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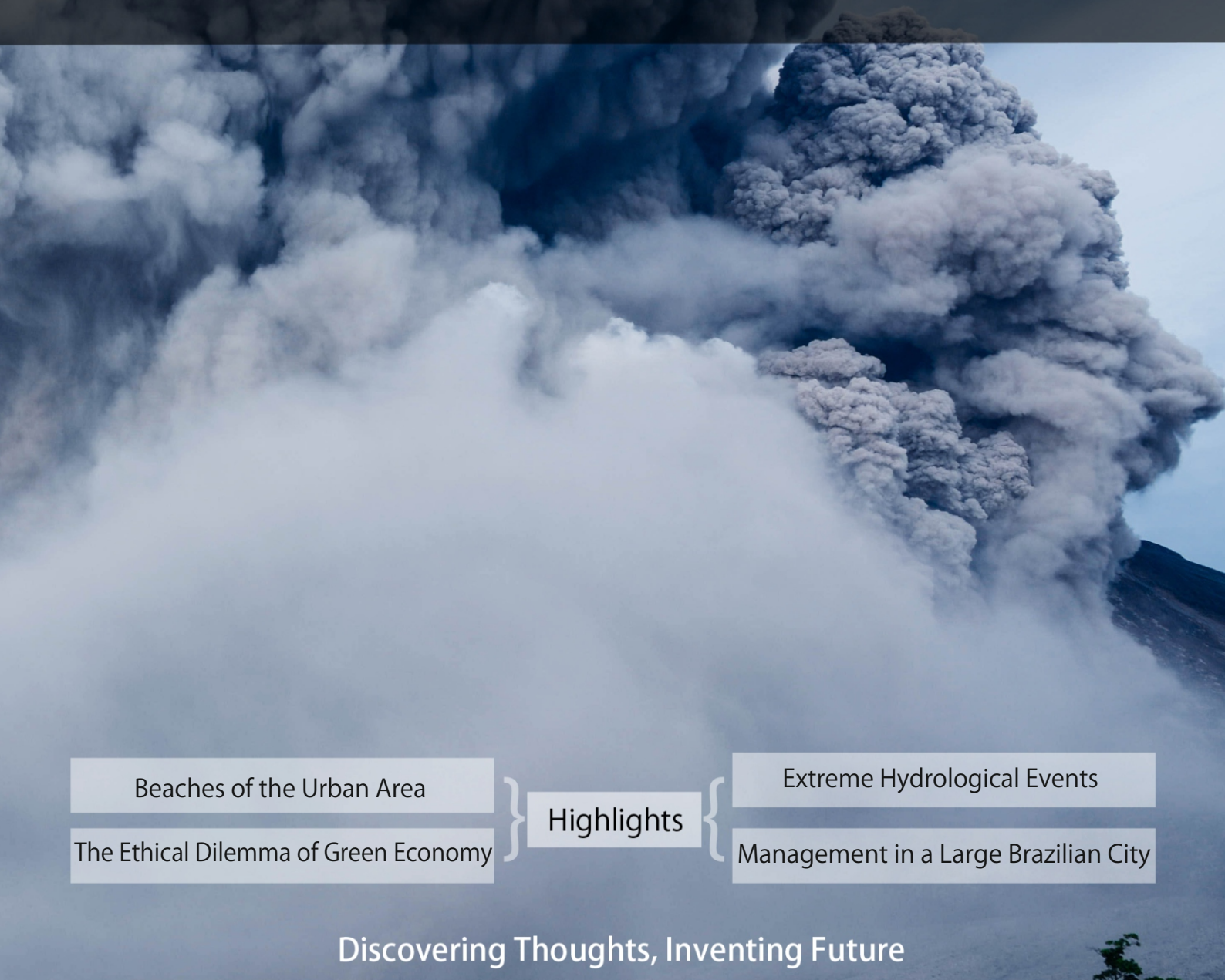

Beaches of the Urban Area

The Ethical Dilemma of Green Economy

Highlights

Extreme Hydrological Events

Management in a Large Brazilian City

Discovering Thoughts, Inventing Future

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Diagnosis and Difficulties in Waste Management in a Large Brazilian City, Focusing on Selective Collection

By Gabriel de Pinna Mendez, Claudio Fernando Mahler, Stella Regina Taquette & Luis Felipe Umbelino

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Abstract- This work evaluated the main difficulties for the implementation and maintenance of selective collection in a large Brazilian city with more than 1 million inhabitants. For that, the qualitative method was used through interviews with 18 professionals who work in the area of selective collection and waste management. The interviews were recorded and the data submitted to content analysis. The results pointed to the following difficulties: lack of government management, low efficiency and limited coverage; poor separation of waste at source; distortions in the logistics chain of selective collection and in the distribution of waste by cooperatives; high informality, precarious work and low remuneration of collectors; the presence of intermediaries and corruption in the system; and idle capacity of cooperatives and public agencies.

Keywords: selective collection, difficulties in the selective collection process, waste management; qualitative method.

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Diagnosis and Difficulties in Waste Management in a Large Brazilian City, Focusing on Selective Collection

Gabriel de Pinna Mendez [α], Claudio Fernando Mahler [σ], Stella Regina Taquette [ρ] & Luis Felipe Umbelino [ω]

Abstract- This work evaluated the main difficulties for the implementation and maintenance of selective collection in a large Brazilian city with more than 1 million inhabitants. For that, the qualitative method was used through interviews with 18 professionals who work in the area of selective collection and waste management. The interviews were recorded and the data submitted to content analysis. The results pointed to the following difficulties: lack of government management, low efficiency and limited coverage; poor separation of waste at source; distortions in the logistics chain of selective collection and in the distribution of waste by cooperatives; high informality, precarious work and low remuneration of collectors; the presence of intermediaries and corruption in the system; and idle capacity of cooperatives and public agencies. It was possible to conclude that in order to evolve in the service rates of selective collection and for it to be more effective, there is a need to improve the management of the process by the public authorities with greater transparency and integration between the various actors involved, education of the population, better working conditions and remuneration for waste pickers.

Keywords: selective collection, difficulties in the selective collection process, waste management; qualitative method.

I. Introduction

Difficulties of waste management in developing countries include small coverage area, deficiencies in the collection, open dumps, and informal management, among others (Simatele et al., 2017; Shams et al., 2017).

In Brazil, the quality of waste management is poor, due to several aspects such as frequent unpreparedness of the personnel in charge of the matter in public agencies, failures in the collection and establishment of fees by the government, problems in the collection and in the transport, large-scale presence of informal waste collectors, frequent irregular disposal of waste, inadequate collection coverage and periodicity, low recycling rates (Marshall & Farahbakhsh, 2013; Chaves et al., 2014; Jabbour et al., 2014).

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On average, Brazil recovers approximately 2.2% of the total collection of household and public cleaning waste (except organic matter and residues). For a country where almost 40% of municipalities declare to have some initiative for selective collection, recovering only 2.2% and composting 1.8% of the collected waste is very little and these numbers haven't changed in years. (SNIS, 2018). Without efficient selective collection, it is not possible to obtain good waste recovery rates, considering that one of the causes of the low recovery rate in developing countries is the difficulties of efficient waste separation in households (Simatele et al., 2017; Almeida & Mol, 2020).

The selective collection is one of the phases of the recyclable material management process, having begun with the segregation of waste in households, public agencies, and private companies, in categories (metal/paper/glass/plastic, dry/wet, recyclable/non – recyclable, organic/inorganic) for subsequent disposal in public places, properties frontage, or voluntary delivery points - PEVs. In Brazil, more than 1000 municipalities have some type of selective collection (CEMPRE, 2016), and in almost all, there is the active participation of formal and informal waste collectors. Unfortunately, selective collection as it should be performed does not occur in Brazil.

Given the above, the question arises as to why waste recovery rates in Brazil are so low, despite having a PNRS since 2010, instituted through Law 12.305/ 2010? This study seeks to understand this failure, through the analysis of the perception of the actors involved in the cycle of solid waste selective collection. Because it is a phenomenon that involves not only technical aspects, but also social, economic, legal and cultural conditions. The selective collection must be understood in a broad way, through the analysis of the different aspects, therefore, the contribution of the present work is in the fact that it has obtained the information directly from the actors involved in the process, those who daily deal with the problems and thus, the phenomenon could be understood more clearly.

II. Materials and Methods

Waste management issues, including selective collection, involve political, economic, social, cultural, regulatory, and environmental aspects. (Warrior *et al*. 2013). As this is a broad problem, the use of qualitative

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research methods that have not been applied so far is growing in importance. Qualitative methods also called comprehensive by some, as they aim at a deeper understanding of the phenomena, have proven to be effective tools for the investigation of complex phenomena, whose objective is to understand it and not just measure it, as in the case of waste selective collection. Used for over a century in research in the human and social sciences, qualitative methods have been used in areas such as health sciences, education, administration, and even engineering (Pessoa *et al*., 2017; Poupart *et al.* 2018; Taquette & Borges, 2020)

a) Characterization of the Study Site

The city where we focused our study has more than 1 million inhabitants, has high cultural, ethnic, regional, and mainly social diversity. These characteristics turn the phenomenon of selective collection even more complex. Selective collection in the studied city began in the 1990s with a one-off initiative in a predominantly residential neighborhood by the local waste collectors cooperative. However, the official selective collection program in the respective city was launched in 2002 through a pilot project in one of the noblest and traditional neighborhoods of the city. Currently, the city's selective collection system works with the participation of the Municipal Public cleaning company and the formal and informal recyclers. The Municipal Public cleaning company theoretically carries out the selective collection of recyclable materials, either in the door-to-door mode or at the voluntary delivery points – PEVs (Baptista, 2015) and makes the material available to the waste collectors cooperatives, which are 23 currently registered. According to official information from the city, the cooperatives carry out sorting, separation by type and preparation of the material for sale (bundling, weighing, tying, identification) (Baptista, 2015).

b) Data and Collection Instruments

We used individual interviews as the main data collection tool. An interview is a privileged tool for the researcher to know, from the perspective of the actors involved, the meaning that themselves confer on their actions (Poupart et al., 2018; Taquette & Borges, 2020). A semi-structured interview was carried out with a two-part script: the first with direct questions to trace the sociographic profile of the interviewed and the role of each one in the selective collection. The second part contained open questions to know the interviewed perception about the selective collection, as it should be and is indeed done, its barriers and challenges.

c) Sample Criteria

Although the number of interviewees is not a consensus among researchers, the vast majority understands that when using the qualitative method, the sample significance criteria do not follow the standards of quantitative methods. In the present work, there was a need to interview a greater number of members of the group of recyclable material collectors, since they work in different areas of the municipality with peculiarities, so it was felt the need to interview a greater number of people. participants in this group, so that the saturation criterion (Minayo, 2017) was met. For the other groups, there was greater homogeneity in the information.

Table 1: Interviewed by interest groups

Interest group	Interviewed Number	Profile of Respondents
Collectors of recyclable materials that are members of cooperatives	7	Leaders (presidents) of cooperatives, all with more than ten years of experience as a collector and/or cooperative manager
Liberal Professionals and Consulting Companies that work in Selective Collection	5	Professionals with at least a college degree and at least ten years of experience with selective collection consulting services
Representatives of Public and Private Institutions that have selective collection programs	3	Members of public authorities or companies, with a management/leadership role and at least ten years of experience in waste management and selective collection
Members of the Government (City Hall/Public Cleaning Company)	3	

d) Ethical Aspects

The research was approved by the Research Ethics Committee – CEP of the institution whose responsible investigator is linked, through Opinion number 4.434.856/2020, and all participants signed the free and informed consent form.

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III. Results and Discussions

After applying the content analysis, it was found that the main information, for the purposes of analysis, could be distributed into seven categories, to facilitate the presentation of results: *Obstacles and difficulties of selective collection in the studied city; Obstacles related to the action of Government/Governance; Obstacles related to the engagement and education of the population; Financial Logistical Obstacles.* All research participants, regardless of the group they belonged to, contributed to all seven categories of analysis, since the information obtained was very similar in terms of message content, regardless of the interviewee's sector.

a) Obstacles and difficulties of selective collection in the studied city

Several difficulties and obstacles of selective collection in the studied city were possible to observe. For better analysis and presentation, these were divided into four subcategories or subgroups in order to synthesize them and draw attention to the most important aspects.

b) Obstacles related to the action of Government/ Governance

The difficulties that the municipal government has in inadequately managing selective collection were evident in the present study. For the interviewed, as for the scope of selective collection, formal selective collection in the studied city does not yet cover a considerable number of neighborhoods, which makes it difficult to improve the efficiency and gain in service scale. "*Just for you to get an idea, this cooperative collects more than the whole public cleaning company"* (Interviewed 18, working for 30 years in the public cleaning Company). In addition to the low spatial coverage of selective collection, it was found that little waste with recycling potential is collected. *"Unfortunately, based on the data I have, the city collects less than 10% of the material that could be collected"* (Interviewed 2, representative of a Public Institution that carries out selective collection).

c) Obstacles related to the engagement and education of the population

It was possible to observe that in the interviewed perception there are problems in the segregation of waste at the generating source, which are an obstacle to the selective collection. "*I think the organic matter is the big villain when it comes to separation at the source"* (Interviewed 18, working for 30 years in the public cleaning Company). It was also found that an important factor for improving the segregation of waste at the source is the awareness of the population and environmental education. "*Only with a lot of environmental education by the Government coming to people's door"* (Interviewed 8, consultant in the area of waste). "*Engagement… People love to do social action, pick up garbage on the beach, take pictures, but the hard part is to do selective collection every day".* (Interviewed 4, collector)

d) Financial Logistical Obstacles

A recurring claim is as to the cost of selective collection. However, it was possible to see that the high cost of selective collection is the result of distortions and inconsistencies in the process. "*Trucks are expensive and collect very little, you take a truck that is supposed to carry 10 tons and it carries, sometimes, 500kg"* (Interviewed 18, working for 30 years in the public cleaning Company). "*The material collected in neighborhood X goes to a faraway transfer station to be weighed because there is no road balance in neighborhood X. The cooperative in neighborhood X receives material collected from neighborhood Y... that's why we see in this "logistic nightmare" that costs a lot"* (Interviewed 12, selective collection consultant). "*Most cooperatives today are idle and no longer process because they receive little material.*" (Interviewed 4, 31 years old, collector)

e) Suggestions for process improvements

Through the present study, it was realized the need for training and awareness of all actors involved in the selective collection process, so that really effective improvements occur. With regard to waste pickers, a constant training program is suggested, led by the government and with the financial support of the productive sector. It is also suggested a constant work of interaction and training with the participation of representatives of the public power, the generating companies and the collectors, so that there is a greater integration between the actors involved, where each one has the exact notion of the role of each actor. involved in the selective collection process and not just individualized training. It is also suggested a constant program of environmental education for the general population, making everyone aware of the importance of separation at source for an efficient selective collection and training the population on the correct form of separation and thus, the population would feel part of the process. A possible solution for training the population and the other actors involved would be the creation of "reference centers in selective collection", places for the dissemination of the selective collection culture, available to everyone.

IV. Conclusion

Through this work, it was possible to know the main difficulties and obstacles of selective waste collection in the city focus of this study. Although limited to the perception of actors in the selective collection chain in a large city, the study provides information about details of the selective collection process, which could not be obtained without a comprehensive

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approach to the problem and which serve as subsidies for policies for the sector.

In general, the interviews showed that poor management, the lack of planning and monitoring of the various stages by the government to which this responsibility is attributed, together with corruption, are the main causes of the problems of selective collection in the studied municipality and probably in other large cities with the same characteristics. Differences were found in the perception of different actors in the selective collection process: for waste collectors and consultants, the role of cooperatives would be a possible solution to improve the efficiency, while for civil servants in the sector, the waste collectors are one of the problems in the process.

The present work is expected to contribute to the improvement of selective collection in Brazilian cities, especially the large ones. The need for public policies for greater awareness, engagement and education of the population, training and social protection to waste collectors aiming improvements in working conditions, support to cooperatives, as well as an efficient logistics of the transport of recyclables to sorting stations, separation and recycling plants, were hereinabove demonstrated.

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Geomorphological Changes by the Action of Coastal Processes and Anthropogenic Activties along the Coastal Zone between Ras Al-Jalaiah and Ras Az-Zour, Southern Kuwait

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Abstract- The coastline is one of the most important linear features on the earth's surface, which displays a dynamic nature. The natural processes that interact with the coastal environment of Kuwait are tides, currents, and waves. The main shoreline of the coast of Kuwait is about 325 km long. In the north, the coast is characterized by wide intertidal mudflats, bounded by a large-scale coastal sabkha, partly covered with sand drifts. The southern shore is characterized by relatively steep sand beaches with narrow to moderately wide rocky intertidal platforms, which are partly covered by sand and algal mats. The area of interest is the coastal area between Ras al-Julaiha and Ras Az-Zour in the southern area of Kuwait. Sandy berm and wave-cut cliff bound this southern intertidal environment.

The study area is a superficial, open, vulnerable bay of a maximum depth of 28 m extending along the southern shore of Kuwait. Ras Al-Jalaiah promontory bounds the area northwards and Ras Az-Zour promontory bounds it southward, with a distance measured vertically of 18.085 km.

Keywords: sand ridges, coastal zones, geomor-phological, cove, shoreline, satellite imagery.

GJHSS-B Classification: UDC: 551.35



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Geomorphological Changes by the Action of Coastal Processes and Anthropogenic Activties along the Coastal Zone between Ras Al-Jalaiah and Ras Az-Zour, Southern Kuwait

Adeeba Al-Hurban [α] & Maryam Al-Shimmari [σ]

Abstract- The coastline is one of the most important linear features on the earth's surface, which displays a dynamic nature. The natural processes that interact with the coastal environment of Kuwait are tides, currents, and waves. The main shoreline of the coast of Kuwait is about 325 km long. In the north, the coast is characterized by wide intertidal mudflats, bounded by a large-scale coastal sabkha, partly covered with sand drifts. The southern shore is characterized by relatively steep sand beaches with narrow to moderately wide rocky intertidal platforms, which are partly covered by sand and algal mats. The area of interest is the coastal area between Ras al-Julaiha and Ras Az-Zour in the southern area of Kuwait. Sandy berm and wave-cut cliff bound this southern intertidal environment.

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The aim of this study is to detect the geomorphological changes along the coastal area between Ras Al-Julaiha and Ras Az-Zour. Remote sensing and GIS techniques are used to monitor these changes and understand the processes of landscape evolution during a 48-year period (1973-2021). The datasets that were used are LANDSAT satellite imagery, taken from 1973 to 2021. The datasets underwent radiometric correction, unsupervised classification, change detection, and maps generation. The results showed that the total coastal area was subjected to a change during the assigned period, which was calculated to be about (3.4 km²) using GIS techniques. In addition, the length of the shoreline has increased successively from (74.5 km) in 1973 to (86.4 km) in 2021.

Keywords: sand ridges, coastal zones, geomorphological, cove, shoreline, satellite imagery.

I. Introduction

The Arabian Gulf is a tectonic basin formed upon the convergent movements of the Arabian plate from its northern edge and the Asian continent. This tectonic movement was followed by the gentle downward subsidence of the Arabian plate from its eastern edge creating the Gulf basin, in which water from the oceans in the vicinity accumulated. The Arabian Gulf was then subjected to a regression period in the early Pleistocene recorded on its Arabian side as successive marine terraces and inland sabkhas (Lees, 1928; Holm, 1960; Al-Asfour, 1978, and Al-Hurban (1996)). A major regression period took place in the Pleistocene glaciation in which Arabian Gulf was almost dried out and continental conditions prevailed (Fairbridge, 1961). In the late Quaternary post-glacial, the Flandrian transgression took place resulting in the present sea level of the Gulf 5,000 years ago and leaving its marks as submarine platforms cut by stillstands of rising sea levels (Al-Asfour, 1982). In relation to tectonic settings, the eastern part of the Arabian shelf is occupied by Kuwait and possibly regarded as a borderline to the fore-deep zone of the changeable shelf bounding the Iranian Orogenic Belt (Youash, 1984). Kuwait is situated in a transitional zone between the settled Arabian foreland towards the southwestern side of the Arabian Gulf and the extensive composite delta of the Mesopotamian Plain north-northwesterly. Consequently, the distinguishing structures of the two units are displayed in the marine and coastal environments of Kuwait. Therefore, Kuwait State is subjected and influenced, to some extent, by the prevailing tectonism and geomorphic processes including aeolian and coastal weathering processes that took place during the late Pliocene-Pleistocene age, which is witnessed from the different geomorphological features occurring along the coastal area (Kassler, 1973; Al-Sarawi, et al., 1993; Al-Sulaimi & El-Rabaa, 1994).

The southern coast of Kuwait is distinguished by several coastal ridges (of maximum height of 5-15 mm) composed of sediments of both oolitic (marine) and calcareous sandstone (terrestrial/aeolian) representing recent and old beaches, barriers, and coastal dunes, which are composed of oolitic sand, sandstone, and limestone (Picha, 1978, Al-Hurban, 1996). Landward, the coastal ridges separate the coastal flat with the existing extensively low-lying flat

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sabkhas from the open sea (Picha, 1978; Saleh, 1975; Khalaf et al., 1984a). The ridges are directed from north to south going parallel to the coastline with varying lengths reaching about 4 km near Ras Az-Zor and extending from 100m to 300m. There are shallow depressions between these ridges filled with some small isolated sabkhas along with the formation of some nabkhas in the same area (Fig. 1).

Oolitic limestone and sands sediments are obviously represented in Az Zor area, constituting slightly to moderately consolidated oolitic limestone exposing as parallel ridges and low cliffs. Those carbonate sediments which are of the Pleistocene and Holocene age, are sourced from the northernmost marginal part of the carbonate province of the shallow Arabian shelf extending from the Strait of Hormuz in the south up to the Tigris-Euphrates delta in the north (Picha, 1978). Saleh (1975) declared the existence of several oolitic ridges in the south of Kuwait, which were deposited while the sea level was fluctuating during the Quaternary period.



Fig. 1: Location map of the study area (Source: Esri).

Sand ridges produced by the action of tides provide a discriminative countenance of tide-prevailed continental shelves. The production of such sand ridges demands a source supplying moving sediment, either produced locally from the existing seabed or from the erosional processes occurring along the coast (Dyer and Huntley, 1999). Their pattern and physical features are resulting from a state of balance between the tidal current dynamic nature, seafloor form and structure, and supplement of sediments. On a general aspect, it is believed water depth of the sand ridges formed by tidal currents is at < 30–50 m, (Off, 1963; Liu et al., 1998; Jung et al., 1998; Park et al., 2006; Stride, 1982). On the contrary, outer shelf sand ridges are commonly considered inactive, immobile, or moribund (Bouysse et al., 1976), developed through the early phase of the last transgression (e.g., Saito et al., 1998; Park et al., 2006).

Furthermore, the eastward margin of the Arabian Gulf region witnessed a compound structural development during the period of late Triassic - Paleogene, followed by the evolution accompanied by the motion of the Arabian plate during the Neogene period. Structures associated with the Pre-Neogene movement in Kuwait include gentle domal features

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towards north-south, faults, and flexures, along with a major structural zone distinguished by frequent basement activation known as "Kuwait Arch". Those associated with the Neogene movement comprise rifting, faulting, and the tilting of beds with striking northwest-southeast and dipping northwesterly (Clarke, 1988).

The main goal of this study is to investigate the geomorphological changes along the coastal area bounded by Ras Al-Jalaiah and Ras Az-Zour in southern Kuwait and how it was developed by time passing during a 48-year period from 1973-2021 using GIS and remote sensing techniques. Before planning to use coastal sites for development activity, it is important to understand the main geomorphological processes and localization of accretion and erosion processes acting on these sites. Most of the previous studies have not comprehensively investigated the interference of the desert and coastal processes in the evolution of the geomorphology of the study area. Therefore, it is necessary to establish baseline data concerning that domain in the study area to establish a comprehensive database, for selecting areas for recreational purposes or in planning socio-economic development activities. Therefore, the program of this research was outlined for the purpose of updating investigations conducted previously on newly selected sites, particularly conducting detailed geomorphical and coastal investigations of the study area with an emphasis on the geomorphic processes and changes.

The results of this study will provide important data and information that can be used for environmental impact assessment studies. If attention was not paid to the desert and coastal processes, this might adversely impact the resources and their users. Utilization of geomorphic zones requires a comprehensive understanding of all existing procedures.

a) Study area

The study area is a superficial, open, vulnerable bay of a maximum depth of 28m extending along the southern shore of Kuwait. Ras Al-Jalaiah promontory bounds the area northwards and Ras Az-Zour promontory bounds it southward, with a distance measured vertically of 18.085 km. It is an open sea with a high-energy environment, is characterized by a relatively steep profile with a narrow foreshore zone, and is covered by sand deposits. The dimensions of the study area are (18.085 km x 14.255 km x 20128 km x 21.702 km) with a perimeter of 56.17 km and an area of 169.327 km^2. The study area is bounded between (48°16′00″ E, 28°54′00″ N at the northwest; 48°24′00″ E, 28°54′00″ N at the northeast; 48°16′00″ E, 28°44′00″ N at southwest; and 48°24′00″ E, 28°44′00 N at the southeast).

i. *Al-Jalaiah*

An open coastline of sandy beaches, where the area is constituted of a hard rock surface coated by a compacted fine-medium sand layer (1m thick). The area is subjected to highly energetic currents created by the waves and tidal currents' action. In addition, this zone encompasses pocket and cuspate beaches.

ii. *Az-Zour area*

Oolitic limestone beaches are found farther southward of Ras Az-Zour, where the coast is constituted of a 2 m high cliff of oolitic limestone, fronted by narrow beaches surrounded by a 700 m wide rock tidal flat, partly coated with coarse sand, from the seaside. The strong waves and currents continuously erode the cliff base, preventing sand accumulation but sometimes in little amounts.

The tidal and nearshore flats of the two southern coastal coves of Kuwait are covered with a number of sand ridges and sand spits. Their morphology, morphodynamics, and sedimentological characteristics may influence the environmental conditions and consequently the biota distribution and diversity within these tidal and nearshore flats. Therefore, understanding the genesis and dynamicity of these ridges and spits can provide valuable information for the marine environment, geology, and sedimentmorphorolgy (Al-Rashidi & Al-Hurban, 2019), vulnerability to anthropogenic hazards (Al-Hurban, 2014) protection and conservation of marine natural resources and coastal zone integrated management and sustainable use.

The beach is constituted of almost 100 m wide fine-medium oolitic limestone. The tidal land is blanketed with sand spits and bars. To the land side, from the oolitic limestone zone, there exists a visible sandy tidal flat, which possesses a rocky bottom underlying thick sand deposits engraved by a group of creeps and channels (Al-Ghadban, 1980, 1990).

II. Previous Studies

Studies conducted on the recent sediments of the Arabian Gulf included studying the shallow-marine sediments of Kuwait's water. Mohammed (1978), Khalaf and Ala (1980), Khalaf et al. (1984a,b), Al-Bakri et al., 1984, Al-Hurban, 2014, and Al-Rashidi & Al-Hurban, 2019) studied the geological and sedimentological properties of the recent surface sediments of the marine environment; in addition to Picha and Saleh (1977), Picha (1978), Al-Ghadban, 1980, Al-Hurban (1996), Al-Hurban and Gharib (2003 and 2004), and (Al-Hurban & Al-Ghadban, 2008) who described the sedimentomorphic characteristics of coastal sediments along the northern and southern part of Kuwait.

The climate changes and weathering processes the area witnessed affected its recent history which was obvious from the formation of the Pleistocene and

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Holocene coastal ridges that of calcareous sandstone and oolitic limestone composition during the flood flow from south to north (Al-Hurban & Al-Sulaimi, 2009). The sandstone ridges show crossbedding structures pointing out the occurrence of fluvial activities while the sea level was fluctuating, as well as, the oolitic sands continued to deposit and fill in the inter-ridge area.

The submarine morphology in the open bay is characterized by the existence of ridges and banks, as they may depict ancient indurated Pleistocene or early Holocene sediments (limestone, oolitic quartoze sandstone) (Al-Ghadban, 1990). The coastal banks in the nearshore zone are roughly in a parallel alignment to the coastline, whereas the deeper banks constitute extensions of the promontories. The study area is different from other areas in the southern Arabian Gulf in the existing aeolian admixture and the shell fragments (bivalves and gastropods) which are characterized as being angular. Al-Ghadban (1990) stated that the beach is variant in its width (2-5m), which is almost flat of the indistinguishable berm with the shore heading marine word from a marine-abraded cliff of maximum height ranging from 5 and an average of 2.2m high. Most of the previous studies covered the coastal and marine recent sediments in the vicinity of the study area but for the internal domain of the study area, the existence of different marine geomorphological features was just stated not describing their sedimentomorphological characteristics. Subsequently, this study will investigate the gemorphological nature, type, and characteristics of the study area.

Al-Hurban & El-Gamily (2013) stated that sea level in the Arabian Gulf witnessed local fluctuation during the Holocene and late Pleistocene, which affected the geomorphological development and evolution of the study area. During the Würm or last glacial age (70,000 - 17,000 BP) the Gulf region was land instead of the sea (Fairbridge, 1961; Kassler, 1973) where the sea levels were lower than nowadays (100 to 120 m) and the Arabian Gulf has a maximum depth of 100 m. The Holocene sediments of the study area are of low siliciclastic constituent indicating the predominance of arid climates similar to those of the current time. The Flandrian transgression events of high sea levels involved the sedimentation of deposits composed majorly of marine shells, which normally exist in the coastal ridges foot, in the intertidal and subtidal zones.

Aladwani (2022) studied the southern coast of Kuwait in general and analyzed the shoreline changes throughout a 35-year period (1986-2021) using GIS and statistical methods. It was found that the southern shoreline witnessed alternating accretion and erosion processes due to historical changes and intervention of anthropogenic activities. A modeling vision was introduced predicting the position of the southern coast of Kuwait in 2030 and 2050.

a) Comparison with similar areas

The study area is of a very uneven bottom structure, as the banks and ridges constitute a submerged older surface flooded by a Holocene transgression, but with less abundant and less thickness depositional. Only very thin layers of Holocene sediments cover the rocky bottom of the area (Al-Ghadban, 1990).

Comparison with other similar areas/ environments in the Arabian Gulf (e.g., Kuwait Bay, Mahammad and Shamlan, 1977, off the coast of Iran, Seibold *et al.*, 1973; off the Qatar coast, Houbolt, 1957; off the United Arab Emirates coast, Shinn, 1973) showed the followings:

1. Existence of high carbonate content due to the influence of the little inflow of river-transported material (where Shatt Al-Arab is the closest river to the area).
2. More aeolian material are received by the Arabian Gulf sediments (Kukal and Saadallah, 1973), which considerably contributes to the origin of silt size fraction of the sediments in the studied area. Nevertheless, such a large contribution is not observed along the Qatar coast.
3. Although the proven detrital nature of the existing carbonate in the area of investigation, the grains are consistently angular differing from the observations of Houbolt's (1957) along the coast of Qatar.

Energetic tides (3m as a tidal range) and created tidal currents (1.5m/s) in the study area are common in the region of the Arabian Gulf. Such tidal currents would result in reworking the sediments as they form strong longshore and offshore currents (Figs. 2(a,b) & 3), which are different from the case in the areas that almost for tides, e.g., the Gulf of Mexico (Al Mukaimi et al. (2018a,b)) the Caribbean Sea, the Red Sea, and the Mediterranean. As a result, many variations in surficial sediment characteristics can be found among arid subtropical carbonate basins, where such characteristics can be attributed to the variability in terrestrial sediments supply, the structure of the bottom, wind activity, availability of tides, and the activity of organic nature.

III. Methods and Material

For this study, the LANDSAT images (path 165, rows 40) are used to study the spatial and temporal changes in the study area and to estimate the geomorphological changes in the coastal area between Ras Al-Julaiha and Ras Az-Zour during different periods. The main source for the images for this research was Landsat from the United States Geological Survey (USGS). After acquiring the images, a pre-prepared mask was used to crop the images for the investigated area. All the processing was done using two software ArcMap and ENVI. Subsequently, the prepared images

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were used to quantify the changes that occurred throughout the years.

The coastline can even be extracted from a single-band image, since the reflectance of water is nearly equal to zero in reflective infrared bands, and the reflectance of the absolute majority of land covers is greater than water (Alesheikh et.al. 2007).

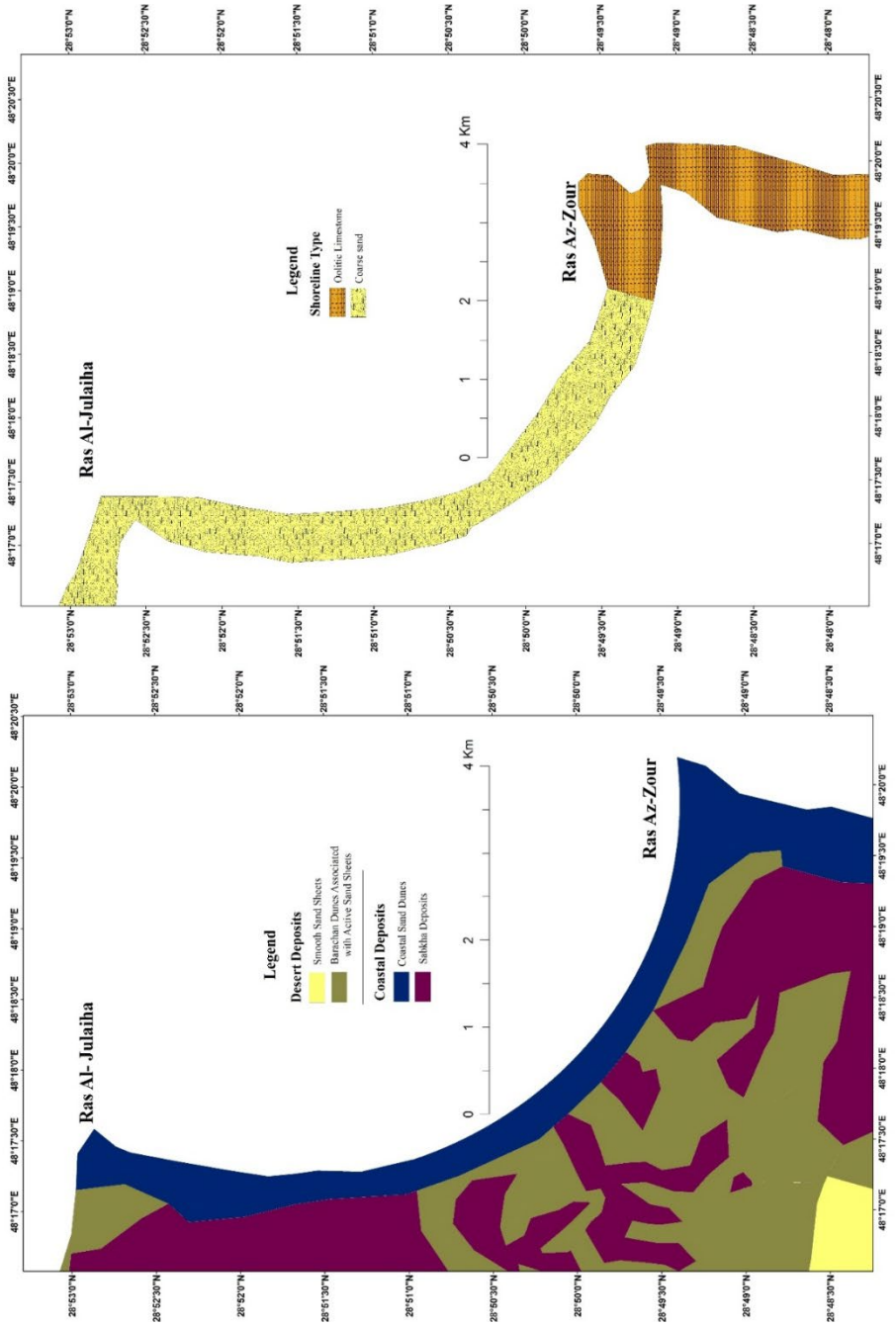

Fig. 2(a, b): Sedimentological and geomorphological maps of the study area: a. Sedimentological map (modified after Al-Hurban, 2014), b. Coastal geomorphological map (modified after Abou-Seida & Al-Sarawi, 1990).

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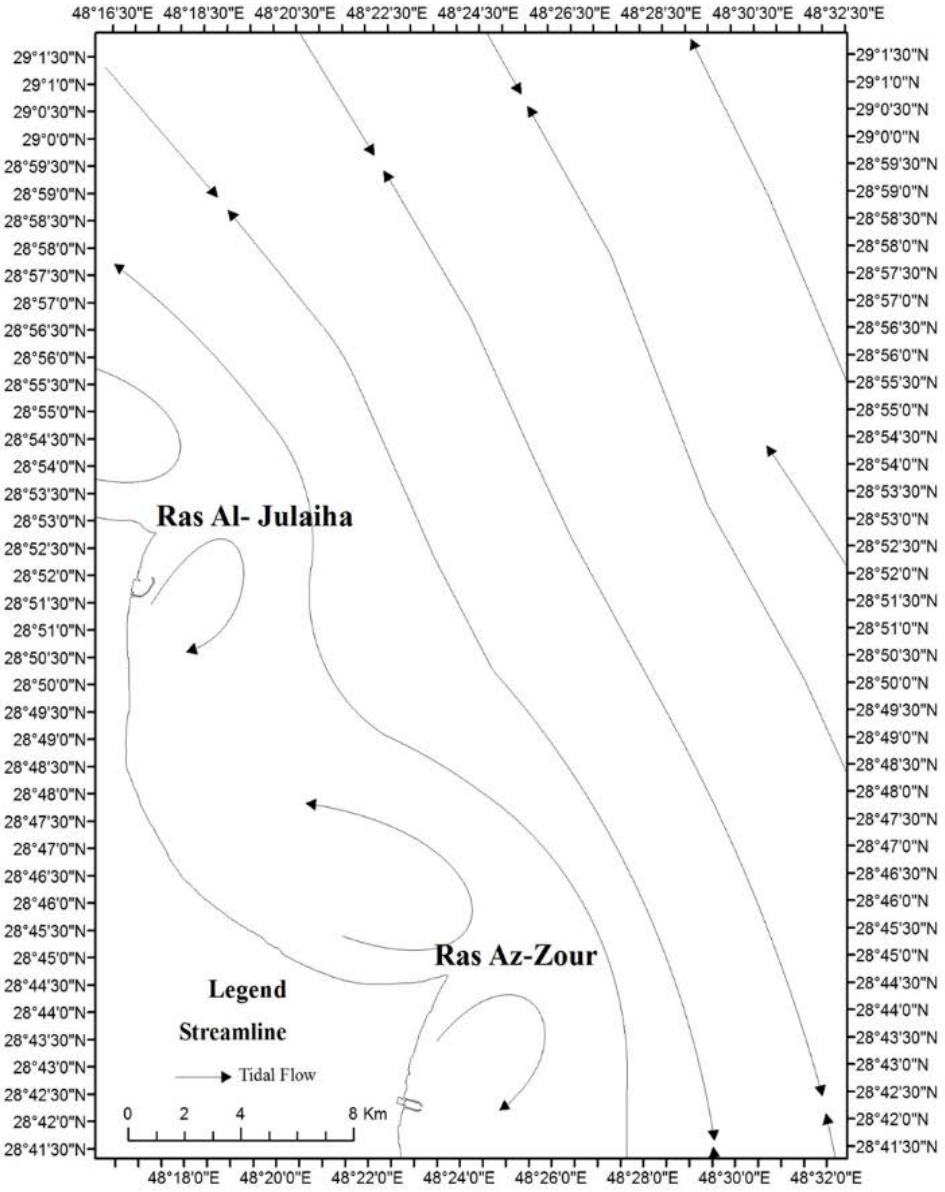

Fig. 3: Streamline of the expected tidal flow pattern off Ras Al-Julaiha and Ras Az-Zour headlands, showing the resulting residual circulation (modified after Al-Bakri etal., 1985).

The coastal area between Ras Al-Julaiha and Ras Az-Zour was extracted from the near-infrared band. Near-Infrared band exhibits a strong contrast between land and water features due to the high degree of absorption of near-infrared energy by water (Jensen, 2015).

The methodology adopted focused mainly on the following steps (Fig. 4):

1. Collection of datasets composed of LANDSAT satellite imagery.
2. Radiometric calibration by using radiometric correction that can help to make an analysis and get information from images.
3. Image classification based on unsupervised classification algorithms using the near-infrared band.
4. Change detection method.
5. Analysis and management of all exported data and study the evolution to get the result of final maps.

a) Data sets used

LANDSAT Satellite imagery is used taken in different periods with a ground spatial resolution of 30 m and 60 m. The obtained images are referenced in the World Geodetic System (WGS84) datum, in Geo Tiff format, and using the Universal Transverse Mercator system (zone UTM 39 North) as a map projection system. The main source for the images for this project was Landsat from the United States geological survey. Table 1 shows a summary of the collected Landsat satellite images for a 48-year period.

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Table 1: Collected Landsat images.

Satellite Sensor Type	Year Acquired	Source	Spectral Resolution	Spatial Resolution
LANDSAT_1 (MSS)	1973	USGS	0.548 to 0.9 μm	60 m
LANDSAT_5 (MSS)	1984	USGS	0.552 to 0.923 μm	60 m
LANDSAT_5 (TM)	1994	USGS	0.485 to 2.223 μm	30 m
LANDSAT_7 (ETM)	2003	USGS	0.483 to 2.206 μm	30 m
LANDSAT_8 (OLI)	2013	USGS	0.443 to 2.201 μm	30 m
LANDSAT_8 (OLI)	2021	USGS	0.443 to 2.201 μm	30 m

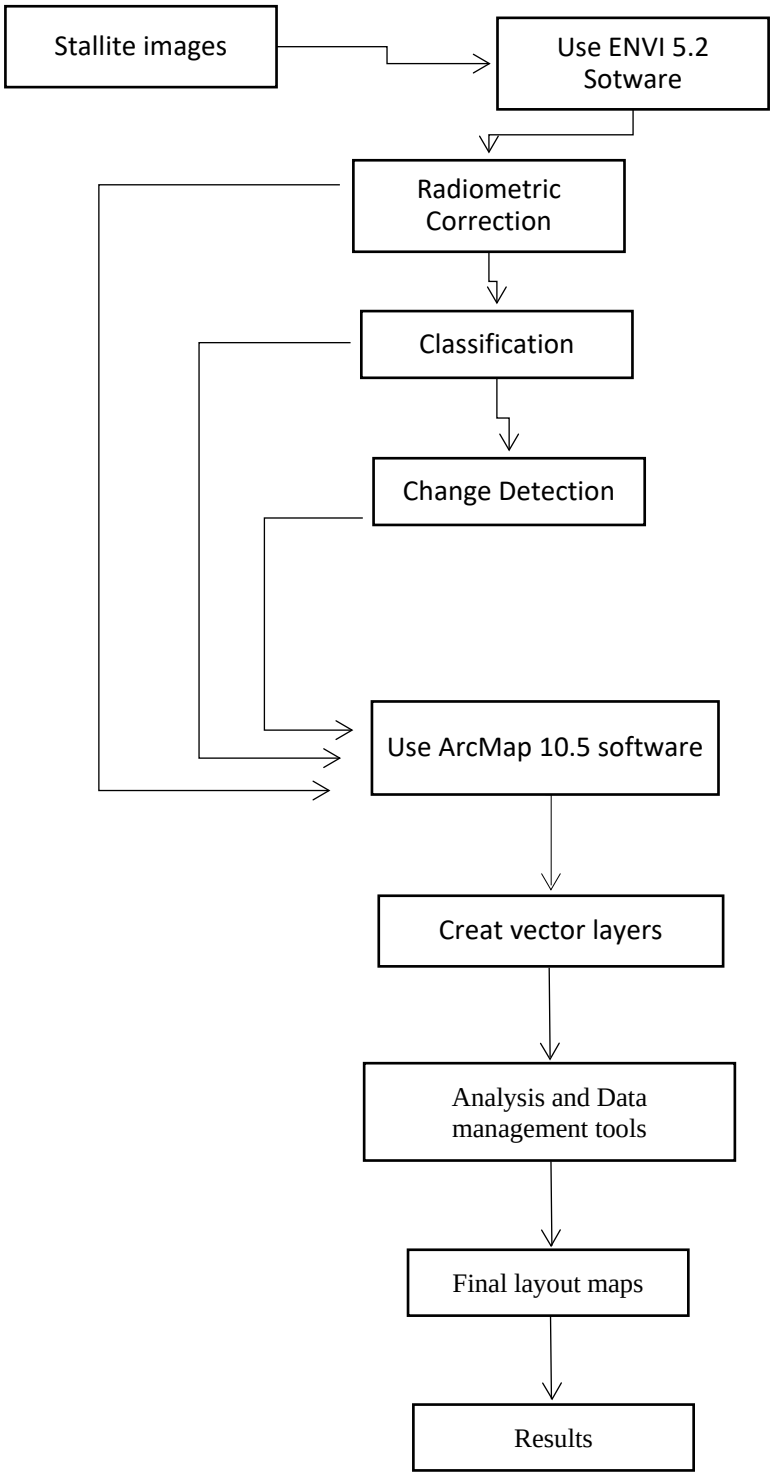

Fig. 4: The methodological framework Including data Input, processing and output.

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b) Software Used

Satellite imagery must undergo several pre-processing steps prior to being used in change detection, mapping, and analysis. The datasets, which utilized and processed using the following software:

1. ENVI image analysis software (ver.5.3, 2015) is used to import Generic Binary data, display images, and perform a radiometric correction, image conversion, and analysis.
2. ArcMap Desktop (ver. 10.5) software with the Geo-processing extensions was used to view raster and vector data, Analysis and Data management tool, edit and geocode descriptive information, and calculate change detection and mapping.

c) Remote sensing and GIS analysis

i. *Digital Image Processing*

The following image processing was carried out from LANDSAT images to extract the needed information.

a. *Image restoration*

ENVI image analysis software (ver.5.3, 2015) is used in this study to carry out digital image processing. The LANDSAT images (path 165/row 40) of 1973 and 2021 were radiometrically corrected to convert the brightness value to radiance value and the subset function of ENVI image analysis software was used to clip the study area from LANDSAT images of 1973 and 2021.

b. *Image enhancement*

The LANDSAT image of the study area was enhanced by utilizing the enhancement capabilities of ENVI image analysis software. This enhancement is applied to improve the appearance of an image for human visual analysis or occasionally for subsequent machine analysis (Jensen, 2015). The enhanced images were subsequently used to investigate and update the geomorphological features of the study area.

c. *Change detection*

Changes in the study area were determined by comparing the LANDSAT images in different years. The layer stack function of ENVI image software collected Band near-infrared (NIR) from two images and produces a new, stacked image. Areas of change appear in color in the resultant image. The unsupervised classification, the identities of land cover types to be specified as classes within a scene are not generally known a priori because ground reference information is lacking or surface features within the scene are not well defined (Jensen, 2015). The produced thematic maps from the classification were exported out to separate and quantify the changed areas.

d) Geographic information system (GIS)

All of the GIS functions and analyses in this study were completed with the ArcMap Desktop software (ver. 10.4). All exported raster layers were extracted as GIS layers. These layers hold the shoreline and coastal area.

e) Integration of remote sensing and GIS

The integration of remote sensing data and GIS layers was used to produce a geomorphological change map of the study area. All the extracted information is saved in Geodatabase. The resultant information was analyzed and compared to achieve the project aim.

IV. Results and Discussion

In order to study the geomorphological changes along the coastal area between Ras Al-Julaiha and Ras Az-Zour during the period from 1973 to 2021, change detection maps were developed using remote sensing techniques in 5-period groups (1-5) with an interval of 9 to 11 years, in addition to a net change detection map for the 48-year period (group 6). Table 2 shows the calculated change area along with the length of the shoreline during each group period, as well as, the total area subjected to change and the variation of the length of the shoreline during the 48-year period.

Based on the area in 1973 it was 2361600.0 m^2 (2.4 km^2) and in 1984 become 2954518.3 m^2 (3.0km^2). In 1973, the northernmost part of the study area including Ras Al-Jalaiah and the southernmost Ras Az-Zour cuspate spit system nicely developed opposite the cape. Also, in the

Table 2: The calculated change area along with the length of the shoreline during each group period and the total calculated change.

Years Group	Change Area-m2	Length-m	Change Area-Km2	Length-Km	Per%
Group 1 (1973 - 1984)	3754800.0	78120.0	3.8	78.1	26
Group 2 (1984 - 1994)	3932442.3	87809.9	3.9	87.8	27
Group 3 (1994 - 2003)	2983011.9	89556.9	3.0	89.6	20
Group 4 (2003 - 2013)	1718182.8	82458.1	1.7	82.5	12

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Group 5 (2013 - 2021)	2291619.5	90177.6	2.3	90.2	16
Total	14680056.6	428122.6	14.7	428.2	100
Years	**Area-m²**	**Length-m**	**Change Area-Km²**	**Length-Km**	**Per%**
1973	2361600.0	74520.0	2.4	74.5	19
1984	2954518.3	78101.9	3.0	78.1	24
1994	2496292.4	89112.7	2.5	89.1	20
2003	1326052.4	78904.9	1.3	78.9	11
2013	1393471.5	80837.6	1.4	80.8	11
2021	1806291.7	86403.2	1.8	86.4	15
Total	12338226.3	487880.3	12.3	487.8	100
Final Result	**Change Area m2**		**Change Area-Km2**	**Length-Km**	**Per%**
Group 6 (1973 - 2021)	3353611.7	98068.3	3.4	9.8	27

southernmost part of the study area including Ras Az-Zour cuspate spit and near the cave sand shoals were developed in 1984. The total area subject to change along the shoreline during the 11 years was calculated to be about 3.8km^2. In addition, the length of the shoreline has increased successively from 74520.0 m in 1973 (74.5km) to 78101.9 m (78.1km) in 1984 with 26% of the total detected change. Figure 5 shows the change detection map through the period from 1973-1984. During the period from 1984-1994, there was a slight increment in the changed shoreline area by 0.1km^2 with a total change of 3.9km^2, as well as a 1% increment of the percentage change (27%). Figure 6 shows the change detection map during this period. These two-period groups constituted the peaks for the change in the area of the shoreline in the study area indicating increasing in accretion rate on the account of erosion rate. This may be attributed to the increased of fine-grained sediments from Shatt Al-Arab in southern Iraq to the north-northeaster portion of Kuwait State due to the enormous drainage of the Mesopotamian marshes in Iraq and to a smaller degree in Iran between the 1950s and 1990s to clear large areas of the marshes in the Tigris-Euphrates river system. The marshes particularly the central marshes were drained at different times for different reasons (Fig. 7). It was described by the United Nations Environmental Program (UNEP) and other observers as one of the worst environmental disasters of the 20th century. Among the environmental effects according to the UNEP report in 2001 was the desertification of over 7,500 square miles (19,000 km^2) of the marshes, which was reflected in the study area by the increase of deflated moving fine-grained sand feeding the southwesterly net longshore current' littoral drift in the study area, justifying the above-mentioned increment in the shoreline area and associated length of the shoreline.

During the third time group (1994-2003) the total area subject was 2983011.9m^2 (3.0 km^2), as well as, the shoreline length was 89.1km with 20% of the total change through the 48-years period. Figure 8 shows the change detection map through the period from 1994-2003. During the second and third-time period groups, there were no big changes in the capes during the 19-year period just the thickness of the shoreline was eroded in the middle and in the upper of the southernmost Ras Az-Zour cuspate. The total area subject to change along the shoreline decreased from the time period group (1984-1994) from 3932442.3 m^2 (3.9 km^2) to 2983011.9m^2 (3.0 km^2) in 1994-2003. This may be attributed to the reflooding that occurred in the marshes as the Central Marshes showed little recovery through 2003 and there was flooding in southern areas that had previously been dry since the early 1990s. This might probably caused less feeding of the deflated sand moving to the north-northeastern portions of Kuwait and consequently to the littoral drift brought by the longshore current in the study area.

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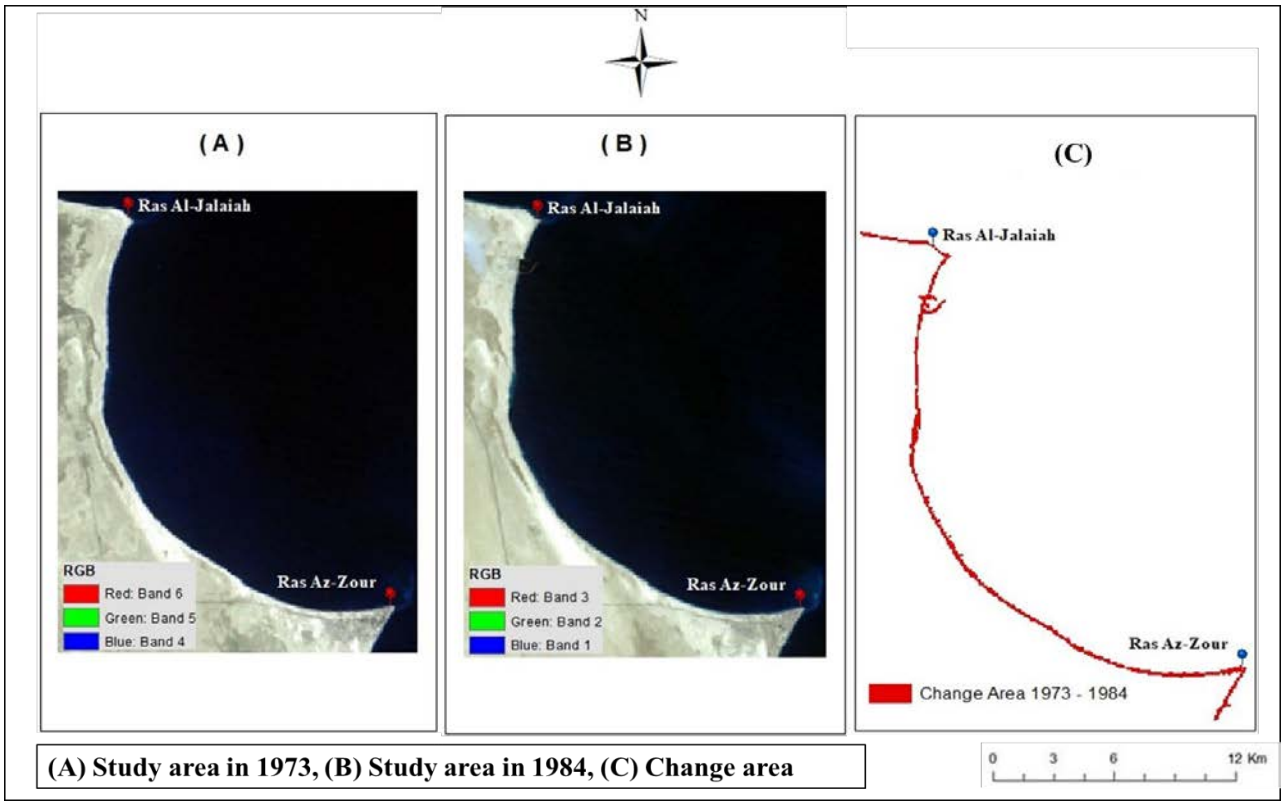

Fig. 5: Maps of the study area in the time-period group (1): (A) Study area in 1973, (B) Study area in 1984, and (C) the change detection map through the period from 1973-1984.

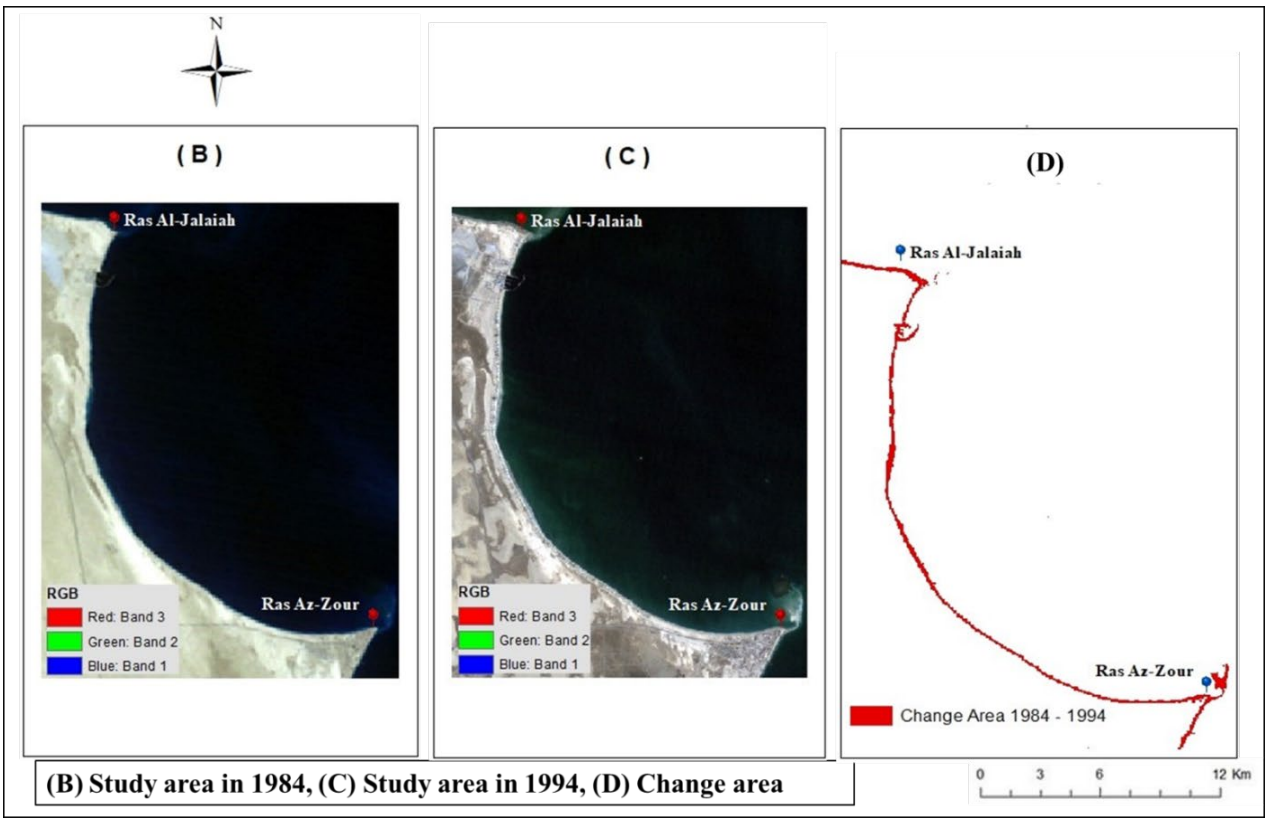

Fig. 6: Maps of the study area in the time-period group (2): (B) Study area in 1984, (C) Study area in 1994, and (D) the change detection map through the period from 1984-1994.

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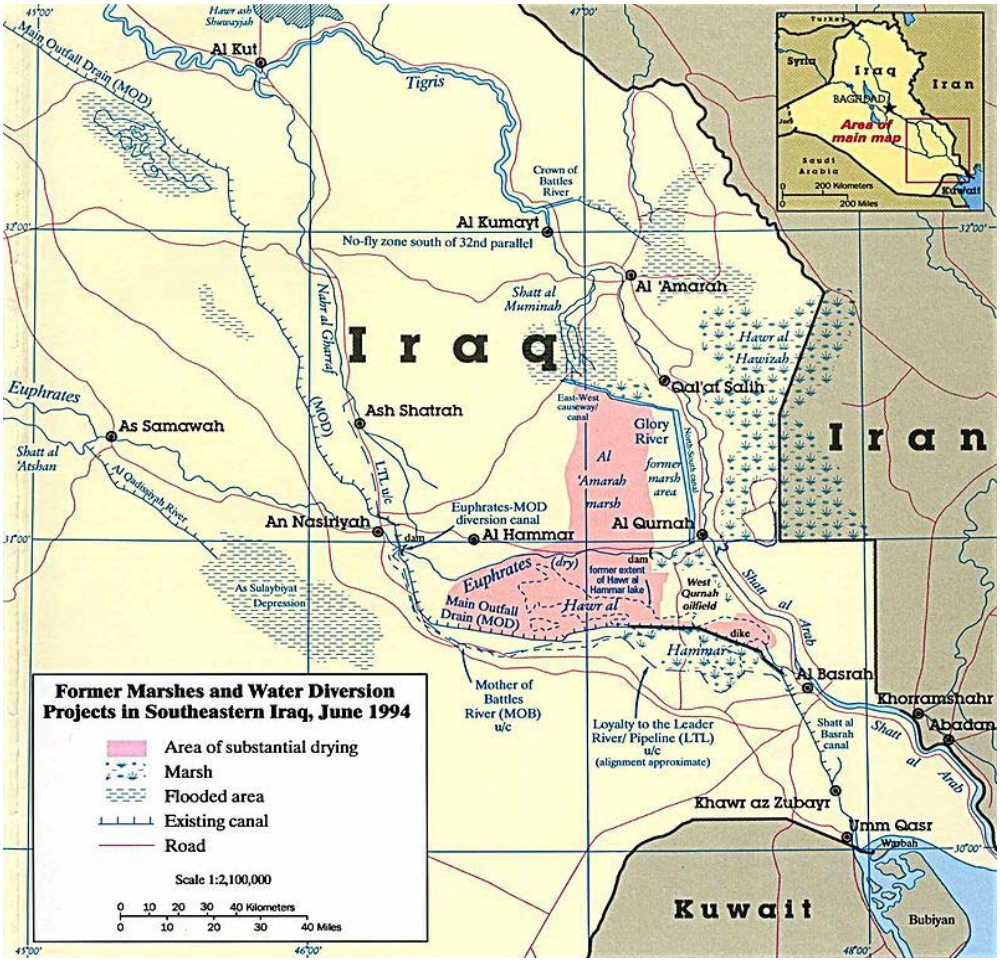

Fig. 7: A 1994 map of the Mesopotamian Marshes with the pink zones showing drained areas (http://www.mapcruzin.com/free-iraq-maps.htm direct link).

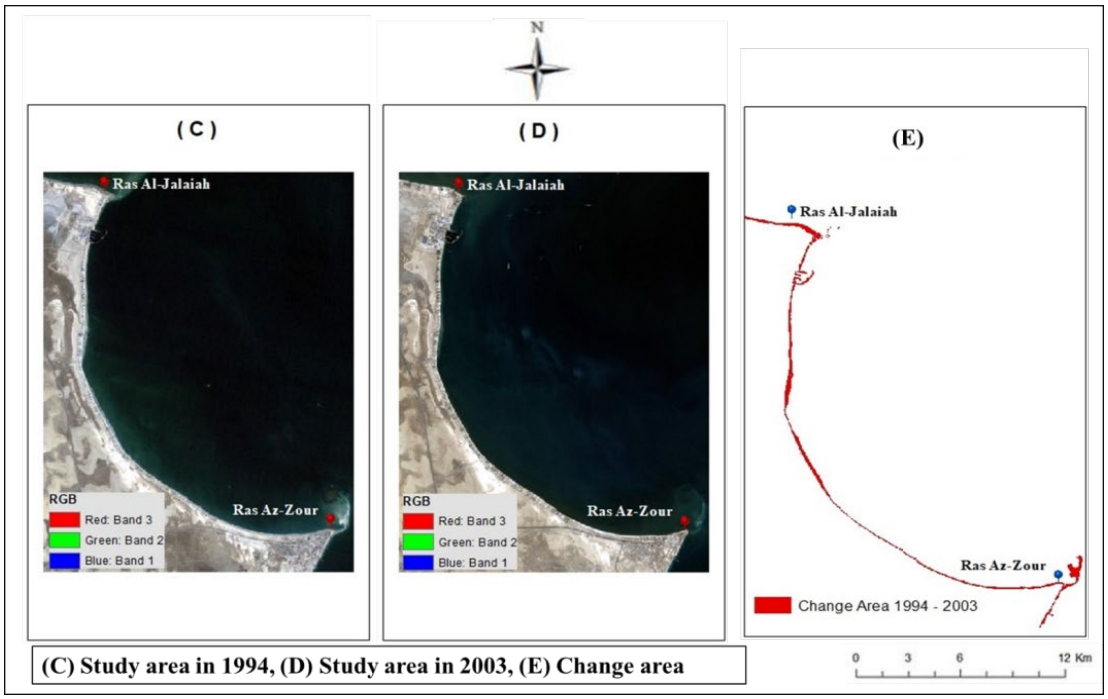

Fig. 8: Maps of the study area in the time-period group (3): (C) Study area in 1994, (D) Study area in 2003, and (E) the change detection map through the period from 1994-2003.

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The fourth time period group (2003-2013) recorded the lowest amount of change with a total area subject to change of 1718182.8m² (1.7km²), shoreline length of 82.5km, and 12% of the total change in the 48-year period. Figure 9 shows the change detection map through the period from 2003-2013. In the fifth time-period group (2013-2021) the total area subject to change increased to 2291619.5m² (2.3km²), the length of the shoreline increased to 90177.6m (90.2km), and 16% of the total change in the 48-years period, where figure 10 shows the change detection map through the period from 2013-2021. Both the fourth and fifth time-period groups constituted the fewer amounts of changes as shown in figures 9 and 10, where the total area subject to change along the shoreline during 18 years was calculated to be about 4.5km² and increased from 1718182.8m² (1.7km²) in 2003-2013 to 2291619. 5m² (2.3km²) in 2013-2021.

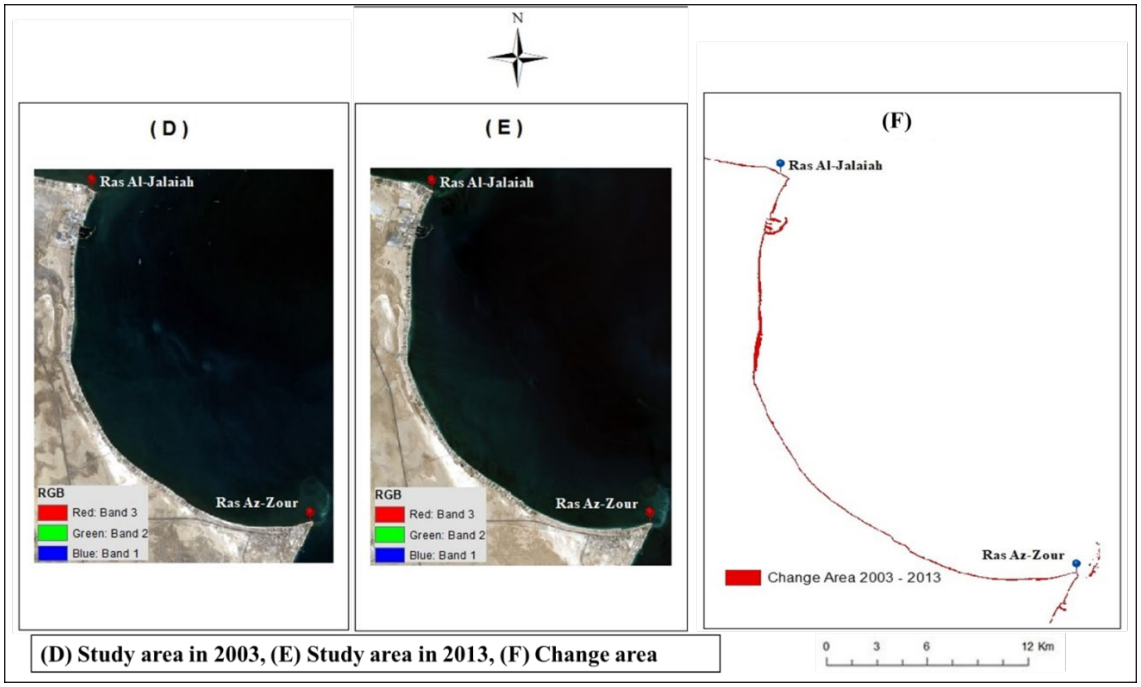

Fig. 9: Maps of the study area in the time-period group (4): (D) Study area in 2003, (E) Study area in 2003, and (F) the change detection map through the period from 2003-2013.

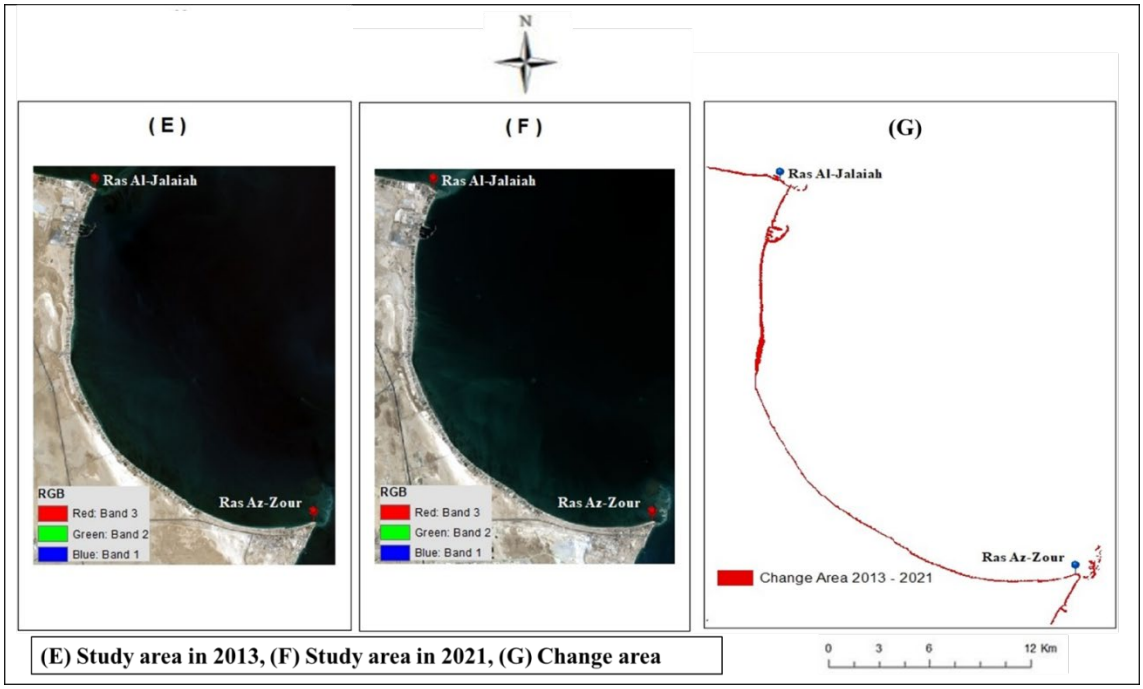

Fig. 10: Maps of the study area in the time-period group (5): (E) Study area in 2013, (F) Study area in 2021, and (G) the change detection map through the period from 2013-2021.

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This may be attributed to the development of Al Zour oil refinery project (ZOR) in the southernmost part of Ras Az-Zour, which is regarded as one of the biggest refineries in the world (Fig. 11). Site preparation works started in 2015. Construction on the project commenced in December 2017 and was scheduled to be completed in 2020. It is operated by the Kuwait Integrated Petroleum Industries Company (KIPIC), a subsidiary of Kuwait Petroleum Corporation. It involves the development of a large number of support infrastructure buildings for administration, security, operations, and maintenance. Project activities also involved feedstock and product supply pipelines, as well as the construction of various channels, a basin for a future jetty, a barge dock, roads, and the construction of a 6.5 million barrels capacity storage tank farm and marine and export facilities (Al Zour Refinery Project (ZOR) - Hydrocarbons Technology (hydrocarbons-technology.com).



Fig. 11: Al Zour oil refinery project (ZOR) in the study area at Az Zour area southern Kuwait (Al Zour Refinery Project (ZOR) - Hydrocarbons Technology (hydrocarbons-technology.com).

Figure 12 shows the net or the total change detection map through the 48-years period from 1973-2021, where The total area subjected to change along the shoreline was calculated to be about 98068.3 m^2 (3.4 km^2) using GIS techniques. In addition, the length of the shoreline has increased successively from 74520 m (74.5 km) in 1973 to 86403.2 m (86.4 km) in 2021. In the central part of the area, deposits accumulated in the lower portion of the northernmost part of the Ras Al-Julaiha, and erosion took place in the upper portion of the southernmost Ras Az-Zour cuspate.

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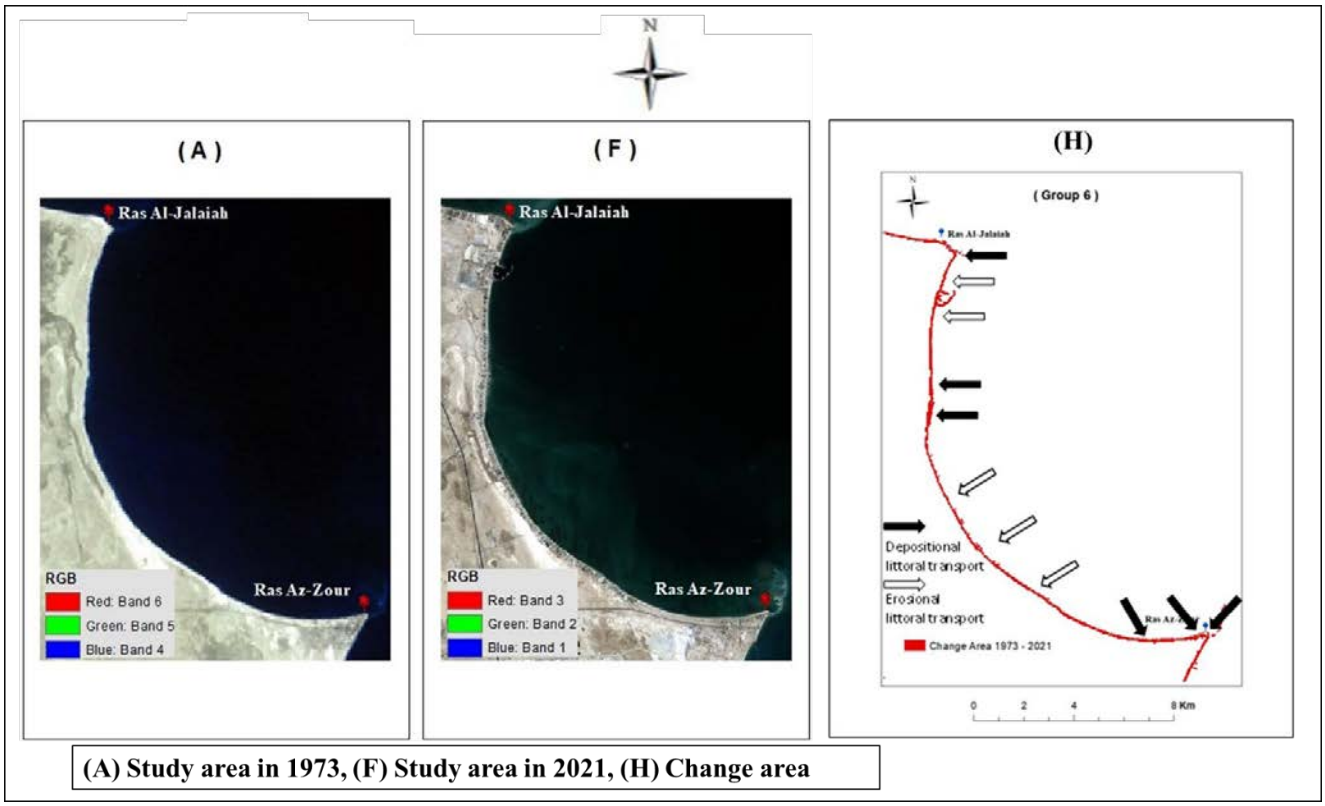

Fig. 12: Maps of the study area in the total time-period group (6): (A) Study area in 1973, (F) Study area in 2021, and (H) the total area subjected to change along the shoreline during the 48-years period (1973-2021).

V. Conclusions

Analyzing the changes in the shoreline of the study area over 48-years period using GIS, remote sensing data, and calculations using the GIS applications, provided conceptual knowledge of the littoral sand debris transport along the shoreline of the study area through locating areas of deposition and erosion. During the different time-periods groups the shoreline of the study area witnessed alternating episodes of deposition and erosion at different rates.

The two large depositional sand spits near the headlands of Ras Al-Julaiha and Ras Az-Zour formed due to the forces of tidal currents around these two headlands. These sand spits are not regularly developed and are not exactly of the same direction as the shoreline before it bends. In the central part of the area, few beach cusps, changed their shape between 1973 to 2021 possibly due to long-shore current activity. The total area subject to change along the shoreline during the 48-years period (1973-2021) was about (98068.3 m^2) 3.4 km^2 and the length of the shoreline has increased successively from (74520 m) 74.5km in 1973 to (86403.2 m) 86.4km in 2021.

The changes were mostly in the southernmost Ras Az-Zour headland and the central part as well as the northernmost of Ras Al-Julaiha. The changes in the tip of the two promontories and the central part of the study area are mainly due to the deposition of aeolian sediments and the littoral debris drift by the northeasterly-southwesterly prevailing longshore current In addition, the anthropogenic activities in the study area, such as Az-Zour oil refinery project in the southernmost part of Ras Az-Zour headland, which is considered as a kind of land reclamation, which causes changes to the coastal morphology of this section, as well as, the shape of the shoreline between 1973 to 2021. Moreover, any actions taken in the neighboring countries or in the vicinity of shorelines can directly or indirectly affect the morphology of the shorelines, such as the environmental catastrophe occurred due to the drainage of the central marshes in Iraq during the 1990s.

According to such changes in the shoreline position would help the integrated management policies in protecting or taking mitigation measures to protect those locations which may subject erosion and consequently considerable infrastructure loss.

The outputs of this study would provide a comprehensive vision of the impact of the intervention and interaction between the anthropogenic activities and the ongoing natural coastal processes in changing the geomorphology of the shorelines. This study could be of good aid in preparing sustainable integrated management plans for such vulnerable coastal sites that are planned to be used for utilities, recreational, touristic, or developmental plants either in Kuwait or other regions worldwide of similar characteristics and protect them

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from the adverse implications of beaches loss or shoreline frequent position change.

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Extreme Hydrological Events: Reflections on the Cabeça D'água Phenomenon in 2021

By João Vitaliano de Carvalho Rocha
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Abstract- *Introduction:* This investigation aims to study the Cabeça D'Água phenomenon, which is characterized by a strong rainfall discharge in a certain region in a short period of time. In the last few decades, worldwide, phenomena of extreme precipitation have been presented, which occur in countries on different continents and which at the same time have been calling the attention of scientists and scholars in relation to the variations observed in the climate.

Methodology: The data presented were carried out through the Google site for the characterization of the event object of study.

Results and Discussion: It was observed that the phenomenon occurred between the months of July, August and September 2021 in countries of all continents.

Conclusion: We concentrated our analysis on the catastrophic events that occurred in China, Belgium, Germany and Saudi Arabia, in an attempt to synthesize the study, which puts in them the greatest disaster.

Keywords: *pluviometric phenomena, water head, pluviometric events.*

GJHSS-B Classification: *FOR Code: 040699*



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Extreme Hydrological Events: Reflections on the Cabeça D'água Phenomenon in 2021

Eventos Hidrológicos Extremos: Reflexões Sobre O Fenômeno Cabeça D'água em 2021

Eventos Hidrológicos Extremos: Reflexiones Sobre el Fenómeno Cabeça D'água en 2021

João Vitaliano de Carvalho Rocha

Resumo- Introdução: Essa pesquisa tem como objetivo estudar o fenômeno Cabeça D'Água que se caracteriza por forte descarga de chuva numa determinada região em um curto intervalo de tempo. Nas últimas décadas em nível global tem acontecido fenômenos pluviométricos extremos cuja ocorrência em países de diferentes continentes e na mesma época vem chamando a atenção dos cientistas e estudiosos com relação às variações observadas no clima.

Metodologia: A pesquisa dos dados apresentados foi realizada através do site Google para caracterização do evento em estudo.

Resultados e Discussão: Observou-se que o fenômeno ocorreu entre os meses de julho, agosto e setembro de 2021 em países de todos os continentes.

Conclusão: Concentramos nossa análise nos eventos catastróficos ocorridos na China, Bélgica, Alemanha e Arábia Saudita, na tentativa de sintetizar o estudo, porque neles o desastre foi maior.

Palavras-chave: fenômenos pluviométricos, cabeça d'água, eventos pluviométricos.

Abstract- Introduction: This investigation aims to study the Cabeça D'Água phenomenon, which is characterized by a strong rainfall discharge in a certain region in a short period of time. In the last few decades, worldwide, phenomena of extreme precipitation have been presented, which occur in countries on different continents and which at the same time have been calling the attention of scientists and scholars in relation to the variations observed in the climate.

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Keywords: pluviometric phenomena, water head, pluviometric events.

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Resumen- Introducción: Esta investigación tiene como objetivo estudiar el fenómeno Cabeça D'Água, que se caracteriza por una fuerte descarga de lluvia en una determinada región en un corto período de tiempo. En las últimas décadas, a nivel mundial, se han presentado fenómenos de precipitaciones extremas cuya ocurrencia en países de diferentes continentes y que al mismo tiempo ha venido llamando la atención de científicos y estudiosos en relación a las variaciones observadas en el clima.

Metodología: Los datos presentados se realizaron a través del sitio de Google para la caracterización del evento objeto de studio.

Resultados y Discusión: Se observó que el fenómeno ocurrió entre los meses de julio, agosto y septiembre de 2021 en países de todos los continentes.

Conclusión: Concentramos nuestro análisis en los eventos catastróficos ocurridos en China, Bélgica, Alemania y Arabia Saudita, en un intento de sintetizar el estudio, pues en ellos el desastre fue mayor.

Palabras clave: fenómenos pluviométricos, cabeza de agua, eventos pluviomét.

I. Introdução

Eventos climáticos extremos têm sido uma das principais consequências das mudanças climáticas em muitos lugares ao redor do mundo. Os eventos extremos de precipitação geralmente são caracterizados por atipicamente valores altos ou baixos registrados dentro de um período de tempo e de observação (SANTOS, 2014).

Na última década ocorreram chuvas recordes em muitos lugares ao redor do mundo, causando graves impactos à sociedade humana e ao meio ambiente, incluindo perdas de vida e agrícolas com as inundações. Cientistas continuam a afirmar que os gases de efeito estufa induzidos pelo homem contribuíram para as mudanças nos eventos de temperatura e precipitação em escala global. Nas últimas três décadas, o número de eventos recordes de precipitação teve significativo aumento em escala global (LEHMANN et al., 2015).

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No estudo da vulnerabilidade ambiental, uma das principais causas está a ação antrópicas na formação de centros urbanos na base ou próximo de áreas montanhosas, o que favorece o recebimento de descargas anormais de chuva causando perdas materiais e vidas. É importante verificar a tendência de eventos anormais de precipitação e buscar quantifica-los para desenvolver ferramentas e estratégias a fim de realocar as residências para áreas mais afastadas de rios e montanhas (NUNES et al., p.3, 2018).

Levando em consideração a impossibilidade de se obter a duração da precipitação e, consequentemente, estimar a intensidade média dos eventos, Nunes et al., (p.6, 2018) obteve a mediana da precipitação diária, uma medida de tendência central que é menos suscetível à presença de valores atípicos, permitindo definir um limite de 40mm, cujo valor de referência adotado foi checada a pertinência para estudos aplicados à cidade de Belo Horizonte e outros locais foram analisados.

Chaves et al (1985) considera que a precipitação é uma das principais condicionantes ambientais com caráter de agente deflagrador de processos erosivos, sendo que em condições naturais, as perdas de solo crescem com o aumento da precipitação anual, sempre correlacionado a outros fatores, como declividade e cobertura vegetal. No solo das zonas urbanas próximas à base das montanhas deveria ser feita uma análise da percolação, da superfície de escoamento e da infiltração para prevenção de desastres futuros.

Assim, a água e seus diferentes processos de intervenções modificam e modelam a superfície terrestre, juntamente com demais fenômenos naturais que ocorrem ao longo da evolução do relevo, o qual é composto por diferentes feições geomorfológicas que compõem as distintas paisagens da superfície terrestre.

Assevera Freitas (2021) que em distintos pontos do planeta, as precipitações figuram como o meio que mais se destaca na formação do relevo, uma vez que as águas das chuvas resultam em enxurradas, e, em alguns casos, deslizamentos de encostas. Esse último se dá por causa da elevada quantidade de água contida no solo, que o leva a entrar em um estágio de saturação. Quando atinge esse ponto, o solo ganha muito peso, não suporta e rompe, produzindo o deslizamento de uma enorme quantidade de solo nas encostas. Muitas vezes o solo não absorve água em razão do deslocamento rápido das enxurradas, não ocasionando o deslizamento, no entanto, ocorre a formação de fendas ou valetas na superfície. As valetas ganham proporções maiores e se transformam em voçorocas (FREITAS, 2021).

a) Fenômeno Hidrológico Cabeça D'água

Nas últimas décadas, um fenômeno hidrológico tem acontecido em diversos países de vários continentes. No Brasil, esse fenômeno é conhecido como cabeça d'água que se caracteriza por uma descarga acentuada de chuva em um determinado lugar, normalmente, onde o relevo é composto de montanhas rochosas ou não, cobertas com bastante vegetação. Collischonn e Kobiyama, (2019) descrevem este fenômeno como um tipo de enchente em que o aumento da vazão, em um determinado local, não é apenas rápido, mas sim, praticamente instantâneo. Nesse tipo de enchente em que é possível observar, claramente, a chegada da onda como uma descontinuidade visível da vazão e do nível da água podendo surpreender pessoas à beira dos riachos, casas nas encostas de morros, dentro de carros nas ruas, pelas quais os mesmos são arrastados por quilômetros podendo transportar sedimentos rochosos e detritos lenhosos que potencializam ainda mais sua letalidade gerando fluxos de detritos ou escoamento hiper concentrado.

A descarga volumosa de água ao descer as encostas pode transportar sedimentos, detritos rochosos e vegetação de grande, médio e pequeno porte. Azevedo (2021) refere-se à *cabeça d'água,* como um fenômeno meteorológico causado pelo aumento rápido e repentino do nível de água em rios ou áreas secas em virtude de grande quantidade de chuva que cai em uma determinada área. Em análise dos relatos deste tipo de enchente é possível concluir que as cabeças d'água acontecem sobretudo em bacias pequenas, com grande declividade, e com solos de baixa capacidade de infiltração. Além disso, as cabeças d'água ocorrem quando a profundidade inicial do rio, antes da chegada da cheia, é baixa. A distribuição espacial da chuva concentra-se na cabeceira ou nas partes mais altas do relevo sendo capaz de criar uma onda que desce das partes mais elevadas arrastando cascalhos, detritos, árvores, pedras e lama.

As vazões máximas e os níveis da água máximos relatados em cheias do tipo cabeça d'água não são, necessariamente, maiores do que outras enchentes registradas nos mesmos locais. Mesmo assim, as cabeças d'água caracterizam-se por um aumento tão rápido do nível da água e da vazão que podem colocar em perigo de vida as pessoas que estão no leito do rio, como banhistas, animais, escaladores e turistas, pessoas dentro de casa, carros no meio da rua ou em qualquer lugar que esteja no caminho da água. Por este motivo, os maiores impactos associados às cheias do tipo cabeça d'água são as perdas de vidas humanas.

II. Metodologia

a) Procedimento Metodológico

i. *Delimitação do Alcance da Pesquisa*

Esse estudo foi direcionado aos países situados acima da linha do Trópico de Câncer, nas

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últimas décadas, em virtude da ocorrência de eventos de chuva, nos quais a precipitação chegou a valores extremos que causaram desastres com perda de vidas, como serão observados nos resultados da pesquisa. Para obtenção dos dados foi utilizado como motor de busca, o site Google, do qual foram obtidos documentários, vídeos e imagens dos principais países em que o fenômeno pluviométrico aconteceu.

ii. *Revisão Bibliográfica*

Foram utilizadas matérias de jornais locais para obtenção de informações sem distorção, além de imagens que apresentassem a topografia do relevo onde ocorreu a maior descarga de água causadora da inundação.

iii. *Caracterização do Evento Pluviométrico*

O evento extremo de precipitação, objeto deste estudo, caracteriza-se por uma descarga excessiva de água em um curto intervalo de tempo sobre uma determinada área. Nas regiões, cujo relevo é alto e, sobre o qual, acontece o fenômeno de descarga da água de chuva, inicia-se uma descida com grande velocidade e volume, arrastando a vegetação, pedras e detritos pelo caminho depositando-se nas áreas de planície. Um fato curioso é que esse fenômeno ocorre nas regiões que estão acima da linha do Trópico de Câncer, mais particularmente, China, Bélgica, Alemanha e Arábia Saudita, países mais castigados nesse evento chuvoso.

III. Resultados e Discussão

a) Fenômeno Hidrológico no Ano 2021

i. *Inundações na Bélgica*

Tomando como base para comparação, no ano de 2017 obtido do site theglobaleconomy.com (2021) choveu o equivalente a 847mm. Em 2021, a precipitação foi mais intensa no leste da Bélgica, com 271,5 milímetros (10,69 in) de chuva em 48 horas no município de Jalhay, na província de Liège - um recorde absoluto para a Bélgica, quase três vezes a precipitação média em um mês neste local para julho. Na cidade de Spa, também em Liège, 217 mm (8,5 pol) de chuva caíram ao longo de 48 horas. Em Reifferscheid, 207 mm (8,1 in) caiu dentro de um período de nove horas, enquanto Colônia observou 154 mm (6,1 in) em 24 horas.

Grandes partes da província de Luxemburgo viram entre 150 mm e 200 mm em 48 horas. Na Flandres, a precipitação máxima foi de 77 milímetros (3,0 pol.) Ao longo de 48 horas em Ransberg. Em Dilsen-Stokkem, Limburg, o rio Maas (Meuse) atingiu um fluxo de 3300 m3 / s em 16 de julho, igualando o fluxo máximo que os diques locais foram projetados para suportar (Wikipedia.org, 2021).

A cidade de Esneux na Bélgica está uma das áreas mais elevadas nas quais o volume de chuva acentuado é projetado em grande quantidade durante um curto intervalo de tempo, e isso faz com que ao descer a encosta, arraste a vegetação composta de árvores e arbustos, além dos troncos e galhos secos associados à lama. Esse conjunto de elementos é o responsável por entupir canais, derrubar casas encontradas pelo caminho. Essa descida repentina de grande volume de água denominamos cabeça d'água que recebeu esse nome nos Estados da Região Sudeste por apresentarem áreas montanhosas cobertas de pedras, solos e abundante vegetação.

Em 24 de julho, tempestades excepcionalmente fortes resultaram em quase 25.000 relâmpagos registrados entre meio-dia e 220:00hs, de acordo com a SRF Meteo. Em Appenzell Innerrhoden (Suiça), uma chuva de 33,2 mm caiu em apenas 10 minutos, o que é excepcionalmente forte de acordo com o SRF Meteo. Uma inundação repentina particularmente severa foi relatada na área de Londres, onde 47,8 mm (1,88 pol.) De chuva foram registrados em 12 de julho em Kew, marcando o terceiro dia mais chuvoso registrado para aquela estação meteorológica e o mais chuvoso desde 6 de julho de 1983. Ambos Putney em Londres e Chipstead em Surrey registraram mais de 31 mm (1,2 pol.) de chuva em um período de uma hora, enquanto outras áreas de Londres registraram mais de 76,2 mm (3,00 pol.) de chuva em 90 minutos. O Corpo de Bombeiros de Londres recebeu mais de 1.000 ligações relacionadas a incidentes de enchentes, pois as casas foram evacuadas e os carros submergiram devido ao rápido aumento das enchentes (Wikipedia.org, 2021).

Inundação na França de acordo com a Météo-France, entre segunda-feira 12 de julho, 8:00 e sexta-feira 16 de julho, 12:00, 199 milímetros (7,8 pol.) De chuva caíram em Châtel-de-Joux (Jura), 160 mm em Plainfaing (Vosges), 159 milímetros (6,3 polegadas) em le Fied (Jura) e 158 milímetros (6,2 polegadas) em Villiers-la-Chèvre (Meurthe-et-Moselle) (Wikipedia.org/ 2021).

Embora as chuvas fortes tenham permanecido ocasionais de 7 a 9, as chuvas mais fortes ocorreram de 10 a 12 de agosto, e vários alerta de enchentes foram emitidos pela Direção Geral de Meteorologia. Algumas estações registraram chuvas superiores a 400 milímetros (16 polegadas) ao longo dessas 48 horas, e os modelos numéricos sugeriram a possibilidade de um máximo local de até 1.281 mm (50,4 pol.), com taxas de chuva por hora bem acima de 125 milímetros (5 polegadas) por hora. Isso provavelmente causou inundações severas em Kastamonu, começando cerca de um dia após o segundo período chuvoso, quando um rio próximo rompeu suas margens. Outras regiões também acumularam chuvas consideráveis, como Ayancık, Küre, Pınarbaşı, Azdavay e İnebolu receberam 240 mm (9,4 pol.), 198 mm (7,8 pol.), 167 mm (6,6 pol.), 145 mm (5,7 pol.) E 123 mm (4,8 polegadas de chuva respectivamente, principalmente no intervalo de

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algumas horas (Wikipedia.org, 2021). Desde 17 de julho de 2021, a província chinesa de Henan foi afetada por severas inundações, causadas por um período de chuvas intensas e prolongadas. Foi observada precipitação máxima recorde de 201,9 milímetros (7,95 in) em uma hora em Zhengzhou, a capital provincial. Dezenove estações meteorológicas na província renovaram seus registros diários de precipitação. Em 2 de agosto de 2021, as autoridades provinciais relataram que 302 pessoas morreram, com mais 50 desaparecidos, 815.000 pessoas foram evacuadas, 1,1 milhão foram realocadas e 9,3 milhões de pessoas foram afetadas. As inundações tornaram-se mais prováveis devido a aumentos nas condições meteorológicas extremas causadas pela mudança climática na China (Wikipedia.org, 2021).

ii. *Zhengzhou*

Em 16 de julho de 2021, Zhengzhou na China começou a sofrer fortes chuvas. Somente em 20 de julho, a precipitação média naquele dia atingiu 253 mm (9,96 in). Das 16h às 17h do dia 20 de julho, a precipitação em uma hora atingiu 201,9 mm (7,95 in); e das 20h00 de 17 de julho às 20h00 de 20 de julho, a precipitação atingiu 617,1 mm (24,30 pol.) ao longo de três dias, (Aljazeera, 2021) próximo à precipitação média anual. (Washington Post, 2021) Surgiram vídeos mostrando que os passageiros do metrô estavam com água até a cintura dentro de suas carruagens e carros flutuando nas ruas (NBC, News, 2021).

Henan foi uma das regiões da China, altamente castigada pelas chuvas que provocaram nos centros urbanos uma catástrofe sem precedentes.

Nos últimos 10 anos, a maior quantidade de chuvas na Alemanha foi observada em 2017, foram 858,7 mm e a menor precipitação pluviométrica foi observada em 2018, totalizando 586,3 mm. Em média na Alemanha, a precipitação total medida para a primavera de 2021 foi de 175,6 mm. De acordo com o serviço meteorológico nacional alemão, DWD, ocorreram cerca de 100 a 150 mm de precipitação em 24 horas entre 14 e 15 de julho. Em um único mês, a estação meteorológica de Rheinbach-Todenfeld (North Rhine-Westphalia) registrou 158 mm seguida por Cologne-Stammheim (North Rhine-Westphalia) com 154 mm, Klein-Altendorf (Rhineland-Palatinate) com 147 mm e Kall-Sistig (North Rhine- Vestfália) com 145 mm.



Fonte: https://www.theguardian.com/world/gallery/2021/jul/16/aftermath

Figura 1: Bad Neuenahr-Ahnweiler/2021

Figura 2: https://www.theatlantic.com

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Fonte: https://public.wmo.int/2021

Figura 3: Blessen/Erftstadt em julho de 2021



Fonte: https://www.theatlantic.com/

Figura 4: Kreuzberg em 17 de julho de 2021

Observa-se que uma vila de casas foi construída à beira do rio e na porção inferior das montanhas. A seta aponta para áreas, além de montanhosas, cobertas de vegetação. Na Figura 1 e 2 observa-se área montanhosa e coberta com extensa vegetação. Na Figura 3 é possível observar o desgaste no solo provocado pelo volume de chuva que caiu em 24 horas, em Blessen, no Estado da Renânia do Norte-Westfália na Alemanha, na sexta-feira. O volume de água foi tão intenso que abriu uma enorme falha denominada voçoroca que levou ao comprometimento das residências do local. Na Figura 4, a seta indica área montanhosa com grande declividade e coberta de vegetação, cuja imagem podemos vizualizar uma árvore arrancada e projetada na rua. Este relevo característico das montanha favorece o acúmulo de água projetado de uma só vez em um curto intervalo de tempo, caracterizando o fenômeno objeto deste estudo, a cabeça d'água comum em áreas inclinadas sobre as quais caem grande quantidade de chuva.

iii. *Precipitação na Arábia Saudita*

A Arábia Saudita possui o clima do tipo desértico de característica árido e quente. Sua precipitação anual está em torno de 100mm entre os meses de janeiro a abril e nos meses menos chuvosos a precipitação fica em torno de 10mm por mês. A quantidade de dias chuvosos tem uma média anual de 45 dias.

A velocidade com a qual a água desce das regiões mais altas arrasta tudo o que estiver pela frente, como foi o caso dos carros que, inadvertidamente foram posicionados bem próximo ao local de passagem da correnteza levando-os inclusive, junto com as pessoas. Em uma área de deserto, a velocidade das águas arrastou vários camelos.

É comum as pessoas pararem para assistir o fenômeno nas proximidades das montanhas, nas quais grande quantidade de chuva que caiu de uma só vez formando a cabeça d'água. Observa-se na Figura 5 que os carros estão posicionados de frente para o leito no qual a água deslizará, momento em que, todos são pegos de surpresa devido ao volume de água e sua velocidade ao descer das partes mais altas.

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Fonte: https://www.youtube.com/watch?v=7E57dfGlq4E&t=79s

Figura 5: Gumayjan Abdullah/Chegada Repentina da Cabeça D'Água

IV. Reflexões Conclusivas

O fenômeno que estudamos nesta pesquisa intitulado Cabeça D'água que se caracteriza por uma descarga volumosa de chuva em um curto intervalo de tempo, normalmente, nas áreas de alto relevo, que favorece o carreamento de solo e detritos da vegetação arrastando tudo o que se encontra pela frente. Este fenômeno, objeto deste estudo ocorreu algumas vezes, principalmente, na região Sudeste do Brasil, em virtude de possuir o relevo mais alto, porém, nas três últimas décadas vários autores registraram nas suas pesquisas, um aumento considerável nas descargas de precipitação em nível mundial. Países como Arábia Saudita cuja precipitação anual é muitas vezes, abaixo de 300mm por ano, tiveram valores de precipitação maiores do que este em menos de 48 horas, o que caracteriza uma anomalia que vem se repetindo em diversos países na mesma época. As causas destes eventos climáticos ainda não foram descobertas e, afirmar este ou aquele motivo, não corresponde a um bom senso. Como o fenômeno Cabeça D'Água é repentino, não há evitar sua descarga nos centros urbanos, quando pega o povo de surpresa, como foi apresentado nas Figuras, cuja maioria das imagens foram retiradas de vídeos feitos por moradores e transeuntes. A melhor saída por enquanto seria retirar as pessoas das áreas de risco, ou seja, mais próximas dos rios, mesmo que sejam de pequeno porte e da base de montanhas, na tentativa de evitar desastres como os deslizamentos de terra ou landslides. O fenômeno em estudo vem acontecendo em diversos países, nos quais, há um clima muito variado e, como podemos observar, as Figuras 21 a, b, c, d, e foram colhidas de um vídeo registrado no mar. Qual o fenômeno climático das duas últimas décadas que tem contribuído para a formação da cabeça d' água em países como a Arábia Saudita cuja precipitação anual é muito baixa? Países como Bélgica, Alemanha, Suíça e Itália registraram volumes acentuados de água descendo das partes mais altas e causando o caos nas zonas urbanas. O mesmo pode ser visto nas regiões mais altas da China, Índia, Tibet, Japão enfrentando o mesmo desafio. O que esperar para os próximos anos?

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The Ethical Dilemma of Green Economy: Examining the Human and Environmental Costs of Cobalt Mining in DRC

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Abstract- This article discusses the ethical challenges of the green economy using cobalt mining in the DRC as an example. The rising demand for cobalt, a crucial mineral in the manufacture of renewable energy technologies, has resulted in serious abuses of human rights and environmental damage in the DRC. The article offers suggestions for addressing the ethical and environmental issues linked with cobalt mining in the DRC. These ideas include responsible sourcing policy, interaction with the community, sustainable mining techniques, and support for alternative technologies. The production of essential minerals must prioritize human rights and environmental preservation, and community engagement and sustainable mining techniques can assist in mitigating negative impacts and ensuring equitable distribution of benefits. The shift to a low-carbon economy is crucial to combating climate change, but it must be accomplished in an ethical and sustainable manner.

Keywords: ethical dilemma, green economy, cobalt mining, democratic republic of the congo (DRC), human rights violations, environmental degradation, sustainable mining practices, alternative technologies, low-carbon economy.

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The Ethical Dilemma of Green Economy: Examining the Human and Environmental Costs of Cobalt Mining in DRC

Sarder Ali Haider

Abstract- This article discusses the ethical challenges of the green economy using cobalt mining in the DRC as an example. The rising demand for cobalt, a crucial mineral in the manufacture of renewable energy technologies, has resulted in serious abuses of human rights and environmental damage in the DRC. The article offers suggestions for addressing the ethical and environmental issues linked with cobalt mining in the DRC. These ideas include responsible sourcing policy, interaction with the community, sustainable mining techniques, and support for alternative technologies. The production of essential minerals must prioritize human rights and environmental preservation, and community engagement and sustainable mining techniques can assist in mitigating negative impacts and ensuring equitable distribution of benefits. The shift to a low-carbon economy is crucial to combating climate change, but it must be accomplished in an ethical and sustainable manner. By addressing the ethical and environmental considerations involved with the creation of renewable energy technology, we can ensure that the transition to a low-carbon economy is accomplished in a way that is beneficial to both people and the environment. To build a more just and equitable green economy, it is vital to take a complete and balanced strategy that evaluates the benefits and possible costs of renewable energy technologies.

Keywords: ethical dilemma, green economy, cobalt mining, democratic republic of the congo (DRC), human rights violations, environmental degradation, sustainable mining practices, alternative technologies, low-carbon economy.

I. Introduction

The green economy's ethical dilemma is concerned with the potential human and environmental costs connected with the transition to a low-carbon economy (Goldthau A, 2018). The source of minerals used in renewable energy technologies, such as cobalt, which is mostly mined in the Democratic Republic of the Congo (DRC), is a critical concern in this respect. The DRC's cobalt mining business has been linked to major human rights violations such as child labor, forced labor, and unsafe working conditions (Amnesty, 2016). Mining firms have been accused of exploiting disadvantaged populations, flouting labor laws, and violating workers' rights. Furthermore, the DRC government's regulatory framework has been insufficient in protecting the rights of local populations and mining workers (Bales, K. 2017).

The environmental consequences of cobalt mining in the DRC are also considerable. Mining has resulted in deforestation, soil erosion, and water contamination (Musingwini C, 2019). The use of harmful chemicals in the mining process, such as sulfuric acid and cyanide, has also harmed local ecosystems and water sources (Sapp A, 2020). The green economy's ethical dilemma stems from the conflict between the potential benefits of switching to renewable energy technology and the human and environmental costs connected with their production. The growing demand for cobalt, in particular, has put strain on the DRC mining industry, resulting in major human rights violations and environmental deterioration (Kennedy, 2019).

The ethical dilemma of the green economy necessitates a comprehensive solution that balances the benefits of renewable energy technologies with human rights and environmental protection. This can be accomplished through responsible sourcing policies that ensure mineral extraction while respecting human rights and the environment (IISD, 2019). It is also critical to collaborate with local communities to ensure their participation in decision-making processes and equitable sharing of benefits (Hilson G, 2018).

Responsible sourcing strategies are required to ensure that mining businesses adhere to ethical standards while also respecting human rights and the environment. Certification programs that validate the source and manufacturing processes of minerals used in renewable energy systems may be included in these policies. For example, the Responsible Minerals Initiative (RMI) is a certification program that attempts to enhance the ethical practices in the global mineral supply chain, including cobalt mining in the DRC. The RMI entails auditing, assessing, and verifying mining activities to ensure that they adhere to responsible sourcing criteria.

Working with local communities is also important for guaranteeing their participation in decision-making processes and the equal sharing of benefits. Mining corporations should engage with local communities to learn about their needs and concerns, and then collaborate to reduce the negative effects of mining activities. These can include community

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development programs that promote education, health, and infrastructure, as well as the creation of local supply chains that benefit the communities.

The ethical dilemma of the green economy necessitates a balanced strategy that takes into account the human and environmental costs connected with the development of renewable energy technology. The DRC's cobalt mining sector exemplifies the ethical problems of procuring minerals for renewable energy systems. Responsible sourcing regulations and community engagement can help to prevent the negative affects of mining activities and assure the production of renewable energy technologies in an ethical and sustainable manner. This paper investigates the ethical implications of cobalt mining in DRC, with an emphasis on the human and environmental costs involved.

II. Global Status of Certain Minerals and Fossil Fuels

The global status of particular minerals and fossil fuels fluctuates based on their availability, production, and demand. As the globe transitions to a low-carbon economy, demand for minerals such as lithium and cobalt is likely to skyrocket. Yet, ethical and environmental issues about their manufacture underline the importance of responsible sourcing and long-term mining techniques. Here's a quick rundown of the current state of some of the most important minerals and fossil fuels:

- *Coal:* Coal is still the most abundant fossil fuel on the planet, with worldwide reserves estimated to be more than 1 trillion tons. Yet, due to worries about its contribution to climate change, coal's place in the global energy mix is shrinking. According to the International Energy Agency (IEA), worldwide coal demand is predicted to level and then drop during the next five years (IEA, 2020)).
- *Oil:* Oil is the most utilized fossil fuel on the planet, with global demand exceeding 99 million barrels per day in 2019. Despite the rise of renewable energy, oil remains a critical source of energy for transportation, heating, and industrial activities. Concerns about climate change and the instability of oil prices, on the other hand, have prompted growing efforts to convert to alternate energy sources (IEA, 2020).
- *Natural Gas:* Natural gas is the fastest-growing fossil fuel, with demand expected to expand at a 1.6% annual rate through 2040. Natural gas is a cleaner-burning fuel than coal or oil and is frequently utilized as a transition fuel to renewable energy. Concerns regarding methane emissions from natural gas production and transportation, on the other hand, have sparked worries about its environmental impact (IEA, 2020).
- *Lithium:* Lithium is a crucial mineral used in the creation of batteries for electric vehicles and renewable energy storage systems. As the globe transforms to a low-carbon economy, global demand for lithium is expected to high. Yet, lithium manufacturing has been linked to environmental consequences such as water contamination and habitat destruction. (IEA, 2019).
- *Cobalt:* Cobalt is another important mineral that is utilized in the manufacture of batteries for electric vehicles and renewable energy storage systems. Almost 70% of the world's cobalt comes from DRC, where human rights violations and environmental problems have created ethical issues regarding its production (IEA, 2019).
- *Rare Earth Elements (REEs)*: REEs are a category of minerals that are vital for the creation of high-tech items such as cellphones, wind turbines, and electric vehicles. China now controls the majority of the worldwide supply of REEs, raising worries about supply chain security and escalating geopolitical tensions (US Geological Survey, 2021).

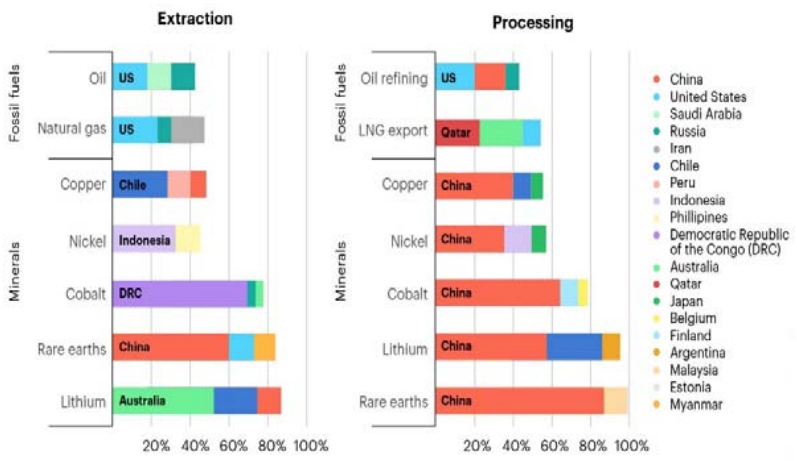

Figure 1: Countries Producing Selected Minerals and Fossil Fuels

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Cobalt demand is increasing as the globe strives for a "greener" economy, with Electric vehicles (EVs) replacing traditional gasoline/diesel vehicles, solar and wind energy being stored in massive batteries, and the manufacture of smartphones and laptop computers. EVs are regarded as a promising means of reducing greenhouse gas emissions and combating climate change (Gopalakrishnan, 2021). But, rising demand for battery minerals, particularly cobalt, a vital component of electric vehicle batteries, has resulted in an increase in demand (The Economist, 2019)

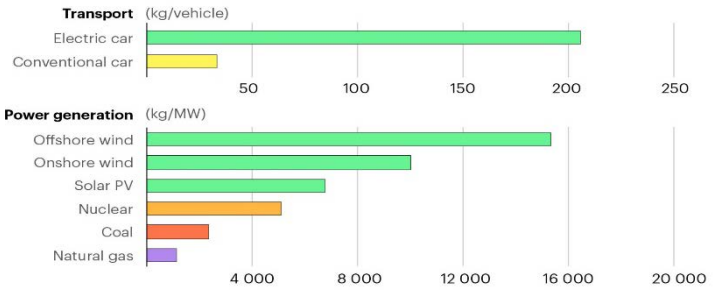

Figure 2: Minerals used in Selected Energy Technologies

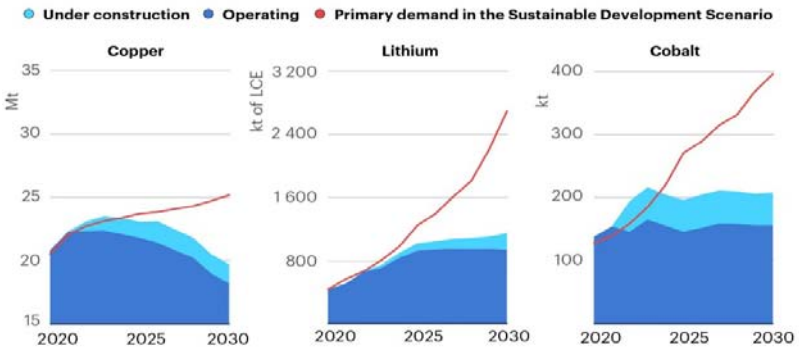

Figure 3: Committed Mine Production and Primary Demand for Selected Minerals in the Sustainable Development Scenario

According to the International Energy Agency's (IEA) research, "The Role of Key Minerals in Clean Energy Transitions," demand for minerals such as lithium, cobalt, and rare earth elements (REEs) is likely to rise dramatically as the world transitions to a low-carbon economy. According to the paper, demand for lithium and cobalt might increase by 40 and 25 times, respectively, by 2040 to fulfill the needs of electric vehicle and renewable energy storage system production (IEA, 2019). Similarly, demand for REEs is expected to climb by more than 300% by 2040, owing to the increased use of high-tech items such as smartphones, wind turbines, and electric vehicles.

These forecasts imply that the shift to a low-carbon economy will necessitate a large increase in the production of essential minerals. However, this increase must be complemented with responsible sourcing and sustainable mining procedures in order to avoid ethical and environmental concerns related with their manufacturing.

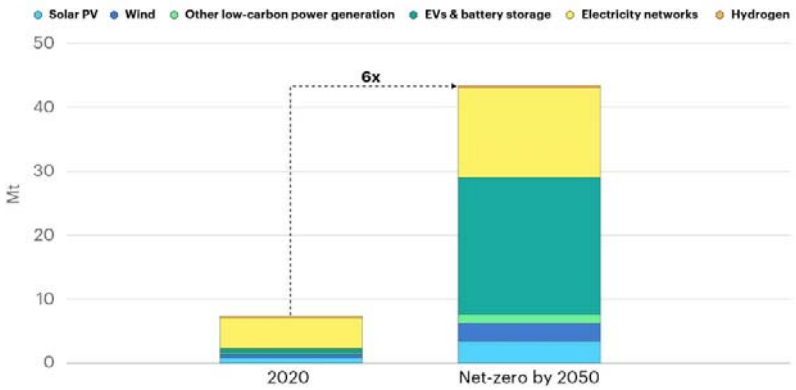

Figure 4: Total Mineral Demand for Clean Energy Technologies Growth to 2040

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III. Literature Review

The transition to a green economy has emerged as a global priority for tackling the climate change challenge. Renewable energy technologies have the ability to reduce carbon emissions and alleviate climate change effects. Unfortunately, the extraction of essential minerals is required for the development of these technologies, which may have ethical and environmental concerns. The following literature review investigates the ethical issues related with the development of renewable energy technology, as well as the necessity for responsible sourcing rules.

Critical mineral production, such as cobalt, lithium, and rare earth elements, has been connected to human rights violations and environmental deterioration in poor countries (IEA, 2020). One such example is the Democratic Republic of the Congo (DRC), where cobalt mining has been linked to child labor and hazardous working conditions (Amnesty International, 2016). To promote a more just and equitable green economy, the development of renewable energy technology must prioritize human rights and environmental conservation.

Responsible sourcing regulations are required to ensure the ethical production of key minerals utilized in renewable energy systems. Implementing responsible sourcing standards may include certification programs that validate the origin and manufacturing methods of minerals. The Responsible Minerals Initiative (RMI) is an industry-led project that strives to create a responsible minerals supply chain that respects human rights and the environment (RMI, 2020).

Community engagement and sustainable mining methods can also play an important role in reducing negative effects and ensuring equitable benefit distribution. Mining corporations should engage with local communities to learn about their needs and concerns, and then collaborate to remedy the negative effects of mining activities. Therefore, sustainable mining procedures that promote environmental preservation and minimize negative consequences are essential (ICMM, 2018).

The survey of literature emphasizes the ethical problems connected with the development of renewable energy technology, as well as the necessity for responsible sourcing rules. Implementing responsible sourcing policies and sustainable mining methods, as well as community engagement, can help reduce the negative impacts of vital minerals extraction and ensure a more just and equitable green economy.

IV. Methodology

This article is a qualitative study of the ethical dilemma of the green economy and the human and environmental costs of cobalt mining in the DRC. The research is based on secondary sources, such as academic publications, international organization papers, and news stories. The literature review investigates the ethical difficulties posed by the manufacture of renewable energy technology and the need for responsible sourcing rules. The examination then concentrates on the issue of cobalt mining in the DRC and the attendant abuses of human rights and environmental damage.

The research is based on a comprehensive literature assessment and includes results from multiple sources to present a thorough and nuanced analysis of the ethical difficulties involved with the manufacturing of renewable energy technology. The focus of the literature review is on scholarly works, reports from international organizations, and news pieces that examine the ethical difficulties involved with the creation of renewable energy technology and the need for responsible sourcing rules. The study of the cobalt mining issue in the DRC is based on news stories and studies from international organizations that show the human rights violations and environmental devastation linked with cobalt mining.

The research is constrained by the lack of data on cobalt mining in the DRC, a difficult area for data collecting owing to political instability and poor governance. Notwithstanding this, the paper presents a complete review of the ethical problems involved with the manufacture of renewable energy technology and the necessity of responsible sourcing regulations.

Using cobalt mining in the DRC as a case study, this qualitative study provides a complete review of the ethical problems connected with the manufacturing of renewable energy technology. The analysis emphasizes the need for responsible sourcing rules, community participation, sustainable mining methods, and the promotion of alternative technologies in order to mitigate the negative effects of essential mineral production and promote a more just and equitable green economy.

V. Discussion

The Democratic Republic of the Congo (DRC) is a major cobalt producer, accounting for roughly 70% of global cobalt production (USGS, 2021). However, cobalt mining in the Democratic Republic of the Congo is related with a number of ethical difficulties, including worker exploitation and environmental destruction. The increasing adoption of EVs by consumers and policymakers alike can be ascribed to the rising demand for cobalt. As countries strive to reach their carbon reduction targets and phase out fossil-fuel-powered vehicles, the market for electric vehicles is expected to grow quickly in the coming years (Gopalakrishnan, 2021). Nevertheless, the production of EVs necessitates the usage of a substantial amount of cobalt, which is primarily mined in the Democratic Republic of the Congo.

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The use of cobalt in EVs has prompted issues about the ethics of the supply chain, particularly in connection to the human and environmental costs of mining in the DRC. The majority of cobalt mining in the DRC is done by artisanal and small-scale miners who operate in dangerous conditions for little pay (Amponsah-Dacosta & Akuffo, 2019). Furthermore, the mining process has caused severe environmental deterioration, such as deforestation and soil erosion, affecting the livelihoods of local residents (Amponsah-Dacosta & Akuffo, 2019).

Cobalt mining in the Democratic Republic of the Congo is primarily carried out by artisanal and small-scale miners who labor in exceedingly hazardous conditions. The mining technique entails excavating tunnels by hand, using primitive tools, and working in small places. Toxic particles in mining dust can cause lung disease, cancer, and other respiratory disorders. The miners, many of whom are children, work long hours in hazardous and unhealthy conditions with inadequate protective equipment (Amponsah-Dacosta & Akuffo, 2019).

The working conditions of miners in the DRC have been described as among the worst in the world (Amponsah-Dacosta & Akuffo, 2019). According to an Amnesty International (2016) investigation, children as young as seven years old work in cobalt mines in the DRC, where working conditions are "hazardous, unclean, and physically demanding." The research also underscores the fact that miners in the DRC are paid very little, with some earning as little as $2 per day (Amnesty International, 2016).

In addition to the health dangers involved with cobalt mining in the DRC, the mining process has resulted in severe environmental deterioration. The mining process consumes a large quantity of water and energy, depleting natural resources and worsening the region's already vulnerable ecosystem. The mining process has led in deforestation, soil erosion, and waterway contamination, affecting the livelihoods of local residents (Amponsah-Dacosta & Akuffo, 2019).

The lack of transparency in the cobalt supply chain has made it impossible to trace the source of cobalt used in the fabrication of electric car batteries. This has made it difficult to ensure that the cobalt used in EV batteries is not linked to human rights violations and environmental destruction (Apple, 2020).

VI. Analysis and Findings

The analysis of the green economy's ethical dilemma, especially in terms of cobalt mining in the DRC, shows how important it is to have responsible sourcing policies and sustainable mining practices to make sure that important minerals used in renewable energy technologies are mined in an ethical way. Here are the most important things that came out of the analysis:

- *Human Rights Violations:* Human rights violations in developing countries have been linked to the mining of important minerals like cobalt. Cobalt mining in the DRC is an example of this. There have been reports of child labor and dangerous working conditions there. Putting in place responsible sourcing policies can help stop these violations of human rights and make sure that critical minerals are made in a fair way.
- *Degradation of the environment:* The mining of important minerals can also hurt the environment. In the case of cobalt mining in the DRC, the lack of rules and enforcement has made it possible for mining companies to ignore environmental rules, which has polluted the soil and water. It is important to use mining methods that are good for the environment and have as few negative effects as possible.
- *Involving the community:* Involving the community is important to make sure that benefits are shared fairly and that problems caused by mining are fixed. Mining companies should talk to people in the area to find out what they need and what worries them. They should also work together to solve problems caused by mining.
- *Policies for Responsible Sourcing:* Policies for responsible sourcing are needed to make sure that critical minerals used in renewable energy technologies are produced in an ethical way. Responsible sourcing policies can be put into place with the help of certification programs that check where minerals come from and how they are made. The Responsible Minerals Initiative (RMI) is an industry-led effort to set up a responsible minerals supply chain that protects human rights and the environment.
- *Alternative Technologies:* Supporting alternative technologies, like solid-state batteries that use less cobalt, can help lower the demand for critical minerals and reduce the negative effects of making them.

The analysis of the green economy's ethical dilemma, especially in terms of cobalt mining in the DRC, shows how important it is to have responsible sourcing policies, sustainable mining practices, community involvement, and support for alternative technologies to make sure that important minerals used in renewable energy technologies are produced in an ethical way. To make sure that the change to a low-carbon economy is good for both people and the planet, the production of renewable energy technologies must address ethical and environmental concerns.

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VII. Recommendations

The ethical problem posed by the green economy necessitates a multifaceted strategy that strikes a balance between the advantages of renewable energy technology and the protection of human rights and the environment. The following recommendations are presented to resolve the ethical concerns related to cobalt mining in the DRC:

- *Supporting Responsible Sourcing Policies:* Businesses that source cobalt must adhere to ethical standards and prioritize the protection of human rights and the environment. Governments should adopt and enforce regulations for mining operations that prioritize human rights and environmental protection (ICMM, 2021). Responsible sourcing initiatives, such as the Responsible Minerals Initiative (RMI), can play an essential role in confirming the source and production methods of minerals utilized in renewable energy systems (RMI, 2020).
- *Encouraging Community Engagement:* Promoting Community Involvement Mining corporations should interact with local communities to understand their needs and concerns and collaborate to mitigate the negative effects of mining activities. Community development programs that provide education, health, and infrastructure support, as well as the building of beneficial local supply chains, can be part of the involvement (Hilson, G 2018).
- *Promoting Sustainable Mining Practices:* Mining businesses should employ sustainable mining techniques that promote environmental protection and minimize negative impacts. This may involve decreasing the production of waste and the use of dangerous chemicals. In addition, the industry should encourage the research and development of sustainable mining technologies and practices (ICMM, 2018).
- *Encouraging Other Technologies:* The expansion of the renewable energy industry must be followed by innovations in alternative technologies, such as solid-state batteries, that minimize reliance on cobalt and other essential minerals (Gao, Y., & Chen, G. 2021).

The ethical issue of the green economy necessitates an all-encompassing strategy that balances the advantages of renewable energy technology with the protection of human rights and the environment. The aforementioned ideas can play a vital role in guaranteeing the ethical and sustainable production of important minerals utilized in renewable energy systems.

VIII. Conclusion

The ethical issue of the green economy necessitates a comprehensive and balanced strategy that takes into account the possible advantages and costs of renewable energy technology. Frequently, the production of these technologies requires the extraction of key minerals, which may have ethical and environmental consequences. As such, cobalt mining in the Democratic Republic of the Congo serves as an illustration of the ethical issues brought by the green economy.

Demand for cobalt, a critical mineral in the development of renewable energy technology such as electric vehicles and solar panels, has led to serious abuses of human rights and environmental degradation in the Democratic Republic of the Congo. Lack of regulation and enforcement has permitted mining corporations to exploit vulnerable communities and disrespect environmental standards. The production of essential minerals necessitates sourcing rules that place human rights and environmental conservation first. Nevertheless, community engagement and sustainable mining techniques can offset negative effects and guarantee equitable sharing of benefits.

This article's ideas, which include responsible sourcing rules, community participation, sustainable mining methods, and support for alternative technologies, present a road map for establishing a more sustainable and ethical green economy. To ensure that the transition to a low-carbon economy benefits both people and the earth, it is crucial to address ethical and environmental concerns linked with the creation of renewable energy technology.

The ethical conundrum presented by the green economy highlights the need for a balanced approach to sustainable development. This article's ideas can serve as a starting point for mining firms, governments, and communities to work jointly to guarantee that the transition to a low-carbon economy is ethical and sustainable. By prioritizing human rights and environmental conservation, we may establish a green economy that is more just and equitable, to the benefit of both present and future generations.

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Geographical, Ecotourism and Environmental Characterization of the Beaches of the Urban Area of the Canton Manta

By Argenis De Jesús Montilla Pacheco, Danica Lalesska Fernández, Milena Anthonella Vélez Rosero, Irene Rosario Rodríguez Pincay & Javier Alfonso Montilla Granadillo

Universidad Laica Eloy Alfaro de Manabí

Abstract- Manta is one of the main coastal cities in Ecuador with the greatest tourist potential of sun and beach, which, over the years is one of the most prevalent. That is why the main objective of this work was to carry out a characterization of the main tourist beaches of that city from the geographical, ecotourism and environmental point of view, as a contribution to the knowledge of each of these spaces of tourist interest. The methodology used was based on the analysis of documentary review, as well as field observation and the use of an information record sheet. They also re-recognized with the application of geographic information systems (GIS) tools, which allowed to identify physical elements on the beaches and represent them cartographically. As result it was found that the beaches of the urban area of Manta have some weaknesses that have a negative impact on tourism, including pollution of its waters and its overall space. It is concluded that the beaches of the city of Manta have weaknesses in terms of conditions for tourism.

Keywords: *ecotourism; environmental; beaches; pollution; manta.*

GJHSS-B Classification: *LCC: G70.212*

GEOGRAPHICALECOTOURISMANDENVIRONMENTALCHARACTERIZATIONOFTHEBEACHESOFTHEURBANAREAOFTHECANTONMANTA

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Geographical, Ecotourism and Environmental Characterization of the Beaches of the Urban Area of the Canton Manta

Caracterización Geográfica, Ecoturística y Ambiental de Las Playas de la Zona Urbana del Cantón Manta

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Resumen- Manta es una de las principales ciudades costeras del Ecuador con el mayor potencial turístico de sol y playa, el cual, al pasar de los años es uno de los que más prevalece. Es por ello que el objetivo principal de este trabajo fue realizar una caracterización de las principales playas turísticas de dicha ciudad desde el punto de vista geográfico, ecoturístico y ambiental, como contribución al conocimiento de cada uno de estos espacios de interés turístico. La metodología empleada se basó en el análisis de revisión documental, así como la observación de campo y el empleo de una ficha de registro de información. Así mismo rehicieron reconocimientos con la aplicación de herramientas de sistemas de información geográfica (SIG), las cuales permitieron identificar elementos físicos sobre las playas y representarlos cartográficamente. Como resultado se encontró que las playas de la zona urbana de Manta poseen algunas debilidades que repercuten de forma negativa para el turismo, entre ellas, la contaminación de sus aguas y su espacio en general. Se concluye que las playas de la ciudad de Manta presentan debilidades en cuanto a las condiciones para el turismo.

Palabras Clave: *ecoturismo; ambiental; playas; contaminación; manta.*

Abstract- Manta is one of the main coastal cities in Ecuador with the greatest tourist potential of sun and beach, which, over the years is one of the most prevalent. That is why the main objective of this work was to carry out a characterization of the main tourist beaches of that city from the geographical, ecotourism and environmental point of view, as a contribution to the knowledge of each of these spaces of tourist interest. The methodology used was based on the analysis of documentary review, as well as field observation and the use of an information record sheet. They also re-recognized with the application of geographic information systems (GIS) tools, which allowed to identify physical elements on the beaches and represent them cartographically. As result it was found that the beaches of the urban area of Manta have some weaknesses that have a negative impact on tourism, including pollution of its waters and its overall space. It is concluded that the beaches of the city of Manta have weaknesses in terms of conditions for tourism.

Keywords: *ecotourism; environmental; beaches; pollution; manta.*

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I. Introducción

El turismo ha experimentado en los últimos años un crecimiento importante a nivel mundial, generado emprendimientos, empleo y riquezas en países y en cada una de sus regiones. El impacto económico que tiene el turismo se mide a través de indicadores, tales como el ingreso, la producción, impuestos, el empleo y el valor agregado, entre otros, no sólo beneficiando a las organizaciones propias de este sector, sino también a las de otros, así mismo el efecto económico se ve reflejado, tanto en su magnitud general, como en su impacto regional (Zhang, Madsen y Jensen Butler, 2007).

En Ecuador se puede evidenciar su desarrollo progresivo de manera importante, el cual se ha ido dando mediante la política gubernamental vigente sobre los generadores de ingresos económicos, pasando de ser un país enfocado en el sector primario a desarrollar el sector industrial y sobre todo el sector servicios. El Turismo en el país ha desarrollado una serie de planes, programas e iniciativas enfocadas a sacarle el mayor provecho a la propuesta del turismo consciente, buscando su potenciación, que será desarrollado en futuros trabajos de investigación.

El Ecuador tiene una amplia y diversificada gama de recursos naturales. Sus ingresos se originan principalmente de lo generado por el sector primario como es la exportación, el petróleo y ahora juega un papel muy importante el turismo dentro de ella, de tal

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manera que le permita a cada sector salir beneficiado con la generación de ingresos que se obtienen por ello se propuso a enfocarse encambiar su matriz productiva y diversificarse, con el fin de dejar de ser dependiente de actividades primarias y desarrollar la industria y el sector servicios.

Dentro de la zona costera del país se encuentra la ciudad de Manta, está entre las más importantes en cuanto a turismo de sol y playa, por lo cual, es uno de los destinos turísticos reconocidos por este tipo de turismo.

El turismo comúnmente denominado de "sol y playa" ha sido y aun hoy continúa siendo, la modalidad que mayores flujos de pasajeros propicia a escala internacional. El poderoso atractivo del mar y, principalmente, las condiciones climáticas subtropicales e incluso en zonas de menor calor, constituyen una motivación de viajes vacacionales de primer orden (Hector Ayala, 2003).

El cantón Manta posee 13 playas: El Murciélago, Barbasquillo, Playita Mía, Tarqui, Los Esteros, Piedra Larga, San Mateo, La Tiñosa, Santa Marianita, Ligüiqui, San Lorenzo, Las Piñas y Santa Rosa, que contribuyen de manera importante en el desarrollo turístico del sector, ya que cada una de ellas presenta características que las hacen diferenciar una de la otra.

Para ello es de importancia conocer sus características actuales, específicamente desde el punto de vista geográfico, ecoturístico y ambiental, debido a que dentro de ellas su mayor problema pudiera se la contaminación producida por descargas de aguas residuales, emisiones de gas tóxico producido por actividades industriales y humanas, que cada día deterioran su calidad ambiental.

II. Desarrollo

El presente trabajo se desarrolló a partir de una investigación documental y de campo; según la Universidad Pedagógica Experimental Libertador (UPEL, 2016, p.18), este tipo de investigación se define como: "El análisis sistemático de problemas en la realidad, con el propósito bien sea de describirlos, interpretarlos, entender su naturaleza y factores constituyentes explicar sus causa y efectos, o predecir su ocurrencia, haciendo uso de métodos característicos de cualquiera de los paradigmas o enfoques de investigación conocidos o en desarrollo". Su principal objetivo fue la caracterización geográfica, ecoturística y ambiental de las playas de la zona urbana del cantón Manta.

Dentro de las técnicas empleadas se consideró la observación, la cual consiste en el registro sistemático, válido y confiable del comportamiento o de la conducta manifiesta que puede utilizarse en muy diversas circunstancias (Hernández, Fernández y Baptista, 2016), como por ejemplo en el estudio del paisaje.

Con la observación se hizo un registro y levantamiento de datos e información que fue complementada con la revisión bibliográfica y documental. La observación se apoyó en una ficha de recolección de geodatos, misma que se aplicó in situ durante los recorridos en cada una de las playas estudiadas (Murciélago, Barbasquillo, Los Esteros y Tarqui). De acuerdo a lo que describe Hernández, Fernández y Baptista (2016), la investigación se enmarcó en un estudio descriptivo y explicativo, por cuanto describe y explica diferentes aspectos presentes en la zona de estudio, especialmente aquellos que guardan relación con lo geográfico y ecoturístico.

Por otra parte, para realizar la cartografía representativa de cada una de las playas estudiadas se emplearon como base 4 imágenes de satélite descargadas de la plataforma de Google Earth correspondientes al año 2020, las mismas fueron recortadas para ajustarlas al área de estudio y se corrigieron geométricamente utilizando herramientas del programa Arc Gis, en el Sistema de Referencia WGS84, proyección UTM, zona 17S.

El área de estudio lo constituye las playas de la zona urbana del cantón Manta. Éstas se localizan en la provincia de Manabí, concretamente en el cantón Manta, el cual limita al Sur–Oeste con Montecristi y Jaramijó, entre las coordenadas geográficas S0°57'43.63" de latitud Sur y los O80°42'45.76" de longitud Oeste. Abarca una extensión territorial de 30.900 hectáreas (figura 1).

El clima que presenta el área de estudio, según la clasificación propuesta por Foghín (2002), es tropical semiárido, correspondiéndose con el predominante en la mayor parte de la franja costera de la provincia de Manabí, caracterizado por un régimen unimodal bien definido, con lluvias que ocurren entre los meses de noviembre a mayo, y un período marcadamente seco entre junio y octubre, durante el cual, la temperatura registra un descenso debido a la influencia que ejerce la corriente fría de Humboldt. Como respuesta a las condiciones de clima, el ambiente de las playas estudiadas es el hábitat para distintos tipos de plantas, especialmente cactáceas.

Según el Instituto Nacional de Estadística y Censo (s.f), la población total del cantón Manta es de 22.477 habitantes, de las cuales 97,44% corresponden a la zona urbana y se destina en gran parte al desarrollo de actividades económicas diversas, tales como la industria, donde se destacan principales empresas de aceite vegetal y maquiladoras, la pesca, el comercio y el turismo constituyen de gran manera para el desarrollo de la ciudad (El Diario, 2016).

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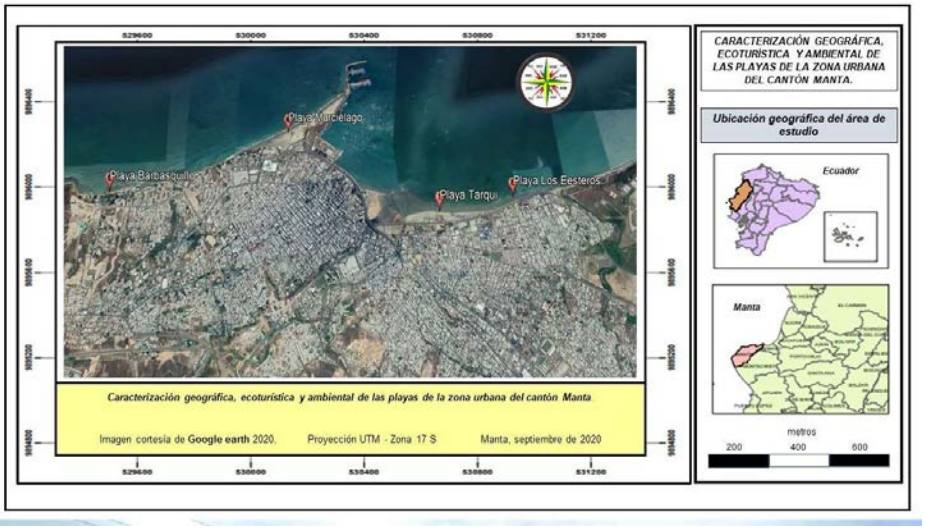

Figura 1: Ubicación geográfica de las playas de la zona urbana del cantón Manta, provincia de Manabí, Ecuador.

A continuación, se describen las características de las cuatro playas estudiadas en esta investigación.

Playa Murciélago

Se encuentra ubicada en el centro de Manta, parroquia Manta en el área urbana de la ciudad, a un costado de la avenida Circunvalación y muy cerca de la entrada al puerto marítimo de Manta. Es una de las principales playas atractiva para el turista. Se localiza en las coordenadas 0°56′17″ de latitud Sur y 80°44′18″ de longitud Oeste.

El acceso a la playa se puede realizar de manera terrestre, y marítima y su tipo de ingreso es gratuito (figura 2).

Dentro de este atractivo hay varios servicios a disposición de los usuarios que allí concurren, entreellos se tiene servicios de parqueadero, servicios de alimentos y bebidas, venta de souvenirs, y muycerca de ella también está el Centro Comercial Mall del Pacífico (figura 3), mismo que brinda diferentes servicios: Además, muy cerca a esta playa hay diversas opciones de alojamiento. Playa Murciélago cuenta también con puntos de información turística, especialmente el Centro de Información Turística de la facultad de Hotelería y Turismo de la Universidad Laica Eloy Alfaro de Manabí (CIINFOTUR).

La flora existente dentro del atractivo se basa en especies introducidas de plantas ornamentales (palmeras) y su fauna está conformada por gaviotas, fragatas, caracoles, cangrejos. A nivel de fitoplancton también Caicedo-Murillo & Quijije-López, (2020), señalan una gran riqueza.

La contaminación es uno de los principales problemas persistentes dentro y cerca del atractivo, además se observa una disminución progresiva del espacio de la playa debido a recientes construcciones de estructuras y edificaciones.



Fuente: Fotografía de los autores.

Figura 2: Vista de la entrada principal a la playa Murciélago.

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Como resultado de esta investigación se encontró que playa Murciélago presenta importantes niveles de contaminación ambiental, causada por la descarga de aguas servidas de diferentes instalaciones que se encuentran en sus proximidades (Vélez Montesdeoca, 2014). Los malos oloresson persistentes, por lo cual, muchos turistas se sienten afectados y prefieren no hacer uso de esta playa.



Fuente: Imagen cortesía de Google Earth 2020.

Figura 3: Panorámica de la playa Murciélago y sus alrededores.

El tema del manejo de la basura es una preocupación de la colectividad, aunque el servicio de aseo urbano es diario, se aprecia la acumulación de desechos en algunos lugares a lo largo de la playa, lo cual afecta la apariencia de esta, así como al ecosistema marino costero presente en ella.

Desde el punto de vista geográfico y geomorfológico, Murciélago es una playa extensa, de aproximadamente 500 metros de longitud. Es de pendiente pronunciada, lo que hace que sea muy profunda a escasos metros de internarse en el mar; además presenta un fuerte oleaje, por una parte, favorable para el desarrollo de deportes acuáticos, pero por la otra, desfavorable, pues representa algún peligro para los bañistas. En la parte sur de la playa se observan afloramientos rocosos que interrumpen el lecho arenoso, haciéndola un tanto difícil de aprovechar.

Playa Los Esteros

Se encuentra ubicada en el cantón Manta, específicamente forma parte de la jurisdicción de la parroquia Los Esteros, dentro del área urbana de la ciudad. Las coordenadas de este atractivo son 0°56'53.5" de latitud Sur y 80°41'54.1" longitud Oeste.

El acceso a esta playa es muy sencillo, se puede hacer por medio de transporte público o privado utilizando la avenida o vía principal Puerto – Aeropuerto (figura 4). Al igual que playa Murciélago,el acceso a Los Esteros es gratuito.

Los servicios con los que cuenta se centran en los expendios de alimentos y bebidas, pero además dispone de un parqueadero y algunos establecimientos de hospedaje relativamente cerca. Otros servicios, como banca, cafés, tiendas y centros de diversiones se encuentran un poco alejado de esta playa.

La flora existente se basa en especies introducidas de plantas ornamentales, como los son las palmeras de diferentes especies, destacando entre ellas las palmas de coco (Cocos nucifera), y entresu fauna se observan especies muy vistosas y visualmente llamativas, como fragatas, gaviotas y muchas otras.

La contaminación de la playa es un problema que viene afectando tanto a la fauna marina, como alos habitantes del sector, turistas y pescadores. La situación empeora en la playa porque en ella está la desembocadura del río Muerto, el cual drena muchos desechos contaminantes provenientes de procesadoras de pescado instaladas en sus cercanías, así como descarga de aguas residuales, cuyo destino final es el mar, y en específico esta playa.

El agua de esta playa presenta una coloración oscura, debido a la presencia de una pluma de sedimentos en suspensión producto de la descarga del río Muerto, tal como puede apreciarse en lafigura 4. Esa situación genera desconfianza a los bañistas, por lo que esta es muy poco concurrida,incluso en temporada de vacaciones y días feriados.

En esta playa se registran los más altos índices y niveles de contaminación permitidos por la Ley de Gestión Ambiental. Según González (2014) registra altos índices y niveles de contaminación nopermitidos por la Ley de Gestión Ambiental, puesto que existen altas

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dosis de grasas, aceites, enterobacterias, E. coli y hasta coliformes fecales (Molina Flores, 2015; Franco & Jessenia, 2015; González Arteaga, & González Arteaga, 2016). Aun cuando los niveles han disminuido en los últimos años, todavía persisten conexiones clandestinas de fábricas y domicilios que vierten sus desechos al río, y este a su vez, a la playa Los Esteros.



Fuente: Imagen cortesía de Google Earth 2020.

Figura 4: Obsérvese la desembocadura del río Muerto en la playa. La presencia de sedimentos en suspensión y desechos contaminantes se puede apreciar con claridad en esta imagen (círculo rojo).

Entre otras actividades que producen contaminación en esta playa se puede mencionar el ruido que produce el tráfico vehicular durante todo el día, pues está separada de la avenida principal apenas por escasos metros. Adicionalmente en sus cercanías se encuentra operando un astillero (figura 5), que aun cuando puede servir de atractivo turístico, también es un foco de contaminación, pues en el marco de sus actividades se emplean productos químicos que alteran el ambiente y genera dañosal ecosistema.



Fuente: Fotografía de los autores.

Figura 5: Vista parcial de un astillero localizado en las inmediaciones de la playa Los Esteros.

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Las actividades comerciales en el sector también contribuyen en la contaminación de este balneario. Particularmente un mercado de productos del mar instalado a la orilla de la playa, no ambientalmente manejado, causa serios problemas de contaminación. De allí emanan fuertes olores que hacen que el visitante se aleje o no se acerque a esta playa.

En cuanto al manejo de desechos, en este sector, al igual que en toda la ciudad, es el municipio el responsable de la recolección. No obstante, la falta de una cultura ambientalmente sana por parte de lugareños y visitantes no contribuye en la sanidad ambiental de esta playa. Por lo cual, es común observar en diferentes lugares de esta, importante cantidad de basura, entre la cual, el plástico ocupa las primeras posiciones. En definitiva, con estas condiciones, a decir de Zambrano, (2019), es muy difícil potenciar las actividades turísticas de la ciudad.

El problema de la contaminación es más notorio, según se pudo observar durante este trabajo, por la ausencia de contenedores para que los turistas o moradores depositen la basura en el lugar apropiado.

Finalmente, Los Esteros, geomorfológicamente hablando, es una playa extensa de aproximadamente 400 metros de longitud, conformada por arena fina, sin afloramientos rocosos. Al igual que Murciélago, es una playa profunda, con un fuerte oleaje casi de forma permanente.

Playa Tarqui

Se encuentra ubicada en el cantón Manta, específicamente en la parroquia Tarqui, entre las coordenadas 0°57'00.0" de latitud Sur y 80°42'29.3" de longitud Oeste.

El acceso hacia esta, al igual que las anteriores, es muy sencillo y se puede hacer por distintos medios. Su ingreso es gratuito y dispone de diversos servicios al turista o visitante, entre ellos, alimentos típicos de la provincia y bebidas de diferentes tipos, parqueadero, y alojamientos cercanos, a bajo costo.

En cuanto a las condiciones ecológicas, esta playa presenta una vegetación muy escasa como respuesta a las condiciones climáticas imperantes en la costa del cantón, expresadas en los muy bajos montos de lluvia que ocurren anualmente. Desde el punto de vista paisajístico se han incorporado plantas ornamentales para darle una mejor impresión al paisaje, no obstante, al respecto queda mucho por hacer. En relación a la fauna, es prácticamente la misma que se encuentra en las dos playas anteriormente estudiadas, es decir, que está conformada por las gaviotas (Sterna hirundo), cangrejos (Carcinus maenas), fragatas (Fregata magnificens) y otras.

Dentro de esta playa también es persistente el problema que afecta a la fauna marina (Reyes & Albino, 2020), así como a los habitantes y a los turistas que acuden a ella. Por la desembocadura del río Muerto en la playa, drenan desechos de algunas industrias o fábricas de aceite y procesadoras de atún, de tal manera que la contaminación es muy notoria, tal como se puede apreciar en las figuras 6 y 7.

En la playa Tarqui también es notoria la contaminación sónica y la emisión de dióxido de carbono por ser un espacio contiguo a una de las vías de mayor circulación vehicular de la ciudad. La recolección de la basura en esta playa es responsabilidad del municipio, quien, en conjunto, desarrolla campañas de recuperación ambiental con la organización Mingas Por el Mar.

Aun así, esta playa está lejos de reunir las condiciones ideales para ser un atractivo turístico; para ello es necesario desarrollar un conjunto de acciones que conlleven a su mejora ambiental y ecológica.



Fuente: https://cutt.ly/VfLnWNn

Figura 6: Panorámica de la desembocadura del río en la playa Tarqui. La acumulación de desechos por parte del río esmás que evidente.

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Fuente: Fotografía de los autores.

Figura 7: Vista del cauce bajo del río Muerto y la presencia de basura que contamina la playa.

La protección de la cuenca alta del río Muerto sería una acción importante, pues la deforestación o pérdida de la vegetación causa serios procesos erosivos, de tal manera que, en la temporada de lluvias el curso de agua arrastra grandes cantidades de sedimentos que van a depositarse a la playa y que le dan al agua de esta, una coloración turbia, lo cual la hace poco atractiva para los visitantes(figura 8).



Fuente: Imagen cortesía de Google Earth 2020.

Figura 8: Nótese en la zona demarcada en rojo la coloración turbia del agua en la playa como producto de la deposición de sedimentos por parte del río Muerto, especialmente en la temporada de lluvias.

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Esta playa tiene aproximadamente 500 metros de longitud, y se caracteriza además por estar conformada por arena de granulometría fina producto de la erosión marina. La revisión de la literatura (Ormazábal Salvatierra, 2018; Macías Ávila, 2020), permite señalar que la batimetría deeste balneario es de menor profundidad respecto a las playas antes descritas. No obstante, por la problemática ya explicada, tampoco reúne las condiciones ambientales y sanitarias para constituirse como un balneario adecuado.

Playa Barbasquillo

Se encuentra ubicada en el cantón Manta, en la parroquia Barbasquillo de la zona urbana de la ciudad, las coordenadas de este atractivo son: 0° 56' 39.76" de latitud Sur y 80° 45' 11. 40" de longitud Oeste.

El acceso hacia este balneario se puede hacer, al igual que en los casos precitados, por vía terrestre, siendo gratuito su acceso, sin embargo, a lo largo de la playa existen cadenas hoteleras donde el acceso a ciertos sectores es restringido.

Es importante destacar que, en esta playa, los servicios son muy escasos, particularmente en lo que respecta a alimentos y bebidas. No obstante, en sus cercanías se encuentran interesantes opciones de hospedaje en hoteles de gran categoría. Además, dispone en sus alrededores de algunos centros de diversión.

La contaminación de esta playa es evidente, la misma es producto de las actividades que se producen en distintos establecimientos turísticos localizados en el sector. Estos, según se pudo observar en esta investigación, tienen drenajes clandestinos con aguas servidas y otros desperdicios que van a depositarse en la playa, siendo este uno de sus principales problemas.

Aunque el manejo de los desechos en esta playa es responsabilidad del municipio, la misma no dispone de contenedores o reservorios que permitan depositar la basura que genera los visitantes.

La playa de Barbasquillo se emplaza en un entorno prácticamente carente de vegetación (figura 9). En cuanto respecta a la fauna, las especies suelen ser las mismas que se observan en las playas antes descritas.

La geomorfología de la costa perteneciente al sector donde se localiza la playa de Barbasquillo dejaver que se trata de una geoforma relativamente nueva, en proceso de formación, por lo cual, aun no reúne las condiciones para constituirse en un balneario como tal.

No obstante, se pudo observar la construcción de una estructura de roca, la cual juega un papel importante en los procesos de sedimentación, de tal forma, se espera que, en el transcurso de unos años esta playa disponga de mejores condiciones para los visitantes, y de manera particular para los bañistas.



Fuente: Fotografía de los autores.

Figura 9: Panorámica de la playa Barbasquillo. Nótese la ausencia de instalaciones de servicios para el turista, así como las precarias condiciones ambientales.

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III. Conclusiones

En base a la investigación realizada se pudieron determinar las características más relevantes de cada una de las playas estudiadas en la zona urbana de Manta, se constata que las diferencias que cada una presenta tanto en lo ambiental, en lo ecoturístico y geográfico son muy similares.

Ambiental y ecológicamente las cuatro playas estudiadas presentan serios problemas que limitan su uso y aprovechamiento desde el punto de vista turístico. El mal manejo de la basura y el drenaje de aguas servidas de tipo industrial, residencial y comercial es una situación que se hace presente en el área de estudio.

El medio marino en el que se asientan las playas mencionadas posee una importante biodiversidad faunística, tanto acuática como terrestre, siendo la vegetación muy escasa, especialmente por las condiciones de aridez que impone el clima local.

Por otro lado, se observa falta de organización por parte de los responsables de la preservación de estos espacios, de allí que la imagen que muestran estas playas no son las más deseables. De las cuatro playas estudiadas, Murciélago es la que cuenta con una mejor organización desde todo punto de vista, sin embargo, requiere de una mayor atención para que sea considerado como un balneariode calidad.

En términos generales, es importante que se tenga un adecuado uso de cada uno de las playas, así como la organización y correcto manejo de los desechos que causan la contaminación, enparticular, el de los establecimientos industriales. Todo ello redundaría en beneficios económicos para la población local.

Adicionalmente es pertinente recomendar a las principales autoridades del gobierno local la promoción de campañas de concienciación a los moradores para la adecuada organización y manejo de desechos. Así como controlar el uso y vertido de productos; promover el reciclado de aceite usado en áreas urbanas; incentivar la producción de bienes duraderos que requieran menos energía para fabricar y reducir de manera significativa la producción de desechos contaminantes.

Proponer a las principales autoridades que establezcan un control sobre el uso de los desagües naturales, los servicios de limpiezas y se incluyan programas voluntarios de recolección de basura por parte de comunidad.

Conformar un comité voluntario por parte de los prestadores de servicios de cada atractivo el cual este encargado de la tarea de sensibilización y cuidado ambiental de la playa.

Proponer y regular el uso de productos biodegradables dentro de cada uno de los atractivos. En este caso, pudiera ser a partir de ordenanzas municipales implementadas por el GAD de la ciudad.

Proponer que la práctica de las actividades recreativas dentro del atractivo se realice de manera responsable; tales como los recorridos navegables en lacha, o actividades terrestres, evitando que los turistas boten desperdicios plásticos o contaminantes que perjudiquen al ecosistema marino costero.

Establecer medidas de manejo adecuadas para que las empresas industriales o comerciales hagan un uso más racional de los recursos y disminuyan la producción de desperdicios y su vertido a loscursos de agua que desembocan en la franja costera de la ciudad.

Así mismo, luce acertado, desde la iniciativa del GAD municipal, la creación de asociaciones con los moradores para la implementación de campañas de arborización y siembra de distintas especies de plantas para mejorar el ornato de las playas.

Desarrollar capacitaciones y difundir de manera sistemática por los medios de comunicación y porredes sociales, mensajes proambientalistas para preservar y rescatar la sanidad ambiental de las playas estudiadas.

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The Implications of the Immanence of God in Genesis 1:1-2 for Rectification of Environmental Crises in Owerri West Local Government Area

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Abstract- Several authors claim that Christians are responsible for the developing ecological problems because they have used the idea of being made "in the image of God" (Gen. 1:26-27) as an excuse to justify exploiting the planet's resources. Given the changes, Owerri-West is experiencing concerning seasons like rain, harmattan, and dry seasons, the issue of environmental crises is clear. In response to the environmental difficulties in Owerri-West, the article examines God's presence, also known as the "Immanence of God." The data for the study was gathered through a literature review done through an analytical-critical discursive approach. The acquired data were examined and synthesized. The article looks at Christian concern for environmental issues in Nigeria and highlights the necessity to accept God's immanence in nature as a solution for environmental sustainability. It also calls attention to the essential need for environmental protection and sustainability among decision-makers and environmental activists. In light of the preceding, the researchers suggest that it is now time for the residents of Owerri West Local Government Area to focus entirely on the theological implications of environmental issues.

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I. Introduction

One of the most serious environmental problems our planet is currently facing is climate change. To stop the damage it poses to the world, various animal species, and people's livelihoods, immediate action is required. Climate change is being caused by an increase in cars, industry, and power plants, etc.[1] The world that humans treasured gained more attention in the latter half of the 20th century. Many arguments have been developed on who is to be blamed regarding climate change, global warming, and the devastation of so many natural resources. Some writers have argued that the exploitative attitude to nature, typical of the twentieth century, directly results from the Christian doctrine of creation. Others argued that the Judeo-Christian idea of humanity having dominion or authority over creation has led to the view that nature exists to serve human needs, thus legitimating a highly exploitative attitude. Christianity thus bears a substantial burden of guilt for the current ecological crisis.[2] In particular, Lynn White Jr. argues that Christianity was to blame for the emerging ecological crisis because of using the concept, the "Image of God," found in the creation account (Gen. 1: 26-27), as a pretext for justifying human exploitation of the world's resources. He argues that the book of Genesis legitimates the notion of human dominion over creation, leading to its exploitation.[3]

While others believe that a closer reading of the Genesis text indicates that such themes as "humanity as the steward of creation" and "humanity as the partner of God" are implied by the text rather than that "humanity as the lord of creation." Far from being the enemy of ecology, the doctrine of creation affirms the importance of human responsibility towards the environment. The biblical concept of "dominion" was to be understood primarily in terms of "stewardship," no matter what interpretation might be placed on the word in a secular context. To put it simply: the Old Testament sees God's creatures as the possession of humanity; it is to be seen as entrusted to humanity, who is responsible for its safekeeping and tending[4].

The human relationship with the environment depicts an understanding of God's manifestation in His creation. Unfortunately, the environment has been abused by human activities. These activities include gas flaring, littering of the environment, improper waste management, and the building of irrelevant structures on waterways. Others are indiscriminate felling of trees and burning of bushes. The world is going through ecological crises such as global warming, climate change, ozone layer depletion, acid rain, and food and water shortage, which may not be unconnected to the ignorance of humans of their responsible stewardship role over creation and as well as the misconception and

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[1] IPCC, "Climate Change 2001: Impacts, Adaptation and Vulnerability", Working Group II Contribution to the Third Assessment Report of the Intergovernmental Panel on Climate Change, "Chapter 18: Adaptation to Climate Change in the Context of Sustainable Development and Equity", (Cambridge: Cambridge University Press, 2001), 877-912.

[2] Sallie McFague, *Models of God: Theology for an Ecological Nuclear Age* (Philadelphia: Fortress Press, 1987), 122-3.

[3] Ibid.

[4] Alister E. McGrath, *Christian Theology,* 3rd ed. (Oxford: BlackWell Publishers, 2001), 303.

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misinterpretation of God's injunction in Genesis 1:1-2 and 1:26, 2:15, among other places in the Bible. The scripture echoes man's responsibility to his environment. This misconception and misinterpretation have led to the widespread exploitation and destructive use of natural resources, the detriment and the demise of several habitats and their life forms. Instead of destruction, Christians are mandated by God to care, which means going to the extreme to prevent environmental crises to show appreciation to God for creation.

Practices such as improper waste management, deforestation, large-scale urbanization, environmental degradation, and pollution in various forms are significant ecological crises. The subject of global warming is no longer unfamiliar in local and global discussions of environmental and ecological concerns. It is seriously threatening the world as the entire globe is experiencing an abnormal temperature increase due to deforestation from various agricultural and industrial activities. One of the concerns of this article and the motivating factors is how some plants in existence many years ago, which would have been beneficial to man and his health, are gradually phasing out of existence. Such plans include: '*ukazi,' 'uziza,''uha'* etc., a side that rivers are no longer safe for swimming and drinking because they have been tampered with and defaced by man. Erosion has its effect on all parts of the nation Nigeria, with the man doing little or nothing about it even when they are the primary cause of it. Many have suggested ways out, but few implementations are being made, and less attention is being given to teaching it.

II. Biblical View of God's Immanence in Creation

Understanding God's reality and how He interacts with the created world depends heavily on God's immanence. It also involves His involvement in history, human nature, and natural phenomena.[5] From Genesis through Revelation, the Bible provides numerous examples of God's interactions and activities with His creation. God makes certain aspects of Himself known to humans in all His interactions with His creation. God's immanence is demonstrated in the creation story in Genesis 1:2 when the divine Spirit appears to hover above the water.[6] God is immanence in the creation through His Spirit.

According to Genesis 3:8–9, Adam and Eve's association with God in the Garden of Eden represents another facet of God's immanence. God would visit the garden in the cool of the day for a stroll in the evening to converse with and fellowship with them. God is shown to be a relational being who interacts with His creation. [7] All things are seen to be sustained by Him, and they all rely on Him to survive. In chapter 104: 29–30, the Psalmist emphasized the natural world's reliance on God. All living things depend on God for survival and are under his whim. The key to all life's physical existence is God's breath.[8] If God turns away from them, all living creatures will feel the loss immediately. Every living thing depends on God's favour because he is the one who gives it to them and keeps it alive.[9]

The incarnation of the person of Christ is another way that God's divine presence is depicted in the New Testament.[10] He came as Immanuel, but He also came to live among His people for all eternity. He set up His tent close to His followers.[11] In the person of Christ, God has chosen to reside among His creation permanently. John's claim that the word became flesh and lived among humans is another example of the incarnation of Jesus (1:14).[12] Paul described Jesus as the representation of God (Col. 1:15). Other allusions state that everything in creation is the work of God and is under His direction, including the bringing of rain and sunshine.

The sun's brightness is not considered to be a natural occurrence. God is the one who creates the sun. God provides for all He has made, not just one specific group of people. Regardless of who they are, he randomly offers gifts to everyone (Matthew 5:45).[13] Therefore, God must be a God of provision. Dressing the grasses in the fields and providing food for the avian birds are both works of God (Matt. 6: 25-30, 10: 29-30). The strength of God can be seen in His concern for even the smallest of His creations; He is attentive to even the most minute aspects of those He has created in His image. Given this, Jesus emphasized the futility of worry and the good reasons for trusting God, who is actively involved in caring for and maintaining His creation.[14] Paul further stated in his theological treatise to the philosophers at Mars Hill that God is not remote from anybody and that humans are created in God (Acts 17: 27-28). Paul's argument for God was that He provides life, breath, and everything else, but also the sum and substance of everything else. He is the one

[5] Millard j. Erickson, *Christian Theology, second edition* (Grand Rapids, Michigan: Baker Books, 1985), 325.
[6] Tokunboh Adeyemo, *African Bible Commentary,* (Kenya: Word Alive Publication, 2006), 13.
[7] Samuel Rolles Driver and George Bughanan Gray, *A Critical and Exegetical Commentary on the Book of Job* (Edinburgh: T & T lark, 1921), 283.
[8] Leslie C. Allen, *World Bible Commentary Vol. 21, Psalms 101-150* (Waco, Texas: World Book Publisher, 1983), 34.
[9] Spence and Excell, 399.
[10] Leon Morris, *The Pillar New Testament Commentary* (Grand Rapids, Michigan: William B. Eerdmans Publishing Company, 1992), 31.
[11] Wintle, 1802-1803.
[12] Buist M. Fanning, "Word", in Desmond Alexander and Brian S. Rosner (eds.), *A Dictionary of Biblical Theology* (Leicester, England: Inter Varsity Press, 2000), 852-853.
[13] Morris, 132.
[14] Ibid, 159-160.

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who guides people toward knowledge of Himself and provides the tools necessary for doing so. Even though God is far from everyone, He is close to everyone on the planet.[15]

III. Theological Viewpoint on God's Immanence

God is first and foremost in charge of the universe. Because of His sovereignty, He has the right to rule the universe He made for His glory in the manner that pleases Him. God's omnipotence indicates that He can act; however, He pleases without being held responsible or accountable to anybody. This was confirmed by the Psalmist when he said that God lives in the skies and does whatever He pleases (Ps. 115:3). He also said that He works following His own will (Dan. 4:35). The idea of God's sovereignty also suggests that He is autonomous, not depending on any other entity or force than Himself (Acts 17:25). God is self-sufficient. He created the world out of His own volition (Rev. 4:11).[16]

The creation demonstrates God's omnipotence. The sovereignty of God is demonstrated in the book of Genesis story of creation, and throughout the Bible. Without seeking advice or requesting an architectural design from anyone, He produced what He desired and how He wanted it to be. The world was formed by Him alone; when He spoke, it materialized (Gen. 1:3). He decided to construct the universe in six days, with a day of rest. He produced a variety of species, including oversized, short, petite, tiny, crawling, walking, swimming, and flying. He put each creature in its appropriate habitat. He created people in His likeness and entrusted the guardianship of everything He had formed to them out of the sovereign will. He instructed Adam and Eve to refrain from eating fruit from the tree of the knowledge of good and evil (Gen. 2:16-17). His authority is also demonstrated in condemning and judging offenses (Gen. 3:14-15). He chose Abraham so that He might use him to create a powerful country (Gen. 12:2). He chose Joseph to maintain the nation He had created and carry out His purpose. He gave Moses a purpose: to free His people from slavery in Egypt. The Old and New Testaments reflect His preference for selecting people for particular roles and objectives. Everything that He does is for His benefit (Romans 8: 28).[17]

God is in charge of providence as well. He is in charge of all He has made, trying to make things happen the way He pleases. The sovereignty of God is manifestly global from the perspective of the Bible. It is unchangeable and unalterable. God's sovereignty is manifested in several ways, including the creation of the laws that govern all things, the determination of the nature and abilities of each created order, the placement of each creature in its suitable habitat, and the distribution of His favour. Although it is the sovereignty of "knowledge, holiness, and love," God's sovereignty is global and absolute.

Given that God is the author of all creation, it relies on God's omnipotent power for upkeep, sustenance, and preservation. God maintains the creation and continually rules over it in a sovereign manner. If God were to leave creation, it would cease to be.[18] God, who created the universe and the planet, is in charge of and controls every event. The ongoing execution of His divine will is necessary for the continued existence of creation.[19]

God maintains the world to establish His reign and bring creation back to life. This suggests that God interacts with His creation in a way that ensures the accomplishment of both His will and His purposes. According to Henry, nothing escapes God's intent and concern. God works out His plan not simply in life's generalities but in the details and intricacies.[20] This implies that God has a purpose for everything He has made and carries that purpose out following His will. Because He created the earth, God has dominion over it, and the earth is subject to His will. As noted by Packer, God nonetheless sustains the universe by managing its affairs even if He is separate from it and independent of it. This is because the universe depends on God for survival. After all, it cannot sustain itself.[21]

All things are sustained and preserved by God, who directs them to maintain and behave following their outward appearance. He makes creation reliant on Him alone for existence. In order to maintain the earth, God directs the stars in heaven (Job 38:32), causes the sun to rise (Ps. 104:10), and causes the grass to grow for people and animals (Job 38:12, Matt. 5:45). He looks after the field grasses and the avian population (Matt. 6:26, 18:29).[22] According to Berkouwer, God's divine nourishment is directly related to Him and is the source of all that exists in the world. God stills the storm, and the sea waves are quiet (Ps. 107:29).[23] According to Packer, God is actively involved in the creation and in redeeming actions. The world is shaped and controlled

[15] Francis Martin (ed), *Ancient Christian Commentary on Scriptures, New Testament, Acts* (Illinois: Inter-Vasity Press, 2012), 219.
[16] Charles Hodge, *Systematic Theology* (New Jersey: P&R Publishing, 1998), 162-163.
[17] Swindoll and Zuck, 172-173.
[18] G. C. Berkouwer, *The Providence of God* (Grand Rapids, Michigan: WM. B Eerdmans Publishing Company, 1952), 57.
[19] Andrew S. Kulikovsky, Creation, Preservation and Dominion: Part 1-God, humanity and the created order. *http://creation.com* accessed 21st November 2018.
[20] Carl F. H. Henry, *God's Revelation and Authority,* 6 vol. (Wheaton: Crossway, 1999), 457.
[21] Packer, 277.
[22] Ibid.
[23] Berkouwer, 60.

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in such a way by God's influence that the cosmos continues on its intended course.[24] The fact that God maintains the universe He created is quite apparent. The universe depends on God for survival because it cannot support itself. God is still with His creation, revealing and tending to it. He has never abandoned the earth to run its course on its own. Though separate from it, God is constantly present.[25] God has revealed His existence and might in nature through the immanence of His creation. In Isaiah 55:12, the trees clap their hands in worship as the hills and mountains praise God. According to Boyce, God's presence causes the planet to be filled with His essence. The infinite deity is exclusively, undividedly present at each point of creation and at every instant of time, filling the entire world, not just parts of it.[26] This implies that God is comparatively close to His creation. He resides in and beside His creation.

In order to make known His intent and purpose, He engages with and interacts with His creation at all times. The deistic viewpoint, which holds that "God is present in creation only by His force, not in His being or nature," stands in opposition to this one.[27] According to deism, the universe is governed by natural laws that God created and imbued with specific characteristics in His created beings before allowing them to fulfill their purposes. He made the universe to serve His purposes, to manifest His glory, and to carry out His will. He is present to reveal a specific facet of His grandeur, and the creation reflects God's majesty. Although separate from the world, God is immanent in it. He differs from the rest of the world. Everything is under His authority, and nothing takes place against His will. He will preserve and protect the creation that He has made to display His splendor. In order to properly care for the earth that the Creator has entrusted to them, humanity must consequently take the essential steps.

IV. Environmental Crises in Owerri-West L.G.A.

The threats that climate change poses to ecology are severe. There are unmistakable indications that environmental threats caused by climate change are on the rise and constantly work against Owerri's natural security. Most nations around the world are affected in terms of socioeconomic security. Today, dry spells, flooding, persistent droughts, and off-season rainfall are too typical. For instance, in Owerri-West, the effects of the environmental disaster may be felt everywhere due to the heat stress, lack of harmattan, irregular rainfall patterns, higher rains, gully erosion, flooding, and landslides. These risks have impacted agricultural lands, water and forest resources, settlement infrastructure, soil fertility, and other considerations.

Because God is present in all creation, Owerri residents West must protect the environment. This is so that God's beauty and splendor can be seen in His created world. God put people on the planet to take care of His creation and made it for His glory (Isa. 43:7). (Gen. 2:8). The preservation of creation is the preservation of God's honour. Ecological problems include flooding, deforestation, climate change, all types of pollution, and improper waste management; Owerri-west, one of Imo State's most populated places, needs to step up to the plate and take care of God's creation. This would be accomplished by informing the residents of Owerri-West of the importance of protecting God's creation. People in Owerri-West should also be aware that God created humans and other animals to live on the land. God gave humans and other animals the world as a place to live. Humans are assigned the duty to take care of creation since they are the pinnacle of God's creation and were made in his likeness (Ps. 8). Humans are therefore not to see themselves as Lord over creation but to have a sense of responsible stewardship for the care of creation.

V. Exegetical Analysis of the Passage (Gen 1:1-2)

a) *The Summary of the Book of Genesis*

In terms of prominence in announcing or confessing "the will and mind of God," the book of Genesis is unsurpassed. The entire body of the canonical scriptures' literary and theological foundation is presented. Without Genesis, the Bible would lack a solid foundation and could not exist. In other words, Genesis serves as the cornerstone for the entire Bible. The Greek term used for the book of Genesis can be translated as "source" or "generation," but the original Hebrew title is simply בְּרֵאשִׁית, which means "in the beginning" and is the first word in the book.

This book of introduction lays out at the outset what people learn, observe, and confirm across the entire body of Holy writing. The book of creation and blessing contains a microcosm of what is said about God, human nature, the world, and salvation history. There is "nothing new under the sun," according to the precursory light of Genesis, yet those volumes do not identify, confirm, or clarify facts that can be explained.[28]

In a technical sense, the author of the book was unknown. However, the consensus among Jews and early Christians is that Moses wrote the first five books

[24] Packer, 276-277.
[25] Geister, 527.
[26] Boyce, *Abstract on Systematic Theology,* pdf.
[27] The belief that God exists and is a transcendent being who created the cosmos was known as deism, which emerged due to the Enlightenment in the 17th and 18th centuries. He has nothing to do with creation and is far from it. Gyang D. Pam, *A Compendium of Theology* (Jos: mSele Printing and Publishing House, 2012), 306.

[28] Kenneth A. Mathias,*The New American Commentary*, vol.1, Genesis 1-11:26 (Nashville: Broadman and Holman, 1996).

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of the Bible, collectively known as the Torah (Hebrew) and Pentateuch (Greek), or the law (English). In other terms, Moses is said to have written the book. Although they do not dispute Mosaic authorship, most contemporary authors attribute the Torah, including Genesis, to the sources J, E, D, and P. The writing of Genesis dates to around 1445 BCE.[29]

b) The Text of the Passage

Hebrew Text of Genesis 1:1-2

1 בְּרֵאשִׁית בָּרָא אֱלֹהִים אֵת הַשָּׁמַיִם וְאֵת הָאָרֶץ

2 וְהָאָרֶץ הָיְתָה תֹהוּ וָבֹהוּ וְחֹשֶׁךְ עַל פְּנֵי תְהוֹם וְרוּחַ אֱלֹהִים מְרַחֶפֶת עַל פְּנֵי הַמָּיִם

English Translation of Genesis 1:1-2

1. In the beginning God created the heavens and the earth.
2. Now the earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over the waters.

c) Interpretation of the Passage/Words Analysis

1) *In the Beginning (1:1a):* The phrase "in the beginning" (בְּרֵאשִׁית) announces a new beginning while also hinting at the "end" of the cosmos and human history. In the Old Testament, "beginning" (*résit*) and its antonym "end" (*'acharit*) are frequently used to denote an inclusive period (Job 8:7; 42:12; Eccl 7:8; Isa 46:10).[30] "Beginning" (*ré'sit*) appears in 1:1, which shows that it was chosen because of its relationship to "end" *('acharit*). If this is the case, the author has already established that the "beginnings" of creation were started with an eschatological purpose in mind. As a result, the apostles and prophets might refer to the new heavens and earth as the beginning of the end (Isa. 65:17; Rev. 21:1). The text states that God, who is Sovereign, understands and is in control of the "end from the beginning" at the beginning of the creation account (Isa 46:10).[31]

2) *God Created…(1:1b):* The word "created" (bara') is frequently used in the Old Testament to describe a new activity. With the prior "in the beginning," it creates a good play because the first three letters are the same: br'sytbr'. The term's derivation is contested and of little use, but because it occurs so frequently in the Old Testament, we can define its meaning reasonably. The word's defining characteristic is that God is always its subject. As a result, it suggests that a unique task carried out by a deity alone results in something fresh or renewed. Bara' refers to the finished item rather than the substance used to make it. Because of these factors, commentators have usually understood the word as a technical term for creatio ex nihilo (literary "creation out of nothing"). It is sometimes contrasted with the verb 'asa, which means "to make" or "do," and which may have human action as its subject (as well as divine). Asa is specifically utilized when "creating" with preexisting materials. -' Therefore, "asa" can describe human action in which preexisting material is altered, while "bara" is only used to describe God's activity in which preexisting material is not there.[32]

The word "created" appears twenty times in Isaiah (chapters 40–66), where the prophet identifies Israel's God as the actual Creator and Lord of history. Isaiah praised Yahweh as the Creator who acts in history, creating Israel for himself (42:5; 43:1,7,15) and carrying out a "new thing" by delivering his people in the backdrop of Babylon's religious practices of astrology and idolatry (Isa. 40:26; 43:15-19; 48:6-8). Consequently, God starts history at creation and continues to "create" history through his absolute sovereignty over all peoples. God is the Creator of everything that exists; thus, he is prior to it, separate from it, and yet intimately associated with it. In ancient Near Eastern mythology, the powers of land and water were controlled by gods, who were numerous in heaven. Israel claims that the universe is nothing more than a creature, in contrast to the earlier mythology, which did not adequately distinguish between the Maker and the creation. This view liberated the sky and the earth from superstition and gave modern science its ideological foundation. The phrase "the heavens and the earth" refers to the entirety of the cosmos.[33]

3) *"Now the Earth" (1:2a):* Before it is altered to become a fit home for human life, the "earth" is initially described in its pure state at the beginning of creation. The description is from the terrestrial viewpoint of a human seeing the transformation throughout the six "days" of creation. Additionally, in verse 1, the words "earth" and "heavens" together allude to the universe, while the word "*erets"* is used in verse 2 to imply the "land" of Israel's abode. "*erets*" denotes "land," which typically refers to a territorial holding. The themes of "land" and "blessing," first mentioned in 1:1-2:3, are recurrent themes throughout the patriarchal narratives and Pentateuch. The country was God's excellent gift to Israel, which he had prepared for their possession. God's good "land/earth" was prepared via creation

[29] *Holman Illustrated Pocket Bible Handbook* (Pocket Reference Edition (Nashville, Holman Bible Publisher, 2004).

[30] Kenneth A. Mathews, *The American Commentary,* Vol. 1A (USA: Broadman and Holman Publisher, 1996), 126.

[31] David Atkinson, *The Message of Genesis 1-11* (Leicester: Inter-Vasity Press, 1990), 26.

[32] H. D. M Spence and Joseph S. Excell, *The Pulpit Commentary, Vol. 1, Genesis – Exodus* (Peabody, Massachusetts: Hendrickson Publishers, 2011), 356.

[33] Mathews, 135.

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for man to enjoy (1:10,12,31) and for Israel to possess.

According to Matthew, verse 2's three parallel clauses explain the earth's initial conditions:

"Now the earth was formless and empty (*tohuwabohu*)."
"The surface of the deep was covered in darkness" (*téhom*)
"The Spirit of God was over the waves" (*mayim*).

The term "*tohuwabohu*" has been interpreted by some as a negative emptiness, a dark abyss, similar to the Greek concept of primordial chaos, or, alternately, as a disorganized mass, a sort of watery mass that opposes creation. The LXX's use of the words "unseen" and "unformed" may have contributed to the current notion of "chaos" as an indistinct mass or empty nonentity. It turns out that *tohuandbohu* refers to an "empty" and "wasteland" land. *Bohu* is only found in *tohuwabohu*, where it appears in Jeremiah 4:23 and 1:2. Isaiah 34:11 also uses the phrases in parallel. The meaning of *tohu* is all left to help one understand the couplet's meaning since the word's etymology is still a mystery.[34]

Although *tohu's* derivation is likewise ambiguous, the word appears enough (20 times) in the Old Testament to give away its meaning. It carries a sense of futility and nonexistence and refers to unproductive, desolate land. In the Song of Moses (Deut 32:10), it is encountered once more in the Pentateuch, where *tohu* mirrors "desert" (*midbar*), denoting a "desert place." The next verse of the Song (32:11) compares God to an eagle that "hovers" over its young and uses the same word "hover" (*rchp*) that appears in Gen 1:2. Deuteronomy 32:10–11 is likely a deliberate repeat of Genesis 1:2 because the word "*rchp*" only appears in one other place, where it means "tremble." Moses' Song recounts how God provided for and cared for his people throughout their desert trip, where they would not have survived without him (32:10-14). In Genesis 1, the word *tohuwabohu* has the same meaning, describing the earth as uninhabitable and hostile to human life. Despite the dangerous desert, God preserves and develops Israel during its trying times. Similar to how the world could not support terrestrial life as it existed, God, whose "Spirit" controlled it, was unaffected by this fact. *Tohu* did not interfere with God's objectives because "he did not form it (earth) to be *tohu* (inhabited)" (Isa 45:18; cf. Job 26:7). Additionally, "hovering" (*rchp)* carries a hint of motion. The movement of God's "Spirit" suggests that the forces for change that are creative begin when God is present.

The couplet *tohuwabohu* also appears once other than in 1:2 of the book of Jeremiah. The prophet's account of Judah's destruction at the hands of God's wrath serves as its background. Similarly, Isaiah 34:11 predicts divine judgment over Edom and uses both phrases (in parallel lines). The creation language of Genesis 1 is strongly reflected in Jeremiah 4:23–26, and the prophecy has traditionally been interpreted as a figurative "reversal" of creation that results in primordial "chaos." As a result of God's judgment, Judah would be "uncreated," according to Jeremiah. Jeremiah announced that the "land" of Judah would turn into a "desolate" location, much as the "earth" (*'erets*) was before it was created, that is, a land lifeless without the blessing of God, rather than a primordial "chaos." The subsequent oracle (Jer. 4:27–29), which states that the "whole land (*kol-ha'erets*) will be devastated," explains this. Isaiah 34:11 similarly depicts Edom as "desolate" (*tohu*) and "empty" (*bohu*), a land that is unsuited for habitation and so devoid of life, save for that of the desert fowl.

Furthermore, we are not required to infer from the prophets' usage of *tohuwabohu* that the earth in 1:2, as a first creation, is under God's wrath.[35] Instead, Jeremiah used creation imagery to declare that God would destroy the country. God placed Judah in the land alive and prosperous, just as God made the earth habitable and alive. However, God would drive out Judah's inhabitants in his fury, making the region as dark and lifeless as the world at its creation, with no birds flying above.[36]

4) *"Darkness was over the surface of the deep…"(1:2b):* "over the surface of the deep" is analogous to the following clause's phrase "over the waves." It is best to view the "depth" (*tehom*) as a component of the "earth" *('erets*) rather than a separate entity. These waters gradually separated from the expanse and land masses on the second and third days, referred to as "seas" (Vv. 6-10). Deep may refer to "depth" (Ps 71:20), underground oceans (Gen 7:11; 8:2), or seas, which are frequently seen in parallel with "water/waters" (*yam*/*mayim*). Genesis describes the waters merely as what they are, God's creations under his supervision.[37]

5) *"The Spirit of God was hovering over the waters…" (1:2c):* God's "Spirit (*ruach)* was hovering" over the planet, governing it and preparing it for the creative word that would come next. Only the "Spirit" is alive and moving, while the inert elements of the lifeless earth are still waiting for their order. This text, *ruach,* may refer to either a spirit or a breeze. Although

[34] Thomas Hale, *The Applied Old Testament Commentary* (Great Britain: David C, Cook, 2007) 239.

[35] Samuel Rolles Driver and George Bughanan Gray,*A Critical and Exegetical Commentary on the Book of Job* (Edinburgh: T & T lark, 1921), 283.

[36] Ibid.

[37] Philip W. Comfort, *Cornerstone Bible Commentary: Isaiah, Jeremiah and Lamentation* (Tyndale House Publishers, Inc. Illinois, 2005), 418.

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traditionally translated as "Spirit," denoting the heavenly Spirit, "wind" is another potential reading that lexically makes sense and also fits the context of verse 2. (cf. 8: 1).[38] Another critical issue centers on whether *ruach* or God's Spirit, is a person or an impersonal force acting under God's authority. Due to its apparent allusion to 2:7, Job 33:4 is not helpful; however, Psalm 104:30 resonates with a unique interpretation ("your Spirit"). Psalm 104:30 shows that the poet confirmed God's Spirit's personal participation in the creation.

However, because of Israel's experience at the Red Sea, where God sent a mighty "wind" to separate the waters and free Israel from the Egyptians, the Mosaic society may have regarded *ruach* as having a dual meaning, with "wind" serving as the prototype of the "Spirit" (Exod. 14:21; 15:10; cp. Exod. 10:19; Num. 11:31). Since God was also at work in creation, where his "wind" (1:2) encircled the mighty waters of the earth as he prepared to convert them, they understood that God was also their God of salvation. The "wind" (*ruach*) in the flood story also blows across the "earth" (*'erets)* under God's command, taming the floodwaters (8:1a), ready for the return of the dry earth-creation anew. The Hebrews could understand the idea, whether it is translated as "wind" or "Spirit": God was sovereignly overseeing the state of the planet and paving the way for his creative word. The divine presence ensures the earth's continued existence "by the covert efficacy of the Spirit" despite its vulnerable position and static state, making it ready for God's activity to make it productive and bloom with beauty and life.

Despite its vulnerable position and static state, the divine presence secures the earth's continuous existence "by the covert effectiveness of the Spirit," preparing it for God's activity to make it productive and bloom with beauty and life. There is no reason to worry that deified entities, like runaway prisoners, are wreaking havoc on the environment and civilization throughout the universe. According to the biblical account of creation, the barren land is turned productive by the almighty royal word, which gives and ensures productivity and life.

VI. Implications for Rectification of Environmental Crises in Owerri West LGA

4.1 God Will Require Accountability from Humankind In Their Care Of The Universe/Earth. The People of Owerri-West have a duty to protect the environment because God is interested in how the environment is treated and because God is immanent in His creation. (Deut. 23:12-14). According to Ajibade, God anticipates that people will make an effort to ensure the environment's cleanliness. This is so because a clean atmosphere suggests a reverent attitude.[39] They are in the environment to worship, praise God, and take care of the ecosystem. In a significant part, human survival is reliant on environmental preservation. Protecting the environment is also protecting human lives. The residents of Owerri-West will be healthy if the environment is. As a result, they are accountable to the environment. Additionally, God has provided them with the world as a place to live and a source of livelihood. Humans are to benefit from the earth's bounty as they take care of it, as it is meant to be a blessing for both them and the rest of creation. This God-given vocation must be carried out with a sense of duty to the environment.

4.2 God Assigned Care of the Universe/ Earth/Environment to Humankind (Gen. 1:2). Humans were put in the Garden of Eden in Genesis 2:15 "to tend it and care for it." This order comes across as being protective rather than exploitative. It implies that everything in creation must be worked at and that people were made to be labourers. It is not necessary to destroy the earth in order to use it. It must be cared for with the understanding that God is its Owner and that people are the earth's stewards. As a result, acts that are contrary to the preservation of the earth, such as deforestation, incorrect waste disposal, unhealthy farming methods, indiscriminate bush and tree cutting, and pollution in all its forms, should be avoided because they lead to environmental deterioration. Additionally, God designed everything with a purpose in mind. Everything in God's creation has a function and is valuable in and of itself. These principles demand that nothing in God's creation under human control be destroyed. Humans owe it to the rest of creation to respect all living things, mindful that God is the one who created, sustains, and provides for all living things, including nonhumans. Humans must live within their means, conserving and preserving resources by exerting self-control and living modestly.[40]

4.3 Realization that God is Present/Immanent in His Universe (Gen. 1:2). God is active and present throughout the entire creative process. He is deeply interested in the world he has made and has

[38] Buist M. Fanning, "Word", in Desmond Alexander and Brian S. Rosner (eds.), *A Dictionary of Biblical Theology* (Leicester, England: Inter Varsity Press, 2000), 852-853.

[39] Ezekiel A. Ajibade, *The Culture of Environmental Care and Sustainability*, (An Environmental Discourse presented to the NBTS community on 24th October 2018), 2.

[40] Steven Bouma-Prediger, *For the Beauty of the Earth* (Grand Rapids, Michigan: Baker Academic, 2010), 153.

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complete control over it. He never abandoned the planet after creating it. God is immanent in and through creation. Without God, there is no creation. The planet's complexity reflects and shows God's splendor, strength, might, and divine essence (Psalm 19:1). (Romans 1:20). Additionally, the continued life of creation is entirely dependent upon the sustaining will and strength of God. A close examination of creation reveals its order, purpose, and design. The precise organization of the various stages of creative activity in Genesis 1 demonstrates order. The design may be recognized in the beautiful and original structure of the world. The utility of what God has created reveals its purpose. Everything was created for God's glory; nothing is meaningless (Isaiah 43: 7), everything has a function.

4.4 Human Being Owe God's Appreciation for Creating the Universe/Earth. Additionally, the creation shows how God manifests himself in it. The heavens display God's majesty, and the skies declare his creative efforts in plain sight. They speak out every day, and every night they share their wisdom. Every language and dialect can hear them. Their voice is audible worldwide, even at the farthest reaches (Psalm 19: 1-4, N.I.V.). God declared everything he created good (Genesis 1:4, 10, 12, 18, 25, 31). He also described it as precious and holy (Exodus 3:5). He handed authority over the earth to man and woman when he created them. God blessed them and gave them the mandate to multiply and populate the land, as well as to exercise dominion over all other living things, including fish in the sea, birds in the sky, and other animals (Genesis 1: 28). Humans have regenerated, multiplied, and ruled over the earth ever since they were first created. God is intimately present and active in his creation; therefore, this charge to rule is to be a steward of it.

4.5 Acknowledge that God is the Maker and the Universe/Earth/Environment Owner. God made them prosperous and gave them the command to populate the earth and to reproduce, as well as to rule over all other living creatures, such as fish in the water, birds in the sky, and other animals (Genesis 1: 28). Since the beginning of time, humans have grown, proliferated, and dominated over the planet. Man must obey this mandate by eating fruits, herbs, and animal flesh. This mandate to reign is to steward God's creation, which is profoundly present and active.[41] The history of life's beginning is clearly described in the Bible. Only the book of Genesis provides a vivid narrative of creation, although there are many theories about the origin of life, such as Darwin's Big Bang Theory. According to Darwin's idea, a "whirling mass of material" expanded by drawing in nearby solid objects, possibly minor planets. The earth's size changed, which increased gravity and produced heat from a compressed inner core.[42] This idea in no way explains the origin of the mass of substances or the creation of other solid particles. A being must have been behind its creation because this swirling mass of matter did not arise by accident.

The creation story found in the Bible details the process of creation and identifies God as the universe's Creator. The Bible explains the cosmos as the creation of God, who spoke into existence out of nothing that had never existed in any shape or form before.[43] As declared by Ojo, "The world was created; it did not evolve."[44] This is seen through the manifestation of God's power and will in bringing all things into existence.[45] God is the ungenerated, initial cause of the existence, continuation, and destiny of all creatures, according to Oden. According to Swinburne, who agrees with Oden, the assertion that there is a single person who is the source of all things must be understood with the qualifier "apart from himself" or, more specifically, "separate from whatever the existence of which is implied by his existence."[46] Every created object owes its life and existence to God, the wellspring of all creation.

VII. Conclusion

Three things are offered in this piece. First, it serves as a reminder that the locals must take a far more active part if Owerri-West Local Government Area is to build any defense against environmental crises. This is because faith is also required by physics and chemistry and is the most significant challenge to social justice the world has ever faced. Second, practical biblical interpretation and a wealth of real-world knowledge about what each individual and collective effort can and should accomplish form the foundation of defense against environmental calamity. Thirdly, as the most pertinent of reminders, this article is primarily written from a biblical perspective on this crucial problem. It has imparted valuable knowledge about how humans fit into the larger scheme of things and the roles played by the environment and animals. Particular

[41] Albert M. Wolters, *Creation Regained* (Grand Rapids, William B. Eerdmans Publishing Company, 1985), 13.

[42] Cora A. Reno, *Evolution, Fact or Theory?* (Chicago: Moody Press, 1952), 91.

[43] Henry M. Morris, (ed), *Scientific Creationism* (California, Creation-Life Publishers, 1976), 206.

[44] John A. Ojo, "God, Man and the Creation," in *Jounal of Creation and Environmental Care,* Vol. 3, 2016, 148.

[45] Wayne Fair and P. Williams Davis, *The Case for Creation* (Chicago: Moody Press, 1972), 80-81.

[46] Richard Swinburne, *The Coherence of Theism* (Oxford: Clarendon Press, 1977), 126.

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residents of the Owerri-West Local Government Area are guilty of taking their privileged status as God's children for granted. Even worse, they frequently misuse their position by utilizing it for their gain.

The article concludes by offering recommendations for raising life quality. Among these is the education of ecological norms to the residents of Owerri-West. However, in a time like this, when the populace's well-being is sacrificed for minority interest, Owerri-West intellectuals have to act as the leader and conscience of communities. Therefore, efforts must be made to stop environmental contamination by Christian faith communities and other interests. Solidarity can assist the populace in managing the world's environment in a spirit of responsibility and collaboration with God in managing the creation that he has provided for people in the face of humanity's careless and irresponsible activities against God's creation. It is crucial to motivate people to estimate their carbon footprints and take action to lower them. The purpose of environmental protection is to promote the health and welfare of people as well as the other creatures of nature and their environments.

VIII. Recommendations

The following suggestions are made to encourage Owerri-West to feel committed to the mission of addressing the environmental catastrophe in light of the research findings as stated above from the review of the biblical exegesis of the presence or immanence of God in nature and care:

- In the past, Owerri-West Local Government Area residents took part in various initiatives to lessen suffering and encourage more sustainable living. They should focus on the religious implications of environmental issues this time.
- The Church should develop a biblical theology of ecological protection with which they can inform people through public education that the earth is the theatre of God's grace and that, as a result, since humanity is a part of creation, they must also be actors in this theatre of grace because they are among the recipients of this grace. They are also called to exhibit this grace in and towards creation by protecting and maintaining the environment. Government at all levels should ensure that policies to combat climate change are balanced with those to reduce poverty, create jobs, and build infrastructure, which will necessitate investigating connections between trade and finance policies.
- Traditional leaders in Owerri-West can also set up the required systems to ensure that cash donated by governments or other organizations reaches those who are negatively impacted by climate change and are not diverted elsewhere.
- In terms of establishing public education programs on climate change to inform rural and urban inhabitants of the adverse effects of climate change, Christian organizations like the Christian Association of Nigeria (CAN) can play a significant role. They can educate the populace on what can be done to reduce or remove the risk that climate change poses to property and human life. In other words, Christians should actively educate the populace about coping mechanisms for the effects of climate change.
- It is advised that to accomplish this, laws against environmental degradation and other environmental vices resulting from the practice of religion should be passed and enforced by the government at all levels. Educational institutions at all levels are also advised to adopt and integrate eco-ethical studies into their curricula.
- As a religious organization, the Nigerian Inter-Religious Council (NIREC) should urgently guarantee that all government policies regarding the practice of religion within the context of sustainable ecosystems are implemented positively.
- Finally, since religious beliefs are at the root of environmental issues, religion is necessary to find a solution. Humans must therefore employ their many religions to protect and sustain the environment because they are creative beings.

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We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

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Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

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Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for writing a good quality Social Science Research Paper

Techniques for writing a good quality homan social science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of homan social science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

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To make a paper clear: Adhere to recommended page limits.



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- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

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Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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