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Sustainable Development of Lithium Resources in Latin America:
Emerging Issues and Opportunities****10-11 November 2010, Santiago, Chile****Contents**

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction.....	1-8	3
II. Opening Session.....	9-11	5
III. Proceedings of the Expert Group Meeting.....	12-33	6
A. Assessment of global supply and demand for lithium carbonate from salt flats.....	17-24	9
B. Experiences, trends, issues and policies in production of lithium from salt flats.....	25-27	11

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C. Perspectives for enhancing sustainability in the production of lithium carbonate in Latin America.....	28-31	12
D. Perspectives for North-South, South-South and regional cooperation in lithium resource development.....	32-33	13
IV. Conclusions and recommendations.....	34	13
 Annex		
Conclusions and Recommendations of the Senior Expert Group Meeting on Sustainable Development of Lithium Resources in Latin America: Emerging Issues and Opportunities.....		14

I. Introduction

1. As a contribution to the intersessional consultative process for the nineteenth session of the Commission on Sustainable Development (CSD), the Department of Economic and Social Affairs (DESA) and the Economic Commission for Latin America and the Caribbean (ECLAC) co-organized a Regional Senior Expert Group Meeting on the topic of Sustainable Development of Lithium Resources in Latin America: Emerging Issues and Opportunities, which was held at ECLAC Conference Centre in Santiago de Chile, Chile, 10-11 November 2010.
2. The meeting was attended by 55 experts, including experts from Argentina, the Plurinational State of Bolivia, Chile, Mexico and Peru, as well as experts from Germany, Japan, Republic of Korea and United States of America. In addition to representatives of Governments, the private sector, academia, NGOs, international resource persons, United Nations organizations and other development agencies also participated in the Meeting.
3. Lithium-based batteries and energy storage technologies play an increasingly important role in laptop computers, mobile phones and other battery-powered electronic appliances. With the growing interest in electric vehicles for more sustainable transport and mobility systems global demand for lithium is widely expected to continue to grow significantly, offering new opportunities for both developed and developing countries. Emerging lithium-based battery technologies may also gain importance in other applications.
4. Global demand for lithium has grown very rapidly. The countries of the Latin American region have the largest known resources of lithium. The world's largest producers of lithium in 2007 were Chile, Argentina, Australia, USA, China, and the Russian Federation. Large known resources of lithium are also located in other countries in Latin America, particularly in the Plurinational State of Bolivia, as well as in Asia and in sub-Saharan Africa. Exploration efforts are increasing worldwide to widen the sources of lithium.
5. Many governments of the Latin American region have expressed keen interest in further exploring and in rapidly developing capacities for the sustainable production and processing of lithium carbonate. However, for such development to be sustainable, it requires the integration of economic, social and environmental aspects in policy decision-making.
6. The Senior Expert Group Meeting was held in the Latin American region in order to provide a platform for wider information and experience sharing, in particular among regional experts and policy makers, as well as with visiting international lithium industry and sustainable development experts. The meeting was interdisciplinary in nature, involving both the public and the private sectors, and intended to facilitate an independent assessment of emerging lithium-related technologies and policies.
7. As a part of its forth implementation cycle (2010-2011), the Commission on Sustainable Development is currently reviewing implementation of its decisions with regard to the thematic

cluster including transport, chemicals, waste management, mining, and the Ten Year Framework of Programmes on Sustainable Consumption and Production. The discussions, conclusions and recommendations of the Senior Expert Group Meeting were envisaged to provide relevant additional background information for the up-coming debate on policy options, in particular with regard to enhancing sustainability in the transport (electric mobility) and in the mining sectors.

8. In accordance with United Nations General Assembly resolution A/RES/64/236 of 31 March 2010 the United Nations Conference on Sustainable Development (UNCSD) will be held in Brazil in 2012. One of the two main agreed themes of the UNCSD (Rio20) is “a green economy in the context of sustainable development and poverty eradication”. Greater resource and energy efficiency and low carbon energy and transport technologies, including advanced battery technologies which require a growing supply of lithium, are widely expected to form an important part of policies and strategies aimed at a “greener economy”. Hence, the conclusions and recommendations of the Senior Expert Group Meeting on Sustainable Development of Lithium Resources in Latin America presented in the Annex to this summary report may also provide useful background information for the UNCSD preparatory consultative process.

II. Opening Session

9. In their opening statements, Mr. Antonio Prado, Deputy Executive Secretary of the Economic Commission for Latin America and the Caribbean, and Ms. Kathleen Abdalla, Chief of the Emerging Issues Branch at the UN DESA Division for Sustainable Development, welcomed the participating experts and highlighted the importance a comprehensive assessment of the potentials for expanding lithium production in the Latin American region in a sustainable manner. Mr. Prado and Ms. Abdalla also expressed their gratitude to the Government of the Republic of Korea for providing generous technical and financial support for the preparations and the convening of the Meeting.

10. H.E. Mr. Pablo Wagner San Martin, Undersecretary of Mining, Ministry of Mining of the Government of Chile State delivered a keynote address, in which he highlighted the historic importance of mining industries for the socio-economic development of Chile. Mr. Wagner analyzed important pertinent trends and issues. He explained the need for regulatory reforms in Chile which would be expected to facilitate expanded investment and increasing production of lithium carbonate, in particular in the Northern provinces of the country. Mr. Wagner noted that Chile was among the leading producers and world market suppliers of lithium carbonate. He also noted that global demand for lithium was widely expected to continue to grow rapidly in the years ahead.

11. H. E. Mr. Eduardo Menez, Minister, Permanent Mission of the Republic of the Philippines to the United Nations and Vice-Chair of the nineteenth session of the United Nations Commission on Sustainable Development and Mr. Jang Myung-Soo, Minister Counsellor, Embassy of the Republic of Korea in Santiago, Chile, also welcomed the participants. Mr Menez informed the participants of the preparations for the nineteenth session

of the Commission on Sustainable Development. He stressed the importance and the timeliness of the Senior Expert Group Meeting which would provide a relevant input, in particular with regard to the discussion on policy options for making transport systems more sustainable. Mr. Jang noted that the Republic of Korea became a member of ECLAC in 1997 and was supportive of exploring opportunities for enhancing regional and international cooperation.

III. Proceedings of the Expert Group Meeting

12. Mr. Ralph Wahnschafft, Senior Economic Affairs Officer at the UN DESA Division for Sustainable Development, expressed the expectation of the co-organizers that meeting would enhance on-going efforts in the South American sub-region to develop lithium resources in a sustainable manner, and to encourage further development of lithium production along positive economic, social and environmental guidelines. He noted the specific objectives of the Senior Expert Group Meeting which was aimed to: (i) identify and discuss sustainable development issues in the extraction and industrial processing of lithium, including economic, social and environmental aspects; (ii) compile an independent assessment of the potentials and the benefits of expanded lithium mining and processing at existing and potential new sites, in particular in the countries of Latin America; (iii) consider the potential contribution to regional sustainable development and related policies that can enhance investment, employment and income generation, as well as benefit sharing; (iv) discuss opportunities for improving the sustainability of lithium production and use; (v) provide proposals for improved regulatory and legislative measures in the sub-region; (vi) create an expanded informal consultative network, bridging the gaps between policymaking, science, academia, and the private-sector; and (vii) identify possible future projects and partnerships for international cooperation.

13. Mr. Wahnschafft introduced the provisional programme which included a total of 21 presentations by experts, including introductory overviews, selected country reports, and technical presentations by the participating experts. He thanked the participating regional and international experts for their respective professional contributions to the programme.

14. The two day programme included expert presentations and discussions, including on the following topics: (i) assessment of national, regional and world market trends and analysis and projection of lithium demand and supply; (ii) assessment of current and future lithium application technologies (batteries, electronics, and other fields); (iii) lithium geological environment and resources (evaporites vs. pegmatites and other lithium bearing rocks); (iv) lithium mining, processing and ultimate upgrading; (v) presentations and discussions of reports by national experts (including Bolivia, Chile and Mexico); (vi) current legal environment (mining code, environment impact assessment, social considerations, mineral beneficiation, taxes) of the mining industry in countries involved in mineral exploitation, in particular in Latin America; (vii) infrastructure and natural resource requirements in lithium mining; (viii) elements of environmental impact assessment of lithium mining in the short and long term; (ix) local employment generation and regional social and economic development; (x) the long-term life cycle of lithium and assessment of its contribution to sustainable development (including

potentials for recycling of materials); and (xi) perspectives for multi-stakeholder participation and benefit-sharing.

15. The programme comprised a sequence of 5 technical plenary sessions. Session I on assessment of global supply and demand for lithium carbonate from salt flats was chaired by Ms. Kathleen Abdalla, Chief, Emerging Issues Branch of UN DESA Division for Sustainable Development. Session II on country experiences, trends, issues and policies in production of lithium from salt flats was chaired by Mr Manlio Coviello, Chief, Natural Resources and Energy Unit and the Natural Resources and Infrastructure Division, ECLAC. Session III on enhancing sustainability in the production of lithium carbonate in Latin America was chaired by Mr. Eduardo Chaparro Avila, Economic Affairs Officer at the Natural Resources and Infrastructure Division, ECLAC. Session IV on perspectives for North-South, South-South and regional cooperation in lithium resource development was chaired by Mr. Moon Young-Seok, Managing Director of the Energy Policy Research Group at the Korea Energy Economics Institute (KEEI), Seoul, Republic of Korea. The concluding roundtable discussion on conclusions and recommendations was co-chaired by H.E. Mr Eduardo Menez and Mr. Ralph Wahnschafft.

16. The sections here below summarize and highlight selected essential points presented and discussed at the Meeting. The complete proceedings, including audio files of all statements and presentations made, as well as the various papers and slides presented and the conclusions and recommendations adopted are publicly accessible at UN DESA and ECLAC webpages under http://www.un.org/esa/dsd/susdevtopics/sdt_transport.shtml and <http://media.eclac.cl/presentaciones/conferencias2010/litio/index.htm>

A. Assessment of global supply and demand for lithium carbonate from salt flats

17. Independent technical assessments, comprehensive market analysis, and short and long term trend projections are all essential prerequisites for informed decision-making on lithium mining and the related investment, resource development and socio-economic policies.

18. At the global level, there is a relative abundance of existing and potential future lithium supplies. However, appropriate extraction processes and related costs can vary considerably between sites. Lithium carbonate production based on extraction of lithium chloride brine from salt flats tends to be more economical and more environmentally benign than lithium extracted from pegmatite.

19. Together, the countries of the “lithium triangle”, including Argentina, the Plurinational State of Bolivia and Chile, hold the world’s largest proven reserves of lithium.

20. Participants shared information on the importance on appropriate mining laws and regulations that can enhance mobilization of necessary investments, and at the same time prevent or minimize any eventual negative economic, social or environmental impacts.

21. In 2009, world market prices of lithium carbonate declined as a result of the global financial and economic crisis. However, it is widely projected that demand for and world market prices of lithium carbonate will continue to increase in future, together with growing demand for electronic appliances and electric cars, powered by rechargeable lithium-ion batteries.
22. Participants noted that large proven reserves of lithium carbonate exist and that lithium can be produced in sufficient quantities and at affordable prices for several decades to come.
23. Participants also noted that countries that produce lithium batteries need to further test and develop battery recycling technologies. Participants called for further research and for the establishment of product standardization and the required regulatory framework.
24. Production costs and retail prices of lithium-ion batteries for electric vehicles are still comparatively high. However, it was noted that the costs of lithium carbonate and lithium metal used in such batteries only accounted for a comparatively small portion of battery costs.

B. Experiences, trends, issues and policies in production of lithium from salt flats

25. Most lithium resources are located in remote and mountainous areas. Many of these locations lack the necessary basic infrastructure in terms of roads or water and electricity supply. The Meeting discussed various concerns and questions regarding the pursuit of lithium resource development: Can the existing local natural and human resource constraints be overcome in a sustainable and cost-effective manner in order to further develop existing or open new lithium mines? Which technology options are available? How can environmental impacts be minimized? How can local communities benefit from mining development? Will supplies be sufficient to meet projected lithium demand growth in the electronic and automotive industries? How will lithium battery technologies develop? Can lithium mining and battery recycling offer emerging opportunities for “Green Economy”? How can greater international cooperation facilitate sustainable development?
26. The country presentations showed that there was no one-size-fits-all standard approach to lithium industry development. Many regulatory reforms have recently been implemented or are currently under consideration. The natural resource potentials, environmental and climatic conditions as well as many other factors vary significantly from country to country.
27. Companies engaged in the commercial development and extraction of minerals from salt flats often simultaneously produce a variety of useful products. Co-production of different products offers essential opportunities for business, marketing and customer diversification.

C. Perspectives for enhancing sustainability in the production of lithium carbonate in Latin America

28. The meeting appreciated the presentation and discussion of country and company experiences, initiatives and good practice examples in lithium carbonate production from the

Andean salt flats. In many of the salt flats and the associated catchment basins surface and groundwater supplies are limited. Therefore, comprehensive studies of existing or anticipated environmental impacts are particularly essential. Most ecosystems in arid or semi-arid areas are highly vulnerable and can be affected even by minor changes in the quantity or quality of water supply.

29. The Meeting discussed the challenges of managing the local economic and social impacts of mining, including potassium and lithium mining. In their discussion participants emphasized the importance of benefit sharing and of involving local communities, including indigenous people, in the relevant decision-making processes.

30. Participants appreciated the sharing of information on initial experiences from Peru with implementing collaborative and participatory approaches to decision-making, including approached under the Extractive Industries Transparency Initiative (EITI).

31. Most of the existing potassium and lithium extraction sites in the Andean mountains have been established only relatively recently and production is projected to continue for many years to come. However, several participants observed that appropriate regulatory provisions are nevertheless needed to ensure the necessary financing of eventual post-mining site rehabilitation.

D. Perspectives for North-South, South-South and regional cooperation in lithium resource development

32. Participants discussed and identified a variety of opportunities for facilitating and improving the sharing of knowledge among research centres and relevant university and other academic institutes in the Latin American region.

33. It was also observed that due to the many site-specific variations appropriately adapted optimal technologies and processes need to be developed. Greater North-South and South-South technical and financial cooperation will be essential enhance the sustainable development of lithium resources in the Latin American region.

IV. Conclusions and recommendations

34. As a part of the concluding roundtable discussion the participants discussed and adopted a brief summary of conclusions and recommendations which are attached in the Annex to this report.

Annex**Conclusions and Recommendations of the Senior Expert Group Meeting on Sustainable Development of Lithium Resources in Latin America: Emerging Issues and Opportunities**

The *Senior Expert Group Meeting on Sustainable Development of Lithium Resources in Latin America: Emerging Issues and Opportunities* was co-organized by the United Nations Department of Economic and Social Affairs (DESA) and the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and held at the ECLAC Raul Prebisch Hall in Santiago, Chile, on 10-11 November 2010.

The Meeting was attended by 55 experts of the Latin American region and other countries, including representatives of concerned national governments, private sectors, business associations, para-statal authorities, research institutes, academia, international organizations, as well as civil society groups.

The Meeting heard and discussed 21 expert presentations, including sectoral overviews assessing major issues and trends in the supply of and in the demand for lithium carbonate, in particular for electric mobility; country reports presented by experts from Argentina, the Plurinational State of Bolivia, Chile, Mexico; selected issue papers and presentations reflecting on perspectives for enhancing the sustainability in the production of lithium carbonate in Latin America, including through greater benefit sharing and empowering local socio-economic development; and national experiences, suggestions and proposals for enhancing national, regional and international cooperation in lithium resource development.

After discussion, participants took note of a number of general conclusion and recommendations, including the following:

1. Lithium can be extracted from various geological formations employing different types of processes. At the global level, there is a relative abundance of existing and potential future lithium supplies. However, optimal extraction processes and related costs can vary considerably between sites. Lithium carbonate production based on the extraction of lithium chloride brine from salt flats tends to be more economical and more environmentally benign than lithium extracted from pegmatite or other sources.
2. In 2009, sales and prices of lithium carbonate declined as a result of weak demand and the global financial and economic crises. However, in the intermediate and long term, global demand and prices for lithium are widely expected to continue to increase, creating new opportunities for investment in the expansion of lithium production capacities. Many of the speakers believe that the demand for lithium will at least double in the next ten years.

3. Several of the salt flats located in the Andean mountain region contain large amounts of lithium which can be extracted from brines in commercially viable and environmentally sound ways. Together, the countries of the “lithium triangle”, including Argentina, Bolivia and Chile, hold the world’s largest proven reserves of lithium.
4. It is widely projected that mobility and the number of motor vehicles will continue to increase worldwide, in particular in the developing countries. Many vehicle manufacturers have announced plans to produce hybrid and/or plug-in electric vehicles (HEVs and EVs) with lithium-ion batteries, and to significantly increase their market share in the future.
5. Given the large proven reserves of lithium resources in the Latin American region, there may no constraints in terms of resource potentials that could pose obstacles to the widely expected rapid expansion of lithium-ion battery based electric mobility, or to the continued and expanded use of lithium batteries in IT or other electronic products.
6. In spite of the above it is essential for long-term sustainable development that countries that produce lithium batteries also develop and test, plan for and introduce lithium battery recycling technologies. Initial efforts are under way to enhance necessary standardization and the required regulatory framework.
7. Efforts of successfully commercialize electric vehicles will depend, among other factors, on retail prices and on the relative costs for electric vehicle batteries, which thus far have remained relatively high. Participants noted that relative to the high costs of lithium-ion batteries, the costs of lithium carbonate and the costs of lithium contained in such batteries is actually very low (less than 5 per cent).
8. The countries of Latin America exercise their sovereign rights in natural resource development and are presently reviewing the applicable national legislation and investment promotion strategies with a view to enhance productivity, employment opportunities, incomes and export revenues from lithium mines for inclusive national socio-economic development.
9. Institutions and companies engaged in the commercial development and extraction of minerals from salt flats often simultaneously produce a variety of useful products, including potassium, lithium, as well as magnesium, nitrates, iodine, or other minerals. Co-production of various products offers essential opportunities for business, marketing and customer diversification.

10. The extraction of lithium through evaporation of brines in salt flats can have significant impacts on the often delicate balance of limited fresh and/or ground water supplies. Comprehensive environmental impact assessment studies and monitoring is crucial to prevent, minimize and mitigate any negative impacts on the flora, fauna and ecosystems in the salars and the adjacent areas.
11. There is a range of new lithium extraction technologies that could go beyond the use of solar energy for evaporation, evaporation itself and solar energy as such, and that could contribute to enhance lithium production in the future.
12. Comprehensive periodical reporting by concerned companies and other stakeholders is an essential precondition for effective information sharing, transparency and public participation in decision-making.
13. Large-scale 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, including indigenous people.
14. 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.
15. Facilities for 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.
16. The countries, institutions and companies engaged in the production of lithium carbonate in Latin America potentially share various common interests and may be able to further explore opportunities for deeper regional cooperation and information exchange that could lead to substantial mutual benefits.
17. Greater international cooperation at various levels, including scientific, technological and financial cooperation, should support the efforts of the developing countries of the Latin American region to enhance national and regional sustainable development, including in the mining sectors.

The participants expressed their thanks to the co-organizers for their effective cooperation in jointly preparing and co-hosting the *Senior Expert Group Meeting on Sustainable*

Development of Lithium Resources in Latin America, and they expressed their appreciation of the generous technical and financial support of the Government of the Republic of Korea for this event.