

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



Bachelor Thesis

**Natural resources
Study case: Morocco**

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

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Objectives of thesis

The aim of this study case is to emphasize and highlight the causes and challenges surrounding the natural resources in Morocco from a political approach, economical approach and environmental approach. To estimate the impact over the economy, while the challenges that the country is facing and the strategic decisions taken in order to manage these resources.

Methodology

The research method used in this bachelor thesis is divided into two major parts. The theoretical part is based on the compilation of many articles found in the literature that gives a clear idea of the situation of natural resources management in Morocco; While the practical part consists of information gathered from reliable sources that shows what was done and will be done in order to solve the current issues that the country and its resources are facing.

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Natural Capital and Human Economic Survival. Book by Thomas Prugh – ISBN-10: 1566703980

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Declaration

I declare that I have worked on my bachelor thesis titled "Natural resources" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 30/11/2020

____Jabairi Mohcine____

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Natural resources

Study case: Morocco

Abstract

By highlighting the actual situation of natural resources in Morocco, we can provide a clear understanding of its causes and consequences, the factors affecting this situation and the key points of its management. The use of different perspectives such as the economic, political, and environmental will give us an idea how the natural resources are being protected and/or drained.

Through this study case, we will give an overview of the situation in Morocco and clarify it through theoretical part and practical part.

Keywords: Scarcity, Challenges, Landscape, Natural Resources, Environment, Politics, Economics, Ethics.

Přírodní zdroje

Studijní případ: Maroko

Abstrakt

Zdůrazněním aktuální situace přírodních zdrojů v Maroku můžeme zřetelně pochopit jejich příčiny a důsledky, faktory ovlivňující tuto situaci a klíčové body jejího řízení. Použití různých perspektiv, jako jsou ekonomická, politická a environmentální, nám dá představu o tom, jak jsou přírodní zdroje chráněné anebo vyčerpané.

Prostřednictvím tohoto studijního případu poskytneme přehled o situaci v Maroku a objasníme ji prostřednictvím teoretické a praktické části.

Klíčové slova: nedostatek, výzvy, krajina, přírodní zdroje, životní prostředí, politika, ekonomika, etika.

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1. Introduction

Natural resources can be considered the essence of life and raw materials provided by Earth which we depend on and which has value for human use. It can be solid, liquid or gas and consumed either directly or indirectly. Furthermore, it can be organic or inorganic, as well as renewable or non-renewable, to say that natural resources can take many forms and have multiple classifications.

History has shown us how valuable certain resources are, from being the reason behind many wars to being used as currency, natural resources have always been at the center of international relations. Thus, nations and organizations are forced to take measures and establish political, economic, and environmental laws and regulations.

Regarding its definition in the dictionary, a natural resource is "A naturally occurring source of wealth, as a land or water" and "The natural wealth of a country, consisting of land, forests, mineral deposits, water, etc." (The Random House Unabridged Dictionary, 2020).

In the economic definition, natural resources are defined as "Natural assets occurring in nature that can be used for the economic production or consumption" meaning "the naturally occurring assets that provide use benefits through the provision of raw materials and energy used in economic activity (or that may provide such benefits one day) and that are subject primarily to quantitative depletion through human use. They are subdivided into four categories: Mineral and Energy resources, Soil resources, Water resources and Biological resources" (Glossary of Environment Statistics, studies in Methods, Series F, No. 67, United Nations, New York, 1997).

2. Objectives and Methodology

2.1 Objectives

The aim of this study case is to emphasize and highlight the causes and challenges surrounding the natural resources in Morocco from a political approach, economical approach and environmental approach. To estimate the impact over the economy, while the challenges that the country is facing, and the strategic decisions taken in order to manage these resources.

2.2 Methodology

The research method used in this bachelor thesis is divided into two major parts. The theoretical part is based on the compilation of many articles found in the literature that gives a clear idea of the situation of natural resources management in Morocco; While the practical part consists of information gathered from reliable sources that shows what was done and will be done in order to solve the current issues that the country and its resources are facing.

3. Natural resources, management and scarcity

3.1 Typology of Natural resources

Natural resources are very diverse, they can take many forms and develop in different ways. Additionally, they can be used to reach various results that can further differ from a state of one development to another.

Due to the rarity of some resources, the limited availability of others, or the amount of time they take to form, from mere seasons to billions of years, and also because of human dependence on natural resources due to how vital they are to our economy, and crucial to our way of living, there should be a way to understand these resources, to classify them based on their nature, the forms they take, as well as their development and availability.

Based on natural resource's origins, they can belong to two categories:

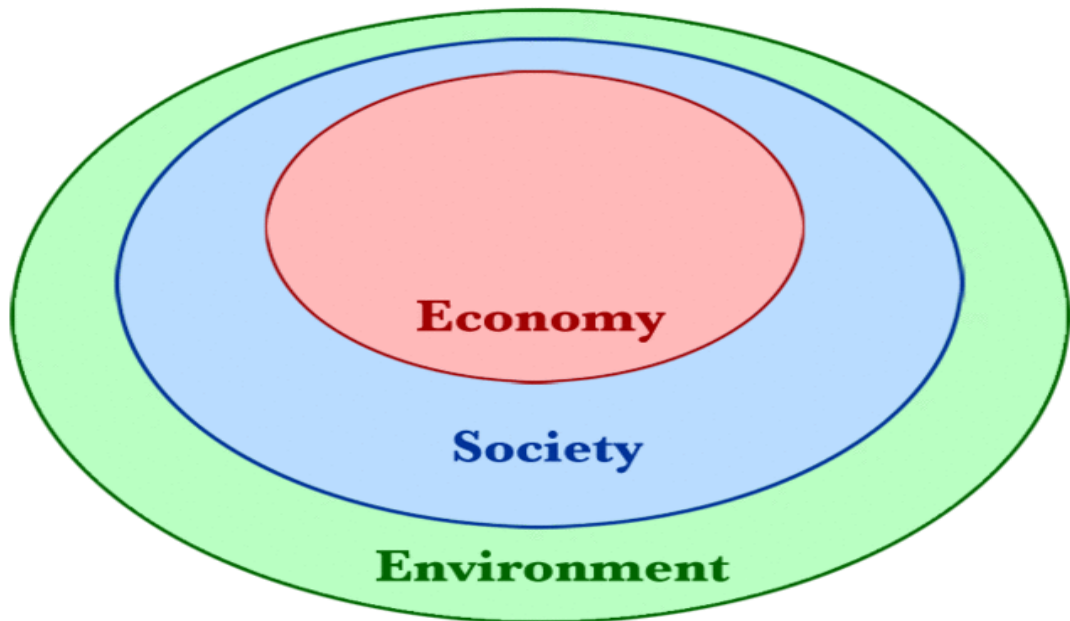
- ***Biotic resources:*** It contains the resources that form the biosphere, meaning living and organic forms. Some of these resources can be collected directly without a waiting period, like animals, while others require either a short amount of time such as plants and crops or a longer period like fossil fuels and phosphate rocks.
- ***Abiotic Resources:*** It includes all resources that shape their ecosystem and environment, that are non-living and non-organic. These resources are usually not created or produced by human activity and belong to a large scale such as land, fresh water, air and sunlight.

Natural resources can be classified based on their renewability:

- ***Renewable Natural resources:*** They can be defined as “Natural resources that, after exploitation, can be returned to their previous stock levels by natural processes of growth or replenishment.” Glossary of Environment Statistics, Studies in Methods, Series F, No. 67, United Nations, New York, 1997. Such as Plants and Animals.

- Non-Renewable Natural resources: They can also be defined as “Natural resources that are exhaustible such as mineral resources that cannot be regenerated after exploitation.” Glossary of Environment Statistics, studies in Methods, Series F, No. 67, United Nations, New York, 1997. Such as Minerals, Fossil fuels and Soils.

Figure 1 Dependency of Society and Economy on Environment



Source 1 Lumenlearning: Boundless economics, Introduction to natural resources economics

Knowing how to classify natural resources provides the necessary tools to adjust to certain sudden or radical situations that can affect or damage certain resources such as natural disasters or a global crisis. Moreover, it makes it possible to predict and forecast future developments for which if needed, measures can be taken to react accordingly in order to save resources from extinction.

3.1.1 Supply and Demand of Natural resources

As any form of capital, natural resources have a value and can therefore be applied to economic laws such as supply and demand. However, we cannot determine the value of each resource using the same approach, simply because some resources can be renewed, while others cannot.

With regard to determining the law of supply and demand of natural resources, the stock and the impact of its future as well as its exhaustion has to be considered. These factors are usually influenced by whether a resource is renewable or non-renewable.

To describe this phenomenon in an economic sense, means that “Inexhaustible resources are resources that cannot be controlled by humans and are essentially intangible. Exhaustible resources are a kind of matter in different substances and aggregate states” (Mburu, 2007)

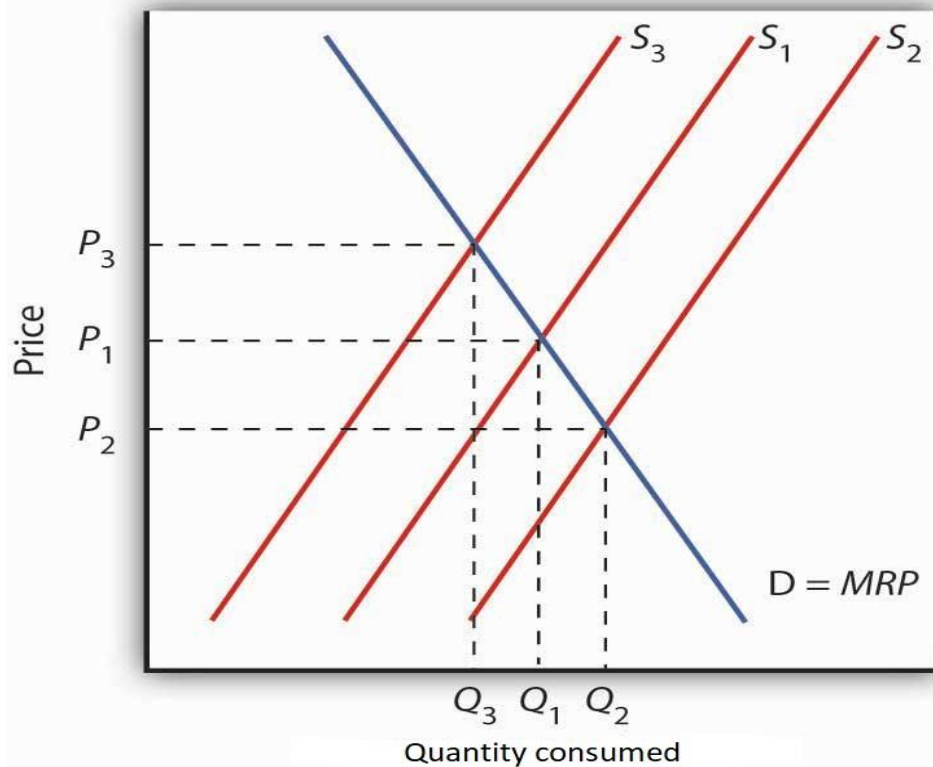
- *Exhaustible Natural resources:*

These natural resources are taken into account for both the current extraction and consumption and also their future demand affecting therefore the world’s reserves, meaning that the overall reserve of the resource will experience a decrease of its supply that will thus lead to an increase in price. The higher the future demand of an exhaustible resource, the higher the price of that resource, although, the higher the quantity preserved for a future use.

The fact that some exhaustible natural resources are still needed and that our current consumption is dependent on them, for as long as our approach to consumption changes radically, there is no choice but to ensure the future preservation of these resources.

In this case, an interest rate is used to interfere in the current market, manipulating the supply and demand for the sake of future plans.

Figure 2 Supply and Demand of exhaustible resources



Source 2 Lumenlearning: Natural resources and conservation

S1 reflects the current marginal cost, interest rate and expectations regarding future plans of Oil where the current consumption level is at Q_1 at a price P_1 .

When the interest rate goes up, the supply shifts to the right-side S_2 , causing the price P_2 to fall that leads to an increase of the quantity consumed Q_2 .

A decrease in the interest rate shifts the supply to the left-side S_3 , increasing the price P_3 while affecting the consumption Q_3 to a decrease.

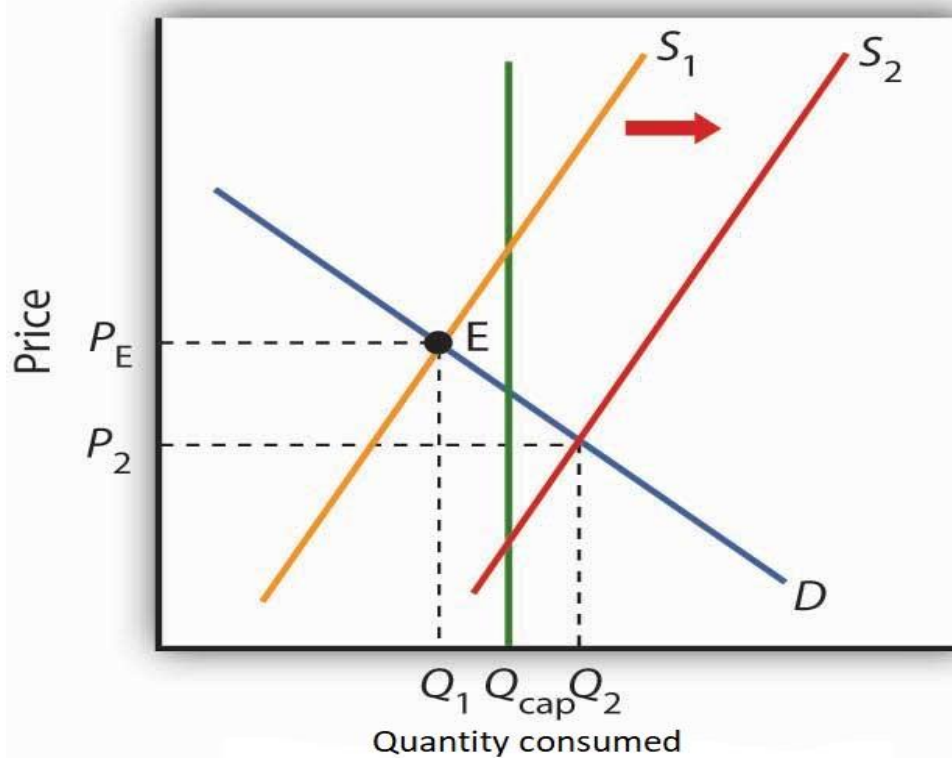
- Non-Exhaustible Natural resources:

Although, these resources are considered renewable, the process of renewal varies from one resource to another. Unlike vegetables that need one season to flourish, or fish reproduce during mating season which occurs yearly, trees require decades to grow and mature. We cannot just consume these resources blindly without a sustainable approach that will ensure that the reserves are kept to a certain degree in order for it to be able to reproduce and avoid damage to the area with all the necessary conditions that directly affect the level of production.

A plan for future use is needed with a focus on sustainability and that combines attention to production and consumption with that to the reserve and capacity of reproduction, this plan should be based on the nature of the resources and adjusted accordingly.

An interest rate is introduced to examine whether the consumption or harvest of the resource is higher than reproduction capacity affecting the supply and demand in order to maintain the level of reserve.

Figure 3 Supply and Demand of non-exhaustible resources



Source 3 Lumenlearning: Natural resources and conservation

Q_{cap} represents the carrying capacity of the resource where production equals reproduction, leaving the reserve unchanged.

E represents the current quantity Q_1 at a certain Price P_e meeting at the intersection where supply S_1 and demand D remains below the carrying capacity Q_{cap} , increasing the reserve for future use.

An increase in interest rate shifts the supply to the right-side S2 leading to a higher quantity consumed Q2 as the price dropped to P2 affecting the reserve to a decrease as now it exceeds the carrying capacity Qcap

3.2 Economical approach & Ecological approach

Managing natural resources is a subject of debate and a continuous conflict between the economic perspective and the ecologic perspective. This means that one aims to maximize the profit while minimize the consumption and ensure that the extinction of these resources is not reached.

The chain and complexity of natural resources and how they interact with each other is a delicate law of nature that should be taken into consideration when managing these resources.

As some researchers said “Natural resources are all connected in a way. Therefore if one is taken away, it will affect the supply or quality of all others“ (Yermakov Yu.G, Kuakova L.I, Romanova E.P, 1993)

- *Economic approach:*

The economic perspective of natural resources allows the use of theories and tools in order to analyze, monitor, evaluate and regulate them in order to provide a sustainable plan for a better management.

In order to manipulate the use or spending of resources while remaining sustainable, some economic tools such as taxes, quotas, subsidies, licenses and permits are introduced.

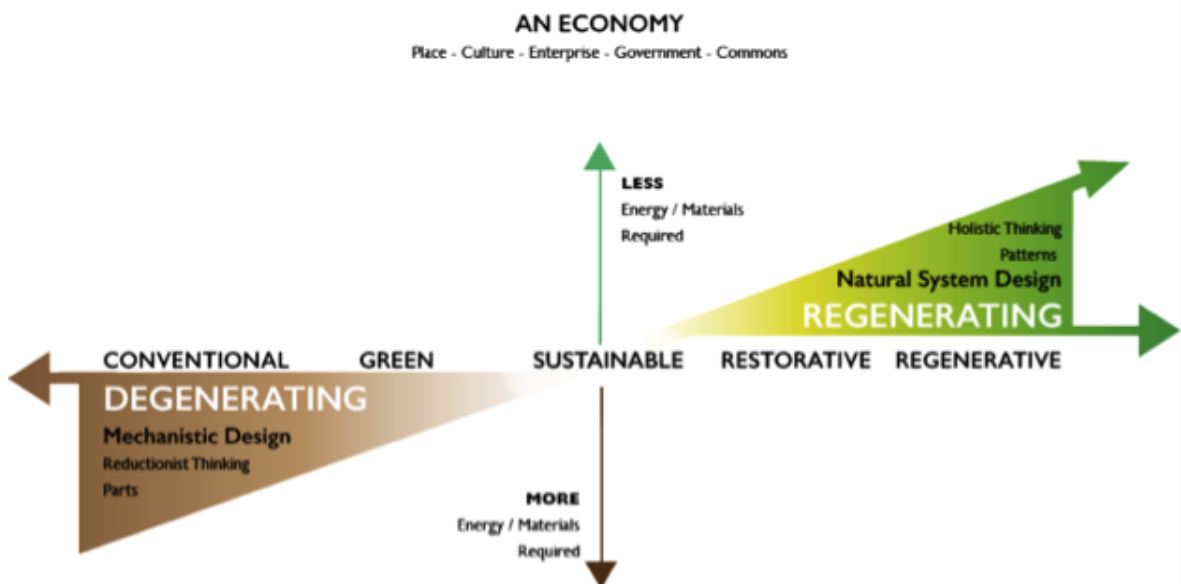
The environment is being adjusted to what best serve mankind above all which can lead to disastrous results of mismanagement and improper regulation. Therefore, some externalities are introduced for the environment to maintain the provision of services in a balanced form so that it can simultaneously regenerate. Some of these externalities can take the form of policies and laws that monitor both the landscape and the eco-system protection.

- Ecologic approach:

When it comes to the ecological point of view, we first need to understand how a natural resource is defined. The environment is considered a collection of factors such as chemical, physical and biological ones that can affect the living organisms in their surroundings, if these factors can be consumed, transformed or used, they are considered a natural resource.

Co-adaptation has been included to this approach and stated “Ecological Economics has improved on this by adding the concept of Co-adaptation between the natural and social worlds. In addition, the dynamics differ from a series of balanced situations. Systemic models that represent the dynamics using stocks-flux relationships are often used“ (Clark, 1990) where there should be a balance between the natural world (Environment and Ecology) with its systemic complexity, and the Socio-Economic world where natural resources are only seen as a way of profit and use.

Figure 4 Economy & Ecology conflict



Source 4 John Fulleron at the Capital institute, *Regenerative Capitalism, Regenerative Economy*

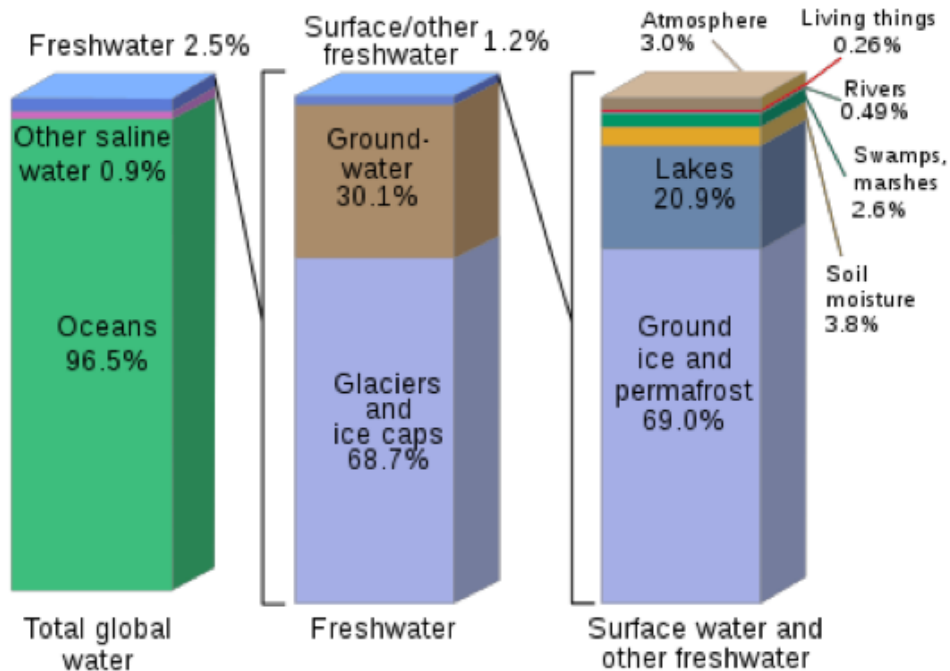
3.3 Scarcity of Natural resources

A natural resource that faces a decline in the quantity, availability, quality and productivity is considered scarce, which might lead to an eventual worldwide economic and environmental crisis or even go as far as to affect our own survival and extinction, simply because of our dependence on some, if not all the resources.

The resources that are on the edge of facing scarcity are those most drained with the most endangered ones being:

- Water scarcity: According to the United Nations, water scarcity is affecting every continent and has been growing at a double rate than the population increase since the previous century. Many regions are about to reach their limit when it comes to water services that can be delivered sustainably. Unfortunately, the situation is worsening due to climate change and the increase in the demand of bio-energy.

Figure 5 Global water availability

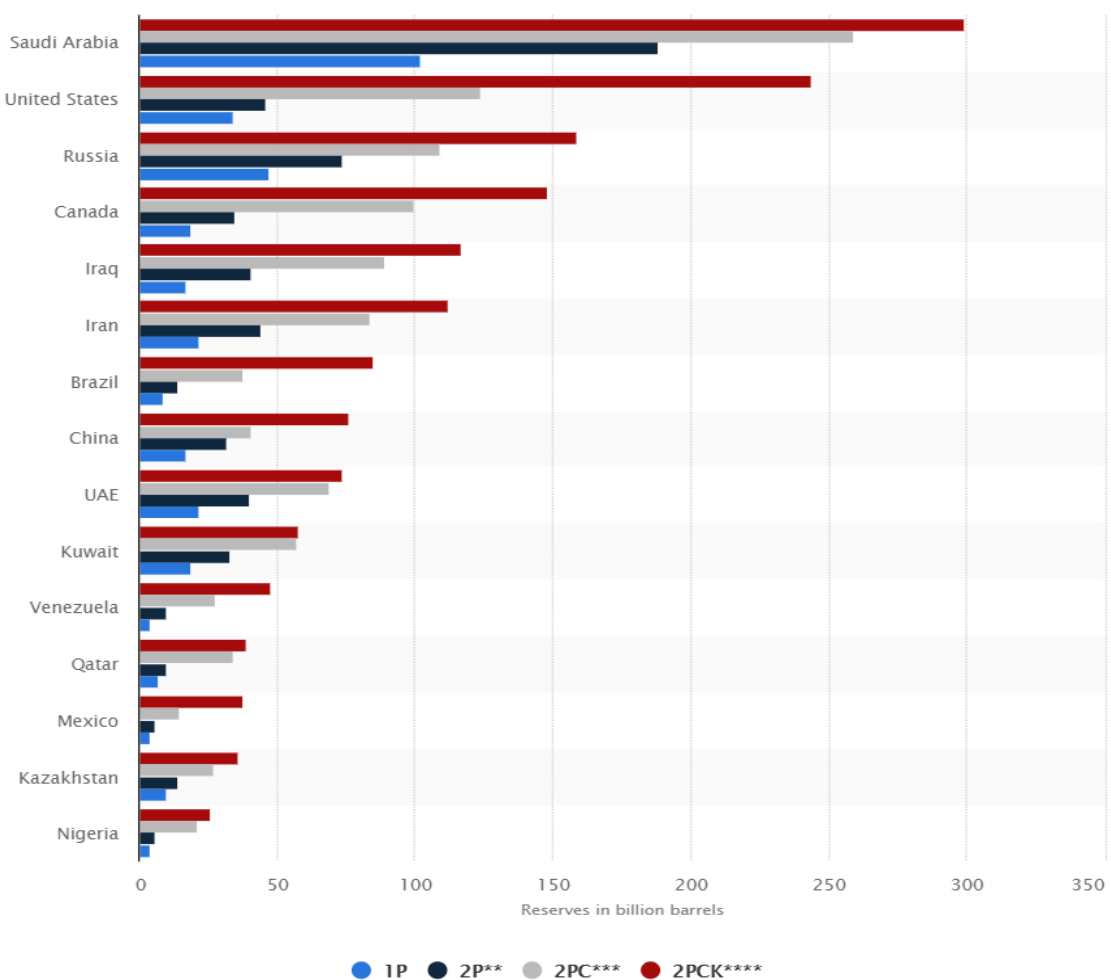


Source 5 Igor Shiklomanov, 1993, Oxford University Press, New York

- Petroleum scarcity: Our current economy and production are highly dependent on petroleum, whether it is clothing production, automotive production or medical production,

our system is turning around oil reserves, only few countries have direct access to these reserves but many of them are in a decline, mostly the world's largest exporter is Saudi Arabia. With the amount of time that fossil fuel takes to reach the maturity to be used, almost all the new reserves will require few decades before usage and therefore cannot be regarded the solution or an alternative to the declining reserves.

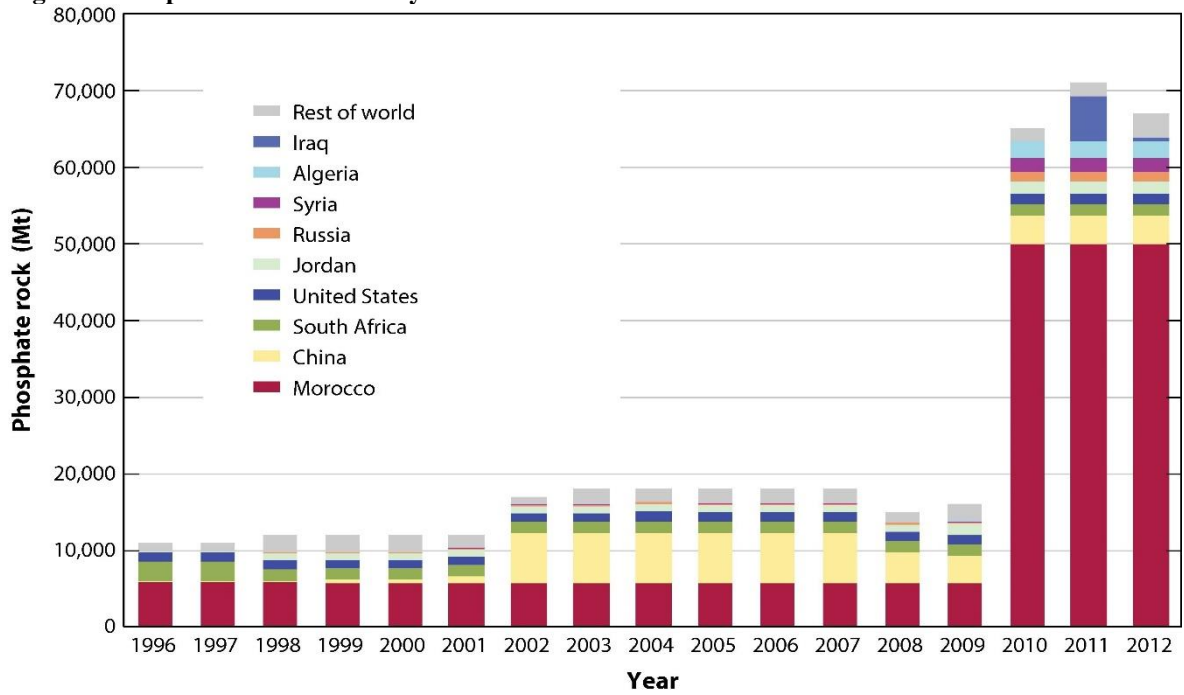
Figure 6 Petroleum reserves by countries



Source 6 Statistica 2020

- Phosphorus scarcity: Phosphorus scarcity is directly linked to demographic growth, as up to 90% of Phosphorus produced is used for food production which leads to an intensive increase in demand of this scarce resource. 88% of worlds production of phosphate rocks is controlled by a few countries only.

Figure 7 Phosphate rock reserves by countries

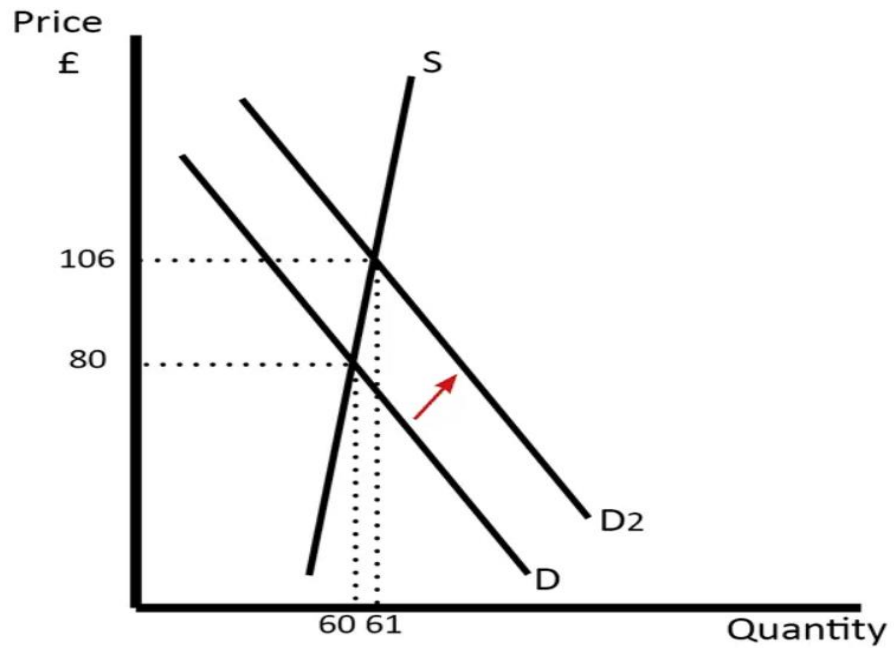


Source 7 Cordell, pp 161 - 188, Volume 39, 2014

3.3.1 Factors of Natural resources scarcity:

- Demand-induced Scarcity: Population growth and increasing consumption levels are reducing the amount of available resources to each individual. An example for this is Africa which is facing a demographic crisis.

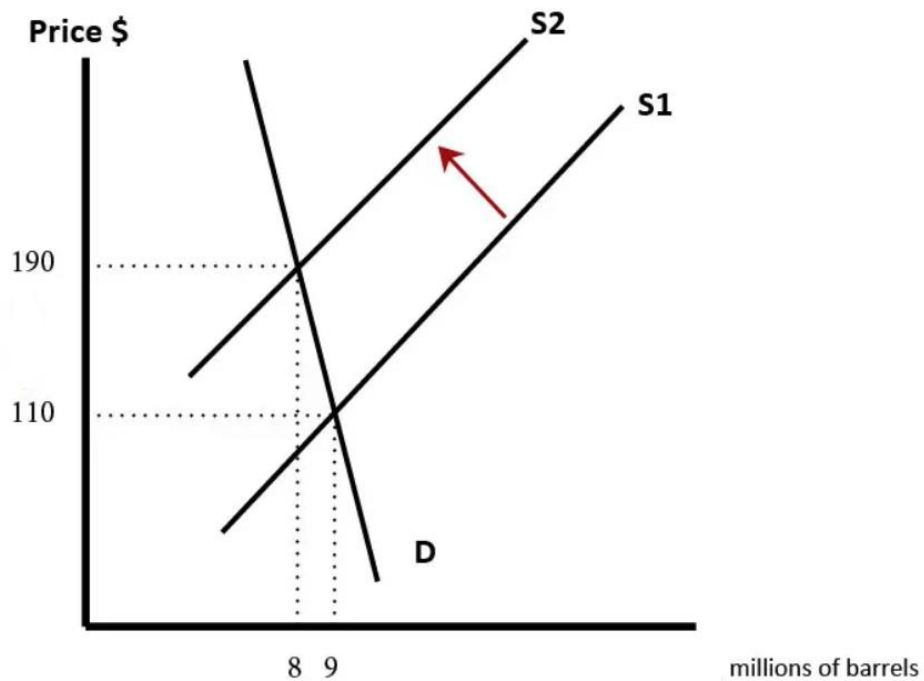
Figure 8 Natural resource's scarcity demand-induced



Source 8 economicshelp.org

- Supply-induced Scarcity: The environmental degradation is decreasing the overall availability of these resources. China is therefore a good example for this situation as some scientists estimate that 900m² of land degrade to desert yearly.

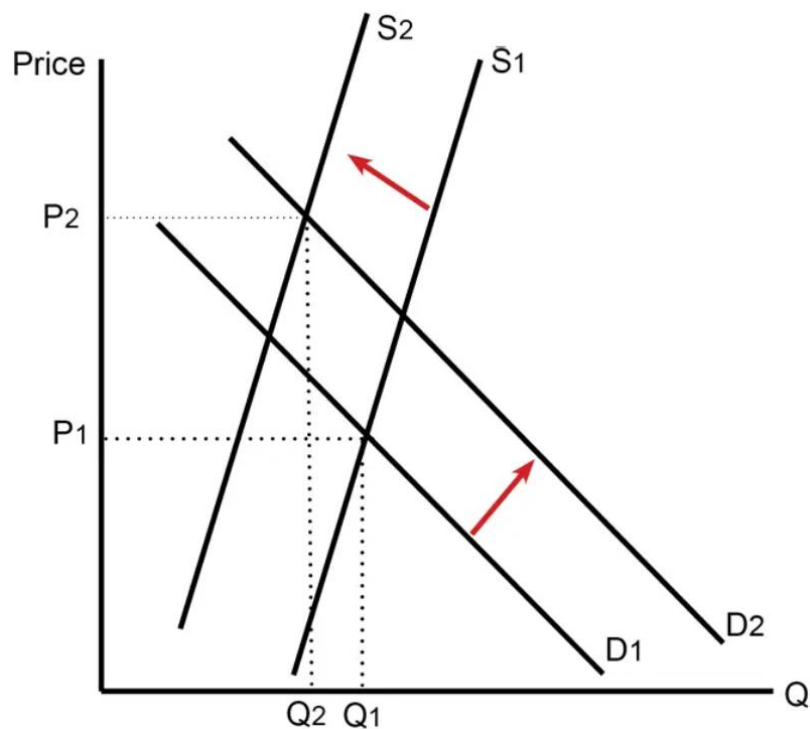
Figure 9 Natural resource's scarcity Supply-induced



Source 9 economicshelp.org

- Combined effects: Besides demand as a factor or supply as a factor, some cases of scarcity can be as well caused by the combination of both that shakes the fragile chain surrounding some resources, usually affected by a chain reaction where one cause affects another cause, leading to a variety of consequences and creating a spiral and loop effect.

Figure 10 Natural resource's scarcity Supply and Demand



Source 10 economicshelp.org

- Structural scarcity: The unequal access to certain resources that are given to some societies but not others make it scarce for some segments of the population, mostly due to distribution issues which create a lack to access to these resources. As an example, villages that leave in the desert who have a water issue that can be solved if there were a well-established distribution plan.
- Resource capture: The valuable increase of certain resources due to its scarcity that makes it impossible for the majority of the population to acquire a resource, while only the powerful and rich have access to it often leads to the monopolization of that resource. Petroleum can be a good example in this case.

- No alternatives: The current structure of our economy is very dependent on certain resources and our current technology and knowledge hasn't reached a level where we can reduce this burden of our dependence. Because of that, we aren't yet able to get over some resources that unfortunately lead to no other choice but to keep its exploitation, even being conscious of the critical state of the resource and its scarcity level.

- Unrectified damage: Whether if a natural resource can be renewable or non-renewable, scarcity can affect it regardless of to what category it belongs. Renewable resource that take mostly a long period to reproduce are the most endangered after the non-renewable resources. Because to the value of some resource, the intensive extraction process by some individuals, countries or companies is driven by pure profit in the short-run, without regard to the risk they might cause in the long-run and even the extinction of these resources.

4. Natural resources in Morocco

4.1 Morocco and Natural resources overview

Located at the edge of North-West Africa with Algeria at its East, Mauritania at its South, Atlantic Ocean at its West and the Mediterranean Sea at its North. In 2020, it has reached a population of almost 39 million at a geographic area of 710 850 km², a coast length of 2934 km along the Atlantic Ocean as well as 512km alongside the Mediterranean Sea.

From a geographical perspective, Morocco's position at the edge of North-West Africa made it convenient to avoid the grand Sahara that is covering most of North Africa. As a result, the upper part of the country knows a higher variety of natural resources compared to its southern part, especially as the climate differs from one region to another, even for a small-sized country like Morocco.

The key natural resources that are found in Morocco are zinc, manganese, iron ore, and most importantly, phosphate rocks.

Other significant natural resources that are found in the Rif domain include tungsten, tin, cobalt, titanium and antimony. In the High-Atlas domain, we can find lead, barite, iron, and copper. The Anti-Atlas domain includes silver, gold, tin, cobalt, titanium, and antimony.

Ultimately, one of Morocco's main natural resources if not the main resources that include phosphate rocks for which the country has the largest reserve worldwide. In addition to this, "Noor complex" project, being the world's largest concentrated solar power plant. Including marine resources, with the largest and richest fish reserves from both the Mediterranean Sea and the Atlantic Ocean.

4.2 Noor Complex Project

Because of the past dependency on hydrocarbon imports, Morocco decided to engage in a large-scale renewable energy plan.

Figure 11 Noor Complex I, II and III – Ouarzazate, Morocco

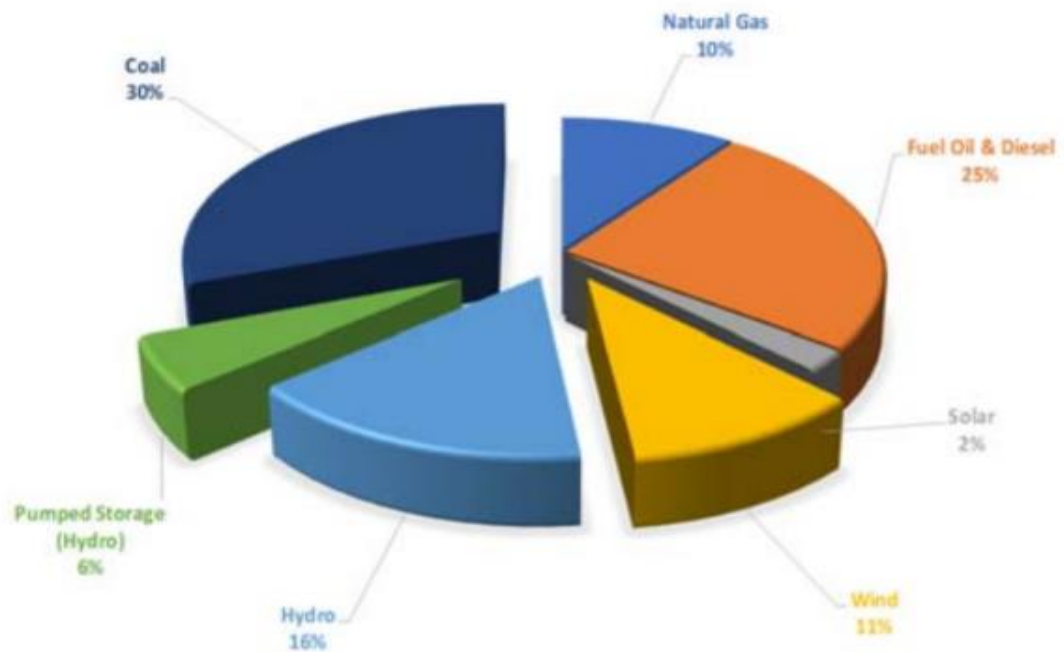


Source 11 protermosolar. Concentrated solar power plant

Launched in 2016 with the first part Noor I which provide 160 MW, Noor II with a capacity of 200 MW and Noor III having a capacity of 220 MW, providing a total capacity of 580 MW, started to deliver clean electricity in 2018.

Located in the southern province of Ouarzazate city in the Sahara of Morocco, divided into Three parts, Noor I, II and III managed to supply 6% of the entire country, with electricity for over a million households, by turning sunlight energy into clean renewable energy with a field of around 2 million mirrors covering over 3000 hectares of pure display, with a capacity of 580 WM, making it the world's largest concentrated solar power point.

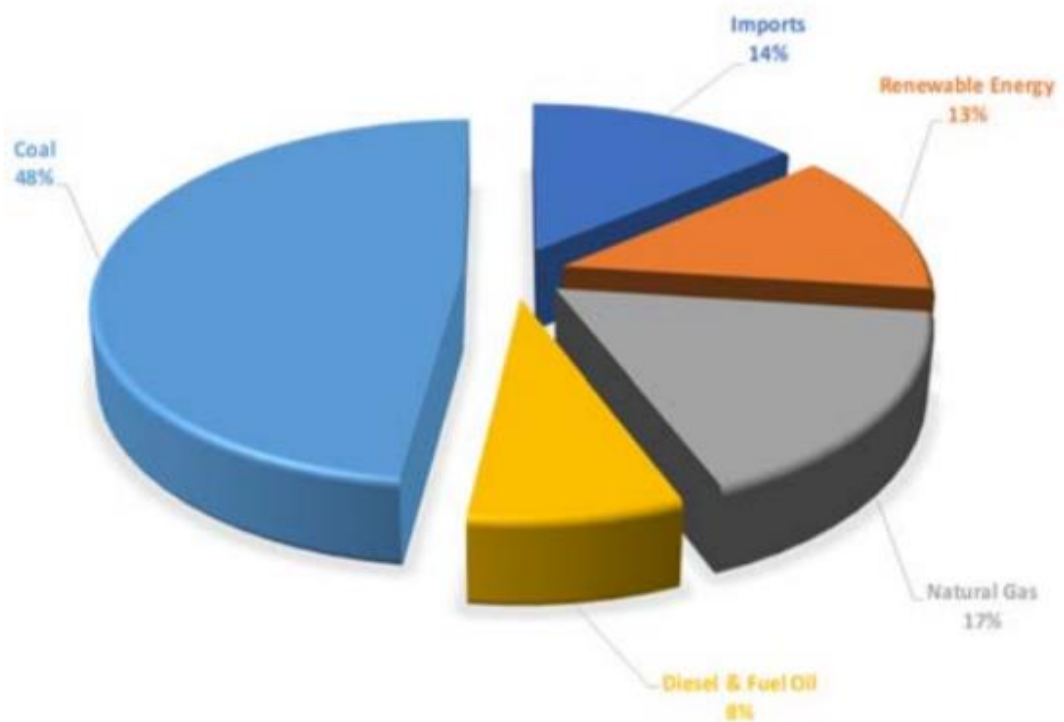
Figure 12 Power generation capacity by Fuel types



Source 12 ONEE 2016

The electricity sector has faced a fast increase in demand, and due to its dependence on high carbon content fossil fuels and the struggle to keep up with the growing capacity of 6.5% from the beginning of the century, reaching up to 35TWh in 2016. This growth in demand is linked to the GDP growth, demographic increase and also standard of living, turning the access to electricity to over 99% in 2017 which is almost a double since 2007 where the rate was only around 50%

Figure 13 Electricity production by Fuel types



Source 13 ONEE 2016

Thanks to Noor complex, more than 760 000 tons of carbon has been saved, with a target of sustaining 42% of renewable energy mix in 2020, taking a further step by setting up a track of reaching 52% by 2030.

In 2016, Noor I offered nearly 2000 new jobs and reduced the carbon dioxide emissions by 280 000 tones a year, which is equal to 1% of the country's CO₂ emissions.

4.2.1 Cost, usage and development

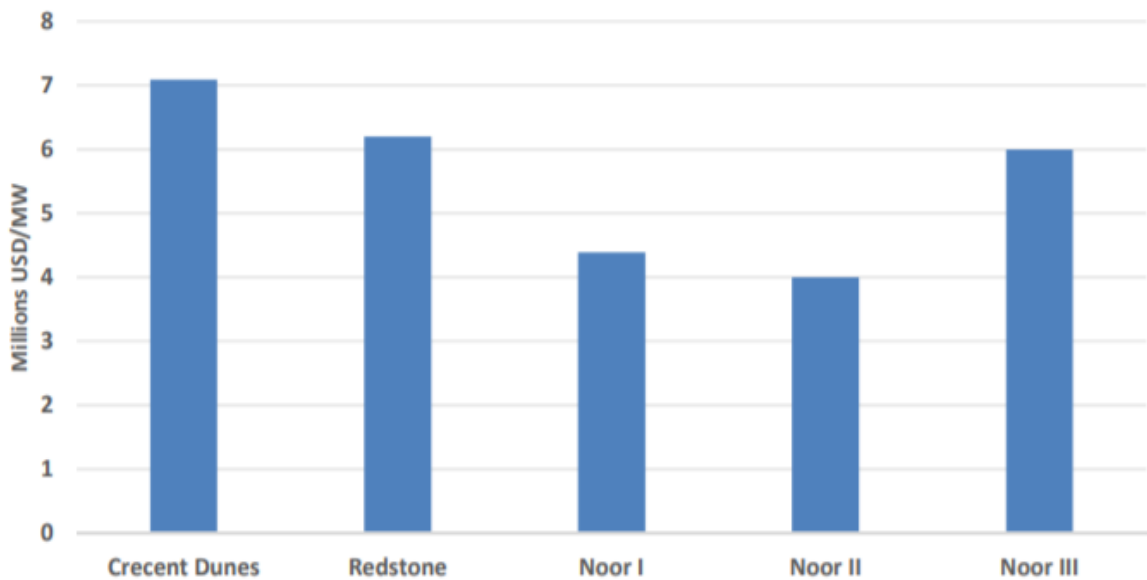
While Noor I and II are both CSP types made to generate electricity through its mirrors, Noor III is more of a technological variation of CSP, with the use of a solar tower at its center.

CSP "Concentrated Solar Plant" technology is a more advanced form of mirrors compared to the classic ones called PV "Photovoltaic" energy plant.

Unlike PV mirrors, that work only by absorbing sunlight and converting it into a usable energy, that cannot work if there is a lack of solar irradiation or if the sun is set.

The CSP consists of shifting the heat collected from the sun into one specific point called a central receiver turning it into a concentrated solar radiation converted to a thermal energy so the steam can generate it in order to drive the turbine. Due to integrated storage system, the CSP mirrors can keep functioning constantly, allowing the continuous production of steam which supply a cleaner and better-quality energy.

Figure 14 Investment costs compared to other CSP projects



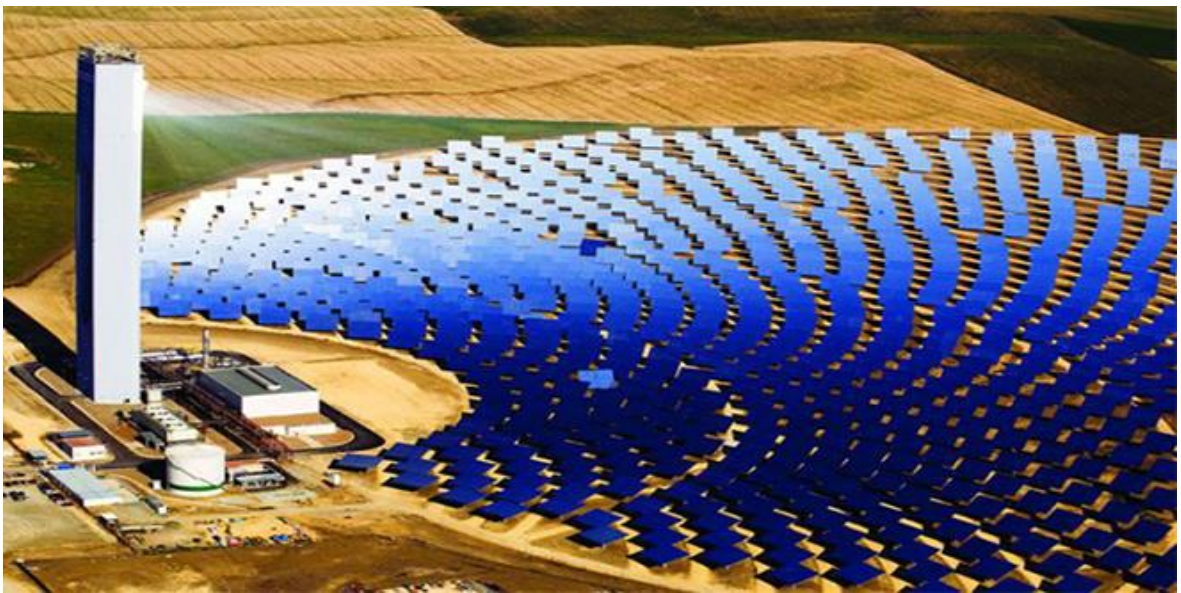
Source 14 International Bank for Reconstruction and Development No: PAD2642

Though, a higher quality comes with a higher price, and the cost isn't only determined by that, but also depends on the local conditions, and energy storage hours, making Noor I over 4.2 million USD/MW, Noor II that have reached 4 million USD/MW and Noor III much higher, reaching 6 million USD/MW.

4.2.2 Noor IV, a new hybrid energy plant

Noor IV, which was not initially part of the Noor complex plan, is located in the Northern part of the country in the Midelt province between the middle and high Atlas Mountains. The project is a hybrid between CSP and PV solar power project which is planned to provide thermal storage and a capacity of 800MW at its first phase where the construction has started in 2019, and expected to be functional by 2022. These factors make it one of the largest worldwide of its kind.

Figure 15 Noor IV - Midelt, Morocco

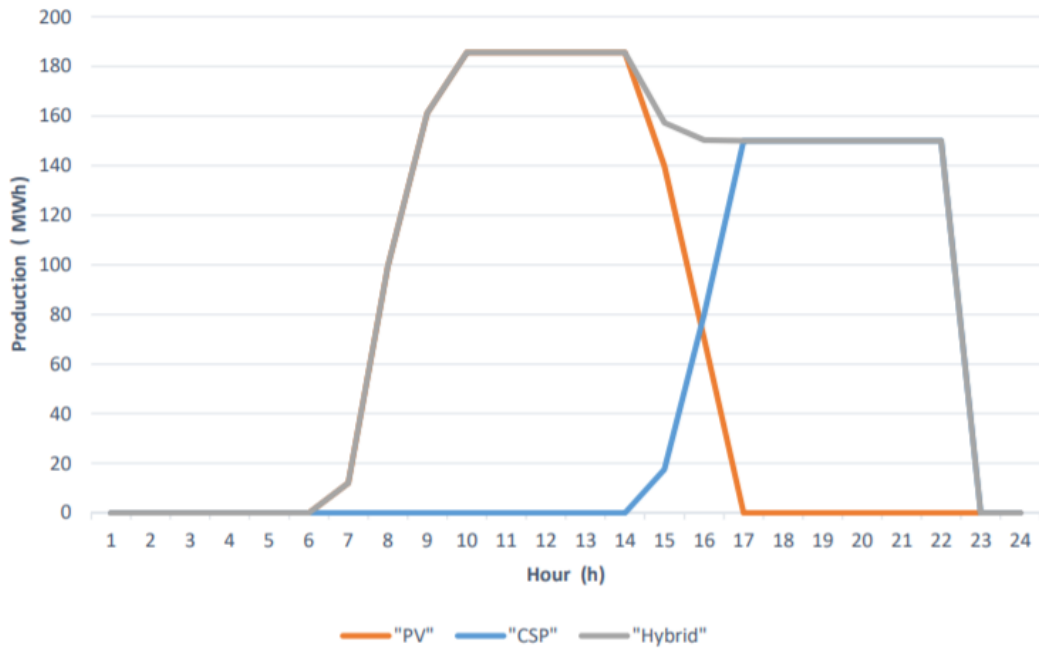


Source 15 2020 The North African Post

With a cost of over 2.3 billion USD and covering 3000 hectares, the project is expected to provide clean electricity to the northern surroundings. This shall cover more than a million household and around 760 000 tons of carbon emissions a year, which will help reach the initial goal of covering 52% of the country's electricity by 2030.

The hybrid project will have its CSP and PV separately under the name of Noor Midelt I and Noor Midelt II with a Solar tower where the CSP will provide 190MW and the PV will reach 210MW.

Figure 16 Generation profile of PV, CSP and Hybrid types plants



Source 16 International Bank for Reconstruction and Development

The decision of opting for a hybrid plant is to meet the surrounding conditions that are completely different from the Southern project Noor complex.

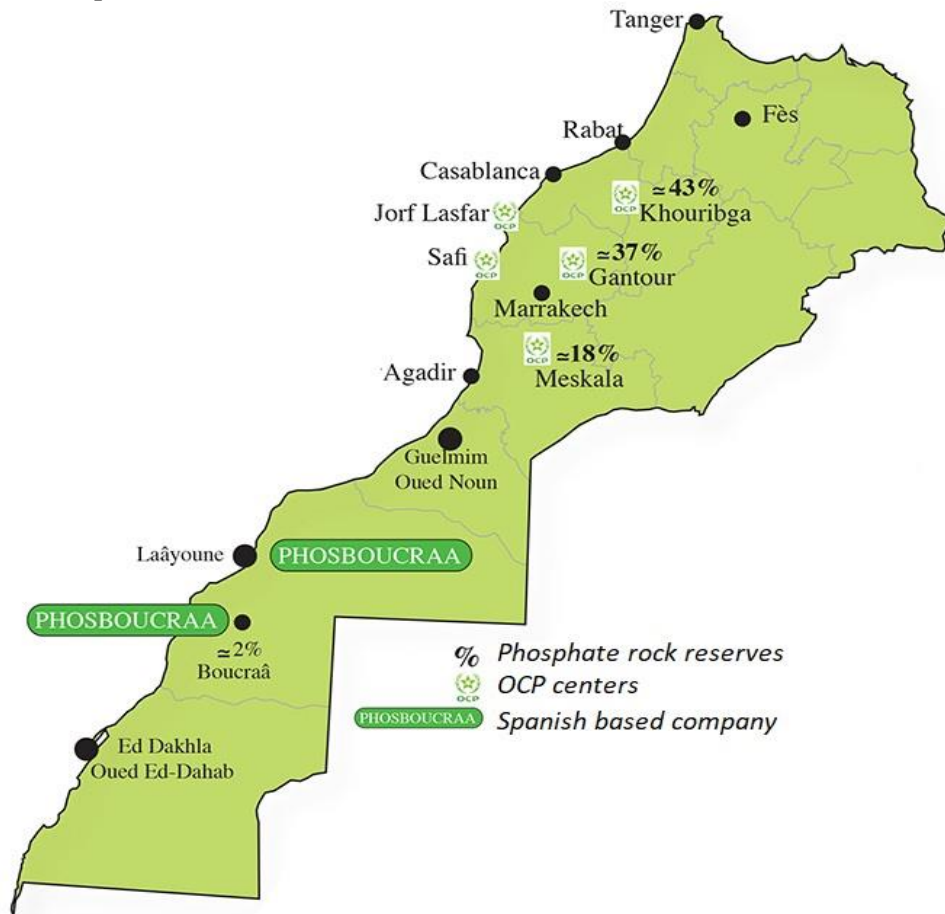
The hybrid solution is the most optimal to reflect the generation profile, electricity demand and cost optimization of the infrastructures while keeping the electricity cost at the minimum possible level. This is part of the strategy of an optimized generation control taking into account the radical weather change between winter where cold and snow reign all over the area and summer where the profile can be almost similar to temperature and conditions of Sahara.

4.3 Phosphate rocks, reserves and production

With regards to phosphate rock reserves, Morocco is known for having the largest reserve worldwide along with its dominance over the fertilizer market. The country counts Four mining centers all owned by the OCP “Office Chérifien des Phosphates”, a state-owned agency founded in 1920. The OCP is known to have an intensive policy regarding working

hours and shift distribution, effectively operating the mine for 24 hours a day divided between Three shifts.

Figure 17 Phosphate rock reserves in Morocco



Source 17 Leconomiste 2017

While Three centers are located not far from each other in the North-Central of the country surrounding the Atlas and Anti-Atlas region, the Fourth one is in the Southern part, in the Sahara, although this one is managed by the Spanish company PHOSBOUCRAA.

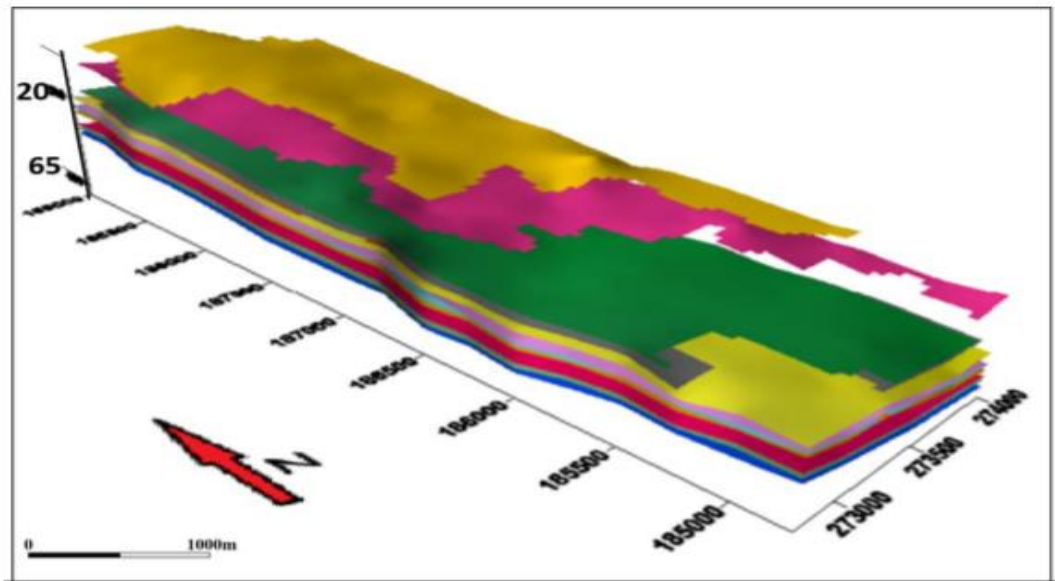
4.3.1 Reserves richness and extraction process

Phosphate rock is the primary raw material for fertilizers and can be divided into Three grades, namely: High-grade ore, Medium-grade ore and low-grade ore. Both High-grade ore and Medium-grade ore are directly sold to a variety of fertilizer plants after having been

under “Crushing” process. The Low-grade ore is grinded after the crushing process, reaching its final phase where it is then used as a Bio-super fertilizer.

The reserves have shown the richness and intensity of phosphate rocks and its components through sampling, scanning and micro-scoping. Seeing as, the area contains layers of phosphate rocks, the process of mining and collecting is done with no intensity.

Figure 18 Phosphate layers in a 3D model



Source 18 *J.Mater. Environ.Sci.* 2020, volume 10, issue 4

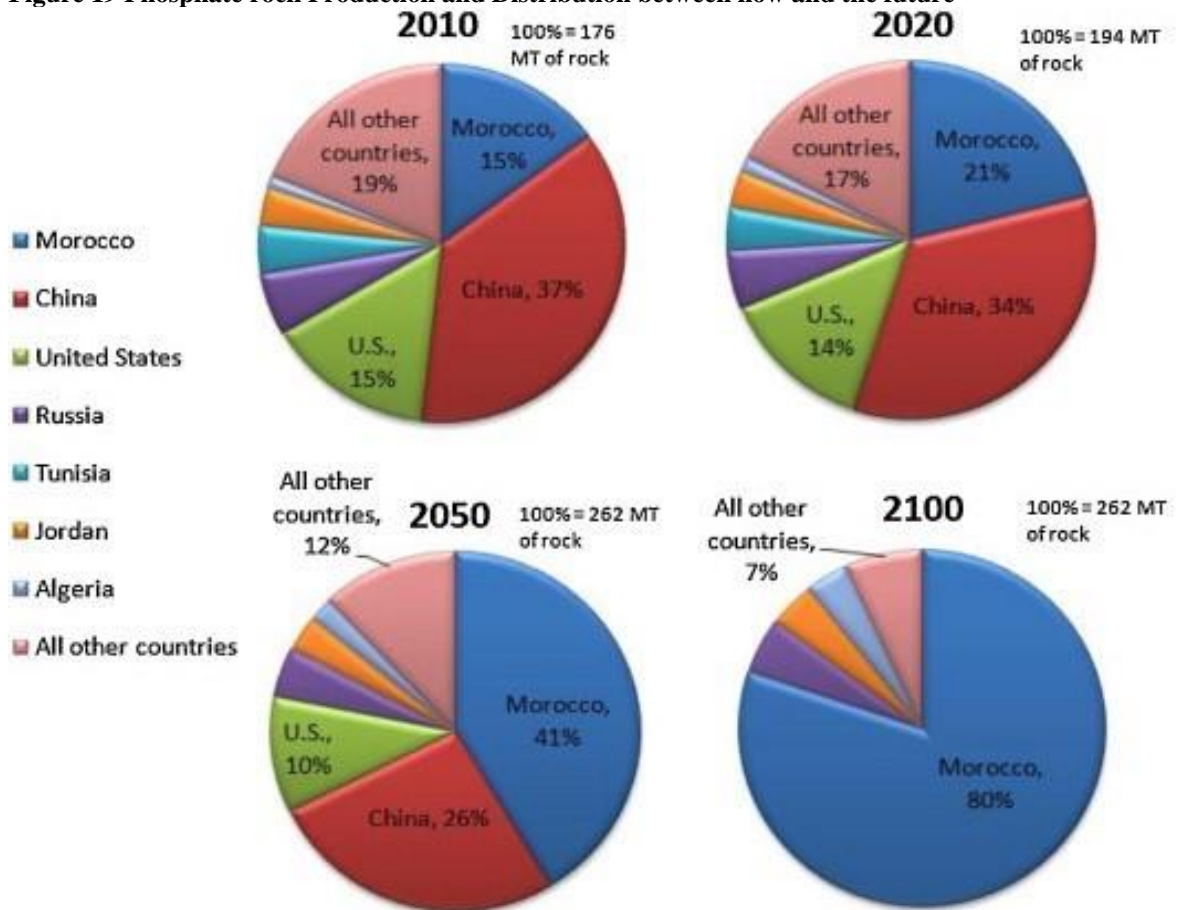
With the recent studies and technology advancements, the estimated level of phosphate rocks reserves in Morocco is far lower than scientists believe it to be, showing that these reserves contain a much higher level of phosphate rocks, which gives the country an even greater opportunity to remain having its hand over the market and continue its dominance. However, studies also suggest that the overall reserves are about to reach the peak in the coming decades which will lead to an increase in demand and value, knowing that the modern agriculture and food structure is entirely based on phosphorus and phosphate rocks which, in turn, will lead to the world dependence on the country’s reserves in the near future.

4.3.2 World's Challenges over Phosphate Rocks

It is essential to keep in mind that phosphate rocks is an exhaustible resource that took millions of years to form with a high dependency on it with regard to modern food production and agriculture.

Global production of fertilizers is rising, with the increase in demand being directly linked to the current demographic crisis that the world is facing. Estimating a population of almost 10 billion by 2050 and a very limited supply where only few countries are able to provide the production level needed for the current situation and including the knowledge that many reserves are reaching their limits; it can be predicted that the situation will worsen in the future and intensify the pressure.

Figure 19 Phosphate rock Production and Distribution between now and the future



Source 19 2011 Elsevier B. V.

4.4 Marine resources and Fishing sector

Geographically speaking, Morocco has a natural advantage over the marine resources due to its positioning. Open to both the Mediterranean Sea with a coast length of 512km and the Atlantic Ocean, having a coast length of 2934 km, and being at the gate of African – European transactions, giving the country all necessary tools for a high production and exportation of its marine resources.

In January 2020, and after years of negotiations, the country officially included its Maritime boundaries that has reached 200 Nautical miles with an increase up 125 Nautical miles securing its resources from the unfair competition received from Spain over the Moroccan borders. Though, Spain was the only country against the Maritime boundaries plan, mainly because of the Canary Islands and the very short distance between Morocco and Spain at the peak of both countries in the Mediterranean area, putting Spain in a large disadvantage as it doesn't have a large access to the Atlantic Ocean due to its geographical neighbor Portugal.

Morocco's positioning and long tradition of fishing have kept it at its position as the largest fishing producer in Africa and the 25th worldwide, keeping its position as the largest canned Sardine exporter, being the main supplier of the European market. With a contribution of 2.3% to the GDP, the sector remains prosperous and the government is working on developing plans to increase the production level by upgrading and modernizing the sector and introducing different opportunities such as aqua-agriculture and farming strategies.

The main species found in the Moroccan territory are Pike, Perch, Black bass, Carp, Barbell, Eels and Roach for the fresh water. The richness of the country's fishing is mainly found in the Mediterranean Sea and the Atlantic Ocean, the main species found are Sea perch, Bonitos, Chad, Sea beans, Mullet, Swordfish, Tuna, Marlin, Barracudas and Grouper. The country also has a quite variety of aquaculture farming such as Seabass, Gilthead seabream, Trout, Eel, Carp, Tilapia, Crayfish, Oyster and Mussels.

In 2009, a new plan “Halieutis” has emerged targeting a higher growth in aquaculture and sustainable fisheries, followed Two years later with the creation of a specialized agency “The National Agency for Aquaculture Development” as a support of Halieutis plan’s ambition.

Figure 20 Halieutis strategy plan



Source 20 anda.gov.ma, halieutis

The recent strategies implemented by “Halieutis” plan was to secure a target by 2020 that meets the current situation with all the changes the market has faced, from increase in demand, a higher standard of living to competitiveness and new competitors, logistics and tighter market.

4.4.1 Fishing sector’s factors and challenges

While the country has a long fishing production history. The sector is still facing many challenges keeping the results expected from seeing a full bloom in term of production level, poor infrastructure, and outdated tools, materials and equipment used. Several regulations have been introduced by the government in order to push this sector further. The main project that has been selected in the long-run is the Halieutas plan.

Figure 21 Halieutis objectives for 2020



Source 21 Food from Morocco, Marine sector, Halieutis plan

Halieutas has managed to reach about 80% of its fixed objectives. Reports has shown many struggles when it comes to applying the strategies by identifying imbalances between the plan and the execution, delays in terms of reaching and achieving goals and weaker results than what was expected, proving once again a long way to take in order to keep up with the current international market and the competitors.

The supreme council has also stated that the main focus that requires improvement is the presence of Moroccan fisheries in the international markets, domestic consumption of sea products, as well as fighting the illegal intensive fishing and the fishing of endangered species that suffer from illegal activities or protected by international organizations

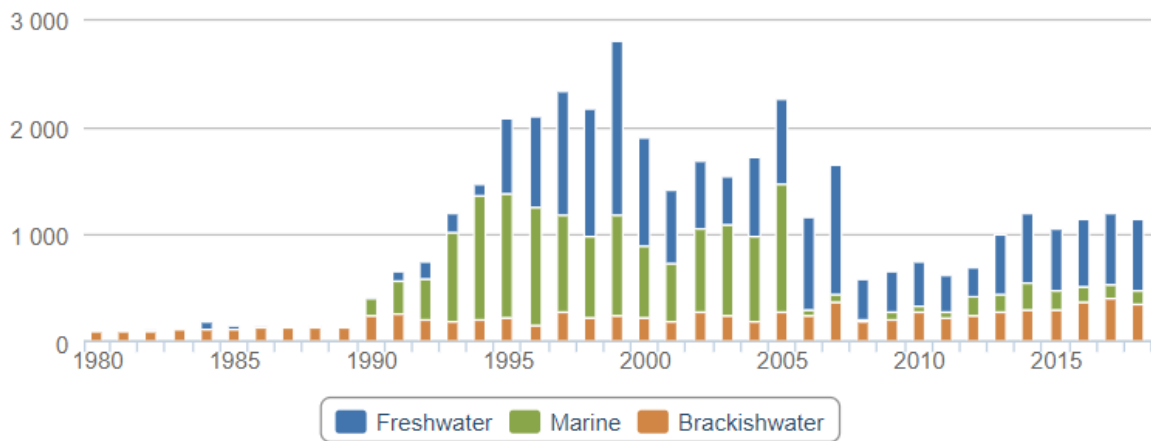
4.4.2 Aquaculture farming

Aquaculture farming has all what it takes to be very successful, mostly due to the country's geographical position and variety of weather that allows diverse species to settle in Morocco. The main factors are the Atlantic Ocean which contains upwelling water system that is suitable for shellfish culture, while the Mediterranean Sea provides the perfect

conditions for intensive fish breeding, including freshwater farming in various of rivers and lakes in the Middle Atlas region and its surroundings

The national market is unfortunately still under the dominance of the international aquaculture environment, with the majority of its feed being imported from the European market. The national marine aquaculture is still in a secondary place with a weak strategy that is lacking a solid structure to take advantage of its full potential.

Figure 22 Aquaculture Production per Ton by water type



Source 22 FAO Fishstat

Currently, the marine aquaculture is farming The European Bass and the Gilthead Seabream only in Three different ways:

- Protected Marine, with the use of Lagoon and Estuary environments.
- Basins, that are
- filled with pumped seawater
- Cages with a depth of 20m to 30m in the open sea.

The farming species and production is mostly dominated by Seabream that counts of around 22%, Seabass occupying almost 20% and Cupper Oysters counting 15%

- Cupped Oysters are being raised on the intertidal areas.

- Hatcheries are used for various of species such as Mussel spats, Carp, Trout, Bass and Gilthead.
- Inland aquaculture is being used for several species including Salmon, Carp, Rainbow Trout, Golden Trout, Eel and two carnivorous species as well that are Pike and Black bass.

The country has started to see the potential that the Aquaculture farming has to offer, especially that the National Agency for Development and Aquaculture ANDA stated that the potential of aquaculture farming could reach up to 380 000tones a year. However, in order to reach such result, a drastic change has to see the light, from a higher investment from the government that the sector has to have, to a diversification plan, especially that the majority of the activities are based on Three species around that will lead to the expansion of farming species and distribution of aquaculture farms that are currently located in Four areas only between the Atlantic Ocean and the Mediterranean Sea.

The Haleutis plan has also set goals for the aquaculture farming, focusing on improving its overall performance and maintaining sustainability of its resources.

5. Conclusion

Going to the conclusion of my work, I would like to highlight the importance of natural resources as a commodity and a core to our structure, either in a micro level like consumption of goods or a macro level such production and economic base, and the importance of sustaining these resources in order to maintain a solid cycle based on a balance between the economic needs and the environment needs.

An adjusted approach is needed to reflect each natural resource based on its characterizations, if dealt with renewed or non-renewed resources, if a non-renewable resource has reached a critical scarcity level, the period taken for the reproduction of the renewable resources.

Alternatives that will shift the focus on certain resources avoiding disastrous results or a chain reaction that will end up affecting its surrounding, either when it comes to other resources or species linked to it, or human consumption in a large overall picture.

In conclusion, Although Morocco is facing many challenges and obstacles that don't allow the country to reach a full potential over its resources, and market dominance, from infrastructure, equipment, workforce to government negligence and bad decisions that had affected the country in the long run. The country has variety of advantages giving it the upper hand over many sectors due to its geographical positioning, providing a variety of natural resources from both land and coast, and the close distance to many markets such as the European market and the African Market. The weather differences that each region know play a direct role that helps providing certain resources that require specific conditions in order to reach a maturity stage that is required for production and consumption.

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