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**ENVIRONMENTAL EFFECTS OF FOREIGN INVESTMENT
VERSUS DOMESTIC INVESTMENT IN THE MINING SECTOR
IN LATIN-AMERICA**

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LIST OF CONTENT

<u>I. INTRODUCTION</u>	3
<u>II. DIRECT NATIONAL AND FOREIGN INVESTMENT IN THE MINING SECTOR</u>	4
<u>II.1. Chile</u>	4
<i>Production</i>	4
<i>Investment</i>	5
<u>II.2. Peru</u>	6
<i>Production</i>	6
<i>Investments</i>	7
<u>III. ENVIRONMENTAL EFFECTS OF DIRECT FOREIGN INVESTMENT</u>	8
<u>III.1. Scale Effects</u>	9
<i>III.1.1. Air contamination</i>	10
<i>III.1.2. Water contamination</i>	11
<i>III.1.3. Water use</i>	12
<i>III.1.4. Other effects</i>	12
<u>III.2. Structural Effects</u>	14
<u>III.3. Technology Effects</u>	14
<u>III.5. Regulatory Effects</u>	16
<u>III.6. Summary of environmental effects</u>	17
<u>IV DOMESTIC AND INTERNATIONAL PRESSURES FOR IMPROVED PERFORMANCE</u>	17
<u>IV.1. Domestic Pressures</u>	18
<u>IV.2. International pressures</u>	18
<u>V. CONCLUSIONS</u>	20
<u>BIBLIOGRAPHY</u>	22
<u>ANNEX 1</u>	24
<u>ANNEX 2</u>	28

I. INTRODUCTION

One of the characteristics of the world economy over the last two decades has been the strong growth in the direct foreign investment flow (FDI¹). In fact, more and more companies, in an increasing number of economic sectors and countries, have decided to expand their investments beyond their borders; in parallel, the receiving parties compete with ever increasing ardour to attract these investment capitals.

The participation of developing countries in the total flow of FDI at a world scale increased continuously between 1984 and 1997, year in which it reached a peak of 41%.

As for Latin-America, FDI in the Region has increased continuously, reaching a total of US\$ 767 billion in 1998, a figure equivalent to about 40% of the total investment flow into developing countries.²

However, it is important to point out that the strong increase in FDI has not been spontaneous, but rather induced by important policy reform processes such as the opening up of the economies and changes in regulatory policies, as well as the implementation of privatisation processes of companies in the Region.³ The agreement to grant national treatment to foreign investments, endorsed by member countries of the WTO, has also contributed to this process.

The economic benefits of FDI are well-known: technological innovation, increases in competitiveness, improvements in efficiency and transfers of intangible resources such as new forms of organisation, administration and marketing.⁴

On the other hand, environmentalists have argued that FDI brings along negative environmental effects especially in developing countries that have lower environmental standards, possibly constituting pollution havens.

Also, many developing economies, particularly those of Latin America, are characterised by their natural resource based production and exports, primarily in the mining, forestry and fishery sectors. These are environmentally sensitive sectors, not only with regard to the potential environmental effect involved in the processing of the resources, but also regarding the exhaustibility of the resources involved, and thus involving, especially at the local level, all kinds of long term sustainability issues.

This document intends to determine the environmental impact of FDI in the mining sector in Latin America. Considering the scarcity of information available on the subject within the Region, Chile and Peru have been chosen as representative, both, for the importance of these countries in regional production and exports, and because they reflect different realities in terms of their production structures and evolution.

The impact of FDI on the environment will be measured against its scale and structural effect, its effect upon environmental regulations; and its effect upon technology.

Additionally, some elements which have a direct impact upon the environmental effects of the domestic and foreign investments will be briefly analysed. Amongst these elements, the degree of environmental consciousness amongst the population, the existence of a regulatory framework, the financial sources of the capital base and the image factor are emphasised.

The paper's findings are based on a literature review, interviews to selected experts in the respective countries, and a survey that involved the major mining companies in Chile⁵.

¹ According to the OECD benchmark definition, FDI refers to capital invested with the aim of acquiring a lasting interest in a company and in order to exercise some degree of influence over the company's operations.

² See CEPAL (1999)

³ See OECD (1998)

⁴ See Johnston (1999)

⁵ This survey was applied to 50 mining companies in Chile. The survey was directed at obtaining basic information on environmental management in foreign and domestic companies. The response rate to the survey was 26%. The respondees make up approximately a 50% of total production. Annex 1 contains the questionnaire.

II. DIRECT NATIONAL AND FOREIGN INVESTMENT IN THE MINING SECTOR

During the last decade there has been an increase regarding investments in Latin America's mining sector from US\$ 200 million to US\$ 117 billion in 1997.

Chile and Peru are the most important mining countries in Latin America. Chile is the largest copper producer in the Region as well as in the world, now delivering about a third of the global copper production. Peru, on the other hand, occupies the seventh place on a global level and second in Latin America. In both cases foreign investment statutes and tax regimes are favourable, and in the Peruvian case there has been an important privatisation process.

II.1. Chile

Production

The mining sector in Chile is made up of the mining of metals, non-metals and fuels. The most important sub-sector corresponds to the mining of metals, which exported an average of US\$ 6,986 billion a year in the last five year period (1995-1999). Copper is the most important mineral within this sub-sector, followed by gold, molybdenum, iron and silver. The second most important sub-sector corresponds to the mining of non-metals, which exported an average of US\$ 276,7 million a year in the last five year period (1995-1999). Iodine, saltpetre, lithium carbonate and table salt stand out for their importance within this sub-sector. The fuels sub-sector is the least important in economic terms and is made up of coal, crude oil and natural gas.

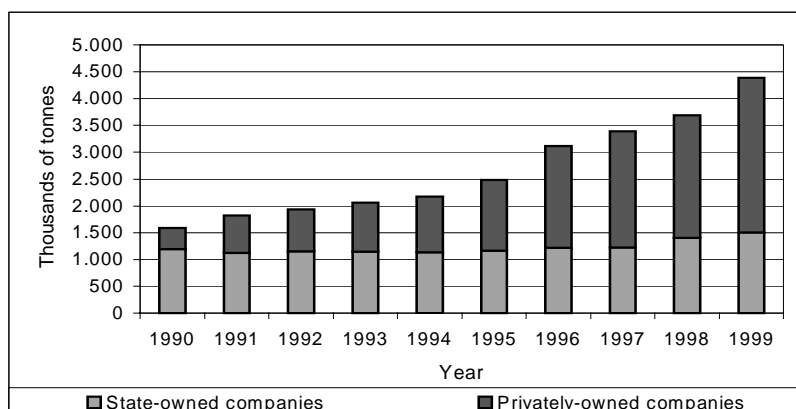
During the last decade the mining sector has contributed an average of 8,5% to the country's Gross Domestic Product (GDP). For many regions of the country the mining sector is the main source of growth and income, especially in the northern area of Chile. For example, in 1996 the mining sector contributed 56%, 47%, 22% and 15% of the Gross Regional Product (GRP) of the Regions of Tarapacá (I), Antofagasta (II), Atacama (III) and Coquimbo (IV)⁶, respectively. In the case of the south of Chile, only in the Regions of Bernardo O'Higgins (VI) and Magallanes (XII) mining is an important source of income, contributing 25% and 20% of GRP, respectively.

46,71% of total Chilean exports between 1990 and 1999 correspond to exports from the mining sector, with copper being the principal product representing 38,7% of all exports between 1990 and 1999.

As seen in Graphic N°1 copper production has slowly increased over the decade of the 90s, especially due to the increase in private production which rose from 393 thousand tons in 1990 to 2.875 thousand tons in 1999. This significant increase in copper production by private companies over the decade, is mainly due to the opening of new mines, especially La Escondida, Candelaria, Zaldivar, Cerro Colorado, El Abra and Collahuasi, amongst others.

⁶ Chile is divided into 13 administrative Regions, numbered from I to XII from North to South - plus the XIII Region which is the Metropolitan Region of Santiago.

**GRAPH N°1
COPPER PRODUCTION BY COMPANY 1990-1999**



Source: COCHILCO, 2000.

Investment

The increase in private investment has basically been an increase in foreign direct investment. In effect, table N°1 shows the importance of FDI over total investment in the mining sector, ranging from 61,7% in 1996 to 78,3% in 1998.

The principal inflow of FDI in the mining sector was materialized through the Decree 600 of 1974. With the intention to promote foreign investment in the country as a means of inducing growth, the government promulgated Decree 600 which was applicable to investment in all productive sectors, basically establishing: non-discriminatory equal treatment for national and foreign investors; free access to the diverse markets and sectors; elimination of payments for the repatriation of utilities and; the possibility for foreign investors to opt for a special tax regime offering long term tax stability.

Another instrument created to promote FDI was the Chapter XIX of the Compendium of Regulations for International Exchanges of the Chilean Central Bank, dated 1985. However, whereas in the forestry sector this instrument acquired some importance, in the case of the mining sector this instrument was irrelevant (CEPAL, 1999)

FDI in the mining sector between 1974 and 1999 amounted to US\$ 14.723 million, equivalent to 36,2% of total FDI in this period (US\$ 40.660 million). Whilst between 1974 and 1989 FDI mining amounted to US\$ 2.400 million, between 1990 and 1999 this sum rose to US\$ 12.323 million.

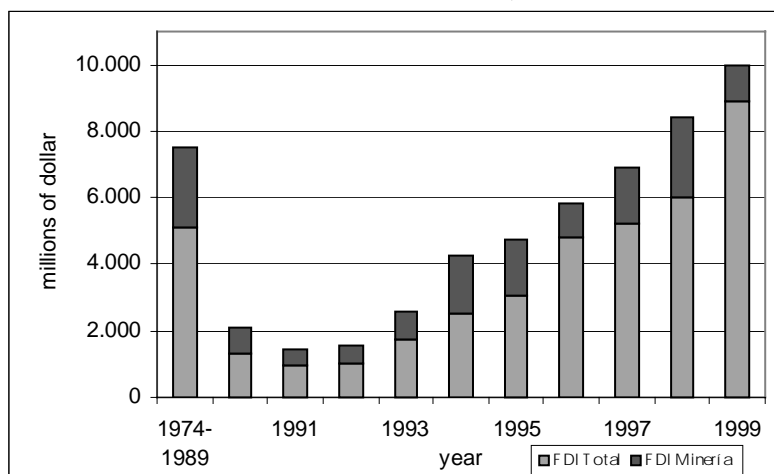
**TABLE N°1
EVOLUTION OF FDI AND DOMESTIC INVESTMENT IN THE MINING SECTOR
(US\$ millions)**

Year	FDI	Domestic Investment ⁷	Total Investment	% FDI
1996	999	619	1.618	61,7
1997	1.705	848	2.553	66,8
1998	2.394	665	3.059	78,3
1999	1.068	434	1.503	71,1

Source: Author's elaboration with data from COCHILCO, 2000.

⁷ As a proxy for the domestic investment in the mining sector, state-owned company CODELCO's figures were taken (published in CODELCO's Annual Balance under Fixed Assets and Mine Development")

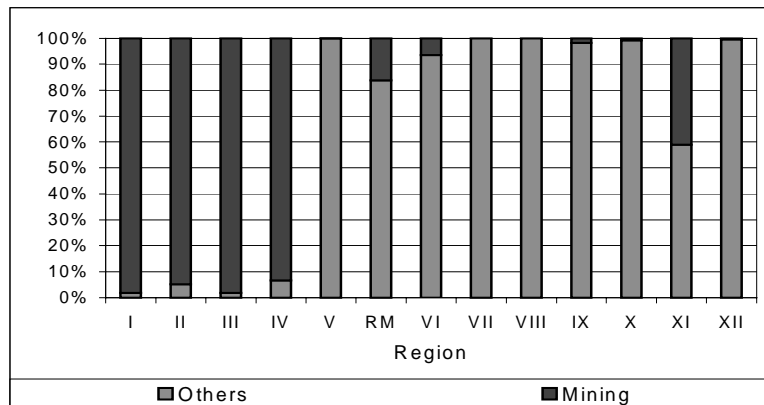
**GRAPH N°2
FDI IN THE MINING SECTOR , 1974-1999**



Source: Foreign Investments Committee

Between 1974 and 1999, 36% of the materialised FDI in mining was in the II Region, 20% in the I Region and 18% in the Metropolitan Region; the remaining percentage was distributed between the IV, V and VI Regions. Mining plays an important role in FDI materialised in the northern area of Chile where almost all FDI has been in the mining sector. For example, between 1979 and 1999, 98%, 95%, 98% and 93% of the FDI materialised in the I, II, III and IV Regions respectively, was in mining.

**GRAPH N°3
CONTRIBUTION OF MINING IN THE FDI MATERIALISED BY REGION, 1979-1999**



Source: COCHILCO, 2000.

The table in annex 2 provides a list of the investments in large-scale mining between 1974-1998.

II.2. Peru

Production

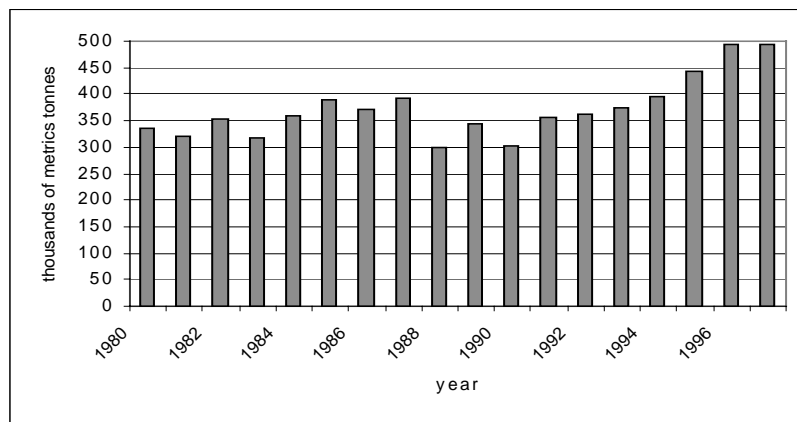
Peru has a long tradition in mining, an activity with a significant share in the national economy. Between 1990 and 1997 mining contributed 44,5% to total exports. In 1997 metal mining production was responsible for 7% of the national product, an amount increasing to 10% when smelting and material refining activities are included. (Pasco-Font, 2000).

In 1997 33,4% of the value of mining production came from copper, followed by zinc (28,8%), gold (24,1%), silver (9,3%) and lead (4,4%) (Pascó-Font, 2000). The production of copper is carried out in large-scale, medium and small-scale operations. Large-scale mining accounts for 93% of national copper production, with Southern Peru Copper Corporation (SPCC) being the main copper production company in Peru. The other large mining companies are BHP Tintaya, Compañía Minera Cerro Verde and Centromín Perú. Foreign capital participates in all these companies.

The medium-scale mining is basically made up of nationally owned companies and contributes about 6% to national copper production (Pascó-Font, 2000).

As can be seen in Graph N°4, the increase in copper production is concentrated in recent years. The 1980s were characterised by unfavourable macro-economic policies and a complicated political and social context.

**GRAPH N°4
COPPER PRODUCTION 1985-1997**



Source: Anuario Minero del Perú, 1997

Investments

The tariff structure and multiple exchange system that prevailed in Peru until 1990 resulted in a cost disadvantage of an average 40% for mining companies in Peru compared to their international competitors (Pascó-Font, 2000). This, together with the social and political instability, generated an unattractive scenario for long-term investments in the mining sector, which had been relatively stagnant already since the beginning of the 70s.

The only private investment in the 70s was the development of Cuajone by SPCC in 1976, this being one of the reasons why SPCC was the only foreign company dedicated to the exploitation of natural resources which was not nationalised. The other mining projects carried out during this period (Cerro Verde, Tintaya, Cobriza) were all public sector investments.

However, at the start of the 90s the Peruvian government initiated a series of structural reforms with the objective of improving investment conditions in the country. Milestones included: unification of exchange rate⁸; reduction and later elimination of export taxes; tariff reform; adoption of legislation to promote private investment with the objective of attracting foreign capital; and the privatisation process in the mining sector (Pascó-Font, 2000).

Table N°2 presents the evolution of FDI in the mining sector. During 1992-1999, mining FDI increased on average by 18% each year. However, growth of total FDI during in this period amounted to 35,9% annually. Thus, the participation of mining FDI in total FDI dropped from 37% in 1992 to 19,2% in 1999.

⁸ Previously, each sector had a different state-fixed exchange rate

TABLE N°2
EVOLUTION OF FDI IN PERU 1992-1999
(millions of dollars)

	1992	1993	1994	1995	1996	1997	1998	1999	Ave. Var 92-99 (%)
Mining FDI	557	565	876	1.046	1.141	1.225	1.364	1.649	17,8
Total FDI	1.503	1.642	4.450	5.541	6.232	7.267	7.998	8.573	35,9
Mining FDI/Total FDI (%)	37,0	34,4	19,7	18,9	18,3	16,9	17,1	19,2	

Source: elaborated with data from CONITE and Pascó-Font (2000)

On the other hand the participation of foreign investment in total investment (foreign and domestic) in the mining sector increased from 44% in 1992 to 76% in 1996.

Both, the guarantees and incentives provided to foreign investment at the beginning of the 1990s, as well as the privatisation process were crucial to the flow of foreign investment. In fact, the public companies Hierro Perú, Cerro Verde, Tintaya and Cajamarquilla, La Granja and Antamina were all acquired by foreign companies. At the end of 1997 the state, which in 1990 controlled 50% of mining production, had reduced its participation to 1,5%. (Pasco-Font, 2000).

The table in annex 2 provides a list of the investments in large- scale mining between 1992-2001.

III. ENVIRONMENTAL EFFECTS OF DIRECT FOREIGN INVESTMENT

Environmental effects from mining are, by now, relatively well studied and have been discussed in numerous international and national fora. In the mining sector the initiative that is currently probably most carefully watched by different stakeholders is the Minerals and Mining Sustainable Development Initiative. Rather than discussing the different environmental impacts from mining, the focus of this paper is on the question of the environmental impact specifically attributable to foreign direct investment. Before analysing this interaction, it is important to keep in mind that mining involves the extraction of natural resource as well as aspects of contamination generated during the extraction and processing phases.

The traditional framework for identifying and evaluating environmental impacts from trade is applied in order to structure the analysis of environmental effects. According to this framework effects can be differentiated into:

- scale effects – positive scale effects occur when the economic growth (in this case that deriving from the FDI) creates a surge in the demand for environmental goods and the economic gains are used to tackle environmental problems. Negative scale effects occur in the absence of environmental regulations and management; the economic growth increases the use of natural resources and the generation of waste and residues. Also, on a microlevel scale effects can refer to the increase in scale of the individual operations and the corresponding impacts on the environment
- structural effects – these relate to changes in the pattern of economic activity, including shifts from one product to another, price changes in input prices, changes in industry ownership, and/or changes in efficiency, amongst others. The changes might imply positive or negative environmental effects.
- technological effects – these refer, on the one hand, to positive spill-overs from the use of environmentally friendly technology in production and exploitation. On the negative side there might be a transfer of inadequate technology or technology that has been prohibited in the country of the mother company due to its negative environmental effects, and is then exported by the mother company to the country of its subsidiary where the use

has not yet been restricted.

- regulatory / policy effects – these refer to potential effects on domestic environmental regulation. Positive impacts would refer to pressures to improve regulation, and negative impacts refer to downward pressure due to competitiveness (“race to the bottom”) in order to attract more foreign investment⁹

Some general issues

There are some general aspects to emphasize beyond the above-mentioned analytical framework:

Before anything, it should be kept in mind that the differentiation between foreign and domestic investment has become, by now, increasingly difficult. Different companies have various owners, and different operations are run, in turn, by different companies. Joint ventures are common and, given the large amount of capital required in mining operations, are a necessity in the sector. Thus, in this context the FDI is becoming more and more blurred and cannot be assessed easily through individual operations. The more open the economy is, differences between large domestic and foreign investment are becoming increasingly subtle. Having said this in the following it will be shown that these subtle differences can still be extremely important.

It is impossible to provide an overall evaluation in the sectors about the effects of FDI. Authors, such as Pasco-font (2000) for the Peruvian case, have referred to the privatisation process, in which FDI has played an important role, stating that: “The net environmental effect of “this process” (in this case the privatisation process) is positive.” However, quantitative and qualitative data is missing to follow up such statements.

According to our survey results, foreign investment operations and domestic operations have converged in their environmental management practices over the last decade. Today all companies have environmental departments with an average of 4 employees, all companies have some sort of monitoring for water and air quality in place, but are lacking monitoring for soil quality; all companies have an environmental policy and written directives, and the average budget for environmental affairs amounts to 1-5% of the overall budget in both, national and foreign companies.

This result compares to previous findings – such as Geisse (1990), or Borregaard et al. (1998) which emphasize the difference in environmental performance between foreign and domestic companies in the 1980s and early 1990s. The involvement of Chilean state-owned copper company CODELCO, alongside multinational mining companies, in important initiatives directed at improving the environmental performance in the sector – such as the Minerals and Mining Sustainable Development Initiative – is an indication that validates, at least partly, the survey results.

On the other hand there seem to remain some differences, reflected for example in the fact that so far it is only foreign owned companies that have certified in ISO 14001.¹⁰

Motivations behind environmental activities and preoccupation – such as existing environmental regulations, environmental awareness of civil society, past environmental abuses (historical burden) – are analysed in the last chapter of this paper. Different factors can constitute significant conditioners to environmental effects of FDI. For example, whereas FDI exerts influence onto domestic environmental regulation, domestic environmental regulation also influences the environmental effects of FDI.

III.1. Scale Effects

For both countries analysed the previous chapter has described the explosive expansion in the mining sector, primarily due to foreign investments. Undoubtedly, this expansion - in the Chilean case an expansion by factor 3 in the decade of the 1990s - carries along significant environmental effects. Even the cleanest production process still

⁹ For amore detailed description of this framework and the analytical aspects see for example UNEP (1999), or OECD (1995)

¹⁰ In the Chilean case the ISO 14001 certified companies in the mining sector are: La Escondida (BHP), Candelaria (Phelps Dodge)

implies environmental effects, especially in mining which is related to a large range of environmental impacts, including air emissions from smelting, dust from mineral extraction, water contamination due to tailings or acid mine drainage, soil contamination from wastewater that contains heavy metals and arsenic from smelting, toxic and non-toxic solid waste, landscape interventions - to mention only the principal effects. Thus, more investment will necessarily imply more environmental effect regarding the expansion of production. However, large differences can arise through the use of cleaner and more modern technologies. Thus, scale effects cannot be measured through a mere lineal correlation of environmental and production effects, but have to be pondered considering technological differences.

In Chile, main environmental impacts from mining relate to air contamination, water contamination, and water use.¹¹ The following table shows production increases by operation:

TABLE N°3
CHILEAN COPPER PRODUCTION BY COMPANY (*)
(thousands of tonnes of fine copper)

Company	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Participation 1999 (%)
Codelco-Chile	1,195	1,125	1,156	1,139	1,134	1,165	1,221	1,231	1,403	1,508	34.4
Enami	142	149	149	154	119	127	128	97	83	71	1.6
Mantos Blancos	73	79	69	75	76	76	122	133	138	152	3.5
Disputada	112	104	132	181	188	199	201	202	216	248	5.7
Escondida	9	298	336	389	484	467	841	933	868	959	21.9
Cía. Minera El Indio	27	27	25	28	32	35	35	32	28	15	0.3
Michilla	-	-	-	-	27	56	63	63	62	61	1.4
Candelaria	-	-	-	-	31	150	137	156	215	227	5.2
Cerro Colorado	-	-	-	-	21	36	59	60	75	100	2.3
Quebrada Blanca	-	-	-	-	7	46	68	67	71	73	1.7
Zaldívar	-	-	-	-	-	22	78	96	135	150	3.4
El Abra	-	-	-	-	-	-	51	194	199	220	5.0
Collahuasi	-	-	-	-	-	-	-	-	48	435	9.9
Lomas Bayas	-	-	-	-	-	-	-	-	19	45	1.0
Los Pelambres	-	-	-	-	-	-	-	-	-	12	0.3
Others	30	29	66	88	101	110	112	128	127	108	2.5
Total	1,588	1,811	1,933	2,054	2,220	2,489	3,116	3,392	3,687	4,384	100.0

Source: Cochilco, Statistics for Copper and Other Minerals 1990-1999

(*): With the exception of Codelco and Enami, the companies are all of private origin.

As can be seen from this table the scale of production in general as well as the scale of individual operations has increased. An outstanding case is the scale of operation of La Escondida which, in 2000, has surpassed the benchmark of 1 million tons of production¹². Even though environmental problems can be managed independent from the scale of the operation, environmental implications in the form of risks and responsibilities that fall on one single company will have to be considered carefully.

III.1.1. Air contamination

Sulfur emissions from copper smelters are amongst the priority environmental problems in Chile. Even though emissions have been reduced substantially over the last decade, as shown in the following table, the problem remains a significant issue with important consequences for human health and the natural environment, affecting not only surrounding natural ecosystems but also agricultural production.

¹¹ See for example Blanco et al. (1997), or Borregaard et al. (2000)

¹² CODELCO-Chile comprises all CODELCO operations.

TABLE 4
APPROXIMATE SULFUR EMISSIONS FROM SMELTERS IN CHILE

	Chuquicamata's Smelter	Paipote's Smelter	Ventanas Smelter
Year	Sulfur (Ton/year)	Sulfur (Ton/ year)	Sulfur (Ton/ year)
1993	215.000		64.000
1994	160.000		62.000
1995	150.000	35.000	60.000
1996	160.000	30.00	55.000
1997	115.000	20.000	45.000
1998	105.000	17.000	23.000
1999	120.000	10.000	15.000

Source: Lagos, Lehudé and Andía, 2000.

The only smelter that is foreign-owned is the Exxon-owned Chagres smelter. Given that Chagres has less than 5% of total smelting capacity its emission data is not included in publications such as Lagos, Lehudé and Andía (2000)¹³. However, local effects for example on agricultural production can still be perceived to be significant.¹⁴

The increase in production of refined copper from smelters over the last decade is much smaller in relative terms than the increase in overall copper production (see table N°12), and indicates that most of the additional copper produced in foreign owned operations is either exported in the form of copper concentrate (before smelting operation) or it is based on hydrometallurgical processing which does not require smelting¹⁵.

There is no systematic data and monitoring of air pollution from dust and particles on mine workers in Chile.

III.1.2. Water contamination

Water contamination is a very poorly researched issue so far. there is no systematic monitoring nor specific studies of acid mine drainage or of the impact of the mining activities on water quality. However, there are different specific measurements and data that can provide an orientation in this regard. For example, in 1990, due to a judicial verdict, the División Salvador of CODELCO (Region III), had to install a tailing dam with a treatment plant to treat and store the production waste, thus avoiding the evacuation of the tailings into the sea. For over 30 years these tailings had been emitted into the Bay of Chañaral, provoking the deposit of sand silts with heavy metals and the accumulation of copper and heavy metals in some marine species¹⁶.

Another example is the Planta Osvaldo Martínez, of Enami, located downstream from Diego de Almagro, (region iii) whose tailings flowed into the river Salado until 1990, when a tailing dam for sulphurs was opened, solving the problem of discharge into the river.

¹³ For a comparison in emissions between Chagres and CODELCO smelters see section on technological effects.

¹⁴ Personal communication with agricultural producers from the area who claim that there has been an effect on production. However, until today this has not been scientifically proven.

¹⁵ There are basically two methods employed world wide at present in order to process copper ores. The most important one, used for possibly more than 75% of the total primary copper produced in 1995, in the "traditional" method, which consists of crushing, grinding, flotation, smelting and electro-refining. This method is applied to sulfide ores, i.e., to "ores" whose chemical species contains sulfur rather than oxygen. Chalcopyrite, CuFeS₂, is the most common copper species in Chile copper deposits. A second method is denominated "hydrometallurgical". This method consists in crushing, agglomeration (optional), leaching, solvent extraction, and electro-winning. This method can be applied to oxide species such CuO, Cu₂O, carbonates, some silicates, and also under certain circumstances, to simple sulfides such as chalcocite and covellite, Cu₂S and CuS. Hydrometallurgical processing, when applied properly, is a more environmentally friendly process in many ways – including the fact that chemical species treated usually do not contain sulfur, as well as the fact that hydrometallurgical processes use much less energy than the traditional process because the ore is not ground to a small size, and because there is no smelting.

¹⁶ See also section on "Biodiversity"

Currently, mining activity still causes contamination in the rivers San José, Loa, (Region II), Limari, Cogotí (Region IV) Aconcagua, Chacabuquito, Rapel (Region V) and the Alhué marsh and in the Pampa del Tamarugal (Region I) - Quebrada Cahuisa (Universidad de Chile, 1999).

One of the few studies on mining and water contamination, carried out by Universidad de Chile (1999), shows that the river Loa has consistently exceeded the regulated levels for arsenic in irrigation and drinking water. However, there is no apparent relationship between the copper production levels and the arsenic concentration in the waters downstream of the river Loa. The only extremely severe case of water contamination due to large scale mining operations has been the case of El Chañaral, in which tailings from the state-owned copper company CODELCO were emitted directly and for many years into a bay close to the mining operations, a fact that has led to the exodus of the ecosystem in and around the bay, and has only been remedied after damage has been irreversibly done.¹⁷

III.1.3. Water use

With regard to water use the additional pressure on environmental resources due to foreign investment can be significant at the local or regional level. The situation of water use is critical in the Chilean mining regions which are mainly desert areas. Each water right bought up by mining companies implies an opportunity cost with regard to other productive activities. In the II and the III Region the mining sector consumes about 70 and 60% of the water respectively. The General Water Authority (1996) had calculated a 50% increase in water demand by the mining sector during 1993-2017, on the basis of existing and projected investments. On account of the increase in water demand from the mining sector in Northern Chile, a price increase in water use rights can be expected. Also, mining operations often use underground water for exploitation. In this case it is important to determine whether the aquifers used are confined or not. If the aquifer were confined, implying that there is no entry or exit of water, its use would correspond to exploitation of a non-renewable resource, implying a cost to future generations.

It is not clear in how far technological improvements, such as the application of hydrometallurgical instead of pyrometallurgical processes¹⁸, reduce the use of water. Not only the application of hydrometallurgical processes can lead to a significant reduction in the use of water, but also recycling contributes to the minimization of water use. According to our survey results, whereas most of the national companies recycle less than 10% of the water used, the majority of the foreign owned companies recycle more than 50% of the water.

III.1.4. Other effects

Beyond the environmental impacts from production it is important to remember the issue of resource exploitation. Minerals are considered a non-renewable finite resource, especially at the local level. An increased pace of extraction leads to an accelerated depletion of the resource and an early cease of mining operations.

As was seen in the previous chapter, the dependence on mining operations is significant in some areas, such as in the II Region in Chile. This can have serious consequences for the economic and social sustainability in the affected areas.¹⁹ There have been several examples of mine operation closures in the past in the Region, one of the most emblematic being the saltpetre operations in Chile which are now ghost towns and tourist attractions in the north of Chile.

Many experts as well as local groups would argue that the key sustainability issue related to mining is the exhaustion

¹⁷ In another case, the recent contamination of the Loa river, cause-effect relationships could not be proven between operations from CODELCO and the contamination.

¹⁸ Unit consumption figures vary between 0,2 and 0,7m³/ton of mineral in hydrometallurgical processes and 0,5 to 2,0 m³/ton of mineral in pyrometallurgical processes.

¹⁹ Even though copper companies in the II Region in Chile have, in the past, discovered always larger resources, this phenomenon cannot be expected to everlasting. According to Borregaard et al. (2000) currently most large operations plan to close between 2017 and 2030.

of the resource, closely linked to the question of local development.²⁰ In general in Latin America there are no special taxes on mining operations to assure the economic, social and environmental sustainability of the mining regions after mine closure, and there are few programs to ensure local development whilst the mines are still operational. Thus, it depends currently on individual companies' initiative whether local sustainability schemes are implemented. One of the first examples in the Region in which a company has taken the initiative and has established a scheme on a small scale, is the Foundation La Escondida in the II Region in Chile. The Foundation operates on the basis of the interests accruing to an endowment made by Minera Escondida. The Foundation has thus an independent, perpetuate existence.²¹ Having said this, to create a Foundation is not the only way to ensure long term sustainability. State-owned CODELCO is investing continuously large sums into local community development and has implemented programs with indigenous and agricultural communities, guaranteeing sustainability beyond the mine's operation in the area.²² First studies show that foreign companies do not differ, on average, from domestic companies, neither in amounts of resources provided to the community²³ nor in the quality of community relations, reflected for example by the degree of participation of local groups in the design, and implementation of projects financed by the company and directed at improvements of quality of life in the communities. Rather than long term agreements between the companies and the local community there is a tradition of paternalistic relationships between the company and the local community, something that will take time, effort and creativity to change.²⁴ In the results of the Mining and Minerals Sustainable Development (MMSD) initiative the importance of the social role of the mining industry in local development and the necessity to make progress in this area is emphasized for the Latin American Region.

The environmental impact and risks that remain behind after mine closure are also an important aspect to be confronted. So far, none of the investors has a detailed, official mine closure plan,²⁵ and very few a plan to try to re-establish conditions previous to the mining operation, landscape variation, and other effects related to the burden of monitoring very long term environmental risks. Again, there is thus a scale effect in terms of long term effects beyond mine closure. However, it has to be pointed out that, whereas foreign investment have a closure plan²⁶, there is none domestic investment that has a closure plan at this stage.

In Peru, "Up to a few years ago the environmental performance of the Peruvian mining sector has been very poor". (p.24, Pasco-Font (2000)) The most significant environmental conflicts have been identified to be related to air contamination around smelters and water contamination due to the absence of adequate tailing dams.²⁷

In the Peruvian case it is important to note that foreign investment basically implied the acquisition and amplification of existing mining operations.²⁸ Thus, increases in production have not been based on an expansion of operations but rather an improvement of existing operations. Pasco-Font (2000) states that approximately a 51% of the increase in production is due to the use of hydrometallurgical processes. Thus again, scale effects and technological changes go hand in hand. For the case of Southern Peru Copper Pasco-Font (2000) calculated scale effects, due to the increase in production of 110.000 tons of refined copper between 1990 and 1997, and technological effects, and came to the conclusion that technological effects outweighed scale effects substantially. There have not been any calculations for the total Peruvian copper production, but Pasco-Font cites other examples of production increases with parallel

²⁰ The preliminary results of the Mining and Minerals Sustainable Development Initiative (MMSD – www.iied.org/mmsd/) for Chile as well as for Peru indicate that the stakeholders in both countries attribute first priority to local development amongst all sustainable development issues. This confirms the finding of previous, more limited studies in scope (see for example Borregaard et al. (2000))

²¹ For a more detailed description of the Foundation see for example Ojeda, J.M. (2000)

²² Ongoing work by the Mining Policy Research Initiative, Uruguay, together with the CIPMA, Chile: "Actividades de Desarrollo Comunitario de Empresas Mineras y de Explotación de Recursos Naturales en América Latina y el Caribe", March 2001 - August 2001, (forthcoming)

See project undertaken by the Mining Policy Research Initiative, Uruguay – publication forthcoming

²³ In a very preliminary study Borregaard et al. (2000)) attempted to quantify the resources mining companies spend on the local community in Chile. Due to a lack of systematicity in the companies' policies and accounting procedures exact amounts could not be quantified – contributions consisted in financial (in general amounting to not more than about US\$100.000,-per year) and in kind contributions.

²⁴ See project undertaken by the Mining Policy Research Initiative, Uruguay – publication forthcoming

²⁵ Not yet obligatory in any of the two countries, but under elaboration.

²⁶ In our survey, eight foreign companies (from a total of 10) state to have a closure plan .

²⁷ See for example Tolmos (2000) or Pasco-font (2000)

²⁸ An exception is the Antamina project which should enter in production in 2002.

investments into technological improvements.

In the Chilean case, as foreign investment has not implied the acquisition of existing operations, but rather the installation of new operations, scale effects are likely to outweigh technological effects - only if there has been a wide-spread adoption of cleaner technologies clearly attributable to FDI – that is use of clean technology in the foreign owned operations combined with significant spill-overs to the rest of the industry – could technological effects and possibly structural effects compensate scale effects. This is analysed in the next sections.

III.2. Structural Effects

Two structural effects from FDI in mining are worth mentioning regarding potential environmental effects:

- in Chile the relative increase in the production and export of copper concentrate versus refined copper.
- the increase in production and exports that has been identified to have led to a reduction in world market prices

The first of these could have positive environmental impacts given that smelting activities to obtain refined copper have the above-mentioned effects regarding air contamination. However, at the same time, less refinement implies less value added, less work force, and thus less community development, thus negatively affecting the environment in the widest sense.

The second effect has been pointed out by authors such as Blanco et al. (1997) to induce structural changes regarding the size structure of the mining companies. Economic viability of small-scale mining, faced with declining world market prices, is in danger. In Chile there are government subsidies to small scale operations in times of low world market prices. Environmental effects of small scale mining in Latin America have been analysed by authors such as McMahon et al. (1998). According to the authors, "...on average artisanal and small scale mining is significantly dirtier per unit of output than other types of mining" (p.10)

As to the policy of subsidizing the activity at times when world market prices are low, experts' opinion is reflected in IENIM (1996): "...Solving the environmental and social problems associated with informal mining should focus on alleviating the worst aspects of the situation without subsidizing or otherwise prolonging uneconomic operations." (p.74)

Ambiguity prevails regarding the social and community development effects from small scale mining – whereas on the one hand it can provide more (at least perceived) net benefits to the local community, it can also imply cultural damage due to entry or invasion of sensitive tribal lands, when small miners outnumber the local population and form a dominant sub-culture.²⁹

III.3. Technology Effects

Pasco-Font (2000) states that the foreign investments that have brought along environmentally friendlier technologies, and that were basically motivated by reasons of competitiveness, on the international markets, have been a decisive factor in environmental improvement in the Peruvian mining sector.

Examples of these investments into new technologies have included, amongst many others, US\$ 445 million in modernization in Southern Peru Copper, including US\$ 135 million for a sulphuric acid plant³⁰ and some additional millions for improvement of the tailing dams and other environmental projects. In the case of Sociedad Minera Cerro Verde investments into new technologies have amounted to US\$ 485 million during 1993-1998. Thus, the privatisation process has implied a technological transformation process. The previously mentioned increased use of hydrometallurgical processes implies lower environmental impacts than in traditional pyrometallurgical processes, basically due to a lower water use and no air emissions.

The Chilean case is somewhat different. State-owned CODELCO still exists, and it was the state-owned company that

²⁹ See McMahon et al. (1998)

³⁰ According to Pasco-font (2000) Southern Peru Copper plans to invest into a Kennecott-Outokumpu Flash Converting Process by the year 2003, a technology which would reduce emissions to a minimum.

had to carry the burden of all investments necessary for technological adaptation in the operations that date from decades ago. Between 1994 and 1999s CODELCO has invested US\$ 727 millions into environmental improvements, including technologies to reduce air emissions, investments into tailing dams and others. As Borregaard et al (1998) have stated, the introduction and use of environmentally friendly technology cannot be attributed directly to FDI. Many of the new technologies have been developed by Chilean companies - such as the Teniente Furnace - and others such as hydrometallurgic processes have been adopted and adapted quickly by foreign and domestic companies alike.

Experts state that currently there are no technological differences between new CODELCO operations and foreign owned companies. However, for older CODELCO operations differences are still evident. For example with regard to emissions Blanco et al. (1997) have analysed the performance of air emissions generated by Exxon-owned Chagres versus air emissions generated by Chilean owned operations. It was concluded from the analysis carried out that:

- the emission levels of the refineries have been (or will be) reduced;
- Codelco began to reduce the emissions from its refineries at the end of the 1980s and the start of the 1990s and the most significant reductions are not expected until 2000;
- Enami's refineries were the last to implement reduction plans and until 1997 still did not show significant emission reductions;
- Exxon's refinery have shown a significantly better environmental performance than the state-owned refineries. This foundry began to carry out environmental investments in the mid-70s (with the construction of the first sulphuric acid plant) and during the 1980s and 1990s the refinery undertook considerable environmental improvements. Its emissions per unit of refined copper are far lower than those of Codelco and Enami, averaging over the period considered a 30% of the emissions of Codelco and Enami.

With regard to "soft technologies" such as environmental management, whereas there have been large differences in environmental management between CODELCO and foreign –owned companies in the 1980s and early 1990s, as pointed out above, today these differences have become smaller. According to our survey results, today all companies, domestic and foreign, have a department of environment with an average of 4 employees. Both types of companies declare to spend between 1 and 5% of their budget on environmental issues. Whether it was the foreign companies that induced these changes or whether it was something that would have occurred anyways will have to be left to each one's speculation. However, there still are some differences. For example, up to now the only ISO 14001 certified mining companies in the two countries under analysis are foreign owned companies. Also, most foreign companies have an environmental risk prevention plan, as well as a mine closure plan³¹ - both of which domestic companies lack.

Some authors³² have also referred to management and budgetary structures in state companies which often do not permit the required flexibility and dynamism to confront environmental challenges.

It is clear that there have been considerable investments in technology, some of which have been driven primarily by cost reasons and increases in productivity, whilst others have had primarily environmental objectives.

In the Peruvian case investments in new technology have formed, by and large, part of the acquisition "packages" elaborated between the government and the foreign companies for the privatisation of the state-owned companies. As Pasco-Font explains: "The environmental problems of the state companies were responsible for the delay in the privatisation process. The investors participating in the bidding wanted to assure some formal agreement with the state to assume the historical environmental burden." In this sense privatisation presented an opportunity to come to an agreement for the introduction of environmental improvement on the basis of a shared financial burden.

The question of potential positive technologies spill-overs through FDI has been analysed by different authors and would lead to the conclusion that these have been rather limited. For example, Kuramoto (2000) has described in detail the process of introduction of new technology in the case of the foreign owned Minera Yanacocha in Peru. The author emphasizes that the operation uses the most advanced technologies, preventing contamination, stating that "The technologies applied in all the processes in Yanacocha are clean". (p.39) However, on the other hand the author also points out that "The Yanacocha mine maintains very few production and commercial relations with the local

³¹ These closure plans are still rather basic.

³² see for example Borregaard et al (1998)

agents.” (p.3), making it difficult that there is a transfer of technology that goes beyond the foreign owned mine’s operation.

III.5. Regulatory Effects

In both countries a parallel process of privatization, increase in foreign direct investment and improvement in environmental legislation can be observed. Without a more detailed analysis it is difficult to establish which comes first, the FDI or the improvement in legislation. However, there seems to be a direct interaction between the two. In the Chilean case Borregaard et al. (1998) have described in greater detail how investments by foreign mining companies have led to an upgrading of legislation, including pressure on the elaboration of an environmental impact assessment (EIA) system, as well as the enforcement of environmental standards and the enactment of Decontamination Plans. Several authors³³ have described how the foreign owned companies all elaborated environmental impact assessment already at time when this system was not obligatory, and how they presumed to become the first pilot experiences with this system. Until 1995, the number of mining related EIA was close to 50, about one half of all EIA carried out in the country. As Lagos (1997) states, these mining EIA have used stricter standards than those applied elsewhere in Chile and in many cases refer to aspects not even regulated by Chilean legislation. An example of this are the standards required for tailing dams, which go far beyond the obsolete Chilean regulation of 1970.

Foreign mining companies not only applied international environmental assessment procedures, standards and management practices, but also lobbied the Chilean authorities to get clear regulations defined. Pagani *et al.* (1992) state that the experience accumulated with the voluntary submission of environmental impact studies has been significant in the definition of the EIA system within the Framework Environmental Law.

Lagos (1997) argues that “internationalisation has brought external requirements, in the sense of raising environmental standards, and completing and making more coherent the legislation on the subject”. According to Lagos, “the contribution of foreign companies toward introducing the most modern environmental technology, in terms of equipment, processes and management in Chile, has been instrumental for the domestic companies of the sector, as it has enabled the transfer of those technologies within the country, to the benefit of the national mining sector.”

O’Brien (1994) assigns Exxon—who acquired the Compañía Minera Disputada de Las Condes, CMD, in December 1977—an important role. He states that Exxon had a clear idea of the need to comply with home standards even where Chilean legislation left a void.

Jaime Solari, who had been the first environmental co-ordinator at the Mining Ministry, hired in 1990, clearly emphasises the external influence on environmental management in the mining sector. He points out that his work and the motivation for hiring him was based primarily on the concern for creating a clear regulatory framework for foreign investors, and to tackle the preoccupation as to what is needed in order to raise the environmental performance of the state companies to the same level as foreign competitors³⁴.

For the Peruvian case different authors³⁵ have described the development of the new legislative framework for the mining sector, including PAMA and EIAs. However, all authors emphasize the weakness of the Peruvian system of enforcement and in that sense the limited impact of environmental regulation. At the same time Pasco-font (2000) states that:

“Given that the principal actors in the copper industry are transnational companies, the institutional shortcomings have not had significant effects. The foreign investors act with an environmental ethic that corresponds to world standards and in various cases they have applied environmental standards that go beyond Peruvian legislation.”

In order to show the commitment of the international investors, Pasco-font (2000) cites the recent experience of EIAs

³³ See for example Borregaard et al. (1998)

³⁴ Personal communication, May 1998. cited in Borregaard et al. (1998).

³⁵ See for example Falla (2000) or Pasco-Font (2000)

with the mining company Antamina, which has to respect, beyond the domestic regulation, guidelines of the World Bank, as well as the environmental and social policies of the foreign-owned mother company. Pasco-font emphasizes the high standard of the EIA, but at the same time points out the fact that "...for now it is premature to evaluate the impact these projects will have." (p.27, Pasco-Font (2000))

In the Peruvian case it is not clear and has not been analysed in detail, in how far the foreign investment has influenced the creation and improvement of environmental legislation. However, it can be expected that the high standards by the foreign investors tend to put an upward pressure on environmental legislation in the country.

III.6. Summary of environmental effects

1. In general, a large part of foreign investors in the mining sector attempt to apply latest technology and environmental management.
2. Regarding environmental effects such as air contamination, effluents and water use the fore-mentioned point is more valid than for sustainability issues such as local community development.
3. Scale effects are important regarding the scale of individual operations as well as the scale of overall production. Increasing scale puts increasing pressure on natural resources and imposes new regulatory challenges. The size of investment implies the need for greater enforcement capacity (and certification schemes based on self-control or independent control of a third party can compensate only to some extent this lack of enforcement capacity) In general, the countries under analysis are not prepared to confront the issue of exhaustability of the resource. There is a lack of policies aimed at assuring local and regional sustainability post extraction. This is a serious problem in the context of FDI, and it cannot be left to individual companies to confront it. Beyond the question of exhaustability of the mineral that is extracted, resources used as inputs are also affected. The use of scarce water is causing problems with regard to biodiversity, and water use for human settlements.
4. If governments were to promote sustainability in the mining sector and promote the positive effects of foreign investment, potential technological spill overs will have to be enhanced.
5. Positive effects from FDI in the mining sector lie especially in the upward pressure on domestic regulation, as illustrated in the Chilean case regarding the Environmental Impact Assessment system as well as decontamination plans.
6. Regarding the use of "soft" technology, environmental management in foreign companies is more formalized and more oriented at certain visible benchmarks in foreign companies. Certification schemes play an important role in this regard. The interface between the certification schemes and the local communities could be taken advantage of: on the one hand a greater involvement of local communities in the elaboration of criteria for certification has to be guaranteed, and on the other hand special indications regarding company-community relations should receive special attention in the certification schemes. Certification is, on the other hand, not easily accessible to smaller owners, which can create exclusiveness and differentiation on the international market.
7. The existence or lack of a regulatory framework is important in several ways: on the one hand to attract foreign investment, on the other to close the gap between foreign and domestic investors in terms of environmental management, and finally to prevent environmental impacts. In general, there has been a mutual relationship between the development of further environmental legislation and the arrival of foreign investment.
8. Specific opportunities refer to the possibility to confront the historical environmental burden when ownership is passed from the state to private companies, as in the Peruvian case.

IV DOMESTIC AND INTERNATIONAL PRESSURES FOR IMPROVED PERFORMANCE

The factors that influence environmental behaviour of companies are key to analyse the interrelation between FDI and the environment and to develop policy recommendations. The knowledge about motivating factors behind environmental improvement is essential for the design and implementation of policies, programs or specific instruments. Amongst the factors are international as well as national factors. The first can be international NGOs, consumers' requirements, international financial markets, international industry associations, pressure by competitors, or environmental guidelines by the headquarters or parent company located abroad. National factors include environmental regulations regarding foreign investment or, more often, production in general, environmental or other NGOs, local image, pressure through the media, national industry associations, or local pressures by affected groups.

Regarding our two country cases, looking at the past and current situation of the pressures for improved environmental performance, these derive primarily from the international level, even though at the national there has also been some pressure. This is reflected in the literature, and can be confirmed in our survey results as well as in interviews with the companies.

IV.1. Domestic Pressures

The relevance of a strong domestic regulatory framework is mentioned throughout the literature as one of the key variables to influence environmental effects from foreign investment, and is, by environmental NGOs, even regarded as a pre-condition for FDI. Our survey results confirm this relevance of domestic regulation, being considered by domestic as well as the foreign investors as one of the key pressures on their environmental performance.

Theoretically environmental regulation applies to both, domestic and foreign investments, in the same way. However, in practice there can be differences.

In the Chilean case it calls the attention that Chagres, being the smelter with lowest emission levels, was the first smelter to be subjected to a decontamination plan under Chilean regulation in 1992. This was a sort of "voluntary" decontamination plan before the obligatory regulations concerning decontamination plans came into force some years later. Even though this treatment was not criticized by the Exxon-owned operation, it can be speculated that there was pressure on the foreign owned operation to be the first to be submitted to the regulation when it was still at a preliminary stage.

Environmental consciousness has only begun to develop and take on relevance in Latin-America since the end of the 1980s or even the 90s. Increased environmental requirements imposed on investors by the local communities, above all in highly sensitive sectors such as mining and forestry, are a phenomenon that only recently has become more wide-spread. Whereas in Chile there are no NGOs or independent academic centres specialized in mining and its environmental or social effects, in Peru there are several NGOs that have made the mining sector the focus of their work³⁶.

In the case of the Peruvian mining sector, authors such as Baker (1997) have stated that, in the face of the private investments in mining operations "...environmentalists within Peru and outside have called for companies to take a certain amount of responsibility in these cases (environmental issues)."

The importance of the "environmental deals" negotiated in the framework of the privatisation processes between the Peruvian government and the foreign investors should also not be sub-estimated. As seen in the previously shown numbers the effects can be considerable.

IV.2. International pressures

International pressure derives from NGOs, international organisations, from clients and consumers, and from the

³⁶ For example GRADE, <http://www.grade.org.pe>, o Sociedad Peruana de Derecho Ambiental, <http://www.spda.org.pe>

financial market (both, in form of the share holders, as well as in form of the capital market).

According to our survey results foreign mining companies in general attribute highest relevance to the guidelines provided by headquarters or the mother company. Several studies³⁷ as well as our survey results point to the importance of the environmental guidelines by mother companies. Borregaard et al.(1998) stated:

“The foreign mining companies, including smelters and copper exploitation, have adopted environmental policies and management practices that go far beyond national regulations. This behaviour is explained by the fact that most of these companies have their headquarters in Canada, USA, England, Finland, Australia and South Africa, and have a commitment to applying their home standards in all their foreign investments.”

These guidelines are a reflection of the shareholders' interest, the consumers' and clients' requirements, pressure by NGOs, as well as requirements by the credit agencies.

Pasco-Font (2000) states: “The multinational companies confront pressures of the large international NGOs in case there are any environmental problems. ASARCO, one of the principal (foreign) owners of Southern Peru Copper, has confronted actions by international NGOs due to the environmental problems in Ilo”.

Whereas there has been growing interest and an evolving body of literature referring to social and environmental responsibility schemes in international financial markets, there is still very little understanding and knowledge about how these pressures work “on the ground”. In the case of mining FDI in Chile and Peru the literature does not provide any evidence on these factors. However, it can be considered a potentially important element in the near future .

Whereas major foreign investors generally operate with some participation of capital from International Financial Institutions (IFI) such as the International Finance Corporation (IFC) or major private commercial banks, most domestic operations are either self-financed or are financed through public funds or smaller domestic banks.

Social and environmental responsibility schemes that have been elaborated recently on the international financial market include the Dow Jones Sustainability Index, the Global Reporting Initiative, and the Social and Environmental Investment Funds.³⁸ IFIs have their own environmental standards that go, in general, beyond the standards prevailing in Latin American countries. Major private commercial banks also require, as a general matter, strict performance covenants, and compliance with World Bank or other internationally acceptable standards.³⁹ However, as Martin Whittaker of Innovest put it recently: “The mainstream financial sector still has to be persuaded of the benefits of addressing sustainability.”⁴⁰

The preoccupation of IFIs with the question of sustainability in the mining sector context is demonstrated in recent conferences and initiatives such as the “Finance Mining and Sustainability Conference” organized by the World Bank and the IFC in April 2001, UNEP's Financial Institutions Initiative or the Agreement on Environmental Guidelines for Export Agencies which the OECD is elaborating for the end of 2001. One objective of these initiatives is to promote the use of positive and negative screens and best of sector approaches regarding sustainability performance. The initiatives are motivated by the consciousness of the significant impact of mining, especially regarding local effects, and the greater risk this implies to investors.⁴¹ Shawn Mays, General Manager at WestPac Financial Services, points out that surveys of pension fund members show that human rights and environment are their two major concerns, thus he concludes: “Mining companies that do not address sustainability run the risk of increased cost of capital and loss of their license to operate.”⁴²

³⁷ See for example Lagos (1997) or Borregaard et al. (1997)

³⁸ The latter in general do not destine funds to mining investment, questioned by most investors regarding sustainability. For a discussion of Socially Responsible Investment see for example Robins (2001)

³⁹ See for example Urda (1997)

⁴⁰ intervention at World Bank/IFC Conference on “Finance Mining and Sustainability”, April 8th/9th 2001, Washington.

⁴¹ James Bond, World Bank, at Conference 8th/9th of April 2001, Washington.

⁴² intervention at World Bank/IFC Conference on “Finance Mining and Sustainability”, April 8th/9th 2001, Washington.

How important the social and environmental requirements are that are imposed on mining operations by the shareholders was demonstrated in the Chilean case with the operation Los Pelambres which depended on financing from the Catholic church, a financing that was held back until the country started its democratisation process in 1990.

In the case of the foreign mining operations in Chile, these depend primarily on self-financing. However, they do have in general small participations of foreign commercial banks or IFIs.⁴³ In the case of La Escondida the IFC participates with a 2,5% in the overall operation, a financing that was crucial to the initiation of the operation.⁴⁴ Under the agreement with the IFC La Escondida has to carry out an annual environmental audit, an audit which is oriented at environmental regulation applied in the country and, where this does not exist, IFC environmental standards.

V. CONCLUSIONS

Overall the dividing lines between foreign and domestic investments have become increasingly blurred and so have the environmental impacts related to the different types of investment. Whereas one or two decades ago the difference in environmental management between foreign and domestic companies was, at times, significant⁴⁵, today environmental management has become more alike. There are positive and negative cases amongst foreign as well as domestic companies. In very general terms, FDI, in the countries under scrutiny, has fared reasonably well with regard to more narrowly defined environmental considerations.

The biggest challenge, however, lies in local sustainability effects. This is as of yet an unresolved topic that requires urgent attention. FDI, due to its volatility and its, very often, large scale will have to assume a special responsibility with regard to assuring local sustainability that can last beyond the time of its operation. Foreign mining companies have to develop clear strategies regarding the interaction with the local community, the identification of the local community's priorities, and the creation of long term partnerships with the local community. At the same time this issue clearly raises requirements for public policy action. In the two countries under analysis there is a lack of public policies to assure local sustainability around mining operations, even a lack of a clear natural resource policy and strategy. The combination of the slow progress on this issue by even the more progressive investors, and the lack of public policy in this area has led to an increasing wedge between globalisation and local concerns.

The second challenge refers to the need for the generation of information on environmental issues. In this paper we tried to recollect existing data and information, a task that had to be complemented by the survey and interviews, basically due to the lack of information. On some environmental issues there is no monitoring (such as soil contamination), and on others there is hardly any information at all (such as acid mine drainage). Environmental Impact Assessment of new investment projects can be used, in this context, as a longer term policy tool, if requirements for monitoring and the generation and accessibility of information become part of the agreements elaborated in the context of the Assessment. Only on the basis of easily accessible and verifiable information can international certification schemes or environmentally oriented stock market listings be relevant tools for monitoring the environmental performance of FDI.

It is clear that both issues, local sustainability, and the lack of information, will require innovative strategies and additional research to confront them. In different countries and different regions first approaches have been tested⁴⁶. An exchange of experiences on these issues is urgently needed. Cooperation between companies, between companies and the public sector, between companies and NGOs, and between the public sector and NGOs will be necessary in order to make progress. Initiatives such as the Mining and Minerals for Sustainable Development⁴⁷ program, the Non-ferrous Metals Consultative Forum for Sustainable Development, organized by the International Copper Study Group,

⁴³ personal communication with Rick Killam, Placer Dome, and Andrés Camaño, La Escondida.

⁴⁴ David Humphreys, Rfo Tinto, in a paper prepared for an informal seminar on the mining and metals industry at the OECD in February 2000

⁴⁵ See for example Borregaard et al. (1998) for the case of the Chilean mining sector.

⁴⁶ See for example the Thailand Business in Rural Development initiative, mentioned in Grieg-Gran (2001), or the tax credit initiative in New Guinea, mentioned in Borregaard et al. (2000).

⁴⁷ See www.mmsd.org

the International Nickel Study Group and the International Lead and Zinc Study Group, or the UNEP's Mineral Resources Forum, certainly help to create a dialogue between the different stakeholders and to start bridging the globalisation-local sustainability gap, and should be strengthened.

To finish, this paper is only a first preliminary look at the evidence. More than answers, there are many open questions – the central one being:

- Where (and involving which stakeholders) does the burden to control mining sector investments' social and environmental effects lie? Are there sufficient tools (including obligatory and voluntary) and resources available at the international, national, but especially at the local level to provide guidance for improving the social and environmental performance?

Last but not least, many investment projects that are referred to in this paper are just being initiated, and it will depend to a great extent on the compliance with the commitments, voluntary and obligatory, short term and especially long term, that have been announced and those that can still be obtained from the foreign investors, whether or not in these two countries there is an overall positive or negative balance from FDI in the mining sector.

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ANNEX 1
Questionnaire

SECCION I: INFORMACION GENERAL

Nombre del entrevistado: EMPRESAS EXTRANJERAS

Cargo: _____

Fono - Fax - E-mail: _____

Fecha _____

A. INFORMACION GENERAL

1. Nombre de la Compañía _____
2. Orígen del Capital de la Compañía _____
- Nacional Extranjero Mixto Si es mixto, indicar % nacional: _____ y % extranjero: _____
3. Período de tiempo con operaciones en Chile _____
4. Producción total aproximada (ton/año) _____

SECCION 2: GESTION AMBIENTAL

B RESPUESTA A PROBLEMAS AMBIENTALES

B.1 Determinantes

5	Esta pregunta apunta a entender los factores que influyen las actividades ambientales de su compañía. Por favor indique cuán importante son cada uno de los siguientes factores en determinar las actividades ambientales de su compañía.						
		Mucha Influencia				Ninguna Influencia	
		6	5	4	3	2	1
	Empleados	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1	Legislación existente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2	La amenaza de legislación futura	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3	Competidores	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4	Grupos ambientales locales y organizaciones no gubernamentales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.5	Grupos ambientales internacionales y organizaciones no gubernamentales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.6	El perfil local de la compañía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.7	El perfil internacional de la compañía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.8	Accionistas de la compañía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.9	Presión pública	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.10	Pautas internas, generadas localmente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.11	Si es compañía internacional, pautas desde las oficinas centrales en otro país	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.12	Asociaciones Locales de Compañías Mineras/Estándares industriales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.13	Asociaciones Internacionales de C. Mineras/Pautas para la industria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.14	Presión local de las comunidades en áreas específicas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.15	Otros: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.16	Otros: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.17	_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.	Cuál es su percepción de la legislación ambiental relacionada con la minería del Cobre en Chile ?	Demasiado exigente	<input type="checkbox"/>
		Adecuada	<input type="checkbox"/>
		Demasiado débil	<input type="checkbox"/>

B.2 Estructura Interna de Gestión Ambiental

7.	Tiene su compañía un departamento responsable de asuntos ambientales?	Si	<input type="checkbox"/>		
		No	<input type="checkbox"/>		
8.	Si la respuesta es no, hay alguien encargado de asuntos ambientales?	Si	<input type="checkbox"/>		
		No	<input type="checkbox"/>		
9.	Si existe un departamento ambiental, de cuánto personal tiempo completo dispone?				
10.	Qué porcentaje del presupuesto anual es destinado a asuntos ambientales? (Aprox.)	<1%	1-5%	5-10%	>10%

B.3 Política Ambiental Interna

11.	Tiene su compañía una política ambiental establecida (escrita)?	Si	<input type="checkbox"/>
		No	<input type="checkbox"/>
12.	En caso que tenga política ambiental , proviene ésta originalmente de la casa matriz?	Si	<input type="checkbox"/>
		No	<input type="checkbox"/>
13.	Provee su compañía entrenamiento a sus empleados en procedimientos de gestión ambiental?	Si	<input type="checkbox"/>
		No	<input type="checkbox"/>
14.	¿Ha sido su compañía certificada en ISO 14001?	Si	<input type="checkbox"/>
		No	<input type="checkbox"/>
15.	Tiene su compañía pautas ambientales establecidas (escritas), listas de chequeo o instrucciones para sus empleados?	Si	<input type="checkbox"/>
		No	<input type="checkbox"/>

B.4 Procedimientos de Gestión

16.	Tiene su compañía sistemas de gestión ambiental que incluyan lo siguiente?	Si	No		
	Monitoreo de la calidad del aire (subraye: PM, As, SO2, CO, NOx, O3)	<input type="checkbox"/>	<input type="checkbox"/>		
	Monitoreo de la calidad de las aguas superficiales (mencione parámetros)	<input type="checkbox"/>	<input type="checkbox"/>		
	Monitoreo de la calidad de las aguas subterráneas (mencione parámetros)	<input type="checkbox"/>	<input type="checkbox"/>		
	Monitoreo de las variaciones en el nivel de aguas subterráneas	<input type="checkbox"/>	<input type="checkbox"/>		
	Monitoreo de la calidad del suelo (mencione parámetros)	<input type="checkbox"/>	<input type="checkbox"/>		
	Plan de prevención de riesgos ambientales	<input type="checkbox"/>	<input type="checkbox"/>		
	Plan de contingencias	<input type="checkbox"/>	<input type="checkbox"/>		
	Plan de abandono	<input type="checkbox"/>	<input type="checkbox"/>		
17.	Cual es el consumo aproximado de agua (lts/ton de concentrado producido)?				
18.	Qué porcentaje aproximado del agua utilizada es reciclada?	<10%	10-30%	30-50%	>50%

C. TECNOLOGIA Y TRANSFERENCIA DE HABILIDADES

- | | | |
|--|----|--------------------------|
| 19. Tiene algún ejemplo de tecnología desarrollada en su país de origen o en algún otro país fuera de Chile y que después haya sido aplicada en Chile? | Si | <input type="checkbox"/> |
| | No | <input type="checkbox"/> |
-
20. Si la respuesta es sí, por favor especifique
-

SECCION 3: ASUNTOS DE LA COMUNIDAD

D. ASUNTOS DE LA COMUNIDAD Y DEL GOBIERNO LOCAL

D.1 Determinantes

21. Esta pregunta apunta a entender los factores que determinan el involucramiento de la compañía en asuntos de la comunidad y del gobierno local. Por favor indique cuán importante son los siguientes factores en determinar estas actividades.

		Mucha Influencia					Ninguna Influencia
		6	5	4	3	2	1
21.1	Empleados	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.2	Legislación existente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.3	Amenaza de legislación futura	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.4	Competidores	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.5	Grupos ambientales locales y organizaciones no-gubernamentales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.6	Grupos ambientales internacionales y organizaciones no-gubernamentales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.7	Perfil local de la compañía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.8	Perfil internacional de la compañía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.9	Accionistas de la compañía	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.10	Presión pública	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.11	Pautas internas, generadas localmente	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.12	Si es una compañía extranjera, pautas internas desde las oficinas centrales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.13	Asociaciones de la Industria Minera Locales/Estándares industriales	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.14	Asociaciones Internacionales de la Ind. Minera/Pautas de la industria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.15	Presión de comunidades locales en el área	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.16	Incentivos fiscales para donaciones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.17	Otro: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.18	Otro: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D.2 Asuntos Internos de la Comunidad y Estructura de Gestión

- | | | |
|--|----|--------------------------|
| 22. Tiene su compañía un departamento responsable de los asuntos de la comunidad? | Si | <input type="checkbox"/> |
| | No | <input type="checkbox"/> |
| 23. Si la respuesta es no, existe alguien encargado de los asuntos de la comunidad ? | Si | <input type="checkbox"/> |
| | No | <input type="checkbox"/> |
-
24. Si existe un departamento responsable de los asuntos de la comunidad, con cuánto personal tiempo completo dispone?
-

D.3 Política de Asuntos Internos de la Comunidad

- | | | |
|---|----|--------------------------|
| 25. Tiene su compañía una política establecida (escrita) respecto a asuntos de la comunidad? | Si | <input type="checkbox"/> |
| | No | <input type="checkbox"/> |
| 26. Mantiene su compañía una comunicación con la comunidad respecto de los diferentes proyectos? | Si | <input type="checkbox"/> |
| | No | <input type="checkbox"/> |
| 27. Tiene su compañía una política explícita de emplear gente que viva en la proximidad de los yacimientos? | Si | <input type="checkbox"/> |
| | No | <input type="checkbox"/> |

D.4 Compromiso con Comunidades

28. Ha estado su compañía involucrada en cualquiera de las siguientes actividades para mejorar las comunidades locales?

- | | |
|---|--------------------------|
| Educación ambiental | <input type="checkbox"/> |
| Otro tipo de educación (e.g. construcción de una escuela) | <input type="checkbox"/> |
| Abastecimiento de agua y saneamiento | <input type="checkbox"/> |
| Salud pública | <input type="checkbox"/> |
| Desarrollo de infraestructura (como caminos) | <input type="checkbox"/> |
| Desarrollo Agrícola | <input type="checkbox"/> |
| Espacio Público | <input type="checkbox"/> |
| Abastecimiento de asistencia en casos de emergencias | <input type="checkbox"/> |
| Otros (por favor especifique) | <input type="checkbox"/> |
-

29. En promedio muy aproximado, de qué orden es la contribución anual a la comunidad?

< \$10mill \$10mill - \$50mill \$50mill.- \$100mill. \$100 mill.-\$500 mill. >\$500mill

30. Hasta qué punto existe participación de la comunidad en la concepción, diseño e implementación de proyectos para la comunidad?

	Considerable					Ninguna
Concepción del proyecto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diseño del proyecto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Implementación del proyecto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

31. De qué manera su compañía provee apoyo para proyectos con las comunidades?

- | | |
|---|--------------------------|
| A través de contribuciones financieras directas (regalos) | <input type="checkbox"/> |
| A través de una fundación propia | <input type="checkbox"/> |
| A través de fundaciones incluyendo otras compañías | <input type="checkbox"/> |
| En colaboración con el gobierno local | <input type="checkbox"/> |
| En colaboración con organizaciones no gubernamentales | <input type="checkbox"/> |
| Otro (por favor especifique) | <input type="checkbox"/> |
-

32. Existen acuerdos formales de cooperación entre la compañía y otros actores para enfrentar un problema ambiental o social en la comuna / Región?

Con la Sociedad Civil:	
Si	<input type="checkbox"/>
No	<input type="checkbox"/>
Con el gobierno:	
Si	<input type="checkbox"/>
No	<input type="checkbox"/>

33. Si la respuesta es sí, por favor especifique muy brevemente

ANNEX 2

**Table
Principal Investments in Mining according to DL 600. 1974-1998
Chile**

Foreign Investor	Country of Origin	Authorised Investment (US\$ million)	Materialised Investment (US\$ million)	Receiving Company
Cyprus El Abra Corp.	USA	3.000	1.349	Soc. Contractual Minera El Abra
Exxon Overseas Investment Corp.	USA	2.400	1.995	Cía. Minera Disputada de las Condes S.A.
Amcoll Limited	South Africa	2.078	976	Cía. Minera Doña Inés de Collahuasi
BHP Escondida Inc.	Australia	1.725	1.052	Minera Escondida Ltda.
Los Pelambres Investment Co.Ltd.	UK	1.650	266	Minera Los Pelambres
PD Candelaria Inc.	USA	1.200	457	Cía. Contractual Minera Candelaria
Nippon LP Resources BV	Japan	1.100	187	Minera los Pelambres
Westmin Resources Ltd.	Canada	1.015	278	Cía. Minera Lomas Bayas
RTZ Escondida Ltd.	UK	900	591	Minera Escondida Ltda.
Río Chile Inc. (Río Algom)	Canada	772	564	Cía. Minera Cerro Colorado
Falconbridge	Canada	560	406	Cía. Minera Doña Inés de Collahuasi
Outokumpu Copper Resources Chile B.V.	Finland	500	409	Cía. Minera Zaldivar.
Cominco Ltd.	Canada	400	369	Cía. Minera Quebrada Blanca S.A.
Macaines Mining Properties Ltd.	Canada	400	305	Cía. Minera Mantos de Oro.
Japan Collahuasi Resources B.V.	Japan	360	248	Cía. Minera Doña Inés de Collahuasi
Teck Gold Ltd.	Canada	342	59	Minera Sta. Rosa SCM
Minorco Société Anonyme	South Africa	300	244	Inversiones Minorco Chile Ltda.
JECO Corporation	Japan	300	194	Minera Escondida Ltda.
Sumitomo Corp.	Japan	300	160	Cía. Contractual Minera Candelaria
Kap Resources Ltd.	Canada	132	115	Minera Yolanda Ltda.

Source: Foreign Investments Committee

Table
Projected and Executed Investment in Large-Scale Mining,
1992-2001
Peru

Owners	Project	Mineral	Investment (US\$ millions)	Period
Quellaveco (AngloA)	Quellaveco	Cu, Mo	800	1993-2002
Corona	Cerro Corona	Cu, Au	250	1994-2003
Shougang	Pellets plant	Fe	172	1993-1999
Cerro Verde (Cyprus)	Cerro Negro expansion	Cu	485	1995-1999
Cerro Verde (Cyprus)	Cerro Negro	Cu	99	1999-2000
La Granja (Cambior)	La Granja	Cu	1.100	1994-2003
BHP Tintaya	Tintaya expansion	Cu	123	1995-1998
Ref. Cajamarquilla	Equipment renovation	Zn	50	1995-2004
Ref. Cajamarquilla	Expansion 230.000 TM/year	Zn	250	1996-1999
Dore Run (Oroya)	PAMA	Cu, Zn, Pb, Ag	107	1998-2007
Dore Run (Oroya)	Improve processes	Cu, Zn, Pb, Ag	85	1998-2007
Yanacocha	Carachugo	Au	37	1992-1997
Yanacocha	Maqui-Maqui	Au	55	1994-1999
Yanacocha	Yanacocha	Au	190	1996-2000
Southern Perú	Cuajone expansion	Cu	245	1996-2002
Southern Perú	Renovate refinery Ilo	Cu	20	1995-1998
Southern Perú	Renovate equipment PAMA	Cu	445	1992-1996
Southern Perú	New foundry	Cu	700	1997-2006
Southern Perú	Renovate foundry	Cu	871	N/A.
Antamina	Antamina	Cu, Pb, Ag, Zn	2.265	1997-2001
Pierina Barrik	Pierina	Au	316	1996-1999
			8.665	

Source: Kuramoto, 2000