The Seybold Report

ISSN 1533-9211

DOI 10.17605/OSF.IO/39ANE

CONTRIBUTION OF LITHIUM RESOURCES IN AFGHANISTAN ON SUSTAINABLE DEVELOPMENT GOAL 7 - AFFORDABLE AND CLEAN ENERGY

ABDUL NASEER KHACSAR

Bakhter University, Opposite of Ministry of Higher Education, Kabul, Afghanistan.
Email: 0774226001sh@gmail.com.

MOHAMMAD SHAKIR EBRAHIMI

Bakhter University, Opposite of Ministry of Higher Education, Kabul, Afghanistan.

ENG. MIRWAIS RAHIMI

Area, 11th Street of Qala-E-Fathullah, Kabul, Afghanistan.

Abstract

Today, lithium is essential for sustainable energy, combating climate change, reducing poverty, and fostering economic progress worldwide, but particularly in Afghanistan, where the major mines are located in a variety of provinces including Nuristan, Ghazni, Herat, and others. How can we then extract it in order to achieve the UN's Sustainable Development Goals (SDGs), which include reducing poverty and promoting clean energy, global warming, and other issues? Since affordable and clean energy is target number seven of the United Nations' 17 sustainable development goals, this paper will examine prior studies on the significance and reserves of lithium in Afghanistan. This study discovered that the finest security environment and strategic location of Afghanistan today make it possible for investors to invest in this industry in order to meet several UN Sustainable Development Goals, including access to affordable and clean energy.

Keywords: lithium resources in Afghanistan, Sustainable Development, Clean Energy

1. INTRODUCTION

Lithium is a chemical element with the symbol Li and atomic number 3. It is the lightest metal and the least dense solid element. It is a soft, silver-white metal that belongs to the alkali metal group of elements. Lithium is highly reactive and flammable, and it is stored in mineral oil or in an inert atmosphere to prevent oxidation.

Lithium has several important uses. One of the most significant applications is in rechargeable lithium-ion batteries. Which are commonly used in electronic devices like smartphones, laptops, and electric vehicles. These batteries have a high energy density, long lifespan, and can be recharged multiple times.

Lithium compounds also have various medical and pharmaceutical uses. Lithium carbonate, for example, is used as a mood stabilizer in the treatment of bipolar disorder. It helps to reduce the frequency and severity of manic episodes.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

In addition, lithium is used in the production of ceramics, glass, and lubricants. It is also used in nuclear reactors as a coolant and in the production of alloys. Lithium is found in small amounts in the Earth's crust, primarily.

Lithium plays a crucial role in clean energy, particularly in the field of energy storage. Here are some key aspects of its role: Lithium-ion batteries: lithium is a key component in lithium-ion batteries, which are widely used in electric vehicles (EVs) and renewable energy storage systems. These batteries have high energy density, longer lifespan, and faster charging capabilities compared to other battery technologies. They enable the efficient storage, reducing reliance on fossil fuels.

Electric vehicles (EVs): Lithium-ion batteries power EVs, making them a viable alternative to traditional gasoline-powered vehicles. Lightweight and high-energy density of lithium-ion batteries allow EVs to travel longer distances on a single charge. This helps reduce greenhouse gas emissions and dependence on fossil fuels in the transportation sector.

Renewable energy storage: Lithium-ion batteries are also used to store excess energy generated from renewable sources like solar and wind. As these energy sources are intermittent, energy storage systems. In terms of Afghanistan, the country is believed to have significant lithium reserves. According to a 2010 report by the United States Geological Survey (USGS), estimated the value of Afghanistan's lithium resources, spread in Ghazni, Herat, and Nimroz at a staggering $3 trillion. The country's lithium resources are primarily located in the Ghazni Nuristan, Badakhshan, Nangarhar, Lagman and Uruzgan and Herat provinces.

The potential for lithium mining in Afghanistan has attracted international attention, as lithium is a key component in the production of lithium-ion batteries. These batteries are widely used in various electronic devices including smartphones, laptops, electric vehicles, and renewable energy storage systems.

However, it is important to note that the development of Afghanistan's lithium reserves was faced numerous challenges due to the country's geopolitical situation, security concerns, and lack of infrastructure, but fortunately now a day the geopolitical situation, and security concerns become solved, and Now, the best opportunities have been provided for international investors to invest in the lithium mines of Afghanistan, because the country has been provided with security throughout the country and the government has provided facilities for investors, but it should be remembered that for the extraction of lithium mines, the infrastructure must be Arrange for lithium to be processed inside Afghanistan and then exported.

2. LITERATURE REVIEW

This paper will go through some prior research on lithium properties, resources, and its role in achieving one of the SDGs through access to affordable, clean energy. The researcher then discusses the obstacles and concerns.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

2.1. Sustainable Development of Lithium-Based New Energy in China from an Industry Chain Perspective: Risk Analysis and Policy Implications

In order to achieve carbon neutrality globally, Jiehui Yuan studied the industry chain for the sustainable development of lithium-based energy in China. After conducting a risk analysis and considering policy implications, he discovered some potential risk points. The findings indicate that these risk points, which include resource supply risks, overcapacity risks, environmental impacts risks, and regulation absence risks.

2.2. Lithium in International Law: Trade, Investment, and the Pursuit of Supply Chain Justice

According to Oliver Hailes' research on lithium in international law, including its trade, investment, and pursuit of supply chain justice, States are not permitted to apply export limits or domestic content requirements in order to pursue industrial strategy under key trade agreements. Insofar as behavior is traceable and unaffected by reservations, foreign investors are effectively safeguarded from expropriation, unjust treatment, and unlawful performance obligations. In contrast, systemic or contextual interpretation of investment treaties that take into account any pertinent obligations of the host State regarding human rights, environmental protection, and Indigenous peoples is preferable to investor-state arbitration of lithium disputes.

2.3. The potential role of the geosciences in contributing to the UN's Sustainable Development Goals

According to Gray, Murray, and Crofts, Roger, the 17 SDGs present bold and difficult goals, but they have the power to change the world by granting everyone the dignity, equality, and resources they require to live healthy, prosperous lives in a sustainable global environment. However, there are still numerous obstacles to overcome, and the available data indicates that in some areas, we are still decades or even centuries away from attaining several SDGs. In order to speed up progress on some issues where it has been slow, new strategies, firm actions, and a willingness to act are required. "Geoscience is fundamental to sustainability and a facilitator of inclusive economic growth, human development, and environmental protection," claims Gill (2021: 466).

2.4. China and Lithium Geopolitics in a Changing Global Market

Lithium geopolitics, however distinct from conventional energy and renewable energy geopolitics, contains components of both, according to Suleyman Orhun and Altiparmak's research. On the one hand, in the oil market, it's crucial to have control over the market or to not be influenced by any other parties. Due to the interdependencies established in lithium manufacturing and lithium-based technologies like Li-ion batteries, it is currently challenging to see interactions in the lithium market that are comparable to those in the fossil fuel or renewable energy markets. Although lithium politics are currently not comparable to petropolitics, there is a growing market and the potential for shifting international political dynamics. China employs two key strategies: first, leading the development of Li-ion battery

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

technology, which creates interdependencies; second, obtaining lithium from supplier states through the growth of interdependencies. China now controls a significant portion of the market.

2.5. Battery Management, Key Technologies, Methods, Issues, and Future Trends of Electric Vehicles: A Pathway toward Achieving Sustainable Development Goals

Several research on global warming have sparked a movement in the energy sector to reduce carbon emissions. This is currently radically improving because to the development of EVs.

Battery storage technology can play a vital role in the advancement of clean technology and SDG for EV applications. Overall, the positive debate, examination, worries, and suggestions can offer decision-makers helpful chances and hints for SDG adaption in the EV industries. The right selection and consideration of battery storage, battery management, power electronics, EV charging, and environmental concerns of EVs can all aid in the integration of SDGs.

2.6. Lithium in the Green Energy Transition: The Quest for Both Sustainability and Security

The demand for lithium is expected to rise significantly in the coming decades due to market trends for plug-in electric vehicles and grid-scale energy storage systems. Meeting the future demand for lithium is both technically and economically viable because lithium is abundant and can be mined for a fair price. The expansion of lithium mining and processing, however, raises serious trade-offs in terms of sustainability and energy security. Geopolitically, North America and Europe desire energy security in relation to China, but China holds a strong position in the lithium supply chain thanks to ownership stakes in US, Australian, and Chilean mines.

2.7. Association between naturally occurring lithium in drinkingwater and suicide rates: systematic review and meta-analysis of ecological studies

At the population level, there is a protective (or inverse) relationship between lithium intake from public drinking water and suicide mortality. Particularly in communities with relatively high suicide rates and geographical regions with a broader range of lithium concentration in the drinking water, naturally occurring lithium may have the ability to minimize the risk of suicide and may perhaps help in mood stabilization.

2.8. From a White Desert to the Largest World Deposit of Lithium: Symbolic Meanings and Materialities of the Uyuni Salt Flat in Bolivia

The paper makes the case that the Uyuni salt flat should be understood in three different ways: as a landscape, as ulexite, and as lithium, as each specific materiality, including its chemical features that form its mineral resources, and its spatiality (isolated location and its geopolitical limits), are essential components. In the salt flat, there is no single materiality, but in ulexite, the historical absence of the State has helped to create a particular kind of resource governance that prioritizes local agreements with the least amount of State engagement. In contrast, the many communities of the Uyuni salt flat are hoping to profit from the extraction of lithium due

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

to its extraction method and the compelling nationalist narrative that supports a state-managed governance.

2.9. Lithium and development imaginaries in Chile, Argentina and Bolivia

It's interesting to see how lithium policies have developed recently in Chile, Argentina, and Bolivia since it indicates that proponents of free markets are losing ground to those who believe lithium can open up prospects for certain types of growth. This perspective, which is best described as a lithium-focused sociotechnical fantasy, imagines a society where the government actively participates in the economy by funding research and development for new technologies and industries. Lithium will no longer be exported as a raw element since industrialization will create things with "value added." Due to lithium's significance in low-carbon technology, South American stakeholders are utilizing it as an opening to spark a lively discussion on the benefits of mining for development.

2.10. The Power of Lithium in South America

If the "Lithium OPEC," which is made up of Chile, Bolivia, and Argentina, is still dependent on extraction and exploitation control, powerful nations would likely condemn us. When it comes time to define the term "natural resource strategy," we must acknowledge that the status of the "white gold" is a relative concept, necessitating a focus on another region.

Currently, lithium batteries are envisioned as being essential to the world's energy future, both for post-fossil fuel storage systems and electric vehicles.

Lithium batteries make it possible to partake in the emerging technological trend, which then creates the sustainable energy carrier and a sizable prospective market. Lithium is merely a prism through which we can catch an overview of a potential route for moving to a better economic and social structure.

2.11. Lithium Geopolitics In The 21st Century

With a concentration on strategic natural resources, notably lithium, geopolitics was the methodology utilized to investigate the international political economy of the South American countries. The key issue is the accumulating of wealth and power, so it is essential to comprehend the geopolitical structures of the area. The group of five recommendations listed below provides general rules for a geopolitics of important natural resources in the area. In order to comply with a regional geopolitics of lithium, these actions in the particular case of lithium should be explored collectively by the three countries:

- Regional security planning and resource protection: A regional project should include strategic security of natural resources.
- Endogenous industrialization policy: the region's lithium geopolitics necessitate the development of a regional industrialization strategy for lithium that shifts the manufacturing of rechargeable batteries for portable electronic gadgets and electric vehicles from Southeast Asia to South America.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

- Participation in the setting of global prices: When the world's strategic resource reserves are concentrated in one area, there is plenty of room for negotiation and setting global prices.
- Effective national public governance of natural resources entails design and execution of public policies as well as regulatory, fiscal, and macroeconomic management.
- Measuring environmental and social impact: To manage and properly measure the socio-environmental conflicts that invariably arise throughout the growth of the natural resource sectors, including figuring out compensation rates, developing plans for the recovery of the environment, and minimizing negative externalities.

2.12. Industrial-Scale Looting of Afghanistan's Mineral Resources

In today's dynamic and uncertain energy market, investors, international development organizations, governments, and other stakeholders need more certainty to make wise decisions. This work must unavoidably take into account the economic, environmental, and social effects of granting billions of people in various countries access to energy. Research is crucial in giving knowledge that is pertinent to developing nations and that can support creative solutions for broad access to sustainable energy. However, research must take into account various energy systems, services, and scales, utilizing experts with a range of disciplinary backgrounds. Universities, think tanks, development banks, UN agencies, and other development partners are among the entities that can contribute to a broad, comprehensive energy research agenda, but it is crucial to also include energy users and non-experts.

2.13. Energy governance and poverty

The millions of people in sub-Saharan Africa without access to modern energy services help to highlight the flaws in the current system of energy administration for the underprivileged. At the international, regional, and national levels, it is encouraging to see that concerns of governance as they relate to energy are receiving more attention. Since those most impacted are often the underprivileged citizens of their nations, there are no "quick fixes" for the problem of energy poverty. This subject involves social subtleties that are particular to each nation and challenging for outsiders to understand. What is required is a commitment from the national government to address energy poverty through national government policy. According to our review, it would be beneficial to conduct additional social science study on at least the following issues. First, conventional assessments of energy governance at all levels must incorporate the poverty issue. Second, there is a need to better comprehend the connections between energy governance at the global level and its effects on energy poverty at the state and local levels. Third, there is an expanding collection of case studies of programs that cater to those who lack access to energy.

2.14. Lithium availability and future production outlooks

This study suggests that the potential lithium production could be a limiting factor for the number of electric vehicles that can be produced, as well as how quickly they can be produced, despite the fact that the projected production of lithium and the demand for lithium for electric

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

vehicles are both fraught with uncertainty. It is feasible, and perhaps even likely, that lithium availability will be a limiting factor if significant portions of the fleet of cars run on electricity and rely on lithium-based batteries in the next decades. It is necessary to recycle as much lithium as possible and perhaps create other battery technologies in order to lessen the effects of this.

2.15. Lithium Resources and Production: Critical Assessment and Global Projections

Electric vehicles powered by lithium batteries must have lithium. Based on the information that is currently available, it has been determined that there are between 19.3 and 55.0 Mt Li of eventually recoverable lithium resources, with a best estimate of 23.6 Mt Li based on deposits that are currently known. In-depth analyses were conducted on the massive brine deposit at Uyuni and the Greenbushes rock deposit. According to an analysis of lithium availability, there is enough lithium to support a sizable number of lithium battery electric vehicles in the future. It must be emphasized once more that this does not suggest that lithium battery vehicles will be widely used in the future, only that there is enough lithium available for this to happen.

2.16. Thermal runaway caused fire and explosion of lithium ion battery

We are becoming more and more interested in wind energy, solar energy, EV/HEVs, and related energy storage technology as the world energy policy shifts from fossil energy to renewable energy. When it comes to energy storage, lithium ion batteries outperform other types of batteries by a wide margin. The use of big or high-rate lithium ion batteries in many high-tech industries, such as electric vehicles and electric storage devices, is still constrained by safety concerns. More research should be done to make lithium ion batteries safer and safer as there is growing interest in using them in automotive applications. It is important to take into account everything from the electrode materials and electrolyte to the cell design when it comes to safety concerns about thermal runaway, which is a very complex process requiring chemistry, material science, and engineering. Thermal stability and electrode compatibility are still being developed in order to create a safe electrolyte with good electrochemical performance. Li-alloy anode-based Li-ion batteries, Li-metal anode-based rechargeable batteries, Li-air batteries, Li-S batteries, and other new generations of rechargeable lithium batteries are now being developed, and the hazards of thermal runaway are being examined. Using one or more safety devices in conjunction with the inherent safety approach is currently an effective way to stop battery explosions.

2.17. Improving Access to Modern Energy Services: Insights from Case Studies

The issue of energy poverty is rising on the international agenda. Numerous initiatives exist to support access to contemporary energy services, and these can be used to guide the development of new initiatives. Even Nevertheless, despite several effective interventions and notable advancements in some cases in reducing energy poverty, achieving universal access to energy in the ensuing decades would necessitate a dramatic scale-up of activity.

ISSN 1533-9211

DOI 10.17605/OSF.IO/39ANE

3. ACKNOWLEDGMENT

The authors acknowledge the financial and technical support for this project provided by: the Agency for Rehabilitation and Energy Conservation in Afghanistan (AREA) and Change Success Consultancy Services Company (CSC)

All of Afghanistan's mines, not only the lithium ones, have gone unexploited, and up to this point, no Afghan government has been able to utilize them in order to relieve the country's citizens of poverty.

Now, the following is required in order to utilize Afghanistan's lithium reserves:

The only way to utilize the lithium reserves is to extract them while the Afghan people are in charge, with the help of foreign investors and professionals, allowing them to escape poverty and achieve self-sufficiency.

If Afghanistan wants to change from a fight between international forces to a capitalist arena the Afghan government has to choose for such a balanced economic policy.

4. CONCLUSION

The lithium mineral processing in business will take place whenever other countries to be able to invest in Afghanistan based on legal processes but unfortunately due to no recognition of Afghan government it will take time deal with other countries accordingly.

Lithium mining in Afghanistan, which is worth more than $3 trillion, will help to eradicate poverty, improve working conditions for hundreds of thousands of Afghans (which will prevent illegal immigration), and increase the export of lithium to other nations, which will aid those nations in achieving the UN Sustainable Development Goals.

If we sum up in such a way that lithium mining in Afghanistan not only achieves the 17 Sustainable Development Goals of the United Nations in Afghanistan, but also puts an end to all the problems of this country, on the other hand, it also assists other nations in achieving the 17 Sustainable Development Goals of the United Nations.

References

1. Jiehui Yuan, Zhihong Liu, Ting Zhou, Xiaoming Tang, Juan Yuan and Wenli Yuan. Sustainable Development of Lithium-Based New Energy in China from an Industry Chain Perspective: Risk Analysis and Policy Implications. Sustainability. 2023, 15, 7962. https://doi.org/10.3390/su15107962.
2. Oliver Hailes, Lithium in International Law Trade Investment, and The Pursuit of Supply Chain Justice. Journal of International Economic Law, 2022, 25, 148-170. DOI: https://doi.org/10.1093/jiel/jgac002.
3. Gray Murray, Crofts, Roger, The Potintial Role of the Geosciences in Contributing to the UNs Sustainable Development Goals, Journal of Parks Stewardship Forum, 38(1). 2022, https://escholarship.org/uc/item/6708p92w.
4. Suleyman Orhun Altiparmak, China and Lithium Geopolitics and in a Changing Global Market, Chines political science review, 2022. https://doi.org/10.1007/s41111-022-00227-3.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/39ANE

5. Molla Shahadat Hossain Lipu, Abdullah Al Mamun, Shaheer Ansari, Md. Sazal Miah, Kamrul Hasan, Shaikh T. Maraj, Maher G. M. Abdolrasol, Tuhibur Rahman, Md. Hasan Maruf, Mahidur R. Sarker, A. Aljanad and Nadia M. L. Tan. Battery Management, Key Technologies, Methods, Issues, and Futur Trends of Electric Vehicals: A Pathway toward Achieving Sustainable Development Goals. MDPI, batteries. 2022, 8, 119. https://doi.org/10.3390/batteries8090119.

6. John D.Graham, John A. Rupp and Eva Brungard. Lithium in The Green Energy Transition: The Quest for Both Sustainability and Security. MDPI Sustainability 2021, 13, 11274. https://doi.org/10.3390/su132011274.

7. Anjum Memon, Imogen Rogers, Sophie M. D. D. Fitzsimmons, Ben Carter, Rebecca Strawbridge, Diego Hidalgo-Mazzei and Allan H. Young. Association between naturally occurring lithium in drinking water and suicide rates: systematic review and meta-analysis of ecological studies. The British Journal of Psychiatry (2020) 217, 667–678. doi: 10.1192/bjp.2020.128. https://doi.org/10.1192/bjp.2020.128.

8. Maria Daniela Sanchez-Lopez. From a White Desert to the Largest World Deposit of Lithium: Symbolic Meanings and Materialities of the Uyuni Salt Flat in Bolivia. A Radical Journal of Geography. 2019. doi: 10.1111/anti.12539

9. Javiera Barandiarán. Lithium and development imaginaries in Chile, Argentina and Bolivia. World Development 113 (2019) 381–391. https://doi.org/10.1016/j.worlddev.2018.09.019

10. Julián Zicari, Bruno Fornillo. The Power of Lithium in South America. Entreciencias: diálogos en la Sociedad del Conocimiento ISSN: 2007-8064, 2016. http://www.redalyc.org/ articulo.oa?id=457650040006

11. Bernardo Salgado Rodrigues, Raphael Padula. Lithium Geopolitics In The 21st Century.: Brazilian Journal of Strategy & International Relations, p.190-212, 2017.

12. William A. Byrd and Javed Noorani. Industrial-Scale Looting of Afghanistan's Mineral Resources. United States Institute Of Peace, 2017. www.usip.org.

13. Benjamin K Sovacool, Morgan Bazilian and Michael Toman. Paradigms and poverty in global energy policy: research needs for achieving universal energy access. Environmental Research Letters, 2016. https://iopscience.iop.org/article/10.1088/1748-9326/11/6/064014

14. Morgan Baziliana , Smita Nakhooda b , Thijs Van de Graaf. Energy governance and poverty. Research Get, Energy Research & Social Science, 2014. https://www.researchgate.net/publication/262880600

15. Hanna Vikström, Simon Davidsson, Mikael Höök. Lithium availability and future production outlooks. Applied Energy, http://www.journals.elsevier.com/applied-energy/.

16. Steve H. Mohr, Gavin M. Mudd and Damien Giurco. Lithium Resources and Production: Critical Assessment and Global Projections, minerals ISSN 2075-163X, 2012. www.mdpi.com/journal/minerals.

17. Qingsong Wanga, Ping Pinga, Xuejuan Zhaoa, Guanquan Chub, Jinhua Suna, Chunhua Chenc. Thermal runaway caused fire and explosion of lithium ion battery. Journal of Power Sources, 2012. www.elsevier.com/locate/jpowsour

18. Morgan Bazilian, Patrick Nussbaumer, Christine Eibs-Singer, Abeeku Brew-Hammond, Vijay Modi, Benjamin Sovacool, Venkata Ramana and Peri-Khan Aqrawi. Improving Access to Modern Energy Services: Insights from Case Studies. The Electricity Journal, 2012. doi:/10.1016/j.tej.2012.01.007.