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# 3

91429



914290



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## Level 3 Geography 2022

### 91429 Demonstrate understanding of a given environment(s) through selection and application of geographic concepts and skills

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of a given environment(s) through selection and application of geographic concepts and skills.	Demonstrate in-depth understanding of a given environment(s) through selection and application of geographic concepts and skills.	Demonstrate comprehensive understanding of a given environment(s) through selection and application of geographic concepts and skills.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

**You should attempt ALL parts of the question in this booklet.**

Pull out Resource Booklet 91429R from the centre of this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–8 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (✖). This area may be cut off when the booklet is marked.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

**Excellence**

**TOTAL**

**08**

ASSESSOR'S USE ONLY

## INSTRUCTIONS

Read the resource booklet about lithium extraction in Bolivia. Integrate supporting evidence from a variety of resource materials into your answers.

Your answers should demonstrate your understanding of a range of geographic skills, conventions, and concepts. A list of geographic concepts is provided on page 2 of the resource booklet.

## QUESTION

- (a) Describe the geography (location, size, and extent) of the Salar de Uyuni (Uyuni salt flat).

Use specific geographic information from the resources, with precision, to support your answer.

The Salar de Uyuni is located South-west region of the country of Bolivia, which is located in the continent of South America in the south-western hemispheres of the world. Salar de Uyuni covers a geographical area of 10,000 square kilometres, which is about one hundredth of the total area of Bolivia ( $1,098,581 \text{ km}^2$ ). From Resource C, at its widest point across, ~~the~~ ~~about~~ ~~the~~ the Uyuni Salt Lake is about 140 km in length, and vertically about 110 km, it is also rather irregularly shaped and ~~the~~ the Salar de Uyuni is comprised of two main lakes; the Coipasa and Uyuni Salt Lake. The Uyuni Salt Lake is located between ~~about~~ about  $67^\circ$  and  $68^\circ 16'$  West, and about  $19^\circ 45'$  to  $20^\circ 40'$  South. Coipasa Salt Lake is smaller in area than Uyuni Salt Lake, and it is located about 20 km North of it.

The ~~area~~ topography of these areas is exceptionally flat due to the crystalline salt crust that formed due to the prehistoric Lake Manchar drying up. The average elevation varies by only a meter over this entire area.



- (b) How and why is the natural and/or cultural environment of this area suitable for lithium extraction?

The natural environment of the ~~El~~ Salar de Uyuni is highly suitable for the extraction of Lithium due to two main reasons: abundance and accessibility.

The element is present in great quantities in the 'Lithium Triangle' comprised of Argentina, Chile and Bolivia due to <sup>the interaction of</sup> geological processes and conditions producing high concentrations of Lithium. In these locations there is lithium-rich magma fluids (Resource E) supplying lithium to the area. ~~Combined with~~ ~~poor drainage~~ Due to the arid, hot conditions on the flats, evaporation of the brine occurs rapidly, and combined with poor soil drainage, the lithium content in the salt flats is highly concentrated and abundant. Furthermore, the lithium present is also accessible — it is far easier and cheaper to <sup>extract</sup> ~~mine~~ from brine than mine from rock, which is favourable for the cultural ~~environment~~ environment of Bolivia which has low income per capita and perhaps less access to more energy-intensive mining equipment, and also many locals who can work in the salt harvesting process, as lithium is accessible within a few centimetres of the surface. ~~so other forms of machinery~~ ~~may be required~~ However, ~~the~~ despite the Bolivian government claiming it has 70% of the world's lithium supply, it is slightly more difficult to extract in Bolivia than Argentina and Chile because the Salar de Uyuni receives more rain — above 100 mm ~~on~~ in December to February and about 20 average rainfall days for each of these months. This slows the evaporation



- (c) Lithium demand is predicted to grow as people embrace 'green' (environmentally friendly) technologies that require lithium-ion (Li-ion) batteries. For example, by 2030, electric vehicles are expected to account for 75% of total lithium demand.

Considering the statement above, and the resource material, how sustainable is lithium mining in Bolivia likely to be in future?

The sustainability of the lithium mining in Bolivia can be considered via the economic, environmental and social impacts resulting from the process. While economically, as a resource in high ~~the~~ global demand, ~~the~~ lithium mining could be important for the development of Bolivia's economy and improving the income and quality of life of Bolivia's citizens, ~~however~~ the ~~long~~ long term environmental costs have negative flow on effects and ultimately outweighs this. Therefore, lithium mining may be beneficial in the short term, ~~but~~ but is ultimately unsustainable in the long term.

Lithium mining has significant economic benefits. By 2030, due to the increased number of electric vehicles ~~expectedly~~ they are expected to account for three-quarters of the total lithium demand as each EV requires between 10 to 63kg of lithium. The increased demand is beneficial for Bolivia's economy as companies are willing to pay more for lithium, and indeed, the Vice President of Bolivia, Carlos Mesa, predicted that by 2023 lithium mining "will be the engine of our economy." As one of South America's poorest countries, this is important for Bolivia and may enable a better quality of life for citizens. ~~but~~ <sup>however,</sup> demand for lithium is expected to outstrip supply by 2023



and Lithium is ultimately a non-renewable, finite resource, meaning that even Bolivia's abundant resources will become depleted over time, therefore the economic sustainability of this ~~one~~ venture is only certain in the short term.

However, even these short term economic benefits may be outweighed by the negative ~~eco~~ environmental impacts resulting from it. An ~~eco~~ environmental perspective suggests that the 2,273,000 litres of water required for the extraction of one tonne of Lithium is inherently unsustainable for the already scarce water sources in South America, especially when scaled up as it is projected to do in the future. Not only does Lithium ~~mining~~ consume large quantities of water, there is also a ~~high~~ chance of water and soil contamination. Toxic chemicals used in the evaporation process may leak into the water supply, thus ~~also~~ negatively impacting the wider ecosystem reliant on these water sources, ~~including~~ including humans, ~~and~~ livestock and fish. Furthermore, these rivers and water systems link to the wider Amazon Basin, meaning that potential contamination or disruption to the wildlife near Bolivian salt mines will have far broader ramifications and ~~also~~ unbalance the wider ecosystem connected via the Amazon Basin and its rivers. This is unsustainable for the local and ~~also~~ national ~~and~~ ~~broader~~ water supply, in a continent that ~~has~~ has some of the driest places on earth and ~~also~~ already faces water scarcity.



These economic and environmental impacts can then be unpacked through a social perspective, in particular, that of the locals. Although the lithium mining industry is a growing one, ~~there~~ 80% of the inhabitants of areas surrounding Salar de Uyuni live in poverty with minimal work opportunities, perhaps because <sup>large</sup> international companies are investing in the mining with little regard for the locals. Instead, the indigenous Aymara people and locals work as 'saleros' in harvesting salt and appear to not reap economic benefits of lithium mining - As Councilwoman Díaz says, "no one here is working on the lithium project. We thought there'd be work for our people here, with high salaries. It's very disappointing." But not only are locals not reaping ~~some~~ economic benefits, the other prominent industries that they work in are being adversely affected by the mining. Tourism employs 200,000 directly and indirectly impacts ~~four~~ times more people, whereas mining generates only 132,000 jobs. From these figures alone, <sup>the tourism</sup> ~~other industries~~ from a social perspective should be more important because more livelihoods depend on it. But for operator Luis de la Barra and other locals of Uyuni are "concerned they will destroy the area and the environment" with mining, negatively affecting tourism in Bolivia in the long term and the lives of people who depend on it. Similarly, quinoa farmers are also at risk because they are dependent on the Rio Colorado and Rio Grande de Lipez which flow into the salt flats and may be ~~washed away~~ depleted. The quinoa industry is also a large one, ~~as~~ as the second largest supplier in the world. ~~the~~ Holding values of social justice and equity, it seems



Extra space if required.  
Write the question number(s) if applicable.

QUESTION  
NUMBER

b) process which hinders Lithium extraction. Also, the magnesium chloride salt content is higher in these salt flats, which is difficult and expensive to remove. Nonetheless, the abundance and accessibility of Lithium in the natural and cultural environment still make it highly suitable for Lithium extraction.

c) Unfair that many ~~per~~ locals' livelihoods will be adversely affected because of one single lithium mining industry with economic potential. It is also unsustainable because a large proportion of the Bolivian population depend on the water sources and salt flats ~~for~~ as sources of income, potentially leading to more poverty.

Evidently, lithium mining has more ~~adverse~~ negative short and long term impacts on the environment and the people of Bolivia than it does ~~&~~ positive economic benefits. Even the economic benefits are likely to be short-term, and once Bolivia's lithium is depleted, there is no other industry to rely on as they would have been hindered by the mining industry. Thus, the Bolivian Government should carefully plan and consider the perspectives of locals to ensure sustainable lithium mining in the future.

## Excellence Exemplar 2022

Subject	Level 3 Geography		Standard	91429	Total score	08
Q	Grade score	Annotation				
1	E8	<p>This candidate uses geographic skills with precision in both parts (a) and (c) when describing the geography of the Salar for all three aspects (size, location, and extent) and also the climate being suitable for lithium extraction. Categorising the aspects of abundance and accessibility allowed the candidate to demonstrate they clearly understood what makes the environment suitable for extraction, and was insightful. They considered the shorter- and long-term impacts of extraction when considering sustainability and also analysed economic, social, and environmental aspects to weigh up potential positive and negative outcomes before coming to a conclusion. Specifics from the resources were used to support the ideas and not merely copied word for word from the text.</p>				