

Original Article

Impacts of Local Community Perception and Participation on Environmental Issues in Integrated Coastal Zone Management: A Case Study of Tyre, Southern Lebanon

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Abstract - Coastal regions are essential hubs of biodiversity, important for maintaining ecological balance and supporting community well-being. Despite this, they are subjected to numerous natural and human-made pressures that threaten their productivity and resilience. Studies highlight the critical importance of community involvement and awareness in managing these areas effectively. Tyre, similar to many coastal regions, confronts environmental challenges such as pollution, erosion, and land cover changes caused by human activities and natural forces. To evaluate local community perception and participation in addressing these environmental issues, surveys were conducted at four key locations. The findings showed that 69.75% of respondents noticed changes, primarily visual ones like erosion and shifts in vegetation. Most respondents assigned responsibility for addressing these issues to the Ministry of Environment, Tyre Municipality, NGOs, and international organizations while attributing less responsibility to the local community and individuals. The results indicate a community reluctance to assume responsibility, with minimal involvement in global or local initiatives. This hesitancy is influenced by factors such as educational attainment, economic status, and perceptions of social justice. Many respondents have lower levels of education and income, and they perceive inequities in the distribution of benefits. These factors contribute to ineffective coastal zone management due to limited human resources and societal vulnerability. To address this, it is crucial to invest in capacity building, allocate resources strategically, and reform policies to strengthen governance structures and promote equitable participation in decision-making processes.

Keywords - ICZM, Perception, Participation, Community survey.

1. Introduction

Coastal zones host a wide variety of habitats, species, and ecosystem services. They rank among the world's most productive areas and play a crucial role in the economies of coastal nations globally [1]. The primary categories of coastal uses include resource exploitation, infrastructure, tourism and recreation, and biodiversity conservation and protection. These encompass activities such as fisheries, forestry, gas and oil extraction, mining, transportation, ports, harbors, shoreline protection, defense, and more [2]. In this context, coastal beaches are complex systems where physical, ecological, social, and economic dimensions converge, offering numerous benefits for human well-being [3]. In reality, beaches provide not only attractive outdoor experiences but also essential and productive ecosystems that are susceptible to human-induced pressures [4].

These uses and benefits often come into conflict with the growing demands on coastal resources due to population growth [5]. Around one billion people currently reside in

coastal urban areas, and it is estimated that nearly 50% of the world's coasts are at risk from development-related activities. This intense pressure on coastal ecosystems necessitates preventive and protective measures at local, national, regional, and global. In fact, habitat destruction and physical changes are now regarded as major threats to coastal regions. It was confirmed that the increase in human population, along with unsustainable consumption habits, escalating waste and pollution, urban development, and international conflicts, further exacerbate the loss of biodiversity [6].

Effectively overseeing coastal ecosystems is crucial for meeting global conservation and climate goals, as these areas uphold biodiversity and provide critical ecosystem services that benefit human livelihoods. Understanding the consequences of human activities in these regions is essential for devising conservation strategies that safeguard the sustained functioning of key ecological processes along coastlines. In the Anthropocene era, it is widely recognized



that coastal areas are complex Socio-Ecological Systems (SESs) [7]. Therefore, the interdependence and co-evolution of human and natural systems cannot be ignored, as social and ecological domains are intertwined through ecological knowledge, governance structures, and ecosystem services [8]. Consequently, the Mediterranean ICZM protocol recommends incorporating various roles and conditions related to social, economic, and governance principles into every ICZM approach, emphasizing the consideration of socioeconomic and cultural systems [9].

Understanding how people interact with their natural and artificial environments is a key goal of human system research. This encompasses various aspects, including how individuals observe their biophysical environment. Additionally, comprehending environmental perceptions is crucial as it aids policymakers in regulating resource usage by influencing people's feelings about the environment, ultimately shaping their behavior. Researchers have identified several factors that affect the interaction between a community and its environment. These factors include demographic factors such as sex, race, income, education, and occupation, personal factors like personality traits, health status, value orientations, environmental attitudes, knowledge, behavior, experience, role, and self-interest; and socio-cultural factors that often overlap with or combine characteristics from the other two groups [10].

2. Participation, Perception, and Research Gaps in Studies on the Tyre Shoreline

2.1. The Importance of Local Community Perception and Participation in ICZM

Integrated Coastal Zone Management (ICZM) focuses on the comprehensive management of coastal zones, taking into account local, regional, national, and international goals [11]. Various environmental and social objectives have been attributed to ICZM by different parties. These include enhancing sectoral management through improved training, legislation, and staffing; preventing habitat degradation, pollution, and overexploitation to preserve the ecological diversity of coastal ecosystems; and promoting responsible development and long-term utilization of coastal resources [12]. Maintaining coastal ecology can be achieved by striking a balance between numerous human activities and managing coastal space resources [13]

To ensure the success of ICZM, management should be grounded in several crucial principles: a long-term perspective, a broad, holistic approach, adaptive management, utilization of natural processes, involvement and participation of local communities and key stakeholders, a variety of instruments, and participatory planning [14]. In this regard, the EU recommendation and the Mediterranean Protocol have both acknowledged participation as a fundamental principle of

ICZM. They emphasize the importance of ensuring adequate and transparent governance that enables the participation of local communities and stakeholders concerned with coastal zones [15], and note participation is not only a democratic right but also a key factor for achieving successful outcomes. Therefore, public participation and stakeholder involvement are essential for establishing effective sustainable development strategies, as highlighted by [16].

The involvement and participation of various stakeholders, such as local populations, Non-Governmental Organizations (NGOs), Civil Society Organizations (CSOs), policymakers, environmental managers, and coastal industries, are essential for effective coastal management. Collaboration at all levels is necessary for integrated management, particularly among national and regional government departments and agencies, as noted by [17]. The only way to ensure that the interests of all stakeholders are safeguarded is by involving them in the policy-making process, according to [18], which has been identified as a crucial measure of effectiveness in achieving sustainable management.

There is widespread agreement that engaging communities and stakeholders during the development phase is vital for the success of ICZM, as evidenced by studies such as those referenced by [19]. Additionally, the importance of participation in ICZM is well-documented, promoting fairness, transparency, conflict resolution, and ultimately, the legitimacy of decision-making processes [20]. In this context, a comprehensive understanding of the current processes in the intricate system of nature-human interactions in coastal regions is crucial in mitigating their negative effects. Achieving this understanding requires the integration of research expertise from natural and engineering sciences with social and economic sciences, along with effective stakeholder engagement. This engagement is essential for developing clear and integrated ICZM policies to achieve sustainable development [21].

The importance of community perception is equal to their participation, as researchers emphasize understanding community perceptions and beach system dynamics for sustainable management. Perception research plays a crucial role in understanding human connections with the environment [22], providing insights into community engagement with ecosystems and natural resource utilization [23]. Several studies highlight the need to integrate public opinion and environmental perceptions into tailored management strategies. In this context, [24] emphasizes an integrated approach to managing flood and erosion risks, advocating for community involvement in policy discussions based on their participation demands. Researchers also stress community awareness and understanding of beach system changes for sustainable management.

2.2. Research Gaps in Assessing Local Community Engagement with Environmental Issues on the Tyre Shoreline

While numerous studies have emphasized the importance of understanding community perspectives for effective coastal management [25], there is generally limited research focusing specifically on the perceptions of beach visitors or residents regarding coastal erosion and other environmental issues. Moreover, even fewer studies have investigated the practical application of these perceptions as a management tool. This lack of attention to the perceptions of those directly affected hinders the development of comprehensive and context-specific management strategies. Therefore, there is a clear need for further research that not only explores these perceptions but also assesses how they can be integrated into management frameworks to enhance the resilience and sustainability of coastal areas.

This challenge of ICZM is evident in many coastal cities, including Tyre. Several studies have highlighted that Tyre's shoreline faces a multitude of environmental challenges, such as pollution, erosion, climate change, and urbanization. Over the past two decades, Tyre has experienced significant urban expansion, transforming into a crucial regional hub, particularly along its coastal areas [26]. This growth has disrupted natural processes like sand replenishment and wave energy dissipation, leading to coastal erosion and the deterioration of beach and dune habitats, which impacts local wildlife communities [27].

Moreover, certain sections of the Tyre coast are plagued by hazardous waste materials such as plastics, metals, paper, discarded fishing gear, and used syringes, posing significant risks to local wildlife. Additionally, Tyre lacks a wastewater treatment facility, resulting in untreated sewage being discharged directly into the sea from neighboring towns [28].

In this context, a 2019 report by CNRS indicated low levels of microorganisms and chemical contamination in the waters of Tyre Nature Reserve and the beach north of El Naqoura Harbor. Additionally, multiple studies have validated the presence of both erosion and accretion in the Tyre coastal zone [29].

Another significant environmental issue is climate change. The Mediterranean region, including Lebanon, has experienced rising sea levels, which intensifies the challenges faced by coastal communities [30].

Despite facing various environmental challenges, there has been a notable absence of studies examining how local communities perceive and engage with environmental catastrophes. The city of Tyre, like many other coastal cities in Lebanon, has experienced diverse circumstances, including periods of peace, conflict, prosperity, and stagnation, all of which have profoundly influenced its culture, attitudes, behaviors, and knowledge. Therefore, this research represents

a significant effort to explore the perceptions and involvement of the local community in ICZM initiatives, as well as to identify social and other challenges related to ICZM in Tyre. This approach aims to shed light on the relationship between the local community and their environment. Additionally, the study seeks to identify shortcomings in cooperation among stakeholders, authorities, and the local community.

3. Study Area

The Tyre shoreline is located on the eastern edge of the Mediterranean Sea, situated in the southern segment of the Lebanese coastline (Figure 1). This coastal area includes the Plain of Tyre, stretching approximately 25 kilometers northward from the mouth of the Litani River to the border between occupation Palestine and Lebanon in the south [31]. The Tyre coastline consists of a mixture of sand, pebbles, rocks, and artificial structures [32].

The climate of Tyre is mainly Mediterranean. The average estimated rainfall in this region stands at 648 mm. Moreover, there has been a rise in both maximum and minimum temperatures, with an increase of around 1.6°C and 1.0°C respectively [33].

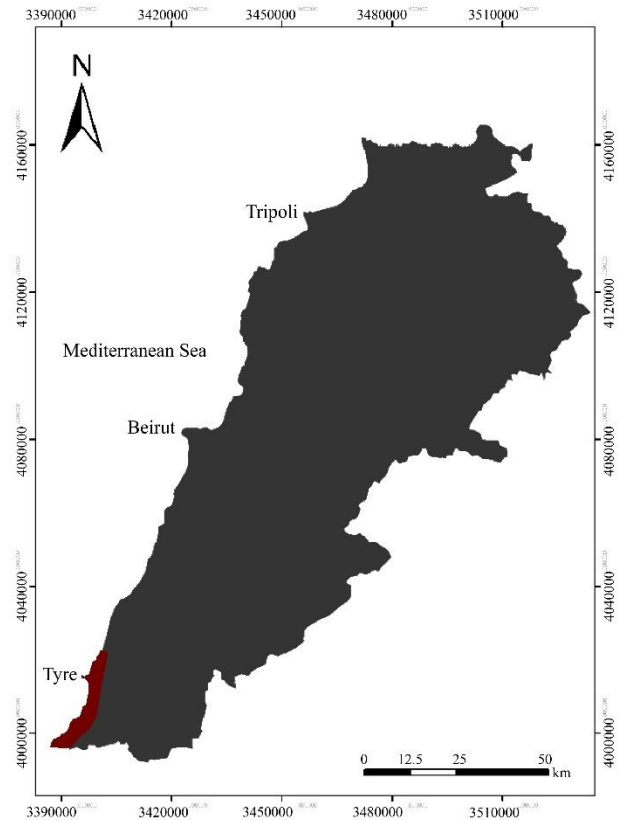


Fig. 1 Study area tyre south lebanon

The marine environment exhibits diversity, comprising both cold and hot underwater freshwater springs. Along the Tyre coastline, there is a rich array of marine life,

encompassing coral reefs, seaweeds, and fish species from 16 distinct families, as documented by [34].

In Tyre, a nature reserve has been established and designated as a Special Protected Area (SPA) since Lebanon's accession to a relevant convention in 1994. In 2011, it received formal classification as an SPA. Known as the Tyre Coast Nature Reserve (TCNR), it encompasses a diverse range of ecosystems, including Mediterranean coastal sand dunes, freshwater areas, agricultural lands, and sandy, pebble, and stony beaches, as detailed by [35]. The reserve's educational significance is derived from its location within the city of Tyre, which has been acknowledged as a UNESCO World Heritage Site since 1984. Tyre Beach has held the status of a nature reserve since November 1998 and was assigned site number 980 under the Ramsar Convention in 1999, as documented by [33].

The importance of Tyre as a habitation endured across different historical eras, documented in archaeological findings ranging from the Hellenistic and Roman periods to the Byzantine and subsequent periods, as evidenced by [36]. Additionally, [37] identified two categories of archaeological sites: submarine archaeological sites and mainland archaeological sites.

According to [38], human intervention in the Tyre shoreline can be traced back to ancient times. The strategic location and natural anchorages of the offshore sandstone ridges drew human communities to the area from the Bronze Age onwards. As succeeding cultures, such as Canaan, Phoenician, Persian, Hellenistic, Roman, and Byzantine, emerged, the coastline landscapes were significantly influenced and altered [39].

Furthermore, the Tyre shoreline is inhabited by a diverse array of communities comprising indigenous populations, immigrants, and refugees. Consequently, the local community in this area embodies a rich tapestry of cultures, habitats, and traditions, each contributing to a unique socio-environmental dynamic. This diversity significantly influences the manner in which individuals interact with their surroundings, particularly given the distinct cultural and environmental contexts of the region.

The study area encompasses four regions: Tyre Souk, Northern Cornishe, Al Kharab Cornishe, and Southern Cornishe (Figure 2). The selection of these four regions was based on their significant population density and their appeal to a large number of visitors from the local community.



Fig. 2 Location of community survey

3. Material and Methods

Survey research is a widely used data collection method in social science research, and it can take several forms, such as interviews, focus groups, panel sampling, telephone surveys, mail-in surveys, kiosk surveys, and online surveys. While surveys can be used for both qualitative and quantitative analysis, they are often used for quantitative research [39]. One major advantage of surveys is their ability to represent a broad population, providing a high level of generalizability [40].

A community survey is a research method that involves asking a series of questions to residents in a particular area, usually through an online survey. This method aims to directly collect information from individuals to gain a better understanding of their concerns, attitudes, experiences, and needs. Conducting a community survey can provide valuable insights into what people want, helping to inform local decision-making [41].

According to [42], the survey process involves several stages. These include determining the necessary sample size and information needed, selecting the appropriate survey

method (such as postal, drop and collect, telephone or interview), designing the survey, and piloting it beforehand. A survey questionnaire was conducted using the same methodology in all of the pilot areas.

The survey targeted residents, day visitors, and local tourists aged 30 years and above. The survey was conducted through face-to-face interviews that lasted approximately 15 minutes. At the start of each interview, a brief introduction was provided to explain the context and purpose of the research project. A total of 400 questionnaires were completed

during December 2021 and January 2022, with an average of 30 to 31 questionnaires per day. A random sample of respondents was selected for the questionnaire, which consisted of two parts and 26 questions (Appendix A). The first part was focused on socio-demographic data such as age, gender, level of education, and profession. The second part was designed to elicit perceptions of local community ICZM, coastal erosion, coastal defense, and coastal issues. To achieve the objectives of the community survey, a series of steps were undertaken, as shown in Figure 3.

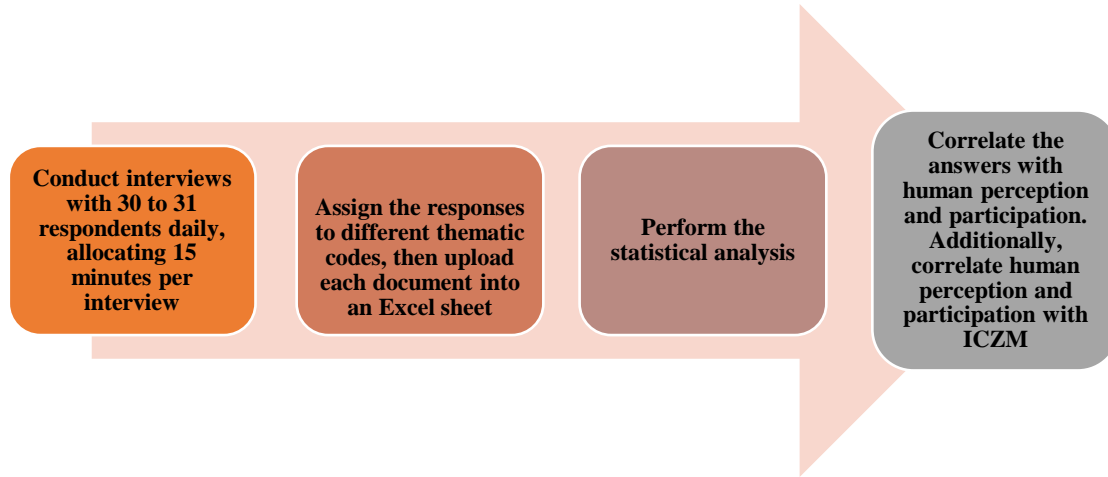


Fig. 3 Methodology of community survey

5. Results and Discussion

5.1. Analysis of Questionnaire Results

5.1.1. Demographic Profile

The demographic data reveals a mature age profile, with all respondents aged 35 years and above, specifically 204 respondents aged 35-45, 110 aged 46-55, and 86 aged 56-65. This mature demographic suggests long-term observational experience of coastal changes. In terms of education, 60% of respondents have an elementary or secondary diploma, while the remaining 40% possess tertiary education, indicating a mix of foundational and advanced academic backgrounds. The respondents demonstrated substantial knowledge about coastal erosion and changes, which is crucial for fulfilling our mission in this survey.

5.1.2. Changes in Tyre's Coastal Zone, Knowledge of Laws, Participation in Local Campaigns, and Responsibilities Towards Environmental Issues

The survey results indicate that all respondents live along the coast, providing a direct connection to the coastal conditions and changes in Tyre's coastal zone. Figure 4 illustrates the length of their residency, highlighting a substantial long-term relationship with the area. Specifically, 56% of the respondents have been residents since birth, signifying a deep-rooted familiarity with the coast. Additionally, 22.5% have lived along the coast for 41 years or more, further emphasizing their extensive experience and potential for detailed observations. The survey also reveals

that 11.25% of respondents have resided there for 31 to 40 years, and 7.5% have lived on the coast for 21 to 30 years. This extensive residency period, ranging from 15 to over 40 years, indicates that the respondents possess a significant level of familiarity with the Tyre Coast. Their prolonged exposure likely allows them to have witnessed and experienced various changes in the coastal environment, making their insights particularly valuable for understanding the long-term trends and impacts of coastal erosion and other environmental factors in the region.

The respondents described coastal erosion as the decrease in beach size or distance, indicating a fundamental grasp of key environmental concerns among the local community. An open-ended question inquiring about observations of changes along the Tyre shoreline (question 1 in Appendix A) generated varied responses.

Out of the respondents, a significant majority of 297 individuals (69.75%) reported having observed changes in the Tyre coastal zone over the past 15, 30, or 40 years. This observation underscores the community's active engagement with and awareness of environmental transformations in their coastal surroundings. In contrast, 103 respondents (25.75%) stated that they had not noticed any changes, suggesting a potential gap in perception or awareness among a smaller subset of the community. Among the 297 respondents who observed changes in the coastal zone, 277 provided specific

descriptions of these changes, highlighting multiple environmental factors. These included pollution levels, beach erosion, alterations due to hydraulic structures, shifts in vegetation cover, and the emergence of new settlements within the Tyre coastal zone (see Figure 5). This detailed

feedback indicates a diverse range of environmental impacts perceived by the community, reflecting their nuanced understanding and direct experiences of the evolving coastal landscape.

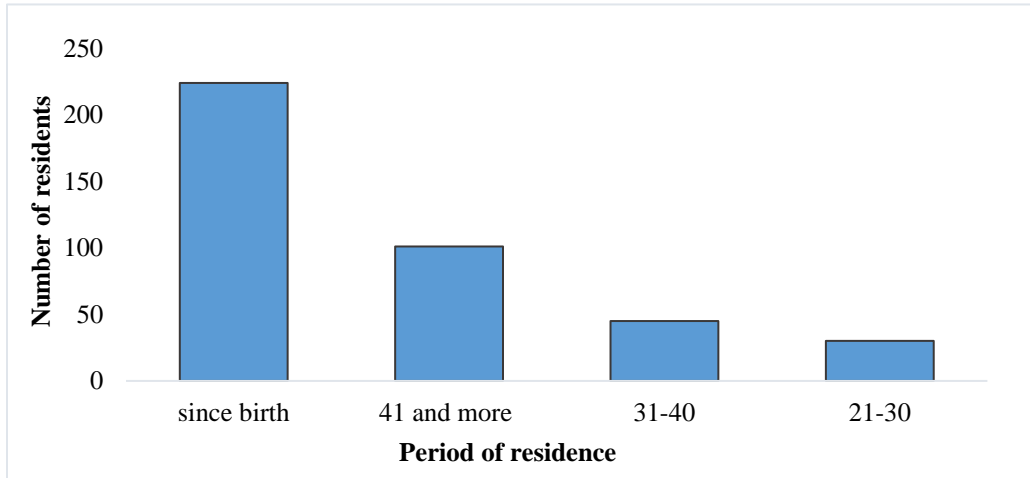


Fig. 4 Period of residence of respondents along the Tyre Coast

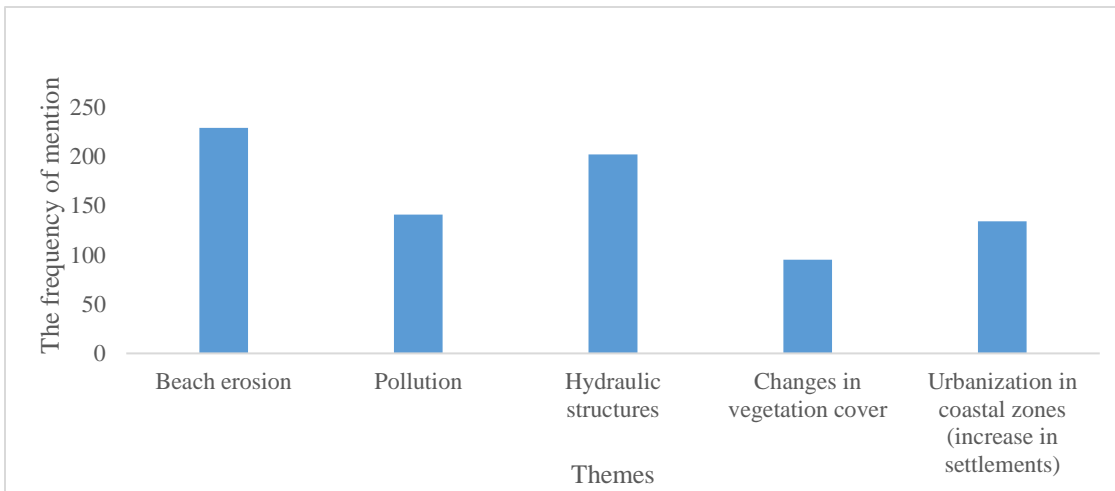


Fig. 5 Description of shoreline change by respondent during the last 15, 30 and 40 years

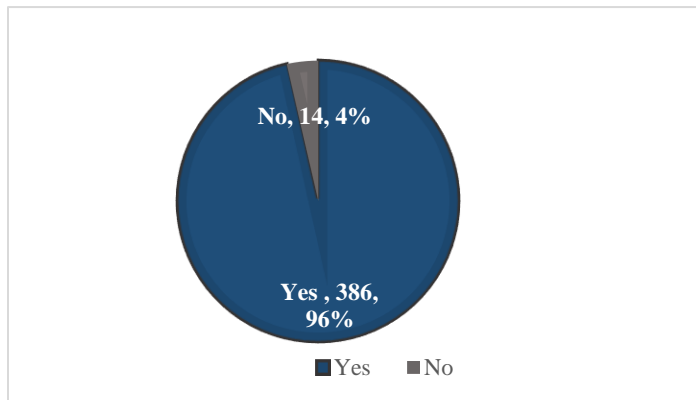


Fig. 6 Number and percentage of respondents confirming or denying changes in the area and number of settlements along the coastal zone

Figure 6 illustrates the perspectives of respondents regarding changes in settlement areas. A vast majority of 386 out of 400 respondents affirmed an increase in various types of settlements such as restaurants, hotels, buildings, resorts, cafes, and industrial facilities. This indicates a widespread acknowledgment among the surveyed individuals of a notable rise in urban development and infrastructure within the Tyre coastal region.

The presence of infringement sites that violate laws has significantly influenced the coastal profile of Tyre. Among the 400 respondents surveyed, 347 acknowledged the existence of these sites along the Tyre shoreline, while 35 respondents chose not to specify them. According to respondents, the primary concerns associated with these infringement sites include beach erosion, cited by 275 respondents, and changes in the beach profile, noted by 77 respondents. In interviews, several participants further detailed their observations, with one remarking, *"The shoreline profile today is different from what it was 30 years ago. The beach area was much larger back then."*

Additionally, out of the 20 respondents who viewed these intervention sites as a violation of public property, six individuals elaborated on how such sites deprived the local community of their rightful access and use of the beach, constituting a breach of public property rights. They highlighted concerns such as the loss of beach area and the degradation of the sandy beach, impacting both the environment and public access. The survey's findings underscored the significance of these comments, reflecting widespread community sentiment regarding the adverse effects of infringement sites on Tyre's coastal environment and public resources.

To comprehensively cover all aspects of ICZM, the questionnaire included a question on coastal floods. Question 13 specifically asked respondents if they recalled any instances of beach floods, with 369 affirming and 31 denying such occurrences. However, only 15 of those who confirmed experiencing beach floods provided detailed responses regarding the impacts of these events on the coastal zone (refer to Table 1). Their feedback predominantly highlighted concerns about beach erosion, mentioned 7 times, pollution, noted 8 times, and the endangerment of marine animals, cited 6 times. It was observed that only seven respondents demonstrated an understanding of the correlation between flooding events and beach erosion, while six respondents acknowledged the link between flood events and the endangerment of marine animals. Furthermore, eight respondents expressed concerns about flooding leading to pollution, attributing this to waste accumulation along the coast. These insights underscore the varying perceptions and awareness levels among respondents regarding the multifaceted impacts of coastal floods on Tyre's coastal environment.

Table 1. Themes and frequency of mentions regarding the environmental impacts of beach flooding

Themes	The frequency of mention
Beach erosion	7
Pollution	8
Endangering marine animal	6

In relation to sand extraction (as per question 16 in Appendix A), out of the 400 respondents surveyed, 248 individuals (62%) indicated that sand removal activities occur along the Tyre shoreline, while 152 respondents reported no such activities. Among those surveyed, 22 respondents were unable to specify particular locations where sand extraction occurs. Conversely, the remaining respondents identified various specific sites where these activities are observed, highlighting varying levels of knowledge regarding the presence and environmental impact of sand extraction in the Tyre coastal region. This diversity in responses may also reflect potential concerns among respondents about freely discussing environmental issues related to such activities.

Regarding primary responsibility for environmental issues (as per question 21 in Appendix A), only 15% of respondents identified individuals as primarily responsible for erosion and other environmental concerns, while 85% attributed primary responsibility to the Ministry of Environment and Tyre Municipality. Additionally, 57% of respondents ranked NGOs, CSOs, and international environmental organizations as second and third in terms of responsibility. This distribution of responses suggests a predominant belief among respondents that government bodies, specifically the Ministry of Environment and Tyre Municipality, bear the primary responsibility for addressing environmental issues in the Tyre region.

Despite several proactive environmental initiatives led by NGOs, public organizations such as TCNR, and collaborations with international environmental bodies, Tyre faces significant challenges in raising awareness and engaging its local community. The research findings reveal a striking disparity: despite these active initiatives, a substantial 79% of local residents remain unaware of global efforts specifically aimed at mitigating environmental issues. Moreover, the study highlighted another concerning trend: 80% of respondents did not participate in any local campaigns aimed at environmental conservation. This suggests that most of the local community is disinterested and has a low level of awareness about these initiatives. Only a small portion of the community is concerned with global efforts to protect the coastal environment.

The final question, number 26, 'According to your knowledge, how can we protect our shoreline?' serves as the culmination of the survey, encapsulating residents' perspectives on the legal and societal dimensions of ICZM in Tyre. Responses predominantly focused on legal frameworks,

the roles of NGOs, the Ministry of Environment, local municipalities, and individual responsibilities. A significant majority, 355 respondents (88.7%), advocated for the enforcement of Lebanese coastal laws and the imposition of taxes or penalties, emphasizing the removal of encroachments such as resorts, hotels, and private buildings on the beach. They highlighted the pivotal role of the Ministry of Environment and Tyre Municipality in overseeing these efforts. The widespread call for strict law enforcement highlights perceived deficiencies in Lebanese legislation and a lack of community trust in the government's capacity to impartially enforce these laws.

5.1. Assessment of Local Community Perception and Participation and Their Impact on ICZM

The notion of perception encompasses a wide array of factors, including knowledge, curiosity, societal values, attitudes, and behaviors [43], all of which significantly influence the respondents' perceptions in this study. Notably, the results of this survey show a significant tendency for people to perceive and focus more on visual issues than non-visual ones. This is evident from Figure 7, which shows that 72% of respondents paid more attention to visual issues (high perception) compared to non-visual concerns (low perception). However, non-visual issues, such as climate change, endangering marine habitats, endangering wetlands, etc., also play a crucial role in environmental and coastal management. This tendency may be attributed to various causes, such as the educational level, where we noticed in this survey that The majority of respondents (60%) have completed elementary and secondary education, whereas individuals with lower educational levels often show reduced capacity and concern for environmental issues [44].

Other factors related to the education system in Lebanon (curriculum) there is insufficient government support for education and the absence of environmental topics in school and university curricula. Environmental awareness among students is minimal, as these subjects are only briefly touched upon in geography or literature lessons. In addition to the limited efforts that are issues despite ongoing efforts by NGOs and municipal bodies, pointing to potential factors such as inadequate communication channels and insufficient community involvement strategies. Consequently, this deficiency negatively impacts the implementation and effectiveness of ICZM. Education and training programs were available in schools, colleges, universities, and adult learning centers can effectively raise public awareness about environmental issues [45].

The law provides a legal framework that governs the operations of numerous public and private agencies and individuals involved in managing and utilizing the coastal zone. It delineates their authority and responsibilities [46]. Regarding law enforcement, several viewpoints from respondents underscore significant challenges in achieving effective ICZM in Lebanon. Some examples can be mentioned, and one respondent noted that Lebanese state laws often prioritize the interests of the state and major investors, such as politicians, over the needs of the local population. Another respondent highlighted that Lebanese laws and authorities predominantly protect individuals with significant financial resources. The third respondent pointed out the rough enforcement of laws in Lebanon, citing local conflicts as evidence of authorities neglecting their legal obligations. Moreover, there were various negative complaints about the overall enforcement and fairness of the laws.

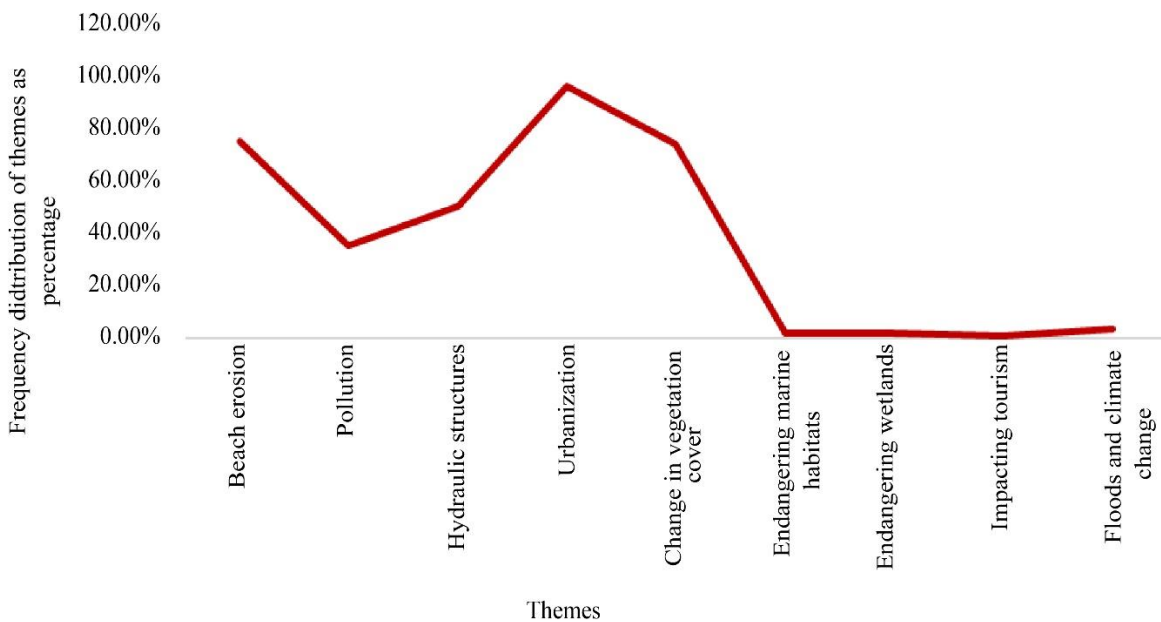


Fig. 7 Frequency distribution of themes as percentage

In this context, several laws are highlighted, such as "Act 17 of Law 1925, requiring a license for the private use of beaches and sea areas," Law 402, law 309, decree No 7464, decree No 7505, decree No 7660/ 1995, allows the increase of built-up ratio by 20% and far by 60% for lots above 20,000 m² and more than."and "Law No. 4810/1966, allowing resort owners to expand marina construction up to three times the surface area of their resort plots," among others [47]. These laws and others reflect the perspectives of respondents, revealing a significant gap between the public, authorities, and environmental concerns.

This disconnect has led to adverse impacts on the principles of ICZM, which requires a legislative and institutional framework to align coastal zone development and management plans with environmental and social objectives developed in collaboration with stakeholders affected by these projects [48]. The lack of trust and perceived inequality in law enforcement damages the relationship between the community and authorities and weakens efforts to achieve ICZM objectives. This sense of inequality leads to resistance to following laws, highlighting the limited capability of Lebanese authorities to effectively manage ICZM initiatives. Furthermore, a lack of knowledge about laws and regulations indicates a poor understanding of this crucial aspect of ICZM. These findings indicate an urgent need for legislative reforms and improved governance practices to effectively address coastal management challenges in Tyre.

This study has brought to light the respondent's significant frustration with the absence of social justice, with 90% of those surveyed expressing concern over this issue. The perceived inequity has fostered feelings of isolation and has led to a breakdown in communication between the local community and stakeholders. This suggests that administrative institutions are neglecting the community's needs and concerns. Additionally, in situations where local communities and indigenous peoples hold customary rights or tenure in the coastal zone, their active participation in integrated coastal zone management becomes especially crucial. Their involvement ensures that their unique perspectives and rights are respected and integrated into the management processes, leading to more equitable and effective outcomes [49].

The results show a low level of participation in environmental initiatives, such as awareness and cleaning campaigns, organized by NGOs, CSOs, Tyre Municipality, and other environmental organizations. Additionally, most respondents believe that the Ministry of Environment and Tyre Municipality should take primary responsibility for environmental efforts or projects.

In this context, several factors influencing the behavior and attitudes of the local community can be noted. Limited collaboration among NGOs, Tyre Municipality, TCNR, and others in raising community awareness and involving them in

environmental projects significantly weakens local engagement. NGOs, with their flexibility and resources, are well-suited to work closely with local communities and implement projects identified by these communities. Their regional and international reach enables effective addressing of cross-border issues. Within the framework of ICZM, NGOs can support project implementation and initiatives through various roles such as community mobilization, information gathering and dissemination, capacity building, conflict resolution, technical assistance, and research [50].

Low income and poverty are significant issues that affect the livelihoods of people living in coastal and marine areas, as well as the ecosystems they depend on. This is a major regional concern with important implications for understanding the link between people and the ecosystems they rely on for subsistence [51]. Furthermore, various studies have shown a negative correlation between economic hardships and the community's concern for environmental issues or ICZM. Consequently, it is clear that people prioritize their economic well-being over environmental preservation when facing multiple challenges to their livelihoods [52]. This trend is evident in our community, where we observed that 80% of respondents are employed in the public and private sectors, typically earning low incomes. Thus, economic pressures significantly shape the abilities, knowledge, attitudes, customs, beliefs, and histories of these residents.

Furthermore, the economic situation in Lebanon presents additional obstacles to effective ICZM efforts. The Lebanese government's limited financial resources pose challenges in aligning with ICZM principles, which prioritize human resources and address coastal protection needs that require significant investment [53]. The contrast between the economic constraints faced by the government and the requirements of ICZM underscores the need for innovative strategies and partnerships to overcome financial barriers and ensure sustainable coastal management practices.

All these factors have led to a gap in the perception, participation and capacity building of the local community. Developing the capacity of human resources is impossible without proper organizational restructuring and capacity building within public communities and administration organizations. This, in turn, makes it impossible to enhance the management of the coastal zone without investing in education, training, skills, etc., as [44] suggests.

5. Conclusion

The challenges stemming from insufficient awareness and involvement in ICZM pose significant obstacles to achieving sustainable coastal management in Tyre. The analysis emphasizes the complexity of these challenges, which encompass a variety of socio-economic factors such as economic volatility, disparities in education, and issues of social equity. Additionally, there are substantial challenges related to the legislative framework. Together, these obstacles

underscore the necessity for comprehensive strategies that address both societal perceptions and institutional frameworks to effectively promote coastal sustainability in Tyre.

Successfully implementing ICZM in Tyre requires a sustained, comprehensive strategy that integrates diverse approaches, such as economic incentives, management programs, environmental education and outreach, and spatial planning. Tackling these challenges demands a holistic approach that acknowledges the complex interaction among environmental, social, and economic factors. Central to this approach is prioritizing community engagement and empowerment, fostering trust and collaboration among local communities. Additionally, promoting environmental awareness and education from an early stage is essential.

Moreover, addressing underlying socio-economic disparities and institutional weaknesses is crucial to establishing an enabling environment for effective coastal management. Investments in capacity building, resource allocation, job creation such as investment in eco-tourism (sustainable coastal tourism) and policy reform are essential for strengthening governance structures and ensuring equitable participation in decision-making processes. Looking ahead, concerted efforts at local, national, and international levels are vital to overcoming these challenges and advancing sustainable coastal development in Tyre, Lebanon.

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Appendix A



Saint Joseph of Beirut University (FLSH)

Department of Geography.

Public opinion poll about shoreline changes (erosion and accretion) and Integrated coastal zone management in Tyre south Lebanon.

My name is Raghda Saad, Doctoral Student at CREEMO (**CENTRE DE RECHERCHE EN ENVIRONNEMENT-ESPACE MÉDITERRANÉE ORIENTALE**), Department of Geography, FLSH, Université Saint-Joseph de Beyrouth. I'm currently working on a thesis on time series analysis of shoreline using GIS (Geographic Information System) and Remote sensing-case study: Tyre Shoreline southern Lebanon, under the supervision of Prof. Jocelyne Gerard. My research work is based on the results of this survey that is addressed to people in Tyre who are between 35 to 60 years old. This survey aims to explore the local perceptions about changes of Tyre shoreline and local awareness about integrated management of coastal zone. I would be thankful if you help me to do this survey by filling these questions. Noticing that this questionnaire has been accepted by Ethics Committee at Saint Joseph university of Beirut.

your professional help will contribute in protecting Tyre shoreline. The questionnaire will take about six minutes. Your answers will be kept confidential.

- 1- Age _____
- 2- Gender:
Male
Female
- 3- Qualifications:
Elementary
Secondary
High school
license
Masters
PhD
- 4- Major: _____
- 5- Profession: _____

Questions on Tyre Shoreline changes

- 1- Current place of residence:
Along the coast
Far from the coast
- 2- How long have you been in your residence site? _____
- 3- Have you noticed any changes in Tyre shoreline during the last 15,30 or 40 years?
Yes
No



- 4- If yes, describe how the shape of shoreline was:

- 5- Have you noticed any changes in coastal vegetation cover during the last years?
Yes
No
- 6- If Yes, describe the most dominate changes:

- 7- Have you noticed any changes in the number of settlements at Tyre coastal area?
Yes
No
- 8- If yes, describe the changes:

- 9- Because some of refugees' camps are found near shoreline or on sandy beach, do you think that this status has environment impacts?
Yes
No
- 10- If yes, mention some of these impacts:

- 11- Do you know any contravention sites on Tyre shoreline:
Yes
No
- 12- If yes, mention the names of the sites.

- 13- Mention the impacts of these sites on Tyre shoreline.

- 14- Do you recall any beach flood?
Yes
No
- 15- If yes, mention the effect of this flood on the beach.

- 16- Have you heard about sand removal at Tyre beach?
Yes
No



17- If yes, mention a name of a location at Tyre beach that was exposed or is being exposed to sand removal.

18- Depending on your knowledge, what effect of sand removal on Tyre shoreline is.

19- Do you think that building a corniche is worth losing a part of the sea?

20- Are you familiar with global initiatives that aim to reduce coastal erosion?

Yes

No

21- Please rank from 1 to 6, according to whom you think should bear the primary responsibility for tackling Tyre Coastal erosion.

Municipalities

Ministry of Environment

Individuals

International Environmental Organizations

Civil Society Organizations

22- Do you know the Lebanese environmental policies and laws that prevent beach trespassing?

Yes

No

23- Mention the environmental impacts of Failure to respect the laws that protect shoreline.

24- Have you ever attended any awareness campaigns about protecting Tyre beach?

Yes

No

25- If yes, mention the environmental benefits of participating in these campaigns.

26- According to your knowledge, how we can protect our shoreline.
