The need for SEA of Metal Mining in Argentina

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Abstract

Investments in the large-scale metal mining industry have been booming in Argentina. Projects have multiplied promoted by high minerals market prices and based on large mineral reserves, an attractive mining potential due to undiscovered resources along the Andes Mountain Range, a series of fiscal incentives and a permissive legislation. Project leases are granted through the performance of Environmental Impact Assessment studies, which is the common legal requirement in Argentinean provinces for the environmental permitting. Nevertheless, these studies are not enough and have not become efficient tools to protect natural ecosystems or prevent social conflicts. Furthermore, to date, no legislation, regulations or guides of procedures exist demanding the application of Strategic Environmental Assessments (SEA). This tool requires urgent implementation in the Argentinean territory as it enables better evaluating the sustainability of the activity, analyzing operation and technology alternatives, cumulative impacts, technological transferences, citizen participation, regional development, conflict prevention, among other benefits. In this study we briefly examine the weakness of the current legal environmental requirements, pressure on natural resources, transference to the communities, conflicts associated and outline the benefits such assessment tool would provide in improving the sustainable management of minerals.

Key words: Metal Mining - EIA - SEA – Sustainability management

1. INTRODUCTION

1.1. Metal Mining in Argentina

The very favorable geological and mineral rich characteristics of the Argentinean territory, a high percentage of the mining potential still unexplored, a series of tax incentives, a highly permissive legislation and a suitable international market, have driven high the number of projects submitted for exploration or construction approval in recent years, placing the country at the top of the investment rankings in the sector (Secretaría de Minería, 2008).

Many of the mineral deposits are located along the 4,500 km of the Andes Mountains, at head of watersheds, located in jurisdictions displaying a wide range of administrative requirements to ensure an effective environmental protection. The Argentinean territory is marked by a great ecological diversity, being divided into 18 eco-regions (Burkart *et al* 1999), and also has a noticeable diversity in the economic, socio-cultural and political fields, as well as in the degree of industrial and agricultural development per region.

Given the high and growing socio-environmental conflictivity that exists in relation to these projects, it becomes essential the performance of a Strategic Environmental Assessment (SEA) (IAIA, 2002; Partidário, 2004; Croal, *et al.* 2010) of the sector in order to analyze, for example, the absorption capacity of the affected ecosystems, regulatory activity, transfer and distribution of economic benefits to the population, tax burden of the activity, contribution to improving the living standards of communities, cumulative and synergistic impacts.

1.2. Some numbers of the sector - evolution

At the national level, in the 20 years from 1987 to 2007, the value of mineral production in Argentina more than tripled, going from 130 to 410 million U$S (Secretaría de Minería, 2008). This growth was followed by a change in the composition of the minerals extracted, becoming the metal minerals categories the leading one while other categories were reduced by a half (Table 1).

TABLE 1: contribution to the production value by type of mining

CONTRIBUTION TO THE PRODUCTION VALUE BY TYPE OF MINING. PERIOD 1987 - 2007			
		1987	**2007**
Metal minerals	%	14,18	48,97
Non-metal minerals	%	23,4	12,32
Rocks	%	62,31	38,6
Semi-precious rocks	%	0,1	0,1
Source: Secretaría de Minería. Self elaboration			

The declared production of metal minerals, consists of Gold, Copper, Lithium, Silver, Zinc, Lead, Iron and Cadmium. Within this set of minerals, however, entries for 2007 in the total production are very different: only the gold and copper represent (aggregate) 90% of the value of the metal minerals production.

The following Table 2, shows the evolution of the projects proposed in recent years for exploration and data of investments, jobs and exports.

TABLE 2. Mining evolution in Argentina. From 2001 to 2008.

MINING IN ARGENTINA	UNIT	2001	2002	2003	2004	2005	2006	2007	2008
PROJECTS	Number			40	110	200	275	336	403
NATIONAL MINING PRODUCTION	Millions of U$S	1116	1089	1360	1523	1887	3150	3435	5640
INVESTMENTS	Millions of U$S	189	162	220	623	831	1300	1900	2409
DIRECT EMPLOYMENT	Thousands	21,4	19	24	27,8	30,7	37	42	87
INDIRECT EMPLOYMENT	Thousands	no data	no data	97	106,7	116,8	160	168	316
EXPORTS	Millions of U$S	861	990	1062	1410	1550	2781	3750	4057
Source: CAEM - Mining Press Nº25 Dic07/Gen08 - Editorial RN - Secretaría Minería de la Nación									

Investments in exploration, development and construction of mining projects in the country have generated a new record during 2011, with investments up to more than 11,000 million Argentinean pesos (2,500 million US$), representing a cumulative growth of 5,700% in the last 10 years (Diario Los Andes. 2011).

1.3. Regulatory framework

In order to attract venture capital and to modernize the sector to current international practices (compared to previous decades and the Mining Code, enacted in 1886), during the 1990s and driven by neoliberal policies enacted after the Washington Consesus, it became imperative to have a special regulatory framework that would allow the country to achieve a leading position in the international context. Consequently, in 1994 the National Constitution was amended and other laws followed setting up a legal framework attractive for global mining corporations. Nevertheless, during the 2000s decade and recently, the pressure exerted by environmental movements due to socio-environmental conflicts resulted in sanctions of environmental laws, e.g. the disputed Act 26.639 which establishes a protection framework for glaciers and periglacial environments, affecting projects located in the Altos Andes ecoregion, like the Pascua-Lama one (Table 3).

TABLE 3. Main standards concerning mining in Argentina.

STANDARDS	SOME CHARACTERISTICS
Constitution	Article 124: .... corresponds to the provinces the original domain of natural resourceswithin their territories, including mineral resources.
	Article 75 (powers of Congress), inc. 17: ... ensure their participation (indigenous peoples) in the management of their natural resources and other interests affecting them.
Act 1919	Mining Code
Act 24.196	Investment Regime for Mining Activities
Act 24.224	Mining Reorganization
Act 24.288	Mining Federal Agreement
Act 24.523	National Mning Trade
Act 24.585	Environmental Protection Mining Activities. Minimum requirements for environmental protection for the mining operation incorporated as complementary title to the Mining Code, in section two.
Act 25.225	Mining Code of Argentina Section 9: The State can not exploit or dispose of the mines,but in the cases mentioned in this law.
	Article 18. The mines are awarded to individuals indefinitely.
Act 25.243	Treaty on Mining Integration, the Supplementary Protocol to the Treaty of Mining Integration and the Agreement, signed with the Republic of Chile
Act 25.675	General Environmental Law. National Implementation. Principles of Prevention,Precaution and Sustainability.
Act 25.831	System of free public access to environmental information
Mining National Plan	Released on 01/23/04
Act 26.639	Minimun Requirements Regime for the Preservation of Glaciers and Periglacial Environment.
Act 5504 Chubut - Act 9526 Córdoba - Act 2349 La Pampa - Act 7879 Tucumán - Act 7722 Mendoza - Act 3981 Río Negro - Act 8137 La Rioja	Prohibits open-pit mining - Prohibits the use of cyanide with variations in each province
02/15/2012	Formalizing the establishment of the OFEMI (Federal Mining Organization) - La Rioja, Salta, Jujuy, Mendoza, San Juan, Rio Negro, Catamarca Provinces.

1.4. Tax Benefits

The big push for metal mining in recent years is covered mainly by the Mining Investment Scheme (Law 24,196) which establishes a regime for mining investments. It was enacted on 04/28/1993 and 05/19/1993 and promulgated by the Federal Mining Agreement (Law 24,288), which provides a series of economic and financial benefits that have no other extractive activities, such as hydrocarbons. Up until now it has not been revised or amended. (See Table 4)

TABLE 4: Main characteristics of the Mining Investment Regime (24,196 National Law).

STANDARD	CHARACTERISTICS	ART.		CHARACTERISTICS	OBSERVATIONS
	Fiscal stability (national, provincial y municipal)	art. 8	30 years	Stability	
	Income Tax	art. 12	100%	Deduction	stage of exploration, special studies, tests, etc.. to determine the feasibility
	Capital expenditures - Depreciation	art. 13	60%	Deduction from tax of profits	fiscal year enabling infraestruture
			40%	Deduction from tax of profits	two (2) subsequent financial years, in equal parts
	Investment in equipment, machinery, vehicles	art. 13	33%	Deduction from tax of profits	per year from the launch
	Import duties for capital goods and special equipment	art. 21	0%		
ACT 24,196	Maximun Mining Royalties	art. 22 and 22 bis	3%	of "Boca de Mina" Value of mineral, after deducting expenses of transportation, crushing, milling, marketing, administration, smelting and refining.	see table 8 of investments, exports and royalties for La Alumbrera (*)
	Utilities, capital increase, issuance of shares for shares in other companies, etc..	art. 14 and 15	0%	Tax of profits and others	
	Fiscal credits	art. 14 bis.			
	Valuation of Mineral Reserves	art. 15		Only for accounting purposes, no value for the income tax and is used for access to credit	
	Issuing shares by capitalization	art. 15	0%	National taxes, include stamps	
	Assets	art. 17	0%	Tax assets	
	Introduction of capital goods, special equipment, etc..	art. 21	0%	Import duties	
	Import capital goods	art. 21		Transfer, alienation or disaffection	end of life (see depreciation)

2. MATERIAL AND METHODS

The study is based on 19 mining projects in different phases, all of them as defined by the run of mine extraction volume. The study area involves the main mining provinces of Argentina and also extends to the Republic of Chile, because most of the studied projects falls under the area covered by Treaty of Mining Integration between the two countries.

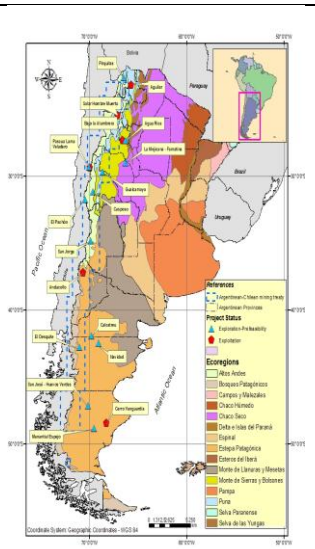
For the selection of projects following aspects were considered, in order to be representative of the current status and cover most of the territory:

- Project stage: the projects should be at least in the exploration phase.
- Administrative Jurisdictions Location: it was designed to cover as much as possible.
- Location of Eco-regions: with a preponderance of those located in areas near heads of watersheds.
- Extraction method: preponderance was given to the open pit extraction method.
- Start date of operations: special care was taken to include projects operating for some years since only in the way they can become reference points for some indicators.
- Principal mineral: must include a carrier metal, especially gold, silver and/or copper.

Based on these criteria we selected the 19 projects that are presented in Table 5. While the number of projects is still limited (there would be more than 400 throughout the country in various stages of development) are representative of the current situation and future trends. The map aside the table shows the location of the selected projects. In blue dotted line, the limits of the Treaty of Mining Integration between Argentina and Chile can be observed. (Anglogold Ashanti. 2008, Knight Piésold. 2006, Rescan. 2007 Minera Alumbrera. 2011, Secretaría de Minería. 2008).

TABLE 5. The 19 principal mining projects, at present.

Nº	PROVINCE (mining location)	DEPARTMENT	MINING LOCATION	MINE NAME
1	JUJUY	Rinconada	346 Km NO S.S. de Jujuy - 4200 masl	Pirquitas
2		Humahuaca	Oriental Side of Sierra Aguilar	Complejo Minero El Aguilar o Mina Aguilar y La Esperanza
3	CATAMARCA	Andalgalá	Andalgalá	Bajo La Alumbrera
4		Andalgalá	25 km N Andalgalá and 35 km E of Bajo la Alumbrera mine	Agua Rica
5		Antofagasta de la Sierra	Antofagasta de la Sierra	Fénix - Salar del Hombre Muerto
6	LA RIOJA	Chilecito	Cerro del Famatina (Peñas Negras)	La Mejicana - Cumbre del Famatina
7	SAN JUAN	Iglesia	Valle del Cura, 320 km NO San Juan, close to Pascua Lama	Veladero
8		Iglesia	Valle del Cura argentine side, near of Veladero and in the birth of Huasco Valley in the Chilean side - Occupies territories of the San Guillermo Biosphere Reserve	Pascua - Lama
9		Calingasta	In The Andes - 160 km O of Barreal	El Pachón
10		Calingasta	28 Km from Villa Calingasta - Near 200 km west to the capital	Casposo
11		Jáchal	North of the Jáchal, near the border with La Rioja, in Quebrada del Diablo	Gualcamayo
12	MENDOZA	Las Heras	90 km NO of the capital city of Mendoza in the Uspallata Valley	San Jorge
13	NEUQUEN	Minas	3 Km of Andacollo, 60 Km (by road) of Chos Malal and 243 Km N-NO of Zapala.	Andacollo
14	RIO NEGRO	25 de Mayo	Distrito Falla de Gastre, cerca de Ing. Jacobacci y de proyecto Navidad	Calcatreu
15		Futaleufú	"Cordón de Esquel", 7 Km Esquel	El Desquite
16	CHUBUT	Gastre	Gastre , Central Plateau of Chubut	Navidad
17	SANTA CRUZ	Deseado	150 km San Julián	Cerro Vanguardia
18		Magallanes	50 km E of Gobernador Gregores and 160 Km San Julián	Manantial Espejo
19		Lago Buenos Aires	50 Km Perito Moreno	San José-Huevos Verdes



3. RESULTS AND DISCUSSION

3.1. Impacts on water resources

The rational management of water resources appears as a key issue because these are key inputs in the production process (like capital, energy, know-how, machinery) for processing of mineral ores. Also, in many arid and semi-arid ecoregions, the value of scarce water resources is maximized and the competition for the use with other traditional economic activities such as agriculture appears as a growing issue.

Table 6 shows the values of extraction of fresh water and permit issue by the Provincial Secretariat of Water and Environment, from the Campo del Arenal aquifer, according to the Sustainability Reports of Alumbrera Mining and others. The numerical differences presented and the lack of technical precision in the critical arguments, are notables. It is also notable, moreover, the lack of reliable technical studies, which allow for verification and audit of baseline and impact assessment carried out by the mining company.

TABLE 6. Alumbrera and Agua Rica Mines.
Water consumption and extraction permits.

		m^3	
		sec.	day
Extraction of fresch water	Minera Alumbrera (2010; 2011)	0,73	61.758
	Montenegro R.	1,10	93.060
Permit issue by the provincie	Minera Alumbrera (2010; 2011)	0,81	68.526
	Machado Aráoz (2009)	1,20	101.520
Extraction of fresh water	Agua Rica (2007)	0,25	21.150
Alumbrera and Agua Rica Mines. Water consumption and extraction permits			

The most emblematic case is currently the Agua Rica project, which would place its water extraction wells in the same aquifer (Campo del Arenal) and in the same area where Minera Alumbrera operate at 25 km upstream. (Rescan, 2007).

According to the Environmental Impact Statement (EIS), the project (Agua Rica) will require a constant volume of extraction of 250 l /sec.(Rescan, 2007) and the model performed the extraction of groundwater for the process will result in a decrease in water level of about 6.73 m in the center of Campo del Arenal, near the well field of Mining Alumbrera, and 0.1 m at the boundary along the Rio Santa Maria.

In the Campo del Arenal, always according to the EIS, there are few rural settlements, and in general, wells extracting groundwater that are known and used for domestic and agricultural uses are located in areas with easy access to water including wetlands along National Route 40. Thus, the predicted decline in the groundwater layer in this area due to groundwater extraction for use in the project will vary from 0.1 to 1.0 meters, which was evaluated as moderate impact of well according to the type and depth of drilling (Rescan 2007, Vol II).

However, it is remarkable to note that in the report referred not assess synergistic impacts that this new water withdrawals would cause the aquifer. As the baseline value was used to coat a surface of groundwater historical (1997) and therefore the impacts occurred due to groundwater extraction by Alumbrera were not considered (Rescan 2007, Vol II, 23 - 76).

This is consistent with the current legal framework that requires only the approval of an Environmental Impact Report without a Strategic Environmental planning.

Meanwhile, regarding the MIning Integration Treaty with Chile (Act 25.243) should be revised in order to tend to real sustainability of the protected area. In this sense some of their articles do not seem to agree with that purpose, for example, article nº 3: " …also allow for this purpose ("mining business") the use of all natural resources…" and article n. 6 of the Supplementary Protocol: "… understanding in this concept existing water resources in their territories…"

3.2. Energy consumption

The energy consumption of mega mining projects, restricted exclusively to the project area, are always of great magnitude and inputs for their production can be summarized in two types: diesel fuel for heavy and light vehicles and electricity for essentially the activity of plant machinery.

The Agua Rica project (see Table 5) is planning to consume 70 million liters of diesel per year and requires an installed capacity of 126 MW. The annual consumption of 1,004 GWh would be, equivalent to 15% of that generated by Salto Grande (hydropower central) (6.900 GWh annual energy). This consumption, in operation phase, would correspond to 1% electricity generation from all over the country. Considering the direct jobs (976) and indirect (2640) that the company will create at that stage, they correspond to a 0.023% of the Economically Active Population (EAP). (Giraud, M. 2009)

With regards to the Pascua-Lama project (see Table5) it would consume 102 million liters of diesel oil per year in the construction phase and 35.4 million liters / year in the operation phase. As for electricity, the average annual consumption during the 21 years of the project, would be about 928.56 GWh. (Knight Piésold. 2006).

The Veladero project (see Table 5) has 22 diesel generators of 2,250 HP each with a capacity of 23 MW, and recently launched the first wind generator in the province at 4,100 meters above sea level installed with a power of 2 MW. Currently, is under construction a wind farm with 18 wind turbines (36 MW) to supply both projects, Pascua-Lama and Veladero.

From the data in Section 1.2, it can be demonstrated that the energy demand of the present and future projects of great magnitude has implications for the national social-productive sector, in addition, to the strictly environmental for the use for generating energy almost exclusively on non-renewable fossil fuels.

3.3. Communities transfer – Social indicators

The following Table 7 shows the tendency of some social indicators and it shows the trend in terms of the investment plan of state resources in the province of Jujuy, Catamarca and Santa Cruz, those with older projects, in recent years. It will be very important to follow-up future trends in investment in this sector.

TABLE 7: Social indicators (Self elaboration based on data of National Institute of Statistics and Census. National Census 2001)

PROVINCE	CITY / DEPARTMENT	HOMES				POPULATION			EDUCATION	EMPLOYMENT	HEALTH							
		total	with UBN (NBI)	No toilet or toilet without flusing	NO tap water	total		with UBN (NBI)	illiteracy rate	unemployment rate	Infant Mortality	Official Health Care Facilities		Beds official sector				
																per capita		Δ
			%	%		1991	2001	%	%	%	‰	1990	2004	1990	2004	1990	2004	%
NACION		10.075.814	14,3	16,9	15,3	32.615.528	36.260.130	17,7	2,6	7,5	14,4	6140	8000	70615	78057	0,22	0,22	-0,12
JUJUY	Rinconada	562	44,1	94,3	49,3	n.a.	2.298	46,1	12,3	n.a	n.a							
	Humahuaca	3.848	29,3	45,4	19,6	n.a.	16.765	30,2	8,6	n.a	n.a							
	Prov. Jujuy	141.631	26,1	33,2	5,4	512.329	611.888	28,8	4,7	5,9	17,8	200	27	2039	1786	0,40	0,29	-10,61
CATAMARCA	Belén	5.610	25,7	38,3	8,4	n.a.	24.582	28,8	9,1	n.a	34,1							
	Santa María	5.056	21,8	36,8	6,3	n.a.	22.048	22,4	6,5	n.a	26							
	Andalgalá	3.864	22,2	26,9	3,9	n.a.	16.942	26,5	5,2	n.a	14,8							
	Antofagasta	340	41,5	66,4	30	n.a.	1.213	39,8	9	n.a	n.a							
	Pcia Catamarca	77.776	18,4	24,8	4,5	264.234	334.568	21,5	2,9	9,1	26,1	325	289	828	932	0,31	0,28	-3,48
SANTA CRUZ	Pto Deseado	19.890	n/d	12	10,7	n.a.	72.953	12,3	1,5	n.a	n.a							
	Prov. Santa Cruz	53.834	n/d	10,1	8,0	159.839	196.958	10,4	1,43714354	4,1	11,9	36	44	443	643	0,28	0,33	4,93

3.4. Royalties

Table 8 shows some numbers, possible only with the benefits provides by the current tax system (see 1.4).

(*) **TABLE 8:** Investments, exports and royalties paid by La Alumbrera

LA ALUMBRERA		
CONCEPT	**YEAR**	**MILLONS US$**
INVESTMENTS		1300
EXPORTS	2002	647
	2003	647
	2004	647
	2005	897
	2006	n/d
	2007	1558
	2008	1249
	2009	1203
	2010	1590
ROYALTIES (average)	Since 2006	32,6 per year

3.5. Administrative procedure

The administrative procedure usually required by the provinces is the performance of a process of Environmental Impact Assessment, which requires the presentation of an Environmental Impact Report, which after being reviewed and improved by designated technical authorities, possibly with some instance of non-binding citizen participation, culminates in the formulation of an Environmental Impact Statement (EIS) by the authority, leading to the actions requested by the mining consortium in question.

Interestingly, often conflict of interests appear through these instances as the Provincial Environmental Management Units (UGAP) depend administratively from the Provincial Mining Secretariat, a fact that does not help to promote transparency and build trust on government regulations and control of approvals.

The National State has issued minimum requirements mandated by the Constitution, through Law No. 24,585, as Title Complementary Mining Code of the Nation. Nevertheless, provincial authorities make the final decisions.

3.6. Conflicts

As an example, it can be mentioned the removal of the Governor (ex – Secretary National Mining when Act 24,196 was passed) relative to the Famatina gold mining project, when the provincial legislature passed the law banning open pit mining and the use of cyanide (03/08/07). Barrick Gold dropped out exploration work on the Cerro Famatina. Some days ago, the company Osisko, new manager of the prospecting, also retired until they obtained the social license. (Mining Watch Canadá. 2012).

There are now around the country, a movement of Citizen Assemblies that are in constant mobilization and alert, with special emphasis in the La Rioja and Catamarca provinces. (Montenegro, R. 2009). Unfortunately, in Argentina referendums for the pursuit of social license are not institutionalized as public consultation tools. One of the few institutionalized stages of citizen participation is non-binding public audience happening before the release of the Environmental Impact Statement. The stages of previous consultations during the SEA process would be very useful to achieve the consensus.

4. CONCLUSIONS

Argentina is a country with huge historical imbalances in regional terms, lack of technology transfer and real regional development plans, what makes it paramount to promote real development programs of these regional economies through specific policies in order to reassembly production in each region.

It is necessary to revise the country's mining policy through a comprehensive strategic environmental assessment (SEA), in order to assess the sustainability of the activity, analyzing operational alternatives, cumulative impacts, public participation, technology transfer, regional development, etc.

The SEA process should provide clear messages for decision makers, based in issues related to achieve the sustainability. The environmental impact that society demands toward an equitable progress, present and future, must be determined by the use of systematic, clear and judicious tools. In this sense, SEA is presented as a need, as it is absolutely imperative to generate studies that analyze the sustainability aspects from a global dimension in space and time.

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