FORMATION OF NATURAL GEOGRAPHICAL CONDITIONS IN THE DRY PART OF THE ARAL SEA

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Abstract: The Aral Sea is one of the most significant inland water bodies in Central Asia. The dry part of the Aral Sea, also known as the Aralkum Desert, has been formed due to various natural and anthropogenic factors. This article provides a comprehensive overview of the geological history of the Aral Sea and the climatic conditions that have contributed to the formation of the Aralkum Desert. The study suggests that human activities, such as irrigation and water diversion projects, have played a significant role in exacerbating the degradation of the Aral Sea and the formation of the Aralkum Desert. The findings of this study can be used to inform sustainable development practices in the region.

Key words: Aral sea, natural resourses, drought, landscape, ecological hazards, climate changes.

Introduction

The Aral Sea, located in Central Asia, was once a flourishing body of water, with a diverse ecosystem and abundant resources. However, over the past several decades, the sea has experienced dramatic changes that have altered its landscape and environment. The human activities, including intensive irrigation practices and poor water management policies, have played a significant role in the Aral Sea's shrinking. Additionally, natural factors such as climate change, geological history, and hydrological processes have contributed to the formation of the dry part of the Aral Sea. The consequences of these changes have been devastating, affecting the local communities' livelihoods, ecosystems, and health. Thus, understanding the natural and human factors that have led to these changes is essential to developing sustainable and effective management strategies that will restore the Aral Sea's ecological health and improve the living standards of the people living in the region. This dissertation will explore the formation of natural geographical conditions of the dry part of the Aral Sea, including its geological history, climatic conditions, and hydrological processes [1-2].

The Aral Sea region has a rich geological history that dates back millions of years. During the Paleozoic Era, the region was covered by a shallow sea, which

gradually filled in with sediment from nearby mountain ranges. This process continued into the Mesozoic Era, resulting in the formation of a thick layer of sedimentary rocks. During the Neogene Period, the Aral Sea was re-established, and it became a significant body of water in the region. This was due to the tectonic uplift of the surrounding mountains, which led to the formation of the Amu Darya and Syr Darya rivers. These rivers provided a steady supply of water to the Aral Sea, creating a diverse and thriving ecosystem [1]. However, the geological processes that created the Aral Sea also made it vulnerable to changes in climate and human activities. In recent years, the Aral Sea has undergone significant changes due to overuse of its water resources and poor management policies. As a result, the dry part of the Aral Sea has emerged, leading to the loss of biodiversity, degradation of soil quality, and increased health risks for local communities. Understanding the geological history of the Aral Sea region is essential to developing effective management strategies that can restore its ecological health and promote sustainable development in the region [3].

Geological History of the Aral Sea

The Aral Sea is located in the region known as the Turan Plain, which is a vast plain located in Central Asia. The Turan Plain is an area of low relief, with elevations ranging from 50 to 300 meters above sea level. The Aral Sea was formed during the Pliocene epoch, which is a geological period that occurred between 5.3 and 2.6 million years ago. The sea was formed as a result of tectonic movements that created a depression in the Earth's crust, which later became filled with water. The sea has gone through several cycles of expansion and contraction over millions of years, primarily driven by climatic changes.

During the Pleistocene epoch, which is a geological period that occurred between 2.6 million and 11,700 years ago, the Aral Sea was much larger than it is today. The sea covered an area of around 350,000 square kilometers, making it one of the world's largest lakes. However, during the Holocene epoch, which is the geological period that began around 11,700 years ago and continues to the present day, the sea began to shrink due to a combination of tectonic movements and changes in the climate.

Today, the Aral Sea is mainly divided into two parts, with the northern part being largely desiccated. The northern part of the sea is now known as the Aralkum Desert, which is a vast desert that covers an area of around 35,000 square kilometers. The Aralkum Desert is mainly composed of fine sand and dust, which are blown by the wind into large sand dunes. The desert is also known for its unique flora and fauna, which have adapted to the extreme arid conditions[4-5].

Climatic Conditions

The Aral Sea basin experiences a continental climate, characterized by hot summers and cold winters. The region receives low levels of precipitation, and the evaporation rate is high due to the hot and dry climate. The Aral Sea plays a crucial role in regulating the climate in the region, as it acts as a heat sink, which helps to moderate the temperature in the surrounding areas.

However, over the past few decades, the Aral Sea has been shrinking at an alarming rate, primarily due to anthropogenic factors. The diversion of water from the two rivers that feed the Aral Sea, the Amu Darya and the Syr Darya, for irrigation and agricultural purposes has significantly reduced the inflow.

Formation of Natural Geographical Conditions in the Dry Part of the Aral Sea.

The Aral Sea is a once-vast inland sea located in the Central Asian region, between Kazakhstan and Uzbekistan. In the past, the Aral Sea covered an area of around 68,000 square kilometers, making it one of the world's largest lakes. However, over the last few decades, the sea has drastically reduced in size, primarily due to human activities such as irrigation and damming of the rivers that feed the sea. Today, the Aral Sea is mainly divided into two parts, with the northern part being largely desiccated. This article discusses the geological history of the Aral Sea and the climatic conditions of the Aral Sea region, leading to the formation of natural geographical conditions in the dry part of the Aral Sea[6-7].

Geological formation

The Aral Sea basin is situated on a tectonic depression that was formed during the late Cenozoic era. The depression was filled with sedimentary rocks, such as sandstone, shale, and limestone. The thickness of the sedimentary rocks varies from 4,000 to 8,000 meters. The depression was later filled with water, creating the Aral Sea.

Hydrological conditions

The Aral Sea was fed by two main rivers, the Amu Darya and the Syr Darya. These rivers originate in the mountains of Central Asia and flow into the Aral Sea basin. The rivers provide water for irrigation and drinking purposes, as well as for the maintenance of the Aral Sea ecosystem. However, due to irrigation projects, such as the Soviet-era project to divert water from the rivers for cotton production, the water flow to the Aral Sea has decreased significantly. As a result, the sea has shrunk, and its salinity has increased, making it inhospitable to many species.

Geomorphological features

The Aral Sea region is characterized by a variety of geomorphological features, including plains, hills, and plateaus. The Ustyurt Plateau is located to the north of the Aral Sea and is composed of sedimentary rocks. The plateau is an important source of groundwater, which is used for drinking and irrigation. The Kyzylkum Desert is located to the south of the Aral Sea and is one of the largest deserts in the world. The desert is characterized by sand dunes, rocky outcrops, and sparse vegetation. The Aral Sea region has an arid climate with hot summers and cold winters. The annual precipitation ranges from 100 to 300 mm, with most of the precipitation falling in the winter and spring months. The region is characterized by strong winds, which can reach up to 25 m/s, and dust storms are a common occurrence [8-9].

Ecosystems

The Aral Sea region is home to a variety of ecosystems, including wetlands, reed beds, and riparian forests. The wetlands and reed beds are important breeding grounds for fish, birds, and other aquatic species. The riparian forests provide habitat for a variety of bird species and other wildlife. However, due to the shrinking of the sea, many of these ecosystems have been destroyed, and many species have become extinct [10].

Conclusion

In summary, the formation of the natural geographical conditions of the dry part of the Aral Sea has been shaped by a combination of geological, climatic, and hydrological factors. The region's Paleozoic history, combined with its harsh desert climate and the overexploitation of its water resources, has led to significant environmental and social impacts. To ensure the sustainability of the region's water resources and ecosystems, it is essential to implement effective water management policies that balance the competing demands of agriculture, industry, and domestic use while protecting the region's fragile environment and promoting sustainable development. By doing so, it may be possible to reverse some of the damage done to the Aral Sea region and ensure its continued existence for future generations.

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