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RESEARCH PAPER

Socio-Economic Impacts of Climate Change on the Coastal Areas of Balochistan

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ABSTRACT

This study investigates the adverse effects of climate change on Balochistan's coastal area, focusing on rising temperatures, sea-level elevation, and increased pollution as major issues. Following a combination qualitative and quantitative methodologies to establish the relationship between human activities and climate change, exposing increased hazards of flooding, erosion, and economic disruptions. Besides, SPSS software was used to analyze the gathered data. Urgent efforts are recommended, such as lowering greenhouse gas emissions, shifting to renewable energy, and strengthening disaster management. Balochistan's sensitivity to climate change and the need for governmental actions to protect ecosystems and promote sustainable development. Given Balochistan's strategic importance in national programs including Gwadar Port and CPEC, tackling climate change becomes critical for long-term development and strategic aims.

KEYWORDS: Adaptation, Balochistan, Climate Change, Coastal Region, Disaster Management, Impacts, Mitigation, Sustainable Development

Introduction

Global climate change, which has effects on the environment and society's economy, provides humanity with a unique challenge in the twenty-first century (Dietz et al., 2020). A few of the terrible consequences of climate change, particularly is brought on by the activities of humans, include heatwaves, rising temperatures, disasters, elevated sea levels, and melted ice sheets (Turi et al., 2022). Also contributing to erratic weather conditions, melting of glaciers, and rising sea levels are changes in humidity, patterns of rainfall, levels of moisture, and air pressure (Abbass et al., 2022; Lipczynska-Kochany, 2018). In addition, the delicate interplay between climate and oceans impacts weather patterns, with industrialization changing ocean dynamics and temperatures since the 1950s (Degroot et al., 2022). Besides rising sea levels endanger nearly 600 million people living in low-lying coastal zones worldwide (Ehsan et al., 2019). Jevrejeva et al. (2018) estimate that unregulated coastal flooding would cause yearly economic losses of up to $14 trillion by 2100. While rising sea levels cause floods, climate-ocean dynamics worsen coastal erosion, harming densely populated, low-lying places (Vousdoukas et al., 2020). This increases susceptibility and increases the threat of hurricanes and cyclones, increasing the likelihood of flooding and erosion (Paranunzio et al., 2022; Flayou et al., 2021).

The South Asian region, specifically Pakistan, faces a severe and escalating crisis due to climate change. This area is particularly susceptible to the impacts of climate change, yet there is a lack of understanding and awareness about the issue and strategies

for adaptation (Noor et al., 2023). As a result, Pakistan's ecosystem, biodiversity, and oceans are constantly under threat from the ongoing climate crisis. . Climate change is having a more pronounced effect in Pakistan, particularly on the Coastline of Baluchistan, and there are concerns that the consequences will worsen over time. Baluchistan, one of the five provinces of Pakistan, covers a vast area of approximately 347,220 square kilometers, which makes up almost 43% of the country's total land area (Ullah et al., 2022). Climate change can impact the biggest initiative of Pakistan Gwadar coast entitled as China Pakistan Economic Corridor (CPEC) which has the tendency to boost the economic condition of Pakistan and GDP in a higher level with its new project of energy and global trade system (Muzaffar, Karamat, & Saeed, 2018; Anwar et al., 2022). Furthermore, the climate in this region has played a crucial role in shaping the rich area of the biodiversity of fauna and flora, which has allowed the people to survive and thrive despite the challenging landscape of the region. The coastal line of Baluchistan is known for its relatively flat coastal surface, enormous population density, and significant economic pollution (Chaudhry, 2017).

Literature Review

Pakistan, especially in the South Asian region, is grappling with growing climate-induced catastrophes affecting ecosystems, biodiversity, and oceans, with few adaption mechanisms (Noor et al., 2023). Unfortunately, Pakistan ranks eighth among nations most affected by climate change, owing to its physical proximity to the world's seas (Ullah et al., 2023; UNDRR, 2019). Moreover, temperature increases, with winter warming surpassing summer warming, have risen by 0.6°C over the previous century, owing to global climate change (Shahzad et al., 2022). Baluchistan, which has a key 770-kilometer coastline, faces undeveloped coastal regions as well as climate-induced stresses (Waldmüller et al., 2019; Khan et al., 2021). The province's arid and semi-dry climate, impacted by a variety of causes, underscores the coastal towns' reliance on marine resources, agriculture, and tourism (Ullah et al., 2022; Naz et al., 2020). Further, the continued neglect of Baluchistan's shoreline emphasizes the importance of extensive investigation and action. Among these obstacles, the China-Pakistan Economic Corridor (CPEC) faces increased climate-related hazards, putting its economic potential at risk (Muzaffar, Khan, & Yaseen, 2021; Anwar et al., 2022). Rising sea levels cause coastline erosion, which worsens coastal flooding and saltwater intrusion and has a negative impact on agricultural and freshwater supplies. Furthermore, coastal populations that rely on fishing and agriculture face dangers from diminishing stocks and crop yields. According to the research by World Wide Fund (WWF) Pakistan, changes in climate had resulted in a 1.1 millimeter increase in the sea level annually along with a nationwide average rise in temperatures by 0.12 °C yearly. According to the report by The Express Tribune (2017), Over 10% of Pakistan's population is living in the areas near coast zones while 20% of Pakistan's coastal areas have been substantially developed and around 40% of the industries are relatively located near or on the coasts (Rabbani, Inam, and Rashid Tabrez, 2008). The climate change condition has been influencing negatively as well as positively the coastal communities of Pakistan. The population living near the coastal areas has been facing several issues due to the change in climatic conditions. In the case of Balochistan, it has been recognized that the temperature factor is one that impacts the livelihood of the local communities living near the coastal area. A research study by Abbas et al. (2018) has been carried out to identify the temperature extremes for 36 years in 4 cities of Balochistan in order to see the climate changes. The research study revealed that the temperature extremes during this period had shown statistically substantial modifications in the historic patterns illustrating a better portrayal of global warming in the areas. The index level for precipitation extremes showed substantial and non-substantial outcomes illustrating unsymmetrical dry spells in the area (Abbas et al., 2018).

Understanding the effects of climate change on Baluchistan's coastal areas is critical. The purpose of this research is to analyze these consequences, assess policy efficacy, and suggest resilience strategies (Naz et al., 2020). Besides, it aims to close knowledge gaps in Baluchistan about climate-ocean dynamics, directing stakeholders and policymakers toward comprehensive climate resilience methods that protect ecosystems, communities, and economies.

Materials and Methods

The goal of the research methodology for this study was to assess the socioeconomic effects of climate change on the coastal regions of Balochistan in great detail. For this purpose, data collecting, sample methods, data analysis, and ethical considerations were all included in the methodology. The logical consistency of the study approach was supported by the research design. For this a quantitative study approach was adopted. In order to measure how people in the coastal regions of Balochistan perceive climate change. This strategy was chosen based on the connection of the study's objectives with the research challenge. Moreover, to gather both quantitative and qualitative data, a structured questionnaire was created and given to participants. Besides, three key elements make up the questionnaire: demographic data, experiences with and viewpoints on climate change, and particular inquiries regarding coastal erosion and recommendations.

Furthermore, non-probability sampling was used to select 200 participants from Balochistan's coastline line. This sampling strategy was chosen for its practicality and effectiveness in getting data from those who have direct experience with the impacts of climate change. The chosen participants came from a variety of backgrounds, ages, and occupations, offering a broad viewpoint on the topic under study. In addition to this, a questionnaire survey was used to acquire primary data. Whereas, the questionnaire, which included both closed-ended and open-ended questions, was created utilizing online tools. The survey was sent out electronically to those who live along Balochistan's coastal line. As well, the questionnaire aimed to ascertain participants' attitudes toward climate change and its socioeconomic impacts. Besides, SPSS software was used to analyze the gathered data. The techniques of correlational and regression analysis were used in combination. The amount of link between variables was assessed in correlational analysis, whereas regression analysis established the significance and influence of variables. This mixed-method study provided a thorough knowledge of the links and factors at work. Throughout the investigation, ethical considerations were strictly adhered to. For this participants were given detailed information about the study, its goals, and their responsibilities. Informed permission was acquired, ensuring that participants understood their right to withdraw at any time. By anonymizing participant information and removing personal identifiers from the data, confidentiality was preserved. Thus this study used a mixed-method approach to investigate the socioeconomic implications of climate change on Balochistan's coastal districts. The technique used a structured questionnaire, non-probability sampling, and advanced statistical analysis to offer trustworthy and relevant insights into the study issue while adhering to ethical norms.

Results and Discussion

The current section presents the study's results with a focus on the local effects of sea level rise, heat waves, and coastal erosion on coastal inhabitants in Balochistan, Pakistan. Data from a survey conducted using questionnaires of 200 persons in coastal communities including Gwadar, Gadani, and Sonmiani served as the basis for this study. The data was evaluated and analysis was done using SPSS. Each climate component was evaluated independently, revealing the coastal populations' opinions and concerns. The study examined the regional impacts of climate change, such as floods and droughts, as well as their socioeconomic ramifications. Certain districts, such as Loralai, Mashtung, and

Pishin, have considerable drought, but Nushki and Lasbella have milder types. Moreover, food insecurity, agricultural and animal losses, groundwater depletion, starvation, increased criminality, and forced land sales are all repercussions of drought. Besides, climate change has increased the social vulnerability of vulnerable communities in non-industrial nations. This study emphasized the significance of improved policies to improve the welfare of society's most vulnerable members while controlling environmental dangers. Additionally, research was done on how coastal settlements might be affected by sea level rise (see Table 1). The survey's results show that 28.5% of participants were concerned of how climate change would affect their coastal regions over the next 20 years. Prospective hazards were also mentioned as a source of concern by participants, with 37% citing sea level rise, 35% naming coastal erosion, and 28% indicating changing climate as major issues. In addition, respondents expected sea levels to increase, hurting developed beach areas (27%), as well as shorelines (21.5%). The vast majority of participants (80%) agreed that sea levels were increasing as a result of climate change.

Table 1
The Influence of Sea Level Rise on Coastal Settlements

Sea level rise and climate change	Frequency	Percent
It isn't a problem for the coast	59	29.4
It's occurring so slowly that it's not really a problem in at the moment	40	19.9
It's already having negative impacts on the coast	53	26.4
It will definitely have an effect on the coast within the next 50 years	48	23.9
Total	**200**	**99.5**

Moreover, the research examined how coastal communities' perceived erosion presented in table 2. However, the survey found that 50% of respondents had experienced direct harm or lost property as a consequence of coastal erosion, whether from land loss or storm waves. There were mixed expectations for the frequency of future coastal erosion, with 21.5% anticipating a rise in frequency, 20.5% anticipating no change, and 18.5% anticipating a decrease. Furthermore, there were both positive and negative reactions to the government's efforts to address climate change issues. Though, concerns about storms and their catastrophic potential were evident, with many participants believing that future storms will be more devastating as a result of climate change.

Table 2
Coastal communities perceived erosion

Direct damage or loss to your property	**Frequency**	**Percent**
Coastal erosion due to loss of land	100	49.8
Coastal erosion by storm waves	100	49.8
Total	200	99.5
Coastal erosion occurrence	**Frequency**	**Percent**
Increase	43	21.4
Stay about the same	41	20.4
Decrease	37	18.4
Don't know	36	17.9
Coastal erosion has decreased, stayed about the same	**Frequency**	**Percent**
Increase	153	76.1
Stay about the same	18	9
Decrease	15	7.5
Don't know	14	7
Total	200	99.5
the government role in prevention people living near a coast	**Frequency**	**Percent**
Strongly disagree	44	21.9

Disagree	40	19.9
Neither agree/disagree	40	19.9
Agree	36	17.9
Strongly agree	40	19.9
Total	**200**	**99.5**

This survey raised concerns about the occurrence of storms and their future impact, with around 100 participants believing that future storms will be more severe as a result of climate change (presented in table 3). According to the findings, the perception of powerful coastal storms varied, with 17.5% expecting persistent unfavourable effects and 15.5% expecting repercussions within the next 50 years. Respondents were doubtful about whether or not heat waves will occur. Furthermore, a sizable proportion of participants expressed anxiety about the frequency of severe storms in the next five years.

Table 3
Occurrence of Storms and their Future Impact

Futuristic perception of storms like this will be	**Frequency**	**Percent**
More damaging	44	21.9
About the same	56	27.9
Less damaging	51	25.4
Don't know	49	24.4
Total	200	99.5
Severe Coastal Storms	**Frequency**	**Percent**
It isn't a problem for the coast	53	26.4
It's occurring so slowly that it is not really a problem in the moment	40	19.9
It is already having negative impacts on the coast	35	17.4
It will definitely have an effect on the coast within the next 50 years	31	15.4
Other	41	20.4
Total	200	99.5
Heat Waves	**Frequency**	**Percent**
It’s not happening	44	21.9
It is happening	36	17.9
Unsure	41	20.4
No opinion	43	21.4
Unknown	36	17.9
Total	200	99.5

However, to analyze the distribution and variability of factors associated with climate change perception, descriptive statistics were used (see table 3). The mean values represented the participants' perspectives on various climatic aspects. Also, the greatest mean was linked to the 'Tropics' climate component, while the lowest mean was linked to 'Climate Change.' However, the model's overall prediction was low, with just 4% of the variance in coastal area effects explained by the analyzed climatic parameters.

Table 4
Descriptive Statistics

Climatic Factors	**Min**	**Max**	**Mean**	**Std. Deviation**
Sea level rise	1	4.75	2.985	0.75048
Climate induced damages	1.5	4.5	3.0	0.5
Coastal erosion	1.5	4.5	3.0	0.6
Climate change	1.4	4.6	2.964	0.6409

Coastal inundation	1.3	4.3	3.0	0.6
Trust	1.2	4.8	3.006	0.6296
Tropics	**1**	**5**	**3.015**	**0.813**

Likewise, regression analysis revealed links between climate factors and their effects on coastal regions (see table 4). Climate change and climate-related impacts exhibited a statistically significant inverse connection (sig = 0.038). On the contrary hand, there was certainly no statistically significant link between coastal erosion and climate-induced changes (sig = 0.407), and there was no correlation among sea level rise and climate-induced impacts.

Table 5
Regression Analysis

Coefficients					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	t	Sig.
	B	Std. Erroı	Beta		
(Constant)	3.736	0.285		13.125	0
Sea level rise	-0.084	0.047	-0.126	-1.798	0.074
Coastal erosioı	-0.049	0.059	-0.058	-0.831	0.407
Climate changı	-0.115	0.055	-0.147	-2.094	0.038

Subsequently, the findings highlight the concerns and opinions of coastal populations in Balochistan about climate change-related problems such as sea level rise, coastal erosion, and storms. While the study discovered some correlations between environmental factors and their implications portrayed in table 5, it also emphasized the need for future research and examination of additional variables to better understand the complex dynamics of climate change and its effects on coastal communities.

Table 6
Correlational Analysis

N=200		Sea level rise	Climate induced damages	Coastal erosion	Climate change	Coastal Erosion	Coastal inundation
Sea level rise	Pearson Correlation	1	-0.122	-0.032	-0.012	-0.108	-0.13
	Sig. (2-tailed)		0.084	0.658	0.865	0.129	0.068
Climate induced damages	Pearson Correlation	-0.122	1	-0.052	-.144*	-0.017	0.011
	Sig. (2-tailed)	0.084		0.468	0.042	0.808	0.874
Climate change	Pearson Correlation	-0.012	-.144*	-0.018	1	0.059	0.054
	Sig. (2-tailed)	0.865	0.042	0.805		0.406	0.452
Coastal Erosion	Pearson Correlation	-0.108	-0.017	0.13	0.059	1	.823**
	Sig. (2-tailed)	0.129	0.808	0.066	0.406		0

Discussion

The findings reported in this research offer light on the socioeconomic implications of climate change on coastal communities, with a specific focus on Pakistan's Makran and Lasbella areas. This study examined the impacts of climate change on livelihoods and income in coastal communities by analyzing survey data obtained from 200 participants in places such as Gadani, Sonmiani, Gwadar, and others. The survey's

findings indicated a complicated interaction of perspectives. While there was universal agreement that climate change will have a significant influence on the coast, this attitude was not necessarily based on scientific skepticism. Rather, it demonstrated a deep attachment to the coastal environment and its economic importance. Notably, the construction of stronger and higher homes to minimize flash floods was a recommended solution that resonated with around 73 participants, demonstrating a realization of the need for adaptive measures. Moreover, the responses revealed a divide between those who supported individual property protection and those who preferred government-led approaches, such as enhanced compensation through insurance. This difference of view underlined worries about the province's ecology and economy in the long run as a result of climate change. This is consistent with recent research indicating that climate change may endanger livelihoods and the economic cycle (Jansson & Hofmockel, 2020). In terms of property damage, survey respondents reported varied degrees of damage caused by climate-related incidents. While around 48% reported extremely little damage, 52% reported modest damage levels. Concerns included the impact on energy supplies, plants, animals, and public infrastructure, in addition to property damage. Participants were noticeably less concerned about the immediate effects of climate change on public infrastructure and mobility.

The study's larger context highlighted worrying implications for Balochistan's economy. Rising sea levels have emerged as a major danger, putting pressure on the shoreline and changing the coastal environment. Floods have been noted as a particular threat to coastal areas such as Pasni, Gwadar, and Somiani, which might harm crops, residences, and water delivery infrastructure. Furthermore, melting glaciers and the expansion of warmer oceans have emerged as prominent markers of global warming and sea-level rise. Despite the Balochistan government's continuing coastal development initiatives, the study found an absence of significant policies and programs geared explicitly at minimizing the effects of climate change. While efforts such as mangrove tree planting were highlighted, the region did not appear to have a comprehensive approach to climate change adaptation and mitigation.

Climate change has the potential to drastically influence the socioeconomic landscape of coastal towns in the research area, based on these findings. Besides, the disparities in adaptation measures, differing assessments of property loss, and the lack of comprehensive mitigation legislation highlight the complexities of dealing with climate change consequences. Further, Balochistan's economic stability, energy supplies, and general standard of life are in danger, thus regional officials must put in place effective measures to protect the environment and the welfare of coastal residents. The relevance of these findings, as the research shows, is in their ability to guide policy choices that may have an impact on the future of these communities and the province as a whole. As a result, the study acts as a call to action for quick and concerted actions to lessen the negative consequences of climate change on coastal communities.

Conclusion

This research study examines the crucial problem of climate change and its complex effects on the coastal communities of Balochistan. The results highlight how urgent it is to address climate change as a worldwide issue that immediately impacts the local economy and way of life in this area. According to the report, Balochistan's coastal towns deal with a complex interplay of issues including erosion, changing precipitation patterns, plastic pollution, rising sea surface temperatures, and shifting fish populations.

The study stresses not just the negative consequences on fisheries and the marine ecosystem, but also the wider ramifications for livelihoods, food security, and economic stability. For both people and marine life, the issue of growing plastic pollution in the seas, together with shifting sea surface temperatures and pollution pressures,

presents enormous problems. Furthermore, the study's analysis of sea level rise and its cascading effects on coastal towns' susceptibility to erosion, flooding, and infrastructure damage also highlights the urgent need for comprehensive climate change mitigation and adaptation methods. The conclusion highlights the consequences of poor waste management strategies, which worsen coastal towns' problems by causing environmental deterioration. In addition to these findings, it is evident that the socio-economic and environmental landscape of Balochistan is in danger, necessitating prompt action. The proposal for improved crisis management systems, climate-sensitive policies, and the use of renewable energy sources is reiterated in the conclusion. In order to effectively address the negative effects of climate change on agriculture, livelihoods, and infrastructure, it emphasizes the significance of stakeholder participation, community awareness, and a comprehensive provincial climate change strategy. Moreover, the strategic importance of Balochistan as a center of economic growth and its crucial role in initiatives like the Gwadar Port and CPEC highlight the need for well-coordinated measures to combat and adapt to climate change. In view of the region's particular risks and potential, the conclusion emphasizes the necessity for personalized approaches to climate change adaptation.

Thus, the study highlights the significant effects that climate change would have on the coastal people of Balochistan and the urgent need for proactive and sustainable methods to safeguard their way of life, ecosystems, and economic development. The findings of the report are a call to action for swift policy reform, widespread public education campaigns, and coordinated measures to protect the province's future from the far-reaching effects of climate change.

Recommendations

Given the high vulnerability of Baluchistan to climate change, it is imperative to strengthen the disaster management system in Baluchistan by improving meteorological and hydrological data collection and processing to understand evolving threats and systematically identify , assess and reduce the risk of disaster. Up gradation and expansion of the weather monitoring station should be implemented along with establishing centers at division level for flood forecasting and warning in the region (CSCCC, 2019).

Another important strategy can be installing plantation along the coastal areas as a barrier to control soil and sand erosion and hence reduce the impacts of natural disasters like cyclones, hurricanes and floods. Towards this end, it can enlist the support of local communities and initiate campaigns aimed at increasing the density of natural vegetation like mangroves, coastal palm and other trees suitable for coastal areas (CSCCC, 2019).

Media and public awareness can also play a critical role as part of disaster reduction strategy which may involve the PDMA in drafting a provincial DRR strategy on a high priority basis. Awareness campaigns can be held through multiple media channels like radio , print media, TV and other participatory workshops to target highly vulnerable population segments along with equipping emergency handling skills of NGOS and other volunteer organizations

The natural resources of Baluchistan can be exploited to generate renewable sources of energy like wind energy by undertaking research and development of cleaner energy technologies like wind, bio thermal, solar and bio fuel which will not only cut down on the co2 emissions associated with fossil fuel usage and contribute to climate change mitigation but also serve the electricity needs of the population.

References

Ashraf, M. & Routray, J.K. (2013) Perception and understanding of drought and coping strategies of farming households in north-west Balochistan. *International Journal of Disaster Risk Reduction*, 5, 49–60.

Ashraf, M. & Routray, J.K. (2015) Spatio-temporal characteristics of precipitation and drought in Balochistan Province, Pakistan. *Natural Hazards*, 77(1), 229–254.

Ashraf, M., Arshad, A., Patel, P.M., Khan, A., Qamar, H., Siti-Sundari, R., Ghani, M.U., Amin, A. & Babar, J.R. (2021). Quantifying climate-induced drought risk to livelihood and mitigation actions in Balochistan. *Natural Hazards*, 109(3), 2127–2151.

Bevacqua, E., Maraun, D., Vousdoukas, M.I., Voukouvalas, E., Vrac, M., Mentaschi, L. & Widmann, M., (2019) Higher probability of compound flooding from precipitation and storm surge in Europe under anthropogenic climate change. *Science advances*, *5*(9), eaaw5531.

Bhardwaj, P., (2019) Types of sampling in research. *Journal of the Practice of Cardiovascular Sciences*, *5*(3), 157.

Bloomfield, J. & Fisher, M.J., (2019) Quantitative research design. *Journal of the Australasian Rehabilitation Nurses Association*, *22*(2), 27-30.

Degroot, D., Anchukaitis, K.J., Tierney, J.E., Riede, F., Manica, A., Moesswilde, E. & Gauthier, N., (2022) The history of climate and society: a review of the influence of climate change on the human past. *Environmental Research Letters*, *17*(10), 103001.

Dietz, T., Shwom, R.L. & Whitley, C.T., (2020) Climate change and society. *Annual Review of Sociology*, *46*, 135-158.

Ehsan, S., Begum, R.A., Nor, N.G.M. & Maulud, K.N.A., (2019) Current and potential impacts of sea level rise in the coastal areas of Malaysia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 228, No. 1, p. 012023). IOP Publishing.

Flayou, L., Snoussi, M. and Raji, O., (2021) Evaluation of the economic costs of beach erosion due to the loss of the recreational services of sandy beaches-The case of Tetouan coast (Morocco). *Journal of African Earth Sciences*, *182*, 104257.

Gul, W., Makki, M. & Yamin, T., (2022) Water energy food security nexus: perspectives and challenges in Balochistan, Pakistan. International Journal of Sustainable Society, 14(2), 165-183.

Gunaratna, K.L. & Gunaratna, K.L., (2018) Managing climate change in South Asia. Towards Equitable Progress: Essays from a South Asian Perspective

Gupta, N., Park, H. & Phaal, R., (2022) The portfolio planning, implementing, and governing process: An inductive approach. Technological Forecasting and Social Change, 180, 121652.

Habel, S., Fletcher, C.H., Anderson, T.R. & Thompson, P.R., (2020) Sea-level rise induced multi-mechanism flooding and contribution to urban infrastructure failure. *Scientific reports*, *10*(1), 1-12.

Hamid, T., Shoaib, N., Qadir, V.A. & Siddiqui, P.J.A., (2022) Noctiluca Scintillans (Macartney) Kofoid & Swezy Bloom Off Gadani Ship Breaking Area of Northern Arabian Sea, Baluchistan. *Bangladesh Journal of Botany*, *51*(3), 507-517.

Jansson, J.K. & Hofmockel, K.S., (2020) Soil microbiomes and climate change. Nature Reviews Microbiology, 18(1), 35-46.

Jevrejeva, S., Jackson, L.P., Grinsted, A., Lincke, D. & Marzeion, B., (2018) Flood damage costs under the sea level rise with warming of 1.5 C and 2 C. *Environmental Research Letters*, *13*(7), p.074014.

Khan, S.U., Shahab, S., Fani, M.I., Wahid, A., Hassan, M.U. & Khan, A. (2021) Climate and Weather Condition of Balochistan Province, Pakistan. *International Journal of Economic and Environmental Geology, 12(2),* 65–71.

Lipczynska-Kochany, E., (2018) Effect of climate change on humic substances and associated impacts on the quality of surface water and groundwater: A review. *Science of the total environment*, *640*, 1548-1565.

Muzaffar, M., Karamat, S. Saeed, K. (2018). Balochistan Insurgency: Causes and Prospects, *Orient Research Journal of Social Sciences, 3* (I), 112-128

Muzaffar, M., Khan, I., & Yaseen, Z. (2021). Issues and Conflicts in Balochistan: Implications for Pakistan, *Journal of Political Studies, 28* (1), 43-54

Naz, F., Dars, G.H., Ansari, K., Jamro, S. & Krakauer, N.Y., (2020) Drought trends in Balochistan. *Water*, *12*(2), 470.

Noor, R., Pande, C.B., Zahra, S.M., Maqsood, A., Baig, A., Misaal, M.A., Noor, R.S., Abbas, Q. & Anwar, M., (2023) Review of Various Impacts of Climate Change in South Asia Region, Specifically Pakistan. In *Climate Change Impacts on Natural Resources, Ecosystems and Agricultural Systems* (269-296). Cham: Springer International Publishing.

Ullah, Z., Wu, W., Wang, X.H., Pervez, R., Ahmed, A. & Baloch, A., (2022) Improving coastal and marine resources management through a co-management approach: a case study of Pakistan. *Environmental Research Communications*, *4*(2), 025003.

UNDRR,(2019) Disaster Risk Reduction in Pakistan: Status Report 2019. UNDRR

Vousdoukas, M.I., Ranasinghe, R., Mentaschi, L., Plomaritis, T.A., Athanasiou, P., Luijendijk, A. & Feyen, L., (2020) Sandy coastlines under threat of erosion. *Nature climate change*, *10*(3), 260-263.

Waldmüller, J.M., Jamali, H. & Nogales, N., (2019) Operationalizing sustainable development goals in vulnerable coastal areas of Ecuador and Pakistan: Marginalizing human development? *Journal of Human Development and Capabilities*, *20*(4), 468-485.