



State of Qatar
Palestinian Schools
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Education & Higher Education



Research Title:

What sand hides ... and Sabkhas contain

ما تخفيه الرمال وتحويه السبخات

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Dedication

To the land on which we live...

To the land where we drink its water and breathe its air...

To the land where we grow up...

To the land which deserves all the words of thanks as gratitude...

To our beloved country... Qatar...

Abstract

Qatar has many important natural features that are spread over large areas in the country. One of these features is Sabkha because it contains a high percentage of salt and important minerals as well.

Lithium element is one of the chemical elements that is found in Sabkha.

No doubt that Lithium is considered one of the most important minerals these days, because it has important technical applications that will contribute to achieve an industrial revolution, if it is optimally utilized, including the manufacture of rechargeable batteries for mobile phones, laptops and digital cameras, that will create job opportunities in the country.

In addition, it is also used in manufacturing Lithium Ion batteries which are used in the running of electric cars, and through that an industrial leap can be achieved in the field of renewable energy which provide a clean environment, free from pollution.

Hence, this study confirms on the importance of Sabkhas because they contain the hidden treasure – Lithium which will achieve a sustainable future for the state of Qatar.

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Introduction

Sabkha is considered an important natural resource that spreads over large areas in Qatar– interior and coastal sabkhas– that is due to the high percentage of salt and important minerals.

However, sufficient and recent studies haven't been done to exploit and extract the minerals in, including Lithium, to revolutionize renewable energy. As Lithium is used in the manufacture of rechargeable batteries such as batteries that are used in mobile phones, laptops, and in Lithium –ion batteries for the running of electric cars.

Hence, this research came as a result of what we saw from the widespread use of Lithium applications in our modern lives.

So we set out to search for the places where this element is on the Earth, and we found that it is found in Sabkhas– salty lands– which enhances the sustainability of natural resources in Qatar and their exploitation in the field of renewable energy.

Thus, this research will be an important addition to the renewable energy field in Qatar.

Research Problem

Sabkhas are spread over large areas in Qatar, but scientific studies haven't been done for them to discover the important minerals in, to revolutionize the field of renewable energy.

Research Question

How can Sabkhas be invested in Qatar to create a boom in renewable energy?

Research Hypothesis

If Sabkhas are mined and Lithium element is extracted from them, an industrial revolution will take place in the field of renewable energy which leads to create a clean and healthy environment and create job opportunities as well.

The Importance of The Research

Qatar has natural features that can be invested in the field of renewable energy, so that it will be one of the pillars of a future industrial leap.

Sabkha is one of the most important natural feature in Qatar, because it contains a high percentage of salt and many important minerals such as Lithium element.

By focusing through our research on Lithium, we found that this element can be used in many areas, including manufacturing the glass, porcelain and lubricating grease. It has medical uses as well.

It is also used in manufacturing batteries that are used in watches and mobile phones. In addition to manufacture Lithium- Ion batteries which are used in the running of electrical cars that leads to create a healthy environment, free of pollution.

Hence, this research came to focus on the importance of Sabkhas and their minerals especially Lithium, to make a leap in the field of renewable energy.

Research Objectives

1. To focus on the importance of discovering natural resources in Qatar.
2. To focus on the sustainability of natural resources in Qatar as much as possible.
3. To focus on mining Lithium element from Sabkhas.

The Limits of The Study

The Objective Limit: is extracting Lithium element from Sabkhas.

The Spatial Limit: is The State of Qatar.

The Time Limit: is from November to January.

Research Terms

- Sabkhas: are salt lands that are formed as a result of a big and continuous precipitation of salts. A white crust is formed from the salty crystals, and this crust is fragile and weak.
- Lithium element: is a chemical element of the alkali metal group that is the lightest metal known and that is used especially in alloys and glass, in mechanical lubricate and in storage batteries. (Merriam-Webster, 1828). Its symbol is Li and its atomic number is 3.

- Lithium –Ion battery: is a type of rechargeable battery and it is of high density and energy. Its positive electrode is made of Lithium and its negative electrode is made of porous graphite carbon.
- Renewable energy: is an energy that is generated from natural processes that are continuously replenished. This includes sunlight, geothermal, heat, wind, tides, water and various forms of biomass. This energy can not be exhausted and is constantly renewed.
(What is Renewable Energy?, 2009)
- Hydrothermal vent: is a chimney –like opening at the bottom of the ocean that emits very hot water which is rich in minerals and sulfur. It's also called black chimney. (1001) فكرة عن الارض/ الفضاء/ المعرفة و
المعلومات و الحوسبة/ المستقبل، 2018

Literature Reviews

Sabkhas are spread over large areas in Qatar and they are two types: interior and coastal ones, with an area of about 700 square kilometres.

They consist of accumulations of limestone which are covered with salts and limestone sand. (موسوعة المعلومات القطرية المجلد الجغرافي، 1998)

The most important sabkhas in Qatar are Dukhan Sabkha, Mesaieed Sabkha, Al Khor Sabkha and Al Thakheera Sabkha.

Sabkhas contain ground water , the level of which lies at depths ranging from 20 cm to two metres below the surface. It's a very salty water that comes from either the layers are carrying the ground water beneath the surface of the peninsula, or it is marine water that leaked through sediments from nearby coasts. (بحيري و الفراء)

On the other hand, through the results of the chemical analysis of samples of sea water, sabkha water and the area that surrounds Dukhan Sabkha, that is located in western of Qatar, it was found that they contain many important chemical elements including Lithium. (Kafelea – 1970)

(القصاص و النصر)

Hence, we found that the available studies on Sabkhas are all old ones and there are no recent studies that focus on what minerals contain in Sabkhas. This is the biggest challenge we faced while we were searching information and that gave us exclusivity and excellence for our research.

Lithium is so reactive element so it isn't found in its pure form in nature. It is found in the world in a variety of areas including seawater, igneous rocks and mineral springs.

Lithium mining methods

Methods of Lithium production have been developed by extracting it from the concentrated solutions of salts and new companies have emerged to meet this demand.

Although Lithium is widespread on Earth, it is not found in its free form as a result of its great chemical activity.

Lithium is present in the form of salts in seawater with a fixed concentration ranging between 0.14 to 0.25 ppm, so that the total amount is estimated at about 230 billion tons. This percentage can increase near hydrothermal vents to about 7 measures per million.

Lithium is often found with minimal concentrations in concentrated salt solutions or in its minerals which is making it difficult to obtain. So the proportion of Lithium in the Earth is estimated at about 20 to 70 bolts per million by weight.

Crystallization is one of the methods that is used for minerals which can be selectively adsorbed by specific adsorbents in the presence of other minerals and the adsorbed minerals are quantitatively desorbed and crystallized. Lithium is one of the minerals that can be mined by this method. (Loganathan, 2017)

Loganathan discussed the process of concentrating Lithium in seawater by passing the sea water through a column which is filled with Manganese Oxide MnO_2 for 150 days, followed by extracting it by using Hydrochloric Acid HCl then exposing it to an electric current and finally obtaining Lithium carbonate $LiCo_3$.

Research Methodology

It's descriptive and analytical method.

Research Population

State of Qatar.

Research Sample

Sabkhas in Qatar.

Data Collection Methods and Instruments

A questionnaire, reading books, articles and surfing the internet.

Research Procedures

A random sample of people (40 persons) was selected and a questionnaire was distributed among them and after analyzing the questionnaire, it was found that a large percentage of them was very satisfied that our responsibility is to protect the environment from pollution, as well as it is necessary to start using new energy sources.

It was also noticed that a large percentage emphasized that renewables are the best way to provide a secure future for the next generations.

On the other hand, a large percentage of them wasn't satisfied that Sabkha in Qatar is a natural wealth and contains chemical elements that help in the production of renewable energy as well as Qatar has the capabilities to extract minerals from Sabkhas. This is due to the lack of knowledge among people about Sabkhas and the minerals that are available in.

- The research team has read some books and articles related to Sabkhas and Lithium element.
- The research team browsed the internet to find out more information about Sabkhas and mining Lithium.

Results

After searching about investing Sabkhas in Qatar to create a boom in renewable energy, we concluded that:

Qatar has important natural features that can be used to make a leap in the field of renewable energy which will secure a good future for the next generations as creating job opportunities and raising economic growth as well.

Recommendations

- Carrying out studies that complete this study.
- Making recent studies on Sabkhas.
- Investing Lithium element in Sabkhas in renewable energy.
- Attracting investments to launch projects which are related to Lithium mining and exploiting it in future industries.
- Establishing a factory which is concerned with extracting and manufacturing Lithium.
- This study, about Sabkhas, is a good example of being a model for manufacturing a Lithium- Ion battery.
- Establishing stations to recharge the batteries of electrical cars.

Closing

Sabkhas are considered one of the most important natural resources in Qatar. That is due to their salts and important chemical minerals, including Lithium which has important applications in our modern life, and in making an industrial leap in the field of renewable energy.

This present research urges us on the importance of conducting a study on sabkhas and minerals in because of their importance in the field of sustainable natural resources in Qatar.

References

Bibliography

المجموعة المستقبل /المعرفة و المعلومات و الحوسبة/الفضاء /فكرة عن الارض (1001), محمد P. P. (2018). العربية للتدريب والنشر.

Loganathan, P. (2017, Nov. 22). *Mining valuable minerals from seawater: a critical review*. Retrieved from University of Technology Sydney.

Loganathan, P. (2017, November 22). *University of Technology Sydney*. Retrieved from Mining valuable minerals from seawater: a critical review.

Merriam-Webster. (1828). *Definition of Dictionary*. Retrieved from merriam-webster.com

What is Renewable Energy? (2009, July 15). Retrieved from PennState Extension:
<https://extension.psu.edu/what-is-renewable-energy>

الدوحة. (Vol. 1) موسوعة المعلومات القطرية المجلد الجغرافي. (1998). الدكتور درويش العمادي وآخرون.

لسبحة دخان غربي قطر، الخليج العربي، لاندسات، تفسير مرئيات القمر الصناعي. (n.d.). ا. د. النصر & ا. د. القصاص جوانات من جغرافية قطر. (n.d.). م. الفرا & ص. ا. بحيري.

ب. بابكر. ع. ا. العريفي. ص. عامر. ا. الخياط. ح. العمادي. د. ا. (1998). موسوعة المعلومات القطرية المجلد الجغرافي (الجزء الاول Vol. 1) موسوعة المعلومات القطرية المجلد الجغرافي، الكواري. خ. م. . . النصر، p. 54).

الدوحة المجلد الجغرافي موسوعة المعلومات القطرية. (1998). د. ا. وآخرون.

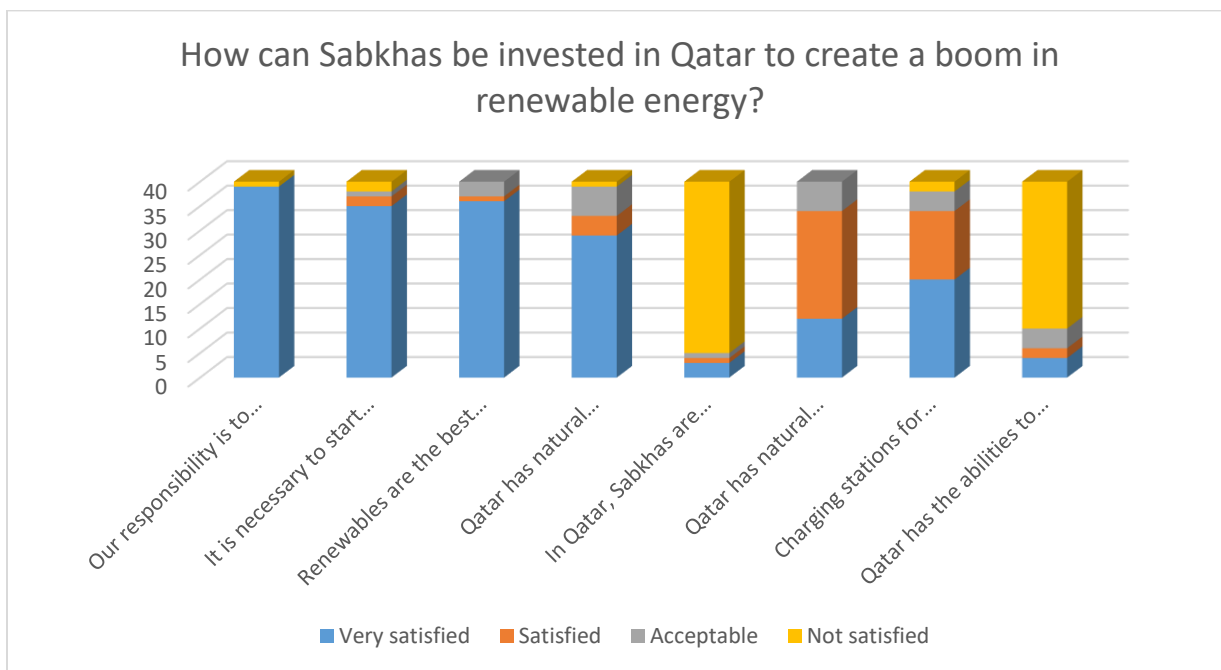
Appendix

Questionnaire

	Statements	Very satisfied	Satisfied	Acceptable	Not satisfied
1.	Our responsibility is to protect the environment from pollution.				
2.	It is necessary to start using new energy sources.				
3.	Renewables are the best way to provide a secure future for the next generations.				
4.	Qatar has natural resources that can be used to make a leap in the field of renewable energy.				
5.	In Qatar, Sabkhas are tremendous natural resources because they contain elements that help in the production of renewables.				
6.	Qatar has the abilities to extract the minerals from Sabkhas.				
7.	Qatar has natural resources that can be manufactured into Lithium- Ion batteries that are used in electric cars.				

8.	Charging stations for electric cars are required in different parts of the country.				

How can Sabkhas be invested in Qatar to create a boom in renewable energy?



جدول (٢) نتائج التحليل الكيميائي لعينات من مياه البحر ومياه السبخة ومن المنطقة المحيطة بسبخة دخان في غرب قطر (عن كاتيليه - ١٩٧٠)

مياه البحر العادية	رقم العينة			المكونات (جزء في المليون)
	M-5	M-4	M-3	
١٠٥٦٠	١٨٥٠٠	٢٠٧٥٠	٣٨٠٠٠	صوديوم
٣٨٠	٧٠٠	٨٢٠	٢٤٨٠	بوتاسيوم
٤٠٠	١٥٠٠	١٣٢٥	٧٤٥٠	كالكسيوم
١٢٧٠	١٦١٧,٥٠	٢٠٦٢,٥٠	١٧٤٧,٥٠	مغنسيوم
٠,٠١	٠,٠١	٠,٠٢	٠,٠٨	حديد
٢٦٥٠	٤٣١٥	٤٦٦٧,٥٠	٤٨٥٠	كبريتات
١٩٠٠٠	٣٣٥٠٠	٣٨٠٠٠	٧٥٥٠٠	كلوريد
-	٧٩,٢	٦٤,٨٠	٤٨	كربونات
-	-	٥٣,٢٨	١,٦٠	نترات
-	٠,٠٠٠٢	-	٠,٠١	نيتريت
-	-	٠,٤٠	٢٤	سليكا
١,٣٠	٢,٥٠	٥,٥٠	٧,٥٠	فلور
٠,٠٦	١,١٠	١,٠٥	٢,٨٥	بروم
٠,١٧	٠,٧٢	٠,٨٠	١,٦٦	ليثيوم
٤,٦٠	٨,٥٩	٦,٢٢	٥,٨٩	بورون
٦٥	٣٤	٣٢	٧٨	بروميد
	٦٠٢٥٨,٤١	٦٧٢٨٩,٠٧	١٣٠١٩٦,٣٧	المجموع
٣٤,٧٢٠	٦٠,٣٠٠	٦٨,٠٠٠	١٣٠,٥٠٠	مجموع الأملاح الذائبة
	٧٧,٠٠٠	٨٥,٠٠٠	١٧٠,٠٠٠	التوصيل الكهربائي، ميكروموز/سم ^٢
	٨	٨	٧,٥	الأس الهيدروجيني
	١٣٢	١٠٨	٨٠	القلوية (كربونات كالكسيوم)
	١٠,٤١٤	١١٨	٢٥٨٢٤,٧	العسر الكلي للمياه
	١	٢	٣	عكارة المياه

- مواقع العينات: M-3 مياه السبخة - جنوب الشرق، من عمق ٦٠ سم -
- M-4 مياه بحيرة لاجون برأس البروق على بعد ٥٠ متر للدخول من الساحل، من عمق ١٠ سم -
- M-5 مياه بحيرة لاجون بدوحة الحصين على بعد ٨٠ متر للدخول من الساحل عمق ١٠ سم -