

**The Copper Geographies
of Chile and Britain:
A Photographic Study of Mining**

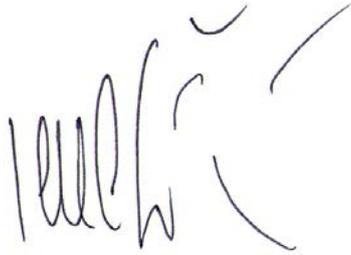
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**A thesis submitted in partial fulfillment of
the requirements of the University of Brighton
for the degree of Doctor of Philosophy**

December 2016

Declaration

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

A handwritten signature in black ink, appearing to read 'Ignacio Acosta', written in a cursive style.

Ignacio Acosta

1 February 2016

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Abstract

This practice-based thesis is a study of the uneven geographical development of Chilean copper mining industry and the circulation of copper in Britain.

My research examines three key historical moments in a pattern of ‘de-nationalisation,’ a term identified by Sassen (2003), of the copper resources of Chile: (1) 1840–1880; (2) 1904–1969; and (3) 1981–today, in which resources have been transferred from public to private management. In my research, I use a combination of photographic and historical methodologies to explore the impact of those processes on the extractive ecologies of Chile and to connect them to the global geographies of London, Liverpool and Swansea. My thesis considers how photography can be used to propose a re-mapping of the relationship between the global and the local, the national and the transnational, making visible the hidden geopolitical forces that shape the mobile and unequal geographies of copper.

My doctoral investigation explores the global circulation of copper and its agency to produce geographical and political change. With the aim of revealing their close connections and networks, it examines the notion of ‘unequal geography’ established by Baran (1957) and the newer ‘mobility paradigm’ proposed by Sheller and Urry (2006). I follow the flow of copper, in Held’s words, ‘across space and time’ (1999), creating a constellation of photographs and texts about the transformation and mutation of copper as it traverses the world, exploring traces of extraction, smelting, manufacture, transport and trade processes across geographies. In doing so, I open ways of

thinking about how landscape carries traces of those processes, bringing to the fore the significance of photographic intervention in highlighting them.

The photographic research conducted during this investigation is organised in three lines of inquiry: *Global mobility of copper*; *Post-industrial landscapes*; and *Contemporary mining industry and its relation to London*. The first, *Global mobility of copper* comprises four visual essays presented together with this written thesis: *Sulphuric Acid Route* (2012), *Metallic Threads* (2010-2015), *High Rise* (2012) and *Hidden Circuits* (2015). These works explore the mutation and transformation of hard-rock mining, back and forth from Chile to Britain from raw material to capital; through ore, smelted commodity, stock market exchanged value, assembled material and waste. The second, *Post industrial landscapes*, is explored through two case studies. The first of these is *Coquimbo&Swansea* (2014), which studies forgotten historical mining connections between Coquimbo, Chile and the Lower Swansea Valley, Wales between 1840 and 1880. This is followed by *Miss Chuquicamata, the Slag* (2012), which examines the Chuquicamata corporate town, Antofagasta Region, Chile and its contested history. The third line of inquiry, *Contemporary mining industry and its relation to London* involves two case studies. It opens with *Antofagasta plc, Stop Abuses!* (2010-14), which connects contemporary struggles of the inhabitants of Pupio Valley with the City of London, the world's centre for mining investment. This line of investigation concludes with the site-specific studies *LME Invisible Corporate Network* (2011-15), which examines the London Metal Exchange within the City of London, using

mapping methodologies. These case studies can also be used to map the three periods of denationalisation of copper resources in Chile.

My photographic work is based on extensive photographic fieldwork in each geographical location, conducted over the last four years, as well as my two years as an activist photographer. Through my written thesis I seek to make visible the historical conditions that are central to the formation of the geographies of copper. Both aspects of my work are informed by the notion of ‘critical realism’ coined by Georg Lukács (1963) and developed later by Allan Sekula (1984). Alongside these case studies, my written thesis contains photographic examples of my practice so as to give insight into my research process.

This thesis has been produced as part of *Traces of Nitrate: Mining history and photography between Britain and Chile*, a research project developed in collaboration with Art and Design historian Louise Purbrick and photographer Xavier Ribas, based at the University of Brighton and funded by with the generous support of the Arts and Humanities Research Council (AHRC).

Abbreviations

AHRC: Arts and Humanities Research Council

CODELCO: Corporación Nacional del Cobre (National Copper Corporation)

HKEx: Hong Kong Exchanges & Clearance

FONDART: Fondos de Cultura (Chilean funding body for culture)

FTSE100: The Financial Times Stock Exchange 100

LME: London Metal Exchange

LMN: London Mining Network

Sernageomin: Servicio Nacional De Geología y Minería (Nacional Service of Geology and Mining)

SONAMI: Sociedad Nacional de Minería (Nacional Society of Mining)

TSOEG: Temporary School of Experimental Geography

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Introduction

A point of departure

My engagement with photography is bound up with environmental activism. I belong to a generation of Chilean artists who started to contest the corporate power of mining through the use of photography at the beginning of the 2000s. Between 2003 and 2005, I worked on a photographic project that aimed to raise awareness of the threats to Pupio valley, in northern Chile. Located in the province of Coquimbo, this valley of pristine rivers, rural agricultural systems, ancient forests, and home to an invaluable archaeological sanctuary, was threatened by the installation of the El Mauro tailings, planned as result of the expansion of one of the Chile's largest copper mines, Los Pelambres, owned by the Santiago-based mining group Antofagasta Plc, and trading in the London Stock Exchange. As the architectural historian Pedro Alonso explains about tailings (also known as mine dumps, culm dumps, slimes, or slickens):

tailings are composed of by-products of the mining process in a compound made up of very fine sand, large quantities of water, and various chemicals and waste minerals. This wet mixture is then built into a solid structure just as you would bake a cake – setting its form through the use of the dam, and then allowing the moisture to evaporate and so harden. It is a complex procedure, not only because the high water content makes the tailings behave as a liquid mass, threatening structural stability, but because there is always a risk.¹

¹ Alonso, P.I. (2013), 'Mountaineering', *AA Files*, pp. 81–86.

Preoccupied by the thread posed by the installation of a tailings for the environment of the valley of Pupio, a group of four photographers, Rosario Ugarte, Paz Errazuriz, Nicolas Piwonka, and I developed a photographic documentation of the valley before the mining intervention. The project aimed to communicate the valley's unique landscape through photography in order to create awareness of its unique forms of life, which were threatened with extinction. It aimed to achieve national and international recognition of the valley as unique ecosystem that needed to be preserved from the mining intervention. My documentation, using a 35 mm camera, consisted of a series of black and white photographs of diverse aspects of human life, countryside scenes, or simply, the pure natural surroundings of the landscape [Fig 1]. Furthermore, I looked for elements that appeared in the landscape that could account for the formation of a local identity, such as the high mountains or the ancient forests and rivers. However, the efforts made in order to stop the building of the tailings were unsuccessful and, as the Latin American Centre for Environmental Conflict argues, in 2007 the inevitability of defeat made the landowner who led the environmental resistance sign an agreement to give the water rights to Antofagasta Plc. for U.S. 23 million dollars.² Today, El Mauro is 'the biggest toxic waste dump of Latin America'³.

² Of this financial settlement, very little compensation went to the community of Caimanes. For further details, see Sanderson, Henry (2015b) *Chile Copper Bottomed* <http://www.ft.com/cms/s/0/b9f15790-eaa0-11e4-96ec-00144feab7de.html?ftcamp=published_links%2Frss%2Fcompanies%2Ffeed%2F%2Fproduct#axzz3Z4mFmuqI> [accessed 3 May 2015]; Financiero, E.D. (2008) 'Luksic paga US\$ 23 millones en acuerdo por tranque El Mauro', *Observatorio Latino Americano de Conflictos Ambientales, OLCA.*, p. 4–5.

³ Franklin, Jonathan (2014) *Chilean dam can't hold back the hatred* <<http://www.theguardian.com/sustainable-business/chile-los-pelambres-copper-mine-antofagasta-broken-town>> [accessed 17 August 2015].

Indeed, ‘the landscape of Chile has seen both its natural and social fabric shaped by mining’⁴. However, my 2003 photograph [Fig 1] could be considered a naïve view of landscape. This thesis not only takes into account the moment of failure of photography to claim truth or represent a truth, but also raises questions regarding my own attempts to use photographic practice to reflect upon the conflict between local communities and corporate mining power. In this image, the inhabitants appear unaware of the shadow of the mining corporation and some signs of a bucolic rural life speak of their apparent innocence. On the left hand side, a man flying a kite can be read as a symbol of pride, a symbol used to commemorate the liberation of Chileans from Spanish oppression in 1810. The same element indicates the beginning of spring, which situates the scenery within a particular time of the year. Perhaps the little girl next to him, running barefoot on the slightly wet grass, is his daughter. This typical rural scenery is completed by a group of people standing in the middle of an improvised football pitch. A closer look reveals their heads raised towards the sky. We can assume they are searching for a lost kite, although the latter is not revealed by the bleached sky of the photograph.

This project also begins with another point of failure: the impossibility of blocking the brutal effects of corporate power through an activist-motivated photographic approach. As this doctoral study has been developed, more specific questions have arisen regarding the capacity of photography to make a

⁴ Lehne, Florian (2015) *Caimanes and the Water – Infinite Legal Struggles about a Finite Good* <<http://futureoffoodjournal.org/index.php/journal/article/download/177/157>> [accessed 18 August 2015].

political geography of copper visible: How can the visible and hidden geopolitical forces that shape the mobile and unequal geographies of copper be revealed? How can photography be used to give visibility to the circulation of copper back and forth from Chile to Britain? What strategies do other artists use to make visible the impact of mining industries under global capitalism?

The Structure of the thesis

This thesis is structured around three chapters: (1) Copper and the uneven geographical development of Chile; (2) Documentary photography and film as a form of mapping; and (3) Copper Geographies.

The first chapter deals with the properties of copper and its agency to produce geographical and political change. The first part considers the properties of copper and its role in the worldwide communication technologies. This chapter is concerned as much with the relevance of copper for the development of industrial and post-industrial societies as with the material qualities of copper.

The second part of this chapter engages with the significance of Chile as an extractive ecology and the world's largest producer of copper. As the U.S. Geological Survey notes, due to its unique geological and geographical configuration, Chile is the source of 27.5 per cent of the global reserves of copper.⁵ Mainly located in the Atacama Desert, these contested extractive ecologies have come to be at the centre of a series of political and

⁵ U.S. Geological Survey (2014) *Mineral Commodities Summaries, February 2014* <<http://minerals.usgs.gov/minerals/pubs/commodity/copper/mcs-2014-coppe.pdf>> [Accessed 6 August 2015].

environmental disputes. Amongst the many conflicts that have arisen are, on the one hand, protracted legal battles involving the big multinational corporations that control 70 per cent of Chilean copper output,⁶ and on the other the agricultural communities struggling with growing desertification, water contamination and land expropriation. Copper is central to the economy of Chile, representing more than 60 per cent of its total exports in 2011. In this scenario, Chile currently produces roughly 5.8 million tons of copper per year, accounting for 31 per cent of the global copper production.⁷ To extract that amount of copper, between 700 and 800 million tons of the mineral have to be extracted with approximately 0.8 per cent of purity, the greater part of which is processed by a flotation system producing ‘copper concentrate.’⁸ In Chile there are 603 tailings, of which 216 are currently active, 244 non active, while for 144 it has been impossible to find any information at all.⁹

The next part of this chapter develops two terms that are central to this study and are a direct consequence of globalisation: ‘hyper-mobility’ and ‘uneven geographical development.’ The notion of ‘hyper-mobility,’ which was

⁶ Caputo, O. and Galarce, G. (2011) ‘Chile’s neoliberal reversion of Salvador Allende’s copper nationalization’ in: Barra, X (ed) *Neoliberalism’s fractured showcase another Chile is possible*. Leiden: Brill, p. 55.

⁷ Banco Central de Chile (2014) *Estadísticas Económicas* <http://www.bcentral.cl/estadisticas-economicas/publicaciones-digitales/anuario_ccnn/pdf/ccnn_cierre2014.pdf> [accessed 6 August 2015]; International Copper Study Group (2014) *The World Copper Factbook* (2014), p. 6 <<http://www.icsg.org/index.php/component/jdownloads/finish/170/1997>> [accessed 6 August 2015] p.6; Cochilco (2014) *Copper Market Trends Report Forth Quarter 2014* <http://www.cochilco.cl/descargas/english/research/quarterly/Copper_Market_Trends_Report_Fourth_Quarter_2014.pdf> [accessed 6 August 2015]; Foreign Investment Committee Chile (2014) *Invest in Chile: Opportunities for Mining Suppliers*, p. 5, <<http://www.ciechile.gob.cl/wp-content/uploads/2015/03/MINER%C3%8DA-WB.pdf>> [accessed 6 August 2015], p.5.

⁸ Vila Vicencio, F. and Vivaldo Sandoval, W. (2015) *Catastro Nacional de depósitos de relave: Depósitos Activos y No Activos 2015*, Santiago: Servicio Nacional de Geología y Minería.

⁹ Vila Vicencio, F. and Vivaldo Sandoval, W. (2015).

introduced into the sociology of globalisation by Felix Damette¹⁰ in 1980, refers to the ‘circulation, flow or liquidity of capital, commodities and labour’¹¹ which has contributed significantly to the formation of a ‘transnational space for the circulation of capital.’¹² At this stage the study takes up a term from Marxist cultural geography, ‘uneven geographical development,’ a concept developed by Neil Smith and David Harvey. ‘Uneven geographical development’ derives from the term ‘accumulation by dispossession’ developed in Chapter 27 of Volume I of Marx’s *Capital* (1867),¹³ a term that relates to the uneven growth between economies as a result of the unequal distribution of wealth.

The second chapter explores theoretical and visual practices which have developed within the last twenty years with the aim of mapping the changing landscape of globalisation ‘through representational forms, such as documentation, written text, maps or photographs.’¹⁴ The first part of this chapter is framed by the theoretical work developed by Allan Sekula (1951–2013), an artist and one of the most important Marxist cultural theorists of his generation. His work is a major point of reference for this investigation because of his exploration of the relationship between photography and capitalist culture. Of particular interest to this thesis is the concern with the notion of

¹⁰ Damette, F. (1980), ‘The Regional Framework of Monopoly Exploitation: New Problems and Trends.’ in: J. Carney, RaJRL (ed) *Regions in Crisis*. London Croom Helm., pp. 76–92.

¹¹ Sheller, M. (2011) ‘Mobility.’ <<http://www.sagepub.net/isa/resources/pdf/mobility.pdf>> [accessed 16 January 2016].

¹² Sassen, S. (1988) *The mobility of labor and capital a study in international investment and labor flow*, Cambridge: Cambridge University Press., p. 1.

¹³ Marx, K. (1988) *Capital: A Critique of Political Economy [1867]* Harmondsworth: Penguin.

¹⁴ Harvey, D. (2006) *Spaces of global capitalism*, London: Verso., p. 136.

‘critical realism,’ a term coined by Georg Lukács, and applied by Sekula to his own work, arguing that realism ‘portrays individuals in their social and historical environments ... capturing the tendencies and developments of the lasting features of society.’¹⁵

The first section of this chapter is followed by arguments around documentary works and collective exhibitions taking up the term ‘critical realism.’ These works examine the impact of globalisation dynamics on contemporary society with a specific focus on the impact of the extractive industries: Alfredo Jaar’s *Gold in the Morning* (1986) and Steve McQueen’s *Gravesend* (2007). These works use documentary photography and film respectively to create tensions between remote extraction sites in Latin America and Africa with trade and manufacture centres in New York, and Derby, UK. What follows is an analysis of three curated exhibitions and biennials dealing with issues raised by globalisation: *Documenta 11* (Kassel, 2002), *Geography and the Politics of Mobility* (Generali Foundation Wien, 2002) and *Uneven geographies: Art and Globalisation* (Nottingham Contemporary, 2010); and one last exhibition *World of Matter* (Dortmunder U, 2014), that takes up the notion of the ‘ecology,’ a major trend in contemporary documentary practices. These works have in common that they address diverse critical approaches developed throughout sustained investigation, including

¹⁵Lukács, G. (1970) ‘Narrate or Describe?’, in Haslett, M. (2000) *Marxist literary and cultural theories*, Basingstoke: Macmillan, p. 89. (Originally published in English in Lukács, *Writer and Critic* London: Merlin Press, 1978.)

unequal geographical development and the mobility of commodities, but also labour exploitation and environmental disruption.

The third chapter focuses on the practice work developed for this investigation. The photographic work on which this doctoral study is based is most closely related to this final chapter and the chapter is the result of a combination of both archival research and photographic fieldwork. The work has been developed using a site-specific working methodology. Through photography and text, it seeks to reveal the hidden geopolitical forces that shape the landscape, hidden forces to which David Harvey refers as ‘economic power of flows across and through continuous space.’¹⁶ Using W. J. T. Mitchell’s definition throughout this thesis, landscape is understood as a ‘verb,’ ‘not as an object to be seen or a text to be read, but as a process by which social and subjective identities are formed.’¹⁷ Following Mitchell, the landscapes this thesis examines are bodies in constant process of transformation that have been formed by diverse geopolitical forces, which are not visible in the photographs. The selection of these sites is the result of my local knowledge and research. The chapter develops a site-specific strategy, approaching the sites of investigation with a combination of photographic fieldwork and research methodologies.

This investigation is organised around three lines of inquiry: Global mobility of copper; Post-industrial landscapes; and Contemporary mining

¹⁶ Harvey, D. (2006), p. 107.

¹⁷ Mitchell, W.J.T. (2002) *Landscape and power*, Chicago, Ill, London: University of Chicago Press, p. 1.

industry and its relation to London. The first, *Global mobility of copper*, draws upon the mutation and transformation of hard-rock mining from ore, to manufactured commodity, recycled material and museological specimen. It is supported by a series of images developed during the research, and takes the form of a visual essay accompanying this bound thesis.

The second, *Post-industrial landscapes*, is formed by two case studies presented within this investigation. These are: (1) *Coquimbo&Swansea* (2014), which explores historical connections between former sites of extraction and smelting sites in Coquimbo, Chile and Lower Swansea Valley, in Wales; and (2) *Miss Chuquicamata, the Slag* (2012), which investigates the ruins of Chuquicamata, a former mining settlement created by the Guggenheim brothers in the early twenty century to serve the copper mine of the same name. The site has been at the centre of a series of political and environmental disputes.

The third line of enquiry, *Contemporary mining industry and its relation to London* is also supported by two case studies: (1) *Antofagasta Plc., Stop Abuses!* (2010–2014), developed around the impact of large-scale copper mining industry in the environmental and social fabric of Caimanes. This case study incorporates activist voices questioning the impact of British based mining on local ecologies. (2) *London Metal Exchange and Invisible Corporate Network* (2012–2015) maps investment mining companies in the City of London that trade within the Ring of the London Metal Exchange (LME). This work has been developed using information available in the open domain using different data sets, such as Google Earth, Maps and Street Views. This work differs from previous approaches, because it is presented in the form of

mapping as a way of giving a structure to the territory. This structure can also be used to map the three periods of de-nationalisation of natural resources in Chile.

Methodology

This doctoral study develops a site-specific methodology, connecting remote extractive ecologies in Chile with centres of production and trade in Britain [Fig 2]. The sites used in this study have been chosen in the first instance from my previous knowledge as Chilean born and my long-standing concern with the impact of mining industries. Once a site is identified, archival research is conducted to investigate its historical significance. A site-specific photographic intervention then follows. Once the photographs are taken, a process of post-production and image editing occurs. Throughout the study, reading and writing about the site's historical and political significance highlights the fact that photographs alone cannot reveal its social, political and economic conditions without being placed a critical context.

Nevertheless, photography is the main research methodology used in this investigation. This thesis explores the use of photography to visualise the political meanings of sites. The thesis also reflects on the limits of photography and its capacity to represent and disclose the geopolitical forces that meet in those sites. Photography is used to document the key features of the extractive mining industries, their uneven geographic development and ecological contamination, which remain obscured in the mainstream news provided by most media platforms. Photographic research has developed through a series of field explorations into the transformed territories of copper. The sites where this

study has been undertaken retain traces of processes of copper extraction, smelting, manufacture, transport and trade. Some photographic work includes activist demonstrations addressing the role of British based mining organisations and the scale of metals trading in the City of London. The methodological photographic approach uses an ‘objective, unmediated record of facts’¹⁸ as a point of departure to question the capacity of photography to reveal the complex histories and narratives of the sites of the study. Thus photography is used to assert evidence of contestation against a neoliberal order. At one level, photography works as a claim to truth, but at another level, it is recognised that the photographic claim to truth is unstable. Mapping both as a visual form and a methodology is developed throughout the works. Mapping can be read as an attempt to give a structure to the research and to enable the viewer to unpack the hidden power structures in each site.

Fieldwork

Approximately 300 large format (4x5) and 600 medium format (6x7) photographs have been taken during this study. Before visiting sites, a considerable amount of time and effort is taken to find people with the local knowledge and who can grant access to sites. Listening to people’s advice enriches the experiences and in some cases, determines the final photographic work. Access to sites has been granted by diverse sources, either directly through the companies which own the sites, through activists’ networks or through local people. Once on location, the sites are explored thoroughly on

¹⁸ Edwards, S. (2006) *Photography a very short introduction*, Oxford: Oxford University Press, p. 26

foot before the photographs are taken. In the majority of the sites, due to restricted access or geographical remoteness, just one visit was undertaken. Consequently, the final images are the result of a range of factors such as accessibility, local knowledge, weather and time, including the act of walking as a way of exploring the territory.¹⁹ Different forms of mapping, such as Survey Maps, Google Maps and Walking Maps have been used to give structure to the fieldwork. My methodology uses large and medium format analogue cameras, in most cases with the use of a tripod. Large format cameras make it possible to capture the landscape with great detail, while medium format cameras preserve a very high quality while permitting work on larger series. The majority of the photographs have been taken with the cameras mounted on the tripod, through long exposures and depth of field, which enables the foreground and the background to be in focus simultaneously.

My photographic approach departs from a documentary tradition in contemporary photographic practice, which engages with globalisation dynamics. In some cases, landscapes have been photographed with distance and objectivity, in a frontal and direct manner; in others this distant, objective view is subverted and the landscapes are approached through detail, prioritizing the fragment over the generic. Landscapes are generally depicted from a vantage point of view, which places me in an empowered position to observe the space

¹⁹ There is a long tradition of artists making work from the universal act of walking whose roots are in the land and conceptual art of the 1960s. Some of these artists, such as Francis Alÿs, Richard Long, Sophie Calle, Hamish Fulton, Dan Holdsworth, Jem Southam and Richard Wentworth, feature amongst the many artists who have been included in the exhibition, 'Walk On: From Richard Long to Janett Cardiff – 40 years of Art Walking' organised by Art Circuit and displayed between 2013–2014 in the UK. See more on <http://www.art-circuit.org.uk/index.php?/forthcoming/walking-journeys/> [accessed on 27 January 2016].

and identify the relevant elements to be represented. Whilst a series of photographs are taken, the number of images depends on the scale and complexity of the site. In this investigation, series are defined by a group of two or more photographs of the same site; however series can be composed of different sequences or groups with a pre-determined order.

After the field-exploration takes place, the negatives are taken to a laboratory for processing. They are then scanned and colour calibrated. In some cases, two or more photographs are stitched together digitally to create a panoramic view that would otherwise not have been possible to capture. The way of ordering the sequences is defined through editing, taking the viewer into a predefined narrative.

Archival Research

A series of archival and bibliography investigations have been conducted during the development of this thesis. Bilingual research (English–Spanish) is a crucial part of the investigation, positioning the photographic work within a larger body of existing knowledge. Archival research determines the significance of sites and gives context to the economic, social and political conditions that shape them. As such, archival research not only reaffirms the significance of the sites, but also gives context to the photographic works, enhancing them as objects of epistemological enquiry.

The selected archives hold records of companies that were involved in historical trade in copper between Chile and Britain, mainly during the nineteenth century. Archival research was initially conducted at the Rothschild Archive in the City of London. The investigation searched for correspondence

between the agents with whom the Rothschilds conducted business within Chile in the nineteenth century. The research focussed on correspondence between the Bank of Tarapaca & London Limited, the Banco de Santiago, the Government of Chile and the Rothschilds.²⁰ The archive consists mainly in records of the bonds issued by the House to the Chilean Government and some transactions between different institutions. This was followed by a visit to the Richard Burton Archives in Swansea, during which I looked at the documentation boxes of Yorkshire Imperial Metals and Imperial Chemical Industries Limited. These documents included notes on trade agreements, valuations, lists of contracts, extracts from letters and details of copper auction sales. An extensive list of names of Chilean copper suppliers was an important source of data for this investigation. Particularly relevant is the case of Lambert,²¹ which came out of this research, who appears on numerous occasions with strong business links to the merchant Henry Bath.²² Finally, archival research was also conducted at the Maritime Archives of Liverpool.

At the Archivo Nacional in Santiago, the research was conducted into documentation relating to Salvador Allende's nationalization of copper in 1971.

²⁰ Whilst researching these records, I discovered a series of transactions by Luis Guevara Reimers (1842–1912), director of Guevara Limited and brother of Blanca Guevara Reimers (unknown–1932), my great grand mother. This discovery was the point of departure for the current work-in-progress named *Intuitive Projects*, based on the painter, poet, playboy and boxer Álvaro Guevara Reimers (1894–1951). Please see more on <<http://www.ignacioacosta.com/intuitiveprojects/>> [accessed 29 January 2016].

²¹ Lambert, C., Mayo, J. and Collier, S. (1998) *Mining in Chile's Norte Chico journal of Charles Lambert, 1825-1830*, Boulder, Colo.: Westview Press.

²² Jackson, M. (2010) *Henry Bath & Sons* Liverpool: Henry Bath.



Figure 1. *Caimanes* before the construction of the 'El Mauro' tailings, Pupio Valley, Chile, 2002.

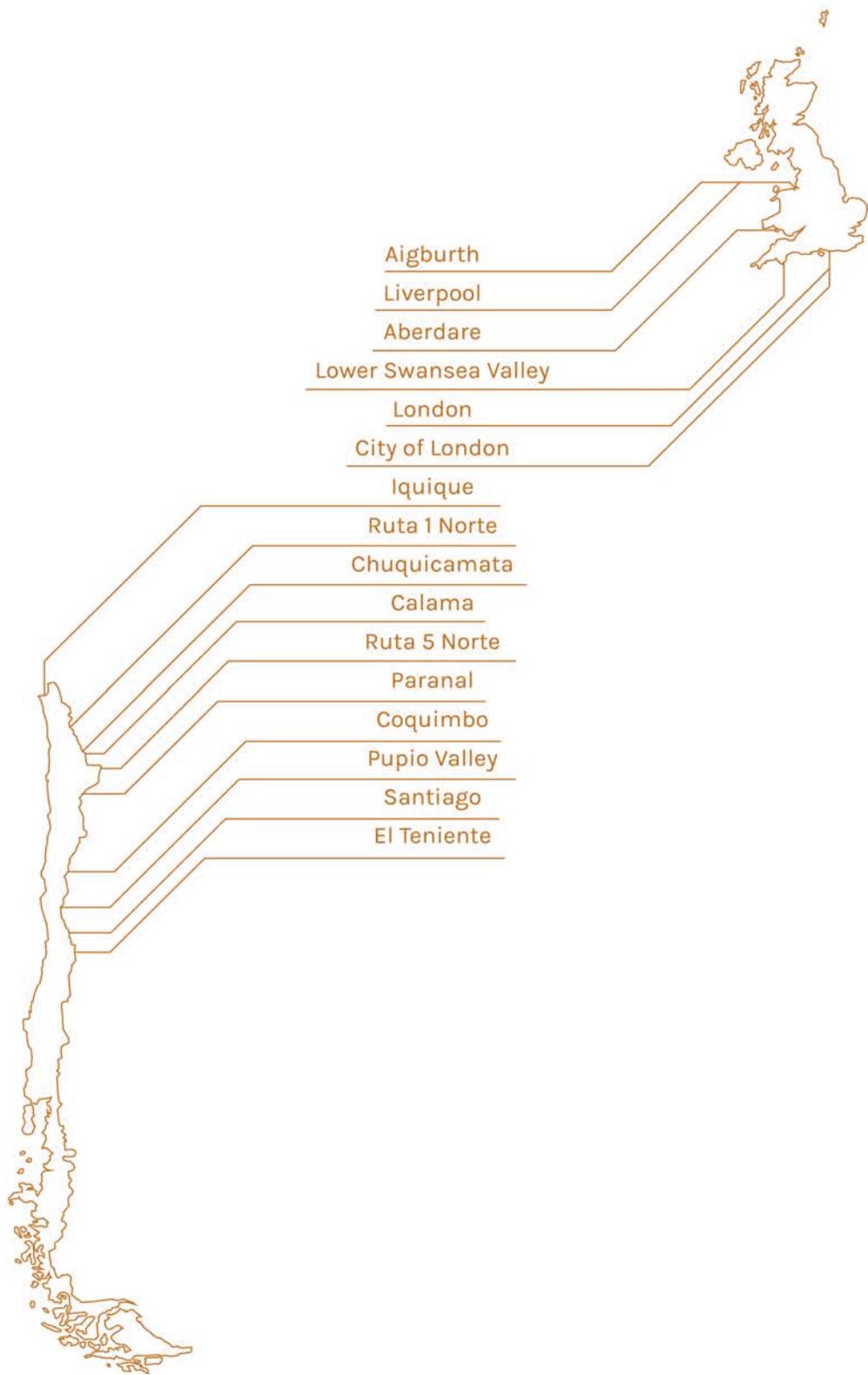


Figure 2. Map of Britain and Chile, showing the locations of the photographic interventions carried out during this investigation between 2010 and 2015.

1. Copper and the uneven geographical development of Chile

Introduction

This chapter develops the principal concepts for understanding the key debates around the Chilean copper mining industry. What are the properties of copper that make it indispensable for human life? What is the significance of Chile as a copper producer? How does this industry impact on the social fabric and environment of Chile? Finally, which are the main characteristics of the copper mining industry that relate to globalisation dynamics?

This chapter sets the ground for the subsequent chapters, giving factual information relating to the Chilean copper mining industry and its global mobility, as well as developing the terms that are central for this investigation, such as notions of mobility and uneven geographical development.

1.1 Copper, an essential component of contemporary life

Copper is a miraculous and paradoxical metal characterised by high electrical and thermal conductivity. Copper is an essential element for nearly every human enterprise. Hidden in plastic, behind walls, bound into cables, carried as loose change, inside air conditioners, cars, computers, electronics, ‘green energy’ generators, airplanes, mobile phones; copper is everywhere yet rarely seen. The journalist and activist Bill Carter, author of *Boom, Bust, Boom: The Metal that runs the World*, points out that twenty kilograms of copper are needed in the average car’s wiring. Beijing adds fifteen hundred cars to its roads every day. Each computer uses around 680 grams of copper. As Carter claims,

more than two billion computers are used around the globe. Millions of copper tubes are used for plumbing each year. Copper is used extensively inside planes, mobile phones, air conditioners and green-energy generators. Although the metal plays a key role in worldwide information and communication technologies, very little attention has been paid to how the industry impacts on the ecologies in which it operates. Carter argues, ‘copper has had a decisive role in contributing to the construction of a world of global communications technologies.’²³

The Copper Development Association defines copper as:

a mineral and an element essential to our everyday lives. It is a major industrial metal for its highly ductility, malleability, thermal and electrical conductivity and resistance to corrosion. It is an essential nutrient in our daily diet. And, its antimicrobial property is becoming increasingly important to the prevention of infection.²⁴

Copper has been, indeed, an important component of society for more than ten thousand years. In Europe, it became a critical component for the nineteenth century war industry. Copper sheathing gave a significant advantage to the British Royal Navy’s domination of the oceans in the nineteenth century expanding the British Empire and opening markets in Europe and Asia.²⁵

²³ Carter, B. (2012) *Boom, Bust, Boom*, New York: Scribner, p. 46.

²⁴ International Copper Study Group (2014) *The World Copper Factbook 2014*, p. 6
<<http://www.icsg.org/index.php/component/jdownloads/finish/170/1997>> [accessed 6 August 2015]
Cochilco.

²⁵ Copper became a critical component of nineteenth century war industry. The Royal Navy used copper and other sheathing on ships as a protection against ‘worm’. See more in Bingeman, J.M., Bethell, J.P., Goodwin, P., et al. (2000) ‘Copper and other sheathing in the Royal Navy’, *International Journal of Nautical Archaeology* 29, pp. 218–229.

Changes in the form of production and distribution had completely re-shaped the landscape of the industrialised world by mid nineteenth century.²⁶ As Carter suggests, the increase in the production of copper was a direct consequence of the mechanised development required by electrification.²⁷ Although copper was used throughout the nineteenth century, it was towards the end of that century that it became an essential component of life owing to its use as conductor of electricity. At the same time, new technologies made possible the transportation of larger quantities in shorter times. Copper is necessary in all elements of industrial development, from military to domestic, through communication technology and electrification. This is why it has become a central part of the development of the corporation as a organizational model, a crucial factor in the formation of the global corporation, as it exists today.²⁸

The convention for measuring concentration of copper is ‘grade,’ which is the weight percentage of mineral the ore contains.²⁹ It is a significant factor in how much a copper body is worth. As CODELCO explains, the grade determines how many tons of ore are needed to produce 1 ton of copper, thus 1,000 kilograms of ore that contains 300 kilograms of copper has a grade of 30 per cent.³⁰ There are two types of copper deposits, ‘sulphide’ and ‘porphyry’.

²⁶ Mikesell, R.F. (1979). *The world copper industry structure and economic analysis*, Baltimore; London: Resources for the Future by Johns Hopkins University Press.

²⁷ Carter, B. (2012), p. 38.

²⁸ Schmitz, C. (1986) ‘The Rise of Big Business in the World Copper Industry 1870-1930’, *The Economic History Review* 39, pp. 392–410.

²⁹ Mikesell, R.F. (1979) *The world copper industry structure and economic analysis*, Baltimore ; London: Resources for the Future by Johns Hopkins University Press, p. 47.

³⁰ CODELCO. (1975) *El Cobre Chileno*, Santiago: Corp del Cobre, p. 124.

‘Sulphide deposits’ are sharply defined, containing a high-grade of the mineral, but are generally of limited extension. In contrast, the ‘porphyry deposits’ contain a low-grade mineral, approximately between 0.4 to 1 per cent.³¹ Porphyry deposits are extracted by open-pit mining and are bound up with other valuable minerals that make their extraction more attractive, such as gold, molybdenum and silver.³²

1.2 Chile, the world’s largest producer

Chile presents itself as a curiosity on the map. The long and narrow Latin American nation (4,300 km by an average of 175 km) appears geographically isolated from the metropolitan centres of the north and disconnected from the rest of the Latin American region. In fact, impenetrable natural barriers surround it. Lying between the high Andes Mountains to the east, the cold Pacific Ocean to the west, the Atacama Desert to the north and Antarctica to the south, Chile is a geographically bound and isolated territory.

Due to its unique configuration in the Andean subduction zone, Chile has the world’s largest reserves of copper. Part of the ‘Pacific Ring of Fire’, where the Pacific plate dives below the continental plates producing an invisible geological conflict, Chile is linked to deadly earthquakes and volcanic activity. The geology and geography of Chile are shaped by these extreme conditions which are intrinsically linked to its mineral wealth. As magma pushes up from underground, it clashes with water, heating it and pushing minerals closer to the

³¹ Mikesell, R.F. (1979).

³² CODELCO. (1975), p. 124.

crust of the earth. Active volcanoes, the product of the clash between the Nazca and South American tectonic plates, accompanied by a long history of earthquake activity, form its dramatic geography. Chile's wealth, as Leila Michele Toovey explains, is based on the rich geological formation that lies beneath its feet:

as the Pacific Plate plunges below Chile, it is heated, melted and chemically differentiated. Masses of magma push up through the crust wherever they can. This magma comes into contact with water along its path and heats it. The water, carrying minerals that have been partly supplied by the intruding magma, moves closer to the earth's surface, cooling and depositing minerals. Simply put, this is how porphyry deposits form. The subduction zone in Chile has forged the geology, and geography of the region. The Andes, the Intermediate Depression, and the Coast Range have all been formed as a direct result of the subduction zone.³³

As Toovey explains, the subduction zone is part of the 'Pacific Ring of Fire,' an a 40,000 kilometres natural depression in the Pacific Ocean with a 'nearly continuous series of oceanic trenches, volcanic arcs, and volcanic belts and/or plate movements.' It is within this ring, in which over 75 per cent of the world's active and dormant volcanoes are located, that around 90 per cent of the world's earthquake activity occurs.³⁴ As the 'Ring of Fire' is a consequence of plate activity, pushing minerals towards the crust of the earth, the geography of Chile is in constant transformation. These conditions have created an

³³ Toovey Leila Michele *Copper Mining in Chile* (2011) <<http://investingnews.com/daily/resource-investing/base-metals-investing/copper-investing/copper-mining-in-chile-part-i/>> [accessed 23 October 2015], quoted in Pereira, G. (2015) *The Underground Frontier: Technoscience and Resource Extraction*, PhD Thesis in Visual Cultures, Goldsmiths University

³⁴ Williams, Matt (2015) 'What is the Pacific "Ring of Fire"?' <<http://www.universetoday.com/59341/pacific-ring-of-fire>> [accessed 23 October 2015].

extraordinarily diverse geography, already noted in the nineteenth century by Claudio Gay (1800–1863), a naturalist who was commissioned by the Chilean Government to conduct a survey of the Chilean flora and fauna between 1832–1837. Gay noted in *La Historia Física y Política de Chile* ('The Physical and Political History of Chile') the way in which natural forces interfere in every day life of Chileans [Fig 3]. As has been argued by Toovey, these natural forces, are intrinsically linked to the mineral wealth of the territory. It was the Polish Mineralogist Ignacio Domeyko³⁵ who called Chile the 'Kingdom of Minerals' in his *Ensayo sobre los depósitos metalíferos de Chile: con relación a su jeología y configuración exterior*³⁶ ('Essays about Chilean mining deposits: their relation to geology and external configuration'). Domeyko's is the first and complete survey of the mining geography of Chile, and became the bible of minerals for future generations of mineralogists and students.³⁷

As a consequence of these geological forces, the land of Chile presents the largest copper mineralisation on the globe, giving Chile the world's largest reserves of copper [Fig 4]: Chile sits on the major copper porphyry deposits of

³⁵ Ignacy Domeyko (1802–1899) is renowned for his achievements in mineralogy as well as in education and geography. He is highly respected for his modest approach to life, his participation in projects that focused on the sustainable development of industry and his aspirations towards inclusivity and the integration of indigenous communities.

³⁶ Domeyko, I. (1876) *Ensayo sobre los depósitos metalíferos de Chile: con relación a su jeología y configuración exterior*, Santiago, Chile: Imprenta Nacional.

³⁷ Ignacy Domeyko is the starting point for a current work in progress called *Mapping Domeyko*. An exhibition of this work is scheduled for 2017 at Laznia, Centre for Contemporary, Gdańsk, Poland. Using Domeyko's memoirs *My Travels* (Diaries in Exile) as a starting point, the project maps out Domeyko's global movements, exploring his blurred national identity, between Chile, Lithuania and Poland. The research links four mineral collections where Domeyko sent rare mineral specimens in the nineteenth century: (1) Musée de Minéralogie at Mines ParisTech, Paris; France (2) Museo Mineralógico Ignacio Domeyko, Universidad de La Serena, Chile; (3) Muzeum Geologiczne Polskiej Akademii Nauk, Kraków; and (4) Muzeum Geologiczne Uniwersytetu Jagiellońskiego, Kraków, Poland. Please see more on Acosta, Ignacio <<http://www.ignacioacosta.com/domeyko/>> [accessed 17 January 2017].

the Andes Mountains.³⁸ However, these large reserves of copper are ultimately the catalyst for political disputes. After the Pacific War (1879–1883), the bases for the contemporary Chilean economic system were established through the incorporation from Peru and Bolivia of the vast territories of the Atacama Desert, rich in copper and nitrate.³⁹ Since then, the management of these resources has been mainly in hands of foreign capital. Foreign control, possession and exploitation of Chilean natural resources has been a long-standing concern for local scholars from the early twenty century until today. Francisco A. Encina,⁴⁰ Santiago Macchiavello Varas,⁴¹ and Aníbal Pinto Garmendia⁴² outlined the main social and economic consequences of the control of copper resources by foreign capital, based on the idea of the failed experience of the nitrate industry. The impact of the flow of capital from local entrepreneurs to foreign corporations was highlighted by the writer Encina, who first noted that the causes of the economic inferiority of Chile were related to the displacement of capital from local entrepreneurs to foreign hands. He observed that the revenue created with the extraction of minerals was not incorporated into the country's economic system as investors used the territory merely to obtain revenues which they then capitalised in their own places of

³⁸ CODELCO. (1975), p 117.

³⁹ Purbrick, L. (2014) 'Nitrate Traffic' in Ribas, X. (2015) *Nitrate*. Exhibition catalogue. Barcelona, Macba, pp. 19–38.

⁴⁰ Encina, F.A. (1912). *Nuestra inferioridad económica, sus causas, sus consecuencias*, Santiago de Chile: Imprenta universitaria.

⁴¹ Macchiavello Varas, S. (1923) El problema de la industria del cobre en Chile y sus proyecciones económicas y sociales Universidad de Chile. Seminario de Ciencias Económicas y Sociales, [s.l.: s.n.].

⁴² Pinto, S.C.A. (1973) *Chile un caso de desarrollo frustrado*, [S.l.]: Editorial Universitaria.

origin. As Encina argues, the feeling of inferiority in Chilean society was deepened by the psychological effect of not being able to have control over its own national resources.⁴³ He criticised the adverse balance between exports and imports, noting a steady increase in the volume of debt owed to foreign institutions, such as the Rothschild Bank in London, which funded private enterprises and government infrastructure projects. Indeed, British capital played a key role in the development of the Chilean economy as a whole, and particularly in the management of its copper and nitrate resources in the nineteenth century. Later in the twentieth century, U.S. investors, such as the Guggenheim brothers, took over the extraction of Chilean minerals. In late twentieth and twenty-first centuries a mix of multinational corporations together with the state owned mining corporation, CODELCO, have been responsible for roughly 11 per cent of global copper production.⁴⁴ Chile has a large-scale mining industry, as has been recently published by Sonami [Fig 5]. Today these mines include the Escondida, currently the world's largest single producer of copper,⁴⁵ and Chuquibambilla, the biggest open-cast copper mine in the world; both are located in the northern region of Antofagasta. Alonso notes that Chuquibambilla's 4.5km long, 3.5km wide and 850m deep open-pit is deeper than the highest built structure in the world, the Burj Khalifa in Dubai.

⁴³ Encina, F.A. (1912).

⁴⁴ Codelco (2011). *Codelco Update*
<https://www.codelco.com/prontus_codelco/site/artic/20110721/asocfile/20110721175704/codelco_june2011.pdf> [accessed 7 August 2015].

⁴⁵ International Copper Study Group (2014) *The World Copper Factbook 2014*
<<http://www.icsg.org/index.php/component/jdownloads/finish/170/1997>> [accessed 6 August 2015] p.15.

‘Chuquicamata dominates an entire territory, not only because of the oceanic, sedimentary depth of this hole in the ground, but because of the nearby ranges of slag-heap mountains that its excavation constantly engineers.’⁴⁶

Today, the economy of Chile still remains heavily dependent on exports of raw natural resources, relying on the import of manufactured goods and technology from abroad. Chile remains ‘economically dependent on large-export oriented natural resource industries developed by foreign capital from metropolitan countries.’⁴⁷ It was Gunder Frank who pointed out the fragility of the extractive industries managed by foreign capital in Latin America:

thus the export sector by its very nature would not allow the transformation of the system as a whole. Once the export disappeared, as happened in Brazilian Northeast with the decline of sugar production due to the competition from the West Indies, the system as a whole would disintegrate and labour would return to subsistence activities.⁴⁸

The Chilean economy still depends heavily on copper and has a very limited portfolio of industrial production. Copper is commonly referred to as ‘Red Gold’ due to the abundance of resources that it brings to Chile. Mining is one of the most profitable activities in the country. CODELCO in 2013 represented 14 per cent of the Government total revenues.⁴⁹ As the Anglo

⁴⁶ Alonso, P.I. (2013), pp. 81–86.

⁴⁷ Girvan, N. (1972b) *Copper in Chile a study in conflict between corporate and national economy*, [Mona, Jam.]: University of the West Indies. Institute of Social and Economic Research.

⁴⁸ Frank, A.G. (1971) *Capitalism and underdevelopment in Latin America* (Revised ed.), Harmondsworth: Penguin, p. 50

⁴⁹ CODELCO (2014b) Codelco Investor Presentation <https://www.codelco.com/prontus_codelco/site/artic/20110803/asocfile/20110803155044/codelco_update_april_2014_web.pdf> (accessed 24 October 2015)

American corporation states in their 2012 Annual Report, copper mining is an attractive industry, with a moderate concentration of customers and suppliers, and relatively good average profitability over the long term.⁵⁰

Chile's economic boom has been pushed by massive demand from Asian markets; as Singh argues, the Latin America region as a whole has embraced a free market economic model framed by resource exploitation and the import of technology, becoming 'a new frontier of an expanding extractive sector as a result of the sustained demands of emerging markets like India and China.'⁵¹ China is forecast to have constructed between four and five million new buildings between 2005 and 2025, as it continues to undergo fast-paced urbanisation.⁵² China's booming construction industry urgently needs copper to build a new city every three or four months.⁵³ As such, China has been the main consumer of 'nearly all the global copper demand between 2005 and 2010.'⁵⁴ However since its peak in 2011, the price of copper has fallen by 40 per cent due the slowing down of demand from China.⁵⁵ The slowed down Chinese economy is a heavy weight on the price of commodities. Countries like Chile, whose economies depend on primary resources, are suffering economic

⁵⁰ Anglo American (2012) *Anglo American reaches deal with Chile's Codelco* <<http://www.angloamerican.com/investors/reports/2012rep>> [accessed 3 September 2014].

⁵¹ Nem Singh, J.T. (2010) 'The Politics of Globalisation and Copper Policy in Chile,' *Journal of Critical Globalisation Studies*, pp. 60–88.

⁵² MacDonald, Alex (2011) *Rio Tinto Forecasts surge in world demand of refined copper* <<http://www.theaustralian.com.au/business/mining-energy/rio-tinto-forecasts-surge-in-world-demand-for-refined-copper/story-e6frg9df-1226132964025>> [accessed 10 August 2015].

⁵³ MacDonald, Alex (2011).

⁵⁴ Sanderson, Henry (2015b) *Chile: Copper bottomed* <<http://www.ft.com/cms/s/0/b9f15790-eea0-11e4-96ec-00144feab7de.html#axzz3jLUGd593>> [accessed 20 August 2015].

⁵⁵ Sanderson, Henry (2015b).

stagnation. The price of copper is heavily influenced by global economic growth and political contingency [Fig 6]. In the current global scenario, countries like Chile, whose economies became buoyant during the peak of commodity prices in the mid 2000s, struggle with reduced income from raw materials.⁵⁶ Whilst the price of copper remains low, Chile needs to boost production to increase state revenue, deepening a circle of dependency on the commodity chain. Chile's local economy relies heavily on the revenues created by the copper industry to sustain growth. Overexploitation of mineral bodies has produced a sharp decline in the quality of this non-renewable mineral.⁵⁷ Additionally, the costs of production, such as energy and labour, are increasing significantly⁵⁸ with 'finding water being one of the biggest challenges of the industry.'⁵⁹ As result, Chile's copper mining industry has becomes less competitive. As Sergio Hernandez claimed at the UKTI Mining Conference held in Canning House in London, Chile is currently considering investing U.S.\$ 90bn dollars in mining projects no later than 2018 to boost production to

⁵⁶ Stratford (2015) *Chile's Copper booms comes to an end* <<https://www.stratfor.com/sample/analysis/chiles-copper-boom-comes-end>> [accessed 24 October 2015].

⁵⁷ Sanderson, Henry (2015a) *Antofagasta sounds warning on Chile copper industry*, London: *Financial Times* <<http://www.ft.com/cms/s/0/4ae8aaba-e267-11e4-aa1d-00144feab7de.html#axzz3i4QREFmu>> [accessed 6 August 2015].

⁵⁸ Jasmine, Cecilia (2014) *Mining cost in Chile 350% higher than a decade ago: report* <<http://www.mining.com/mining-costs-in-chile-350-times-higher-than-a-decade-ago-report-99531-94592>> [accessed 6 August 2015].

⁵⁹ Jasmine, Cecilia (2013).

8.5 million tons per year by 2025, representing an increase of 48 per cent with respect to 2013.⁶⁰

The global mobility of Chilean copper

Currently Chile produces mainly ‘copper concentrate,’⁶¹ a powder produced by means of a flotation system (crushing, milling and concentrating the primary material), typically containing 30 per cent of copper.⁶² Chile produces 1,400,000 tons of waste daily as a result of copper production⁶³, known as overburden.⁶⁴ In this process, sulphuric acid is used to separate copper from unwanted materials. Each ton of refined copper generates around one hundred tons of toxic residue, generating by-products that have transformed the desert into a wasteland of hidden toxic matter. These billions of tons of waste form artificial geographies containing arsenic, lead and other heavy metals.⁶⁵

Whilst these toxic residues remain in the landscape where copper is being extracted, the primary material is shipped to industrial centres in Asia and Europe where it is transformed into ‘blisters,’ a more concentrated intermediate

⁶⁰ Hernandez, Sergio (2014) *Mining Investment Portfolio 2014-2013* <<https://www.canninghouse.org/wp-content/uploads/2014/09/UKTI-Conference-Sergio-Hernandez-Chilean-Copper-Commission.pdf>> [accessed 6 August 2015].

⁶¹ Banco Central de Chile (2014) *Estadísticas Económicas* <http://www.bcentral.cl/estadisticas-economicas/publicaciones-digitales/anuario_ccnn/pdf/ccnn_cierre2014.pdf> [accessed 6 August 2015].

⁶² International Copper Study Group (2014) *The World Copper Factbook 2014*, p. 10, <<http://www.icsg.org/index.php/component/jdownloads/finish/170/1997>> [accessed 6 August 2015] p.10

⁶³ Sernageomin.<<http://www.sernageomin.cl/detalle-noticia.php?iIdNoticia=240>> [accessed 2 November 2015].

⁶⁴ Earthworks, Oxfam America (2004) *Ruined Lands, Poisoned Waters*, p. 4, <https://www.earthworksaction.org/files/publications/DirtyMetals_RuinedLands.pdf> [accessed 6 August 2015] p.4

⁶⁵ For more information, see: <<http://www.relaves.org/remediacion/>> [accessed 6 August 2016].

material⁶⁶. ‘Copper blisters’ are stored in warehouses around the world, where they can be exchanged up to forty times before final delivery.⁶⁷ These intangible transactions take place through centres for metals trading, such as the London Metal Exchange, through ‘future contracts, agreements made to buy or sell a fixed amount of metal on a fixed future date at a price agreed today.’⁶⁸ The ‘blisters’ are melted down and mixed with other sources of copper, including recycled materials, forming ‘anodes’ that are transformed into ‘cathodes’ and then into ‘rods’ – the basic component for the production of cables for the energy and telecommunications industries. Smelted copper returns to Chile hidden within manufactured goods, perpetuating a circle of mobility that began with the extraction of the ore. Copper is everywhere, yet rarely seen.

1.3 Uneven geographical development and the hypermobility of commodities as products of globalisation dynamics

Globalisation and the mobility of commodities

David Held claims that globalisation⁶⁹ can be considered as a ‘process (or set of processes) which embodies a transformation in the spatial organization of social

⁶⁶ International Copper Study Group (2014), p. 4.
<<http://www.icsg.org/index.php/component/jdownloads/finish/170/1997>> [accessed 6 August 2015].

⁶⁷ LME (2012) *The LME from A-Z*, London: The London Metal Exchange, p. 23.

⁶⁸ LME (2012) *The LME from A-Z*, London: The London Metal Exchange, p. 17.

⁶⁹ There is an enormous wealth of literature relating to the new configuration established by globalisation. This includes: Allen, J. (2008) ‘Claiming connections: a distant world of sweatshops?’ in: Barnett, C, Robinson, J and Rose, G (eds) *Geographies of globalisation a demanding world*. London: SAGE in association with the Open University; Barnett, C., Robinson, J. and Rose, G. (2008) *Geographies of globalisation a demanding world*, London: SAGE in association with the Open University; Callinicos, A. (2007) ‘Globalisation, Imperialism and the Capitalist World System’ in: Held, D and McGrew, AG (eds) *Globalization theory approaches and controversies*, Cambridge:

relations and transactions – assessed in terms of their extensity, intensity, velocity and impact – generating transcontinental or interregional flows and networks of activity, interaction, and the exercise of power.⁷⁰ As Held notes in this context, flows are understood as physical activity between ‘artefacts, people or symbols, tokens of information across space and time’ and networks as ‘regularised or patterned interactions between independent agents, nodes of activity, or sites of power.’⁷¹ Globalisation as a process is driven by multiple actors in the economic, social and cultural sphere.⁷²

The new order of globalisation under advanced capitalism generated by the global movement of capital has produced a circulation of labour and commodities. The latter have in turn played a key part in generating transnational flows that have created a new spatial order. Hardt and Negri point out that in the new order of globalisation there is a significant shift in which the national gives space to the transnational.⁷³ In this new global configuration

Polity; Harvey, D. (1989) *The condition of postmodernity an enquiry into the origins of cultural change*, Oxford: Basil Blackwell; Harvey, D. (2006) *Spaces of global capitalism*, London: Verso; Held, D. (1999) *Globalization*, London: Foreign Policy Centre; Held, D. and McGrew, A.G. (2003) *The global transformations reader an introduction to the globalization debate*, Cambridge: Polity Press in association with Blackwell Publishing; Ohmae, K. (1995); *The evolving global economy making sense of the new world order*, Boston, Mass.: Harvard Business School Publishing; Sassen, S. (1998) *Globalization and its discontents*, New York: New Press; London I. B. Tauris [distributor].

⁷⁰ Held, D. (1999) *Globalization*, London: Foreign Policy Centre, p.16

⁷¹ Held, D. (1999), p.16

⁷² Nem Singh, J.T. (2010), pp. 60–88.

It has been argued that since the incorporation of China and the former Soviet block into the global capitalist market in the late 1980s these flows have been accelerating at an exponential rate, producing massive changes in the way the world economy has expanded and the environments changed. Harvey, D. (2006).

⁷³ Hardt, M. and Negri, A. (2000) *Empire*, Cambridge, Mass.; London, Eng.: Harvard University Press, p. 33.

‘economic power of flows across and through continuous space’⁷⁴ and as distant localities become integrated new relationships are established between the local and the global. The formation of a new geographical configuration of globalisation blurs the boundaries between both the local and the global, creating a set of alienated spaces, which although they appear disconnected on the map, are linked through global processes of production and trade.

Mimi Sheller, whose work revolves around the globalisation of information and mobility, suggests a convergence of the term hypermobility between the physical movement of people, vehicles and things and information technologies that include the production, storage and retrieval of computing and surveillance and tracking technologies, and at the same time local daily processes of transportation and movement between sites, including the movement of material things within everyday life. This was created by the acceleration of the worldwide network of communications produced during industrial revolution, particularly with the expansion of electricity networks, which require copper to function. Mobility indicates movement, flows and liquidity, including all types of circulation, such as cultural, financial, material and social. The material production of commodities and their global circulation alters the geographies where these processes take place. As such, geographically distant localities become connected by means of commodity circulation. In the case of copper, as the metal passes through the process of production, mutating from ore through smelted commodity and recycled material, sites where these

⁷⁴ Harvey, D. (2006), p 107.

processes take place become inevitably linked. For example, remote extraction sites in Chile, manufacturing districts in China and trade in Britain are linked by a system of exchange. However, the connections between these geographically distant, but historically connected, sites are not be visible. It therefore becomes imperative to open new ways of creating an understanding of their complex relationship.

Uneven Geographical Development

It was Paul Baran who, in the early seventies, made an important contribution to the understanding of the way in which the division of the world system of capitalism produces unavoidable inequality, through his important interpretation of the Marxist notion of ‘accumulation by dispossession.’⁷⁵ This term refers to the appropriation of economic surplus in the metropolitan centres from their peripheral satellites. As result of this expropriation, the satellite countries in the Southern Hemisphere remain underdeveloped. Andre Gunder Frank developed Baran’s thesis of he ‘metropolitan-satellite’ relationship, using Brazil and Chile as the central case studies in the development of the term. Both countries, although marginal, were elements of global capitalism.⁷⁶

The term ‘uneven geographical development’ was coined by David Harvey and Neil Smith in the 1980s and refers to the unequal patterns of spatial development that are produced by a new geography of global capitalism.

Moreover, Harvey claims that the promise of poverty reduction through the free

⁷⁵ Baran, P.A. (1957) *The political economy of growth*, New York: Monthly Review Press.

⁷⁶ Frank, A.G. (1969).

trade and open markets of the neo-liberal order has not materialised and that unequal geographical development remains throughout the world and particularly in the north-south relationship of exploitation. Environmental degradation and social inequalities are unevenly distributed. At the same time, the ‘uneven geographical development of oppositional movements to neo-liberalism creates both opportunities and barriers in the search for alternatives’⁷⁷. Harvey understands this uneven geographical development using four theoretical approaches. The first of these is an historical interpretation, which locates this theory of ‘a differentiated diffusion processes ‘from the centre that leaves behind residuals from preceding eras or meets with the pockets of resistance towards the progress and modernisation that capitalism promotes.’ The second consists of constructivist arguments that focus on the ‘development of underdevelopment,’ which entails the exploitative practices of capitalist centres that engage in imperialist, colonial or neo-colonial activities of exploitation that produce underdevelopment. These practices create uneven relationships between the cores and the peripheries. The third theoretical approach is based around environmental interpretations, which are associated with doctrines of European superiority and, as Harvey argues, create tensions between the rural and the built environment – a polarization that is becoming reduced by the advance of globalisation and gentrification in rural areas. The

⁷⁷ Harvey, D. (2006), p. 25

fourth consists of geopolitical explanations, which relate to the unpredictable outcomes of political and social struggle between organised powers.⁷⁸

Neil Smith notes the idea of unequal development as a truly twenty first century phenomenon, like the restructuring of the geographical space which has been intensified⁷⁹. He argues that from a Marxist point of view that ‘development-underdevelopment relation is a geographical mirror of the capital-labour relation of global capitalism.’⁸⁰

Hardt and Negri argue that the movements of globalisation are organised and expressed through the communications industries, and these networks of communication have a direct relationship with the organisation of a new order.⁸¹ In the same way, the Dutch-American sociologist, Saskia Sassen, a key figure in this thesis on account of her engagement with the reconfiguration of the space of globalisation, refers to this new spatial configuration of globalisation as ‘the new geography of centrality and marginality.’⁸² Sassen argues that geographical inequality is an essential part of economic disparity, creating polarities in the social, economic and political spheres. While former manufacturing centres decline, she argues, there is an increase in the growth of global cities. This is produced by an unequal distribution of capital: business centres receive large sums of investments in real estate, while low-income urban

⁷⁸ Harvey, D. (2006), p. 72.

⁷⁹ Smith, N. (2010) *Uneven development: nature, capital, and the production of space*, London: Verso.

⁸⁰ Smith, N. (2010), p. 199

⁸¹ Hardt, M. and Negri, A. (2000), p. 33

⁸² Sassen, S. (2007b) *A sociology of globalization*, New York; London: W.W. Norton.

areas decline sharply. This polarisation, as Sassen argues, can also be seen in education: while financial and service workers experience increases in income, low-skilled workers see their wages drop.⁸³ In the case of the copper mining industry, early forms of globalisation, functioning between 1840 and 1880 with the transnational mobility of copper from Chile to Wales, brought a legacy of uneven geographical development. Today, after more than two hundred years of activity, both sites remain clearly affected by unequal development: while former extraction sites in Chile remain in state of abandonment, smelting sites in Wales have been cleaned and new housing development, shopping centres and sport facilities have arisen.

Sassen argues that globalisation emerges from a series of systems of interactions and exchanges, which leads to the creation of a new political geography, an order characterised by the ‘hypermobility, global communications and neutralisation of place and distance.’⁸⁴ Processes of ‘production, trade, commerce, capital flows, money transfers, labour migration, technology transfer, currency speculation’⁸⁵ generate a complex network of financial activity, connecting distant geographies and man-made environments and generating a ‘new political’ geography of the post-colonial area. Unified by corporate power, the configuration of globalisation – as Sassen suggests – is comprised of transnational movements of goods, people and capital. In the case

⁸³ Sassen, S. (2007b).

⁸⁴ Sassen, S. (2007a) ‘The Global City: Strategic Site, New Frontier’, *Manolo Laguillo: Barcelona 1978-1997*. Barcelona: Museu d’Art Contemporani de Barcelona.

⁸⁵ Harvey, D. (2006), p.107

of Chile, those networks can be revealed through an examination of territories in which raw materials are extracted, as they have been well integrated into the world system of capitalism since colonial times: in particular, those related to the nitrate and copper mining industry in the Atacama Desert, such as underground mines, open-pits, tailing dumps, ports, highways, artificial forests, contaminated rivers or corporate mining settlements. At a more complex level, the network that Sassen proposes can be extended to include global financial centres, where these commodities are traded, power centralised and capital accumulated. Furthermore, hypermobile networks that are the product of the globalized economy are manifested physically through architectural formations, such as corporate buildings, stock exchanges, and conference centres, but also in mansions and luxury cars as well as museums holding art collections. The City of London, one of the world's leading financial centres, emerges as the most relevant reference in relation to the mining sites in Chile, as it is in London that the global price of metals is settled and where the world's largest and smallest mining companies base their operations.

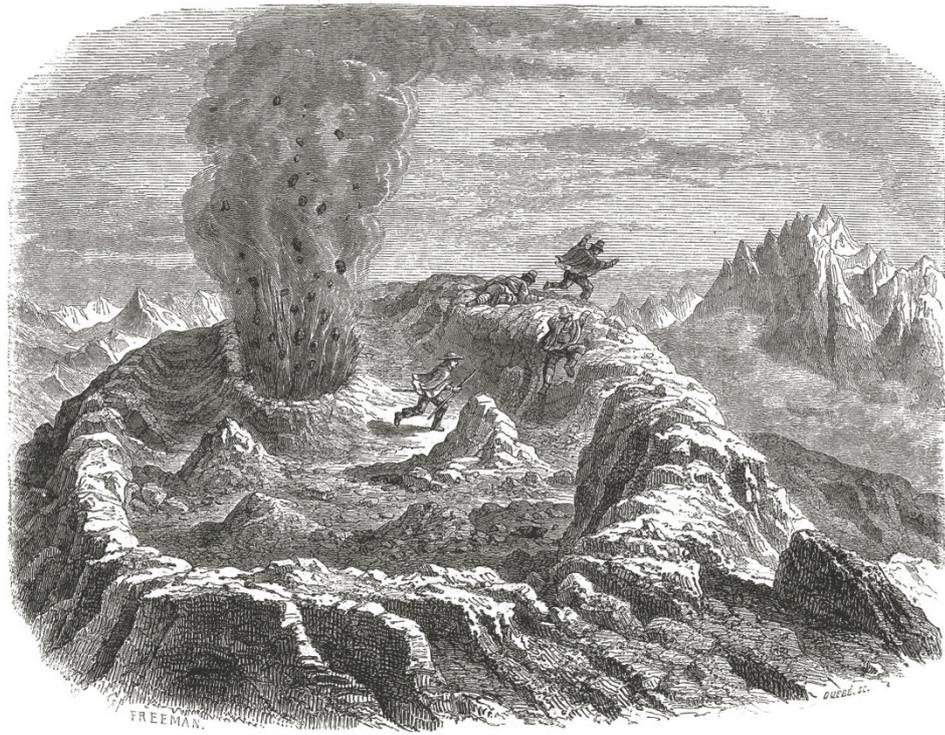


Figure 3. Lehnert, Pierre Frédéric. *Le Volcan d'Antujo, au Chile (the Antuco volcano)*, France: E. Thunot, 1854.

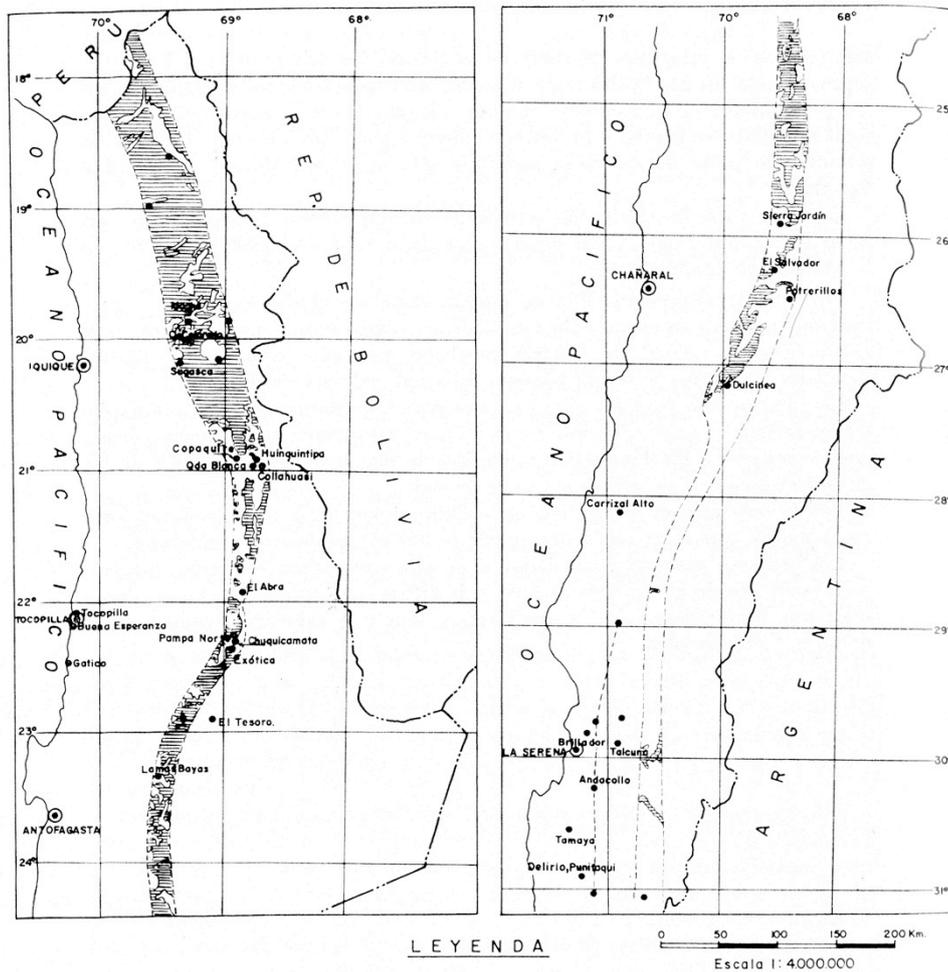


Fig. 3.1 Distribución de los principales yacimientos cupríferos de Chile (Zona Norte)

Figure 4. Distribution of the main copper mineral deposits in the North of Chile.⁸⁶

⁸⁶ CODELCO. (1975) *El Cobre Chileno*, Santiago: Corp del Cobre, p. 116.



Figure 5. Sonami, *Mapa Minero de Chile* (Chilean Mining Map), 2014.⁸⁷

Price above long term average, explained by a strong demand 1908-2014*

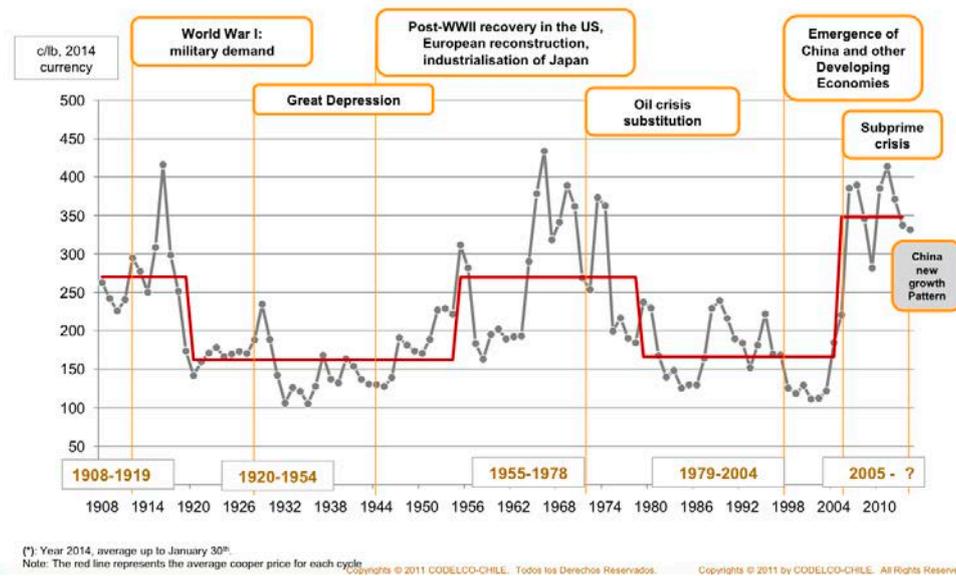


Figure 6. CODELCO. Price above long term average, explained by strong demand 1908–2014, 2014.⁸⁸

⁸⁷ Sonami (2014) *Mapa Minero de Chile*
http://biblioteca.sernageomin.cl/opac/index.asp?param=o%AD%88%92bp%92%8Cr_&Op=3
 [accessed 24 October 2015].

⁸⁸ CODELCO (2014b)

2. Documentary photography and film as form of mapping

Introduction

This chapter deals with artistic and theoretical approaches to the landscape of globalisation. I begin with a series of questions exploring how these are approached through artistic works using documentary practices: Is it possible to produce documentary works on the exploitative nature of mining that really expose its uneven geographical development? How can politically engaged practices be used to investigate power relations in the mining industry? What are the strategies of documentation and depiction that artists use to achieve this?

This thesis considers practices utilising documentary strategies. The term ‘documentary’ was first used by John Grierson in 1926 and, as Steve Edwards argues, it is an incredibly elastic category, with diverse approaches.⁸⁹ One of the most widely recognizable has been the use of black and white photography, which has been associated with the notion of ‘truth,’ entailing an ‘objective, unmediated record of facts.’⁹⁰ The term was formulated as category between the 1930s and the 1960s when documentary photographs and film, such as the Dorothea Lange’s Farm Security Administration photographs, were used by the state as a tool for the distribution of social and political knowledge.⁹¹ Documentary provided ways in which the ‘matter of fact’ could

⁸⁹ Edwards, S. (2006) *Photography a very short introduction*, Oxford: Oxford University Press, p. 26

⁹⁰ Edwards, S. (2006), p. 27

⁹¹ Stallabrass, J.E.O.C. (2013) *Documentary*, London: Whitechapel Gallery and the MIT Press.

help nations to reflect on and think about themselves. Documentary was thought to be a pure reflection of truth, in which creativity and expression were reduced and suppressed in favour for the commitment to social reality.⁹² Although, as Edwards argues, it is difficult to define the term documentary, it is possible to assert that ‘conventions assure the viewer of documentary status.’⁹³ In this vein, Enwezor argues that the term documentary is rooted in the notion developed by Giorgio Agamben of ‘bare life’⁹⁴ or ‘naked life’ as a ‘purposive forensic inclination concerned essentially with the recording of dry facts by joining the idea of the “verité” as an exploration and process, and diagnosing a search of truth.’⁹⁵

As a point of departure, the works reviewed in this thesis (including mine) are aligned with ‘critical realism,’ a particular strand of documentary practices developed by Allan Sekula. ‘Critical realism’ has been defined as:

a practice, a research method rather than artistic style ... It is a way of seeking to understand the social reality by critically ‘making notes’ of it. The visual comments artists such as Allan Sekula communicate to their public, are inscriptions and traces of the reality surrounding us,

⁹² Stallabrass, J.E.O.C. (2013).

⁹³ Stallabrass, J.E.O.C. (2013) *Documentary*, London: Whitechapel Gallery and the MIT Press, p. 15

⁹⁴ Agamben, G. (1998) *Homo sacer sovereign power and bare life*, Stanford, Calif.: Stanford University Press.

⁹⁵ Enwezor, O. (2008) ‘Documentary/Verite’ in: Lind, M and Steyerl, H (eds) *The green room: reconsidering the documentary and contemporary art*, Berlin Annandale-on-Hudson, NY: Sternberg Press; Center for Curatorial Studies and Hessel Museum of Art, Bard College, p. v.

This claim to ‘truth’ of photography from the middle of nineteenth century has shifted with the wide dispersion of communication technologies. Today, this notion of certitude has vanished from contemporary consciousness, partly a product of the large-scale experience of propaganda. Day, G. and Edwards, S. (2012) ‘Global dissensus: art and contemporary capitalism’ in: Edwards, S. and Wood, P. (eds) *Art & visual culture, 1850-2010 modernity to globalisation*, Milton Keynes: Tate Publishing in Association with The Open University, p. 300.

dialectically generated through the paradoxes of that reality and as such reflecting its contradictions.⁹⁶

As such, the chapter begins with an analysis of the theoretical work developed by Sekula around the role of photography within visual culture. Sekula's work provides a framework for understanding the works and curated exhibitions that follow. At this point, the thesis engages in discussions around the entry of the documentary form into the gallery space as a reflection of a political turn in contemporary art.

The second part of the chapter deals with documentary photography and film addressing the problematics of global extractionism. It looks at works by Alfredo Jaar, *Gold in the Morning* (1986), and Steve McQueen, *Gravesend* (2007), both critically engaging with the relationship between two extractive enclaves, Brazil and the Congo. These works are of particular relevance for this thesis in that they utilise different methodological strategies to oppose the notion of 'peripheral sites' that of the 'core,' as developed by Gunder Frank.

The third part of this chapter examines the collective exhibition as a critique of globalisation, such as *Documenta 11* (Kassel, 2002),⁹⁷ *Geography and the Politics of Mobility* (Generali Foundation Wien, 2002),⁹⁸ and *Uneven geographies: Art and Globalisation* (Nottingham Contemporary, 2010).⁹⁹ The

⁹⁶ Baetens, J. and Gelder, H.V. (2006a) *Critical realism in contemporary art around Allan Sekula's photography*, Belgium: Leuven University Press, p.9

⁹⁷ *Documenta 11, Platform 5* (2002) Exhibition catalogue. Kassel: Museum Fridericianum Ostfildern-Ruit: Hatje Cantz.

⁹⁸ Biemann, U. (ed) (2003) *Geografie und die Politik der Mobilität/Geography and the Politics of Mobility*, Cologne: Verlag Buchhandlung Walther König.

⁹⁹ Demos, T.J. and Farquharson, A. (2010) *Uneven Geographies Art and Globalisation* Nottingham: Nottingham Contemporary.

chapter also looks at the exhibition, *World of Matter* (Dortmunder U, 2014),¹⁰⁰ to consider how the trend in contemporary documentary practices has shifted from the geographical to the ecological.

2.1 Allan Sekula and ‘critical realism’

Allan Sekula, along with other artists, such as Martha Rosler, emerged as a prominent artist in the conceptual scene of San Diego in the late 70s.¹⁰¹ His exploration of the relationship between capitalism, human labour and photographic culture was produced through a constellation of films, photographic essays and critical texts. Sekula’s practice was enlightened, as Steve Edwards suggests, by an ‘enduring political commitment’ against capitalism.¹⁰² Much of his theoretical and practical work can be read as a sustained attempt to unravel the function of photographs within a system of late capitalism. He explored the main issues associated with photographic culture within a tradition of Marxist thought, by writing on the circulation and exchange of photographs,¹⁰³ the documentary function of photography, the photographic meaning,¹⁰⁴ photographic archive,¹⁰⁵ in particular the complex

¹⁰⁰ Arns, I. (2015) ‘Editor’s Foreground’ in: Arns, I. (ed) *World of Matter*, Berlin: Sternberg Publishers.

¹⁰¹ Ruchel-Stockmans, K. (2006) ‘Loops of History: Allan Sekula and representations of labour’ in: Baetens, J and Gelder, Hv (eds) *Critical realism in contemporary art around Allan Sekula’s photography*, Belgium: Leuven University Press.

¹⁰² Edwards, S. (2013) ‘Socialism and the sea: Allan Sekula, 1951–2013’, *Radical Philosophy* (182), pp. 61–65.

¹⁰³ Sekula, A. (1981) ‘The Traffic in Photographs’, *Art Journal* 41, pp. 15–25.

¹⁰⁴ Sekula, A. (1984b) ‘On the Invention of the Photographic Meaning’ in: *Photography against the grain essays and photo works*, Halifax, N.S., Canada: Press of the Nova Scotia College of Art and Design.

¹⁰⁵ Sekula, A. (1986) ‘The Body and the Archive,’ *October* 39, pp. 3–64.

relation between photographic culture, labour and capitalism.¹⁰⁶ For Sekula, photography was positioned between literature, painting and cinema, and as such the notion of sequence remained central to his practice.¹⁰⁷

Sekula developed his work around ‘critical realism’ for which art ‘cannot – nor should it – be separated from class perspective and therefore socialist realism may not be wrong in se.’¹⁰⁸ As understood by Baetens and Van Gelder in relation to Sekula’s work, the term refers to more than an artistic style; it is a practice, a research method that, as well as making notes about reality, ‘brings questions to the foreground without offering ready made answers.’ It offers scratches of reality and leaves their traces in viewers’ minds.¹⁰⁹ ‘Realism’ has also been defined as a ‘research method that testifies to a certain artistic and social engagement.’¹¹⁰ For David Bate, it is the ‘mode of representation that supports reality.’ As he argued, ‘the realism of an image corresponds to a perception of reality.’¹¹¹ Sekula’s photographs, on the limit between art and documentary, ‘reflect on the possibilities for the visual arts today to deliver an “act of criticism”, as his fellow Martha Rosler has named

¹⁰⁶ Sekula, A. (1983) ‘Photography between Labour and Capital’ in: Shedden, L, Macgillivray, D and Sekula, A (eds) *Mining photographs and other pictures 1948-1968 a selection from the negative archives of Shedden studio Glace Bay Cape Breton*, Halifax N.S.: The Press of the Nova Scotia College of Art and Design.

¹⁰⁷ Documenta 11, Platform 5 (2002), p. 582.

¹⁰⁸ Baetens, J. and Gelder, H.V. (2006a) *Critical realism in contemporary art around Allan Sekula’s photography*, Belgium: Leuven University Press, p.9.

¹⁰⁹ Baetens, J. and Gelder, H.V. (2006a), p. 9.

¹¹⁰ Baetens, J. and Gelder, H.V. (2006b), p. 121.

¹¹¹ Bate, D. (2009) *Photography the key concepts*, Oxford: Berg, p. 41

it.¹¹² Sekula's critical realism is usually sustained through photographic sequences and the inclusion of text within the photographs, which refers to literature and cinema through films.¹¹³ How series and sequences of images are ordered and in the way in which the text interferes with the visual is the key for understanding Sekula's work.

In one of his most celebrated essays 'On the Invention of Photographic Meaning,'¹¹⁴ Sekula argued that the claim of the significance of photography 'lies at the centre of the established myth of photographic truth.'¹¹⁵ For him, photography, had no specific content as it is suspended between the 'chattering ghost of bourgeois art and bourgeois science, which has haunted photography since its inception.' Photographs are used for various representational duties and, as he argued, they are in 'conflict between affective memory and informative power.'¹¹⁶ On one hand, Sekula proposed, photographs evoke meaning by 'transcendent magic,' which resonates metaphorically in our affective area. Trapped between 'nostalgia and hysteria,' photographs have the power to evoke memories, suggest imaginative realities and create affected spaces. This intrinsic power of photography, Sekula writes, penetrates appearances and transcends the visible. On the other hand, the mythical power of photographs is the legal authority of truth, which is embedded within each

¹¹² Baetens, J. and Gelder, H.V. (2006a), p. 9

¹¹³ Edwards, S. (2013), p.65.

¹¹⁴ Sekula, A. (1984b).

¹¹⁵ Sekula, A. (1984b), p. 5.

¹¹⁶ Sekula, A. (1984b), p. 10.

photographic record. In this case, Sekula refers to photographs as having the ‘legal power of proof’ as empirical objects.¹¹⁷ For Sekula, the notion of the ‘aura’ of the photograph, or the photograph as ‘work of art,’ is less important than the photograph as ‘document’ that enables the transmission of a message.¹¹⁸ As such, the importance of the context in which images are distributed become crucial.

As Toscano observes, Sekula’s work raises questions regarding the ‘notion of representation of representability of contemporary capitalism.’¹¹⁹ This is the concern that is central to my thesis. My doctoral study turns upon these ideas, as they are directly relevant to my photographic practice. The question of representation is taken up by the theorist Fredric Jameson who proposed in the 1980s that a ‘new aesthetic of “cognitive mapping” of capitalism’¹²⁰ was needed to create an analysis of the main features of capitalism in the age of globalisation. For him, its function is ‘to enable a situational representation on the part of the individual subject to that vast and properly unrepresentable totality which is the ensemble of society’s structures as a whole.’¹²¹ ‘Cognitive mapping’ therefore appears as a new aesthetic dimension of political art, which coordinates ‘existential data (the empirical position of the subject) with unlived,

¹¹⁷ Sekula, A. (1984b), p. 10

¹¹⁸ Sekula, A. (1984a) ‘Dismantling Modernism, Reinventing Documentary (Notes on the Politics of Representation)’ in: *Photography against the grain essays and photo works*, Halifax, N.S., Canada: Press of the Nova Scotia College of Art and Design, p. 84

¹¹⁹ Toscano, A. (2013) ‘Landscapes of Capital, Circulation and the State: Farocki, Paglen, Sekula’, *Lectures 2013-14*, Goldsmiths Department of Art MA.

¹²⁰ Jameson, F. (1988) ‘Cognitive Mapping’ in: Nelson, C and Grossberg, L. (ed) *Marxism and the Interpretation of Culture Urbana*, Chicago, IL: University of Illinois Press, pp. 347–357.

¹²¹ Jameson, F. (1991) *Postmodernism, or, The cultural logic of late capitalism*, London: Verso.

abstract conceptions of the geographic totality'¹²² in order to close the gap between 'our local phenomenology and the structural conditions which determine it.'¹²³ The way of presenting data can be delivered in a wide range of forms and through cartography, film, photography and writing. Day and Edwards define Jameson's notion of 'cognitive mapping' as a new set of practices that emerged in 'response to the dilemma on how to represent processes that seem to be beyond representation.'¹²⁴

Although 'cognitive mapping' refers mainly to cartography, diagrams and plans, it can be argued that Sekula – and many of his successors – do practice a form of mapping. For them, photography is unable to tell the whole truth or scratch deep enough at the realities of capitalist exploitation. To make visible the hidden power structures of the capitalist system, which would otherwise remain unknown in the photograph, hybrid installations can 'provide the documentary evidence'¹²⁵ of the research process, such as documents, photographs and videos. In the case of Allan Sekula, this is achieved through photographic sequences and text. The mapping process in his work is found in his extensive writing and photographic sequences, which, when combined, give critical meaning. Most importantly, he attempts to unravel the hidden power of the structures that lie beyond photographic culture: the economic context in

¹²² Jameson, F. (1991).

¹²³ Srnicek, Nick (2011) *What We Talked About At ISA: The Decline of Cognitive Mapping (Part II)* <<http://thedisorderofthings.com/2011/05/11/what-we-talked-about-at-isa-the-decline-of-cognitive-mapping-part-ii/>> [accessed 7 September 2015].

¹²⁴ Day, G. and Edwards, S. (2012), p. 309

¹²⁵ Day, G. and Edwards, S. (2012), p. 311

which the photographs are produced, the social and the labour conditions of the systems represented, and the way photographs shape how historical memory is preserved.

One of Sekula's main arguments is that a photograph is not able to communicate the logic of the life behind it. Photographs remain incomplete utterances, 'a message that depends on some external matrix of conditions and presuppositions for its readability. That is the meaning of any photographic message is necessarily context determined.' In this line of argument, Sekula claims that the meaning of a photograph is determined by 'means of its associations with some with some hidden, or implicit text; it is the text, or system of hidden linguistic propositions, that carries the photograph in the domain of readability.'¹²⁶ Meaning is 'indeterminate, as the same picture can convey a variety of messages, under different presentational circumstances.'¹²⁷ Thus, the condition of readability of the image is determined by the cultural relationships around it. Photographic meaning, for him, is a 'hybrid construction'¹²⁸ and 'always directed by layout, captions, texts, site and mode of presentation.'¹²⁹ It is only alongside writing, often extensive writing, that the meaning of the photographic image is constructed.

¹²⁶ Sekula refers to texts as 'a semiotic system that lurks behind any given icon.' Sekula, A. (1984b), p. 4.

¹²⁷ Sekula, A. (1983), p. 193–194.

¹²⁸ Sekula, A. (1984c), 'Traffic in Photographs' in: *Photography against the grain essays and photo works*, Halifax, N.S., Canada: Press of the Nova Scotia College of Art and Design, p. 81.

¹²⁹ Sekula, A. (1983).

Sekula's practice revises the theme of labour.¹³⁰ In *Mining Photographs and other Pictures*,¹³¹ Sekula works with the archive of Shedden Studio, a former commercial photographic studio that regularly photographed the activity of coal miners in Cape Breton, Canada between 1948 and 1968. Sekula's intervention in the photographic archive can be read as an attempt to consider the 'emerging landscape of industrial capitalism.'¹³² Sekula creates a constellation of historical and critical knowledge around the subject of the archive, mining, labour and photography, that is intended to lead the reader to consider the 'relationship between photographic culture and economic life.'¹³³ He has observed that 'when photographs are uncritically presented, as historical documents, they are transformed into aesthetic objects. Accordingly, the pretence to historical understanding remains, although that understanding has been replaced by an aesthetic experience.'¹³⁴ To avoid the aestheticism of the photographs, Sekula makes visible the hidden power relationships behind the making and distribution of the photographs with substantial historical writing around the subject of mining, photographic culture and labour conditions. Consistently, the photographic work developed during his prolific career was never presented in terms of individual entities but in the photo-essay form, that

¹³⁰ Baetens, J. and Gelder, H.V. (2006a), p. 9.

¹³¹ Shedden, L., Macgillivray, D. and Sekula, A. (1983) *Mining photographs and other pictures 1948-1968 a selection from the negative archives of Shedden studio Glace Bay Cape Breton, Halifax N.S.*: The Press of the Nova Scotia College of Art and Design.

¹³² Edwards, S. (2013), pp. 61-65.

¹³³ Sekula, A. (1983), p.193

¹³⁴ Evans, J., Image, O.U., Team., V.C.C., et al. (1999) *Visual culture: the reader*, London: Sage; Sekula, A. (1999) 'Reading an archive: photography between labour and capital' in: Evans, J, Image, OU, Team, VCC, et al. (eds) *Visual culture: the reader*, London: Sage, p.189.

is, as a combination of photography and text, of which *Fish Stories* is another example.

Fish Stories is a study of maritime trade and an allegory for the sea as a forgotten space of capitalism.¹³⁵ One of the most important works at *Documenta 11*,¹³⁶ held in Kassel in 2002, *Fish Stories* gives an insight into the conditions of workers. It is organised in chapters and presented in the form of slide projections, colour photographs and text panels. *Fish Stories*, according to Edwards, ‘transcends the photographic format to engage painting, socialism and politics of economic life around the sea.’¹³⁷ The photographic essays are sequences ordered in chapters woven with texts drawn from the experience of the sea and the embodiment of labour activities.

For Sekula, working with documentary photography means working with ‘a medium that has been systematically refused by a modernist tradition.’¹³⁸ Indeed, as Buchloch argues, his work ‘programmatically redeploys precisely those subjects and semiotic and textual conventions that have been disqualified within modernism by longstanding interdictions’¹³⁹ However, Sekula was highly critical of documentary photography, often calling it as ‘find-a-bum school of concerned photography’¹⁴⁰ for exploiting poverty in favour of capitalist interests.

¹³⁵ Sekula, A. (1995) *Fish story*, Dusseldorf: Richter Verlag.

¹³⁶ Okwui, E. (2002).

¹³⁷ Edwards, S. (2013), pp. 61–65.

¹³⁸ Buchloch, B. (2002), ‘Allan Sekula: Photography Between Discourse and Document’ *Fish story*. 2nd rev. ed. ed. Dusseldorf: Richter Verlag, p. 190.

¹³⁹ Buchloch, B. (2002), p. 190.

¹⁴⁰ Sekula, A. (1984a), p. 62.

He proposed instead, in Edwards' words, a 'dialectical documentary,' which refused to address staged photography, referred to as 'theatricalised epistemological scepticism.'¹⁴¹

A political turn in contemporary art: the documentary form within the gallery space

The extension and deepening of capitalism across the globe placed a great demand on photography to develop a practice that could record that process. Today, the demand is even greater. Currently, with the use of digital photography, notions of certitude of the documentary have been put in doubt. This shift in the documentary tradition is the result of the 'large-scale propaganda and disinformation' of mass media.¹⁴² Indeed, the ambiguity in which 'truth' had been communicated by the media, contributed to create zones 'between the aesthetic and the ethic, between artifice and authenticity, between fiction and fact, between documentary power and documentary potential and between art and its social, political, and economic conditions.'¹⁴³ Within a context in which a conformist press that no longer provides a space for critique, as a product of a rapid privatization of media and cuts to funding bodies, 'experimental documentary production has again been increasingly pushed into the art field.'¹⁴⁴ 'In this scenario, the gallery space has come to operate as an

¹⁴¹ Edwards, S. (2013), pp. 61—65.

¹⁴² Lind, M. and Steyerl, H. (eds) (2008) *The green room: reconsidering the documentary and contemporary art*. Berlin, Annandale-on-Hudson, NY: Sternberg Press; Center for Curatorial Studies and Hessel Museum of Art, Bard College, pp14—16.

¹⁴³ Enwezor, O. (2008), pp. 62—102.

¹⁴⁴ Lind, M. and Steyerl, H. (2008), p.14.

alternative public sphere, providing access to reportage or investigations of the contemporary world no longer shown in mainstream arenas.’¹⁴⁵ Echoing what Day and Edwards refer as the ‘political turn of contemporary art,’¹⁴⁶ the gallery space has proved to be an effective ‘laboratory for experimentation in the documentary.’¹⁴⁷ Within the global exhibition culture, curated exhibitions, biennials and triennials have played a crucial role in the dissemination of politically engaged works, as often the most challenging works are shown in this context.¹⁴⁸

2.2 Works dealing with mining through documentary film and photography

This part of this chapter looks at five curated exhibitions, biennials and research platforms dealing with issues raised by globalisation and which are fundamental for the argument of this thesis. The aim of this section is to recognise the development of gallery contexts for photography, and the shift that has been produced since the entry of documentary into the museum space. These multi-faceted representation approaches combine works offering a complexity of visual and theoretical dynamics. They follow a formula which seeks to offer a critique of globalisation through the analysis of place. They are: *Documenta 11*

¹⁴⁵ See more in Jonsson, S (1988) ‘Facts of aesthetics and fictions of journalism: the logic of the media in the age of globalisation’ in Day, G. and Edwards, S. (2012), p. 300.

¹⁴⁶ Day, G. and Edwards, S. (2012).

¹⁴⁷ Lind, M. and Steyerl, H. (2008b), p.14

¹⁴⁸ Day, G. and Edwards, S. (2012), p. 300.

(Kassel, 2002),¹⁴⁹ *Geography and the Politics of Mobility* (Generali Foundation Wien, 2002),¹⁵⁰ *Uneven geographies: Art and Globalisation* (Nottingham Contemporary, 2010),¹⁵¹ and *World of Matter* (Dortmunder U, 2014).¹⁵²

All the works and exhibitions examined in this section develop in some way the practice of ‘critical realism.’ It has become an important artistic, and not only photographic, strategy for making visible the impact of globalisation, and the economic activity worldwide which has become unified into one large capitalist system. Mining, in particular, exemplifies the human and environmental degradations of globalisation, and it is the subject of the works on which these platforms focus. Importantly, they address the ‘uneven geographical development’ between remote extraction sites in Latin America and Africa, and the First World’s financial and technology centres. These critical realist documentary forms include film as well as photography.

2.2.1 Gold in the Morning, Alfredo Jaar, 1985

New York based Chilean-born artist Alfredo Jaar explores the limitations of documentary by representing events associated with human suffering, such as genocides, labour exploitation, military conflicts or toxic pollution. Jaar has developed ways of looking that locate ‘photographic knowledge at the centre of

¹⁴⁹ Documenta 11_Platform 5 (2002).

¹⁵⁰ Biemann, U. (ed) (2003).

¹⁵¹ Demos, T.J. and Farquharson, A. (2010).

¹⁵² Arns, I. (2015).

the enquiry'¹⁵³ and he questions the role of images within contemporary mainstream media. Jaar's procedure follows the steps of the 'concerned photography' tradition, first approached by Cornell Capa in the exhibition *Concerned Photographers* (1967), which brought together works that share a commitment to 'witness and to be involved with his subjects' offering an 'objective reaction to the restrictions that the print media imposed to journalists.'¹⁵⁴ In the case of Jaar, as Duganne argues, his involvement with his subjects through research, photography and aesthetics demonstrates an intimate knowledge of those subjects and reveals Jaar's concern for social reform.¹⁵⁵ Through substantial fieldwork and the way in which Jaar engages with his subjects, he offers a critique of photojournalism.¹⁵⁶ The strategies deployed by Jaar are slower than those used by photojournalism, something which permits a deeper engagement with his subjects. This is achieved mainly through the substantial research and observation carried out before the photographic work is produced. This strategy seeks to uncover the hidden structures of exploitation sites, such as the mining enclave of Sierra Pelada. Since his work is centred upon the politics of representation, he does not, therefore, just expose its

¹⁵³ Blocker, J. (2009) *Seeing Witness: Visuality and the Ethics of Testimony*, Minnesota: University of Minnesota, p. 55

¹⁵⁴ Duganne, E. (2007) 'Photography after the fact' in: Reinhardt, M, Edwards, H and Duganne, E (eds) *Beautiful suffering: photography and the traffic in pain*, Williamstown, MA; Chicago: Williams College Museum of Art in association with the University of Chicago Press.

¹⁵⁵ Duganne, E. (2007), p. 66

¹⁵⁶ The latter, engages with and critiques the project of globalisation through a direct and un-manipulated 'photojournalism reportorial powers derive largely from the physical and emotional proximity of the photographers to their subjects and their ability, thereby, to witness the events first-hand.'

environmental and social problems, but most importantly opens debates around the global systems of visual representation in which they operate.

In 1985 Jaar received a Guggenheim Fellowship and travelled to Sierra Pelada to document the harsh conditions of the workers.¹⁵⁷ Jaar took thousands of photographs during the fieldwork which lasted several weeks. The mine, located 270 miles south of the Amazon delta, was considered one of the richest of the open-cast gold mines at the time. It worked with a primitive system of extraction, small portions of ground being distributed to gold diggers who excavated vertically to avoid intruding on others, resembling, as Stallabrass observed, ‘living elements of a vast insect colony.’¹⁵⁸ A mass of displaced hunters, like an ‘army of ants,’ who have been migrating around Brazil since colonial times, drifted to Sierra Pelada during the search for gold in the 1980s”. [Fig 7].¹⁵⁹ Without other means of subsistence, this huge mass of migrants have been historically destined to a life of mere subsistence. The brutal system of labour exploitation consists of thousands of workers digging holes with shovels, collecting mud and loading it into sacks (weighing around 26 kilos), which they then carry up ladders and mud slopes to the authorities at the top, waiting to exchange them for a minimum wage of 20 U.S. cents.¹⁶⁰

¹⁵⁷ Phillips, P.C. and Jaar, A. (2005) ‘The Aesthetics of Witnessing: A Conversation with Alfredo Jaar’, *Art Journal* 64, pp. 6–27.

¹⁵⁸ Stallabrass, J. (1997) ‘Sebastião Salgado and Fine Art Photojournalism’, *New left review* 223, pp. 131–160.

¹⁵⁹ Galeano, E. (1990) ‘Salgado, 17 Times’ *Sebastião Salgado: An Uncertain Grace*. London: Thames and Hudson.

¹⁶⁰ Stallabrass, J. (1997), pp. 131–160.

Jaar's photographic intervention establishes a close relation between the subject and the spectator, permitting the viewer to visualise the complex systems of abuse operated in the mining zones during the 1980s. His engagement with the humanity and suffering of the miners is reflected in the straightforward perspective he uses when looking at the miners [Fig 8]. Yet, the images are technically and aesthetically compelling: Jaar uses the images as political devices to give visibility to the hidden networks that make this system of exploitation possible. He borrows the tools of advertising that engage consumers. He reproduces his photographic images of miners alongside directive text in the glossy poster finish of the commodified advertising image, and appropriates the spaces of publicity hoardings for their display. In this vein, Jaar wishes to bring 'the news of the world to the art world ... constructing a bridge from the almost fictitious reality of the art world with the realities of the real world.'¹⁶¹ When Jaar placed the large-scale posters series, *Rushes*, in one of the oldest subway stations in Manhattan [Fig 9] they were exposed to thousands of passers-by who rush through the busy station every day. The title also refers to the miners who hurry to climb the muddy walls to deliver their heavy-loaded bags. The posters depict cropped fragments of groups of mud-covered miners in juxtaposition to graphs displaying the fluctuation of the price of gold traded in New York, Zurich and Frankfurt [Fig 10, 11]. The use of an advertising tool of neoliberal ideology to depict the miners allowed the images to show that these types of systems of exploitation based around enslavement still survive today.

¹⁶¹ Phillips, P.C. and Jaar, A. (2005), pp. 6–27.

This simple and traditional photomontage strategy used by Jaar disrupts the easy and unfixed relationship between the figure and body of the miner. By contrasting the geopolitics of global capitalism, Jaar is linking those territories where capital is exchanged to the sites of exploitation. In doing so, he is challenging the viewers' perception of today's easy access, consumerist commodity culture. He reveals the hidden networks of labour exploitation and suffering behind it, using powerful – although conventional – ways of looking at the communication of his message. By unfixing and disrupting the easy relationship established between the viewer and the subject, Jaar is forcing us to look at the images again and again to understand more deeply the relationship between the text and the image. The multiplicity of meanings entailed in the connection made between the territories of capital exchange in New York and the zones of extraction in Brazil, opens a pathway for understanding the dynamics of globalisation.

The strategies of Alfredo Jaar can be brought into sharper focus through a comparison with the work of Brazilian-born photojournalist Sebastião Salgado, who took his *Sierra Pelada* (1986) photographs in the same mine, just one year after Jaar. Salgado offers photographs which are fairly similar to Jarr's aesthetically compelling glossy photographs, but his are in black and white [Fig 12]. Like Jaar, Salgado engages directly with the suffering of the miners [Fig 13] but his monochrome images are a more recognised way of depicting hardship. His work can be read as a study of the harassment to which the miners are subjected in their work. However, it has been criticised for being opportunistic, self-aggrandising, and romanticised. For Ingrid Sischy:

Salgado is too busy with the compositional aspects of his pictures – and with finding the “grace” and the “beauty” in the twisted forms of his anguished subjects. And this beautification of the tragedy results in pictures that ultimately reinforce our passivity toward the experience they reveal. To aestheticize tragedy is the fastest way to aestheticize the feelings of those who are witnessing it. Beauty is a call to admiration, not to action.¹⁶²

Salgado underpins the way in which Western audiences perceive the ‘others’ and their suffering through a form of desirable aesthetics.¹⁶³ In this vein, Reinhardt and Edwards suggest that the ‘aesthetic satisfaction of the images is a source of the picture’s failure to provide a genuine understanding of the situations and suffering of those pictured.’¹⁶⁴ Arguably, the viewer’s attention is driven towards the subjects’ ‘grace’ and this, as Sischy suggests, creates an aesthetic contemplation with respect to Salgado’s work, that reinforces our passivity.¹⁶⁵ As the miners’ biblical poses capture our attention, a difficult relationship is established between the viewer and the suffering. Furthermore the detailed pictorial relationship that exists in between clay/body and fabric/landscape appears to take over the whole experience of the act of looking.

A comparison between Salgado’s and Jaar’s representation of Sierra Pelada miners helps to identify the notion of critical realism in Jaar’s work.

¹⁶² Sischy, Ingrid. (1991) ‘Good Intentions.’ *The New Yorker*, September 9, p. 2. Also in Strauss, L. (2005) *Between the eyes essays on photography and politics*, New York: Aperture, p. 5.

¹⁶³ In the essay, *Shock-Photos*, Roland Barthes notes: ‘images of suffering and misery remind us of what we are free from.’ Such images, as Levi Strauss argues, ‘do not compel to action, but to acceptance.’ Strauss, L. (2005), p. 81.

¹⁶⁴ Reinhardt, M., Edwards, H. and Dugganne, E. (2007), p. 22.

¹⁶⁵ Sischy, Ingrid. (1991), p. 2. Also in Strauss, L. (2005), p. 5.

Alfredo Jaar's *Gold in the Morning* reveals one of the structures of capital, a relationship between miners and commuters, mapping the uneven geography between Brazil and New York. Jaar also explores ways of looking, challenging viewers' perceptions of the way in which photographs are read. The meaning of the figure of the miner indeed shifts in accord with how the images are presented to the public. The display of contextual geographies, so important to Sekula's practice, is the most substantial difference between the work of Jaar and that of Salgado.

The issue of reading the image is considered in carefully planned installations, such as the that of the 1987 Venice Biennial, at which *Gold in the Morning*, was exhibited. Jaar places the beautifully glowing images of suffering in a dark non-conventional environment, forcing the spectators to look above eye level and through the peripheral zones of the gallery space to be able to 'see' the images. Provoking a re-assessment of the pre-conceived ways in which we read these images, Jaar 'created a physical and conceptual framework to engage viewers and to provide a context for them to begin to think about some of the political and aesthetical ramifications of representing the other.'¹⁶⁶ It operated as a complex mechanism that reflects on the capacity of photography to represent such histories of disaster and suffering. The installation of the work interrupts the ways through which the viewer may bypass the problematic of the representation and the beautification of the 'other's suffering. Photographs could not exist without aesthetic qualities, as Reinhardt points out: such

¹⁶⁶ Dugganne, E. (2007), p. 68.

qualities are inherent to the nature of the medium. But similar photographs can be presented through radically different strategies. While Jaar's challenging installations pose questions regarding the role of photography in highlighting the uneven geographical development between marginal sites of extraction and global centres of trade, Salgado's classical linear photographic narrative gives an aesthetic experience of looking at the suffering of others [Fig 14].

Despite their different exhibition strategies, the work of both Jaar and Salgado centres on the relation between the body of the miner and the politics of labour. However, more recent documentary practices, such as the film works by Steve McQueen, focus rather on geographies of globalized mining than on the human body.

2.2.2 Gravesend, Steve McQueen, 2007

Coltan (columbite-tantalite) is a mineral that has been described as the 'new blood diamond',¹⁶⁷ thus evoking the brutal exploitative practices in its extraction process and the smuggling networks through which it circulates. Coltan is a mineral rich in tantalum which, when refined, is both heat resistant and capable of holding a high electric charge.¹⁶⁸ Its properties thus make it a key component in capacitors, a polarised device essential in almost all types of electronic commodities, such as mobile phones, laptops and gaming consoles. The

¹⁶⁷Shapiro, R. (2007) *The New Blood Diamonds: Turner Prize-winner Steve McQueen's new film shows at the Renaissance Society* <<http://www.chicagoweekly.org/2007/09/27/the-new-blood-diamonds-turner-prize-winner-steve-mcqueens-new-film-shows-at-the-renaissance-society>> [accessed 2 September 2015].

¹⁶⁸ Mantz, J. (2008) 'Improvisational economies Coltan production in the eastern Congo,' *Social Anthropology* 16, pp. 30–50.

importance of the mineral is impossible to underestimate. 'Coltan is virtually everywhere, in every cell phone, every digital electronic device, because it is a conductor that doesn't overheat'.¹⁶⁹ Sixty four per cent of the world's reserves of coltan are to be found in the eastern region of the Republic of the Congo.¹⁷⁰ Jeffrey Mantz argues that while the voracious global demand for the mineral continues to grow, its huge impact on Congolese society can be observed as local warlords fight to control informal regimes of production and distribution.¹⁷¹ This small-scale extraction system generates a huge human and environmental cost. Miners sell coltan to middlemen who operate under the local militia, smuggle the mineral and use the revenues from the trade in the mineral to finance military operations that are said to 'have claimed five million lives in the last twenty years, making it the deadliest conflict since World War II.'¹⁷² The on-going war, as well as the natural resources exploitation, are controlled by the militia who 'have been feeding raw materials into the world's biggest electronic and jewellery companies and at the same feeding chaos.'¹⁷³

Gravesend (2007), a film (17:58 minutes) by Steve McQueen (born 1969), one of Britain's most renowned artists, touches upon coltan's uneven geographical development. "Gravesend" makes reference to a location in

¹⁶⁹ Coggins, D. (2008) *Steve McQueen* <[http://www.interviewmagazine.com/art/steve-mcqueen#_>](http://www.interviewmagazine.com/art/steve-mcqueen#_) [accessed 2 September].

¹⁷⁰ Mantz, J. (2008), pp. 30–50.

¹⁷¹ Mantz, J. (2008), pp. 30–50.

¹⁷² Demos, T.J. (2013) *The migrant image: The art and politics of documentary during global crisis*, Durham; London: Duke University Press, p. 21.

¹⁷³ Gettleman, J. (2013) 'The price of precious' *National Geographic*, New York, 39-61.

England as well as to the place of death. From the reviews of the film¹⁷⁴, we learn that the laboratory where Congo's coltan is refined is located in Derby, UK, otherwise no indication is given in the film of the type of industry or its geographical locations. The film starts with a disturbing sound emanating from metal objects banging loudly against each other and against a brick surface [Fig 15]. The darkness of the screen slowly lightens so as to reveal the restricted space of an industrial furnace from which the sound is generated. The spectator can catch a glimpse of the highly mechanised process through which coltan is refined to make it an indispensable element in technological production.

Within the restricted space of the industrial furnace, a metallic tool is used to pour a hot liquidised metal into a small container; the liquid becomes both aesthetically and conceptually the centre of the spectator's attention. The fact that the moving image captures just a portion of the process of transformation of the metal from ore to commodity, gives the viewer an early indication of the minimal and restrained intervention of McQueen. The film continues, as T.J. Demos describes it, with 'shots of warm, golden hues of technoscientific refinement of columbite-tantaline in a in a British laboratory.'¹⁷⁵ The sound of automated machinery introduces the viewer to the next stage of the refinery process, in which a circular shape of the liquid metal is shown

¹⁷⁴ Including: Demos, T.J. (2013); Demos, T.J. (2010); Schapiro, R. (2007) 'The New Blood Diamonds: Turner Prize-winner Steve McQueen's new film shows at the Renaissance Society. *Chicago Weekly* <<http://www.chicagoweekly.org/category/arts-and-culture/page/116/>> [accessed 13 November 2015], Walker, H. (2007) *The grand scheme of things* <<http://www.renaissancesociety.org/site/Exhibitions/Essay.Steve-McQueen-Gravesend.591.html/>> [accessed 13 November 2015].

¹⁷⁵ Demos, T.J. (2013), p. 21.

slowly changing status from a warm, fluid and translucent material towards a solid, obscure and dark object of precision. Through the next series of moving images, the narrative continues to depict the journey of the coltan in fragments, from refining process to its final stage as a tantalum capacitor. With the precision of an infra-red laser, computerised arms pick, lift and move the refined material through the confined space of the laboratory. The complex technological apparatus shown in the images of the laboratory offers very little indication of human intervention. An idea of the location of the laboratory is given by showing a British-standard electric plug on the wall onto which the shadows of the frenetic computerised mechanical arm are projected. These movements rush to complete the transformation of commodity before it is inserted into the global market of digital production.

After showing us the sterile high-tech environment of the laboratory and the sound of precision produced by the technological apparatus, which is central in the first part, the film then takes us into the profound silence of an underground mine. The camera is looking through the hole towards the sky, before we enter the confined space of the cave for a private view of a brutal and chaotic labour process that creates deep environmental and social problems in the Congo [Fig 16]. The network of tunnels makes the ground an unstable territory for agriculture and pasture as well as contributing substantially to the reduction of forests. A shovel emerges from what has been described as a ‘pit of a grave-size, that is anything but shallow.’¹⁷⁶ The spectator is confronted with a

¹⁷⁶ Walker, H. (2007).

history of mining exploitation described by Smith, J. and Mantz, J.W. as an ‘underground, informal, or second economy,’¹⁷⁷ which allows prices of coltan to remain low at a high cost to both the society and environment of the Congo. Through obscured views of the process in which the miners search for the valuable mineral, only their shadows picking and shovelling soil can be seen. As the miners deepen the hole, the camera points towards the sky, mimicking a miner’s claustrophobic view. The spectator is left confronting a disjunction between the smooth movement of the camera and the highly aesthetic appearance of the moving image on the one hand, and the rough surface of the underground mine and the obscure nature of the coltan extraction process, on the other. In doing so, *Gravesend* opens up, as Demos argues, ‘a space of contestation where the aesthetics challenges the conventional organisation of appearance.’¹⁷⁸ In depicting this politically provocative yet aesthetically compelling scene, McQueen makes his key intervention; he draws a conceptual connection between disconnected parts of the world, but most importantly extending visibility to the ‘shadowy zones on the margin of the global order.’¹⁷⁹ By showing, on the one hand, the cutting-edge space of scientific development and, on the other, the extraction site where the conflict takes place, he therefore gives a ‘critical picture of globalisation,’ in which distant localities become unified through global systems of commodity production. Drawing conceptual

¹⁷⁷ Smith, J. and Mantz, J.W. (2006) ‘Do Cellular Phones Dream of Civil War? The Mystification of Production and the Consequences of Technology Fetishism in the Eastern Congo’, in: MH, K (ed) *Inclusion and exclusion in the global arena*, London: Routledge.

¹⁷⁸ Demos, T.J. (2013), p. 31.

¹⁷⁹ Demos, T.J. (2013), p. 36.

connections between these distant and disconnected localities, McQueen is referencing centuries of colonial exploitation in Africa and inviting reflection upon the long-lasting historical legacies of the European intervention and its current contingency.

McQueen deploys modes of representation that differ from traditional forms of documentation used in reportage or photojournalism. He slows down the way of looking, challenging the rapidity of photojournalism. He then creates sequences that utilise a more direct and confrontational approach but always refusing a full disclosure of information and context. He uses fragments of a history of exploitation without explicitly informing the viewer of the narrative history to which the fragments belongs [Fig 17]. The viewer, alienated from any contextual information, is therefore forced to put together the fragments. Consequently, the artist deals with an uncompleted history of coltan. By focusing on specific details of its processing, he avoids the representation of a more politically contextualised narrative – such as the representation of the conflict between militia and miners, the poor living conditions of the workers, the trade in the global metals markets, or any technological device in which coltan might be used. The methodology of representation focuses, instead, on a cinematic approach that involves a high degree of aesthetisation. As Demos indicates, ‘the film is remarkable for its oblique approach, obviously distant from the seemingly more immediate routes of political contestation embodied.’¹⁸⁰ As the film suggests metaphorically, but without making it

¹⁸⁰ Demos, T.J. (2013), p. 25.

explicit, the Congo's exploitative system of extraction and trade are examples of the historical problems of local economies which, so long as the cost remains low, can benefit millions of global users of digital technologies. Indeed, the Democratic Republic of the Congo is maintained merely as a place of extraction, and no further processing of materials takes place there.

Gravesend can be read as an invitation to explore the economy of coltan, its hypermobile nature and global function in the industry. I would argue that it is here, in the intermediate spaces or the zones which the film does not touch or which it refuses to inform about, that the real contribution of the director can be found. These gaps create a space between the fictional narrative of the film and the political reality of the industry. Acknowledging the limitations of the capacity of artistic practices to present a complete picture of globalization, the film provides fragments of an incomplete history, generating in the curious viewer a sense of urgency for finding out more about its crucial role within global systems of capitalist exchange. The viewer is alerted by the absence of context that a critical realist practice would have supplied, confronting them, the beneficiaries of globalisation, with this lack of knowledge and emphasizing that they must resolve it themselves.

Also absent are the bodies of the miners, who have been obscured by McQueen's cinematic strategy of depiction of site/place: the miners are not to be shown as victims – but rather as a key element in a global chain of the production of commodities. T.J. Demos has noted a shift from an historical to a geographical discourse in contemporary art practices, of which *Gravesend* is an

important example.¹⁸¹ Artists working in this field contribute substantially to creating a mapping of the transformation of a new geo-political space of global capitalism, pursuing questions related to the social inequalities, environmental disruption, and global mobility.

2.3 Curated exhibitions contesting globalisation dynamics

Since the 1990s there has been an explosion of high profile curatorial practices dealing with environmental and humanitarian disasters, alongside the war and surveillance that are associated with the imposition of the neoliberal agenda across the globe.¹⁸² The burst of exhibitions dealing with the relationship between artistic production and globalisation has been made possible, particularly, through the biennial artistic circuit art, which has had a number of associated labels, such as ‘the political’ or the ‘documentary’ turn.¹⁸³ While neoliberal ideologies have been taken as common sense by politicians, Edwards observes that artists have come to disagree with them and have sought to represent what Jacques Rancière would call ‘dissensus.’¹⁸⁴ Indeed, the curatorial selections discussed in this chapter can be described as propositions engaged in ‘exploring the various ways in which dissensus erupts when those excluded from the mainstream politics are made the subject of artworks.’¹⁸⁵

¹⁸¹ Demos, T.J. (2013).

¹⁸² Day, G. and Edwards, S. (2012), p. 290.

¹⁸³ Day, G. and Edwards, S. (2012), p. 292.

¹⁸⁵ Day, G. and Edwards, S. (2012), p. 290.

Exhibitions, such as *Documenta 11*, *Geography and the Politics of Mobility* and *Uneven Geographies*, highlight the impact of globalisation and open a dissentive perspective, offering diverse ways of reading complex social, political and environmental problematics. These curated exhibitions work as connectors for different theoretical and practical models across frontiers. What they have in common is the study of the material transformation of globalisation through looking at the mobility of capital, people and commodities.

Although the representation strategies vary from case to case, most of the works share a common working methodology based upon site-specific investigations involving substantial research. Thus they can be considered part of a broader documentary practice dealing with ‘mapping’ specific aspects of the social, environmental and political problematics of the sites or subjects of study. It can also be suggested that this methodology of documenting globalisation is accompanied by a political commitment to the subjects and an advocacy of the uncaptured, to use another of Rancière’s terms. Additionally, group exhibitions give a platform for works sharing similar issues, which in reference to Sekula’s notion that the ‘meaning is determined by the context,’ prove to be a crucial part of the readability of the work. Considering that the ‘production of the work and its mediation in the context of public display become interlaced,’¹⁸⁶ these group exhibitions also present opportunities for

¹⁸⁶ O’Neill, P. (2012) *The culture of curating and the curating of culture(s)*, Cambridge, Mass.; London: MIT Press, quoted in Andaur, R. (2015) *Paisajes Tarapaqueños*, Santiago, Chile Metales Pesados, p. 96.

understanding not only each specific site or subject but also globalisation as a system.

2.3.1 Documenta 11, Kassel, 2002

Documenta 11 took place in 2002 in Kassel, Germany. It comprised a series of exhibitions, interventions, workshops and lectures, involving 116 artists over a five year period. Directed by Okwui Enwezor, the works were classified on five platforms and four continents, which explored themes related to globalisation with a focus on the ‘majority world.’¹⁸⁷ The platform included artists, curators, architects, activists, and participants across disciplines who combined to collaborate on the creation of critical thought on the impact of globalisation. Allan Sekula [Fig 18], Alfredo Jaar and Steve McQueen were among the 116 participants.

McQueen’s film, *Western Deep* (2002), can be interpreted in much the same way as *Gravesend*. It is a 24 minute documentary film made in South Africa in the deepest gold mine in the world, depicting the harsh living¹⁸⁸ conditions of the workers who descend to a system of brutal exploitation and oppression. The Super-8 film uses a grainy texture throughout, depicting the harsh living conditions of the workers. The film explores the dangerous working conditions, starting with an extremely frightening journey in which the viewer descends more than three miles into the underground darkness, and while sound plays a key role, silence is also used to underline the anxiety that the film

¹⁸⁷ Okwui, E. (2002).

¹⁸⁸ Demos, T.J. (2005), pp. 61–89.

produces. By deploying dark representational strategies, the director draws the viewer's gaze towards the daily experience of the miner. What the film 'does not show,'¹⁸⁹ is the political background of the miners. Nevertheless, it conveys substantially critical ideas about the problematics of mining in South Africa. This written material is developed in conjunction with the film and presented in the printed material which comes with the exhibition.

Docuementa 11 was a pioneer in the formulation of a critical model that combined diverse cultural and artistic forms of production in the global context. But how was the economic destruction caused by mining made visible on this occasion? The great variety of the works highlighted on that occasion utilised diverse representational strategies and working methodologies, with documentary works prominently on display. Photography and moving images were used as modes of visualisation, opening spaces of contestation to a mainstream mode of understanding imagery, which circulates in a globalized society, including installations, drawing, photography, mapping through moving image. Following Sekula's notion of the 'meaning depending upon the circulation,' the significance of those artworks can be defined by the context in which they were shown, highlighted by the writing, lectures and conversations produced around them. Led by critical theorists, art historians and geographers, *Documenta 11* provided a place of 'contemplative speculation,' as T.J. Demos

¹⁸⁹ Demos, T.J. (2005), pp. 61–89.

describes it, ¹⁹⁰ a place for the analysis and aesthetic articulation of the various forms in which globalisation impacts on our daily experience.

2.3.2 Geography and the Politics of Mobility, Generali Foundation, 2002

Geography and the Politics of Mobility was held at Generali Foundation Wien from January 2003 throughout April 2013. The Zurich based artist, Ursula Biemann, was the guest curator for a series of experimental exhibitions based on the relationship between geography and artistic practice. As Biemann suggests:

geography examines places, which are constituted not only by the people who inhabit them, but by connections and movements of all sorts that traverse them on a variety of scales, ranging from local, private and intimate processes to public, economic, transnational and systemic ones.¹⁹¹

Furthermore ‘geography is seen as a working hypothesis that allows us to reflect on concepts of demarcation, connectivity and transgression in society.’¹⁹² As such, the exhibition and publication addressed the notion of geography as related to the transformative quality of globalisation. The exhibition and publication looked at the way in which geography is constructed through the circulation of capital, people and goods, with the presentation of the work of five collectives: Bureau d’étude, Frontera Sur, Makrolab, Multiplicity

¹⁹⁰ Demos, T.J. (2015) ‘Decolonizing Nature: Making the world of matter’ in: Arns, I (ed) *World of Matter*, Berlin: Sternberg Publishers, p.15

¹⁹¹ Biemann, U. (2003).

¹⁹² Foundation Generali *Geography and the Politics of Mobility*
<<http://foundation.generalifoundation.at/en/info/archive/2003-2001/exhibitions/geography-and-the-politics-of-mobility.html>> [accessed 22 January 2016]

and Raqs Media Collective. Each used a variety of research-based documentary methodologies and media, including video, sound, photography, installation and text, but it is the mapping of the Bureau d'étude, a French collective led by Léonore Bonaccini and Xavier Fourt, that is most relevant here.

Bureau d'étude create gigantic interconnected maps, giving structure to complex networks of information on the biochemical, energy and military sectors, as well as on entertainment, information, and surveillance systems. Through complex compositions that resemble the computerised digital systems of today's global technologies, the duo's methodological approach to mobility revolved around mapping. Their visual strategies mapped the intricate political networks and global systems of corporate power exploitation. These networks demonstrated proprietary relations between 'financial funds, government agencies, banks and industrial firms.'¹⁹³

¹⁹³ Biemann, U. (2003), p. 164.

Previous references to these kinds of information networks include the work of Mark Lombardi, who gained recognition for his beautiful and complex hand drawings, mapping global financial networks, with a particular interest in money and corruption networks arising from Neoliberal networks (Hobbs and Lombardi, 2003). His work is on display at MoMa in New York as part of the exhibition *Uneven geographies* and recently at *Cartographies* in Caixa Forum in Madrid where it was discussed in relation to the works that work around the idea of mapping geographies and the body.

Other collectives, which were part of this exhibition include Frontera Sur RRVT, a group of activists and artists from Spain and Switzerland working primarily with multimedia platforms and looking at the notion of political borders, through the analysis of diverse mobilities in the frontier between the Southern European and African border; Makrolab, a collective from Slovenia shows artists' and scientists' works produced in laboratories during isolation periods in fragile environments; multiplicity, a network based in Milán for the investigation of the transformation of the territory, and composed of a multidisciplinary group of artists, architects and scholars presented, on this occasion, *Solid Sea*, which explored the Mediterranean as solid space for holding multiple mobilities; finally, the Raqs Media Collective, from India, works on a multiplicity of research-based documentary-led platforms, that maps a new shifting geography of developing societies.

So, how was the notion of mobility made visible? What presentation strategies played out to explore it? The installation of this exhibition differs from the archetypical ‘gallery-magazine-museum style’¹⁹⁴ through the presentation of research as a fundamental strategy of communication. The works are accompanied by a series of documentation, including archival materials, documentary film and photographs, maps, and historical writing, giving the viewer multiple contexts for understanding the subjects of inquiry. It can be said that the aim of the curatorial strategies was to expose particular political narratives through the study of the geographies in which they take place, and that have been neglected or ignored. Representation strategies are crucial for the creation of meaning. Even a glimpse of the installation views should be enough to reveal that the significance of the works presented on that occasion lies in the relationship between research and documentary evidence [Fig 19]. Indeed, this juxtaposition is created by the overlapping of image and text as complimentary forms of visibility, which produces diverse ways of reading a single subject of study – mobility.

2.3.3 Uneven Geographies: Art and Globalisation, Nottingham

Contemporary, 2010

Uneven Geographies: Art and Globalisation was held at Nottingham Contemporary between May and July 2010. The show, curated by Alex Farquharson and T.J. Demos, followed the same tradition of the previous exhibitions and focused on a critique of globalisation through the study of sites.

¹⁹⁴ Biemann, U. (2003), p. 165.

It highlighted the work of fourteen contemporary artists and art collectives who deal with the politics of globalisation.¹⁹⁵

The works presented a critique of what Jameson has termed ‘present-day multinational capitalism.’¹⁹⁶ The exhibition as a whole proposed a re-thinking of the relationship between artistic practice and global capitalism; the works were centred around the uneven geographical development that is produced between the Northern and Southern hemispheres, which has increased considerably with the extension of globalisation and the integration of the world

¹⁹⁵ The fourteen artists are: (1) the Mexican artist, Eduardo Abaroa, who presented three sculptural installations about the economic life of the most impoverished inhabitants of Mexico City; (2) through a film piece, the Berlin and Caracas based artist, Dario Azzellini, in collaboration with the artist and activist based in Vienna, Oliver Ressler, examine the changes that Venezuela has been going through since the rise of Hugo Chavez to power in the 1998 elections; (3) the French artist, Yto Barranda, presented a series of photographs commenting on the Mediterranean as political border between Africa and Europe and the dreams embedded with the contradictory notions of ‘here’ and ‘elsewhere’; (4) also commenting on the freedom of movement, Ursula Biemann explores sub-Saharan migration routes through a film installation, including documentary imagery depicting the journey of migrants and interviews; (5) the distribution of hidden knowledge is the central concern for the French collective, Bureau d’Etudes, who present complex graphic installations of their research into intricate networks of multinational and government agencies, as well as dissident organisations; (6) using comics as structural device to comment on emerging forms of neoliberal capitalism, the work of Brazilian artist, Öyvind Fahlström (1928-1976) was an installation about the geopolitics of Latin America and Indochina, with particular attention to the involvement of the U.S. backed military dictatorship installed by the Chilean coup; (7) the Stockholm based duo, Goldin+Senneby, make visible hidden banking networks through a series of exhibitions, lectures, newspaper interventions, etchings and films about offshore finance in the Caribbean; (8) the artist from the U.S., Mark Lombardi, uses complex hand-drawing graphite lines resembling global constellations that interconnect financial institutions and individuals, providing a comprehensive understanding of abuses by corporate power around the globe; (9) Steve McQueen’s *Gravesend* (2006); (10) the Brazilian artist, Cildo Meireles, uses subtle ideological interventions on Coca-Cola bottles and banknotes, which he then puts into circulation, as means of challenging U.S. economic imperialism in Latin America; (11) George Osodi, a Nigerian artist living between Lagos and London, uses photography to make visible the environmental impact of the ‘black gold’ in the region; (12) also using photography as means to contest the impact of corporate power, is, Bruno Serralongue, an artist born in Serralongue and based in Paris, who travels to World Submits in Africa, to contest the way in which these events are portrayed in the media and focuses on the flow of events to create a narrative that is both objective and inquisitive; (13) graphic works created by the Croatian conceptual artist, Mladen Stilinović, who uses graphic representations of disparities of wealth to make it possible symbolise the disparity of wealth in a globalised world; and (14) the Chinese artist, Yang Zhenzhong, whose video depicts the life of the employees in Siemens factory in Shenzhen, China, draws attention to the impact produced after Deng Xiaoping launched the far-reaching economic reform of 1978.

¹⁹⁶ Jameson, F. (1992) *The geopolitical aesthetic: cinema and space in the world system*, Bloomington: Indiana University Press; London BFI Publishing.

into a 'single capitalist market,'¹⁹⁷ characterised by the mobility of money, commodities and people across frontiers and nation-states.

At the core of the curators' strategy is the representation of satellite sites through a variety of documentary practices that supply layers of context sufficient to be considered as critical realism practices. Alex Farquharson and T.J. Demos's inclusion of marginal subjects is also indicative of the curatorship of 'dissensus.' Fourteen works were presented for that occasion, six focused on Africa, four on Latin America, three on global issues and one on China. The variety of mediums include five mixed media installations, four films, three photographic essays and two graphic pieces, pushing the boundaries of traditional documentary practices towards more experimental and research-based works. These juxtapositions were central to that exhibition and unpinned the curatorial strategies of Farquharson and Demos: the gathering of works exposing unequal development, therefore posing a critique of the neoliberal model. Within the gallery space, diverse aesthetic approaches were assembled [Fig 20]. Considering the multiple aesthetic approaches of the artwork, the exhibition could be interpreted as an expression of the fragmented geography of global capitalism. As such, the viewer was drawn to connect particular relationships between distant events within the defined and confined space of the gallery.

¹⁹⁷ Demos, T.J. and Farquharson, A. (2010).

2.3.4 World of Matter, HMKV IM Dortmund U, 2014

Since *Uneven Geographies*, the geographical focus shifted towards a newer concern and a major trend in the documentary field, the ‘ecological,’ something which is exemplified by *World of Matter*. The notion of ecology refers to ‘a compositional state of existence that historically constitute non-hierarchical interactions between multiplicities of life, matter and technology.’¹⁹⁸ Emily Eliza Scott addresses:

an emergent phenomenon wherein self-organized proved complex, cross disciplinary ecological subjects through the development of structures from sustained investigation, exchange and production. These entities not only address (political) ecological matters but also forge ‘ecological’ modes of art-making.¹⁹⁹

This mayor new trend in contemporary documentary practice has its origins in the opening of debates regarding the agency of man over nature, and notion of the ‘anthropocene’ or ‘age of man.’²⁰⁰ A term coined down by chemist Paul Crutzen and biologist Eugene Stoermer in 2000, it refers to a new age in which humans are the main drivers of geological change. The product of intense environmental degradation and intense resource exploitation, this new chapter in the history of the Earth is marked by the devastating impacts of global

¹⁹⁸ Bethônico, M. (2013) ‘Provisões,’ Belo Horizonte, Brazil: Instituto de Cidades Criativas, ICC, p.11.

¹⁹⁹ Scott, E.E. (January, 2013) ‘Artists’ Platforms for New Ecologies,’ *Third Text*:

²⁰⁰ Kolbert, Elisabeth *Enter the Anthropocene – the age of man*, <<http://ngm.nationalgeographic.com/2011/03/age-of-man/kolbert-text>> [accessed 10 October 2015].

warming, including high levels of carbon dioxide, desertification, deforestation, melting ice, a rising sea level and a massive extinction of species.²⁰¹

*World of Matter*²⁰² distinguishes itself from other exhibitions by conceiving itself primarily as a research platform. The platform is a collaboration between scholars and artists that has been developed over many years, as the group proclaims, as an ‘international art and media project investigating primary materials (fossil, mineral, agrarian, maritime) and the complex ecologies of which they are part.’ The platform has eight core participants who have been meeting to develop it since 2010.²⁰³ The exhibition of the same name proposes to expand the understanding of how raw resources impact on the fragile ecologies of which they are part. Demos argues that *World of Matter* ‘reinvigorates the longstanding environmental urgency of inventing new approaches to finite resource and exploitation proposals for creative sustainable options.’²⁰⁴ It seeks new forms of representation of primary materials, encouraging a radical shift on natural resources, from a market-led to a sustainable approach debate.²⁰⁵ *World of Matter* ‘no longer places the man at

²⁰¹ Demos T.J. (2015).

²⁰² Named originally *Supply Lines*, it was launched during *Provisiões*, during the visual research conference organised by Mabe Bethônico in Museo de Arte de Pampulha, Belo Horizonte in 2012.

²⁰³ These are Mabe Bethônico, Ursula Biemann, Uwe H. Martin, Helge Mooshammer & Peter Mörtenböck, Emily E. Scott, Paulo Tavares, Lonnie van Brummelen & Siebren de Haan. Other contributors to the on-line platform, include Nabil Ahmed, Peter Cusack, Ed, Kashi, Elaine Gan, Judy Price and Xavier Ribas.

²⁰⁴ Demos, T.J. (2015).

²⁰⁵ See more on www.worldofmatter.net

the centre of their considerations,²⁰⁶ encouraging a shift in thinking from the notion of ‘resource’ towards ‘ecology,’ seeking to acknowledge the complex network of materialities and histories of primary resources.

Renata Marquez suggests that the ‘artist-researchers “perform” the border between art and fields of research, proposing a construct that could be defined as exhibitiv-epistemological.’²⁰⁷ This exhibited-epistemological proposal is explored in an exhibition of *World of Matter* works curated by Inke Arns and held at HMKV IM Dortmunder U, Dortmund, Germany in 2014.²⁰⁸ The long-term research projects are presented in this exhibition as documentary evidence alongside a constellation of photographs, videos, materials of evidence and analytical and speculative texts. As Demos states, the exhibition provides ‘a

²⁰⁶ Arns, I. (2015) ‘Editor’s Foreground’ in: Arns, I (ed) *World of Matter*, Berlin: Sternberg Publishers, p. 6

²⁰⁷ Marquez, R. (2013), p.15.

²⁰⁸ The eight artists, scholars and collectives participating were: (1) Mabe Bethônico, who presented a multimedia installation, *Mineral Invisibility* (2009), in three parts: *Mineral Practices*, *Mineral Exploitation* and *Museum of Public Concerns*, composed of diverse graphics and texts as well as both still and moving images surrounding mining activity in Minas Gerais, Brazil; (2) Ursula Biemann, who presented two installations, *Egyptian Chemistry* (2012), a multi-channel video installation, water laboratory, wall drawing and videos about water contamination in the Nile, Egypt; and *Deep Water* (2013), a one-channel video projection using oil and water, linking the vast sand mines in Northern Canada and the rising of water levels in Bangladesh; (3) Elaine Gan, who explored through a large wall plot and photographs, *Rice Child* (2011), how diverse varieties of rice emerge through temporalities of technology, history, memory and matter; (4) Uwe H. Martin & Franke Huber, who displayed *Landrush* (2011-2014), a multiple I-pad presentation exploring the conflictive relationship between the food industry and corporate land investment in Brazil and Ethiopia; (5) Helge Mooshammer & Peter Mörtenböck, whose analysis of how knowledge of resources is produced and disseminated in *A World of Matter* (2014), an installation including a large scale world map with data, as well as still photographs, archival material and video; (6) Emily Eliza Scott, who developed an interpretative walking tour around the exhibition, highlighting relations and hidden connections between the works; (7) Paulo Tavares, whose *Non-Human Rights* (2012), an installation composed of a multi-channel video installation, wallpaper, a map and 3 videos, draws a parallel between a painting of Francisco Goya and documentation from a process in Ecuador acknowledging the ‘Rights of Nature’; and (8) Lonnie Van Brummelen & Siebren De Haan, whose first piece was *Moments of Sugar* (2007), a multimedia installation, comprising 304 sugar blocks and a silent 16mm film, addressing the global mobility of sugar between Europe and Nigeria, documenting an expedition and the transformation processes from raw material to the work of the show, and whose second piece, *Episode of the Sea* (2013), a 1-channel, 35 mm, video projection, is the result of a collaboration with fishermen in Urk, in the Dutch territory, covering the everyday lives of fishermen performing scripted dialogues.

place for contemplative speculation, research analysis and pioneer aesthetic articulations regarding the different ways of defining and organising our relationship to the natural environment.²⁰⁹ All the works presented in the exhibition had been developed as long-term projects, and give substantial documentary evidence to make visible their findings, creating the conditions needed to formulate ‘instruments for understanding the world.’²¹⁰ Scott suggests that one of the commonalities of this type of research is the investment in the field,²¹¹ and the revelation of the ‘spatial aesthetics through which the resource ecologies are disclosed.’²¹² Arns’ curatorial strategy differs from previous exhibitions, such as those curated by Demos, in that the works almost collide in the exhibition space [Fig 21], as opposed to being displayed neatly as art works arranged with white space between them. As the works blend into each other, the curatorial strategy invites the viewer to reflect upon the relations between the works.

Some of the works in this exhibition, such as *Forest Law* (2012) by Paulo Tavarés, were also included on *Rights of Nature*, an exhibition held at Nottingham Contemporary in 2015.²¹³

²⁰⁹ Demos, T.J. (2015), p. 15

²¹⁰ Marquez, R. (2013) ‘Art as Border Practice’ in: Bethônico, M (ed) *Provisões*, Belo Horizonte, Brazil: Instituto de Cidades Criativas, ICC.

²¹¹ Scott, E.E. (2014) ‘Wondering Subjects: In the Middle of Things’ in: Arns, I (ed) *World of Matter*, Berlin: Sternberg Publishers., p.117

²¹² Bridge, G. (2015) ‘The Resource Archipelago: Spatial Aesthetics and Resource Ecologies’ in: Arns, I (ed) *World of Matter*. Berlin: Sternberg Publishers, p.64.

²¹³ *Rights of Nature* includes the work of artist and collectives working with ecological subjects in Latin America. They are: (1) Eduardo Abaroa, a Mexican artist working on practices of archaeology and anthropology, whose *Proyecto de Demolición del Museo de Antropología* (2012), simulates the destruction of an archeology museum; (2) Darren Almond, whose works dealing with geographical limits, *Fullmoons*, consist of large-scale painterly photographs shot in the light of a full moon in

Patagonias; (3) Ala Plástica, an Argentinian art and environmental organization working on public programs to communicate critical urban matters, whose video and documentation, *Who designs territories* (2015), reflects upon new unequal urban development; (4) Marcos Avila, a Colombian artist working with Amazonas, whose *Tarapoto, Un Manati* (2011) is a three part video installation of an action that took place in the Amazonas in which indigenous communities re-constructed the legendary herbivorous mammal manatee, which has virtually disappeared from the rivers; (5) Amy Balkin, whose cross-disciplinary research plays with the land and the geopolitical relationships that frame, presents the video installation, *Public Smog* (2004–14), offering a critique of how capitalism has failed air quality regulations; (6) the artist, activist and educator, Subhankar Banerjee, presents a series of beautifully composed aerial photographs of the Arctic Wildlife Refuge and other Alaskan regions, accompanied by extensive writing on the historical context; (7) Mabe Bethônico, whose work weaves diverse forms, such as video, interviews, photographs, websites and sound pieces, such as *Mineral Visibility* (2009) (as in *World of Matter*), an installation that uses historical images of Minas Gerais to open debate about the environmental and social cost of mining; (8) the video artist researcher, Ursula Biemann, together with Paulo Tavares, a Brazilian forensic analyst of land use, present the video installation, *Forest Law* (2014); (9) the Center for Land Interpretation, a leading centre in the U.S. for the creation of knowledge around land, whose *Houston Petrochemical Corridor Landscan* (2008) reflected on notions of resource exploitation and environmental damage in the Texas oil industry as viewed from the earth; (10) the Mexican artist, Minerva Cuevas, whose work for *Rights of Nature* was *Hydrocarbon* (2007), a series of objects covered in oil, as a subversive response to one of the various accidents of the state-owned oil company in the Gulf of Mexico; (11) Jimmie Durham, a sculptor, poet and essayist from the U.S., whose five sculptural bodies invoke the struggles of indigenous communities; (12) the work of the German filmmaker, Harun Farocki, whose two channel video installation, *The Silver and the Cross* (2010), narrates the history of the colonial expropriation of silver by the Spanish in Bolivia through the analysis a painting by Gaspar Miguel de Berrios (1706–1762); (13) GIAP, a research platform dedicated to exploring the relationship between the arts and politics, presents a multimedia installation composed of photographs and video exploring the ‘zapatista’ movement in Mexico; (14) Paulo Nazareth, a Brazilian artist whose work addresses his mixed race background through walking former slave routes and through photographs; (15) The Otolith Group, the British film collective, presented *Medium Eath* (2014), a one channel video projection exploring the sensorial collective physique around seismic activity in California; (16) Fernando Palma Rodríguez, a Mexican working artist, presents three animated robots, , made of recycled materials, allegorising living animal bodies, and commenting on the environmental problematic of the district of Milpa Alta, located n the southern edge of Mexico City; (17) Claire Pentecost, an artist and writer from the U.S., whose series of drawings examines relationships between food production/distribution, ecology, and geopolitics; (18) Abel Rodríguez, a Colombian artist of exquisite drawings of plants and fragile indigenous environments; (19) Miguel Angel Rojas, a Colombian conceptual and multimedia artist, whose *El Nuevo Dorado* (2012), made of dried cocopowder, gold leaf and video, reflects on the deforestation of the Amazon, the gold rush and the troubled relation of Latin America with drugtrafficking; and (20) Walter Solón Romero, a Bolivian artist, and one of the main exponents of the painting of murals in Latin America, whose series of drawings reflects upon Latin America’s long history of mineral and political exploitation on the part of Europe.



Figure 7. Alfredo Jaar, *Gold in the Morning*, 1985.



Figure 8. Alfredo Jaar, *Gold in the Morning*, 1985.



Figure 9. Alfredo Jaar, *Rushes*, 1986.

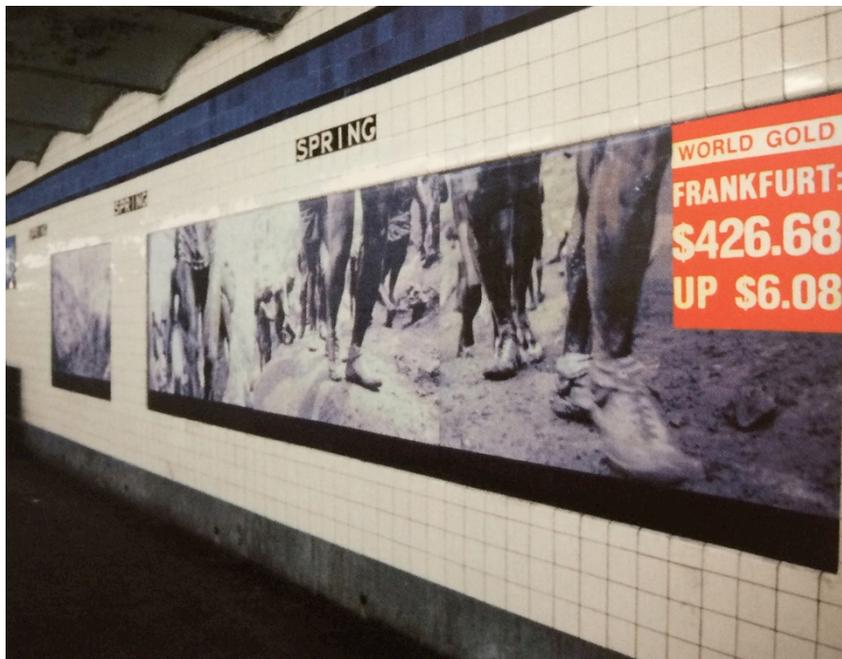


Figure 10. Installation View. Photography and text. Spring Street Tube station, New York, 1986. Alfredo Jaar. *Rushes* (1986).



Figure 11. Installation View. Photography and text. Spring Street Tube station, New York, 1986. Alfredo Jaar. *Rushes* (1986).



Figure 12. Sebastião Salgado, *Serra Pelada*, 1986.



Figure 13. Sebastião Salgado, *Serra Pelada*, 1986.



Figure 14. Installation View. Photographs. International Center of Photography, New York, 2014. Sebastião Salgado, *Genesis* (2014).

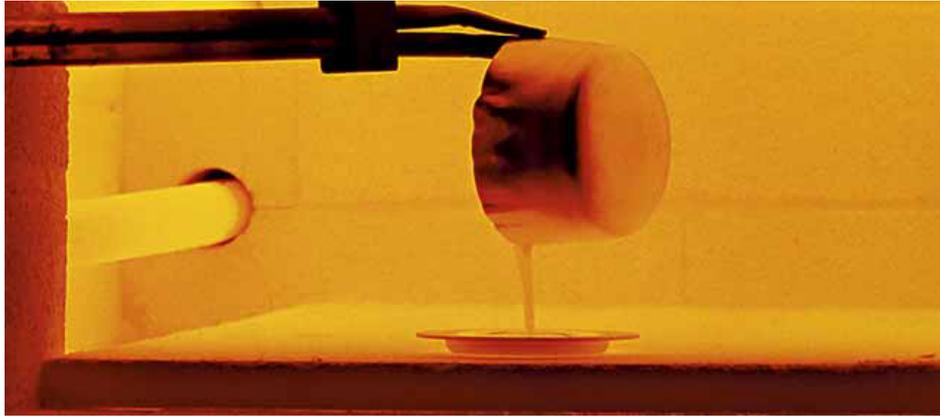


Figure 15. Steve McQueen, *Gravesend*, 2007, detail.



Figure 16. Steve McQueen, *Gravesend*, 2007, detail.



Figure 17. Installation View. The Renaissance Society, Chicago, 2007, Steve McQueen, *Gravesend* (2007).



Figure 18. Installation view. Photography and text. *Documenta 11*, Kassel, 2002. Allan Sekula, *Fish Story* (1990–1995).



Figure 19. Installation view. Mixed Media Installation. *Geography and the politics of mobility*. Generali Foundation, Vienna, Bureau d'étude, 2003. *World Monitoring Atlas* (2003).



Figure 20. Installation View. *Uneven Geographies: Art and Globalisation*. Eduardo Abaroa, Yto Barranda, Mark Lombardi, Goldin+Senneby and Bruno Serralongue, Nottingham Contemporary, 2010.



Figure 21. Installation View. Mixed Media installation. *World of Matter: On the Global Ecologies of Raw Material*. HMKV Dortmund, 2014. Peter Mörtenböck & Helge Mooshammer, Lonnie van Brummelen & Siebren de Haan and Frank Huber & Uwe Martin.

3. Copper Geographies (2010–2015)

Introduction

Copper Geographies is a photographic exploration of copper, the ‘metal that runs the world.’²¹⁴ The project investigates the relationship between capitalism, mining and photography. The theoretical underpinning of *Copper Geographies* is based on the notions of hyper-mobility and unequal geographical development, two important tools related to the natural resource industries that are central to the understanding of globalisation. The research develops through a series of fieldwork explorations of geographically disparate landscapes historically connected by copper, connecting remote extraction ecologies in Chile with global sites of consumption and trade in Britain. The photographs made during this investigation are the result of a combination of organisational, methodological and technical factors. Firstly, a human network of people who facilitated the expeditions, including those who gave access to the sites of this investigation; secondly, the photographic methodology developed based on extensive fieldwork; and thirdly, technical issues around the production and post-production of the images.

This investigation is eight case studies which are organised along three axes: *Global mobility of copper*; *Post-industrial landscapes*; and *Contemporary mining industry and its relation to London*. The first strand consists of photographic series developed during the research process, exploring the notion

²¹⁴ Carter, B. (2012).

the mutation and transformation of hard rock mining, depicting the global flow of mined copper, from raw material, through stock market exchange value, smelted commodity, recycled material and museological specimen. It is woven together as four visual essays that go together with this thesis and are: *Sulphuric Acid Route* (2012), *Metallic Threads* (2010-2015), *High Rise* (2012) and *Hidden Circuits* (2015). Each of these visual essays includes an introductory written piece, thus giving a framework to the underlying narratives of the photographs. The second strand investigates the post-industrial mining landscape and new forms of territorial occupation and is composed of two case studies: *Coquimbo&Swansea* (2014) and *Miss Chuquicamta, the Slag* (2012). The third line of inquiry looks into the impact of contemporary large-scale mining operations and its relationship to London, the global centre for mining investment, *Antofagasta Plc., Stop Abuses!* (2002–2014) and *LME: an Invisible Corporate Network* (2010–2015).

Although it is beyond the scope of this study to develop an in-depth political history of the Chilean copper mining industry, histories of sites and some key historical periods of Chilean the copper mining industry have been outlined, to give visibility to the geopolitical forces that shape the landscape. Consequently, three case studies are developed to mirror three main periods of ‘denationalisation’ of copper resources in the history of Chile.²¹⁵ The case study around *Coquimbo&Swansea*, corresponds to the first denationalisation period

²¹⁵ This term refers to a process through which specific components of the national state are transferred to global markets. Sassen refers to these as part of ‘transboundary networks and formations connecting multiple local or “national” processes and actors, or involve the recurrence of particular issues or dynamics in a growing number of countries.’ Sassen, S. (2003), pp. 1–22.

that took place between 1840 and 1880 when copper resources were given to British entrepreneurs and Chilean private investors. The second case, *Miss Chuquicamata, the Slag*, is based upon a second denationalisation period that took place between 1904 and 1970, when copper resources were handed over to U.S. investors. The third case study, *Antofagasta Plc., Stop Abuses!*, reflects upon a third period of denationalisation of copper resources that took place from 1981 and continues to be in force during the writing of this thesis.

Each of these three case studies develops, firstly, with an historical section outlining the key historical aspects of the denationalisation period when the sites were active, including a brief history of the sites. The histories of the sites are significant to the interpretation of the photographic work. These sites are crucial either because they are sites of the extraction, smelting or trade of copper, or because they have served for the mining industry as housing enclaves or for disposing of its contaminated residues. The selection of the sites is a result of archival and historical research as well as of my personal commitment to documenting sites of conflict that have been the centre of disputes between local communities and multinational corporations. Secondly, the following section describes the working methodology of the photographic research conducted during this investigation, including a detailed narrative of the fieldwork. Thirdly, there is an analysis of the main issues thrown up by the work. At last, there is an analysis of the presentation strategies developed during the development of this thesis. The fourth case study on the LME work departs slightly from this pre-defined structure, as the information has been collected mainly in the open domain.

The photographic studies of sites are conceived as sequential. As in the majority of the cases, the photographs document sites where the action has happened; they reflect upon the traces that remain in the landscape. As such, this thesis considers the dates when the sites were fully functioning so as to organise the material in chronological order. The order of the field work is not necessarily correlated with the order in which the photographic research was conducted. The dates of the fieldwork are the result of a combination of logistic and financial factors and personal circumstances.

3.1 Global mobility of copper

3.1.1 Sulphuric Acid Route (2012)

A series of eight photographs exploring the 'camanchaca', a unique meteorological condition consisting of a dense morning fog that makes it very difficult to see and never drops rain [Fig 22-23]. This phenomenon takes place along the coasts of the Atacama Desert, the driest place on earth. In Aymara cosmology, camanchaca is associated to the obscure, the hidden, the secret and unknown; a point of no return connected to danger and death. These uncertain landscapes conceal the world's largest known reserves of copper. Across them, hundreds of trucks, each carrying twenty-six tons of sulphuric acid, transit daily to fulfill the thirsty needs of the extractive industry. In the extraction process, sulphuric acid is used to filter copper from unwanted materials, generating by-products which have transformed this vast desert, most famous for its rich mineral deposits, into a wasteland of hidden toxic residues. Further,

desertification means that it is expanding at the rapid speed of 0.4 kilometres per year, product of de-regulated land use and water appropriation.

3.1.2 Metallic Threads (2012-2015)

A series of photographs documenting sites of transformation of copper alongise the commodity chain [Fig 24-38]. This series weaves together one visual essay resulting from a series of photographic interventions in Chile and Britain. Some of these were developed during four research trips conducted with Xavier Ribas in Chile between 2010 and 2012 as part of the process of Traces of Nitrate. In chronological order these interventions took place in the followig sites: Natural History Museum, London, England (2010); Paranal Observatory, Desert of Atacama, Chile (2010); Los Vilos, Coquimbo, Chile, (2010); Chuquicamata mine, Antofantasta, Chile (2012); Tarapacá, Desert of Atacama, Chile (2012); El Teniente copper mine, Chile (2011); Calama, Antofagasta Chile (2011); City of London, England (2012-2013); Embassy of Brazil, Santiago Chile (2012); Canning House, London, England (2014); Geology Museum Mines ParisTech, Paris (2014); Lower Swansea Valley, Wales (2014); Museo Geominero; Madrid, Spain (2014); Prysmian Group Aigburth, South Wales, Wales (2015); Photographic studio at Brighon University, Brighton, England (2015); Banking district, Dockands and World Museum, Liverpool, England (2015); Computer Aid International, North London, England (2015), Slade School of Fine Arts, London, England (2015).

These series are intertwined with drawings taken from the publication 'El Cobre Chileno', a book produced to promote national copper development

by Codelco (National Copper Corporation) during the military dictatorship of Augusto Pinochet in 1975²¹⁶.

3.1.3 High Rise (2012)

A series of photographs exploring urban sprawl in Iquique linked to the ‘boom and bust’ of copper [Fig 39-40]. These photographs were taken in 2012 in Iquique, in the heart of the Atacama Desert, northern Chile. They explore the ‘back doors’ of new high-rise urban developments, revealing the fragility of an economic system based on the extraction of raw materials. Until the 1970s Iquique was a small port town characterised by low level urbanisation. Since the 1980s there was a dramatic acceleration in the urban sprawl beyond the city limits, due to the impact of neo-liberal policies imposed by General Augusto Pinochet. As a result of these policies, new free trade agreements with the Latin American region and the opening of three large copper bodies by transnational corporations, the city became a magnet for investment and as such, its social fabric was heavily impacted. The flow of capital brought new geographies of inequality to this inhospitable desert territory. While slums spread chaotically throughout the Atacama, serving as an unplanned solution to a huge displaced population; gated communities and high-rise buildings close to the Pacific secured ‘sea views’ and flourished as symbols of status. These urban developments are tied to the ‘boom and bust’ of base metals, such as copper. In the 2000s during the commodities boom, when prices rose by demand from emerging markets, particularly China, urban growth in Iquique accelerated

²¹⁶ CODELCO (1975)

rapidly. Most recently, with the slowdown of copper consumption from emerging markets, the city has experienced a dramatic fall in demand for housing, which has led to a stagnation of the local economy as a whole.

3.1.4 Hidden Circuits (2015)²¹⁷

Hidden circuits is a series of photographs in which I searched for manufactured objects that contain copper within one of Liverpool's finest painting collections, in Sudley House, Liverpool, which includes major Pre-Raphaelite works [Fig 41-42]. This is the original collection which George Holt (1825-1896) assembled through the trade of copper ore and other raw materials that helped boost Britain's industrial expansion during the nineteenth century. Merely looking at the collection gives no indication of how it was acquired or which capitalist networks it originated from, the broader economic and labour conditions in which copper was extracted, smelted and distributed, or the impact on the social ecologies of mineral resource exploitation and the powers that controlled them. My photographic intervention focuses on the relationship between copper circuits and parts or elements of the collection, raising questions about the hidden dynamics between the two.

²¹⁷ This series of work was developed during a residency for LOOK Festival in 2015 [please see Appendix II].

3.1.5 Exhibition strategies

Twenty Mining Billboards, 'Traces of Nitrate: Archives and Landscapes between Britain and Chile Seminar,' Keynes Library, School of Arts, Birkbeck, University of London., 11–15 March, 2013²¹⁸

A site-specific installation of images of advertising billboards for imported manufactured goods for the mining industry from the series *Metallic Threads* was exhibited²¹⁹ [Fig 43]. These images were taken at the side of a motorway on the outskirts of the mining town of Calama in the Chilean region of Calama in 2012. These images are open to a variety of interpretations: they can be seen as a reflection of Chile's contemporary lack of manufacturing industry, as windows for viewing the mining industry and for a neoliberal ideology, in which the boundaries of the local and the global have been blurred, or as objects of aesthetic interpretation.

Copper Geographies, 'Biennial of the End of the World,' Mar del Plata, Argentina, 12 December 2014 – 22 February 2015²²⁰

This site-specific installation consisted of 40 photograph of variable dimensions mounted on wooden shelves, plus text and a map [Fig 44-45]. The overall installation highlighted the polarisation between the remote extraction sites and the sites of consumption in Britain, which fit into the overall title of the biennial

²¹⁸ Centre for Iberian and Latin American Visual Studies, <<http://www.bbk.ac.uk/cilavs/events/pastevents/past2013>> [accessed 25 October 2015].

²¹⁹ Please see Appendix I

²²⁰ Bienal del Fin del Mundo, <<http://bienaldelfindelmundo.org/artistas/el-ritmo-del-arte-se-encuentra-en-un-lugar-intermedio/ignacio-acosta/>> [accessed 2 November 2015].

Contrasts and Utopias. Four other artists working political subjects in the same room were Juan Delgado, Omar Castañeda, Regina José Galindo and Rafael Gomezbarros.

***Copper Geographies*, Noorderlicht Photofestival 2016. Museum Belvédère Heerenveen The Netherlands, 2016.²²¹**

A sites-specific installation for ARENA a version of Noorderlicht festival, which casts a forensic look at the traces left behind in the landscape [Fig 46-49]. Through a twenty one photographic works, the exhibition and publication examine the impact of man on the landscape. *Copper Geographies* was selected by the festival chief curator Wim Mellis.

***Hidden Circuits*, Galeria AFA. Feria Ch.ACO. Santiago, Chile, October 2016.²²²**

A series of six prints from the series *Hidden Circuits* were presented at the art fair Feria Ch.ACO [Fig 50].

²²¹ Noorderlicht Photofestival 2016, <http://www.noorderlicht.com/en/photofestival/arena/exhibitions/arena/> [accessed 9 December 2016].

²²² Feria Ch.ACO 2016 <<http://www.feriachaco.cl/> [accessed 9 December 2016].

3.2 Post-industrial landscapes

3.2.1 Coquimbo&Swansea (2014)

Introduction

These photographs explore traces left by the copper mining industry in the Province of Coquimbo in Chile and the Lower Swansea Valley in Wales. Their subject is the extraction processes and exchange activities that occurred during the first denationalisation of copper of Chilean copper resources between 1840 and 1880. The whole series is conceived in terms of the journey of the copper from initial extraction and primary smelting in Chile, across the Pacific and Atlantic Oceans to the final smelting and manufacturing processes in the once heavily industrialised River Tawe, in the Lower Swansea Valley.

3.2.1.1 History

First denationalisation period, 1840–1880, and British Intervention

Alongside these new global and regional hierarchies of cities is a vast territory that has become increasingly peripheral, increasingly excluded from the major economic processes that are seen as fuelling economic growth in the new global economy. Formerly important manufacturing centers and port cities have lost functions and are in decline, not only in the less developed countries but also in the most advanced economies.²²³

The industrialisation process of the copper mining industry in the region of Coquimbo represented a major economic boom for transnational

²²³ Sassen, S. (2007a).

maritime trade businesses in Chile between 1840 and 1880. The ores extracted in the remote geographies of Coquimbo were transported to Swansea between 1840 and 1880 to be smelted.²²⁴ At that time it was, mainly, British and Chilean private capitalists who exploited these resources.²²⁵ These copper bodies were located in the Province of Coquimbo and Copiapó and were very high-grade and limited magnitude sulphide deposits.

Britain and Chile never became trade competitors in the copper industry as peaks of output in the different countries did not overlap in time. However, British capitalists invested heavily in Chilean copper extractive industry during the early nineteenth century. Chile was the largest producer of copper in the world between 1850 and 1879, producing 36 per cent of the world's copper output, yet Britain retained its leadership as smelter on account of the vast costs of the process as well as its closeness to consumption centres.²²⁶ British interest in Chilean mining began in 1818²²⁷ when David Barry, an English mineralogist, visited the country to explore its coal deposits.²²⁸ Also in

²²⁴ Araya, G. (2009) *Compañía Minera de Panucillo (su historia)*, Viña del Mar, Chile: Talleres Millaray Gráfica.

²²⁵ Centner, C.W. (1942), p.76

²²⁶ Valenzuela, L. (1996) 'The Copper Smelting Company "Urmeneta y Errázuriz" of Chile: An Economic Profile, 1860-1880,' *Journal of the Trevithick Society* 53, pp. 235–271.

²²⁷ Chile became independent from Spain in 1818.

²²⁸ As Centner (1942) has said, historically Britain played a key role in the extraction, smelting and trade of copper, particularly during the nineteenth century. Fuelled by metals, Britain led the industrial revolution and copper played a pivotal role in the development of industrialisation. By 1830 Britain was the world's leading producer of copper. Cornwall and Devon accounted for nearly 45% of the world's output of copper (Centner, 1942). However, due to the limited nature of these high-grade deposits, over-extraction had left them almost exhausted by 1840s. By then, however, British entrepreneurs had already begun to seek out new sources of the copper so as to meet the increasing demand produced by industrialisation. As consequence, British entrepreneurs went to abroad in the search for metals to feed the growing need for metals. As has been observed (Evans, 2014), the supplies came from extraction sites in Cuba, Colombia, Perú, Chile, Australia and New Zealand.

1818, John Miers went to Chile to examine copper deposits, giving, in his *Travels in Chile and La Plata*, a detailed description of his voyage from England to Chile, his travels in that country, and his plans to set up copper smelting facilities. Miers could not have known how his observations would still resonate today:

copper of fine quality was said to be procured in abundance from the mines of Chile, and could be purchased for about half the price it bore in the English market. Nearly all copper raised in the country was exported in its crude state to the East Indies, its islands, and Chile, in return for manufactured goods, and as all the copper sheathing consumed in the extensive shipping building there carried on was sent to England, the inference was irresistible, that upon the given data an immense fortune might rapidly be made in the proposed speculation, especially as coal might, it was said, be procured for nothing in Chile, and labour was not one-fourth of the cost it bore in England; added to this the demand for sheet copper along the coast of the Pacific was also said to be very great, particularly in the sugar manufactories of Peru ... Under these flattering prospects, I dispatched for Chile, in different vassals, about one hundreds tons' weight of machinery, and embarked with my wife in a merchant brig, called the Little Sally, with about 70 tons of machinery.²²⁹

Later on, mining explorations continued and expanded to other types of minerals. In 1840 Joshua Waddington was actively engaged with copper mining.²³⁰ Coal was a crucial element in the supply chain of copper that enabled the system of production and distribution to take place. British coal was

²²⁹ Miers, J. (1826) *Travels in Chile and La Plata*, [S.l.]: Baldwin, Cradock and Joy, p. 1–2

²³⁰ Centner, C.W. (1942) *Great Britain and Chilean Mining 1830-1914*: Blackwell Publishing on behalf of the Economic History Society.

imported to supply the fuel needed for copper and nitrate mining activity, and to feed the steam railway system required for transportation.²³¹

Copper extraction sites were successfully established in Chile from around the middle of the nineteenth century.²³² The English entrepreneurs, Edward Abbott and David Lewis, among others, made significant contributions to the development of the copper extractive and smelting industries. One of the most important entrepreneurs was Charles Lambert (1793–1876), a French-English man who went to Chile to work for a British company and who developed his own mining enterprises with remarkable success, especially his refining and export enterprises, most importantly ‘Las Compañías.’

Chile’s high point as the world’s most important exporter of copper was in 1860; however, as result of the overexploitation of copper resources, the majority of the sulphide mines in Coquimbo had become exhausted by the end of 1880.²³³ At that point, foreign businessmen, such as Lambert, as well as

²³¹ Valenzuela, L. (1992) ‘The Chilean Copper Smelting Industry in the Mid-Nineteenth Century: Phases of Expansion and Stagnation, 1834–58,’ *Journal of Latin American Studies* 24, pp. 507–550.

²³² The Chilean copper mining industry played a key role in production for the world copper market between 1850 and 1880 (Girvan, 1972), its share in the global market rising from 11% in the 1830s to 51% in the 1860s, when it became the principal producer in the world. Culver, W and Reinhart, C. J. (1989) ‘Capitalist Dreams: Chile’s Response to Nineteenth-Century World Copper Competition’, *Comparative Studies in Society and History* 31, p. 726.

²³³ Chile was the single largest single copper exporter during the 1860s, when it is thought to have produced around 40 per cent of the world’s copper output. Corporación del Cobre Chileno (1975), p. 25. Production dropped dramatically in the following decades and by 1870s accounted for just 7% of the world’s output, dropping further to 0% by 1880 (Culver, W and Reinhart, C. J. [1989], p. 726). As a result of these developments, from 1880s the U.S. overtook Chile as the world’s leading mine producer of copper. This dramatic drop in production can be attributed to the exhaustion of high-grade deposits and changes in governmental policies which discouraged investment in infrastructure. From the 1860s there was a huge growth in copper consumption due to the rapid industrial expansion of the U.S. Very soon, the industrial expansion of railroads, joint-stock corporations, and limited companies created the bases for the modern mining code based on private property. In a short time, the U.S. had an ‘aggressive, efficient, and competitive industry because the state provided the necessary legal, physical and economic infrastructure.’ (Culver, W and Reinhart, C. J. [1989], p.738). Chile did not achieve the same success in the management of its own resources partly because governmental policies were aimed at increasing state revenue instead of boosting new industrial development. Instead, state policies benefited the U.S., which had a policy of economic growth, including a diverse portfolio of

Henry Bath and Antony Gibbs, moved their investments to Europe, or in the case of Gibbs, capitalised the entire Chilean nitrate industry. Part of the surplus produced with these businesses was transformed into manor houses, art collections, such as Tyntesfield of Antony Gibbs, or charitable and philanthropic activities in Europe.

Las Compañías, Province of Coquimbo, Chile

Charles Lambert consolidated his fortunes as businessman in Coquimbo around 1840. As Cavieres Figueroa suggests, he was one of the richest men in Latin America due to the fortune he amassed from copper.²³⁴ It was in 1840, when copper was exported in its most basic form to Britain, that Lambert realised the big business opportunity which lay ahead if copper was exported with added value. With this in mind, he opened the first modern smelting industrial facilities in Chile, Las Compañías, between 1840 and 1842. The importance of this site both played a crucial role in the industrialisation of Chile and provided an important source of material development for the industrial development of Britain. This site worked at full capacity with seventeen industrial ovens to smelt the ores and employed more than two hundred workers, becoming both the first modern smelting facility in Chile and the most important one in the region.²³⁵ The ore was extracted from the extraction sites, Brillador, Panucillo,

investment in public works and the opening of large mines that increasingly gained supremacy within both new and old markets.

²³⁴ Cavieres Figueroa, E. (1988) 'Comercio Chileno y Comerciantes Ingleses, 1820-1890 (un ciclo de historia económica),' *Serie Monográficas Históricas*. Valparaíso: Univ. Católica de Valparaíso, Instituto de Historia, pp. 247–254.

²³⁵ Cavieres Figueroa, E. (1988), pp. 247–254.

Huamalata and Totoralillo, some of them controlled by Lambert himself and brought by mule to the Las Compañías where it was crushed and smelted at around 70 per cent purity. This smelted copper was then taken to Swansea by clippers around Cape Horn and refined at around 99 per cent. Merchants, such as Henry Bath and Sons, the Pacific Steam Navigation Company or Balfour, Williamson and Co were actively engaged in the transport and trade of copper during the nineteenth century. Nonetheless, Las Compañías did not last long, as the over-exploitation of trees in the surroundings produced a drop in the supply of fuel for the smelting processes. After the site closed, the smelting business was relocated to Southern Chile or simply exported to Swansea without substantial industrial processing and therefore contributing nothing to local economies. As Gunder Frank would argue, almost all the surplus value was exported. Lambert moved to Swansea and his two daughters married the sons of the British merchant, Henry Bath.²³⁶ The Baths were amongst those who established the ring of the London Metal Exchange in 1877 at the Jerusalem Coffee House, off Cornhill in London.²³⁷

Lower Swansea Valley, Wales

The ore extracted from Coquimbo was shipped mainly to Wales and smelted in the Lower Swansea Valley between 1840 and 1880. As Tehmina Goskar states, ‘Chilean ores and copper products in the form of blister copper and sometimes regulus were a major source of raw materials for the Welsh smelting industry in

²³⁶ Jackson, M. (2010).

²³⁷ Hart, J. (2007). *LME 130th Anniversary Supplement*, London: Newsdesk Communications.

the mid nineteenth century.’ The Lower Swansea Valley was a ‘truly transoceanic phenomenon, involving mining/processing complexes on different continents and mobilization of capital, labour and technology across immense distances.’²³⁸ From the eighteenth century until the 1870s about half of the world’s mined copper came here to be smelted ready for use in manufactures in the UK and beyond.²³⁹ Such was the importance of the valley in the copper smelting business during the nineteenth century that by the middle of the century it had become known as ‘Copperopolis.’²⁴⁰ As has already been argued in this study, mining industries have a heavy environmental impact on the land where they operate. This is particularly true of smelting industries on account of the amount of chemicals required for the process and the toxic vapours they produce. As result of these processes, the Lower Swansea Valley was heavily contaminated for more than two centuries. As such, it can be debated that Chilean copper ore had a considerable impact in polluting the landscape of Wales. Indeed, the Lower Swansea Valley was described as ‘one of the most polluted landscapes of the world’²⁴¹ until the 1960s and 1970s when the Lower Swansea Valley Project²⁴² was established as a revolutionary conservation work

²³⁸ Evans, C. (2014), ‘A world of copper: introducing Swansea, globalization and the industrial revolution,’ *Welsh History Review* 27/1: 85-92. p.86.

²³⁹ Goskar, Tehmina (2010) *A History of Welsh Copper in 29 objects: displaying the Latin American connection* <<http://tehmينا.goskar.com/2010/12/04/a-history-of-welsh-copper-in-29-objects-displaying-the-latin-american-connection>> [accessed 8 August 2015].

²⁴⁰ Newell, E. (1997) ‘Atmospheric Pollution and the British Copper Industry, 1690-1920,’ *Technology and Culture* 38: 655-689.

²⁴¹ Newell, E. (1997), p. 655.

²⁴² The Lower Swansea Valley Project conducted research into economic, social and environmental aspects of the valley and set up a reclamation project to clean the heavily contaminated valley. The conservation work included demolishing old buildings, removing toxic residues and re-plantation. After the reclamation project, housing developments, shopping centres and a stadium were built.

of reclaiming the toxic land from the pollution caused by the smelting industries. Today, as result of this process of de-contamination, housing developments, shopping centres and stadiums have replaced the industrial facilities of the past.

3.2.1.2 Fieldwork methodology

This subject was first brought to my attention by Tony Hartwell, Network Director, Security of Supply Mineral Resources at Knowledge Transfer Network, during an interview I carried out in March 2013. Hartwell suggested contacting historian Dr. Tehmina Goskhar, who has carried out extensive research into nineteenth century copper. Goskhar in turn suggested contacting Frank Vicencio López, a local mineralogist and history enthusiast interested in raising local awareness of the historical significance of Coquimbo's mining heritage. In February 2014 I travelled to La Serena, in the northern region of Coquimbo to photograph the former sites of extraction and smelting facilities. I was accompanied by Mr Vicencio, whose knowledge and expertise on the area were crucial both to reaching the sites and understanding their local context. In the case of Swansea, a series of conversations with Robert Protheroe-Jones, Principal Curator of Industry at the National Waterfront Museum in Swansea, highlighted the scale of the exchange between Coquimbo and Swansea.²⁴³

²⁴³ An exhibition proposal titled *Coquimbo&Swansea: A journey of copper, 1840–1880*, consisting of twelve photographs of Chile and Swansea and texts of Tehmina Goskhar has been accepted for the Waterfront Museum for 2017.

These post-industrial landscapes in Coquimbo and Swansea were approached consistently with the preconceived idea of making a series of panoramic landscapes created by joining/stitching together two 5x4 large-format landscape analogue photographs. This decision influences the way in which the landscape is approached and gives consistency to the overall series.

Las Compañías, Province of Coquimbo, Chile, February and June 2014

Although only one photograph of *Las Compañías, Province of Coquimbo* [Fig 51] has been included in this thesis, a larger documentation took place in the region of Coquimbo in February and June 2014. Local historian Frank Vicencio López was the guide for the visits to the following sites: the former smelting site Las Compañías and the former mines Panucillo, Huamalata in February 2014 and Brillador in June 2014. Reaching these places involved long road trips due to their remote geographical location. Two consecutive views of the sites were taken on location, which then were joined together as a single panoramic view in my digital studio. The view offers an elevated perspective of the post-industrial site that enables spatial relationships within the frame. The horizon plays a crucial role within the frame of the landscape represented.

Lower Swansea Valley, Wales, May 2014

A field exploration trip took place in the Lower Swansea Valley in May 2014 [Fig 52]. Like the journey of the metal itself, my exploration followed the River

Tawe upwards towards the Lower Swansea Valley using a trekking map.²⁴⁴ Contrary to the Chilean landscapes where vast extensions do not permit walking between mining locations, in Swansea the smelting industries were located alongside the River Tawe, and after conservation work they are designated touristic pathways. As I walked on the designated paths, the few remains of mining heritage appeared scattered through the landscape and semi camouflaged by the growing vegetation. I used the same working methodology as in Coquimbo, consisting of finding an elevated point of view to oversee the territory, be it a bridge or a hill. Then, the large format view camera is placed and two straightforward photographs are taken. As the river shapes the experience of walking, it is the element that unifies the series of photographs and it appears as the central element in each one of them. The consistent framing, the attempt to acknowledge the past through the photographic image, is perhaps the most important aspect applied to the two geographically distance sites in Wales and Chile.

3.1.1.4 Analysis

Although these photographs offer a straightforward reading of the post-industrial landscapes, new relationships are born by placing one image next to the other. It can be argued that both geographies, Coquimbo [Fig 51] and Swansea [Fig 52] are marginal to the notion of ‘core,’ in relation to financial metropolitan centres such as London or Liverpool. However, Coquimbo remains evidently underdeveloped in relation Swansea. It can be said that the

²⁴⁴ This map is available from the Copperopolis website.

‘uneven geographical development’ of Coquimbo is partly a result of the expropriation of its natural resources and the economic surplus generated with them, as was argued in Chapter 1. The images functioned together, as meaning is relational, deriving from their position in relation to the other. The consistent captioning the photographs as *Las Compañías, Province of Coquimbo, Chile* and *Lower Swansea Valley, Wales, UK* indicates their geographical location. In this way, the viewer is invited to reflect upon the different forms of territorial occupation.

In Coquimbo, the symbols of marginality such as discarded vehicles, abandoned lorries, trucks, buses and cars, as well prefabricated housing structures and improvised workshops appear as part of the landscape. Additionally, the photograph is populated with symbols of colonial occupation, such as low-cost corrugated iron cladding panels for animals and bricks, both symbols of British economic imperialism in the nineteenth century. As Wells points out, ‘the pictorial offers more than graphic representation. It articulates subjective memory and cultural currencies not only in relation to literal reading of images but also in terms of emotive effects.’²⁴⁵ This site is camouflaged by the growing vegetation and the urban development around it, covered in symbols that represent the decay of a capitalist system in Chile, deeply rooted in the process of denationalisation of copper resources, for example, the abandoned blue bus of the Universidad del Mar in the bottom left hand corner. This university was at the centre stage of a scandal of illicit appropriation,

²⁴⁵ Wells, L. (2011) *Land matters: landscape photography, culture and identity*, London: I.B. Tauris, p 5.

which caused the institution to close in 2014 and is remembered as iconic institution of the student mobilisations which have been taking place since 2006. Chilean audiences are invited to interpret this symbolic element in relation to the neoliberal system. The aesthetics of the decay of the post-industrial landscape are strengthened by the desolation produced by the intentional absence of people.

In contrast to the dry landscape of Chile, water is a fundamental element in the photograph depicting the Lower Swansea Valley. It has been said that water is a highly political subject in the West and, as stated already, this valley and its river formed one of the world's most polluted landscapes before the reclamation project.²⁴⁶ As such, the inclusion of the river as central element can be read as a symbol of the rebirth, circulation and transformation of the former toxic geography. The photograph reveals one remaining structure of the industrial heritage of copper: the bridge in the background of the photograph. Instead of traces of industrialised past, the structure of the Liberty stadium and conference centre emerge from the dense vegetation. On the right hand side, the logos of Starbucks and Pood, a coffee and a food chain respectively, are part of the complex Morfa Retail Park, which was built on the former industrial facilities of Morfa Copperworks. Again, these buildings appear to arise from within the vegetation, giving a glimpse of the regeneration and investment that has been poured into this former toxic geography since the land was reclaimed.

²⁴⁶ Wells, L. (2011), p. 151.

3.1.1.3 Exhibition Strategies

Coquimbo & Swansea, 'Traffic: Movement / Flow / Place / Mobility

Conference,' Land/Water Research Centre, Plymouth University, May 2016

Together with the presentation of a conference paper at the Traffic Conference [see Appendix I] I was invited to present a pin up exhibition during a PhD. The photographs are presented to the viewer next to each other. For this occasion two photographs one of Coquimbo and another one of Swansea were confronted to each other (110x40cm each). Each photograph had a small caption recalling the site of the photograph, highlighting the difference between the two post-industrial landscapes. However, it is the layer of information together as extended landscape format, created digitally by joining the two large format photographs together. The horizon is located in the middle of the frame and becomes a point of interest as much as the elements within it. Additionally, the elements on the edge invite the viewer to focus on the sublime aspects of the landscapes, such as the moving clouds or the reflection of the water in the case of Swansea. These photographs resemble the panoramic photography that was made popular in mid-nineteenth century with the development of photographic cameras that traversed 180 degrees; at that time, the industrial sites represented were in full production. The vantage point of view places the viewer in a position that empowers him or her to analyse the underlying political narratives running through them.

3.2.2 Miss Chuquicamata, the Slag (2012)

Introduction

These photographs are the product of a field-survey exploration undertaken in September 2012 in Chuquicamata, a corporate town. The settlement was designed as a model town in the offices of the Guggenheim brothers in New York in the early decades of the twentieth century. As well as the photographic series produced during the fieldwork, an analysis of the historical narratives in which it developed is offered here.²⁴⁷

3.2.2.1 History

Second denationalisation period, 1904–1969, and U.S. intervention

A second major denationalisation period occurred between 1904 and 1969 when investors from the U.S. opened large copper resources in Chile.²⁴⁸ This period began in 1904 with the acquisition by the Guggenheim brothers of series of large copper ore deposits, such as Chuquicamata, El Teniente and Potrerillos. At the time, Chile presented the ideal characteristics for the establishment of large foreign corporations to exploit large low-grade porphyry copper deposits, with a cheap semi-skilled labour force and relative political stability.²⁴⁹ By contrast with the previous period, a different type of industrial development was

²⁴⁷ This essay is part of a paper, 'Chuquicamata: a corporate mining town: bounded territory within a territory,' to be published in *Beyond Gated Communities: Urban Gating and Soft Boundaries* by Routledge in 2014. It was previously presented at *Gated Communities and Private Urban Governance Conference*, Brighton University, June 2013.

²⁴⁸ Girvan, N. (1972a), and CODELCO, (1975), p. 31.

²⁴⁹ Moran, T.H. (1974) *Multinational corporations and the politics of dependence: copper in Chile*, Princeton ; London: Princeton University Press, pp. 3–5.

required. These porphyry deposits constitute a high risk investment.²⁵⁰ Although the deposits were of much lower quality or lower grade than the deposits exploited by British entrepreneurs in the previous period, they still provided a high value return on the investment. The resources were denationalised for a variety of reasons. Firstly, as Norman Girvan suggested, huge investments were needed for starting an operation and such funds were not available within the country.²⁵¹ Secondly, the nitrate boom had attracted the attention of wealthy investors and, most, importantly, such investors had the technology necessary to exploit porphyry deposits that had not been developed by Chilean investors.

The Chuquicamata copper mine

The Guggenheim brothers, who controlled Kennecott Copper, acquired the Chuquicamata through their subsidiary, the Chile Copper Company, in 1913. Chuquicamata, where the world's largest copper deposits were located, started operations on 18th May 1915.²⁵² The brothers believed in driving profit opportunities to the limit, and were, as Thomas O'Brien has suggested, 'the corporate crown of a classic American success history.'²⁵³ Despite the fact that the primarily source of their fortune came from the wholesale trade, the family consolidated the expansion of their wealth through their ownership of other

²⁵⁰ Mikesell, R.F. (1979), p. 45.

²⁵¹ Girvan, N. (1972b).

²⁵² For more information, see: Orellana Retamales, Luis. (2004) 'La lucha de los mineros contra las leyes: Chuquicamata (1900-1915)' in *Historia (Santiago)* v. 37, Santiago: Pontificia Universidad Católica de Chile, p. 169-206.

²⁵³ O'Brien, T.F. (1989), "'Rich beyond the dreams of avarice": the Guggenheims in Chile' in *Business History Review* 63, pp. 122-159.

mining, smelting and refining businesses. Their empire extended worldwide through Utah, Alaska, Mexico, the Belgian Congo and Chile, as their advanced techniques of non-selective mechanised processes of extraction permitted the processing larges of volumes of material in a highly cost-effective way, thus revolutionising the industry. The Guggenheim brothers had pioneered the use of power shovels since 1892 and their flotation system completely re-shaped the landscape of the mining sector. The brothers brought to Chile systems of extraction, smelting and refining that were already in place in their U.S. subsidiaries. Geoffrey Jones explains how the knowledge and processes developed in one country were exported in order to maximise efficiency and return-value. The capital-intensive nature of the business meant that long periods of operation were needed before large profits arrived.²⁵⁴ In addition, technological developments powered the acceleration and transformation of the mining business ‘from a family-run, small scale, cottage speculation to a highly developed, large-scale, mechanized business.’²⁵⁵ Economies of scale were needed for securing long term-growth and return of value, and therefore the key points of this historical shift lay in the development of new technology to process large amounts of material and the high level of investment required. Jones argues that the legal framework in which multinationals developed in the United States from a centralised business operated by its owners towards a

²⁵⁴ Jones, G. (2005) *Multinationals and global capitalism: from the nineteenth to the twenty-first century*, Oxford: Oxford University Press.

²⁵⁵ Culver, W and Reinhart, C. J. (1989), p.738.

larger firm permitted a new type of corporate power, one that facilitated the raising of capital.²⁵⁶

The Guggenheims formed the Chile Copper Company in 1910.²⁵⁷ At the time of their arrival, the nation's basic industry required intensive capital investment so as to be operated profitably. As Christopher Schmitz suggests, the brothers' major ventures in Chile changed not just the nation's old-fashioned mining industry, but also contributed to a new direction of the modern world economy by 'developing a new generation of giant, low-grade copper mines.'²⁵⁸ Chuquicamata rapidly contributed to the consolidation of the brothers' domination as the leading finance capitalists in the world's metals market.²⁵⁹ In 1923, with the aim of investing in the nitrate industry, the Guggenheim brothers sold the mine to another U.S. mining corporation, Anaconda. On 1 March 1923, Murray Guggenheim received the largest check in history at the time, for U.S.\$70.000.000. Flushed with cash, the brothers were recognised to have the fourth largest fortune in the U.S.²⁶⁰

Anaconda controlled Chuquicamata mine until 1971 when a major nationalisation of copper came to effect on 11 July. Based on the UN Resolution 1803, regarding the rights of sovereignty of natural resources, the major copper

²⁵⁶ Jones, G. (2005), p. 25.

²⁵⁷ O'Brien, T.F. (1989) p. 122.

²⁵⁸ Schmitz, C. (1986), p. 396.

²⁵⁹ By 1918 American interests accounted for over 87% of Chile's copper output. See: O'Brien, Thomas F. (1989), p. 122.

²⁶⁰ O'Connor, H. (1976) *The Guggenheims. The making of an American dynasty*, New York: Arno Press, p. 414.

bodies of Chile of were expropriated by President Salvador Allende from U.S. international mining corporations. These included Chuquicamata and El Salvador mines (Anaconda Copper Company) and El Teniente (Kennecott). Since then, copper resources have been a key asset of the state, forming part of a major territorial transformation of the industrial landscape of Chile. Nationalisation was partly reverted during General Augusto Pinochet's dictatorship with the implementation of neoliberal policies.

Chuquicamata: corporate town

The corporate town of the Chuquicamata mine [Fig 53] – which has the same name – was designed as a model town in the offices of the Guggenheim brothers in New York in the early decades of the twentieth century, where more than thirty architects were hired to design its urban plan.²⁶¹ The town grew up next to the mine, following the patterns of other mining settlements in the U.S., such as Butte, Bisbee and Tyrone. All are in close proximity to the location of natural resources. This runs counter to the general process of global urban transformation generated by industrialisation: access to transport networks determines where urban development takes place. Due the capitalist nature of mining endeavours, corporate towns are designed, as Carter suggests, 'to fulfil basic social necessities by maximising profits. They are thus both hypercapitalistic and socialist at the same time. The companies maintain

²⁶¹ For further details, see: Gutiérrez-Viñuales, Alejo. (2008) "Chuquicamata: patrimonio industrial de la minería del cobre en Chile", *Apuntes: Revista de Estudios sobre Patrimonio Cultural – Journal of Cultural Heritage Studies*. 21. (2008): 74-91.

dictatorship authority over the towns and the residents but provide for certain needs so that the workers stay happy and, much more important, productive.’²⁶²

As result, both architectural formations and urban design are conceived in a typological form. While reducing substantially the costs by increasing efficiency, the standardisation and mass production of the architectural foundations of corporate towns can be seen as a reflection of the mechanised nature of the modern mining industry. In this way, it is important to recall that the functionality and profitability of industrial development is the main driving force behind the growth of corporate mining towns. To archive efficiency, urban systems must fulfil the basics needs of their inhabitants. This includes: housing; educational establishments for primary and secondary students; a health-care system for the miners and their families; and retail and foodstuff businesses.

The Guggenheim brothers financed the investment needed to plan and execute the urban settlement of Chuquicamata, including public services and a complete welfare, social and housing association system for the workers and their families. Within the confined zone of the town everything was subsidised by the company, including a modern hospital, primary and secondary educational institutions for the children and housing schemes, depending on the needs of each family. This paternalistic social system, which covered all their basic needs, allowed workers to concentrate fully on their work. As result, no

²⁶² Carter, B. (2012), p. 50.

one outside of the corporate umbrella was allowed to live within the town's boundaries; if a worker left his work, he was also required to move out of town.

Constructions were created initially as temporary structures; however, as the town expanded and the population settled, these became permanent. With regard to spatial layout, concepts of social stratification and the division of labour were part of urban design. These separations within a bounded territory had an impact in the power relations created between inhabitants. To give one example, different 'types' of workers were given different 'types' of accommodations. These divisions respected institutional hierarchies in relation to their skills, citizenship and marital status. Thus, the disappeared Campamento Americano was created only for U.S. citizens. It was located 3 km away from the settlements for the local workforce and represented the best type of accommodation. To give another example, 'Campamento Nuevo' was designed around a central square, similar to Tyrone in New Mexico, and other mining settlements in the U.S.

The social divisions between different 'types' of workers reflected the closed urban systems created by the company in the first place. The production of copper increased over time and the mine grew to become the world's biggest open-cast copper mine. Accordingly, the subsidised settlement expanded its capacity to fulfil the housing demands of the workforce. This process of expansion preserved, however, the town's isolation from its natural surroundings. This was a key factor and partly a product of the tough geographical conditions of the Desert of Atacama in which the mine was found and partly a result of Kennecott's corporate policies that established a new legal

regime that ran parallel to state sovereignty. Furthermore, these conditions created a ‘bounded territory within a territory,’ an autonomous enclave controlled by foreign interests and responding to an international corporate legal framework within state sovereignty.

The town was closed to habitation in 2007 when high levels of pollution, caused by the expansion of the mine to secure continuing profitability, threatened public health. At the time of closure, the 25,000 workers living there were relocated to the nearby city of Calama where new neighbourhoods were built – following the same strategies of social segmentation and urban fragmentation. Today, the majority of its 140,000 inhabitants work around the mine. Since the evacuation, the town of Chuquicamata has been detached from its original function, which was housing the mine’s workforce. Its boundaries are fenced off and its buildings closed for habitation. Half of them are buried under a mountain of thousands of tons of waste material; the other half is abandoned and waiting to be consumed by the new artificial topography. Its boundaries are fenced and protected against unwanted intruders. The remaining houses, banks, shops, schools and public spaces have been closed. Some iconic buildings remain open for daily-organised tours run by the state-mining corporation. While guides explain the material qualities of copper that permit today’s world of hyper-connectivity as well as the importance of Chuquicamata for the local economy, the visitors photograph fragments of its ghostly appearance.

3.2.2.2 Fieldwork methodology

Chuquicamata mining town, 20 September 2012

A field-exploration trip took place on 20 September 2012. Special permissions were requested from CODECO, and Daniel Chirino, who works in the company's public relations department, was designated to take me around. I used a large format view camera and a 6x9 medium format back, a technology used to create a greater volume of work with the appearance of a large format view camera.

Like my fieldwork for *Coquimbo&Swansea*, the act of walking shaped the way in which the photographic intervention was conducted. But, on this occasion, instead of a walking map, I was guided by the knowledge and experience of Daniel Chirino, who lived for twenty years in the settlement before its closure. Listening to Chirino's personal experience was key to deepening my insight into Chuquicamata's complex history and for guiding the picture making process. His concerns regarding the dismantling of the settlement, the vanishing of cultural heritage and the disappearance of historical buildings under the slag-heap shaped my conception and understanding of the site.

Guided by Chirino, an exploration of Chuquicamata took place in the course of six hours. The documentation began in the central square and continued through the town towards its limits as time progressed. At the time, I was interested in the seriality of the architectural formations, which responded to a capitalist logic of maximisation of resources, as explained in the previous section. As such, the photographic work began by focussing on the iconic

elements of the mining town located in the central square [Fig 54]. It continued with a series of standardised houses using typological photographic conventions that look straight at the subject of the photograph [Fig 55]. The photographic expedition progressed with the photographing of street views of the town [Fig 56], including a series of abandoned shops [Fig 57], a series of portrait photographs of trees [Fig 58] and various types of buildings used for religious activities, taken in landscape format [Fig 59]. At the end of the day Chirino suggested a visit to his former family home, which – as appears in the photographs – was dramatically almost buried under the slag-heap [Fig 60]. At this stage, I shifted the topographic strategy of documentation deployed during the fieldwork towards a more spontaneous act of documentation of the fragmentation and disintegration of the topography and the architectural formations, and as such the photographic process became more spontaneous and less rigid. At this site, I asked Chirino to point out a rock with a high amount of copper. The piece he suggested appeared greener than the rest and had clearly fallen from the top of the slag-heap. Like the disordered earth and broken architecture, the act of photography became increasingly fragmented as I worked around the stone chosen by Chirino, examining it from different angles [Fig 61]. I took a fragment of this rock as a prime example of a copper ‘specimen’ from the site. Mimicking the scientists who collect samples for their investigation, I took this piece to a high-technology environment in the University of Brighton where it was examined by Dr. Norman Moles, Assistant Head of Environment and Technology School at the University of Brighton, using an X-Ray Diffractometer [Fig 62].

3.2.2.3 Analysis

From the start of the twentieth century, the open-cast mine of Chuquicamata in northern Chile has contributed to globalisation processes by supplying large volumes of copper that have enabled global communication and information technologies to develop. Since then, both the mine and the corporate town of Chuquicamata have been integrated into a complex global network of exchange and production of commodities. Today, more than hundred years since large-scale operations were established by the Guggenheim brothers, copper is still exploited in large quantities, but of a considerably lower quality and in more remote locations. A recent study by CODELCO announced that the life of the mine will be extended by another forty years, by building a network of 180 km of tunnels below the open pit mine.²⁶³ As copper has been taken away from the territory, capital is accumulated through surpluses in the extraction and trade processes. Meanwhile in the mining town, architectural formations have almost disappeared under the expanding slag-heap and the local work-force has been relocated to cities such as Calama, Antofagasta, Iquique or Santiago. What remains are the residues, those discarded pieces of unwanted materials with no market value that form large artificial geographies of contaminated residues.

Chuquicamata can be seen as an exemplary case of a ‘transnational’ space created ‘for the circulation of capital.’²⁶⁴ The ‘landscapes of resources and

²⁶³ CODELCO. (2014a) *Histórica Inversión para Chuquicamata* Available at: <http://elamerica.cl/img/OASIS2271.pdf> [accessed 24 January 2016].

²⁶⁴ Sassen, S. (1988).

future wealth²⁶⁵ of Chuquicamata are presented through photographs of man-made sites of geographies transformed by corporate power. Chuquicamata certainly recounts a narrative of U.S. imperial intervention in Latin America and its role in shaping the modern world economy. The typological strategy of documentation mirrors the seriality and repetition of the built structures which can be interpreted as a reflection of the mechanised nature of the modern mining industry. The corporate town can be read as a post-industrial archaeology or residue of a metropolitan-satellite structure of global capitalism.

3.2.2.4 Exhibition strategies

*Miss Chuquicamata, the Slag, Feria Ch.ACO, Santiago, Chile, October 2016*²⁶⁶

An installation of this series has been presented during Chaco, an art fair of contemporary art in Santiago, Chile [Fig 63]. The final piece was built with using fifty-six photographs (15x21 cm each) mounted on aluminium and perspex on the front. The piece includes one visual of the X-Ray examinations and an aerial satellite view of mining town. The photographs are presented in an exhibition context along a horizontal line at eye level. The sequence follows my own fieldwork on 20 September 2012, giving the viewer an insight into my walking practice as an artist and opening windows to visualise the

²⁶⁵ Sörlin, S. (2002) 'Can places travel?' in *Documenta 11, Platform 5* (2002) Exhibition catalogue. Kassel: Museum Fridericianum Ostfildern-Ruit: Hatje Cantz.

²⁶⁶ This piece was donated to the Foundation FAVA (Foundation for the Visual Arts) in Chile by invitation of Pablo Leon de la Barra, curator of the Salomon R Guggenheim Museum for the Latin American plan of the Guggenheim UBS MAP Global initiative. Leon de la Barra curates the collection of FAVA under the theme 'territory'. For more information please visit: <http://www.fava.cl/> [accessed 19 September 2016].

fragmentation and disintegration of the mining town. From left to right, the installation begins with a photograph of an arch called Cecilia, a landmark located in the central square, and follows through town, ending at Daniel Chirino's former family home half buried under the slag-heap. The piece was presented to the collection with a 50 pages artist book with essay taken from this thesis in English and Spanish languages, permitting the viewer to analyse the narrative beyond the photographic image²⁶⁷.

3.3 Large-scale mining industry and its relation to London

3.3.1 Antofagasta Plc., Stop Abuses! (2010–14)

Introduction

The series *Antofagasta Plc., Stop Abuses!*²⁶⁸ is the product four photographic interventions around the case of Los Pelambres.²⁶⁹ These interventions are presented in chronological order for this thesis: 1) Eucalyptus Forest, Los Vilos, Province of Coquimbo, December 2010; 2) Eucalyptus Forest, Los Vilos, Province of Coquimbo, September 2011; 3) Protest, Church House Conference Centre, London, June 2013, and 4) El Mauro tailings, Pupio Valley, Province of Coquimbo, February 2014.

²⁶⁷ An electronic version of this leaflet can be viewed here < http://ignacioacosta.apps-land1.net/pdf/Chquicamata2_Final_Web.pdf> [accessed 11 December 2016].

²⁶⁸ The names of series takes its name the protest held by an activist outside Church House in London, while the Annual Year Review of Antofagasta Plc. takes place.

²⁶⁹ Excluding the photographic explorations of landscapes undertaken in 2002 and as explained in Chapter 1.

3.3.1.1 History

Third denationalisation period; 1981–today, and Multinational Corporations

As result of the nationalisation of copper mining carried out by democratically elected government of Salvador Allende, the CIA, U.S. corporations and Henry Kissinger, the U.S. Secretary of State,²⁷⁰ established the goal of decelerating socialism in Chile, something which was accomplished by economic blockade and by actively financing the opposition.²⁷¹ After the coup of 11 September 1973 and during the dictatorship of General Augusto Pinochet (1973–1989), Chile became the first experiment in neoliberal state formation²⁷². Neoliberalism was implemented through a series of reforms implemented between 1974 and 1988. A group of Chilean economists known as the ‘Chicago boys,’ because of their attachment to the ideas developed by Milton Friedman, who taught at the University of Chicago, set out to ‘reconstruct’ Chilean economy. Chile became an ‘exemplary case for neoliberalism.’²⁷³ These ideologies ‘asserted the superiority of private investment and market mechanisms over the state provision.’²⁷⁴ Characterised by strong property rights, free markets and free trade, the neoliberal regime privileged export-led growth industries over the import of foreign manufactured goods. Natural resources – including water, fishing and new mineral deposits – were opened up ‘for private and unregulated

²⁷⁰ Harvey, D. (2005b), p. 7.

²⁷¹ Guardiola-Rivera, O.A. (2013), p. 231.

²⁷² Harvey, D. (2005a).

²⁷³ Day, G. and Edwards, S.(2012)pp. 288 – 289.

²⁷⁴ Day, G. and Edwards, S. (2012), p. 288.

exploitation.²⁷⁵ Although Pinochet retained CODELCO, as a key source of the financial viability of the state, the ideal conditions for a new major phase of denationalisation were laid in 1981 when four members of the Military Junta approved Law 18,097. This law allowed new mineral bodies to be handed to private property as ‘full concessions.’²⁷⁶ Under the new system, land was handed to private investors without them having to pay for the value of the resources, allowing them, moreover, to trade those resources in open markets by ‘recognizing the right of ownership of mines through a concessionaire system.’²⁷⁷ In 1981 the ‘Water Code’ was created to promote private investment in the mining sector and has been legally turned into nearly untouchable private property.²⁷⁸ Based on the principles of neoliberal economics, water rights were transferred from national to private hands and traded in open free markets. The ‘Water Code’ entails that the rights of water are completely separated from the land where water is located, giving, as Nancy Yañes claims ‘a gratuitous, perpetual, and unconditional right to water usage.’²⁷⁹ As such, the case of Chile remains unique, in Carl J. Bauer words, ‘as no other country has gone so far, so long in the direction of pro-market water laws.’²⁸⁰

²⁷⁵ Harvey, D. (2005a) *A brief history of neoliberalism*, Oxford: Oxford University Press, p.8.

²⁷⁶ Caputo, O. and Galarce, G. (2011), p. 52

²⁷⁷ Nem Singh, J.T. (2010).

²⁷⁸ Bauer, C.J. (1977) ‘Bringing water markets down to earth: The political economy of water rights in Chile, 1976–1995,’ *World Development* 25: 639–656.

²⁷⁹ Yañez, N. and Gentes, I. (2005) *Derechos locales sobre las aguas en Chile: análisis jurídico y político para una estrategia de gestión pertinente en territorios Indígenas*, Santiago, Chile: Walir-Cepal.

²⁸⁰ Bauer, C.J. (1977).

Antofagasta Plc.

Antofagasta Plc. is a Chilean based mining corporation owned by the Luksic family.²⁸¹ Antofagasta currently trades on the London Stock Exchange and is listed as FTSE 100 company.²⁸² The corporation began to trade on the London Stock Exchange in 1888 when British investors listed the Bolivia Railway Company Plc. on the London Stock Exchange.²⁸³ This company was created to raise funds for the construction of a railway between Antofagasta and La Paz, Bolivia. Known as ‘Fags,’ the railroad was materialised the same year and became an important element in the development of the mining industry. However, it almost became bankrupt in 1930 as product of the decline of the nitrate industry.²⁸⁴ ‘Fags’ was acquired by the Chilean-based Luksic Group in 1979. In the same year, the Luksic Group was renamed as ‘Antofagasta Holdings Plc.’²⁸⁵ Antofagasta expanded its mining portfolio in Chile and globally. Additionally in 1996, the Luksic family opened Quiñeco, a investment holding controlling financial services, beverages and food, manufacturing, energy transport and port and shipping services, operating in Chile, Brazil, Argentina and Peru.²⁸⁶ As result, the family became what is today, the largest

²⁸¹ The group was founded by Andronico Luksic, a son of a Croatian immigrant who made his fortune in the mining industry in the 1960s. Pederson, J.P. (2004) *International Directory of Company Histories*, St. James Press, pp. 46–53.

²⁸² The FTSE 100 are the 100 most highly capitalised companies listed on the London Stock Exchange.

²⁸³ Pederson, J.P. (2004), pp. 46–53.

²⁸⁴ Blakemore, H. (1990) *From the Pacific to La Paz: the Antofagasta (Chile) and Bolivia Railway Company 1888-1988*, London: Lester Crook Academic/Antofagasta Holdings.

²⁸⁵ Pederson, J.P. (2004), pp. 46–53

²⁸⁶ Bloomberg (2015) Quiñeco S.A Profile, <<http://www.bloomberg.com/quote/QUINENC:CI>> [accessed 20 August 2015].

single economic group in Chile and one of the largest in Latin America.²⁸⁷ The company has been severely criticised over its negative impact on the ecologies where its mining businesses operate. Indeed, the contamination, pollution and abuses of local rights seems a commonality for these type of conglomerates.

Los Pelambres

Mining is one of the most polluting industries in the world. It has a disproportionate impact on land-based communities, especially indigenous peoples and is frequently associated with forced-evictions, militarization, conflicts and human rights abuses... Mining's impact on the environment is behind many of the conflicts between companies and communities. The processes involved in heavy metal mining have affected countless water systems around the world, as companies often circumvent environmental regulations or fail to clean up their operations properly.²⁸⁸

Antofagasta Plc. began construction of Los Pelambres in 1997 and operations started in 2000. In 2015, its expected output was estimated to be 385,000 million of tons of copper concentrate. The open-pit mine is located 3,800 meters above the sea level in the Andes Mountains on the border with Argentina.²⁸⁹ There, ore is extracted through a system of perforation, then crushed, milled and transported to a concentration plant located at 1,600 meters

²⁸⁷ Iris Fontbona, widow of Andronico Luksic & family stands at No. 82 in the world's billionaires' list, with an estimated US \$11.8 billion in 2015. Forbes (2015). *The Worlds Billionaires* <<http://www.forbes.com/profile/iris-fontbona>> [accessed 8 August 2015].

²⁸⁸ London Mining Network (2012). *What is the London Mining Network?* <<https://vimeo.com/31641482>> [accessed 8 August 2015].

²⁸⁹ Los Pelambres is 40 per cent owned by the Japanese consortium formed by Nippon LP Investment and MM LP Holding BV; Antofagasta Plc. (2015a); Plc, A. (2015) 'Annual Report and Financial Statements 2014', p.16; Antofagasta Plc. (2010). *Sustainability Report* <<http://www.aminerals.cl/wp-content/files/Reporte-Sustentabilidad-MLP-2010.pdf>> [accessed 19 August 2015].

above sea level where the materials are separated.²⁹⁰ In the concentration plant, an alkaline flotation system is used to selectively separate the copper concentrate from the worthless material or gangue – by using the way that the different physical properties of their molecules repel water.²⁹¹ The unwanted material from these operations are deposited in El Mauro tailings.

El Mauro tailings

After much controversy, by the end of 2008 the El Mauro started to operate.²⁹²

Today, El Mauro is ‘the biggest toxic waste dump of Latin America.’²⁹³

Following a report by the Foundation Frances Libertés published by United Nations in 2012, a wall of 1,000 meters of compressed sand holds 2060 millions tons of toxic waste material just 470 meters above the town Caimanes. As the report claims, the tailings is located in an earthquake prone zone, and that if it collapsed, the 1,600 inhabitants of Caimanes would have five minutes to escape before being buried. Additionally, global warming may cause catastrophic effects, including sudden flooding or extreme droughts. For its construction, 23 families were displaced from their original land. As the report details, the building of the tailings involved the re-direction of the natural course of the

²⁹⁰ <<http://www.antofagasta.co.uk/~media/Files/A/Antofagasta/reports-and-presentations/analyst-site-visit-dec13/analystvisit-los-pelambres-site-visit.pdf>> [accessed 19 August 2015].

²⁹¹ CODELCO (1975), p. 169.

²⁹² Lehne, Florian (2015) *Caimanes and the Water – Infinite Legal Struggles about a Finite Good* <<http://futureoffoodjournal.org/index.php/journal/article/download/177/157>> [accessed 19 August 2015].

²⁹³ Franklin, Jonathan (2014) *Chilean dam can't hold back the hatred* <<http://www.theguardian.com/sustainable-business/chile-los-pelambres-copper-mine-antofagasta-broken-town>> [accessed 17 August 2015].

water and the contamination of underwater resources with heavy metals, with the consequence of the loss of agricultural activities, traditionally the main economic activity of the region before the installation of the mine. As a result of the construction of El Mauro there has been considerable damage to the national heritage, including the destruction of 140 archaeological sites, the flooding of indigenous burial grounds, and the destruction of the last forest of ‘Canelos’ in Northern Chile.²⁹⁴

Antofagasta Plc. controls the national and regional press and it has blocked oppositional points of view in mainstream media.²⁹⁵ However, with the burst of globalized internet and social media in the last decade, alternative distribution channels have opened mainly on the web and have had a significant impact on the dissemination of opposition both nationally and internationally.²⁹⁶ In the UK, series of activist-led organisations have placed the subject in the global agenda. As well as organising protests, War on Want and the London Mining Network (LMN) have published regular technical reports questioning the safety of the tailings.²⁹⁷ As result of international pressure, media platforms in

²⁹⁴ Mitterrand, F.D. (2012) *Industria minera y amenaza al derecho fundamental al agua: El caso simbólico de la comunidad Caimanes en Chile*, New York: Naciones Unidas: Asamblea General. p. 2.

²⁹⁵ Quiñeco S.A. controls 67 per cent of Canal 13, one of largest Chilean TV channels and 13 Radios, a radio conglomerate based in Santiago.

²⁹⁶ The General Assembly of the United Nations distributed an investigation into the contamination of water resources and the threats to the health of the inhabitants of Caimanes. ‘Exposición escrita conjunta’ presentada por France Libertés – Fondation Danielle Mitterrand, American Association of Jurists, organizaciones no gubernamentales reconocidas como entidades consultivas especiales, Mouvement contre le racisme et pour l’amitié entre les peuples, organización no gubernamental reconocida en la Lista’, *Naciones Unidas* (2012), <http://www.france-libertes.org/IMG/pdf/caimanes_esp-2.pdf> [accessed on 26 July 2015].

²⁹⁷ Solly, Richard (2014) ‘Antofagasta at Caimanes: questions remain about safety and heritage,’ *London Mining Network*, 28 May 2014 <<http://londonminingnetwork.org/2014/05/antofagasta-at-caimanes-questions-remain-about-safety-and-heritage/>> [accessed 26 July 2015].

UK, such as *The Guardian*²⁹⁸ and *The Financial Times*²⁹⁹ have covered the conflict.

The Eucalyptus Forest

After copper is ground in the Andes, it is transformed into copper concentrate.

This black powder is transported to Punta de Chungo, a port on the Pacific, through a pipeline 120 km long.³⁰⁰ For this transportation, the company uses

large quantities of water to create flows using the power of gravity. At the Pacific port, the concentrate is dried and shipped mainly to Asian markets.³⁰¹

The excess of water contains high doses of toxins, and particularly molybdenum and sulphate, both considered highly damaging to the environment and health.

Therefore, it cannot be used in the food chain or deposited in the sea.

Water connects the production of food and mining.³⁰² For every stage of the mining process, large volumes of water are required, making it a critical and strategic component of the mining operation.³⁰³ To dispose of these toxic water residues, water-intensive monocultures of eucalyptus have been created.

²⁹⁸ Franking, Jonathan (2014) 'Chilean dam can't hold back the hatred,' *The Guardian*, 21 March 2014 <http://www.theguardian.com/sustainable-business/chile-los-pelambres-copper-mine-antofagasta-broken-town> [accessed 26 July 2015].

²⁹⁹ Sanderson, Henry (2015b) *Chile: Copper bottomed* <<http://www.ft.com/cms/s/0/b9f15790-eea0-11e4-96ec-00144feab7de.html#axzz3jLUGd593>> [accessed 20 August 2015].

³⁰⁰ Antofagasta Plc. (2010).Sustainability Report <<http://www.aminerals.cl/wp-content/files/Reporte-Sustentabilidad-MLP-2010.pdf>> [accessed 19 August 2015].

³⁰¹ Antofagasta Plc. (2015b) *Annual Report 2014*, p.18.<http://www.antofagasta.co.uk/~/-/media/Files/A/Antofagasta/pdf/press_releases/2015/annual-report-2014.pdf> [accessed 7 August 2015] p.18.

³⁰² Lehne, Florian (2015) *Caimanes and the Water – Infinite Legal Struggles about a Finite Good* <<http://futureoffoodjournal.org/index.php/journal/article/download/177/157>> [accessed 18 August 2015].

³⁰³ CODELCO. (1975) *El Cobre Chileno*, Santiago: Corp del Cobre., p. 169.

Eucalyptus specimens from Australia have been imported because they grow rapidly and reach great heights. But most importantly, these are thirstiest trees on earth. In addition, these forests are highly dependent on the regular supply of water from the mine. The mine has created a forest³⁰⁴ that can dispose of 18 to 24 litres per second of the 27 litres of contaminated water per second it produces.³⁰⁵ As required, eucalyptuses return liquids to the atmosphere by a process named as ‘evotranspiration,’ which, following the Company’s Sustainably Report, contributes to the environment.³⁰⁶

3.3.1.2 Fieldwork methodology

This case study has been built from four different photographic interventions that took place between 2010 and 2014. In contrast to *Coquimbo&Swansea*, where a consistent systematic strategy of documentation was developed, capturing two continuous landscape photographs that are joined together digitally into one single landscape photograph, in the case *Antofagasta Plc.*, *Stop Abuses!*, the a various different formats are sued. Although fieldwork continues to be at the core of the case study, the aesthetic result varies depending on the documentation strategy chosen. This one used a medium

³⁰⁴ In 2010 there were 157 hectares of Eucalyptus forests claimed by the mining corporation. See Antofagasta Plc. (2010) *Sustainability Report* <<http://www.aminerals.cl/wp-content/files/Reporte-Sustentabilidad-MLP-2010.pdf>> [accessed 19 August 2015].

³⁰⁵ Zulueta, R. (2013) ‘Proyecto de Cooperación para Abastecimiento de Aguas para el proceso de Flotación de Minera Don Alberto mediante el uso de agua residual de proceso de evatranspiración Minera Los Pelambres’ in *Antecedentes requeridos de pertinencia de ingreso als servicio de evaluacion ambiental de proyectos mineros* <<http://documentos.dga.cl/ADM5443v2.pdf>> [accessed 16 January 2016].

³⁰⁶ Antofagasta Plc. (2010) *Sustainability Report* <<http://www.aminerals.cl/wp-content/files/Reporte-Sustentabilidad-MLP-2010.pdf>> [accessed 19 August 2015].

format view camera to produce landscapes photographs that were then reproduced by combining three large format photographs together.

Eucalyptus Forest, Los Vilos, Province of Coquimbo, December 2010

Although I had previous knowledge of the existence of this site, my first photographic intervention in the Eucalyptus forest trees was the product of an accidental encounter. In December 2010, I was on a road-trip through Carretera Norte to the Province of Coquimbo when a large forest of Eucalyptus appeared in the landscape. The contrast with the native vegetation is considerable. The short vegetation of this area is product of a semi-arid climate of Norte Chico.³⁰⁷ Thus, the difference between the tall Australian Eucalyptus and the local vegetation can be seen from the distance when driving through the landscape. The boundaries of the forest are gated and the access heavily guarded.

On 30 December 2010, without any previous contact, I approached the security personnel of the port to request access to the forest. I was interested in experiencing the forest from within and to embark on a documentation process that examined the notion of the imported landscape. Without engaging in any environmentally and politically conflicted conversation with the staff, my access was granted on the basis of my interest in investigating the landscape of Norte Chico. Cristián Sepúlveda, a local port manager provided me with a local guide, Antonio Gomez, to take me around the forest. For two hours Antonio drove me through the forest in the company's 4x4. The trip started with an

³⁰⁷ Norte Chico is zone of transition between the dry zone of Atacama Desert and the Mediterranean zone of Central Chile. The area is mainly used for agricultural activities and goat herding.

overview of the new demarcations where new trees are planted [Fig 64]. He stopped whenever I requested to take photographs. I asked the driver to take me through the most mature forest to obtain a more compelling aesthetic result. Once in the forest, I was guided by Antonio's experience of driving through the site. As in the case of other fieldwork conducted through this doctoral investigation, the final photographs can be attributed a combination of factors, including my intentions and interest in particular aspects of a site and the experience and knowledge of local people.

The sense of being within the forest remains in my mind. There is a feeling of loneliness, desolation and despair, just broken by sound: the wind through the trees, the sound of the dried leaves being crushed under my shoes [Fig 65]. No form of life can be observed. The dense canopy of leaves does not permit the sun to pass through to the soil, which combined with the acidity of the eucalyptus trees, makes it very difficult for other forms of life to emerge. A monoculture, the cultivation of a single crop on the land, does not permit other ecosystems to live. When I was walking, the irrigation system composed of black pipes suddenly became visible under the thick layer of golden leaves. The irrigation system runs throughout the forest spreading contaminated water through the pipes that are pushed to the surface through sprinklers of a red colour that stick out the ground. The multiplicity and repetition of these plastic devices becomes a visual pattern, line with the alignments of the plantation. I searched for elements, such as dead leaves, or deformations in the trees, which disrupt the uniformity of the landscape [Fig 66].

I was interested in the reinforcing the notion of alienation that is perceived within the bounded space of the forest. I sought to create an illusion of an endless space. This was achieved by avoiding photographing the edges of the forest, including the perimeter fence, and photographing diagonally to break the rigid grid of the plantation. On this occasion, a medium format Mamiya camera (6x7) was used. The shutter speed was calculated around aperture f/32 to permit great depth of field. Therefore, to produce a sharp image, long time exposures were needed and the use of a tripod.

Eucalyptus Forest, Los Vilos, Province of Coquimbo, September 2011

The second photographic intervention involved gaining permission from the mining corporation. I contacted Fernando Garay, the general manager of Los Pelambres in order to secure access the day of the shooting. Since the forest is at a 600 km drive from Santiago, it was necessary guarantee admission in advance. On this occasion, I brought a large format camera to document the forest in greater detail. Fernando assigned Carlos Pavez, the engineer in charge of the forest, to drive me around in the company's pick-up. This time, I visited the forest with significantly greater knowledge about its role within the ecology of Los Vilos. As such, I was aware of both the environmental issues and political conflicts surrounding the place and these informed my intention to seek out artificial signs that can provide evidence of a contested history.

As before, my fieldwork was a combination of my search for specific aspects of the forest and the experience of the local guide. I was guided by Carlos to the thickest part of the forest. On this occasion, I had a clear idea of which aspects of the forest might reveal a the notion of artificiality, such as the

broken, crooked or dead trees. I worked around these strange trees, walking in circles around them and identifying the specific angles that might reveal best their aspects in contrast with the environment. I photographed them from different angles, focusing on their unusual shapes, which I framed centrally to direct the viewer's gaze to these deformations that break the regular pattern of the environment. The final photographic piece developed from this second visit is, as noted above, digitally composed of three large format photographs joined together. As such, the final piece becomes an artificial construction of an artificial space [Fig 67].

In contrast to the statements by Antofagasta Plc., who claim that these forests contribute positively to the environment by releasing CO² into the atmosphere,³⁰⁸ Carlos held a more critical view of its effect upon the ecology of the valley. As he told me: firstly, the forest is highly dependent on the large volumes of water coming from the mining industry and therefore its life is intrinsically tied to the production of copper from Pelambres; secondly, the forest plays a crucial role the current exhaustion of underwater resources due to the large amount of water it consumes; thirdly, in summer, heat waves and drought produce widespread wild fires, which pose a constant threat to agricultural communities; fourthly, and most importantly, this 'forest' cannot be

³⁰⁸ Antofagasta Minerals (2013), p. 39, <<http://www.antofagasta.co.uk/~media/Files/A/Antofagasta/pdf/sustainability-report-2013.pdf>> [accessed 9 August 2015].

used for any purposes other than serving the thirsty needs of the mining industry. This a ‘toxic forest,’ claimed Carlos.³⁰⁹

Church House Conference Centre, London, 13 June 2013

It is 09:30 am on Wednesday 12 June 2013. Outside Church House Conference Centre, Dean’s Yard, Westminster, London, while Antofagasta Plc. holds its Annual Year Performance Review,³¹⁰ a group of activists stand in front of the back entrance of the Conference Centre [Fig 68]. They have been gathered by War on Want and LMN,³¹¹ two organisations pressing public concern over global inequalities of capitalism, such as global poverty and social injustice. They have gathered to attract the attention of media and the stakeholders attending Antofagasta Plc. Annual Year Performance Review.³¹² The activists had met first in the main entrance of the Conference Centre but the police pushed the group to the back entrance. This action can be seen as reflection of a larger political agenda that favours corporate power over local human and environmental rights. As has been said, ‘the British government has consistently

³⁰⁹ The name of the photographic piece created from this fieldwork, *Toxic Forest*, comes from this conversation.

³¹⁰ ‘Protest! Stop Antofagasta Abuses against The Caimanes Community’ *War on Want*, <<http://www.waronwant.org/media/protest-stop-antofagasta-abuses-against-caimanes-community>> [accessed 26 July 2015].

³¹¹ London Mining Network actively challenges, publishing weekly newsletters, reports and participating as dissident shareholders in company meetings

³¹² The protest was covered by *Daily Mail*. Davis, Rob (2014) *Chilean copper mining group Antofagasta polluted local water, campaigners claim* <http://www.dailymail.co.uk/money/news/article-2341316/Chilean-copper-mining-group-Antofagasta-polluted-local-water-campaigners-claim.html?ITO=1490&ns_mchannel=rss&ns_campaign=1490> [accessed 7 August 2015]; London Mining Network (2013) *Flat contradiction: no meetings of mind at the Antofagasta AGM* <http://londonminingnetwork.org/2013/06/flat-contradiction-no-meeting-of-minds-at-the-antofagasta-agm>> [accessed 9 August 2015]; War on Want (2013) *Protest! Stop Antofagasta Abuses against the Caimanes Community* <<http://www.waronwant.org/media/protest-stop-antofagasta-abuses-against-caimanes-community>> [accessed 8 August 2015].

backed UK mining companies despite the many accusations led at their door ... UK mining based companies are coming under increasing criticism for pursuing their interests whatever the cost.³¹³

The activists firmly and peacefully stood trying to capture the attention of pedestrians passing by. Their placards drew attention to the contamination of the water resources in Caimanes: 'We demand clean water for the People of Los Caimanes in Chile,' 'Chile, Caimanes: El Mauro damp of toxic waste from Antofagasta contaminates the water and environment. Solidarity with Caimanes:' 'Antofagasta Plc. Water is Life: Agua es vida:' and 'The People of Caimanes have the right to resist in order to live.' These bold statements are just the tip of the iceberg of a much longer conflict affecting the local communities. These are critical issues for the ecology of the Valley but they remain largely underexposed. The conflict, as represented by UK activists, focuses mainly on water scarcity and contamination, with great emphasis on the struggle of agricultural communities to sustain crops and pastoral activities. They highlight the community's immediate struggles to cope with resource contamination and scarcity; the complex network of historical and political conditions that permitted the moment of confrontation to take place, even when known, are not so easy to communicate.

While the activists' protests attempt to draw attention to the water contamination of Caimanes, a silver Mercedes Benz with black windows appears swiftly in the street. A chauffeur exits the car and promptly opens the

³¹³ London Mining Network (2012) *What is the London Mining Network?* <<https://vimeo.com/31641482>> [accessed 8 August 2015].

back door to a stakeholder arriving for the Annual Year Performance Review. I witnessed this moment of confrontation while taking a picture of the protest across the road using a medium format camera (6x9) without tripod. As such, the photograph is the result of the ‘moment’ in which both corporate and local forces clash. It was another accidental encounter, between the activist and the stakeholder and between both and my camera, and one which would have allowed me to adopt a conventional documentary approach of focussing upon the newsworthy. However, rather than depicting the encounter explicitly, I have decided to select a shot of the stakeholder as he is about to get out of the car. The slightly open door suggests the stakeholder’s presence but without showing it. The photograph hides not only the identity of the stakeholder, but also avoids his encounter with the activists.

El Mauro tailings, Pupio Valley, Province of Coquimbo, February 2014

For my last fieldwork visit to Chile I returned to the Pupio Valley, the point of departure for this thesis, to document any changes in the environment. Through my involvement with activist networks meetings organised by War on Want, I was put in touch with Patricio Bustamante from the ‘Comité de Defensa de Caimanes’ (Caimanes Protection Committee). Patricio put me in touch with Jaime Jamanett, a local activist who agreed to take me on an expedition through the mountains to have an overview of El Mauro tailings. I also was put in touch with María Vilches, President of ‘Comité de Aguas de Caimanes’ (Caimanes Water Committee), who rents a spare room in her house to people involved in the battle against the Antofagasta Plc.

With these contacts, and confident I could get closer to the tailings, I drove 184 kilometres from Viña del Mar to Pupio Valley. I arrived at Caimanes at dusk, looking for María's house, which was initially difficult to locate. The town had dramatically changed since my last visit in 2002. The former agricultural town had been transformed into a mining town: its environment disrupted and its social fabric radicalised. Divisions and polarisation can be observed in the community even at first glance. On arrival, I noticed sporadic black flags waving and graffiti with political propaganda displayed on the buildings, a sign of people's disapproval of the corporate mining intervention. While some residents showed their opposition through these symbols, others attempt to show off the economic benefit of working in the mine by driving pick-ups, four wheeled motorbikes or wearing branded clothing. While some houses have been transformed into prosperous businesses, such as restaurants or hostels adapted to host the nomad population of miners, others seem to be in evident misery. The community of Caimanes has been broken. The town is divided into those opposing the mining intervention and those working for the corporation. With tears in her eyes, María told me: 'Hemos tenido que aprender a vivir con este dolor [de vivir con la intervención minera]. Como uno aprehende a vivir con el dolor cuando se le muere un hijo' (We have had to learn to live with the pain [of living with the mining intervention], like learning how to live with the pain when a child dies).

The following day, I picked up Jaime at 5:30 am with the intention of getting as close as possible to El Mauro. With his guidance, I drove to a house of a family living just few kilometres away from the dam in the middle of the

mountains. From there, we walked three hours through the mountains until we reached a fence demarcating the beginning of the El Mauro, a hacienda owned by Antofagasta Plc. and where the tailings is located. Knowing it is a criminal offence to enter private property without permission, a feeling of excitement and fear was felt when illegally crossing the fence. While in the territory of the mining corporation, we walked until we were able to get an overview of a new valley. At the end of the vast landscape a straight line – like a wound in the territory – can be seen, demarcating the beginning of the tailings. We tried to get closer, but it was not possible. The steep configuration of the topography and the type of ground, made the slopes slippery, which, added to the weight of the large format camera, made movement slow and above all dangerous. While trekking, Jaime also received a phone call from a friend working in the tailings, telling him that security had been alerted to our presence and that the police might be on their way. At that point, I decided to stop to take a picture from the highest point of the mountains. The photograph produced from this visit follows the same strategy that the of forest; it is comprised of three large format photographs which were joined together into one landscape photograph [Fig 69]. This image has been assembled in post-production to create a elevated view of the landscape. Since then, further environmental damage, militarization and social segregation have arisen, all common problems in these types of zones of exemption.

3.3.1.3 Analysis

The transformation of Pupio from an agricultural to a mining economy is the effect of complex geo-political forces. The photographs in this series suggest a

disruption without explicitly pointing out the conflict or the contamination; rather they hint at elements that might unsettle the viewer's relationship to the landscape: the crooked tree, the broken valley, the open door of the Mercedes. This strategy allows the photographs to work as an imaginative mechanism rather than an accusatory device. By doing so, rather than providing propaganda themselves, they work as a mechanism of visibility, thus facilitating the entry of the viewer into a space for debating the impact of Antofagasta Plc. on Pupio Valley.

While the landscape photographs of El Mauro and the forest explore notions of artificiality and disruption, the protest photograph explores notions of contestation and inequality. The photograph of the protest uses a different strategy. People are at the centre of the frame, and their actions, gestures and postures offer a narrative. In this particular photograph the symbols of social discontent can be read in contrast to the symbols of corporate power, all of which might help us to articulate the conflicted relationship between local struggles and corporate power and such as placards versus Mercedes and activist versus chauffeur.

This study argues that neither the protest nor the landscape photographs are able to disclose the complexity of historical threads that lead to this confrontation. Text, or context, is needed to help those narratives unfold: the purchase of 'Fags' by the Luksic family in 1979, which enabled their Antofagasta company to trade on the London Stock Exchange; The Water Code of 1981, which permitted water to be sold in open markets and the purchase of the water rights of Pupio Valley by Antofagasta Plc.

Following Sekula's line of argument, the meaning of these photographs depends upon the context in which they are placed. Although they portray geographically disparate landscapes, utilise diverse documentary and exhibition strategies, they are all presented as one body of work. I am interested in the various meanings created about the Pupio Valley and the way in which my photographs are able to open discussions regarding the contested nature of site. On the one hand, the forest can be seen as symbol of environmental degradation produced by the mining industry through importing a monoculture, breaking the natural ecosystem of the desert and producing an extermination of the underground water resources. On the other hand, it can be seen as an environmental contribution to the environment contribution by returning CO² to the atmosphere.

3.3.1.4 Exhibition strategies

***Antofantasta PIC. Stop Abuse!* 'Surface Exposure,' University of Brighton, 16 July, 2013³¹⁴**

A site-specific installation with a selection of works from this PhD investigation was exhibited during an exhibition by four students exploring photographic research at the University of Brighton. A poster 2x5 meter poster of the photograph *Toxic Forest* [Fig 71] was presented together with a photograph of the protest of Church House [Fig 72]. A text piece mediated the relationship of the two [Fig 73], the elements being displayed centrally on a made-to-measure

³¹⁴ Surface Exposure, <<http://arts.brighton.ac.uk/whats-on/gallery/gallery-exhibitions-2013/july-2014/surface-exposure>> [accessed 25 October 2015].

wall of 6 meters [Fig 72]. These works were in relation to one studio photograph of the copper ore [Fig 73] mounted on 5mm of perspex. The inclusion of text permitted an a more direct engagement with those hidden narratives. The text disclosed the historical, geographical and political conditions that shaped these contested geographies.

Antofagasta Plc., Stop Abuses!, ‘Depresiones Intermedias,’ Parque Cultural, Valparaíso, 12 Sept – 12 October 2015³¹⁵

The installation presented for this occasion was centred around the case study *Antofagasta Plc., Stop Abuses!* [Fig 74-75]. The installation consisted of: a 1x2 m swooden table; five photographs; a four page document available in the public domain published by United Nations explaining the violations of the water rights and security of the communities of Caimanes by the mining company of Los Pelambres;³¹⁶ and lastly, a 60 page bound book consisting of a report on the 603 tailings in Chile, published by Sernageomin.³¹⁷ These factual materials were presented at the same height as the photographs so as to be examined by the viewers. This group exhibition was curated by Rodolfo Andaur, and was centred around the notion of ‘Depresión Intermedia,’ an

³¹⁵ Parque Cultural de Valparaíso, <<http://pcdv.cl/2015/09/12/exposicion-4/>> [accessed 4 November 2015].

³¹⁶ Naciones Unidas, Asamblea General. <http://www.france-libertes.org/IMG/pdf/violacion_del_derecho_al_agua_-_chile_-_caimanes.pdf> [accessed 4 November 2015].

³¹⁷ At the moment of writing this thesis, the document presented on in the exhibition had been removed from the website and replaced by a shorter version published by Sernageomin, b.<<http://www.sernageomin.cl/pdf/mineria/seguridad/estudios/Catastro-depositos-relave-de-Chile-julio2015.pdf>> [accessed 3 November 2015].

expression which denominates the Chilean transverse valleys, a group of valleys in the semi-arid north of Chile, which ‘transverse’ the country from the Andres Mountains to the Pacific Ocean. The exhibition theme explored different artists’ approaches to this geographical configuration, with an emphasis on works that address political, social and environmental issues. The series *Antofagasta Plc.*, *Stop Abuses!* was part of this exhibition, as it touches upon the impact of large-scale copper mining in the transverse valley of Pupio.

3.3.2 LME Invisible Corporate Network (2012–15)³¹⁸

Introduction

The last case study of this thesis consists of a written account of the role of the London Metal Exchange (LME) and its contested role within the City of London, accompanied by the mapping of 35 Members of the LME based within the Square Mile. To begin a serious mapping dealing with the complexity of this vast amount of information, the case study investigates the projected image of the corporation that is available online.

Quite unlike the works that have been developed through extensive fieldwork, this case study builds an archive of information available in the open source. Although the research process involved extensive fieldwork, walking around and around the City of London using diverse mapping and photographic

³¹⁸ This work stems from previous investigations of the corporate space of London, such as *Mapping the Zone* developed in Canary Wharf and *Epiphanies on the commuter belt* developed in the City of London, between 2007 and 2010.

methodologies, the final piece has been assembled on the basis of information collected solely online.

3.3.2.1 History

In the nineteenth century, the Industrial Revolution had transformed Britain from a metal export-led based economy into an avid importer of metals, which inevitably meant longer delivery times. As result, the LME was born in 1877, above a hat shop in Lombard Court in the City of London. The organisation aimed to secure merchants a fixed price in the long term. Previously, most British and imported copper ores were sold at ticketing events in Cornwall and Swansea.³¹⁹ The LME opened using a standard three months contract, reflecting the time necessary to transport copper from Chile and tin from Malaya to Britain.³²⁰ Soon other European businesses started using the ring and the trading business expanded considerably.³²¹ Since its humble origins of above a hat shop, the exchange has moved its base, first, to Whittington Avenue, Plantation House and subsequently to its current location in Leadenhall Street.³²²

Today, the LME is the premier non-ferrous metal market, a ‘meeting place of buyers and sellers of metal futures’ providing ‘producers and consumers of metal around the world with the best way to manage their

³¹⁹ Goskhar, T. (2014).

³²⁰ Hart, J. (2007).

³²¹ Hart, J. (2007).

³²² In 2016 the LME will move to Finsbury Square. Sanderson, Henry and Neil, Hume (2015).

exposure to the risk created by metal price volatility.’³²³ ‘Metal futures’ is a market exchange instrument to secure the future price of copper from market volatility and it is used mainly as investment mechanism.³²⁴ The LME is currently controlled by the Hong Kong Exchanges & Clearing (HKEx), since the conglomerate bought it in 2012 in a £ 1.4bn deal.³²⁵ Although it uses a 24 hour screen-based system of trading, it keeps its traditional open-outcry trading pit trading system, the last of its kind in Europe.³²⁶ Although the amount of copper it trades is marginal in relation to the world’s output, it is of huge importance as the price determined by the LME is used as a global benchmark.³²⁷ The LME has seven categories of membership: (1) Ring Dealings; (2) Broker Clearing; (3) Trade Clearing; (4) Broker; (5) Trade; (6) Individuals; and (7) Honorary members.

The speculative nature of the business can mean that these metals are exchanged up to forty times before they are delivered to the final consumer.³²⁸ Although as industrial metals the majority originate in places such as Chile,

³²³ London Metal Exchange (2012) *A guide to the LME*.
<<https://www.lme.com/~media/Files/Brochures/A%20Guide%20to%20the%20LME.pdf>> [accessed 16 January 2016].

³²⁴ A future contract is ‘An agreement to buy or sell a fixed amount of metal for delivery on a fixed future date at a price agreed today.’ LME (2012).

³²⁵ The Chinese Government is one of the largest stakeholders of HKEx. Dunkley, Jamie (2012) *Hong Kong wins race to buy London Metal Exchange*,
<<http://www.telegraph.co.uk/finance/markets/9333414/Hong-Kong-wins-race-to-buy-London-Metal-Exchange.html>> [accessed 23 August 2013].

³²⁶ Onstad, Eric (2014). *London Metal Exchange to keep outcry ring*
<<http://www.reuters.com/article/2014/06/23/lme-ring-idUSL6N0P41VT20140623>> [accessed 23 August 2015].

³²⁷ London Metal Exchange (2012).

³²⁸ London Metal Exchange (2012), p. 17

they are stored in a large network of warehouses working with the LME around the globe, for example, the warehouses of Henry Bath in Liverpool. Copper is the base metal of choice for most investors and speculators. Its price generally offers ‘great insights into how traders view the global economic outlook.’³²⁹ Copper is said to have a PhD in economics, giving it the nickname of Dr. Copper because of its ability to predict the global economy.³³⁰ The widespread use of copper in many sectors of the economy means its demand and price can be seen as an indicator of global economic growth. At times of recession, the stagnation of economy and lack of demand devalues the copper price; at times of recovery, high demand raises it.

The literature about the LME devoted to business success, gives no consideration to the impact of mining industries on the ecologies from which the metals are extracted. However, London, as the world’s centre for mining investment, is intrinsically linked to the sites where metals are extracted. Furthermore, investing and trading networks are indeed bound up to the geographies where metals come from. As the activist London Mining Network states:

... Most of the world’s biggest mining companies and many smaller mining companies are listed on the London Stock Exchange, including its Alternative Investment Market. UK listed mining companies, together enjoy around half of the market capital available to the world’s ten biggest

³²⁹ Burgert, P. (2012). *China stays key to copper demand: Standard Bank*. <<http://www.futuresmag.com/2012/02/07/china-stays-key-copper-demand-standard-bank>> [accessed 16 January 2016].

³³⁰ Investopedia, ‘Dr. Copper’ <<http://www.investopedia.com/terms/d/doctor-copper.asp>> [accessed 23 August 2015].

miners and London is the world's biggest for the investment in the mineral industry. British high street and investment banks, pension funds and insurance companies invest hundreds of millions of pounds a year in scores of mining projects across the globe, connecting working people's earnings in Britain with the fate of mining-affected communities around the world.³³¹

As the LMN suggests, London plays a key role in the world's metal market. Thus, geographies that might appear distant to London, such as the remote extractive ecologies of Chile, are connected by an invisible network of exchange. The fate of mining communities and ecologies are also linked to people's livelihoods in Britain, especially through their pensions, a hidden aspect of the mining industry. Indeed, the uneven geographical development is realised in an unequal distribution of wealth: the development of some at cost of the underdevelopment of others. While British investment banks, pension funds and insurance companies profit largely from the exchange of metals, lives in the 'periphery' are severely affected, local communities struggle with water contamination and land expropriation.

3.3.2.2 Methodology

The Ring at LME, 5 November 2012

Photographic documentation was conducted inside at the Ring of the LME. I contacted Miriam Haywood, the LME's Press Officer to request access to photograph the Ring and I was granted unique access on the grounds of my

³³¹ London Mining Network (2012) *What is the London Mining Network?* <<https://vimeo.com/31641482>> [accessed 8 August 2015].

academic investigation. Miriam allocated 45 minutes from 10:30 to 11:15 for me to work. On 5 November 2012, I photographed the empty Ring, using a Large Format View Camera with a Medium Format back (6x9) to enable me to take large number of photographs within a short period of time. The result was 27 photographs, of which I selected two portrait photographs to join together as a continuous landscape photograph [Fig 77].

Mapping as Methodology

To place limits on what could be an unmanageable survey, this study of metal trading companies considers only those Members of the LME based within the City of London. This strategy of selection was undertaken to highlight the importance of the City as a centre for mining investment as well as to give a framework to the work. As a starting point I used the LME website to identify which of the Members were based within the Square Mile [Fig 78]. These locations were marked on an Ordnance Survey Map of the City of London, which was the base for the fieldwork [Fig 79]. Of a total of 98 Members, 35 companies are based within the Square Mile: seven Ring Dealings,³³² 22 Associate Broker Clearings,³³³ two Associate Brokers,³³⁴ and four Associate Traders.³³⁵ Google maps were used as mechanism to establish walking routes before fieldwork was conducted [Fig 80].

³³²London Metal Exchange, 'Ring Dealing.'

³³³London Metal Exchange, 'Associate Broker Clearing.'

³³⁴London Metal Exchange, 'Associate Broker.'

³³⁵London Metal Exchange, 'Associate Trader.'

The City of London, Spring – Summer 2012–13

Prior to the survey expedition in the City of London, walking routes were designed using Google maps to guide the fieldwork [Fig 80]; pre-defined routes between the locations gave a structure to the walk. I conducted a series of expeditions using these pre-defined routes. I started photographing buildings with a traditional strategy of documentation using a Large Format View Camera, looking the buildings in a frontal and detached manner. Then, I started to utilise an iPhone to record data for each building, including a photograph of the actual building [Fig 81], one screen shot of Google maps with the location where the photograph was taken and the location of the building in question [Fig 82].

As time progressed, I became more interested in the fact that a subject of this complexity could not be grasped in a single body of work. As a result, I decided to subvert my own photographic strategy of documentation. Thus, the subsequent attempts became more experimental, using less recognisable elements of the architecture and giving, therefore, a more abstract result. I used the same walking methodology as the base for my expeditions, consisting of pre-defined drawn routes on Google Maps, which I carried on the iPhone and as hard copies. However, this time, I used a Medium Format camera (6x9 format cropped later to 6x7). As I became more interested in the notion of the representability of the invisibility of the trading businesses, I became less interested in the building as an architectural embodiment of power and control. Then, I started to focus my attention on the metaphorical relationship between

the sky and the volatile nature of trade. The result is a recollection of fragments of buildings with dramatic skies [Fig 82].

A series of problems were encountered during the fieldwork. Firstly, the simplified two-dimensional interpretation of the map versus the complexity of the reality of the City of London cannot be underestimated. Therefore, sometimes walking was erratic and I got lost on several occasions. Secondly, some exact addresses were very difficult to find, with the result that I missed locations on several occasions. On top of everything else, the iPhone battery run out fairly soon after journey started. The length of my field expeditions was therefore limited by these unwanted technical issues. As result, I have an incomplete recollection of fragments with some of unrecognisable locations.

In the process of data collection, images for each company were collected from Google Earth and Google Street View. Additionally, information for each was collected from diverse web sources available in the Public Domain, using the LME platform as starting point: (1) LME Classification; (2) Company Number; (3) Description; (4) Company Number; (5) Registered Address; and (5) Trading Address.

After collecting data, a series of tests were designed combining the Medium Format photographs, data and maps. Although none of these posters were selected for use in the final design of *LME Invisible Corporate Network*, they are indeed an important part of the process of deciding how to organise data.

Poster Design

Although a considerable amount of information was collected for this case study, the final piece consists of a single double-sided A0 Poster. On one side, the poster contains an abstraction of the map of the City of London [Fig 83]. Its edge is marked with a strong line that defines the edges of the historical centre. Firstly, each of the 35 Members were located and numbered on the map. Secondly, a system of colour coding was created to symbolise each category of Membership: Black for LME; green for Ring Dealings; orange for Associate Broker Clearings; purple for Associate Trade Clearing, magenta for Associate Brokers; and yellow for Associate Traders. [Fig 84].

On the other side of the poster, the images collected from Google Earth and Google Street View were visually organised in a grid [Fig 85]. From left to right and top to bottom, each category of Membership begins with the colour designated above. The colour coding is followed by the names of the companies, following their order of appearance on the LME website. The entry for each Member follows the same structure: first a Google aerial view of the Members' location followed by one or two Google Street view of the same company. The editing process of the Street Views focused mainly on two aspects of human activity: 1) Labour – the workforce engaged in labour activities, such as cleaning or building [Fig 86]; and 2) Mobility – people on the move, either cycling, driving or walking [Fig 86]. At the bottom of the page, a glossary of trading terms published by the LME was included in the form of list [Fig 87-88]. As a way of subverting the corporate language, the work blocks out

the Members Categories' names with blocking text using the pre-existing colour coding.

3.3.2.3 Analysis

The geography of copper creates a disparity between those who profit from trading activities and the communities directly affected by mining development. While the metal has provided a source of wealth for multinational corporations, agricultural communities are struggling to survive. Exposing links between peoples' earnings in Britain and the fate of extractive ecologies develops new ways of thinking about a metal that is essential for almost every human enterprise.

As Sekula argued, photographs are not able to communicate the complete truth. This investigation acknowledges the impossibility of revealing the invisible networks of capital exploitation. The vast complexity of the invisible stock market exchange value of copper cannot be grasped by photography. As has previously been argued in this thesis, in relation to Sekula's work, other representation strategies are needed to get closer to an understanding of the incomprehensible nature of contemporary capitalism.

3.3.2.4 Exhibition strategies

This work has not been yet presented in public yet. It is has been conceived a A0 double sided posted that can be taken by audience as a 'souvenir' from the exhibition [Fig 83, 85]. As it has been said, on this occasion, images from the open source are mixed with the other forms of knowledge, such as digital data, survey maps and written documents. The research has been organised, shaped,

and visually formed from existing bodies of publicly available knowledge. The organisation of this knowledge responds to an aesthetic and logical rationale in order to communicate data clearly. To make the data visually appealing also facilitates the access to the information. The final poster incorporates semiotics of corporate power, graphic design/advertising techniques of visual communication used to increase value of the material. Traversing the original significance of corporate semiotics by replacing their context and distribution channels entails the creation of new meanings.

The system of hidden linguistic propositions that accompany the photographs is what gives them the key for readability. I am interested on exploring how meaning of the work can shift from an object of aesthetic contemplation and appreciation to a 'souvenir' and as useful resource for making visible hidden links of the city of London with and the global metals market.



Figure 22 *Untitled* from the series *Sulphuric Acid Route*, 2012.



Figure 23 *Untitled* from the series *Sulphuric Acid Route*, 2012.

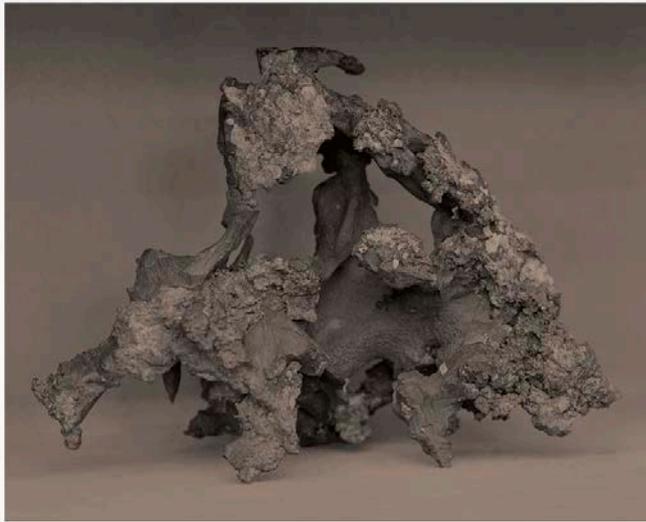


Figure 24 Geology Museum Mines ParisTech, Paris (2014). From the series *Metallic Threads* (2010-2015)



Figure 25 Tarapacá, Desert of Atacama, Chile (2010). From the series *Metallic Threads* (2010-2015)



Figure 26 Photographic studio at Brighton University, Brighton, England, 2015. From the series *Metallic Threads*, 2010-2015.



Figure 27 Natural History Museum, London, England, 2010. From the series *Metallic Threads*, 2010-2015.

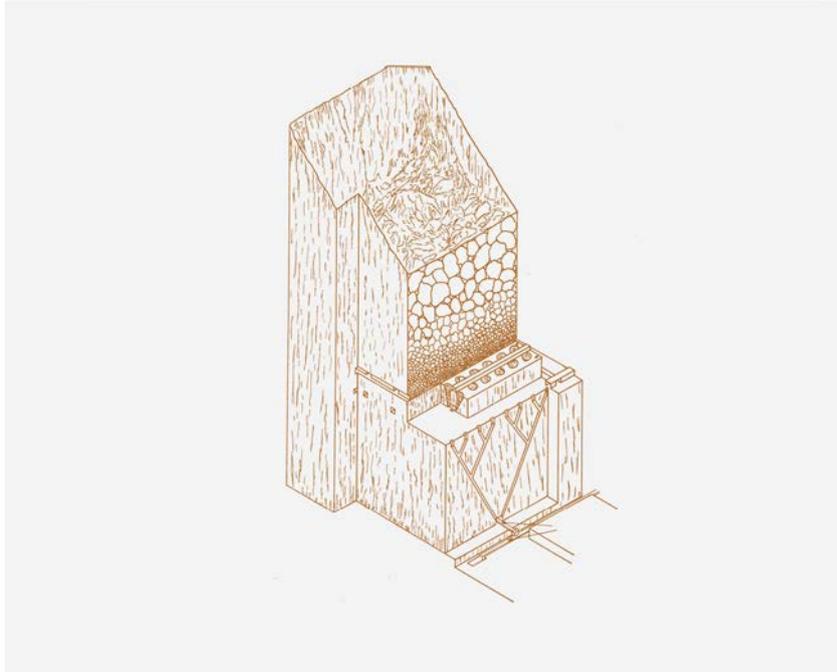


Figure 28 Drawing taken from 'El Cobre Chileno'. From the series *Metallic Threads*, 2010-2015.



Figure 29 Calama, Antofagasta, Chile, 2012. From the series *Metallic Threads*, 2010-2015.



Figure 30 Lower Swansea Valley, Wales, 2014. From the series *Metallic Threads*, 2010-2015.



Figure 31 Banking sector, Liverpool, England, 2015. From the series *Metallic Threads*, 2010-2015.



Figure 32 Henry Bath, Liverpool, England, 2015. From the series *Metallic Threads*, 2010-2015.

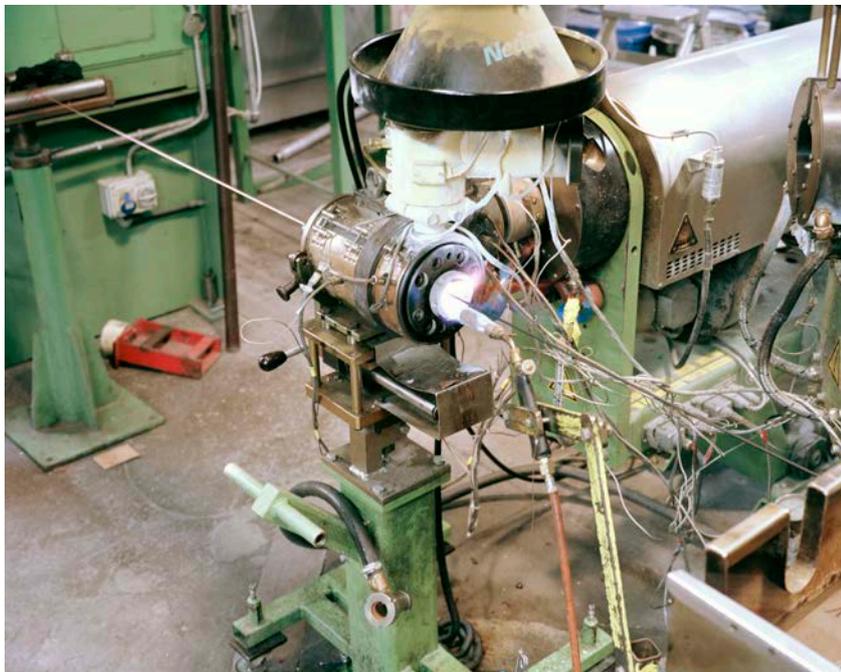


Figure 33 Prysmian Group Aigburth, South Wales, Wales, 2015. From the series *Metallic Threads*, 2010-2015.



Figure 34 Photographic studio at Brighton University, Brighton, England, 2015. From the series *Metallic Threads*, 2010-2015.



Figure 35 Canning House, London, England, 2014. From the series *Metallic Threads*, 2010-2015.



Figure 36 Paranal Observatory, Desert of Atacama, Chile, 2010. From the series *Metallic Threads*, 2010-2015.

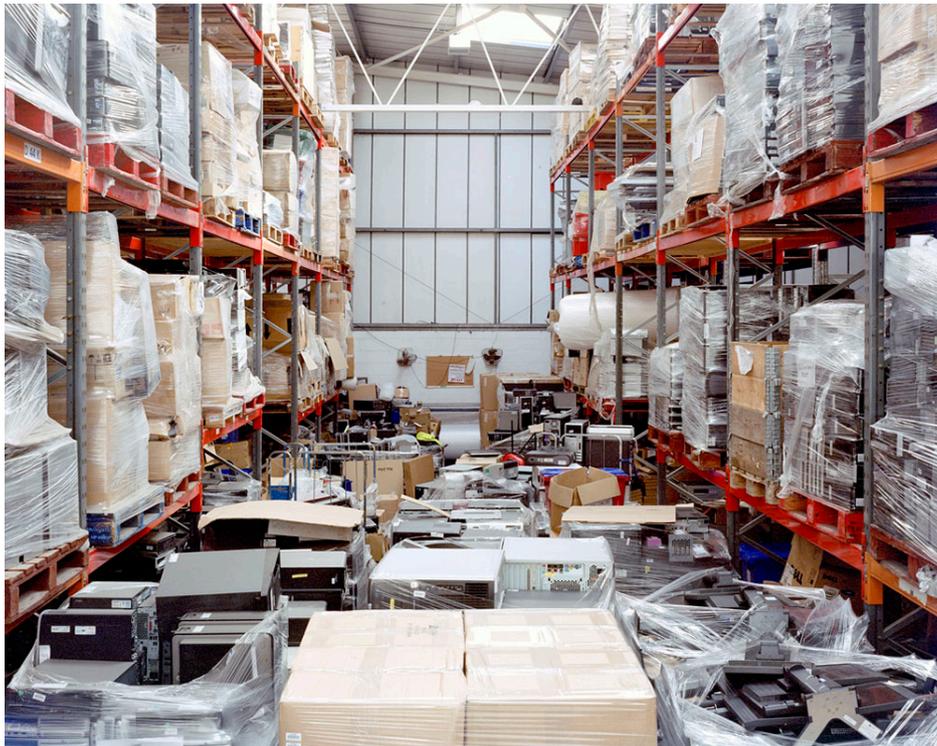


Figure 37 Computer Aid International, North London, England, 2015. From the series *Metallic Threads*, 2010-2015.



Figure 38 Prysmanian Group Aigburth, South Wales, Wales (2015). From the series *Metallic Threads*, 2010-2015.

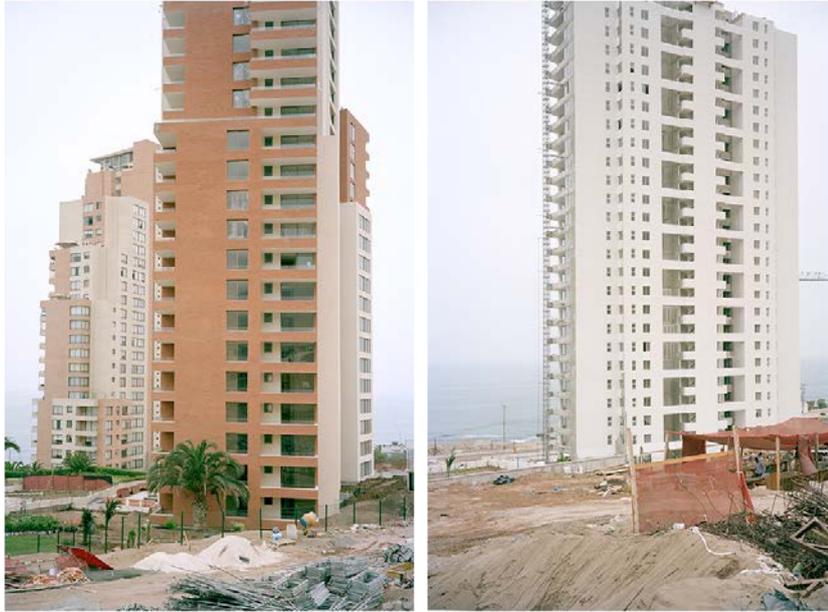


Figure 39 *Untitled* from the series *High Rise*, 2012.



Figure 40 *Untitled* from the series *High Rise*, 2012.



Figure 41 *Untitled* from the series *Hidden Circuits*, 2015.



Figure 42 *Untitled* from the series *Hidden Circuits*, 2015.



Figure 43. *Twenty Mining Billboards*, 'Traces of Nitrate: some documents,' 2013.

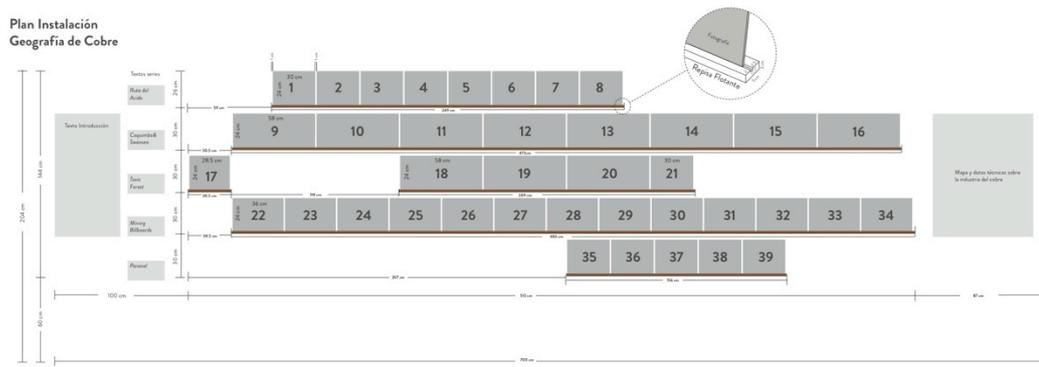


Figure 44. Installation Plan. *Copper Geographies*, 'Biennial of the End of the World,' 2014.



Figure 45. Installation View. *Copper Geographies*, Biennial of the End of the World, 2014.

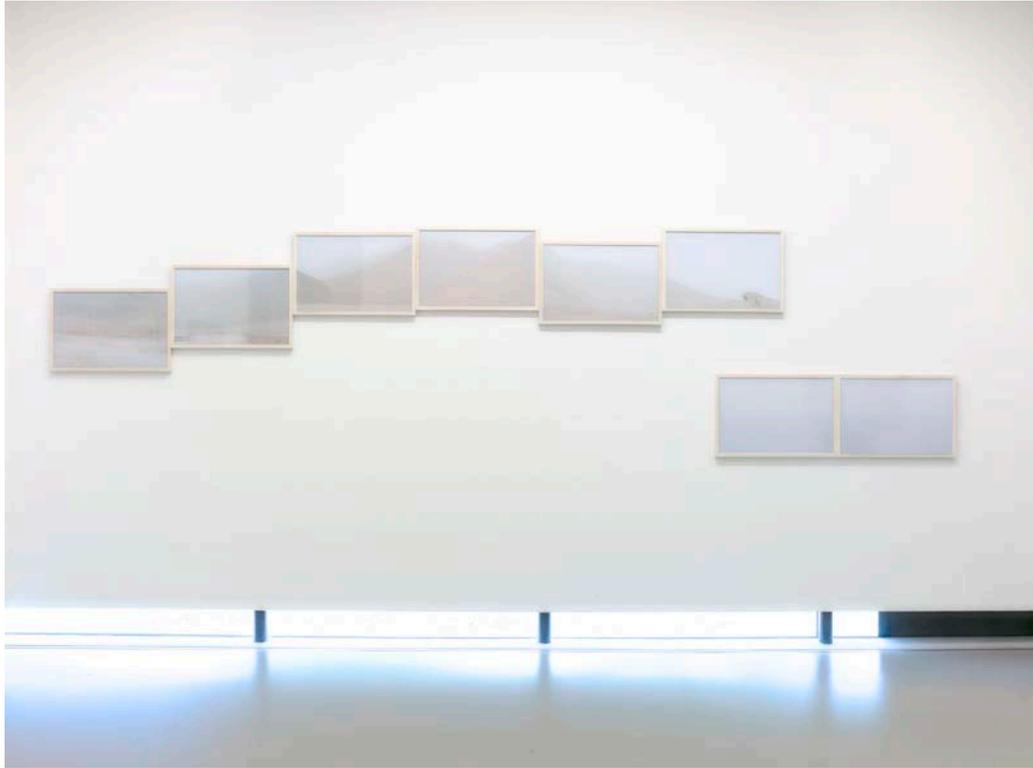


Figure 46 Installation View. *Copper Geographies*. Noorderlicht Photofestival 2016. Museum Belvédère Heerenveen The Netherlands, 2016 (detail).



Figure 47 Installation View. *Copper Geographies*. Noorderlicht Photofestival 2016. Museum Belvédère Heerenveen The Netherlands, 2016 (detail).



Figure 48 Installation View. *Copper Geographies*. Noorderlicht Photofestival 2016. Museum Belvédère Heerenveen The Netherlands, 2016 (detail).



Figure 49 Installation View. *Copper Geographies*. Noorderlicht Photofestival 2016. Museum Belvédère Heerenveen The Netherlands, 2016 (detail).



Figure 50 Installation View. *Hidden Circuits*. Feria Ch.ACO. Santiago, Chile, 2016.



Las Compañías, La Serena, Province of Coquimbo, Chile

Figure 51. *Las Compañías, Province of Coquimbo, Chile*, from the series *Coquimbo&Swansea*. Archival Pigment Print. 60x120 cm, 2014.



River Tawe, Lower Swansea Valley, Swansea, UK

Figure 52. *River Tawe, Lower Swansea Valley, UK*, from the series *Coquimbo&Swansea*. Archival Pigment Print. 60x120 cm, 2014.



Figure 53. *Chuquicamata corporate mining town from above*, from the series *Miss Chuquicamata, the Slag*. Aerial photograph © Servicio Aerofotométrico de la Fuerza Aérea de Chile (Saf). A0 Poster print, 2012.



Figure 54. *Cecilia*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 18x15 cm, 2012 .



Figure 55 .Untitled house, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 15x18cm, 2012.



Figure 56. *Untitled street*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 15x18cm, 2012.



Figure 57. *Untitled shop*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 15x18cm, 2012.



Figure 58. *Untitled tree*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 18x15cm, 2012.



Figure 59. *Untitled church*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 18x15cm, 2012.



Figure 60. *Former home of Daniel Chirino*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 15x18cm, 2012.



Figure 61. *Untitled ore*, from the series *Miss Chuquicamata, the Slag*. Archival Pigment Print, 15x18cm, 2012.

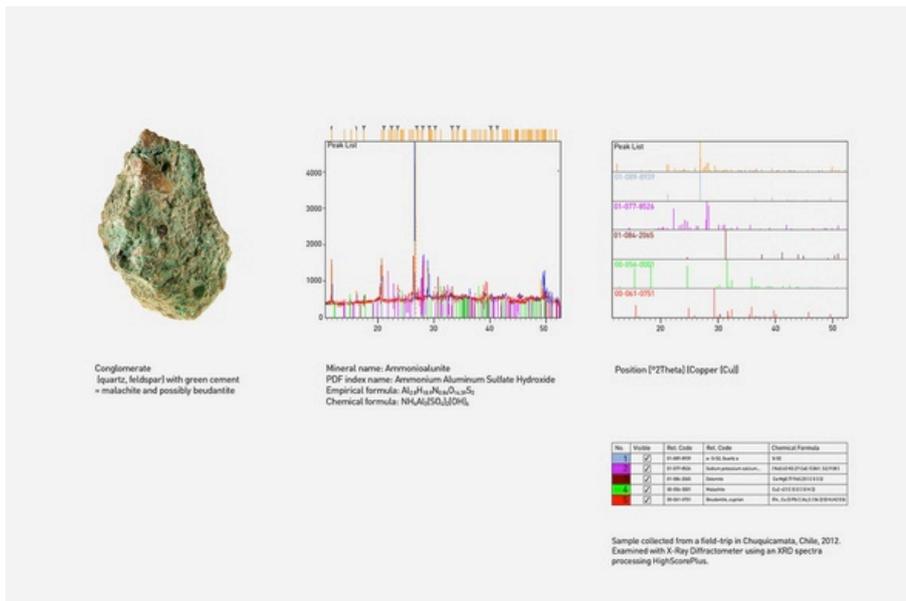


Figure 62. X-Ray Ray examination of a copper ore from Chuquicamata mine. Conglomerate with green cement. The analysis shows large amounts of quartz and feldspar (minerals which make up the conglomerate). Also present are small amounts (<10%) of malachite (hydrated

copper carbonate), dolomite (calcium-magnesium carbonate) and cuprian beudantite. The latter is an unusual mineral. Poster A0 Format, 2012.



Figure 63 Installation view. *Miss Chuquicamata, the Slag*. Feria Ch.ACO, Santiago, Chile, 2016.



Figure 64. Landmark at the edge of a forest of eucalyptus planted to dispose of liquid contaminants from Los Pelambres from *Antofagasta Plc.*, *Stop Abuses!*, Los Vilos, Province of Coquimbo, Chile. Archival Pigment Print, 40x50cm, 2010.



Figure 65. Toxic leaves of eucalyptus trees planted to dispose of liquid contaminants from Los Pelambres from *Antofagasta Plc.*, *Stop Abuses!*, Los Vilos, Province of Coquimbo, Chile. Archival Pigment Print, 40x50cm, 2010.



Figure 66. Monoculture of eucalyptus trees planted to dispose of liquid contaminants from Los Pelambres, from *Antofagasta Plc., Stop Abuses!*, Los Vilos, Province of Coquimbo, Chile. Archival Pigment Print, 40x50cm, 2010.



Figure 67. *Toxic forest*, from *Antofagasta Plc., Stop Abuses!*, Los Vilos, Province of Coquimbo, Chile. Poster, 200x480cm, 2010.



Figure 68. *Solidarity Caimanes*, from *Antofagasta Plc., Stop Abuses!*, Church House Conference Centre, Archival Pigment Print, 36x46 cm, 2013.



Figure 69. *View of El Mauro tailings*, from *Antofagasta Plc., Stop Abuses!*, Los Vilos, Province of Coquimbo, Chile. Archival Pigment Print, 18x46cm, 2014.



Figure 72. Installation view. *Copper Documents*, 'Surface Exposure,' 2013 (detail).

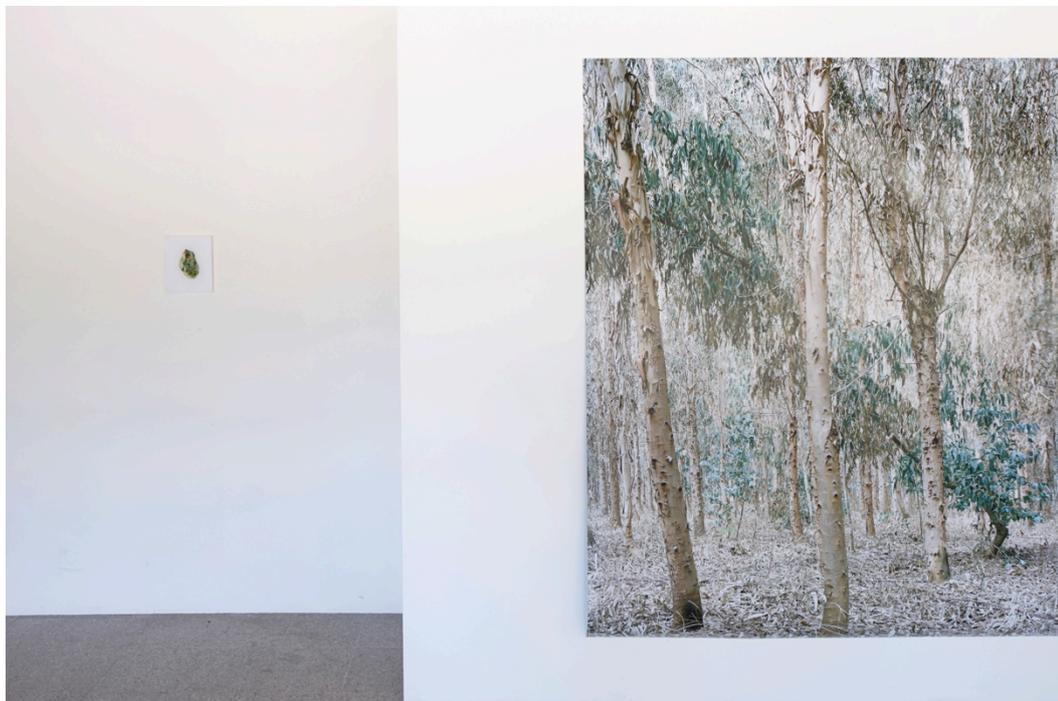


Figure 73. Installation view. *Copper Documents*, 'Surface Exposure,' 2013 (detail).

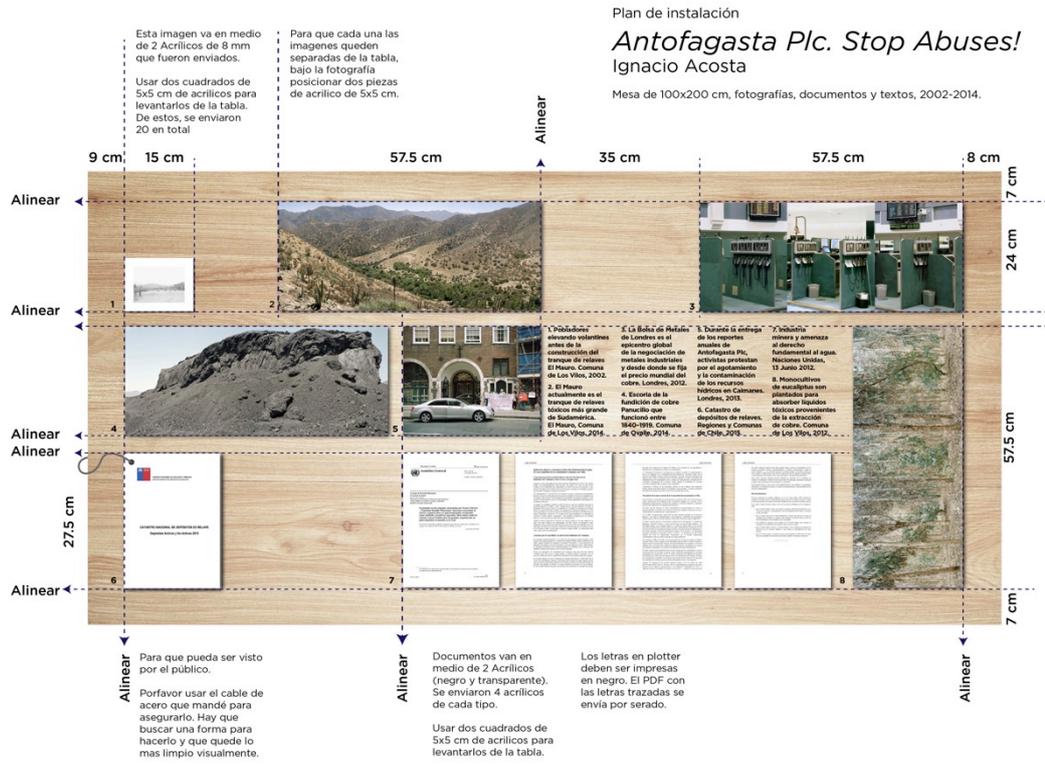


Figure 74. Installation Plan. *Copper Geographies*, 'Depresiones Intermedias,' 2015.



Figure 75. Installation View. *Copper Geographies*, 'Depresiones Intermedias,' 2015.



Figure 76. Installation View. *Copper Geographies*, ‘Depresiones Intermedias,’ 2015.



Figure 77. *The Ring*, from *LME Invisible Corporate Network*. Archival Pigment Print, 41x60cm, 2012.

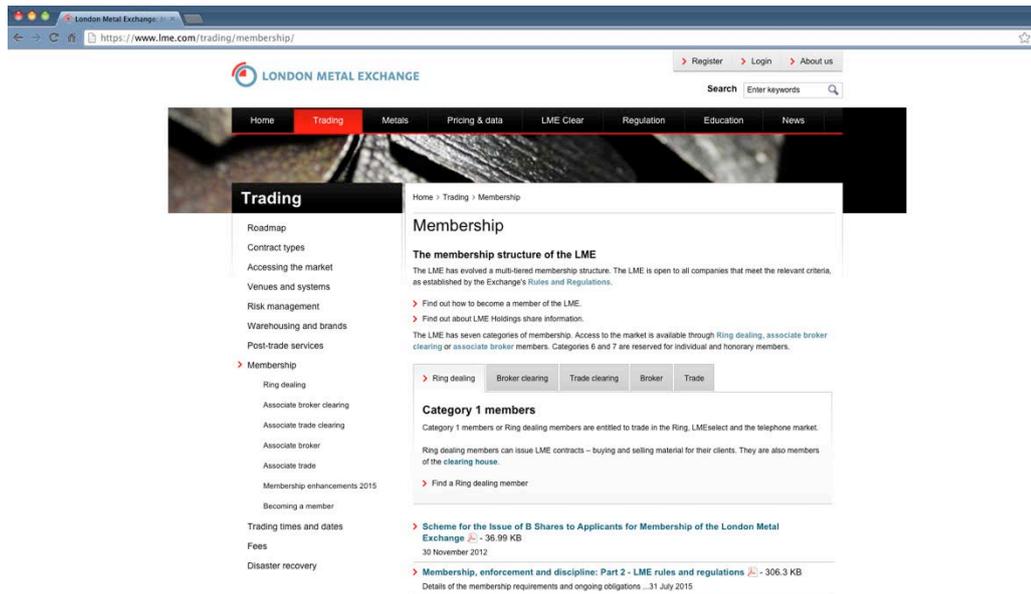


Figure 78. Data collection of five types of memberships of the LME based within the City of London.³³⁶



Figure 79. Ordnance Survey Map of the City of London with the locations of 35 companies registered in the LME website.³³⁷

³³⁶ London Metal Exchange, *Trading Memberships*.

³³⁷ The City of London Map 2006/07, Scale 1:2500 (2006) Ordnance Survey and City of London.

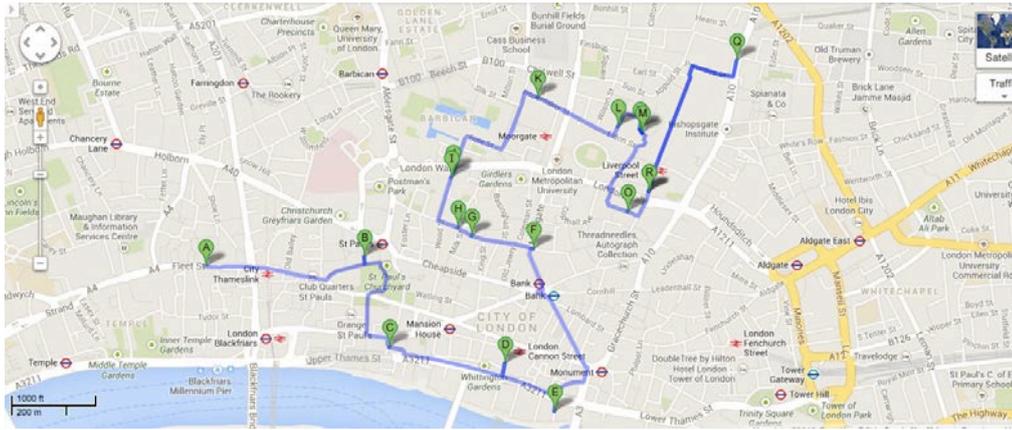


Figure 80. Designated routes created for each category of membership on Google Maps to guide the fieldwork.

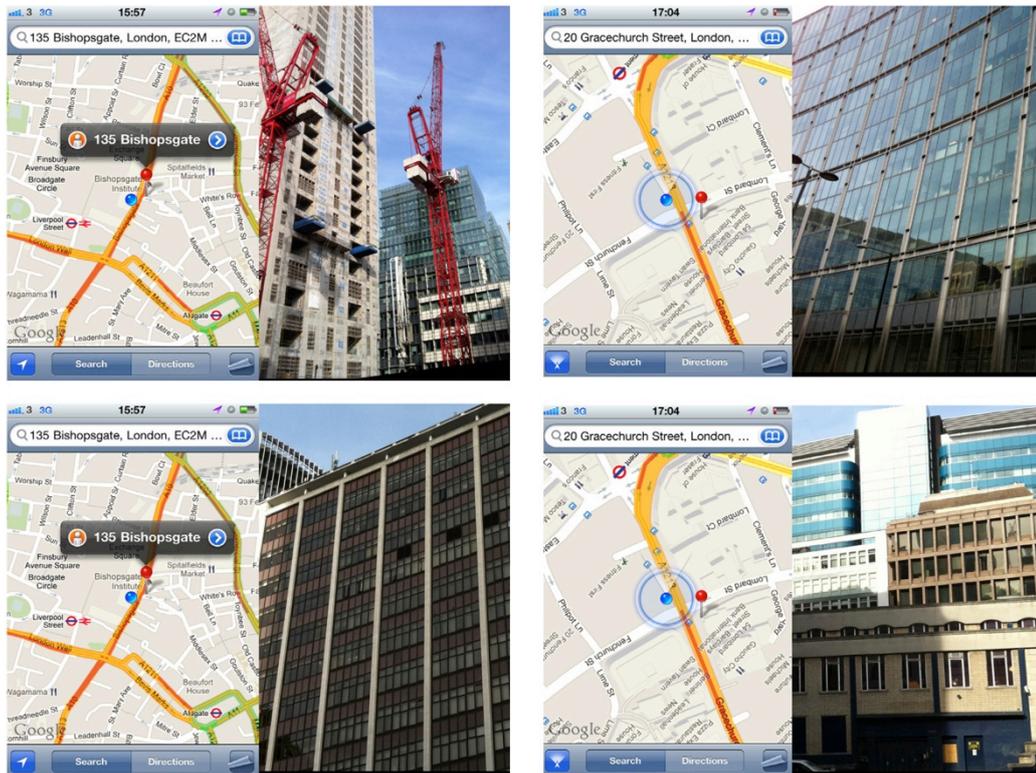


Figure 81. Fieldwork: Four of the 35 companies mapped within the city of London using Google Maps and iPhone camera.

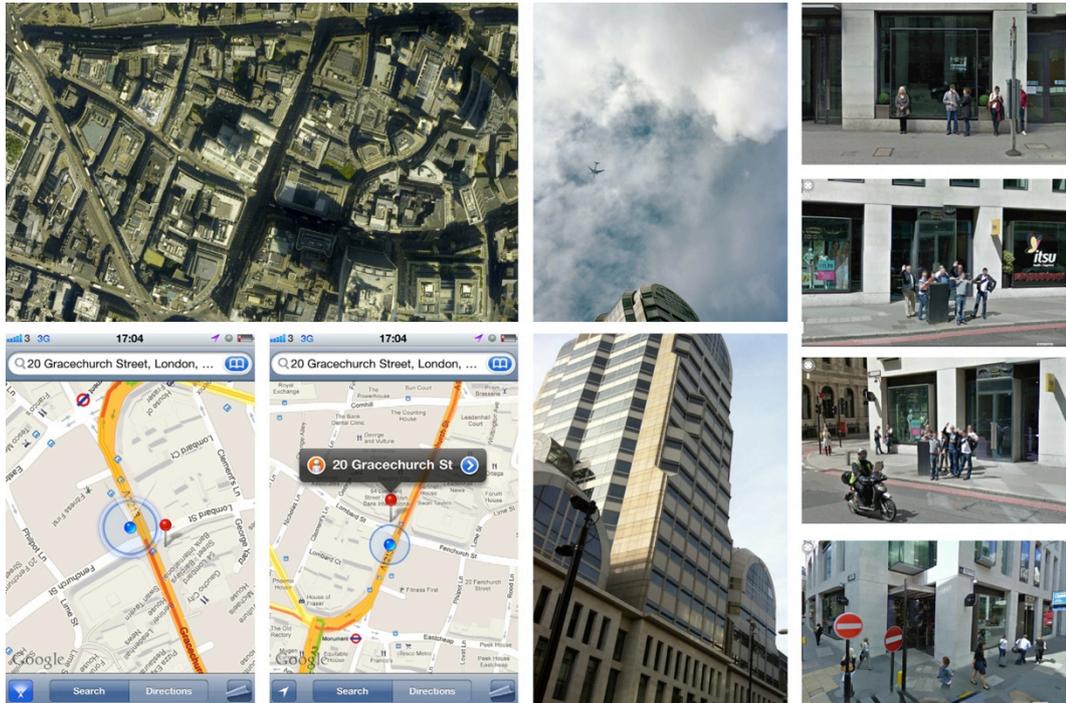


Figure 82. Open source data collection for each of the 35 locations of companies trading with the LME and based within the City of London. From top to bottom, left to right: Google Earth view, Medium format photograph, Google Street views, Google Maps (of location and of my own location at the moment of recording the photograph) and iPhone photographs.

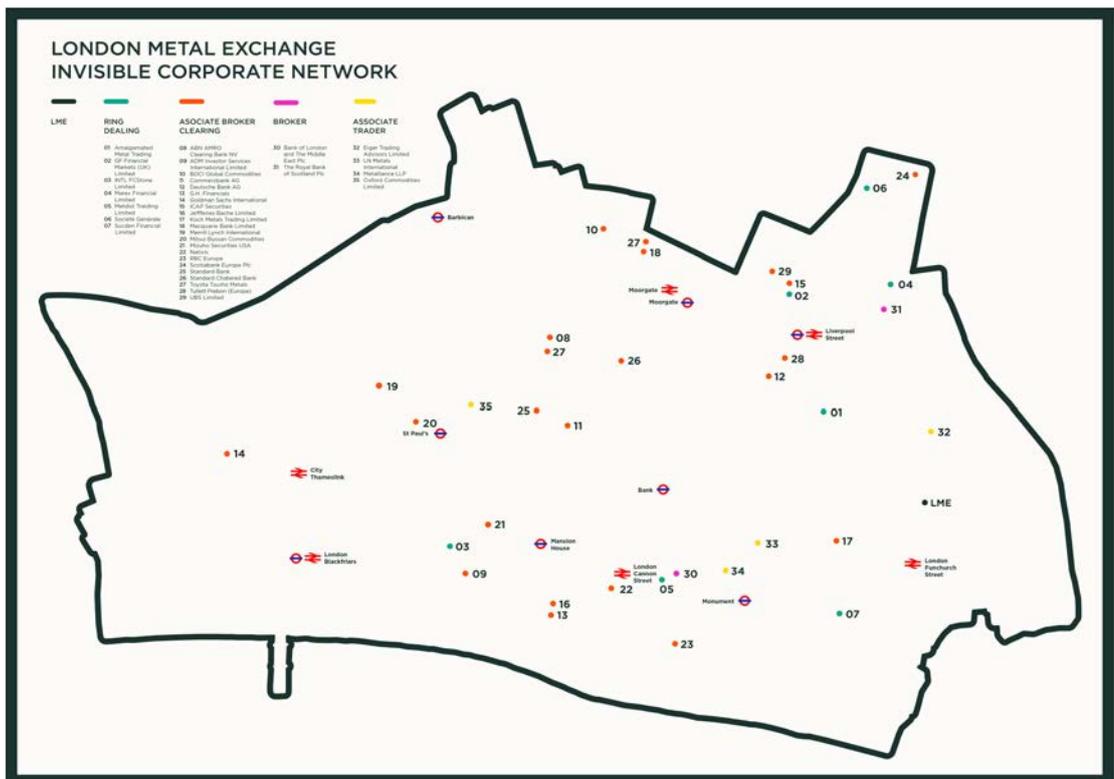


Figure 83. LME Invisible Corporate Network. Double sided A0 Poster Print, 2015.



Figure 84. *LME Invisible Corporate Network*. Double sided A0 Poster Print, 2015 (detail).



Figure 85. *LME Invisible Corporate Network*. Double sided A0 Poster Print, 2015.



Figure 86. *LME Invisible Corporate Network*. Double sided A0 Poster Print, 2015 (detail).



Figure 87. *LME Invisible Corporate Network*. Double sided A0 Poster Print, 2015 (detail).

abandon: To allow an option to expire without exercising it | **actuals:** Trades that result in the delivery of the commodity, i.e., not hedging, speculation or arbitrage. This term is interchangeable | **assay:** An independent qualitative and quantitative evaluation of the chemical elements contained in metals. [redacted] contract specifications define the strike price or exercise price | **bear:** One who anticipates a decline in prices | **bear market:** A market in which prices are declining | **bear spread:** The simultaneous purchase of one who anticipates a rise in prices | **bull market:** A market in which prices are rising | **business day:** Any day except Saturday or Sunday, any public or bank holiday in England for a 'cash' trade (i.e., for delivery two business days later) | **cathode:** The negative pole in electrolysis. Cathodes deliverable on the [redacted] are flat rectangular shapes that have a client cross: A purchase and sale by a clearing member to themselves which is recorded in the member's House account at LCH.Clearnet. A client cross is for a clearing member protection against a rise in raw material prices | **contango:** Market situation when a nearby price is lower than a further forward price | **contract specification:** The detailed specifications that limit the [redacted] | **day order:** A day order must be executed within the same trading day as the order is placed or it shall be cancelled | **declaration date:** The last date of positions to the [redacted] so that the market may be properly regulated and Lending Guidance enforced | **efficient market:** A market in which information is immediately available in relation to another | **exercise:** The process by which an option holder initiates the right to buy or sell the relevant futures contract | **exercise price (strike):** The process by which a theoretical price at which a contract/warrant should trade | **floor:** A recognised low point in market prices. This may be a point the market does not expect the price to fall for a commodity. The futures curve is also referred to as a forward curve | **50 delta:** The state of an option where the strike price is the same as, or nearest to, that of entered into with the motivation to reduce risk | **hedger:** Person undertaking a hedge | **holder:** The buyer of an option, more commonly referred to as the taker | **house account:** are traded simultaneously | **LCH:** LCH. Clearnet, the clearing house | **lending:** One form of carry. In this case the simultaneous selling of metal for a near-dated prompt and trade conducted on the Exchange | **long:** An open position for the purchase of metal | **lot:** A specified quantity of a single contractual unit (e.g., [redacted] Copper 1 lot = 25 per tonne) to confirm the trade | **matching period:** A specified period of time, by which trades must be matched | **maturity:** The date when a futures contract that has not been offset | **official prices:** The last bid and offer prices quoted in the second Ring of the morning session, commonly used by industry as a reference price for the day | **offset:** Closing applications and through which [redacted] member firms receive and execute client trading requests | **OTC:** Over-the-counter. A derivative transaction that is not standardised nor sold on any given prompt date. Also the overall position, being the net tonnage bought or sold for all prompt dates combined | **position limit:** The maximum overall position with each clearing member | **producer's hedge:** The sale of futures or purchase of put options, or both, as protection against a fall in metal prices | **prompt:** Due for immediate use to describe the periods of trading which are broken down into five-minute sessions for each metal | [redacted] category 1 member firms that have the exclusive and the price quoted for it. On the [redacted] the term 'cash' is more commonly used | **spread:** A term referring to the difference in two prices. The contango or backwardation in shape or the exchange of one futures contract into another, usually to change the prompt date | **synthetic:** A strategy of buying a combination of futures and put options at a stated price level | **traded option:** An option contract that can be bought and sold freely up to the declaration date | **transfer:** The movement of a customer's contract from one of possession, issued by the warehouse company, for each lot of [redacted]-approved metal held within an [redacted]-approved facility. Warrants are used as the means of delivering

Figure 88. *LME Invisible Corporate Network*. Double sided A0 Poster Print, 2015 (detail).

Classification	Company Name	Description	Website	Address*
RING DEALING	01 Amalgamated Metal Trading Limited	Trades physical metal as well as the trading on the LME. The company provides market making and brokerage services to its clients who wish to mitigate or manage their metal price exposure.	amt.co.uk	7th Floor, 55 Bishopsgate, London EC2N 5AH
	02 GF Financial Markets (UK) Limited	A derivatives broker providing execution and clearing services across a wide range of international futures markets.	gffm.com	1 Broadgate, London EC2M 2GS
	03 INTL FCStone Limited	Provides hedging services for clients in base metals and soft commodities. The company also provides foreign exchange prime brokerage services to a variety of clients worldwide.	intlfcstone.com	129 Queen Victoria Street, London EC4V 4BJ
	04 Marex Financial Limited	Broker in commodities and financial instruments and trades as principal on the LME and one of the largest financial services groups in the euro-zone.	marexspectron.com	55 Bishopsgate, London EC2M 3TQ
	05 Metals Trading Limited	Trades non-ferrous metals futures. The only privately owned Category I Ring Dealing Member of the London Metal Exchange.	metals trading.com	80 Cannon Street, London EC4N 6EJ
	06 Societe Generale	French multinational banking and financial services company headquartered in Paris and one of the largest financial services groups in the euro-zone.	societegenerale.com	5 G House, 41 Tower Hill, London EC3N 45G
	07 Sutden Financial Limited	Derivatives broker operating in a broad range of markets, including exchange and OTC traded financial and commodity futures and options, equities, foreign exchange and bullion.	sutdenfinancial.com	2nd Floor, South 60 Great Tower, London EC3R 5AZ
	08 ABN Amro Clearing Bank NV	Global securities services provider clearing over 16 million trades per day and covering 85 exchanges worldwide.	abnamroclearing.com	5 Aldermanbury Square, London EC2V 7HR
	09 ADM Investor Services International Limited	Global brokerage serv Quoting approximately 50 currencies spot, forward and emerging market NDF's.	admisi.com	10th Floor Temple Court, London EC4N 4TJ
	10 BOCI Global Commodities (UK) Limited	This subsidiary of Bank of China Ltd offers a wide range of investment banking services, including securities underwriting, mergers & acquisitions, financial advisory, equity sales & trading, equity derivatives, fixed income, asset management, private equity investments and global commodities.	boocigroup.com	1 Silk Street, London EC2Y 8HQ
11 Commerzbank AG	A Germany-based bank for private and corporate customers offering global banking and financial services. It serves its clients in all markets worldwide.	commerzbank.co.uk	30 Gresham Street, London EC2V 7PG	
12 Deutsche Bank AG	A German global banking and financial services company with its headquarters in Frankfurt. It operates within the City of London, a centre of global flows of trade and wealth, and combines a wide range of financial markets products.	db.com	1 Great Winchester Street, London EC2N 2DB	
13 G.H. Financials Limited	A provider of bespoke global clearing solutions for exchange traded futures and options contracts to the world's leading derivatives markets.	ghfinancials.com	Vintners Place, 68 Upper Thames St, London EC4V 3BJ	
14 Goldman Sachs International	Global investment banking, securities and investment management firm. Provides a wide range of financial services to a substantial and diversified client base that includes corporations, financial institutions, governments and high-net-worth individuals.	goldmansachs.com	Peterborough Court, 133 Fleet St, London EC4A 2BB	
15 ICAP Securities Limited	A markets operator and provider of post trade risk mitigation and information services, helping users of financial products to reduce operational and system-wide risks.	icap.com	2 Broadgate Circuit, London EC2M 7UR	
16 Jefferies Bache Limited	Global commodities and financial derivatives broker. Provides insight, expertise and execution to investors, companies and government entities. Offers deep sector expertise across a full range of products and services in investment banking, equities, fixed income and wealth management.	jefferies.com	9 Devonshire Square, London EC2M 4HP	
17 Koch Metals Trading Limited	Provides a full range of risk management products to participants from all sectors of the base metals market. Acts as principal, agent and intermediary in a variety of exchange-listed and over-the-counter commodity derivatives.	kochmetals.com	Fountain House, 130 Fenchurch Street, London EC3M 5DJ	
18 Macquarie Bank Limited	Provider of financial, advisory, investment and funds management services. It covers advisory and capital markets, trading and hedging, funds management, asset finance, financing, research and retail financial services.	macquarie.com	Ropemaker Place, 28 Ropemaker Street, London EC2Y 9HD	
19 Merrill Lynch International	Provides various financial services Acts as a broker and dealer in equities and fixed income, currency and commodities financial instruments. It also offers investment banking advisory and underwriting services, as well as offers post trade related services, and equity and fixed income research services.	ml.com	2 King Edward St, London EC1A 1HQ	
20 Mitsui Bussan Commodities Limited	A full service price risk management company, offering a global client base round the clock access to base metals and energy derivatives market making. The new Mitsui Bussan Commodities Ltd. was established in 2015 through the merger of Mitsui entities; MBC and MCRM.	mbcl.com	4th Floor St. Martin's Court, 10 Finsbury Row, London EC4M 7BB	
21 Mizuho Securities USA Inc.	One of the world's largest financial institutions, offering a broad range of financial services including banking, securities, trust and asset management, credit card, private banking, and venture capital through its group companies.	mizuho securities.com	Bracken House, 1 Friday Street, London EC4M 9JA	
22 Natixis	The international corporate, investment, insurance and financial services arm of Groupe BPCE, the second-largest banking group in France. Provides customized solutions to meet the specific needs of companies, financial institutions and institutional investors.	natixis.com	Cannon Bridge House, 25 Dowgate Hill, London EC4R 2YA	
23 RBC Europe Limited	One of Canada's largest banks and one of the largest banks in the world, based on market capitalization. Offers diversified financial services companies, and provide personal and commercial banking, wealth management, insurance, investor services and capital markets products and services on a global basis.	rbc.com	Riverbank House, 2 Swan Lane, London EC4R 3BF	
24 Scotiabank Europe Plc	Offers a broad range of corporate and investment banking, capital markets, and trade finance and corresponding banking services. In addition, offers clients a range of precious and base metals trading services and complete oil and gas advisory services.	scotiabank.com	201 Bishopsgate 6th Floor, London EC2M 3NS	
25 Standard Bank Plc	A leading integrated financial services group on the African continent. Offers a range of trading and risk management solutions across various financial markets, including foreign exchange, commodities, interest rates, equities, and credit, as well as client financing and money market funding units.	standardbank.com	20 Gresham Street, London EC2V 7JE	
26 Standard Chartered Bank	Standard Chartered plc is an international banking group operating principally in Asia, Africa, and the Middle East. The company offers its products and services in the personal, consumer, corporate, institutional and treasury areas.	sc.com	1 Basinghall Avenue, London EC2V 5DD	
27 Toyota Tsusho Metals Limited	Wholly owned subsidiary of Toyota Tsusho Corporation located in Nagoya, Japan. Specialises in futures and options trading in the non-ferrous metals market and precious metal market.	ttmetals.com	88 Wood Street, London EC2V 7DA	
28 Tullett Prebon (Europe) Limited	One of the world's leading interdealer brokers. Primarily operating as an intermediary in the wholesale commercial and investment banks.	tullettprebon.com	Cable House, 54-62 New Broad Street, London EC2M 1JJ	
29 UBS Limited	Provides financial services. The company offers investment banking, asset management, and wealth management services. UBS serves private, corporate, and institutional clients worldwide.	ubs.com	100 Liverpool Street, London EC2M 2RH	
ASSOCIATE BROKER	30 Bank of London and The Middle East Plc.	Offers competitive products and services that can be tailored to customers' needs, providing them with solutions that help their businesses and wealth grow. Provides a wide range of financing solutions and investment opportunities through Wealth Management and Corporate Banking Divisions.	blme.com	Sherborne House, 119 Cannon Street, London EC4N 5AT
	31 The Royal Bank of Scotland Plc	A financial group that provides various banking and financial products and services to personal, commercial, and corporate and institutional customers in the United Kingdom, the United States, Europe, and internationally.	rbs.co.uk	135 Bishopsgate, London EC2M 3UR
ASSOCIATE BROKER	32 Eiger Trading Advisors Limited	Asset-trading company, specializing as an intermediary in Islamic financial products. Facilitates Sharia-compliant financial products and services across the globe, connecting local economies to the asset-backed structures of Islamic Finance.	eigertrading.com	39 Houndsditch, London EC3A 7DB
	33 Metalliance LLP	Company active in the supply and production of non-ferrous metals with a primary focus on lead and lead alloys. The company supplies industrial customers worldwide but in particular Africa, the Middle East, Europe, CIS and the Far East.	metalliance.co.uk	St. Clements House, 27-28 Clements Lane, London EC4N 7AP
	34 LN Metals International Limited	Trades ferrous and non-ferrous metals, ores concentrates, residues, and by-products. The company offers non-ferrous metals, including aluminum, copper, lead, nickel, tin, and zinc, and minor metals, including bismuth, cadmium, cobalt, and selenium.	lntrading.ch	5th Floor 20 Gracechurch, Street, London EC3V 0BG
35 Oxford Commodities Limited	A secondary counterparty specialising in physical commodities transactions, acting for regulated financial institutions in the Middle East, Far East and Europe.	oxfordcom.co.uk	28 Epirus Road, London SW6 7UH	

*List compiled with information available on the LME website in 2013. Please For an updated version please see: www.lme.com/trading/membership/

Figure 89. LME Invisible Corporate Network. A4 Print, 2015.

Conclusions

Today, more than ten years after I began this thesis, thus becoming involved in photography of mining sites in Chile, the landscape and social fabric of the Pupio Valley have been irreparably torn apart. It is now just a question of time before a major ecological disaster occurs. As this thesis points out, threats include earthquakes, sudden flooding and the extreme droughts caused by global warming. A collapse of the *El Mauro* tailings dam could bury hundreds of hectares of agricultural land and potentially kill hundreds of the people who live in los Caimanes. The photograph I took in 2002 in the Pupio Valley depicts an idealized landscape. The conflict between local agricultural communities and Antofagasta Plc. remains hidden to the viewer of the photograph. Using this image as a point of departure, the case studies subsequently developed during this investigation are the continuation of an on-going commitment to give visibility to the impact of extractive industries in Chile.

Copper is a fundamental aspect of everyday life and yet, as has already been noted, it is rarely seen. Copper possesses ductile properties and is a fundamental aspect of contemporary communication technologies. Copper blends together with other forms of metals and undergoes and produces transformations endlessly. As copper travels around the globe from its base in Chile, its origin vanishes and becomes a real global phenomenon. However, copper creates disparities between those who profit from trading activities and who are directly affected by mining development.

My investigation explores the global flow of Chilean mined copper. It presents a series of fieldwork explorations of geographically disparate

landscapes, historically connected by copper. It has made visible traces of copper from raw material to capital; through ore, smelted commodity, stock market exchange value, assembled material and waste. It has disclosed the uneven spatial conditions in which the material circulates, by connecting the ecologies of resource exploitation in the Atacama Desert with the global centres of consumption and trade in Britain, and by making visible its return, hidden in manufactured goods, to the territories in which it originated. Through interconnected research, involving substantial fieldwork, archival research and photographic documentation with large and medium format cameras, and writing, the geographies of copper have been subjected to critical examination.

As my research progressed, it became clear that it was not going to be possible to represent a subject of this complexity as a whole within the scope of this thesis. My photographs do not expose the contamination of the Chilean territory – as photojournalism does – but function as mechanism to encourage viewers to think about what is hidden in the photographs. What is not visible is key to understanding the photographs. It is not just the historical conditions that remain obscured, but also the toxins that have been left in the landscape by the mining industry. To expose these forces and give meaning to the photographs, my study engages critically with the historical condition of the represented sites. However, it is not only the critical but the creative value of my photographic images, including their compositional and pictorial qualities, which has enabled me to enter the gallery and museum exhibition space. In this context, photographs can be viewed as aesthetically pleasing objects. Yet through interconnected layers of information and provocative titles, my photographic

works challenge the viewer to find out what is lurking behind idealist landscapes. This presentation strategy unsettles traditional conventions of landscape photography, in which the landscape is presented as subject to aesthetic appreciation. Instead, my photographic images and their layering of information has encouraged viewers to engage with the ongoing political, environmental and social dynamics. It is precisely those dynamics, which are not visible, that are the fundamental for photographing the sites. By giving visibility to a series of neglected historical narratives through photography in relation to writing, the work opens new ways of thinking about the geographies of copper.

Each case study can be seen as an independent fragment of a whole narrative and the meaning of each is constructed in relation to that of the others. The combined works speaks about the copper mining industry and its global circulation, uncovering the impact of the denationalisation of copper resources on the social and environmental fabric of Chile. These fragments have been created through continuous engagement with continuous fieldwork activities. Indeed, photographic practice has been central to this investigation. It has defined the way the historical research and writing have unfolded and has shaped the final outcomes (this written thesis and the photographic work accompanying it).

The journey through 'making' photographic work continually re-shaped the investigation and opened new research possibilities. Each case study presented in this thesis involved substantial planning. Many of the initial questions and thoughts came through the photographic practice, and so forth,

the outcomes becoming clearer through practice. Although a complex organizational network remains hidden to the viewer of the photographs – especially when the photographs are abstracted from their context – it is intrinsically part of it. From initial conception to the completion of the photographic object, the journey of ‘making’ photographic work includes: requesting access to sites, travelling to and reaching destinations, walking around the sites, talking to the locals, looking at manufactured copper objects, observing landscapes, reading maps, collecting archival materials, loading photographic films, shooting the camera, scanning negatives, editing photographic series, retouching, colour correcting, printing proofs, mapping connections, writing up exhibition proposals, uploading works onto websites and to my own website, setting up exhibitions, presenting works at conferences, meeting curators, art historians, amongst others.

As the title suggests, this investigation is a reflection of the geographies where the photographs were taken and also the geographies where my photographs circulate. This thesis has exposed not just the journey of copper but also my own mobility. Each photograph and written text stands as evidence of a particular moment in time and it can be used to map both the journey of copper and my own explorations. As such, the circulation of copper, my photographic images and my own journey, back and forth from Chile to Britain, remains at the core of this investigation.

We know photographs are neither able to tell the whole truth nor communicate the logic of the life behind them. Scratching at the truths of capitalist exploitation, this work critically engages with the geopolitical forces

that shape the Atacama Desert. This thesis also reflects on the boundaries of photography and its capacity for representation. Moreover, it acknowledges the limitations of photography in disclosing the history of sites. Aware of the restrictions of photography, this thesis has engaged with rigorous examinations of the geographies of copper as a way of giving visibility to those hidden connections. As such, the constellation of photographs produced during this research process work on different levels. On one, they work as mechanisms for visibility that, in conjunction with the text, reveal the political meaning of sites. On another –and since photographs provide a material trace of the objects photographed –they become artefacts of cultural significance, that explore, link and question relationships between history, geography, politics and representations. My photographs are not just tools but artefacts capable of knowledge production and transmission. As objects of aesthetic and cultural significance, they are sources for epistemological enquiry open to those who might consider this body of work in relation to other photographic practices dealing with the representation of landscape and territory in the future.

Although the photographic work produced during this investigation can be analyzed and articulated through a wide range of perspectives, including aesthetic, creative and critical, I wish their meaning to remain bound up with context in which they developed, within a critical and academic environment and as part of the *Traces of Nitrate* research project.

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<<https://lookphotofestivalblog.wordpress.com/2015/04/22/look15-artist-in-residency-ignacio-acosta/>> [accessed 4 November 2015].

Procter, Cameron (2015) *Coquimbo&Swansea*,
<<https://lookphotofestivalblog.wordpress.com/2015/05/04/coquimboswansea/>> [accessed 4 November 2015].

Procter, Cameron (2015) *Drawing on the smelted commodity*,
<<https://lookphotofestivalblog.wordpress.com/2015/04/22/drawing-on-the-smelted-commodity/>> [accessed 4 November 2015].

Procter, Cameron (2015) *Ignacio Acosta, artist in Residence*,
<<https://lookphotofestivalblog.wordpress.com/2015/05/27/ignacio-acosta-artist-in-residency/>> [accessed 4 November 2015].

Procter, Cameron (2015) *Miss Chuquicamata, the Slag*,
<https://lookphotofestivalblog.wordpress.com/2015/05/10/miss-chuquicatama-the-slag/> [accessed 4 November 2015]; *Antofagasta Plc., Stop Abuses!*

Griggs, Tom (2015) *Interview: Ignacio Acosta* <<http://www.fototazo.com/2015/10/interview-ignacio-acosta.html>> [accessed 16 January 2016].

TSOEG <<http://tsoeg.org/artists/ignacio-acosta/>> [accessed 4 November 2015].

TSOEG <<http://tsoeg.org/fieldwork/chanavaya/>> [accessed 27 January 2016].

TSOEG <<http://tsoeg.org/fieldwork/copper-geographies/>> [accessed 27 January 2016].

TSOEG <<http://tsoeg.org/fieldwork/sulphuric-acid-route/>> [accessed 27 January 2016].

Works by Ignacio Acosta

Acosta, Ignacio <<http://www.ignacioacosta.com/>> [accessed 4 November 2015].

Acosta, Ignacio <<http://www.ignacioacosta.com/chanavaya/>> [accessed 4 November 2015].

Acosta, Ignacio <<http://www.ignacioacosta.com/domeyko/>> [accessed 4 November 2015].

Acosta, Ignacio <<http://www.ignacioacosta.com/intuitiveprojects/>> [accessed 4 November 2015].

Acosta, Igancio (2014) 'Chuquicamata: a corporate mining town: bounded territory within a territory,' in *Beyond Gated Communities: Urban Gating and Soft Boundaries* by Routledge in 2014. It was previously presented at *Gated Communities and Private Urban Governance Conference*, Brighton University, June 2013.

Acosta, I. (2015) *Copper Directory for Liverpool*.

<<http://www.zeemaps.com/view?group=1376498&x=-2.989008&y=53.405487&z=0>>
[accessed 4 November 2015].

Appendix

Appendix I: Academic Papers, Artists talks and Workshops

Miss Chuquicamata and the copper ore, 'CUE Critical Urban Ecology: Urban Territories,' 13 February 2013, University of Brighton³³⁸

This paper presented a summary of work in progress developed for this PhD thesis, discussing the photographic work created in Chuquicamata mining town, alongside the political history of the site. The Symposium examined the notion of urban ecology, with speakers exploring different approaches to political, cultural and ecological matters.

Twenty Mining Billboards 'Traces of Nitrate: Archives and Landscapes between Britain and Chile Seminar,' Keynes Library, School of Arts, Birkbeck, University of London. 11 March, 2013³³⁹

This paper discussed the series of photographs *Twenty Mining Billboards* taken in Calama in 2012. It was presented in the context of a seminar organised by the Traces of Nitrate team, a project initiated by photographer Xavier Ribas in collaboration with Art and Design historian, Louise Purbrick and me [Fig 90].

³³⁸ Critical Urban Ecology Events, <<https://criticalurbanecology.wordpress.com/>>, [accessed 25 October 2015]., Critical Urban Ecology Events, <<https://criticalurbanecology.wordpress.com/cue3-2013-2/ignacio-acosta-gomez-lomo/>> [accessed 25 October 2015].

³³⁹ Centre for Iberian and Latin American Visual Studies, <<http://www.bbk.ac.uk/cilavs/events/pastevents/past2013>> [accessed 25 October 2015].

Photographic Documentation of Sites and Histories Workshop. 'Traces of Nitrate: Archives and Landscapes between Britain and Chile Seminar,'
Keynes Library, School of Arts, Birkbeck, University of London. 12
March, 2013³⁴⁰

This postgraduate workshop discussed the role of photography in the process of research, documentation and story telling of contested sites and histories. I showed examples of work to illustrate methodologies and production of photographic works. Conducted by Xavier Ribas and myself.

Toxic Forest. Ph: The Postgraduate Photography Research Network, The Photographers' Gallery, London, 4 April, 2013³⁴¹

This paper presented the problematic of Caimanes through the series of *Antofagasta Plc., Stop Abuses!*. Ph: The Postgraduate Photography Research Network was established in 2010 as a research forum for early career scholars working in the field of photography who meet monthly at The Photographers' Gallery to discuss work-in-progress. I have been a member since 2013 by invitation of the artist Corinne Silva.

³⁴⁰ Centre for Iberian and Latin American Visual Studies.
<<http://www.bbk.ac.uk/cilavs/events/pastevents/past2013>> [accessed 25 October 2015].

³⁴¹ Ph: The Photography Research Network, <<https://phphotographyresearch.wordpress.com/>> [accessed 25 October 2015].

Miss Chuquicamata: disputed mining settlement between foreign capital and national identity, 'Re-Contested, Research Conference,' Chelsea College of Art and Design, 8 May 2013³⁴²

This paper explored the contested history of Chuquicamata, once the world's largest known deposit of copper. It discussed the repercussions of these economic processes on Chilean economic systems, as well as their role in shaping the modern world economy. The multidisciplinary research conference theme revolved around sites of conflict and political art dealing with questions raised by their visual representation. The keynote speech was given by the art historian and cultural critic T.J. Demos, who has been a major source of knowledge for this thesis.

Miss Chuquicamata, the slag: disputed mining settlement between foreign capital and national identity, 'Beyond Gated Communities Research Conference.' University of Brighton, 26–28 May, 2013³⁴³

This paper discusses the material legacy of the Chilean copper mining industry in the gated corporate mining town of Chuquicamata. Through photographs and an analysis of urban structure, the presentation suggested a parallel between modular architecture and ideas of modernisation, and the ruins as a symbol of

³⁴² TrAIN & CCW Graduate School, Re-Contested Sites/Sights Research Conference. <<http://www.transnational.org.uk/projects/34-re-contested-sitesights-research-conference>> [accessed 25 October 2015].

³⁴³ Gated Communities Research Conference 2013. <http://about.brighton.ac.uk/gated/files/9613/7243/8086/Gated_Communities_Outline_Programme.pdf> [accessed 25 October 2015], Beyond Gated Communities <<http://about.brighton.ac.uk/gated/>> [accessed 25 October 2015].

their disintegration. This Research Conference was organised around the notion of the ‘gated’ as a contemporary condition of urban life across the globe.

***Copper Documents*. MA Photography Department, University of Brighton,
20 May, 2013**

An informal discussion about the photographic work developed for this PhD investigation with MA Photography students.

***Copper Documents* ‘Surface Exposure Discussion,’ University of Brighton,
16 July, 2013³⁴⁴**

Each of the artists involved in the *Surface Exposure* exhibition (Peter Bennett, Jonathan Baggaley, Rachel K. Gillies and Ignacio Acosta) gave a brief introduction to their research followed by a discussion with BA and MA students about creative practice and the development of a research idea.

***Geografía de Cobre (Copper Geography)*, ‘Dispositivo 2/Plataforma Editable,’ June, 2014 (please see more on Appendix II Awards and Residencies)**

As part of this residency, four artists talks on the work developed for this PhD of around 60 minutes each were given: 1) 17–18 June, Centro Cultural de España, Santiago; 2) 19 June, Parque Cultural, Valparaíso; 3) 20–22 June,

³⁴⁴ Surface Exposure. <<http://arts.brighton.ac.uk/whats-on/gallery/gallery-exhibitions-2013/july-2014/surface-exposure>> [accessed 25 October 2015].

Balmaceda, Antofagasta; 4) 23–25 June, Consejo Regional de Tarapacá, Iquique. [Fig 92-94].

Fotografía y Patrimonio Minero: Los antiguos circuitos mundiales del cobre, Chile-Inglaterra en el siglo XIX, (Photography and mining heritage: Global circuits of copper exchange: Chile, Britain in the nineteenth century), Centro Cultural Santa Inés, La Serena, Chile, 29 June 2014

Artist talk in the former mining region of Coquimbo about the photographic work produced during this PhD thesis. The focus was on the series *Coquimbo&Swansea* and the role of photography as a medium for re-reading mining histories. The talk was organised by ‘Corpatrimonio,’ an organisation devoted to the conservation of nineteenth century mining heritage in the region of Coquimbo [Fig 95].

Copper Geography: Photography and the politics of representation of the mining industries, ‘3rd Conference of Photography and Theory, Cyprus,’ 5 December, 2014³⁴⁵

This paper examines the dynamic relationship between photographic representation and the extractive industries. It utilised the series *Antofangasta Plc., Stop Abuses!* as point of departure for a series of questions. How can environmental and political struggles arising from natural resource industries be

³⁴⁵The International Association and Photography and Theory (IAPT) Conference Program 2014, <<http://photographyandtheory.com/wp/wp-content/uploads/2014/12/ICPT2014-Program.pdf>> [accessed 5 October 2015].

mediated through photographic representation? In the context of the series of images presented on this occasion, how can photography be used to re-articulate the relation between the local and the global, the national and the transnational? These questions were raised in the context of the 3rd Conference of Photography organised by The International Association and Photography and Theory (IAPT) on the island of Cyprus and centred on the relationship between Photography-Theory. I was part of ‘Post-colonial Perspectives: Photography and the “Global” Economies’ panel, shared with Ben Burbridge, who presented a paper titled *Mishka Henner’s Landscape of Capital*.

***Copper Geography, ‘LOOK 15 International Photography Festival,’ The Bluecoat, Liverpool, 16 May 2015*³⁴⁶ (Please see more on Appendix II Awards and Residencies)**

A conversation with my supervisor Louise Purbrick as the culmination of the residency for the LOOK Festival held at The Bluecoat. An hour-long talk was given to a local audience about the photographic work and research developed during this PhD as well as the outcomes of the research conducted about nineteenth century trading routes of copper in Liverpool and their connections to Chilean extractions sites.

³⁴⁶ The Bluecoat, <<http://www.thebluecoat.org.uk/events/view/events/2735>> [accessed 2 November 2015], LOOK 15, <<http://lookphotofestival.com/events/artists-talk-ignacio-acosta-in-conversation-with-dr-louise-purbrick/>> [accessed 2 November 2015], LOOK 15, <<http://lookphotofestival.com/events/artists-talk-ignacio-acosta-in-conversation-with-dr-louise-purbrick/>> [accessed 2 November 2015].

***Copper Geography, 'LOOK 15 International Photography Festival,' The Bluecoat, Liverpool, 16 May 2015*³⁴⁷ (Please see more on Appendix II Awards and Residencies)**

A walking tour around the former banking sector of Liverpool led by Louise Purbrick and I. The walking tour followed the points of interest highlighted on a map created during the time at 8 Water Street. The tour stopped at Derby Square, Albion House, Martins Bank, and finally, the Royal Exchange, to reveal the forgotten links between Liverpool and Latin America in the nineteenth century. One particular highlight of this tour was the mosaic on the floor of the entrance to Albion House, laid by the Pacific Steam Navigation Co., which provided crucial commercial links between Europe and South America in the late 19th century. An A5 leaflet was printed as part for the attendees of the workshop [Fig 96].

***Copper Geographies, 'Visuality, Materiality and Mining Symposium,' University of Brighton, 26 June 2015*³⁴⁸**

The 20 minute paper discussed the work developed for this PhD with an specific focus on the relationship between the series *Antofagasta Plc., Stop Abuses!* and *LME Invisible Corporate Network*. This one day symposium, organised by the Traces of Nitrate team, brought together artists, photographers,

³⁴⁷ LOOK 15, <<http://lookphotofestival.com/events/artists-talk-ignacio-acosta-in-conversation-with-dr-louise-purbrick/>> [accessed 2 November 2015], The Bluecoat, <<http://www.thebluecoat.org.uk/events/view/events/2736>> [accessed 2 November 2015].

³⁴⁸ LOOK 15, <<http://lookphotofestival.com/events/radical-history-tour-photographic-workshop/>> [accessed 2 November 2015].

geographers and historians. The academics engaged in investigations of the material and visual culture of mining, with a particular focus on global inequalities and how it affects to peoples and the environment [Fig 97].

Copper Geographies, Universidad Finis Terrae, Santiago, 15 December 2015

Talk to students on the MA Photography about the work developed for this PhD.

Copper Geographies, ‘Symposium: Artists in the Field – Ephemeral Landscapes and Experimental Geographies,’ Parasol unit, foundation for contemporary art, London, 16 January 2016³⁴⁹

I was invited to a talk as part of a symposium of artists exploring the role of fieldwork in contemporary art organised by TSOEG.

Copper Geographies, ‘Symposium Artists in the field: Ephemera landscapes and experimental geographies’. Parasol unit, foundation for contemporary art, London, 16 January 2016³⁵⁰

Artist talk as part of a symposium of artists exploring the role of fieldwork in contemporary art organised by TSOEG.

³⁴⁹ Parasol unit, <<http://parasol-unit.org/symposium-artists-in-the-field-ephemeral-landscapes-and-experimental-geographies>> [accessed 13 January 2016].

³⁵⁰ Parasol unit, <<http://parasol-unit.org/symposium-artists-in-the-field-ephemeral-landscapes-and-experimental-geographies>> [accessed 13 January 2016].

***Copper Geographies*, ‘Traffic: movement / place / flow / mobility**

Conference, Plymouth University, 15 April 2016³⁵¹

A 20 minutes paper about the work developed for this PhD at the a conference that explored the fluid notion of place. I also took part in a pin up exhibition and presentation organised by PhD students.

***Copper Geographies*, ‘Ecologias Mutantes’, MACBA, Museum of**

Contemporary Art, Barcelona, 1 December 2016³⁵²

Curator Marta Dahó presented a paper titled ‘Like a rolling stone. Rastreos y transmutaciones de lo mineral desde las prácticas artísticas’ in which, three bodies of work were used to map new photographic research practices dealing with the extractive industries: *Copper Geographies* (2010-2015), Ignacio Acosta; *Tudela* (2014), Jorge Yeregui; and *Symton* (2013), Regina de Miguel.

Appendix II: Prizes and Residencies

Artist in Residency: Geografía de Cobre (Copper Geography), ‘Dispositivo

2/Plataforma Editable Residency,’ Centro Cultural de España, Santiago,

17–18 June; Parque Cultural, Valparaíso, 19 June; Balmaceda,

Antofagasta, 20–22 June; Consejo Regional de Tarapacá, Iquique, 23–25

June, 2014

³⁵¹ ‘Traffic: movement / place / flow / mobility’ Conference <<https://www.plymouth.ac.uk/whats-on/traffic-movement-place-flow-mobility>> [accessed 22 September 2016]

³⁵² ‘Ecologias Mutantes’ International Symposium <<http://artglobalizationinterculturality.com/es/actividades/simposios/simposio-2016>> [accessed 1 December 2016]

The yearly residency is conceived as point of cultural and artistic exchange between artists and curators and local Chilean Audiences. I was invited because of my PhD investigation of the transformation of the Atacama Desert by the copper mining industry. It is organised by the curator, Rodolfo Andaur,³⁵³ who works from Iquique, at the heart of the Atacama Desert and is funded by Chilean Ministry of Culture. For the 2014 residency, the participants were: the curators, Soledad García and Lorenzo Sandoval, as well as the artists Benjamin Ossa and I. The project was structured as an artists' residency. It involved a series of fieldwork investigations and workshops/lectures with local artists. The work had a strong impact as the regions where the activities took place are major mining zones. In addition to the activities listed in Appendix I, during this residency I conducted a photographic work, *Chanavaya*, of a former guano extraction zone in the Tarapacá Region, a work which has been featured in the TSOEG website.³⁵⁴

Four talks of around 60 minutes each were delivered in four cities/five cultural centres as described Appendix I, which included two cities located in major mining zones that are central to my study. I encouraged local artists to contest mining industries through artistic research.

³⁵³ Andaur, R. <<http://www.rodolfoandaur.com/>> [accessed 2 November 2015].

³⁵⁴ Acosta, I. <<http://www.ignacioacosta.com/chanavaya/>> [accessed 4 November 2015], TSOEG. <<http://tsoeg.org/fieldwork/chanavaya/>> [accessed 4 November 2015].

Artist in Residency: Copper Geography, 'LOOK 15 International Photography Festival,' 8 Water Street and Bluecoat, Liverpool, April – May 2014

The artist residency was part of the activities of *Traces of Nitrate* project in collaboration with LOOK Festival. This residency was set up to research and map forgotten relationships between Liverpool and Chile in the copper mining industry.³⁵⁵ For the first two weeks of the residency, archival research was conducted at Liverpool Central Library and Maritime Museum.³⁵⁶ From this research, I obtained a list of companies involved in Liverpool's copper trade at the time of the opening of the London Metal Exchange in 1877 [Fig 98], which formed the basis for the construction of an open source electronic map³⁵⁷ which was later translated into a printed map [Fig 99]. During the second and third weeks, photographic works were taken in Liverpool's former banking centre, looking for elements containing copper, such as banking doors or electric cables, the North Docks outside Henry Bath industrial warehouse, and in Sudley House, built with the fortune of merchant magnate George Holt. I searched for elements containing copper in the city and within the building, such as electric plugs, or within bronze decorative elements of the architecture.³⁵⁸ The outcomes

³⁵⁵ *LOOK/15 Artist in Residency, Ignacio Acosta* <<https://lookphotofestivalblog.wordpress.com/2015/04/22/look15-artist-in-residency-ignacio-acosta/>> [accessed 4 November 2015].

³⁵⁶ *Archival Research on Copper*. <<https://lookphotofestivalblog.wordpress.com/2015/04/22/archival-research-on-copper-trade/>> [accessed 4 November 2015].

³⁵⁷ *Copper Directory for Liverpool*. <<http://www.zeemaps.com/view?group=1376498&x=-2.989008&y=53.405487&z=0>> [accessed 4 November 2015].

³⁵⁸ *Drawing on the smelted commodity*, <<https://lookphotofestivalblog.wordpress.com/2015/04/22/drawing-on-the-smelted-commodity/>> [accessed 4 November 2015].

of the residency were compiled on the blog of the festival as well as a series of reviews by Cameron Proctor on the series *Coquimbo&Swansea*, *Miss Chuquicamata, the Slag* and *Antofagasta Plc., Stop Abuses!*.³⁵⁹ The other outcomes of the residency include the artist talk and the radical walking tour described in the Appendix I.

The activities of LOOK were funded by LOOK Festival, *Traces of Nitrate* project and the Chilean Ministry of Culture through FONDART.

Copper Geography, 'Prix Pictet Prize,' 2015

The work developed for this PhD was nominated twice for the global award in photography and sustainability by Martin Barns, senior curator of the Victoria and Albert Museum, London, and by Chantal Fabres, Latin American photography advisor. This year's theme was Prix Pictet, developed around the theme *Disorder*.

Copper Geography, 'Solas Prize,' 2015

The work developed during this investigation has been shortlisted for the Solas Prize 2015.

³⁵⁹*Ignacio Acosta, artist in Residence*,
<<https://lookphotofestivalblog.wordpress.com/2015/05/27/ignacio-acosta-artist-in-residency/>>
[accessed 4 November 2015]; *Coquimbo&Swansea*,
<<https://lookphotofestivalblog.wordpress.com/2015/05/04/coquimboswansea/>> [accessed 4 November
2015]; *Miss Chuquicamata, the Slag*, [https://lookphotofestivalblog.wordpress.com/2015/05/10/miss-
chuquicamata-the-slag/](https://lookphotofestivalblog.wordpress.com/2015/05/10/miss-chuquicamata-the-slag/) [accessed 4 November 2015]; *Antofagasta Plc., Stop Abuses!*
<<https://lookphotofestivalblog.wordpress.com/2015/05/14/antofagasta-plc-stop-abuses/>> [accessed 4
November 2015].

Copper Geographies, 'Prix Pictet Prize,' 2016

Copper Geographies was nominated by editor of the online portal Tom Griggs, editor of the online journal Fototazo. This year's theme was Prix Pictet, developed around the theme *Space*.

Appendix III: Interviews and Publications

***This is a toxic Forest, 'Quadern de les arts i les lletres,' Barcelona, Spain, May 2014*³⁶⁰**

This is an intervention of photography and text in the central spread of a Spanish magazine with the work *Toxic Forest*. The text reads 'This is a Toxic Forest' and aims to unsettle the aesthetic experience of the photograph [Fig 100].

Copper Geography, 'Biennial of the End of the World Catalogue,' 2015

The work developed for this thesis has been published in the Biennial catalogue.

***High-Rise 'Tarapacá Landscapes,' Metales Pesados, Santiago, Chile, 2015*³⁶¹**

A photograph from the series of High-Rise buildings developed during the course of this PhD investigation has been featured in a book by curator Rodolfo

³⁶⁰ Quadern, <<http://quadern.fundacioars.org/este-es-un-bosque-toxico/>> [accessed 4 November 2015].

³⁶¹ *Paisajes Taracapeños*, <<http://metalespesados.cl/#/editorial/categoria/estetica>> [accessed 4 November 2015].

Andaur, alongside other works by artists working in the Tarapacá Region, Chile.

Miss Chuquicamata, the Slag ‘Beyond Gated Communities,’ Routledge, London, 2015³⁶²

A 4,000 word paper and a visual essay with photographs were published in this academic publication. Amongst the international contributors addressing notions of bounded communities, modern communications and networks of influence, is Saskia Sassen, who wrote the book’s preface.

Copper Geography interview in ‘TSOEG,’ 2015³⁶³

I became a member of a network of artists working in fieldwork. Some of the images developed during this PhD investigation were also included on this platform.

Copper Geography interview, ‘Fototazo,’ 2015³⁶⁴

An interview by a Photography Latin American journal has been published, highlighting the work developed during this PhD investigation

³⁶² *Beyond Gated Communities*, <<https://www.routledge.com/products/9780415748254>> [accessed 4 November 2015].

³⁶³ TSOEG, <<http://tsoeg.org/artists/ignacio-acosta/>> [accessed 4 November 2015], *Copper Geographies* <<http://tsoeg.org/fieldwork/copper-geographies/>> [accessed 4 November 2015].

³⁶⁴ Fototazo, <<http://www.fototazo.com/2015/10/interview-ignacio-acosta.html>> [accessed 16 January 2016].

Appendix V: Leaflets



11th-15th March
**Traces of Nitrate:
some documents**

**Pelz Room, School of Arts,
Birkbeck, University of London
43 Gordon Square, London WC1H 0PD**

CILAVS
Centre for Iberian and Latin American Visual Studies
School of Arts, Birkbeck, University of London
In collaboration with the History and Theory
of Photography Research Centre

Figure 90. Leaflet. *Traces of Nitrate: some documents*, Birkbeck University, London.




University of Brighton
Faculty of Arts

**Surface
Exposure**

Photography Research at
the University of Brighton
University of Brighton Gallery
16th - 24th July

**Ignacio Acosta
Jonathan Baggaley
Peter Bennett
Rachel K Gillies**

—
Tues 16 July 2.00 – 5.00 Seminar
G4 Grand Parade

—
Tues 16 July 5.00 – 7.00 Private View
All welcome

—
Gallery opening hours
10am – 5pm Mon-Fri (Closed Sat & Sun)
Grand Parade, University of Brighton
BN2 0JY

Image: Jonathan Baggaley

Figure 91. Leaflet. *Surface Exposure*. University of Brighton.



Figure 92. Leaflet. *Dispositivo 2/Plataforma Editable*, Santiago, 2014.



Figure 93. Leaflet. *Dispositivo 2/Plataforma Editable*, Antofagasta, 2014.



Figure 94. Leaflet. *Dispositivo 2/Plataforma Editable*, Iquique, 2014



Figure 95. Invitation. Corpatrimonio, La Serena, 2014.

**RADICAL HISTORY TOUR &
PHOTOGRAPHIC WORKSHOP**
7 May 2015

Ignacio Acosta
Louise Purbrick

LOOK/15



Archives of Antony Gibbs & Son, London Metropolitan Archives.
© Louise Purbrick, 2013

Cover
Untitled (from *Smelted Commodity*), Liverpool © Ignacio Acosta, 2015

For Further information, please visit:
www.arts.brighton.ac.uk/projects/traces-of-nitrate

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LOOK /15 / LIVERPOOL INTERNATIONAL PHOTOGRAPHY FESTIVAL

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Arts & Humanities
Research Council



BWS Liverpool's creative hub
at the Bluecoat.

Figure 96. Booklet. Cover and back cover Radical Walking tour.

Visuality, Materiality and Mining

Grand Parade
University of Brighton

Thursday 25th June 6pm
Film showing: *White Oil*, 2013,
dir. Judy Price

Friday 26 June 2015 9am-5pm
Symposium

Confirmed speakers: Ignacio Acosta, Mabe Bethonico, Ursula Biemann,
Vinita Damodaran, Gareth Hoskins, Carlos Larrea, David Paton,
Godofredo Pereira, James Ryan



Hosted by the Traces of Nitrate project, University of Brighton, in conjunction
with The Centre for World Environmental History, University of Sussex.

The symposium brings together artists, photographers, geographers and historians to explore the visual and material culture of mining from the disrupted landscape to the labour of miners. In different ways, using both academic and artistic practices, participants in the Visuality, Materiality and Mining symposium will consider the global inequalities of extractive industries, their affects upon land and people. The symposium examines how raw materials, exploded, prised or pumped from beneath the surface of earth, appear in industrial and post-industrial cultures. It investigates how mined landscapes are or can be represented. We hope to edge towards a better understanding of the mobilities and entanglements of mined materials, their material and political effects.

<http://arts.brighton.ac.uk/projects/traces-of-nitrate>

<http://www.sussex.ac.uk/cweh>

Image: *The Ring*. London Metal Exchange, London (from *Copper Geographies*) © Ignacio Acosta, 2012

Figure 97. Poster. Visuality, Materiality and Mining.

Copper and guano directory for Liverpool, 1877*

Category	Name	Address**
Copper agents	Ellis William Bond	9 Redcross Street
Copper merchants	Bailey Bros & Co.	22 Tower-buildings north
	Clifford Chas & Sons	15 Sweeting Street
	Elliot's Patent Sheathing and Metal Co.	18 Drury Buildings, Water Street
	Lambert C. (and yellow metal sheathing)	37 Brook Street
	Leishman and Welsh	4 Vulcan Street
	Lloyd & Lloyd	63 Paradise Street
	Martyn, Dennis & Co.	14 Water Street
	Murtz's Metal Co. Ltm	2 Redcross Street
	Newton, Kates & Co.	28 Saint James Street
	Richard & Co.	48 South John Street
	William, Foster & Co.	20 Canning Place
Copper smelters	Bibby John, Sons and Co.	31 James Street
Guano merchant	Quinn P and Co.	6 Mathew Street
Iron and metal broker	Birch John and Co.	10 Chapel Street
Merchants	Balfour, Williamson and Co.	Alexadra Buildings, 19 James-street
	Birch ad Co.	Queen-Building
	Duncan, Fox and Co.	31 James Street
	Pacific Steam Navigation Co.	Pacific building, 31 James Street
Metal agent and merchants	Scott F E B	21 Strand Street
Metal agent and merchants	Samuel Mark and Lewis	1 Rurnford Place

Category	Name	Address**
Metal and chemical merchants	Samuel Ralph & Sylvester	62 Dale Street
Metal and producer brokers	Vivian, Bond & Watson	4 Rurnford place
Metal brokers	James and Shakspeare	3 Peter Street
	Eyre William and Nephew	1 India buildings, Water Street
	Hallows James	31 James Street
	Ross Charles	6 Old Hall
	Sanders Brothers	15 Bery's building
	Sparrow Alexaner & Co.	55 The Albany, Old Hall-Street
	Wells, Charles	2 India Building, 31 Water Street
Metal broker and coal merchants	Senior John and Co.	Barned's Building
Metal broker and agent	Roach John	11 Rurnford Place
Metal broker and shipping agent	Sweeney Williams James	32 Tower building west
Metal merchants	Dickenson and Co.	14 Queen Insurance-building
	Nash Henry and Co.	12-14 Tower-building north
	Phelps Brothers and Co.	26 Chapel Street
Mineral oil merchants	Samuel W H and Co.	62 Dale Street
Phospho guano merchants	Samuell and Sons	Orange Court
South American merchants	Dickinson, Robinson & Co.	18a South Castle-street
Ship owners and merchants	Gibbs, Bright and Co.	Derby Square

* Compiled by Ignacio Acosta during during artist residency for LOOK/15. Based on the Gore's Directory of Liverpool, 1877 and The Liverpool Commercial List, 1877.
 ** Please note that some of these addresses do not longer exist.
 A map based on this list can be found online: <http://lmp/iaghce7>

Figure 98. Map. Copper and guano directory for Liverpool, 2015.

COPPER AND GUANO DIRECTORY FOR LIVERPOOL, 1877*

Category	Name	Address
	Exchange	
	Customs House	
Copper agents	Ellis William Bond	9 Redcross Street
Copper merchants	Bailey Bros & Co.	22 Tower-buildings north
	Clifford Chas & Sons	15 Sweeting Street
	Elliot's Patent Sheathing and Metal Co.	18 Drury Buildings, Water Street
	Lambert C. (and yellow metal sheathing)	37 Brook Street
	Leishman and Welsh	4 Vulcan Street
	Lloyd & Lloyd	63 Paradise Street
	Martyn, Dennis & Co.	14 Water Street
	Murtz's Metal Co. Ltm	2 Redcross Street
	Newton, Kates & Co.	28 Saint James Street
	Richard & Co.	48 South John Street
	William, Foster & Co.	20 Canning Place
Copper smelters	Bibby John, Sons and Co.	31 James Street
Guano merchant	Quinn P and Co.	6 Mathew Street
Iron and metal broker	Birch John and Co.	10 Chapel Street
Merchants	Balfour, Williamson and Co.	Alexadra Buildings, 19 James-street
	Birch ad Co.	Queen-Building
	Duncan, Fox and Co.	31 James Street
	Pacific Steam Navigation Co.	Pacific building, 31 James Street
	Scott F E B	21 Strand Street
Metal agent and merchants	Samuel Mark and Lewis	1 Rurnford Place
Metal and chemical merchants	Samuel Ralph & Sylvester	62 Dale Street
Metal and producer brokers	Vivian, Bond & Watson	4 Rurnford place
Metal brokers	James and Shakspeare	3 Peter Street
	Eyre William and Nephew	1 India buildings, Water Street
	Hallows James	31 James Street
	Ross Charles	6 Old Hall
	Sanders Brothers	15 Bery's building
	Sparrow Alexaner & Co.	55 The Albany, Old Hall-Street
	Wells, Charles	2 India Building, 31 Water Street
Metal broker and coal merchants	Senior John and Co.	Barned's Building
Metal broker and agent	Roach John	11 Rurnford Place
Metal broker and shipping agent	Sweeney Williams James	32 Tower building west
Metal merchants	Dickenson and Co.	14 Queen Insurance-building
	Nash Henry and Co.	12-14 Tower-building north
	Phelps Brothers and Co.	26 Chapel Street
Mineral oil merchants	Samuel W H and Co.	62 Dale Street
Phospho guano merchants	Samuell and Sons	Orange Court
South American merchants	Dickinson, Robinson Co.	18a South Castle-street
Ship owners and merchants	Gibbs, Bright and Co.	Derby Square



* Compiled by Ignacio Acosta during artist residency for LOOK/15. Based on the Gore's Directory of Liverpool, 1877 and The Liverpool Commercial List, 1877.
 A map based on this list can be found online: <http://lmp/iaghce7>

Figure 99. Map. Copper and guano directory for Liverpool, 2015.



Figure 100. Spread Magazine. *This is a Toxic Forest*, 2012.