

Article

Resilience Components in Mexican Whale-Watching Regulation

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Abstract: Whale watching (WW) is a growing tourist activity that is at risk of becoming unsustainable. Legislation regarding WW must mitigate adverse effects on species and address the dynamics of complex systems. This study proposes analyzing this interaction using a socio-ecological resilience framework, considering both social and ecological components. Resilient governance is characterized by four features: flexibility to respond to change, adaptability, multi-level governance, and participation. The aim of this study was to assess how Mexican WW regulations contribute to the resilience of the socio-ecosystem through a literature review on compliance with the regulations and the presence of resilience elements in the regulations. Non-compliance with 12 guidelines was identified, with vessel crowding, distance, and unauthorized vessels being the most frequently reported issues. The analysis of the regulations revealed the presence of all four elements of resilient governance; however, participation is limited to certain key stakeholders, which undermines whale conservation due to non-compliance. In conclusion, the Mexican regulations contribute to resilient governance; however, to ensure whale conservation and socio-ecological resilience, it is essential that all involved parties understand their roles and actively participate in decision-making processes.

Keywords: whale watching; non-compliance with regulation; resilient governance; sustainability



Citation: Espinoza-Rodríguez, I.J.; Chávez-Dagostino, R.M.; Heckel, G. Resilience Components in Mexican Whale-Watching Regulation. *Tour. Hosp.* **2024**, *5*, 1028–1041. <https://doi.org/10.3390/tourhosp5040058>

Academic Editors: Brian Garrod, Shuyue Huang and Dagnachew Leta Senbeto

Received: 8 September 2024

Revised: 22 October 2024

Accepted: 25 October 2024

Published: 28 October 2024



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1. Introduction

Whale watching (WW) is considered a sustainable and non-consumptive activity [1]. It is currently one of the main economic service activities in coastal communities that capitalize on species, some of which are categorized as at-risk, as a tourist attraction [2]. In recent decades, there has been a global boom in WW [3]. As a common-use resource, marine life and habitats are under increasing pressure and risk of overexploitation, which can negatively impact whale behavior, populations, and coastal communities [2,4,5]. The negative effects of human activities can directly or indirectly impact cetacean populations and their habitats. These effects can be immediate or medium- or long-term [6]; the level of impact varies depending on the degree of exposure of the species [7]. Conversely, the activity can have positive effects on both whales and coastal communities. Currently, most of these benefits focus on the direct and indirect economic development of coastal communities [3]. Another recognized benefit includes educational opportunities for tourists, tour operators, and the local people [8,9].

As an ecotourism activity, WW is generally assumed to produce a low environmental impact. It is possible that negative effects may go unnoticed, as they may become visible in some cases only in the long term, obscuring the causes and poor practices of service providers [10]. This raises concerns about long-term sustainability [11], as the absence of an observable negative effect does not indicate a lack of disturbance [7]. Therefore, the unregulated growth of WW may endanger whales and the sustainability of the activity [12]. To reverse this situation, WW-related legislation must be capable of reducing the adverse effects on species [13], while also addressing the dynamics of these complex systems. WW activity can be considered part of a complex socio-ecological system, wherein a close

relationship exists between ecosystems and society; consequently, social, political, and environmental changes impact the resilience of these systems [14].

1.1. Regulatory Framework and Socioecological Resilience

According to Wilbrink [14], this socio-ecological system is dynamic, comprising operators, tourists, and the local population as part of the social component, while whales and their habitat represent the ecological component. This system may also be referred to as a socio-ecosystem where biophysical and social components interact at different scales and moments [15]. According to the level of involvement of the stakeholders in the conservation of the ecological component of the system and their material interests, they can be classified into exogenous or shadow stakeholders, who do not participate directly in conservation but who do have a material interest in the resource, and endogenous stakeholders, who are responsible for the conservation management project [16]. Related to WW, the endogenous agents are the ones in charge of promulgating, monitoring, and enforcing the rules, through sustainability criteria to achieve conservation, improving human living conditions, and balanced development of the country.

In order to prevent whales and their habitat from experiencing negative effects derived from WW, a variety of regulatory measures have been implemented worldwide [9]. These include both voluntary and mandatory measures, as well as collaborative management activities driven by research [3]. The regulatory framework for WW is highly diverse, reflecting the variability in species and regional characteristics [17–19]. In general, regulatory measures aim to control the distance between vessels and whales, the duration of observation, the speed of navigation, the approach, and the number of vessels in the vicinity. In Mexico, the legal instrument that regulates this tourism activity in the country is the Mexican Official Standard 131 [20]. It is mandatory and specifies the guidelines that must be adhered to by all vessels engaged in WW for tourism purposes (Table 1). It also states that the Federal Attorney for Environmental Protection (PROFEPA, for its Spanish acronym) is responsible for monitoring and enforcing the standard. Additionally, the legislation underscores the importance of scientific research in comprehending not only the ecological aspects of the species but also the adverse impacts of this tourist activity. The law also mandates that each year, prior to the start of the whale watching season, an “announcement” be published in the Official Gazette of the Federation, specifying the start and end dates of the season and the areas permitted for whale watching based on recent scientific research. Lastly, the standard assigns responsibility to the environmental ministry (SEMARNAT, by its Spanish acronym) to provide or coordinate training courses for whale watching tour operators and vessel crews, covering topics such as safety, health, and species ecology, with the aim of preventing negative impacts of vessels on whales and their habitat. The elements included in the standard aim to ensure that this activity is sustainable, thus promoting the country’s economic benefits and the conservation of the species involved. According to Wilbrink [14], a sustainable WW activity must have socio-ecological resilience and resilient governance.

Table 1. Mexican whale-watching regulation guidelines (NOM-131-SEMARNAT-2010) [16] evaluated in the publications reviewed.

Guideline	Specifications
Authorized vessels	All tourist vessels engaged in whale watching must obtain and carry a permit and an authorization flag.
Restricted area	It is prohibited to engage in whale-watching tourism activities within the designated restricted zones as outlined in the regulatory framework.
Manner of approach	From the rear and to the side of the individual, while the vessel must travel parallel to its path.
Distance to the whales	Blue whale: 100 m for small vessels (less than 10 m in length), 120 m for medium-sized and large vessels (10 m in length or above). Other whales: 60 m for small vessels (less than 10 m in length), 80 m for medium-sized and large vessels (10 m in length or above). For vessels waiting their turn, 240 m.

Table 1. Cont.

Guideline	Specifications
Watching time	30 min maximum.
Number of vessels	Maximum of four vessels per whale or group of whales.
Engine running	Keep the engine running during the observation. If the whale approaches the boat, keep it in neutral. Turning off the engine is only allowed when using a hydrophone.
Vessel movement	Avoid abrupt acceleration and deceleration. Boats should move parallel to the whale's displacement.
Whale watching season	Period indicated by SEMARNAT and published in the yearly announcement authorizing the whale watching period.
Whale watching on prohibited vessels	Do not use vessels such as jet skis, kayaks, canoes, paddle inflatables, submersibles, dinghies, bananas, airplanes, or helicopters.
Vessel speed	The maximum permitted speed of navigation within the observation areas should be less than 5 knots or 9 km/h, decreasing to 2 knots or 4 km/h when the vessel enters the observation zone; the vessel should always travel at a speed slower than the whales.

1.2. Conceptual Approach

Socio-ecological resilience is defined as a system's ability to withstand disturbances and adapt through changes while preserving its fundamental functions, structure, identity, and feedback mechanisms [21]. Resilience thinking is comprehensive, as it addresses uncertainty, system dynamics, and ways to cope with change [22]. For a socio-ecological system to be considered resilient, it must be able to overcome disturbances by adapting and reorganizing in the face of change [23]. Resilient governance must have four characteristics: flexibility to respond to change, adaptability, multi-level governance, and participation. In this way, management achieves species conservation and the sustainability of the activity [14]. Flexibility refers to the ability to provide a quick and tailored response according to changing circumstances, ensuring effectiveness in the face of change; in other words, flexibility is a rapid response based on knowledge [24], which allows for varied application of regulation. Alternatively, adaptability is the capacity of management strategies to adjust and respond to changing circumstances and address new challenges; to achieve this, the strategy must be flexible and dynamic, capable of continuously evolving according to new information and changing conditions. For this, research is needed to generate new knowledge, evaluate routines and revise strategies, considering the dynamism of the system and the effects it could cause. Flexibility and adaptability are interrelated, as both involve responding to change. Conversely, multi-level governance involves coordination and cooperation among various stakeholders to provide alternative and complementary options at different levels, addressing the diverse causes of problems [24]. This means there must be interactions across scales, very similar to the concept of polycentric governance; both approaches are crucial for the socio-ecological system. Lastly, participation refers to the active and meaningful inclusion of stakeholders in the decision-making process, ensuring a diversity of perspectives, with socially equitable and culturally appropriate policies. This ensures that stakeholders are engaged in the adopted measures. The inter-relatedness of multi-level governance and participation is evident. These measures allow for the monitoring of procedures in these complex social systems where, in addition to generating knowledge, they foster cooperation among the various elements of the social component. The integration of these four characteristics into management strategies can effectively contribute to the conservation of species and the sustainability of activities.

Whale watching is the largest economic activity dependent on cetaceans [14] and is experiencing steady growth, encompassing both beneficial and adverse effects. Consequently, Mexican regulations for managing this activity should contribute to the socio-ecological resilience of the system, thereby promoting the conservation of whales and their habitat and ensuring the sustainability of the activity. Analyzing the elements of resilient governance within the regulation would assist in the identification of potential avenues for inclusion or

reinforcement to improve management and achieve conservation objectives. It is assumed that the more resilient the governance, the more efficient the management should be, and the better the management, the more resilient the system.

Although some documents report non-compliance with regulations in specific locations in Mexico [25,26], it is unknown which are the most frequent. Additionally, there is a lack of research analyzing WW regulations and integrating the perspectives of social-ecological resilience and resilient governance, with the goal of whale conservation, under the assumption that such regulations would promote a more sustainable activity. The following questions must be addressed: Has there been any non-compliance with the regulations in question? What are the main forms of non-compliance? Furthermore, what elements of resilient governance are present in the Mexican regulations for whale watching? Therefore, the objective of this paper is to analyze the contribution of Mexican whale-watching regulations to the resilience of the socio-ecological system, influencing the conservation of the species and its habitat through a resilient governance approach.

2. Methods

A literature search was carried out as a first step to identify the main forms of non-compliance with Mexican regulations that have been documented by other researchers during WW activities along the Mexican coastline where WW is conducted (Figure 1). The search was conducted in multidisciplinary databases (Scopus, Web of Science, EBSCO, Proquest, and Google Scholar). A total of 14 documents (articles and theses) met the search criteria (Table 2), of which two were duplicates, resulting in 12 articles. Full texts were then examined to verify their focus on regulatory compliance, and to extract the main forms of non-compliance. A narrative analysis was performed to summarize the findings.

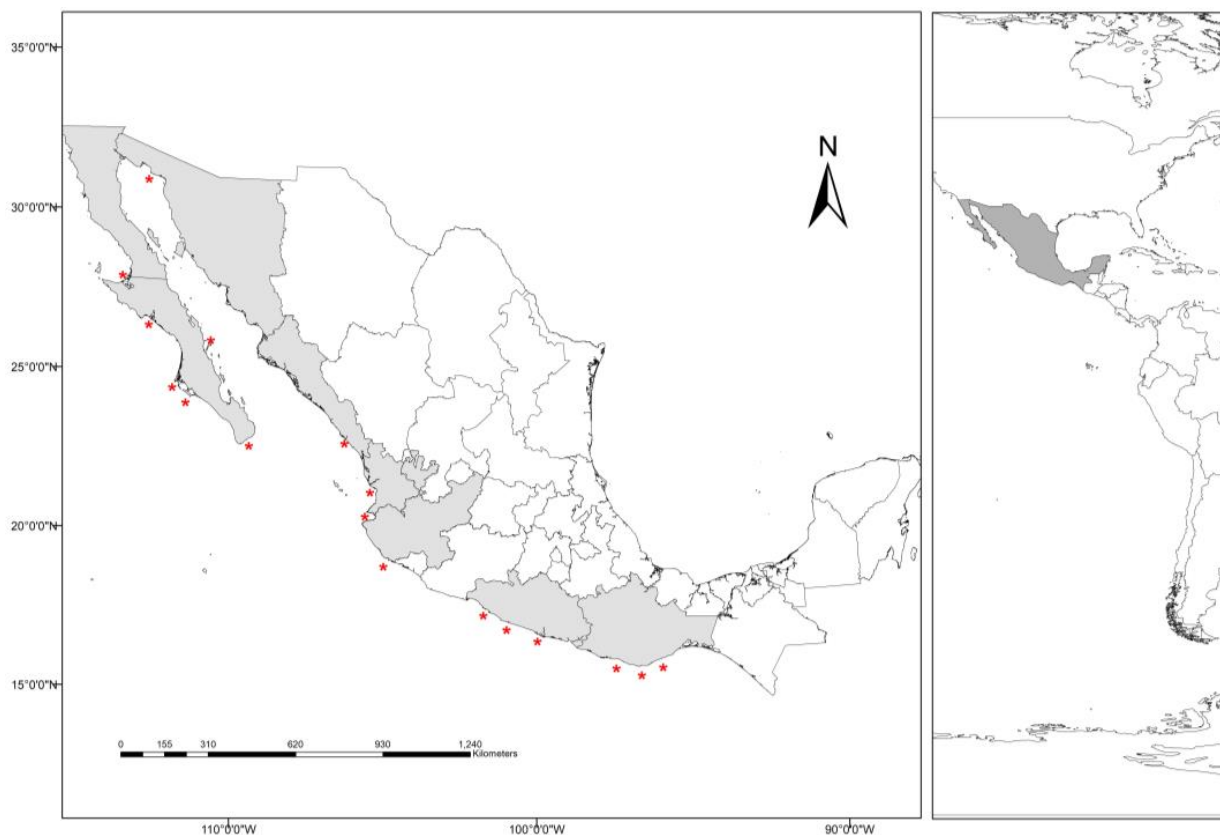


Figure 1. Geographical locations for whale watching in Mexico, as defined by existing Mexican regulations. The states of Mexico where whale watching takes place are shown in gray, while the asterisks in red mark specific sites [27].

Table 2. Search terms and number of documents found in databases.

Database	Search Terms	Documents Found
SCOPUS		
(Title; Abstract; Key Words)	(compliance OR observance OR	1
WoS (all databases) (Topic)	adherence OR enforcement) AND whale	1
EBSCO	AND watching AND (regulations OR	1
PROQUEST	rules OR standards) AND Mexico	1
Google Scholar (By relevance)		10

Subsequently, an analysis of the Mexican official standard NOM-131-SEMARNAT-2010 [16] was conducted to ascertain the presence of the four elements of resilient governance: flexibility to respond to change, adaptability, multi-level governance, and participation [14]. The components and agents were identified according to the actions and/or effects generated by WW activities and then classified according to Wilbrink [14] and Khan [16]. In the first classification, the ecological component consists of the whales and their habitat. To classify the social component, Wilbrink's classification was modified, leaving the following sub-components: tour operators, local people, government, and researchers. Although tourists are part of the social component of this socio-ecosystem, Mexican regulation does not establish any function that they have to fulfill during WW. Within the tour operators sub-component, there are individuals or legal entities that own boats, known as service providers, as well as the boat crews; in the local population sub-component, the regulation mentions private agents and, in some cases, tourists are included. In the government sub-component, government institutions (SEMARNAT, PROFEPA, CONANP) and other agencies, such as the Ministries of Tourism, Communications and Transport, as well as the Navy, are included. Finally, the researchers' sub-component includes educational institutions and NGOs. On the other hand, considering Khan's classification [17], the endogenous agents include all the actors in the government and researchers' sub-component, while the exogenous or shadow agents consist of the tour operators and local population sub-components.

3. Results

3.1. Regulatory Compliance Documented

The oldest document reviewed [28] analyzed the laws, regulations, and guidelines governing WW in North America (including Mexico), comparing them among the three countries while recognizing whales as a shared migratory resource whose conservation is also a shared responsibility. A form of non-compliance was the watching distance, highlighting the effect of getting too close to the whales (harassment), although the related guidelines were diverse and, in Mexico, were not officially established.

The documents analyzed revealed a consistent pattern of non-compliance with whale-watching regulations by tour operators in Mexico, and there is agreement about the presence of better WW practices associated with protected areas [15]. Most of these studies focused on the gray whale (*Eschrichtius robustus*) in the Baja California Peninsula [4,17,26,28–30]. The humpback whale (*Megaptera novaeangliae*) in Banderas Bay [25,31,32] and the blue whale (*Balaenoptera musculus*) in Loreto [33] are species regulated by the same standards as those for gray whales in Mexico. The findings, in general, indicated inconsistencies in the application of the regulations. In the case of the gray whale, only three out of 16 evaluated indicators (prohibition of touching, feeding, and obstructing the whales) were fully complied with. Seven indicators demonstrated a high degree of non-compliance (80%), particularly with regard to engine shutdown, vessel movement and distance, observation time, and vessel positioning [17,33]. In Banderas Bay, even though there has not been a direct assessment of compliance [25,34], actions that violate the regulations have been reported, such as WW outside of the designated season or in restricted areas, at distances closer than allowed, vessel crowding, speeding, and the use of unauthorized (private for

other tourist purposes) and prohibited vessels [25,31,32,35] (Figure 2). These issues have intensified in recent years.

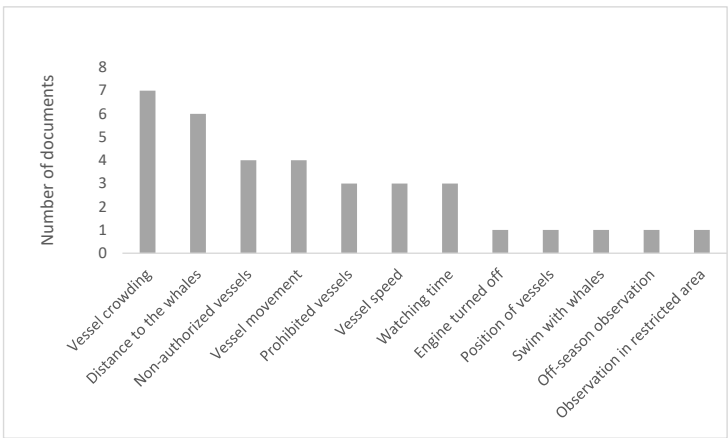


Figure 2. Number of documents reporting non-compliance with whale-watching regulations in Mexico.

3.2. Elements of Resilience in Mexican Whale-Watching Regulations

In the analysis of the standard, the current regulations implicitly include the four elements of resilient governance. Each of these elements is explained as follows:

3.2.1. Flexibility to Respond to Change

The regulation comprises two elements of flexibility, one of which falls under the purview of the government. This element allows for the issuance of permits to all tour operators that apply for them and comply with the established requirements. There is no limit on the number of permits issued, and permits are only denied to those operators who fail to adhere to the guidelines. The other element falls under the purview of the tour-operators, which can also be considered part of the social component. This element is related to actions on whales, which can be classified as part of the ecological component. The regulation indicates that, during the observation, tour operators must withdraw if they observe evasive behavior in the whales or remain with the whales with the engine in neutral if the whales are behaving curiously and move away after the whales do (Figure 3).

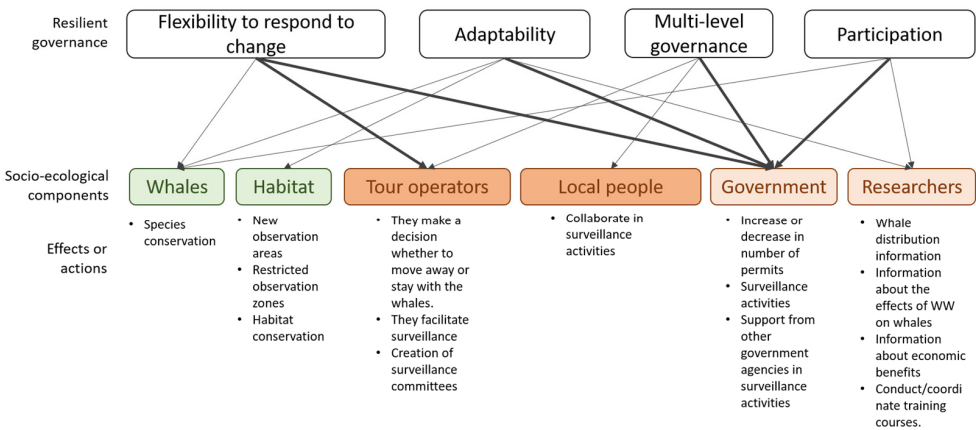


Figure 3. Elements of resilient governance present in the Mexican whale-watching regulation. Thick lines indicate which components of the socio-ecological system are directly responsible for resilient governance actions. Thin lines indicate which components of the socio-ecological system are affected by governance actions. Green represents the ecological components of the system, while orange represents the social components (exogenous agents: dark orange and endogenous agents: light orange).

3.2.2. Adaptability

Two elements of adaptability were identified, both of which fall under the purview of the government. The first of these elements is also related to flexibility in terms of the indefinite limit on the number of authorized vessels. The second element of adaptability is the annual publication of an additional instrument to the regulation, known as the announcement. This establishes new areas authorized for WW, as well as the inclusion or exclusion of restriction areas for whale watching and the period of time in which it is permitted. In this case, the responsibility for action falls to the social component, namely the researchers, who, in light of the findings of their research, are able to propose amendments to the announcement; the government may choose to accept or reject these recommendations. Tour operators also play a role by using and respecting the designated areas, which in turn exerts pressure on and benefits the ecological component (Figure 3).

3.2.3. Multi-Level Governance

In relation to multi-level governance, two elements were identified, both of which can be summarized as forms of surveillance conducted by the relevant authority. The first element indicates that the Federal Attorney's Office for Environmental Protection (PROFEPA) is empowered to conduct surveillance operations, and that tour operators are obliged to facilitate such operations. This includes the requirement for tour operators to present their authorization to conduct whale watching for tourism purposes. The second element involves the possibility of surveillance operations being carried out by other federal government agencies (see government sub-component), provided that it falls within their competencies and authorities, and that support has been requested by the competent authority. In addition, surveillance committees may be created that involve the participation of civil society (Figure 3).

3.2.4. Participation

Only one element of participation was identified in the regulation, and it falls under the purview of the government. This element involves considering and/or promoting the involvement of specialized scientists to generate knowledge about the ecological component (the species and the effects of tourist activities). This scientific input is crucial for determining, for example, the establishment of seasonal dates, as well as the designation of restricted zones and new observation areas. This is the least represented element in the regulation (Figure 3).

4. Discussion

This study analyzed both publications reporting compliance with Mexican regulations by tour operators and the Mexican regulation itself, focusing on elements of resilient governance. Both aspects are considered crucial for identifying opportunities in the regulation that promote compliance, stakeholder participation, and the reduction of impacts on the ecological component, all in pursuit of the socio-ecological resilience of the system.

Regarding compliance, Mexico permits WW activities for several species; however, direct studies on regulatory compliance are scarce. Among the reviewed articles, only one conducted a direct assessment of compliance with WW regulations involving gray whales on the Baja California Peninsula, Mexico [17]. The remainder of the articles provided indirect assessments based on surveys of key stakeholders and tourists who observed humpback and blue whales. These studies reported non-compliance with 12 regulatory guidelines, with the most frequent violations involving vessel crowding, watching distance, and WW conducted on unauthorized vessels, followed by the use of prohibited vessels (Figure 2). However, since most data come from the perceptions of tourists and other key stakeholders, this may not accurately reflect the actual compliance with whale-watching regulations in the country. It has been indicated that non-compliance may be unconscious, as interviews revealed that operators often believe they are complying adequately, while authorities have a different view [25]. This discrepancy highlights the need to strengthen

inspection and monitoring efforts, as well as to provide proper training [25]. Some authors have suggested that targeted training can lead to attitude changes and improve compliance with regulations [36].

Conversely, the regulatory analysis identified elements of resilient governance that contribute to WW sustainability. Although some governance elements are prominently represented in the regulations, their effectiveness is limited by the nature of the regulation itself.

The first component of resilient governance is the capacity to adapt in response to change. It was determined that the responsibility for permit authorization lies with the government (Figure 3). However, the unlimited issuance of permits benefits tour operators by increasing permits, thereby conferring advantages on the exogenous agents, leading to an increase in the number of vessels, which negatively impacts the ecological component [35]. Another element of flexibility allows operators to interpret whale behavior to decide whether to stay nearby or move away. While this ability is beneficial, it requires operators to have appropriate training and ecological awareness; otherwise, decisions may be based more on the captain's individual skills and training [17], potentially leading to choices that favor the operator over the well-being of the whales (Figure 4). According to the regulation, training must be coordinated by the endogenous agents. (Figure 2) [20]. In summary, the flexibility within the regulation is subject to changes in the components of the socio-ecological system.

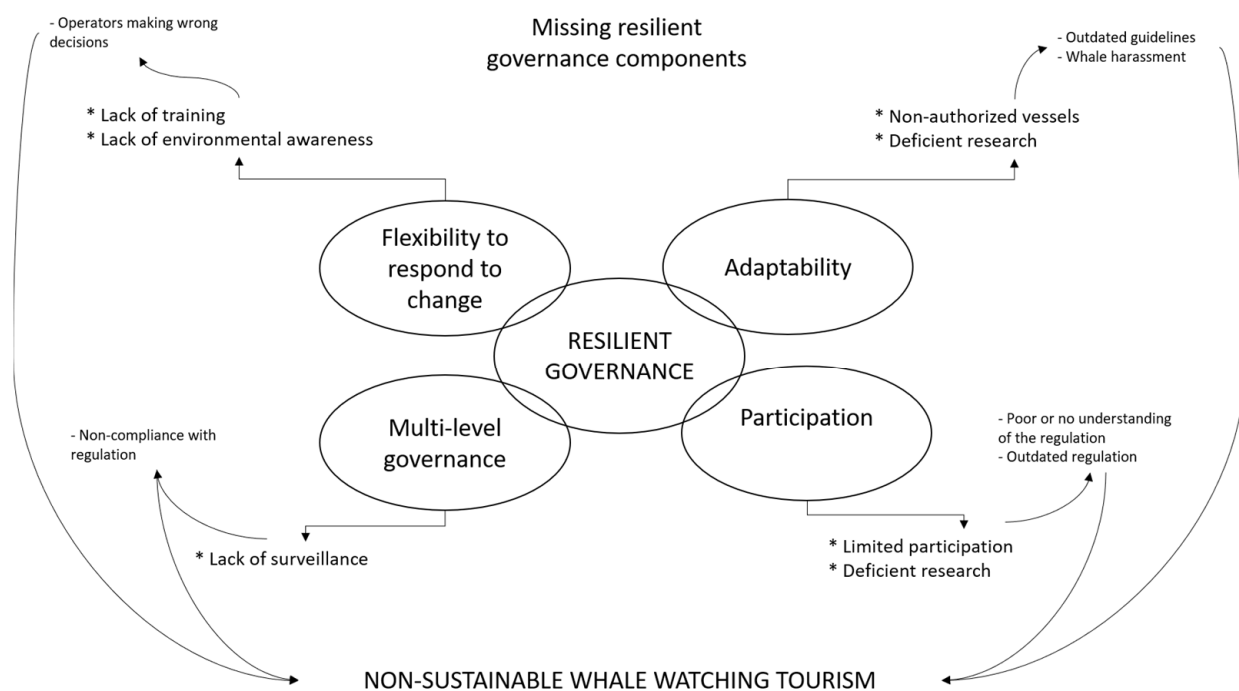


Figure 4. Consequences of the lack of resilient governance.

Regarding adaptability, the growing interest in WW has driven an increase in service offerings in the region and, consequently, the number of vessels, economically benefiting both operators and the local population. Scientific research has identified new distribution areas for humpback whales, leading to the designation of new WW zones in states such as Sinaloa, Jalisco, Guerrero, and Oaxaca, in response to the demand of the local community. These new WW areas have been published in the yearly announcement [37–40]. Additionally, in Bahía de Banderas, adjustments have been made to the seasonal dates, and new restriction zones have been established [39,41,42]. While these changes demonstrate adaptability in response to the social component, they fail to consider the potential negative

impacts on ecological resilience resulting from the increase in boats and inadequate tourism practices (Figure 4).

Although the yearly announcement is useful for determining dates and areas, it is limited in terms of managing the activity, as it does not include guidelines for mitigating negative impacts on the whales. According to the competent authority, modifications to the guidelines for WW operation can only be made through a revision of the current regulation (personal communication (SEMARNAT Wildlife Directorate)). However, no revisions have been implemented since 2010, despite significant changes in circumstances. In the pursuit of equilibrium between the economic advantages conferred upon exogenous agents and the prevention of detrimental effects on the ecological system, it has been proposed to establish indicators based on studies of species distribution and biological cycles to limit the number of vessels per area and time, considering that the number of permits increases by 15% annually [35]. Currently, the allocation of permits has been based solely on performance and social pressures of exogenous actors, making it essential to involve both endogenous and exogenous actors in achieving more effective regulation in terms of resilience and thus sustainability of the activity.

Some authors have noted an increase in unauthorized vessels (private or commercial) conducting whale watching in the country [31]. The current Mexican regulations do not encompass these vessels, which exert increased pressure on the ecological component and erode the trust of operators in the authority, thereby limiting their participation. In order to reinforce relations with key stakeholders, it is recommended to promote actions that generate trust. Ultimately, incorporating these vessels into the regulatory framework would enhance management and serve as an additional example of adaptability (Figure 4).

In terms of multi-level governance, PROFEPA is the authority responsible for monitoring and enforcing the regulation [20]. However, surveillance operations are generally infrequent across the country [35]. When these operations do take place, operators are often aware of them and comply with the regulations during the surveillance days. However, in the absence of authorities, various forms of violations are observed. The regulation allows for the involvement of other agencies to increase surveillance; however, this typically occurs only in urgent cases such as entanglements, strandings, or collisions [25].

In Laguna San Ignacio, Baja California Sur, where gray whale watching is conducted, boat captains understand and enforce the regulations, monitoring the behavior of others [17]. During the 2023–2024 season, in Banderas Bay, the National Commission of Natural Protected Areas (CONANP, for its Spanish acronym), in collaboration with PROFEPA and local people, implemented WW surveillance committees (personal observation). However, operators have expressed distrust in this system, pointing out the lack of effective monitoring with sanctions and fines (anonymous tour operator, 15 March 2024). This is because these committees have preventive and informative functions, where it is crucial to provide them with ongoing training to ensure timely and correct reporting to PROFEPA.

Surveillance could be enhanced through the establishment of marine protected areas (MPAs), which would allow for greater control over activities, as seen in Laguna Ojo de Liebre, Baja California Sur [17]. In other areas of the Baja California Peninsula, there are already academic proposals to create MPAs [31]. However, in Bahía de Banderas, more research and detailed efforts are still needed; in both cases, it is crucial to formalize these proposals.

Finally, participation is the least represented element of resilient governance within WW regulations, as it only includes the government and researchers, excluding tour operators, owners, and the local people. The latter, as exogenous agents, have a material interest in WW, given that they are the parties engaged in non-extractive use and consequently receive the associated economic benefits. It thus becomes evident that they should participate directly in the formulation of the regulatory strategies. In general, the elements of the social component do not exhibit a joint interaction, as it is primarily the endogenous agents who are responsible for formulating regulatory strategies [20]. In the most recent reform of the WW regulation, it is indicated that seven government agencies, two educational

institutions, five NGOs, and one company participated in the formulation of the guidelines. However, it should be noted that there was representation from both endogenous and exogenous agents at the time of the formulation, but it is evident that there was a low level of participation from exogenous agents, particularly tour operators, since the total number of permits granted by SEMARNAT in Banderas Bay alone exceeds 200 [43]. However, as Khan [16] notes, at the time of enforcement, material interests provide exogenous agents with reasons to engage with endogenous agents in the regulatory strategy, especially when there are critical moments such as disagreements at the time of enforcement. In these cases, the participation of exogenous agents may be more related to material interests than to resource conservation. On the other hand, research is essential to understand both the effects and benefits on both components of the system. Public participation is crucial to integrating local knowledge, improving solutions, and securing greater support from tour operators [29]. Although some of them have expressed proposals in training courses, these have not been considered because it has not been the appropriate forum for public participation.

Although the four elements of resilient governance were identified, the mandatory and federal nature of the regulation limits the participation of stakeholders and the proper application of the regulation. The lack of resources for enforcement exacerbates this situation [25]. Since the regulation's inception in 1998 and during the 2010 revision, academia, NGOs, government agencies, and tour operators were invited to participate, and the regulation was also subjected to public consultation [20,44]. However, participation was limited, compromising resilient governance and the sustainability of the activity. It is of the utmost importance that the federal authority updates the regulation to include exogenous agents in the process. The last reform saw only one company participate, which evidences a lack of interest or dissemination of the request for participation in the formulation and public consultation. These stakeholders are in direct contact with the ecological component and can offer applicable suggestions, as well as understand and encourage compliance with the regulation among other operators. Without participation or with limited participation, resilience will not be effective, as federal centralization limits resilient governance and cetacean protection [14].

Several authors have suggested ideas that could improve regulation and contribute to resilient governance, encompassing all components of the socio-ecological system. In regard to flexibility, emphasis has been placed on the necessity for management to adapt to changes in tourism development [33]. Concerning adaptability, ref. [45] highlights the lack of limits on permits, while ref. [46] proposes reducing the number of vessels to protect the species under conditions of uncertainty. In terms of multi-level governance, several authors mention the lack of effective monitoring [25,31,35]. Regarding participation, the challenge of involving communities is acknowledged, as it is crucial for improving whale-watching practices and contributing to compliance and sustainability. Furthermore, the local people must participate in the conservation and ecological and social valuation of the resource [47]

Finally, according to the analysis conducted, non-compliance with regulations and limited resilient governance create disturbances in the ecological component while neglecting the social component. Resilient governance aims to achieve socio-ecological system resilience by conserving whales and their habitat (ecological component) and promoting effective stakeholder participation (social component). In order to achieve this objective, five urgent actions are proposed: 1. Ensure enforcement and proper application of the regulations; 2. Update the regulations, which have not been reviewed in 14 years, despite the law requiring revisions every five years [48]; 3. Ensure continuous stakeholder participation, especially tour operators, in areas where tourism activity is rapidly growing [29], as this indicates changes in both system components; 4. Improve dissemination of the regulations using both current and traditional media, ensuring that information reaches all operators and boat owners; and 5. Examine the involvement of actors or stakeholders—along with their interests—that may have previously gone unnoticed or newly emerged and are now affecting the ecosystem and WW management practices. One way to finance these actions

is to implement a tourist fee [29] covering enforcement, research, and outreach. These measures would strengthen resilient governance and the sustainability of the activity.

In summary, WW cannot be considered sustainable due to the increase in the number of permits [35], the lack of enforcement [25,35], the scarcity of research assessing compliance with regulations and the negative effects of tourism activities, and the lack of stakeholder participation (Figure 3). In Mexico, there is a paucity of studies on regulatory compliance, and those that do exist address the topic indirectly. It is necessary for scientists, NGOs, and other stakeholders to conduct formal studies evaluating each aspect of the regulations. Absent such evidence, strict enforcement actions cannot be justified, nor can enforcement be effective, nor can awareness be generated among operators about the importance of complying with the regulations or about the negative effects of whale watching. A significant proportion of the coastal population relies on tourism-related activities, such as WW, as a source of income. Furthermore, the interest of tourists in these activities is also growing, which raises concerns about the sustainability of the industry. This study is therefore of great relevance in that it identifies and examines the issues associated with WW, from the management of the activity to its development.

5. Conclusions

It was established that non-compliance with regulations in Mexico related to WW was one of the questions proposed in this research. NOM-131-SEMARNAT-2010 is the legal instrument that regulates WW in Mexico. The analysis conducted revealed that the main forms of non-compliance are related to vessel crowding, watching distance, and non-authorized vessels. The reported forms of operation constitute a form of harassment of whales and could have biologically significant repercussions for whales. WW is a tourism activity in constant development, and in several places, there is no surveillance by the regulatory authority, as reported in the results. Therefore, if the activity is to be sustainable, there must be enforcement of the law by the competent authority, the local people must participate in the surveillance, and the regulations must be revised. The revision must receive input from scientific research and management experience from the authorities. Research should be continuous, with both the guidelines and their application evaluated, as well as the distribution of whales, the effects of WW, and economic benefits.

Related to the other question that guided the research about the elements of resilient governance present in the Mexican regulations for WW, it is concluded that it does contribute to resilient governance, as all four elements of resilient governance were identified: flexibility to respond to change, adaptability, multi-level governance, and participation. The presence of these four elements in the regulations may facilitate the implementation of effective management strategies that are conducive to the sustainable practice of WW. However, not all components of the socio-ecological system are integrated into its application. In addition, all four elements are the direct responsibility of the government, while only one of them is shared by the tour operators. The involvement of researchers is essential for both the government and tour operators to make informed decisions across all elements of resilient governance. In the case of tour operators, their participation is limited to collaboration with the authorities in the area of multi-level governance. This suggests that there is a limitation to the resilience of the socio-ecosystem, as it restricts the full and active participation of all stakeholders. In order to guarantee the conservation of whales and ensure socio-ecological resilience, it is essential to ensure that all stakeholders are aware of their roles and actively participate in decision-making processes related to WW activities.

The four elements of resilience governance present in the regulations analyzed do not guarantee a sustainable activity in a context of non-compliance.

This work has contributed to the exposure of the principal forms of non-compliance with the Mexican regulatory framework for WW. The study proposed new components for the socio-ecosystem that had not been previously defined by other authors. Additionally, it identified elements of resilient governance within the Mexican regulatory framework that

contribute to the resilience of the socio-ecosystem and, consequently, to the sustainability of the activity.

One of the limitations of this work is the aggregation of local people as one large group, a fact that can overshadow the participation of important actors such as artisanal anglers and tourists who are not mentioned in the Mexican regulations studied.

Even though the standard studied only applies to Mexico, the analysis applied with respect to the elements of resilient governance can be used in other studies around the world. The above limitations may constitute the basis for further research.

Author Contributions: Conceptualization, I.J.E.-R. and R.M.C.-D.; methodology, I.J.E.-R. and R.M.C.-D.; formal analysis, I.J.E.-R.; investigation, I.J.E.-R.; writing—original draft preparation, I.J.E.-R.; writing—review and editing, R.M.C.-D. and G.H.; visualization, I.J.E.-R.; supervision, R.M.C.-D. and G.H.; project administration, I.J.E.-R. and R.M.C.-D. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Requests to access raw data should be addressed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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