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

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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 -

- Economic Development
- Social Development
- Environmental Protection

Sustainable Development

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?
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

ECLAC, Santiago, Chile, 10-11 Nov 2010
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

<table>
<thead>
<tr>
<th></th>
<th>Deposit</th>
<th>Country</th>
<th>Concentration %</th>
<th>Magnesium / Lithium Relation</th>
<th>Evaporation rate</th>
<th>Estimated cost range</th>
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<tbody>
<tr>
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<td>US$ per ton</td>
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<td>Chile</td>
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<td>Olaroz</td>
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<td>Silver Peak</td>
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Source: compiled by Christian Moscoso W., University of Chile, presented at DESA/ECLAC Seminar 10-11 November 2010
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 -

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

International Merchandise Trade Statistics / United Nations DESA
Average prices of lithium carbonate in US$/ton - selected exporting and importing countries

Source: Global Trade Atlas

Credit Suisse Report "Lithium", 01 October 2009, P23
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).

Sustainable development concerns: Assessing hydrologic and environmental impacts

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.
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.
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:


Formal Report on Expert Group Meeting:


Further information:

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