Economic dynamics, sustainability of fisheries resources and environment protection: An analysis of Sahara coastal cities in Morocco

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Abstract. The economic dynamic in Morocco's Saharan coastal cities is focused on sea fishing. Nevertheless, while this activity plays an important role in the development of these areas, it also exposes them to the risks of overexploitation of fisheries resources and pollution, which are exacerbated by the effects of climate change. The aim of the present work is to analyze the correlation between the economic dynamics of Saharan coastal cities and the sustainability of fisheries resources. To realize this objective, we carried out an empirical study using a mixed quantitative and qualitative approach in Boujdour city from southern Morocco. The results showed that citizen participation and commitment are low. Also, the essential assets to face the challenges of sustainability and to support the introduction of mechanisms for accountable governance, integrated, and concerted management of fisheries resources, to pool the opportunities for innovation in green energy available in the region and to improve the efficiency of fishing activities, the promotion of integrative and inclusive territorial development and the protection of the environment.

Index Terms— Territories, Risks, Governance, Sustainability, Fisheries resources, Territorial development.

1 Introduction

We are living in an age of risks and opportunities, in which society must rise to the many challenges posed by globalization, such as the sustainability of natural resources as a key element of sustainable and inclusive territorial development.

This globalization has prompted the Kingdom of Morocco to invest more in the blue economy as an essential vector for socio-economic development, through public policies and forward-looking development strategies: the National Port Strategy 2030 and the HALIEUTIS strategy are two examples. [1]

Morocco's coastal cities stretch over 3500 km of Mediterranean and Atlantic coastline, with a significant fishing potential estimated with 1.2 million km² of exclusive maritime economic zone (EEZ), and a national fish production of 14.92 million tonnes (2022 figures), with a 14% increase in catches compared to 2021.

Internationally, Morocco ranks first in maritime fishing at the Arab and African level, and 17th worldwide in terms of fish wealth, according to the FAO. [1,2]

Following the post-pandemic recovery (COVID19), sea fishing accounts for between 2% and 3% of the national GDP and contributes to the creation of 700,000 direct and indirect jobs, making it a key factor in attracting people to the coastal regions. [2,3]

Thus, after the return of the cities from Saharan coast to the motherland in 1975, the field of study of our research, the central power deployed colossal means, both on the superstructural level, by the construction of cities endowed with all the means, and infrastructure through the construction of ports and the promotion of investment in the maritime sector.

However, in recent years, the strong economic dynamism of the port cities from the South Atlantic has been confronted with a significant reduction in fish wealth, due to a sustained increase in demand, the strong industrialization of the fishing industry and the effects of climate change [1,2].

Faced with this dilemma, the quest for sustainability in maritime fishing is a challenge that needs to be met, through the involvement of all local stakeholders in the preservation and enhancement of local resources. This is a societal project that depends on a clear development strategy, which must consider the specific characteristics of each territory and the empowerment of local stakeholders to ensure inclusive territorial development [8,9]

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Similarly, because territorial development processes are intended to achieve a number of objectives, such as combating unemployment, improving living conditions, protecting the environment, reducing social exclusion and

territorial inequalities... a study of territories, given the complexity of the relationship between the economic dynamics of coastal cities and the sustainability of fisheries resources, raises a series of challenges to be met, by highlighting the problems faced by these cities in their quest for socio-economic development. [4,10,14]

This research proposes to analyze the economic dynamics of Morocco's Saharan coastal cities, which are generally a function of fishing activity and its impact on the sustainability of fisheries resources and environmental protection, to ensure a viable future for Morocco's coastal communities and marine ecosystems. [7,8]

This research on the economic dynamics of port cities and the sustainability of fisheries resources in Morocco would help to fill several existing gaps, notably because:

•A context where economic interests take precedence over the preservation of resources, and the sustainability of fisheries resources, like all territorial resources, calls for real involvement and ownership by all territorial stakeholders, to reconcile economic, social, and environmental interests.

•A lack of training, awareness-raising and empowerment programs for fishermen and stakeholders in port areas, on the importance of the environment and the sustainability of fisheries resources in triggering genuine territorial development processes, based on skills, capabilities, and the innovation promotion.

•Invest more in technological innovation to reduce the negative environmental impacts of economic activities and fishing operators on the sustainability of fisheries resources, bearing in mind that preserving and protecting the environment contributes directly and indirectly to resource production and renewal.

•Adopt palliative solutions to polluting energies to increase the efficiency of fishing activities and reduce their impact on the environment, which amounts to being strategically part of an energy transition in the fishing sector, by exploring alternatives to traditional fuel such as renewable energies: Solar energy - Wind energy - Hydraulic energy [5,6,12].

To achieve the objectives of this research, it is essential to answer the following questions:

What is the relationship between the local Saharan population and the issue of sustainability of fisheries resources?

What role can governance play in the sustainability of fisheries resources?

What is the impact of the industrialization of fishing on environmental protection?

What is the impact of rising fuel prices on the sustainability of fisheries resources and environmental protection?

Do the economic dynamics of Saharan coastal cities help to combat social exclusion?

The methodology applied in this research is based on the collection of data from a literature review, using a descriptive method based on a literature review to determine the current state of knowledge on the economic dynamics of port cities and the sustainability of fisheries resources.

Secondly, an empirical study of Saharan coastal cities will be investigated, based on researches, data and information collected on the territory via a qualitative study. To this end, interviews are scheduled with fishermen, fishing sector operators, civil society and government departments, on the basis of a questionnaire.

This work will help to highlight the challenges and opportunities linked to the fishing sector, and to promote a culture of sustainability of fisheries resources and territorial responsibility among territorial players. It will also open up prospects for action research to explore innovative projects linked to the use of renewable energies in the value chain of the fishing industry and participation in environnemental protection [15-17].

Article Maps :

In this paper we have examined the problems faced by cities on Morocco's Atlantic coast, particularly in the Sahara, in their quest for economic development while preserving fishery resources.

On reading our work, it is easy to see that it is divided into five parts, namely a general introduction, followed by the research methodology adopted, a detailed presentation of the results obtained; the four part of the present paper is dedicated to a discussion of the elements put forward, as well as a few propositional avenues, and finishes with a general conclusion.

2 Methods

2.1 Data collection

Going through a literature review, the descriptive method - which combines qualitative and quantitative methods was preferred.

The qualitative method enables us to make a diagnosis of the areas under study, in order to better understand the dynamics and interactions between the variables involved. While the quantitative study was used to collect and analyze statistical data and set up questionnaires addressed to the various territorial players.

The choice of this methodology to study the economic dynamics and sustainability of fisheries resources in Morocco was justified by several reasons. Firstly, the literature review will enable us to discover new concepts and take stock of the state of knowledge related to the problematic of the present research.

In the empirical part, the use of the data triangulation method, which brings together the quantitative and qualitative approaches, favors the efficiency and mastery of the research subject in all its dimensions.

The scope of our study is focused on Moroccan Saharan coastal cities s, a choice explained by the richness of these rapidly changing territories, which offer economic potential in several sectors of activity such as sea fishing, renewable energy, mining, agriculture, socio-cultural heritage and tourism.

The population studied is made up of several territorial players: the local population, economic operators and professionals in the fishing sector, civil society, local authorities and local businesses.

Finally, direct observation of these territories remains an important part of the study, as does analysis of the impact of economic dynamics on ecosystem sustainability and environmental protection.

2.2 Data analysis

To analyze the qualitative data collected, we used techniques such as content analysis of the various testimonies and contributions of the different territorial stakeholders interviewed, as well as participatory observations of the territories. In addition, recourse to descriptive statistical calculations and regression analysis were not omitted.

The period of the present study extends from January 2023 to April 2023, and covers a sample of stakeholders in the coastal town of Boujdour, located between Laayoune and Dakhla cities in the extreme south of the Moroccan Kingdom. The results showed that men represent 72% of the population studied, and women 28%, as illustrated in the figure 1:

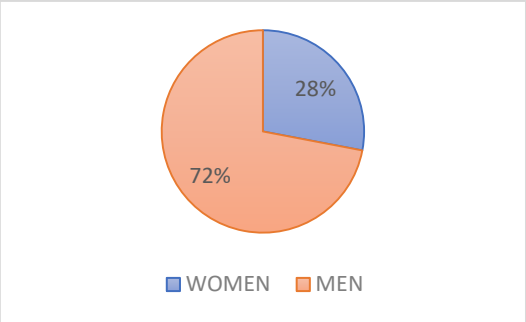

Fig. 1. Gender

The illustration in the figure2 shows the distribution of the population in terms of educational level. According to the data provided, 51% of the population has received no formal education, and is made up of fishermen. The remaining 11% of the population has attained a higher level of education.

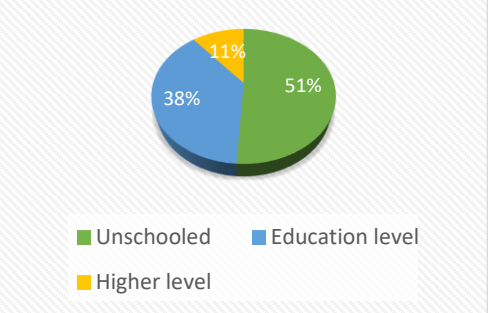

Fig. 2. study level

Regarding to the public awareness, only 32% of the local population are aware of the importance of sustainability, while the remaining 68% show no interest in the sustainability of fishery resources.

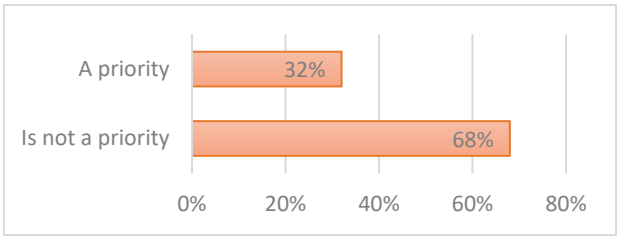

Fig. 3. Raising awareness of the challenges of sustainable fisheries resources

Figure 4 shows the degree of participation of the local population in the management of fisheries resources Also, illustrates that the vast majority of the population is neutral and only 12% of the local population is involved in this process. This part shows an interest and a desire to contribute to the management and preservation of fisheries resources.

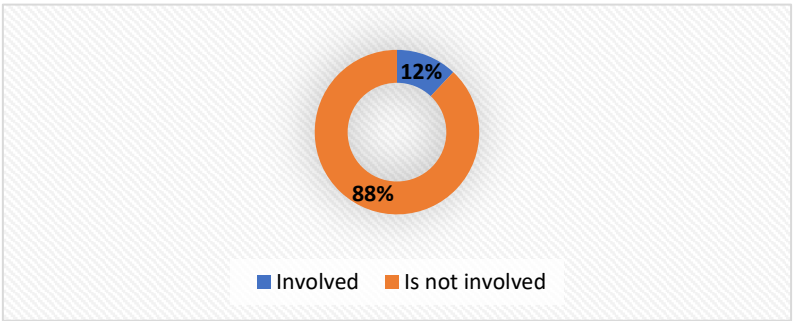

Fig. 4. Community participation in fisheries resource management

3 Results

The results of this study on the dynamics of port towns - which revolve around fishing and seafood processing activities and the sustainability of fisheries resources - reveal dysfunctions in rapports of the Saharan local population's perception and appropriation of the stakes involved in the sustainability of fisheries resources and environment protection, as well as the low level of involvement of citizens and stakeholders in fisheries resource management processes.

Nevertheless, the low level of education of artisanal fishing professionals and the absence of good governance due to the cash economy that is becoming "a culture" in Saharan coastal cities are a major handicap to sustainable and inclusive territorial development. A close positive correlation between the economic dynamics of port cities and the sustainability of fisheries resources is essential for the sustainability of fisheries resources in the region.

In conclusion, the effectiveness of public policies in the sustainable and efficient management of the cities on the Saharan coast depends on the promotion of responsible investment, the involvement of citizens and stakeholders in the fishing sector in decision-making, and the effective management of marine resources, to guarantee the long-term preservation of marine resources.

The table 1 summarizes the responses to the survey conducted at the level of the population of Boujdour city.

Table 1. Citizen surveys.

Questions	Answers	**% of replies**
(Q1): Citizens' priority	Environment	27%
	Job	70%
	Security	3%
(Q2): Fishermen's priority	Sustainability of fisheries resources	18%
	Yield	60%
	Environment Protection	22%

(Q3): Rising fuel prices encourage the overexploitation of fisheries resources	Yes	12%
	No	88%
(Q4): Impact of the fishing industry on the local population	Creation of employment local	8%
	Urban development	52%
	Contamination source	40%
(Q5): Governance level	Equity	5%
	Transparency	22%
	Rentier economy	73%
(Q6): Use of renewable energies as an alternative to conventional fuel	With	96%
	Against	4%

4. Discussion

4.1 Raising awareness of the challenges of fisheries resources sustainability

The results of the survey show that a large part of the local population (68%), is not interested in the issues of the sustainability of fisheries resources.

These outcomes underline the need for education and awareness campaigns to draw the population's attention to the environmental and economic issues of the sustainability of territorial resources, in order to generate a need for participation among the local population in favor of the preservation. To generate a need for participation among the local population in favor of the medium and long-term preservation of marine resources: vector of inclusive economic development.

Regarding participation in the management of fisheries resources, it is noted that only 20% of respondents who declare to be involved in the processes of management of fisheries resources, in specific associations and cooperatives; while the other respondents representing 80% say they are excluded.

Faced with this situation, it is crucial to promote greater citizen participation through an inclusive and sustainable territorial approach by setting up mechanisms for citizen participation at the level of coastal territories.

Furthermore, this citizen participation mechanisms must prioritize the possibility of taking advantage of knowledge and strategic perspectives for the transformation of port territories in aim to develop effective and efficient management tools for fisheries resources.

4. 2 Sustainable fishing and environmental protection

Illegal fishing - unreported and unregulated (IUU) - constitutes a tangible risk at the global level for the sustainability of fisheries resources, marine ecosystems, and socio-economic development. In this context, the HALIEUTIS strategy, of the Morocco Kingdom, which has significant fish wealth, and makes the sustainability of resources a major concern by firmly committing against the practice of IUU fishing for ensure sustainable exploitation of these resources, through the adoption of a control and monitoring system (CMS) which covers the value chain upstream and downstream (control at sea, control on landing, control in the value chain and catch certification).

Conversely, observations and interviews show that despite the efforts made by the State in the fight against IUU fishing, a large number of fishermen continue to escape responsible fishing practices and continue to resort to fishing practices, unregulated fishing that destroys the fishing heritage; which practices are justified by the additional costs linked to the increase in oil prices which leads fishermen to maximize catches, overfishing and non-compliance with the standards of responsible fishing.

Therefore, it is essential to support sea fishermen in sensitive periods by providing support in the form of subsidies to the maritime sector and by compensating fuel-related costs, as well as by promoting new energy resources, especially for the small-scale fleet which represents about 6245 fishing canoes (1002 boats at the level of the city of Laayoune, 1971 boats at the level of Boujdour city and 3272 at the level of Dakhla city). Such a generalization of green energies would undoubtedly contribute to the fight against overfishing and to the elimination of the negative impacts of fishing gear on marine ecosystems and the sustainability of fisheries resources.

4. 3 Seafood processing industry and environmental protection

According to the empirical study of this work, it is noted that cities of the Sahara coast have important port infrastructures and platforms for the valorization and processing of fisheries products, such as the manufacture of preserves, the freezing, the manufacture of fishmeal and fish oil, as well as the processing of seaweed; knowing that the majority of factories in the localized fishing industry sector are equipped with waste pre-treatment systems and integrated management systems: Quality, Food Safety, and respect for the environment [11].

Still, attention must be drawn to the fact that industrial fish processing plants release greenhouse gas emissions which aggravate air pollution and contribute to global warming which negatively impacts the coastal and marine environment, as well as the sustainability of fisheries resources and the protection of the environment.

4.4 Economic dynamics of cities on the Saharan coast and social exclusion

The cities of the Saharan coast are experiencing a significant economic dynamic which revolves around the activity of fishing, we are grateful to the efforts made by the State which is the first investor in the region.

The outcomes of the interviews highlight the vulnerability of the economy of coastal cities, due to rent policies and the lack of equity in the distribution of wealth, which contributes to the increase in the unemployment rate, and remains quite high (about 15%). This unemployment rate is explained by the low employability of young people and the non-involvement in fishing professions.

To solve these problems, it is essential to put in place mechanisms for responsible governance, through strategic orientations aimed at promoting the diversification and complementarity of economic structures based on the principles of equity and sustainability, as well as only through the implementation of an effective policy of orientation and reinforcement of young skills people in parallel with the needs of the local market.

5 Conclusion

This work is a contribution to the reflections that focus on territorial resources, particularly fisheries, from a sustainability perspective through a study of the relationship between the economic dynamics triggered at the level of the cities of the Moroccan Saharan coast and the question of the sustainability of resources. fisheries which play a key part in the processes of sustainable and inclusive territorial development which should not be done to the detriment of any natural resource and which should not exclude any social category.

Aware that the maritime sector in Morocco has a "Halieutis" development strategy which aims to make the Moroccan fisheries sector a real engine of sustainable development; the current context remains marked by a dynamic of the territories which continues to present deficiencies, particularly in terms of achieving the purposes of sustainable development and governance due to the economy of rent, to the non-social involvement and to the weak appropriation of local citizens in the management of territorial resources, which aggravates the vulnerability and the protection of the environment.

The outcomes of this study confirm that at the level of the cities of the Saharan coast, the fishing sector occupies an important place in the fishing economy. Just as they show that its sustainability, it is being put to the test since economic interests remain a priority in the face of the preservation of territorial resources. Knowing that the quest for sustainability must be an ultimate objective that requires involvement and ownership of this tangible resource of the territory by citizens and stakeholders in sequence to guarantee a healthy future for the coastal community.

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