación governments, centre-left governments most recently led by Michelle Bachelet. By 2012 this value had grown almost seven-fold in size to US\$15.6 billion. The acquisition of Banco de Chile in 2002 was significant in providing the group with more access to financial resources, as their profits were increasingly linked to financial capital and speculation. The Caval Case (Caso Caval), detailed later in this report, is also evidence of aspects of the exercise of political power which the bank acquisition facilitated.

The Luksic Group continues to dominate the mining sector in Chile through Antofagasta Minerals and Minera Los Pelambres. The El Mauro tailings dam has been an important part of a broader appropriation of local water resources and supply for the company's mining operations. Cheap disposal of mining waste has been another way to push down costs, which has recently caught up with Antofagasta Minerals in its conflict with Glencore over waste disposal at a site on the Chile-Argentina border, called Cerro Amarillo. Aligning with global patterns, subcontracted labour is increasingly central to Antofagasta Minerals' mining division operations; in 2014, for example, almost 80% of the company's labour force was subcontracted.

Resistance to the Luksic Group is growing, but it is complex terrain. The 2013 Chilean Federation of Industry's (SOFOPA) Annual Survey of investment projects stated that fifty-three investment projects had been postponed, paralysed or abandoned on account of socio-environmental conflicts. The net value of these separate investment projects represented US\$70.9 billion, equivalent to around a quarter of Chilean GDP that year. 59.9% of these conflicts were linked to mining sector investment projects. At least 14% – over US\$10 billion in value – of these paralysed projects directly involve Luksic Group companies.[1] One of the longest-running conflicts, of significant detriment to Antofagasta Minerals, has been the conflict involving the El Mauro tailings dam and the community at Los Caimanes.



## Fast facts about Minera Los Pelambres/El Mauro tailings-dam

- The El Mauro tailings dam is the biggest in Latin America, and third biggest in the world.
- Minera Los Pelambres is the most profitable subsidiary of Antofagasta Minerals.
- Minera Los Pelambres is the biggest business in the Coquimbo region.
- The El Mauro dam replaced Quillayes dam. Quillayes was the first dam with a final height over 200m in a high seismicity region. Up until the 1970s dam heights did not reach over 70m in Chile.
- The Samarco dam in Brazil, which collapsed in the disaster known as "Mariana", is around 100 times smaller than the El Mauro tailings dam.
- The El Mauro tailings dam currently holds around 1700 million tonnes of tailings.[2]
- Minera Los Pelambres are currently planning to expand the dam, alongside planned expansion of production at the mine itself.

## Minera Los Pelambres' expansion plans

With an investment of US\$1.1 billion, Minera Los Pelambres plan to expand the mine by building two new grinding mills and a desalination plant. Through this expansion the company hopes to maintain production levels of around 400,000 tonnes of copper and 8,000 tonnes of molybdenum per year. Although the works were scheduled for 2016, Minera Los Pelambres was forced to delay these works, which they have stated is due to the conflict over El Mauro.

# Timeline of the El Mauro dam and the resistance against it

**2004** Licenses granted to begin work on El Mauro tailings dam.

**2006** Construction of El Mauro tailings dam begins. The Court of Appeals rules that the construction should never have begun, but it continues. Minera Los Pelambres makes settlement payment of \$25 million to Victor Ugarte, a local landowner.[3]

**2009** Construction at El Mauro ends.

**October 2010** Eleven residents from Los Caimanes go on hunger strike for 81 days to protest against the El Mauro dam.[4]

**December 2010** Work accident kills employee at Minera Los Pelambres mining site.[5]

**March 2013** Work accident kills Minera Los Pelambres employee. Two more fatalities are reported by Antofagasta Minerals as occurring during the year at La Esperanza mine.

**July 2013** The Chilean Supreme Court rules the tailings dam a “danger to human life”, making Minera Los Pelambres officially culpable for any loss of human life in the event of a collapse of the dam. The company was ordered to submit a plan to reinforce the dam in case of an earthquake. At the time of writing Caimanes residents claim they have not had access to such a plan.[6]

**February 2014** The Environmental Agency (Superintendencia del Medio Ambiente) fines Minera Los Pelambres US\$2.3 million for damage to archaeological heritage. Minera Los Pelambres appealed this ruling in the Environmental Tribunal; the Tribunal upheld the ruling – that Minera Los Pelambres was responsible for violations of regulations in relation to archaeological heritage – but ordered the amount of the fine to be re-calculated.[7]

**April 2014** Robert Mayne-Nicholls takes over as the General Manager at Minera Los Pelambres. He was previously employed at Barrick Gold Chile, leaving after fines were imposed on the company over breaching environmental legislation at their Pascua Lama mine.

**May 2014** Los Caimanes residents win a case against Minera Los Pelambres in the court of Los Vilos Province. The tailings dam is ruled a “Ruinous Work” (Obra Ruinosa), in reference to the risk of the dam’s collapse in the event of an earthquake. This was appealed in April 2015.[8]

**September 2014** An accident kills a Minera Los Pelambres employee near the El Mauro tailings-dam.[9]

**October 2014** In a case relating to the ongoing construction of the dam wall (“Obra Nueva”), the Chilean Supreme Court orders Minera Los Pelambres to restore the free flow of uncontaminated water to the Pupio basin, where the tailings dam is located, and to do this by demolishing the tailings dam. The company was permitted one month to present an alternative option, which would restore water to the surrounding areas.[10]

**December 2014** Residents from Los Caimanes block an access route to the tailings dam for 75 days.

**March 2015** Protests spread to the valley of Choapa. Several people sustain minor or serious injuries.

**March 2015** The plan Minera Los Pelambres presented as an alternative means to return the flow of water to the Pupio basin without demolishing the dam is rejected by the Supreme court, who order the tailings dam to be demolished. This was a very significant ruling, but Minera Los Pelambres succeeded in overturning it at the Appeals Court of La Serena.[11]

**March 2015** Negotiations between representatives of Los Caimanes and Salamanca, provincial mayor Patricio Trigo, government ministers Jorge Insunza and Luis Lemus and representatives of Minera Los Pelambres result in plans for the construction of a desalination plant, which will guarantee access to seawater for the mine's expansion. Minera Los Pelambres is currently negotiating payments with residents of areas which are located on the planned route of the pipeline associated with the desalination plant.

**April 2015** Minera Los Pelambres wins an appeal against the ruling at Los Vilos, which declared the tailings dam a "ruinous work" [Obra Ruinosa], due to the risk of collapse in the event of a strong earthquake.

**June 2015** Mining Minister Jorge Insunza publicly resigns, following a report published by Codelco, the state-owned copper mining company. The report showed that Insunza had received payment from Antofagasta Minerals, for consultation work undertaken by Insunza's own company, Sistema Consultores.

**May 2016** An accident at Antofagasta Minerals' Antucoya mine causes the death of a worker.[12]

**May 2016** Agreement between residents of Caimanes, lawyers from Ossa y Cia legal firm and Minera Los Pelambres. Rejected by the Comité de Defensa (a group of Caimanes residents who have been leaders of resistance to the project in the town), and their supporters.[13]

**August 2016** Appeals Court of La Serena overturns Supreme Court ruling of March 2015, which ordered the demolition of the tailings dam.

**October 2016** Environment Regulatory Commission (Superintendencia del Medio Ambiente) issues nine charges against Minera Los Pelambres for failing to comply with environmental regulation relating to damage to flora and fauna in their operations.[14]

## The settlement agreement between Minera Los Pelambres and Caimanes residents: Controversies

In May 2016 Minera Los Pelambres and a group of residents from Los Caimanes signed an agreement with a total value of 24,700 million Chilean pesos (around £3 million). Signature of the agreement followed negotiations between the company, lawyers from the firm Ossa y Cia who formerly represented the community at the time and who previously worked together with the Caimanes Defence Committee (as previously described above), and a group of residents from Caimanes, Rincon and Pupio. It is entitled "Agreement of understanding and cooperation between the mining company and the residents of the Pupio valley".

The agreement has promised 28 million Chilean pesos (around £35,000) to each family who signs. Although this is a considerable sum, some researchers and residents in the town believe that Caimanes residents who signed have been bought off for an amount that which will not sustain entire families for long. They say that this amount will not guarantee many of them the amount of land, or the standard of living, that many had prior to the construction of the tailings dam.

The agreement lays the groundwork for the expansion of the mine and tailings dam, or possible construction of another tailings dam in the area. Lawyers from firm Ossa y Cia who previously represented the community were given 3.1 million Chilean pesos (around USD\$4.6 million) in total; 2.4 million pesos towards legal fees and 700 million towards trial expenses. Esteban Vilches, who currently represents the Defence Committee, argues that there are no documents available which would prove that these amounts reflect costs incurred from representation and trial fees.

As a result of the agreement Ossa y Cia desisted with their representation in the "Obra Ruinosa" (Ruinous Work) case, and the agreement appears significant in the decision of the Appeals Court to overturn the Supreme Court's ruling to demolish the dam.

The Defence Committee's new lawyer, Esteban Vilches, is representing them in continuing the case regarding Obra Nueva, which initially led to the Supreme Court ordering the company to demolish the dam, before this ruling was overturned by appeal. However the demands of the case now involve access to water in the area through pipes and tanks, rather than restoring the natural water flows.

Other aspects of the agreement include an employment programme to run between 2017 and 2018 through which Caimanes residents will be able to work as guides at the Monte Aranda museum. This museum was only recently built after Minera Los Pelambres was issued with a series of fines relating to concealment and neglect of archaeological discoveries in the area. The agreement states that a community development fund will be set up. Residents may also rent small plots of land belonging to Minera Los Pelambres for agricultural use – land which in some cases may have previously belonged to residents themselves.

Minera Los Pelambres and the Caimanes Defence Committee have outlined different versions of the process of ratifying the agreement. Minera Los Pelambres have stated they were happy to see a 58% vote by residents in favour of the deal, but the Caimanes Defence Committee have responded by stating that only 64% of residents cast votes, below the required quorum of 70%.

In February 2017 members of the Caimanes Defence committee announced they would bring a case accusing three of their former lawyers at Ossa y Cia of Prevarication regarding the agreement. This case is currently being investigated by the Public Ministry of Complex Crime.

## **Allegations of corruption**

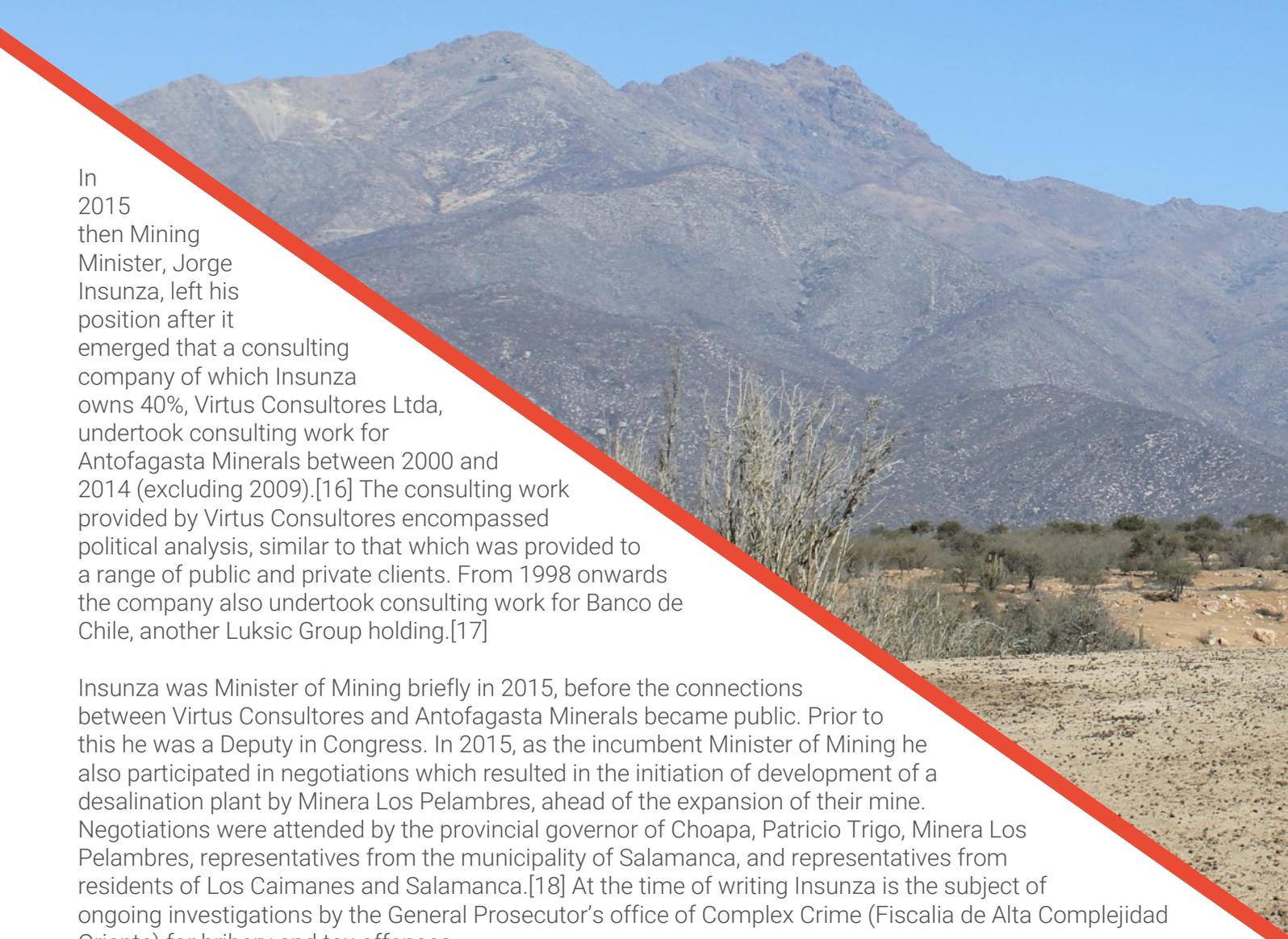
### **The Luksic Group, Antofagasta Minerals and allegations of corruption**

Since 2014 a series of scandals involving high-profile figures have shed light on the entangled worlds of public administration and the political power of business in Chile. These scandals involved some individuals whose power can be traced back to the Pinochet administration, as well as figures closely associated with Michelle Bachelet's left-leaning administrations (2006 – 2010, and 2014 – present). In one instance, these cases even implicated President Bachelet's own family. The political party most exposed in these scandals was the right-wing UDI, although cases also involved members of Congress, current and former politicians and public officials from across the political spectrum. Most cases involved illicit forms of financing of political campaigns, often by businesses issuing false receipts for services not rendered.

Political campaign and party financing has been an area obscured from public knowledge even since the transition to democracy. Until these scandals came to light there had been around a decade of regulation of campaign financing, but no way for the public to find out this information. According to the NGO Ciudadano Inteligente, which works to improve the transparency of Chile's political system, the scandals have left confidence in public institutions at its lowest ratings for 20 years. Bachelet's support ratings also fell to the lowest in years as a result.[15]

During her first presidential term in 2006 Bachelet announced a new anti-corruption programme, and created a commission headed by the Minister of Economy at the time. Despite being able to effect some changes, the reach of the commission was limited. With the most recent round of scandals Bachelet created a new advisory council led by economist Eduardo Engel. The key law that came into force in 2016 was a new political financing law. The law, which banned donations by businesses to political campaigns, has, among other things, halved the financial resources candidates may use on campaigns.

From 2014 the Luksic Group, Antofagasta Minerals and Minera Los Pelambres have been entangled in several ongoing cases regarding improper financing of politicians and political parties.



In 2015 then Mining Minister, Jorge Insunza, left his position after it emerged that a consulting company of which Insunza owns 40%, Virtus Consultores Ltda, undertook consulting work for Antofagasta Minerals between 2000 and 2014 (excluding 2009).[16] The consulting work provided by Virtus Consultores encompassed political analysis, similar to that which was provided to a range of public and private clients. From 1998 onwards the company also undertook consulting work for Banco de Chile, another Luksic Group holding.[17]

Insunza was Minister of Mining briefly in 2015, before the connections between Virtus Consultores and Antofagasta Minerals became public. Prior to this he was a Deputy in Congress. In 2015, as the incumbent Minister of Mining he also participated in negotiations which resulted in the initiation of development of a desalination plant by Minera Los Pelambres, ahead of the expansion of their mine. Negotiations were attended by the provincial governor of Choapa, Patricio Trigo, Minera Los Pelambres, representatives from the municipality of Salamanca, and representatives from residents of Los Caimanes and Salamanca.[18] At the time of writing Insunza is the subject of ongoing investigations by the General Prosecutor's office of Complex Crime (Fiscalia de Alta Complejidad Oriente) for bribery and tax offences.

In a case known as Caso Caval, the son of current President Michelle Bachelet is accused of attempting to gain a loan of US\$10million to buy land through a company registered in his wife's name, after a personal meeting with Andronico Luksic, director of Banco de Chile. The meeting occurred during Bachelet's electoral campaign period. The loan was approved the day after Bachelet's electoral win, and was used to purchase land that was resold some weeks after.[19] Investigations by the Regional Public Prosecutor's office in the O'Higgins region are ongoing.

## Beyond legality/illegality: how the Luksic group stay powerful

These dubious activities of Luksic Group companies, such as those mentioned above, are important and several relate directly to Minera Los Pelambres and the El Mauro tailings dam. However, we should contextualise El Mauro within the Luksic Group's power as one of Chile's biggest business conglomerates, which arguably comes to influence the political, legislative and intellectual landscape in which they operate.

The Luksic Group finance a series of organisations and institutions involved in the production of ideas. These include the funding of scholarships at prestigious universities, and Andronico Luksic III's role on the advisory Board of faculties including Harvard Business School, the Centre for Latin American Studies at Harvard, and the Blavatnik School of Government at Oxford, amongst others. Whilst this is by no means illegal, it raises some questions around the Luksics' possible influence over future international scholars, business figures and lawmakers, however unintentional.

Another example of manifestations of the Luksics' influence is the funding of think-tanks. Luksic-funded Grupo Res Publica Chile (GRPC) is a major think-tank in Chile which develops policy proposals. During the turbulent political climate of 2011 it developed a series of policy responses to the unrest, proposing 95 policy

recommendations in 2013. One key area of these was environmental regulation. A tax reform programme, which was a key policy of the Nueva Mayoría coalition, drew extensively on GRPC proposals. Nueva Mayoría are an alliance of centre-left and left wing political parties through which Michelle Bachelet returned to the presidency in 2014. It has been emphasised by one of its members that GRPC 'does not seek to form part of any one of the presidential candidacies, though it aimed to hopefully ensure that all the candidates incorporate portions of our proposal as their own or that they at least take these proposals into account as useful background information at the time of formulating their proposals.'<sup>[20]</sup> GRPC proposals did have an impact; for example the Nueva Mayoría's tax reform programme referred to above.

A revolving-door pattern is also evident between public ministries and private businesses, which although not illegal in Chile does in some cases raise concerns over possible conflicts of interest. Revolving doors are widely visible across the Luksic group. In the case of Antofagasta Minerals, relevant examples include:

- Vivianne Blanlot (political party PPD) is ex-executive secretary of the National Commission for the Environment (2000 - 2003), as well as ex-Minister of Defence. She was president of the Transparency Council 2014 - April 2016.<sup>[21]</sup> She is currently on the Board of Directors at Antofagasta Minerals.<sup>[22]</sup>
- Pablo Orozco, head of communications for ex President Ricardo Lagos is currently head of Communications for Antofagasta plc.
- The current Minister of Mining is Aurora Williams. Williams was Manager of Administration and Finance for Antofagasta Minerals (2010 - 2014), and was a Senior Manager at the International Terminal of Antofagasta, a Luksic venture.<sup>[23]</sup> In 2015 a section of the terminal was closed due to failure to comply with environmental standards which caused high levels of pollution in the area.<sup>[24]</sup> Williams was Regional Minister (Seremi) of Public Works in the Chilean Region of Antofagasta during the first administration of Michelle Bachelet (2006 - 2010). During this period construction began at El Mauro.<sup>[25]</sup>
- Francisca Castro is currently a non-Executive Director at Antofagasta Minerals.<sup>[26]</sup> She previously occupied positions in the Ministry of Finance and Ministry of Public Works.

## The Glencore-Minera Los Pelambres conflict; a case of déjà vu?

Cheap waste disposal has been one way Antofagasta Minerals maintains low costs and high rates of profit at their mines. As well as the conflict over El Mauro, this business approach has caught up with the multinational in other ways – most recently in a conflict with mining giant Glencore over a site of mining waste disposal belonging to Minera Los Pelambres on the Chile-Argentina border.

Glencore began a series of legal challenges against Minera Los Pelambres over Cerro Amarillo, a waste dump located almost 4000m above sea level on the Chile-Argentina border. The site was authorised in 2004 and was active until 2011. Minera Los Pelambres have stated they received all the appropriate permissions to create the dump from Chilean authorities. However in 2012 it was found that part of the dump was in fact located in Argentina, where Glencore's subsidiary Pachon planned to operate. Between 2007 and 2012 around 55 million tonnes of waste was dumped on the Argentinian side of the border.

Glencore took three forms of action against Minera Los Pelambres regarding the dump: in 2013 they contacted the Luksic group and requested the removal of the materials; in 2014 they filed a civil lawsuit to the federal judge in the province of San Juan, in Argentina, where Cerro Amarillo is located. Through the lawsuit they requested that that Minera Los Pelambres remove the wastes, take them to Chile and recuperate costs of the damage; and in 2015 Glencore filed criminal charges against Minera Los Pelambres through its subsidiary Pachón.

Minera Los Pelambres responded to the cases by stating that they obtained full authorisation from Chilean authorities for the site. They also claim that no contamination has been caused by the dump, but that removal and transportation of the waste would cause contamination.

In 2015 Chilean news reports published that Adolfo Galindo Fuentes, a member of the PPD party and the Mining Ministry was subject to an internal investigation, removed from his post and sanctioned for his dealings with Minera Los Pelambres regarding Cerro Amarillo. The internal enquiry was initiated after Chilean news publication The Clinic attained and published information regarding copies of emails between Galindo

and legal representatives of Minera Los Pelambres.[27] London Mining Network's efforts to obtain copies of official documents relating to the internal enquiry have so far been ineffective.

The first matter of concern, details of which were first made public by The Clinic, was an official letter from the Mining Ministry stating that "in the construction and operation of the Cerro Amarillo dump, the company acted in good conscience and in a way consistent with the information publicly available in Chile", and signed by department member Adolfo Galindo. Galindo is said to have sent the letter despite the fact that the department had publicly classified the conflict a concern between two private businesses. The letter was sent at the request of Andres Jana, a member of Minera Los Pelambres' legal team, according to The Clinic.

The same year, the legal team of Minera Los Pelambres was sent a copy of a technical report which proved that there was no contamination of the water supply in the area around Cerro Amarillo. The report was sent to the company with the official stamp of the Mining Ministry, and the signature of Adolfo Galindo, who affirmed that it had been approved by the National Geology and Mining Service (Sernageomin). However it later emerged, through the series of emails attained by The Clinic, that the study was in fact undertaken by private consultancy firm SGM, and paid for by Minera Los Pelambres. [28]

Chilean news outlets also published reports of an Argentinian study which found high acidity levels in the water in the area, as well as heightened levels of sulphate, nitrate and copper. The study claims that tests taken by Minera Los Pelambres were in fact taken 2km away from the site, but the Argentinian study has not been made available to the media.[29]

The conflict over the Cerro Amarillo waste dump shares some similarities with the story of El Mauro, where conflicting studies have also been undertaken regarding water quality. The circumstances surrounding the issuing of one set of results are believed to be doubtful in the case of Cerro Amarillo. That example casts doubts on the company's claims not to have contaminated the water at El Mauro, where test results are also in conflict with each other.

The situation at Cerro Amarillo also raises questions around the "revolving-door" between public ministries and private businesses. Aurora Williams, Mining minister at the time the Cerro Amarillo conflict arose, was formerly General Manager of Administration and Finance at Antofagasta Terminal International, which is 65% owned by the Luksic Group.

## **Earthquake risks at El Mauro**

### **Construction problems with tailings dams**

Chile is one of the most seismically active countries in the world. There have been numerous historic earthquakes of very large magnitude, including the largest earthquake in recorded history, the magnitude 9.5 event in 1960 which occurred in Valdivia.

The El Mauro tailings dam is situated in the same tectonic setting that gives rise to all Chilean earthquakes, including Valdivia, in which the Nazca and Antarctic tectonic plates are subducting beneath the South American Plate (on which the El Mauro and other tailings dams are located).

Earthquakes have been one of the key triggers of tailings dam failures in Chile, alongside overtopping, seepage and foundation instability.[30] Of total dam failure incidents reported internationally involving mining operations, 41% involved sand tailings dams and/or cyclone sand tailings dams.[31] Amongst these, in 1965 70 km south of Los Caimanes, the magnitude 7.7 "La Ligua" earthquake collapsed a tailings dam and 300 people were killed. A magnitude 8.8 earthquake in Chile in 2010 (the 6th largest earthquake in recorded history[32] caused five tailings dam failures, causing loss of human life and environmental damage.[33] In a paper published in 2010, engineer Michael Davies states that the failure rate for tailings dams is approximately 10 times that of water-retention dams.[34]

Given the high level of seismicity and a history of associated dam failures, Caimanes residents have lived in fear of the potential collapse of the El Mauro tailings dam since it was built. The dam's critics believe that residents would have as little as ten minutes to escape a spillage of 1700 million tonnes of toxic waste, the full capacity of El Mauro.

## Legal cases concerning earthquake risk

Residents have spent years demanding that Minera Los Pelambres install an early warning system for the tailings dam, as well as evacuation and emergency procedures. In July 2013 the Chilean Supreme Court ruled[35] that the tailings dam is a 'threat to the physical and mental health of the residents of Caimanes', aligning with community concerns. The ruling outlines that Minera Los Pelambres should design an emergency plan in case of dam collapse, involving the public bodies National Geology and Mining Service (Sernageomin), Home Office and Department of Security (Onemi) and Water Department, Ministry of Public Works (DGA)[36]. Although the company has published some details of an "Emergency Manual" approved by Sernageomin, residents' attempts to access this plan using the Transparency Law have not been attended to.

The July 2013 ruling also observed that the tailings dam is constructed to withstand an earthquake of between 7.5 and 8.3 magnitude with an epicentre 80 km away. El Mauro tailings dam, therefore, falls short of the industry standard of 8.5 with an epicentre located 60km away.

In May 2014 Caimanes residents and their representatives presented a claim of "Obra Ruinosa" (Ruinous Work) to the local court in Los Vilos.[37] The case rests on the claim that the current wall of the dam poses a security risk to the residents. The court at Los Vilos ruled in favour of the community. In April 2015 Minera Los Pelambres presented an appeal at the court of La Serena, a regional appeals court which overturned the ruling.

(See the technical appendix at the end of this report for further information about problems with tailings dams in Chile.)

## El Mauro and the water shortage in Chile

In 2007 the worst drought in a century began in Chile. Conditions do not look set to improve in the long term; according to the World Resource Institute Chile will have one of the world's biggest water shortages by 2030 – the worst in Latin America.[38] Water shortage has wide-ranging effects for the mining industry, which according to government statistics accounts for around 7% of national water consumption[39]. In light of these facts, the scale of Minera Los Pelambres and other mining projects looks increasingly unsustainable.

In the face of these changes in water availability, increasing numbers of mining companies are developing desalination plants which take water from the Pacific to use in their operations. However large-scale operations such as that of Minera Los Pelambres do not look set to slow down; Minera Los Pelambres currently has plans to expand their mine, despite public resistance and the drought. The tailings dam has increased water scarcity in the area, where residents now rely on deliveries of bottled water for use in agriculture as well as human consumption. The river in the Pupio basin has had groundwater diverted away from El Mauro dam into wells; less water is readily available, and this water supply is likely to be contaminated – as outlined in the next section.

In the wake of the Supreme Court ruling which ordered the demolition of the El Mauro tailings dam in 2014, a negotiation occurred between representatives of Minera Los Pelambres, representatives from local and national government, and representatives from Salamanca and Los Caimanes. Following the negotiations at Salamanca, Minera Los Pelambres agreed to build a desalination plant, fulfilling a demand of representatives from Salamanca. Some Caimanes representatives have criticised the plant, which will facilitate the expansion of production at Minera Los Pelambres' mine. The desalination plant is part of a trend in the Chilean mining industry towards a water supply delivered by desalination plants, and follows measures taken in 2014 by the Chilean government to improve water access, such as upgrading canals and building dams. The Minera Los Pelambres desalination plant will be developed through a private-public alliance with the Chilean government.

# Water pollution and El Mauro

## The Tchernitchin report: water pollution

Residents at Caimanes have for many years expressed concerns over pollution of the local water supply since the installation of the El Mauro dam.

After a complaint made by residents to the investigative police (PDI) in 2012 the health minister Osvaldo Iribarren stated publicly that the water was safe for consumption. He then arranged tests taken by the Institute of Public Health (Instituto de Salud Pública). These tests found low levels of contamination, and the water was declared safe to drink.

At the beginning of the same year, tests were also taken on the orders of the PDI by the Environmental Crime Team (Brigada Investigadora de Delitos Medio Ambientales, Bidema), which were sent to the Police Forensic Laboratory (Laboratório de Criminalística Central, Lacrim). These tests, registered as Report 153, were taken at five different points of the Pupio Basin. They showed contamination consisting of cadmium, manganese, iron and mercury.

The Department of Health (Seremi) have attempted to discredit the results of the PDI's tests, claiming their labs are inadequate.[40]

In 2012 an independent investigation into water contamination in the area was undertaken by Dr. Andrei Tchernitchin from the University of Chile.[41] Tchernitchin is a surgeon and associate professor at the University. He is also President of Environmental Commission of the Medical School. Tchernitchin's report suggests that the local water supply is contaminated due to leaks from the tailings dam. This contamination should be understood as separate from any resulting from spillages. Tchernitchin's report concerns permanently occurring leakages into the groundwater channels in the area. His findings include:

- In 2011, mercury was found in local drinking water at 26% over permitted levels.
- 50% more iron and 86% more manganese than permitted levels were found in the Pupio river.
- At another point in the river, manganese levels were almost 100 times over the permitted amount. However, a test some months later found the manganese levels to have decreased, and only high levels of molybdenum remained, as well as high levels of nickel.
- Over time, these pollutants are predicted to be found in increasing amounts in the soil as well.
- Health problems associated with overexposure to manganese, mercury, iron, nickel and molybdenum are listed in the report. These include: psychosis, dementia, memory loss, stomach ulcers, infertility, lung cancer, gastrointestinal and cardiovascular diseases, damage to fetuses, eczema, asthma, gingivitis and personality changes.

In October 2016 the Chilean Environmental Regulatory Commission (Superintendencia del Medio Ambiente, SMA) charged Minera Los Pelambres with nine counts of failure to comply with environmental regulation. These nine charges relate directly to water quality, as well as protection of flora and fauna, and include amongst others[42]:

- The submission of test results of water quality without including results relating to some required parameters.
- The extraction of water from three monitoring wells (PRP-1, PRP-2 and PRP-3) without checking the usability of this water. Water was found with levels of sulphate, molybdenum and copper higher than the permitted levels stated in Chilean law.
- Failure to plant specimens of Guayacan (*Porlieria chilensis*) and Algarrobo (*Prosopis Chilensis*) in the region of Fundo Monte Aranda.

## Timeline of spillages across Minera Los Pelambres' operations

Minera Los Pelambres' operations have seen a high number of spillages, many of which the company have been fined for by Chilean authorities. Despite these spillages occurring over several years it appears that the company may be failing to adapt their operations adequately. [43] Here is a timeline:

**2002** (prior to the building and operation of El Mauro dam) storms provoke two spillages at the Buzeta Canal.[44]

**2003** A truck belonging to Minera Los Pelambres overturns, causing a spillage of petroleum at Quebrada de Canelillo.[45]

**2009** Minera Los Pelambres fined by COREMA for four incidents that occurred in the second half of 2008. These were spillages of polluted water and petroleum at different locations.[46]

**2010** Minera Los Pelambres fined for spill in 2009 by COREMA. COREMA stated that the company had insufficient mitigation measures, considering that this was the fifth fine of this type since 2008.

**2012** Andrei Tchernitchin from the University of Chile publishes a report which counteracts Minera Los Pelambres' claims that the local water supply is not polluted. His report suggests that high levels of toxins in the water supply are the result of tailings dam leakages. These should be understood as separate from spillages; they would be permanently occurring in the subterranean water channels in the area.[47]

**2015** The breakage of a pipeline causes a spillage of copper concentrate of at least two cubic metres.[48]

## Archaeological damage and Minera Los Pelambres

The El Mauro dam has proved a disastrous and landmark case of neglect of archaeological heritage in Chile. In 2014 Minera Los Pelambres was landed with one of the biggest fines for damage to heritage in Chilean history, a fine of USD \$2.3million.[49] This is now being re-calculated after Minera Los Pelambres appealed to the Environmental Tribunal, however the culpability of the company is maintained.[50] Ever since the licence for the construction of the dam was issued in 2004 archaeological matters have been strongly contested.

During the licencing process for the El Mauro tailings dam in 2004, Minera Los Pelambres was issued with an RCA ruling: a binding document issued by the government which outlines the environmental standards of a work following an evaluative study, and states requirements for the work. Minera Los Pelambres submitted a "Comprehensive Development Project", and after evaluation the RCA ruling in 2004 stated that a museum should be built for the archaeological finds excavated from the site of El Mauro, in nearby Monte Aranda. This museum should have the necessary conditions, funding and resources for visitors to view the archaeological finds. Furthermore, the pieces should be kept far from any water channels or the dam itself.[51]

In 2004, an archaeo-astronomer visiting the tailings-dam site began finding petroglyphs that were not marked on the study. After he made a formal complaint, the National Council of Monuments rejected the company's original report[52], however the tailings dam was granted a licence to operate. A new study by the General Controller's Office (Contraloría General de la República) began in 2005, at a cost of \$5 million. This study identified 148 archaeological sites which were excavated, removing many tonnes' worth of archaeological pieces and around 500 rocks with 2000 petroglyphs.

More than a decade after archaeological excavations began, no museum or storage facility had been constructed for the archaeological material. Minera Los Pelambres never delivered a report on the sites, as is required in Chilean law. In February 2014 Minera Los Pelambres was fined US\$2.3 million by the Superintendence of the Environment for failing to comply with the RCA ruling. Investigators from the



Superintendence found that the mining company had not complied with any of the regulatory requirements laid out by the RCA. The fine is one of the biggest ever issued by the Environmental Regulatory Commission (SMA) in Chile.

A significant amount of information regarding the original location and nature of the archaeological findings has been lost. Archaeological pieces were seen left in the open air or under plastic sheeting near the tailings dam site, and investigators found that archaeologists had stored material in their homes due to lack of storage facilities. No photographs or plans were made detailing original location of the pieces. Of 148 sites, Minera Los Pelambres presented partial information on 40 sites.

The Council of National Monuments never assessed the operation, and repeatedly denied requests made by the initial archaeo-astronomer visiting the site between 2005 - 2011 through the Transparency Act for access to technical reports of the archaeological operations. A report from 2006 which was obtained via the Central Auditor's Office (Controloria General de la Republica) showed a discrepancy between the 148 archaeological pieces found by Dr. Andrea Seelenfreund and 60 declared by the company during the applications for approval of the tailings dam construction.[53] The report also detailed three members of the Department of Libraries, Archives and Museums (DIBAM), part of the Department of Education, who simultaneously worked for the mining company and DIBAM, during the preparation of the impact study concerning the tailings dam. These individuals were Cristian Becker, an archeologist at the Museum of Natural History in Santiago; Gaston Castillo, archaeologist at the Museum of La Serena and Gonzalo Ampuero, history teacher and employee at the Museum of La Serena. Ampuero was also partially responsible for approving the tailings dam proposal in his capacity, at the time, as General Secretary of the Council of National Monuments, whilst being employed by Minera Los Pelambres. He filed for retirement soon after.[54]

## Conclusion

This report raises serious concerns about political influence, the safety of tailings dam construction, the use and pollution of water, the treatment of the mining industry's critics and the use of the Chilean legal system.

It is clear that Chilean regulation needs to be tightened and enforced to ensure that communities' rights are defended in the face of enormous 'development' projects.

But it is also clear that UK regulation needs tightening and enforcing: Antofagasta plc is a London-listed company. The UK Government therefore has a responsibility to ensure that it operates to the highest possible standards.

London Mining Network will continue working in solidarity with communities affected by mining companies funded from London, and will continue insisting that the UK Government and UK financial institutions take responsibility for the behaviour of those companies.

# Technical appendix: failures of sand tailings dams in Chile

## Failures of sand tailings dams in a highly seismic country, 2013, Gabriel Villavicencio, Raul Espinace, Juan Palma, Andy Fourie, and Pamela Valenzuela

Gabriel Villavicencio and his colleagues produced a report[55] which focused particularly on the 2010 earthquake in central Chile and its impacts on mining waste tailings dams. The 2010 earthquake was highly destructive, causing a tsunami which inundated coastal towns, with a death toll in the thousands. A major report by the Global Extreme Emergencies Response (GEER) detailed seismic impacts at five smaller waste tailings dams in Maule region, and observed that potential impacts were mitigated with it being dry season [summer] and groundwater levels being low, since material-bound water is a specific medium through which seismic impacts are increased.

Villavicencio's paper investigated these five failed tailings dams, and used new monitoring equipment (Pan penetrometer) to work out in what ways liquids in tailings were indicated as causal, and at what depth they were situated. Fourie has published about the accuracy limitations of the equipment, which worked accurately down to 7m.

This is useful for retrospective use on less deep waste dams, since the equipment is mobile and might help expand participatory monitoring – a form of citizens' science. On deeper waste dams only the most rigorous and participatory monitoring – done as the waste is laid down – would optimize waste tailings integrity.

This would be an adjunct to good practice on emergency preparedness as is envisaged in international guidance (such as WB-IFC, and UNEPTIE).

Villavicencio cites government data of existing tailings dams by province North to South: Arica 0; Tarapaca 1; Antofagasta 21; Atacama 117; Coquimbo 205; Valparaiso 99; Maule 6. He also cites five large waste dams [table 4] Los Bronces, El Soldado, two at Los Pelambres, and Andina, which have higher containment walls which were 'unaffected' by the 2010 earthquake. The report is inadequately mapped but the mining industry have since argued that Chilean mining waste dams are essentially safe.

Mining waste dam data is generally inadequate. Villavicencio's data is derived from national sources and that derived through their academic project at PUCV (the Pontifical Catholic University of Valparaiso). Bowker and Chambers have included Villavicencio's data in their 2015-16 database (on [www.csp2.org](http://www.csp2.org)). As Villavicencio briefly summarized, 32% of the world's tailings dam failures have been in Chile (table 2 lists 38 known failures). This is important. Earlier earthquakes have been more destructive, and tailings dams have so failed with greater human impacts.

Villavicencio details Chilean state responses to previous deadly waste failures in the form particularly of the 2007 Supreme Decree #248 and how this banned upstream dams and provided for tighter more rigorous geotechnical construction specifications and monitoring. In 2012 more reform was expected.

The questions now to be answered:

- Can the community expect to see the remedial plan for the El Mauro (referred to in the Timeline July 2013 re a Supreme Court order under Chilean law)?
- Why is it not on public record?
- Given that it involves a 230m high tailings dam made of sands and/or 'borrow', is the Chilean regulatory system sufficiently rigorous to guarantee safety? If so, how?

# Endnotes

1. [https://www.academia.edu/12783372/Chiles\\_Grupo\\_Luksic\\_the\\_Center-Left\\_and\\_the\\_New\\_Spirit\\_of\\_Capital\\_in\\_Latin\\_America](https://www.academia.edu/12783372/Chiles_Grupo_Luksic_the_Center-Left_and_the_New_Spirit_of_Capital_in_Latin_America) p.31
2. [http://www.ejolt.org/wordpress/wp-content/uploads/2015/02/FS\\_013\\_Los-Pelambres.pdf](http://www.ejolt.org/wordpress/wp-content/uploads/2015/02/FS_013_Los-Pelambres.pdf)
3. Corte de Apelaciones. Recurso: 11915/2005 Resolución 134027
4. <http://www.elciudadano.cl/medio-ambiente/huelga-de-hambre-contranque-de-relaves-el-mauro-cumple-50-dias/11/15/>
5. <http://www.federacionminera.cl/portal/?m=201012&paged=9>
6. Corte Suprema. Causa rol: 19-2013
7. <http://www.tribunalambiental.cl/tribunal-ambiental-confirmando-la-gravedad-de-la-infraccion-de-minera-los-pelambres-y-ordeno-a-la-sma-recalcular-multa-correspondiente/>
8. Juzgado de Letras y Garantía de Los Vilos, Sociedad Colectiva Civil Defensa Comunidad Pueblo de Caimanes / Minera Los Pelambres: Denuncia de obra ruinoso, 7981-2008 (2014).
9. <https://www.bnamericas.com/en/features/mining/how-safe-is-chiles-mining-sector>
10. Corte Suprema: Causa rol 12938-2013
11. Corte Suprema, Flores Tapia Cristián y otros con minera Los Pelambres: Obra Nueva, 12938-2013 (2014); Corte Suprema, supra note.
- Appeal: Corte de Apelaciones La Serena, Sociedad Colectiva Civil Defensa Comunidad Pueblo de Caimanes / Minera Los Pelambres: Denuncia de obra ruinoso, 946-2014 (2015).
12. <http://www.aminerals.cl/comunicaciones/noticias/2016/accidente-causo-muerte-de-trabajador-en-minera-antucoya/>
13. <http://www.theclinic.cl/2016/08/17/acuerdo-entre-los-pelambres-y-caimanes-contempla-3-100-millones-para-abogados-y-posibilidad-de-extender-el-tranque-el-mauro/>
14. <http://www.sma.gob.cl/index.php/noticias/comunicados/724-sma-cargos-pelambres-dos>
15. <https://www.opensocietyfoundations.org/voices/following-money-through-chilean-politics>
16. [http://www.contraloria.cl/prensa\\_cgr/litoral/2015/06/08\\_Noticias.pdf](http://www.contraloria.cl/prensa_cgr/litoral/2015/06/08_Noticias.pdf)
17. [http://ciperchile.cl/wp-content/uploads/Consultorias\\_ministro\\_Jorge\\_Insunza.pdf](http://ciperchile.cl/wp-content/uploads/Consultorias_ministro_Jorge_Insunza.pdf)
18. <http://diarioeldia.cl/articulo/region/comunidad-pelambres-buscan-restituir-dialogo-tras-primer-quebre-mesa>
19. <http://ciperchile.cl/especiales/caval/>
20. <http://www.economiaynegocios.cl/noticias/noticias.asp?id=103347>
21. <http://www.consejotransparencia.cl/vivianne-blanlot-soza-nueva-presidenta-del-consejo-para-la-transparencia/consejo/2014-10-28/130552.html>
22. <http://antofagasta.co.uk/about-us/leadership/board/>
23. <http://www.gob.cl/ministros/mineria/>
24. <http://www.theclinic.cl/2015/03/12/ordenan-el-cierre-parcial-de-galpon-del-terminal-internacional-del-grupo-luksic-en-antofagasta/>
25. <http://www.minmineria.gob.cl/ministerio/aurora-williams-baussa-ministra-de-mineria/>
26. <http://www.antofagasta.co.uk/investors/news/2016/board-changes/>
27. <http://www.theclinic.cl/2015/05/25/el-trato-preferente-a-los-pelambres-de-la-ministra-de-mineria-que-trabajo-en-empresa-controlada-por-luksic/>
28. <http://www.theclinic.cl/2016/02/23/mineria-los-detalles-del-sumario-que-sanciono-a-adolfo-galindo-el-sobreviviente-de-la-g90/>
29. <http://www.theclinic.cl/2015/06/19/estudio-argentino-botadero-contamina/>
30. [https://www.researchgate.net/publication/263247119\\_Failures\\_of\\_sand\\_tailings\\_dams\\_in\\_a\\_highly\\_seismic\\_country](https://www.researchgate.net/publication/263247119_Failures_of_sand_tailings_dams_in_a_highly_seismic_country)
31. Ibid.
32. [USGS, 2012] Largest Earthquakes in the World Since 1900, Updated 2012 April 11. [http://earthquake.usgs.gov/earthquakes/world/10\\_largest\\_world.php](http://earthquake.usgs.gov/earthquakes/world/10_largest_world.php)
33. [https://www.researchgate.net/publication/263247119\\_Failures\\_of\\_sand\\_tailings\\_dams\\_in\\_a\\_highly\\_seismic\\_country](https://www.researchgate.net/publication/263247119_Failures_of_sand_tailings_dams_in_a_highly_seismic_country)
34. <http://www.wsj.com/articles/brazils-samarco-disaster-mining-dams-grow-to-colossal-heights-and-so-do-the-risks-1459782411>
35. Supreme Court: 4 July 2013. Corte Suprema. Causa rol: 19-2013.
36. General Director of Water, Ministry of Public Works
37. Corte de Apelaciones La Serena, Sociedad Colectiva Civil Defensa Comunidad Pueblo de Caimanes / Minera Los Pelambres: Denuncia de obra ruinoso, 946-2014 (2015).
38. <http://www.wri.org/blog/2015/08/ranking-world%E2%80%99s-most-water-stressed-countries-2040>
39. <http://www.mdpi.com/2071-1050/8/2/128/pdf>
40. <http://www.elobservatodo.cl/noticia/sociedad/seremi-de-salud-ordena-contramuestras-de-agua-en-caimanes>
41. Andrei Tchemitchin, "Health and Environmental Effects of Mining in Chile. Pupio River and Drinking Water Pollution in the town of Caimanes: Does it originate from the El Mauro mining trail?", Cuadernos Médicos Sociales, Vol 52 (2012), 4
42. Full list and details of charges available here: <http://www.sma.gob.cl/index.php/noticias/comunicados/724-sma-cargos-pelambres-dos>
43. [http://mapaconflictos.indh.cl/assets/pdf/conflicto\\_nro\\_37.pdf](http://mapaconflictos.indh.cl/assets/pdf/conflicto_nro_37.pdf)
44. [http://www.olca.cl/oca/chile/region04/mlp/olca\\_mlp/informes/informes\\_pdf/informe\\_II.pdf](http://www.olca.cl/oca/chile/region04/mlp/olca_mlp/informes/informes_pdf/informe_II.pdf)
45. [http://www.olca.cl/oca/chile/region04/mlp/olca\\_mlp/informes/informes\\_pdf/informe\\_II.pdf](http://www.olca.cl/oca/chile/region04/mlp/olca_mlp/informes/informes_pdf/informe_II.pdf)
46. <http://www.derechoalagua.cl/mapa-de-conflictos/contaminacion-del-rio-choapa-por-minera-los-pelambres/>
47. See previous section.
48. <http://www.elobservatodo.cl/noticia/sociedad/rotura-de-concentructo-de-minera-los-pelambres-genera-derrame-en-choapa-viejoh><http://sindicatocmcc.cl/sitio/derrame-concentrado-de-cobre-en-minera-los-pelambres/>
49. <http://www.tribunalambiental.cl/tribunal-ambiental-confirmando-la-gravedad-de-la-infraccion-de-minera-los-pelambres-y-ordeno-a-la-sma-recalcular-multa-correspondiente/>
50. <http://www.tribunalambiental.cl/tribunal-ambiental-confirmando-la-gravedad-de-la-infraccion-de-minera-los-pelambres-y-ordeno-a-la-sma-recalcular-multa-correspondiente/>
51. Resolution of Environmental Qualification (RCA) No. 038 April 8, 2004
52. [http://ciperchile.cl/pdfs/elmauro\\_Acta\\_CMN\\_octubre2004.pdf](http://ciperchile.cl/pdfs/elmauro_Acta_CMN_octubre2004.pdf) (p.18)
53. [http://ciperchile.cl/pdfs/elmauro\\_InformeNr19\\_Contraloria\\_de\\_Coquimbo.pdf](http://ciperchile.cl/pdfs/elmauro_InformeNr19_Contraloria_de_Coquimbo.pdf), [http://ciperchile.cl/pdfs/elmauro\\_Carta%20a\\_Contraloria\\_20062012\\_timbrada.pdf](http://ciperchile.cl/pdfs/elmauro_Carta%20a_Contraloria_20062012_timbrada.pdf)
54. [http://ciperchile.cl/pdfs/elmauro\\_Contraloria\\_General\\_de\\_La\\_Republica\\_23082010.pdf](http://ciperchile.cl/pdfs/elmauro_Contraloria_General_de_La_Republica_23082010.pdf)
55. [https://www.researchgate.net/publication/263247119\\_Failures\\_of\\_sand\\_tailings\\_dams\\_in\\_a\\_highly\\_seismic\\_country](https://www.researchgate.net/publication/263247119_Failures_of_sand_tailings_dams_in_a_highly_seismic_country)

# **london mining network**

225-229 Seven Sisters Road,  
London N4 2DA.

Tel: +44 (0)7903 851695

Email: [contact@londonminingnetwork.org](mailto:contact@londonminingnetwork.org)

Web [www.londonminingnetwork.org](http://www.londonminingnetwork.org)

Twitter: [@londonmining](https://twitter.com/londonmining)

Facebook: London Mining Network

Registered charity number: 1159778

“EL PORVE

