

Sustainable Development of Lithium Resources from Salt Flats: Emerging Opportunities and Policy Perspectives for Latin American Countries



Ralph Wahnschafft

**Emerging Issues Branch
Division for Sustainable Development
United Nations
Department of Economic and Social Affairs
New York, NY 10017**

Part I **The Intergovernmental Policy Debate on Sustainable Development at the United Nations**

- The Sustainable Development Concept
- The Normative Policy Debate on Transport and Mining at the United Nations
- The “Green Economy” Theme at “Rio+20” Summit, 2012

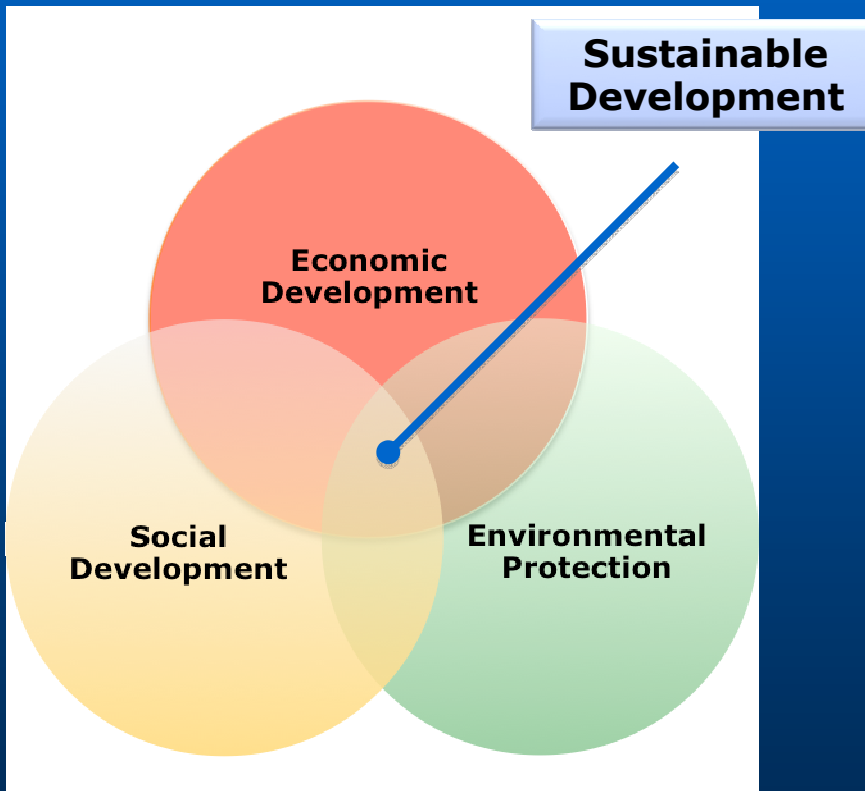
Part II **DESA/ECLAC Senior Expert Group Meeting on Sustainable Development of Lithium Resources in Latin America**

- Santiago, Chile, 10-11 November 2010
 - Participants, Programme, Proceedings

Part III **Selected Recommendations on Sustainable Production of Lithium (from Brines)**

The Sustainable Development Concept

- Integration of economic, social and environmental considerations in decision making -



1972

- United Nations Conference on the Human Environment – Stockholm

1982

- United Nations Conference on the Human Environment – Nairobi

1992

- Earth Summit : United Nations Conference on Environment and Development – Rio de Janeiro

2002

- United Nations World Summit on Sustainable Development – Johannesburg

2012

- United Nations Conference on Sustainable Development – Rio de Janeiro

United Nations Conference on Environment and Development (UNCED) Rio de Janeiro, Brazil

1992



- Rio Declaration on Global Principles on Environment and Development Policies
- Agenda 21: Programme of Action for Sustainable Development
- United Nations Commission on Sustainable Development (CSD) established

United Nations Conference on Sustainable Development (UNCSD) Rio de Janeiro, Brazil

Agreed Themes:

2012

- "Green Economy" in the Context of Sustainable Development and Poverty Eradication
- Institutional Framework for Sustainable Development

United Nations Commission on Sustainable Development (UN CSD)

18th Session (May 2010) and 19th Session (May 2011)

New York

Thematic Cluster

- Transport
- Chemicals
- Waste Management
- Mining
- 10 Year Framework of Programmes on Sustainable Consumption and Production Patterns



Policy options for enhancing transport and sustainable development: What could the Commission recommend?

- Improve access to basic transport infrastructure (all weather roads) and services in rural areas of developing countries;
- Reduce congestion, air pollution and inefficient use of fuel and resources in (individual) motorized urban transport in cities;
- Enhance modal shift from high-carbon to low carbon modes of transport;
- Improve (energy) efficiency in all transport systems;
 - fuel standards, motor vehicle standards, inspections, taxation;
 - transition to electric mobility (?)
 - based on lithium-ion battery technology (?)

Under which conditions are electric mobility systems (more) sustainable ?

- Fuel source and efficiency of power generation, transmission and distribution systems
 - fuel source ?? (renewables ?, coal ?, nuclear ?)
 - availability ? - costs ? - affordability ? - impacts ?
- Battery technology development and availability of lithium
 - availability ? - costs ? - affordability ? - impacts ?

What kind of transport policies can be recommended with regard to electric mobility?

DESA/ECLAC Senior Expert Group Meeting on Sustainable Development of Lithium Resources in Latin America



ECLAC, Santiago, Chile, 10-11Nov 2010

Programme structure:

Opening

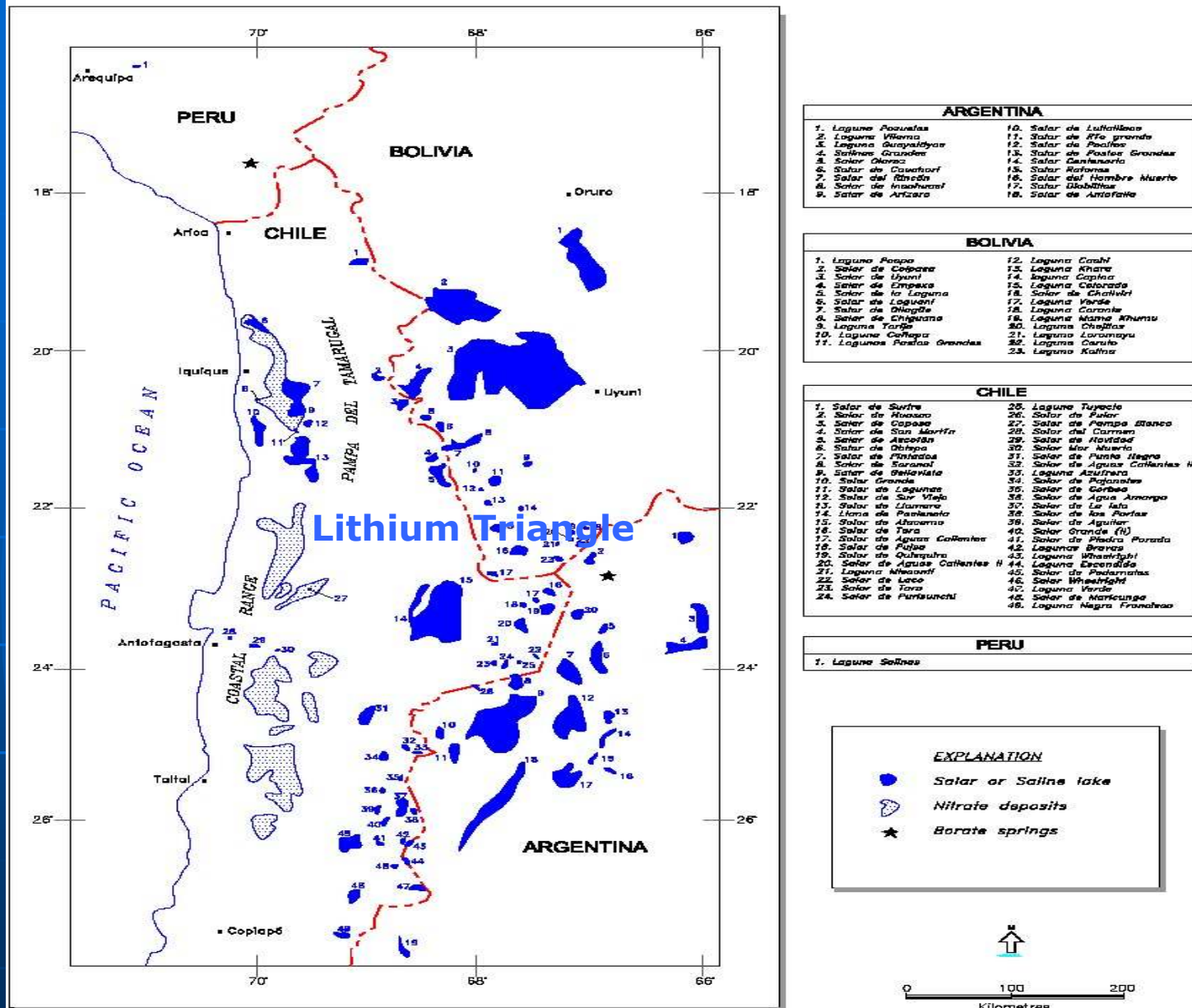
Session 1: Introductory overviews: Assessing global supply and demand for lithium from salt flats

Session 2: Country reports – Bolivia, Chile, Mexico

Session 3: Selected issues and perspectives for enhancing sustainability in the production of lithium carbonate

Session 4: Perspectives for international cooperation

Session 5: Conclusions and recommendations



Together, the countries of the "lithium triangle", including Argentina, Bolivia and Chile, hold the world's largest proven reserves of lithium.

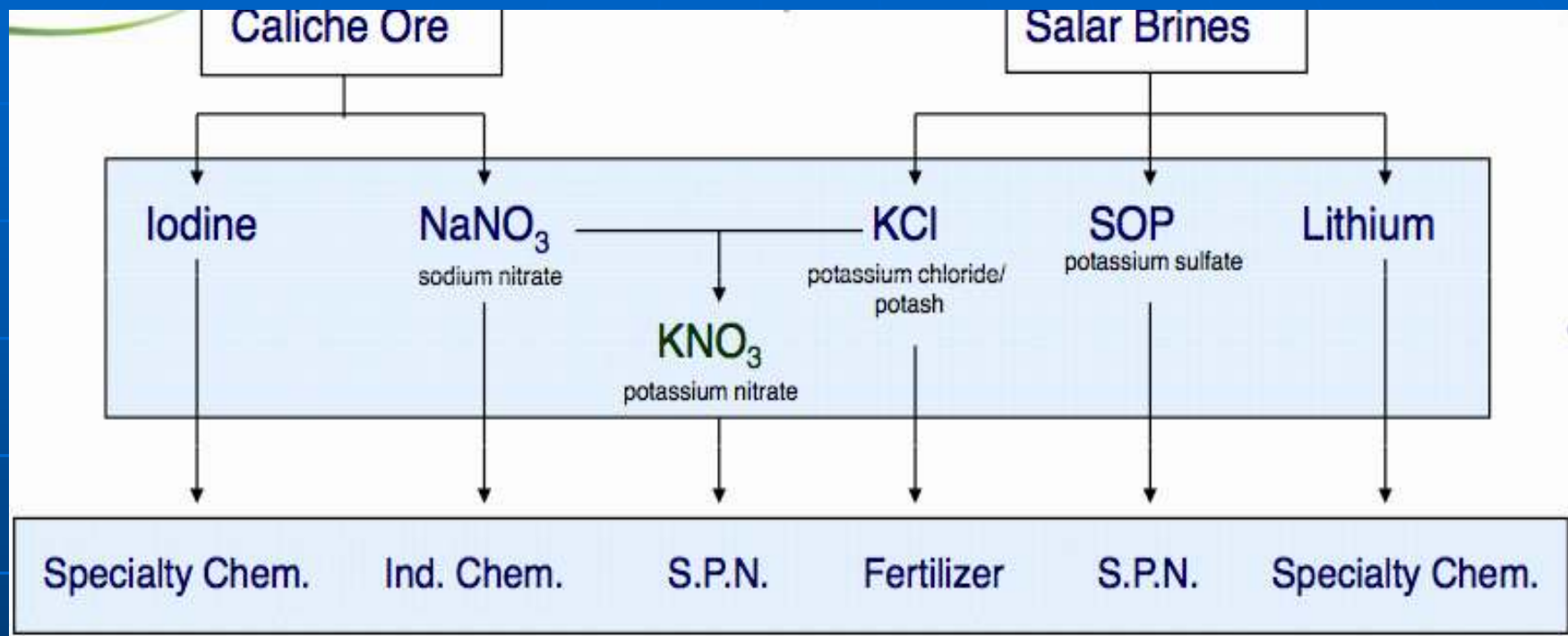


Comparative cost estimates of production of lithium carbonate from salt flats

	Deposit	Country	Concentration %	Magnesium / Litium Relation	Evaporation rate	Estimated cost range		
					mma	US\$ per ton		
1	Atacama	Chile	0.15	6.4	3700	1.543	-	2.205
2	DXC	China	0.04-0.05	0.22	2300	2.205	-	2.646
3	Zhabuye China	China	0.05-0.1	0.001	2300	2.205	-	2.646
4	Taijinaier	China	0.03	34	3560	2.425	-	2.866
5	Hombre	Argentina	0.06	1.37	2600	2.425	-	2.866
6	Olaroz	Argentina	0.09	2	2600	2.425	-	2.866
7	Silver Peak	USA	0.023	1.5	1000	2.425	-	2.866
8	Rincón	Argentina	0.04	8.5	2600	2.646	-	3.307
9	Maricunga	Chile	0.156	8	2600	2.646	-	3.307
10	Greenbushes	Australia	1.36	n/a	n/a	2.646	-	3.307
11	Uyuni	Bolivia	0.04	19	1500	2.866	-	3.968
12	Masvingo (Bikita)	Zimbabwe	1.4	n/a	n/a	2.866	-	3.968
13	Bernic Lake	Canada	1.28	n/a	n/a	2.866	-	3.968
14	Cherryville	USA	0.68	n/a	n/a	2.866	-	3.968

Source: compiled by Christian Moscoso W., University of Chile, presented at DESA/ECLAC Seminar 10-11 November 2010

Simultaneous Extraction and Processing of Multiple Products from Atacama Salt Flats



S.P.N. : Specialized Plant Nutrient

Co-production of multiple products, including potassium, lithium, magnesium, nitrates, iodine and other minerals offers essential economic advantages and opportunities for business resilience through diversification of markets, suppliers and customers.

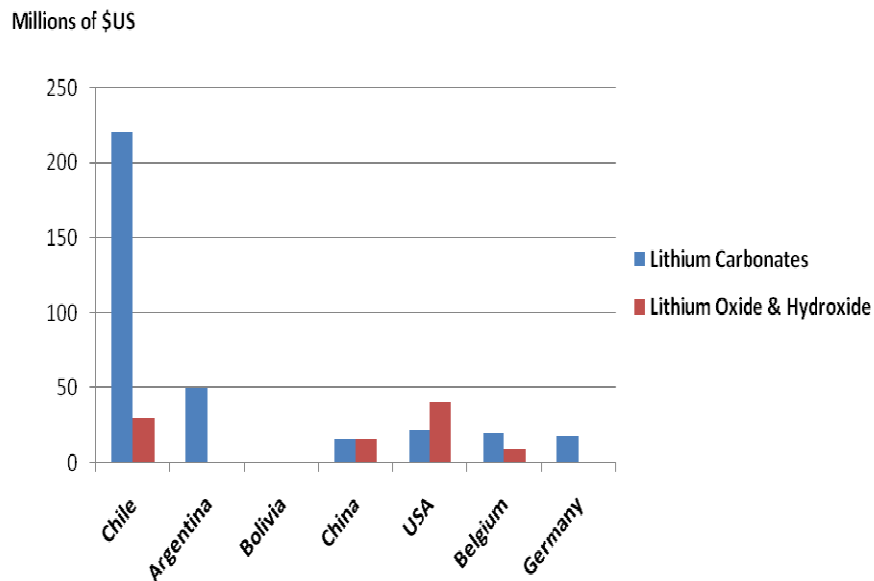
Revenues from lithium exports (2008)

- in million US\$ -

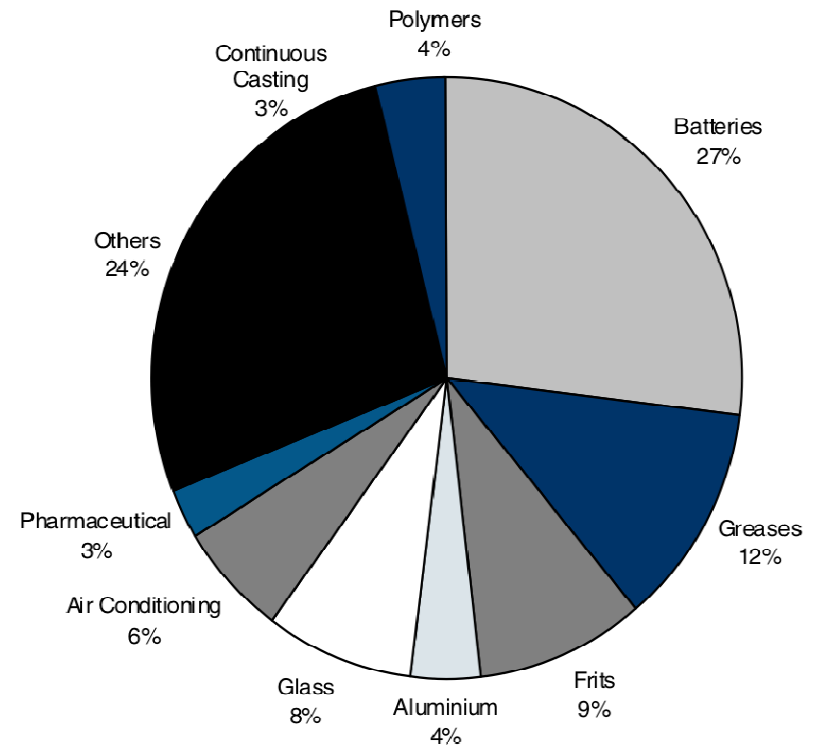
Global lithium consumption by end market (2008)

- in lithium carbonate equivalent units -

Revenues from Lithium Exports – Selected Countries (2008)

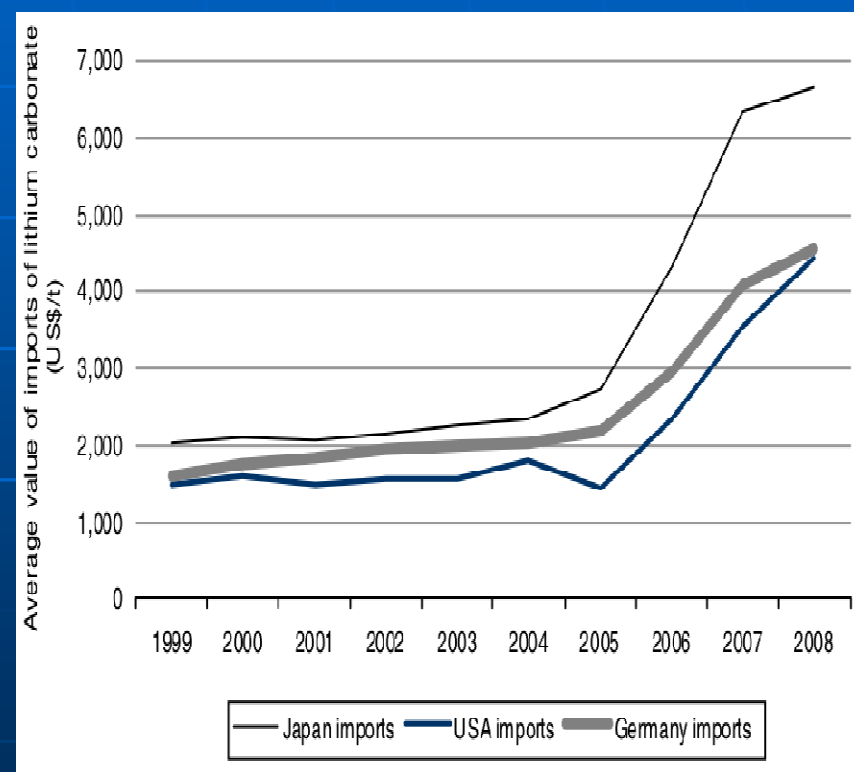
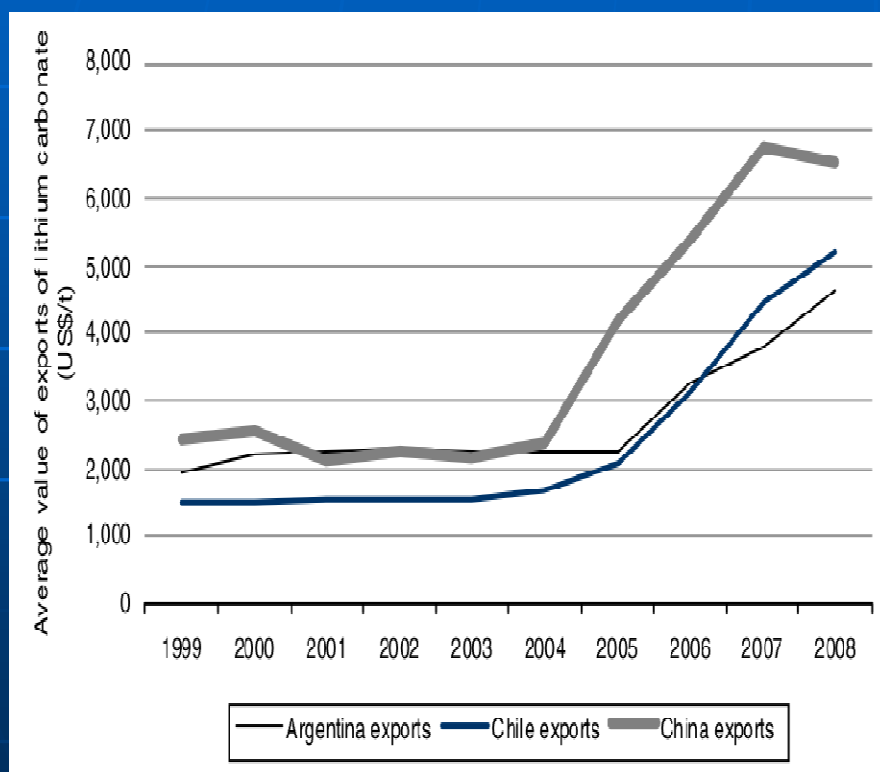


Source: UN Comtrade (United Nations Commodity Trade Statistics Database)



Source: SQM, Credit Suisse estimates

Average prices of lithium carbonate in US\$/ton - selected exporting and importing countries



Source: Global Trade Atlas

Source: Global Trade Atlas

Recent and projected trends in global lithium demand

In 2009, sales and prices of lithium carbonate declined as a result of the global financial and economic crisis.

In the intermediate and long term, global demand for lithium is widely expected to continue to increase (and may at least double in the next ten years).

Increased demand is mostly projected to come from manufacturers of lithium-ion batteries, in particular batteries for HEVs, PHEVs and EVs.

There are ample resources to meet the projected growing lithium demand for several decades to come.

Growing investments in capacities make price trends difficult to project.

Need for regulatory initiatives to prepare for lithium-ion battery recycling

Sustainable development of electric mobility requires that battery producing countries develop, test, plan for and introduce economically viable and environmentally friendly battery recycling technologies.

Initial estimates and studies suggest that approx 50 – 70 per cent of lithium and other battery materials can be recovered and reused.

Further efforts will be needed to enhance product standardization and to establish the necessary regulatory framework.

Private sectors / industries may consider to take a lead.

Prospects for electric mobility and the role of lithium supplies

Efforts to successfully commercialize electric vehicles will depend, among other factors, on retail prices and on the relative costs of batteries, which thus far have remained relatively high.

Relative to the high costs of batteries, the cost of lithium carbonate and the costs of lithium contained in such batteries is actually very low (less than 5 per cent).

Hence, success in the commercialization of electric vehicles will primarily depend on battery technology development and costs (and not on the costs or price of lithium).

Government policies for promoting lithium production are under review

Chile:

Production of lithium as “strategic mineral” previously restricted to authorized public sector corporations;
liberalization of regulations intended and under way;

Bolivia (Plurinational State of Bolivia):

New national constitution of January 2009 defines natural resources as the property of the Bolivian people;

- Government mandate (Art. 306.I and Art 349.I) and objective to reduce dependency on primary commodity exports (Art 311.II.3)

Uyuni / Rio Grande Pilot plant under construction;

Technology IPRs: 7 Bolivian/COMIBOL patents pending;

International collaborations: Brazil, Iran, Rep. of Korea, Japan;

No larger scale commercial production to date (planned for 2014).

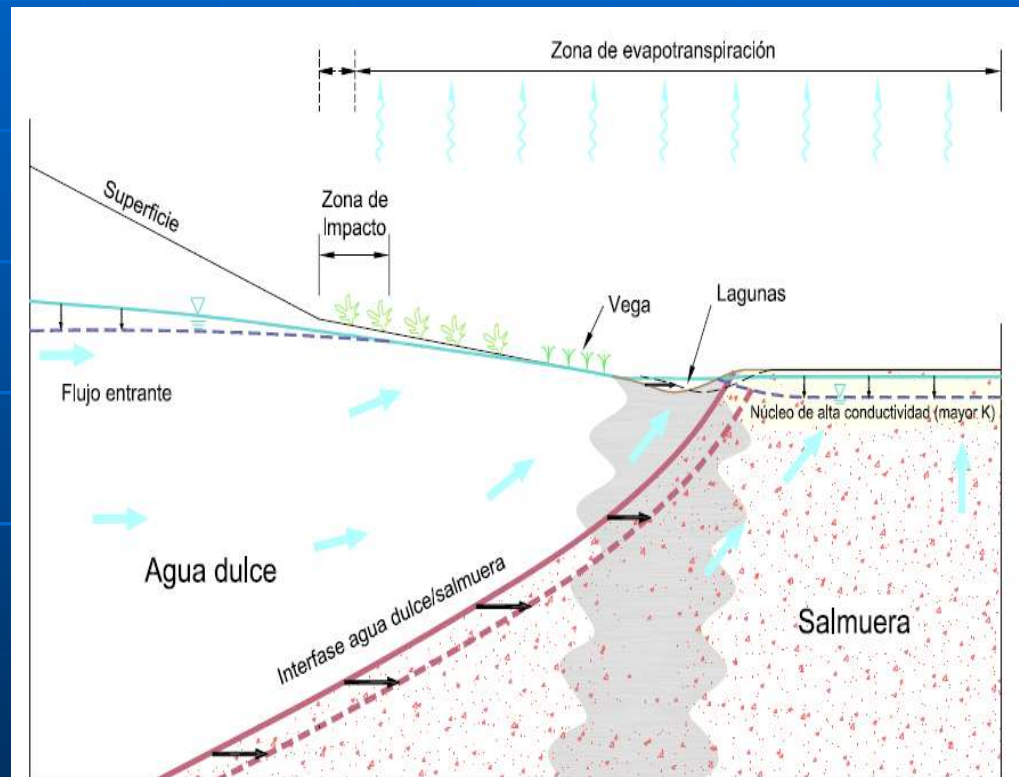
[www.un.org/esa/dsd/susdevtopics/sdt tran_egm1110.shtml](http://www.un.org/esa/dsd/susdevtopics/sdt_tran_egm1110.shtml)

Sustainable development concerns: Assessing hydrologic and environmental impacts

Potential effects of brine extraction on delicate balance of fresh and/or ground water supplies

Comprehensive environmental impact assessment studies and monitoring is crucial to prevent, minimize and mitigate negative impacts on the flora, fauna and ecosystems in the salares and the adjacent areas.

Weak environmental regulation and control mechanisms can lead to significant damages and "external" effects.



Extracción de salmuera

- Interfase salina se desplaza hacia el núcleo
- Nivel freático - descendiendo aguas arriba de la zona de vegetación
- Las lagunas migran y la salinidad cambia
- Reducción de los niveles de salmuera

Source: John McCartney, Schlumberger Water Services, Chile

Sustainable development: Social concerns, public participation, including rights and concerns of indigenous people

Mining for world markets often relies on imported equipment and temporary migrants with the required skills, offering only very limited opportunities for sustained local value-added or socio-economic development.

Greater efforts are needed in many regions to further enhance local benefit-sharing and the diversification of economic activities in local communities.

In order to avoid or reduce potential social conflicts it is essential to ensure a broad based public participation process starting at the project planning stage, including the involvement of indigenous people and communities.

Corporate social responsibility (CSR): Periodic reporting and transparency

Comprehensive periodical reporting by concerned companies and other stakeholders is an essential precondition for effective information sharing, transparency and public participation in decision making.



The image shows the cover of a document titled "Sustainable Development Policy" from SQM. The cover features a collage of images: a woman in a blue uniform, a bird, a group of children, and a worker in a hard hat. The SQM logo is in the top left corner. Below the title, there is a paragraph of text and a list of ten bullet points. At the bottom, there is a signature of Patricio Contesse González, Chief Executive Officer of SQM, and the date "Santiago, November 29, 2010". The website "www.sqm.com" is at the bottom right.

SQM
THE WORLDWIDE
BUSINESS FORMULA

SUSTAINABLE DEVELOPMENT POLICY

SQM is committed to sustainable development of its business, incorporating in its activities the care and respect for the people working in its facilities, the environment, the community and its customers. A good performance in these matters is key to the success of our business and future development. Therefore, SQM whose main business lines are the production of specialty plant nutrients, iodine, lithium, potassium and industrial chemicals, with facilities in Chile and commercial and productive presence abroad commits to:

- Comply with legislation and regulations applicable to its activities, products and services, and the commitments acquired voluntarily, including standards defined internally.
- Develop and implement the necessary prevention plans and control measures in a timely manner to minimize the risk of injury and damage to the health of our employees and those of our service companies, contractors and subcontractors; promoting the active participation of all workers in risk prevention matters.
- Minimize the environmental impacts that could be caused by our activities on the surroundings by including the environmental factor at an early stage of the design of our operations, and thereby, prevent and implement control and mitigation measures to avoid pollution through the appropriate waste and emissions management.
- Promote responsible and efficient use of natural resources and productive supplies, according to national and international standards and best practices on the subject.
- Provide our customers with quality products according to agreed standards, and provide them with a quality service to ensure a long-term relationship and mutual benefit.
- Keep a good neighbor relationship and get involved in the development of communities near our operations, supporting projects and joint activities leading to improve the quality of life of such communities, emphasizing education, culture and environmental protection.
- Keep an open and ongoing communication with our employees, contractors, customers, shareholders, neighbors and authorities, reporting regularly on our performance.
- Promote continuous improvement of our performance in safety, health, environment, quality and relationship with the community.
- Instruct, train, and evaluate our employees and staff from service companies, as active and participative players of the effective implementation of this policy throughout the activities performed by the company.


Patricio Contesse González
Chief Executive Officer
SQM

Santiago, November 29, 2010

www.sqm.com



Long-term sustainability perspectives: Post-mining site rehabilitation

Facilities for the extraction and processing of lithium are commonly projected to have a long operational lifetime.

However, the application of the precautionary principle would suggest a timely provision of measures that can ensure the necessary financial resources for the eventual post-mining site rehabilitation.

Perspectives for regional cooperation on lithium development in Latin America

The countries, institutions and companies engaged in the production of lithium carbonate in Latin America potentially share various common interests and may consider enhancing regional cooperation and information exchange for mutual benefits, e.g. through

- Academic / scientific / research cooperation and information exchange;
- Improvement of sub-regional transport infrastructure and services;
- Facilitation of cross-border travel and trade;
- Bi-lateral mining cooperation and integration treaties

Complete proceedings on
**DESA/ECLAC Expert Group Meeting on Sustainable
Development of Lithium Resources in Latin America**
Emerging issues and opportunities
available via:

www.un.org/esa/dsd/susdevtopics/sdt_tran_egm1110.shtml

Formal Report on Expert Group Meeting:

http://www.un.org/esa/dsd/csd/csd_pdfs/csd-19/sg-reports/CSD-19-Report-on-EGM-on-Sustainable-Development%20of%20Lithium%20Resources-in-Latin-America-single-spaceddoc.pdf

Further information:
wahnschafft@un.org