



## Research article

# Leveraging local environmental management in the scope of an administrative decentralization process: The case of Portuguese coastal municipalities

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## ABSTRACT

Administrative decentralization has been widely promoted as a pathway to more responsive and context-sensitive governance; however, its implications for local environmental management remain underexplored. This study examines how to leverage local environmental management in the context of administrative decentralization in Portugal, focusing on coastal municipalities. Our findings reveal that despite formal administrative decentralization reforms, central government retains strong control through uniform competence structures that disregard regional specificities, limiting municipalities' capacity for local environmental management. Municipalities exhibit a preference for maintenance and operational tasks over strategic planning roles, reflecting constrained autonomy and resource limitations. Drawing on these insights, we propose a conceptual framework for strengthening local environmental management under administrative decentralization, highlighting four critical factors: (i) institutional capacity (political, human, and technical resources); (ii) financial and political autonomy; (iii) multi-level and cross-sectoral collaboration; and (iv) local political willingness to act proactively. This framework offers practical guidance for designing context-sensitive, participatory approaches to environmental governance, contributing to both theoretical debates and policy implementation. Our study underscores the importance of capacity-building and sustained stakeholder engagement to ensure decentralization reforms translate into effective local environmental outcomes.

## 1. Introduction

Addressing contemporary socio-ecological crises requires strengthening environmental governance at multiple scales, particularly at the local level where context-specific interventions are most impactful. Administrative decentralization has been widely promoted as a means to enhance local responsiveness and foster adaptive environmental management. However, the environmental implications of administrative decentralization remain underexplored.

While sector-specific environmental decentralization — focused on sectors such as water, forests, and fisheries — has received considerable scholarly attention (Agrawal and Ostrom, 2001; Ribot, 2003; Ribot et al., 2006; Béné et al., 2009; Moore, 2020; Nishimura, 2022) and aligns with the principles of polycentric governance (Agrawal and Ostrom, 2001; Ribot, 2003; Ostrom, 2005; Folke et al., 2007; Andersson and Gibson, 2007; Duit and Galaz, 2008; Lebel et al., 2006; Verma and

Singh, 2016; Carlisle and Gruby, 2019; Baldwin et al., 2024), administrative decentralization, which primarily aims to improve governance in broader domains such as health, education, and environment, has not been adequately analyzed for its environmental implications (Rondinelli et al., 1989; Pollitt, 2007; Ozmen, 2014; Chatzopoulou and Poulsen, 2016; Savy et al., 2017; Kyvelou and Marava, 2017; Faguet and Pal, 2023). Administrative decentralization involves transferring competences from central to subnational governments to improve overall governance effectiveness and local autonomy. In practice, however, environmental responsibilities are often transferred without sufficient consideration of local capacity, autonomy, or willingness to prioritize environmental outcomes. This raises critical questions about whether decentralization reforms truly enable municipalities to develop context-specific, effective environmental strategies or merely impose additional burdens without adequate support.

Portugal represents a highly relevant case for examining this issue.

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Historically centralized, Portugal has undertaken administrative decentralization reforms since 2018, including the transfer of certain environmental competences to municipal governments elected through direct suffrage. Coastal municipalities, home to nearly half of the national population and facing intense urban and environmental pressures, provide a particularly compelling context to analyze how to leverage local environmental governance under administrative decentralization.

Empirical evidence on the actual conditions that enable or constrain effective local environmental management under administrative decentralization is limited. To address this gap, this study aims to (i) analyze the roles that local governments envision for themselves in environmental management in the scope of an administrative decentralization process, (ii) identify key factors shaping the uptake of environmental competences, and (iii) propose a conceptual framework to strengthen local environmental management under administrative decentralization.

By integrating empirical evidence from Portugal with theoretical perspectives on decentralization and environmental governance, this research contributes to filling a significant knowledge gap. This research is original in that it (1) provides empirical insights from an European context, (2) advances theoretical understanding of how administrative decentralization affects environmental governance, as most prior studies have focused on sector-specific cases (e.g., forests, water, fisheries) while neglecting broader administrative reforms; and (3) integrates empirical evidence with theory to propose a practical framework that explicitly links administrative decentralization to local environmental management. The findings have direct policy relevance for designing context-sensitive, participatory decentralization reforms that effectively support local environmental outcomes.

## 2. Methods

This study employs a mixed-methods exploratory design to examine the relationship between administrative decentralization and local environmental management in Portuguese coastal municipalities (Fig. 1).

The methodological approach combines three complementary data collection steps: (1) desktop research and document analysis to contextualize the Portuguese decentralization process, (2) semi-structured expert interviews to capture analytical perspectives on institutional design and implementation challenges, and (3) an online

municipal survey to gather ground-level insights on operational realities and local adaptation strategies. This triangulation approach enhances the validity and robustness of findings by capturing perspectives from both knowledge producers (experts) and knowledge implementers (municipalities).

### 2.1. Portugal as a case study context

Portugal was selected as case study due to its relevance for administrative decentralization research. As a historically centralized European state undergoing administrative decentralization reforms since 2018, Portugal provides a valuable context for examining how uniform, top-down competence transfer relates to local environmental management.

Given the asymmetry in population distribution and service provision among the 278 continental municipalities in Portugal, this study focuses explicitly on the 61 coastal continental municipalities (CCMs). CCMs are particularly relevant for examining local environmental management under administrative decentralization because they host 46 % of Portugal's national population and 55 % of purchasing power (PORDATA, 2022; INE, 2022). Additionally, 90 % of Portugal's major urban areas are located within CCMs, representing 19.6 % of the surface area (Fig. 2).

CCMs are part of major urban areas and encompass the largest population centers, making them increasingly vulnerable to environmental challenges, including those associated with climate change (Elmqvist et al., 2019). The focus on coastal municipalities also reflects significant disparities compared to inland continental municipalities (ICMs), including variations in ecological footprint and biocapacity (Galli et al., 2020), as illustrated in Figure 2. Also, CCMs are among the most service-intensive in continental Portugal, making them significant for examining competence transfer processes. These trends served as the foundation for analysing CCMs as case study for this research.

### 2.2. Data collection

Information regarding the Portuguese decentralization process was collected through a literature review that triangulates insights from different streams of thought. Historical information was systematically collected and synthesized into a chronological timeline documenting key events from the 1960s onward. Sources consulted included peer-

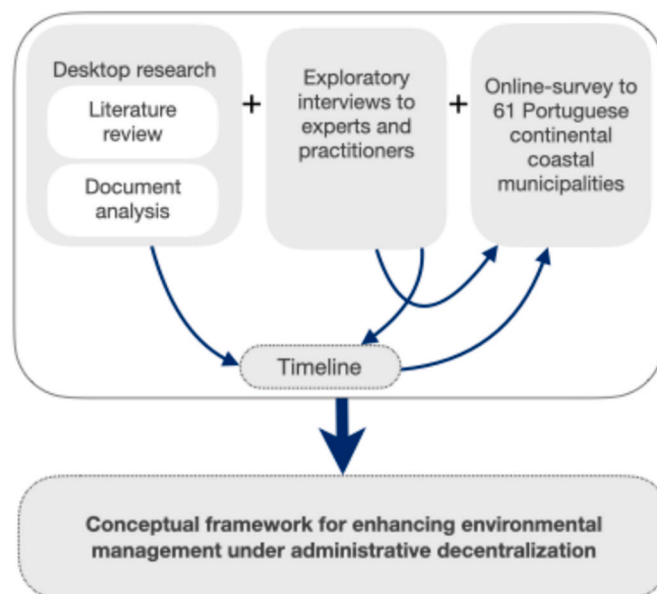


Fig. 1. Overview of data collection steps.

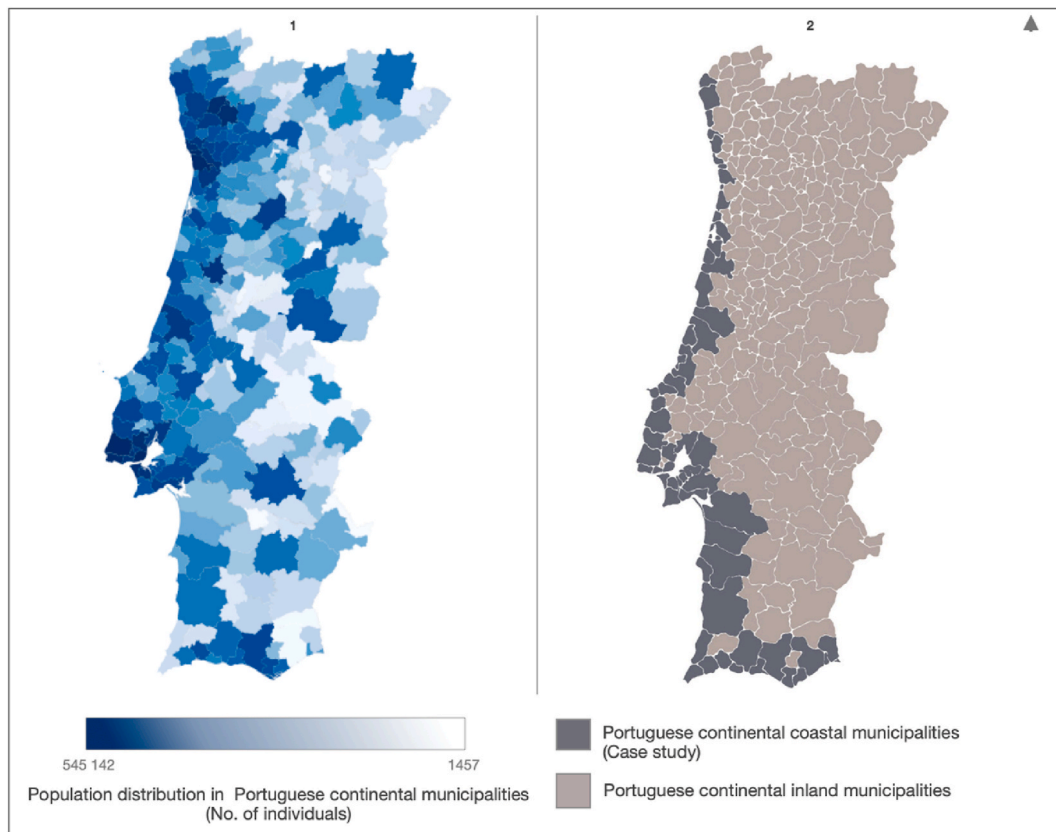


Fig. 2. Map of Portugal<sup>1</sup> illustrates the population distribution, and continental inland municipalities<sup>2</sup>. Maps created by authors using data from the 2021 Census published at <https://www.pordata.pt>.

reviewed scientific literature, master's theses, doctoral dissertations, policy documents, government reports, legal texts and decree-laws.

The comprehensive timeline consolidated fragmented information on this process, offering a detailed account of the key milestones in Portuguese administrative decentralization and providing context for subsequent empirical work.

### 2.3. Expert's perspective on administrative decentralization process and environmental management

Expert participants were identified through purposive sampling using a snowball approach (Reed, 2008; Halperin and Heath, 2020). Twenty-five individuals were initially identified and contacted, including researchers, public administrators, entrepreneurs, and members of the Independent Commission for Decentralization (Comissão Independente para a Descentralização – CID). Of these, 15 agreed to participate, representing a 60 % response rate (Fig. 3).

We analyzed their perspectives on improving environmental management at the local level in the context of the administrative decentralization process. Their perspective encompasses the process of administrative decentralization in Portugal, spanning from the 1960s to its formalization through a decree-law in 2018.

The aim was to understand how existing environmental challenges could be better addressed through local governance, particularly in the context of receiving new competences from the central government. These individuals were selected for their expertise in local government decision-making and familiarity with local environmental problems.

Semi-structured interviews were conducted either in person or online. The interview protocol addressed five key thematic areas: (i) perspectives on administrative decentralization in Portugal; (ii) the relationship between administrative decentralization and environmental management; (iii) competences that should be designed or

transferred to municipalities; (iv) opportunities to enhance local environmental management during decentralization; and (v) factors influencing municipal acceptance of transferred competences.

The interviews were conducted either in person or online, following the methods outlined by Voinov et al. (2018) and Oltmann (2016). Given the establishment of the Independent Commission for Decentralization (CID) as part of the decentralization process, some CID members were also included in the interview cohort.

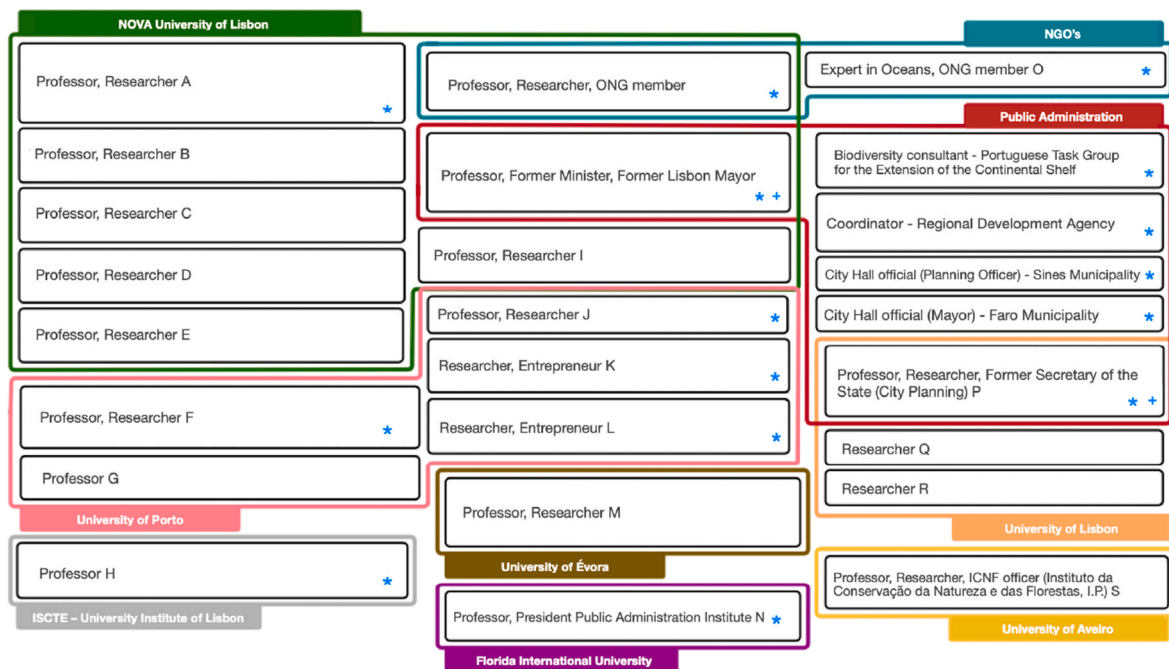
### 2.4. On-line survey: Portuguese coastal municipalities perspective on administrative decentralization and its link with environmental management

An online survey was developed to gather insights from all 61 Portuguese coastal continental municipalities on improving local environmental management during administrative decentralization. The survey instrument comprised a series of questions (Voinov et al., 2018) and was designed to be user-friendly, requiring no specialized technological skills, and took approximately 10–15 min to complete (Bryman, 2016).

The survey addressed key areas: (i) the CCMs' perspective on the establishment of a new administrative level above the municipalities, (ii) their views on a set of competences identified through expert interviews, and (iii) the delineation of roles—such as planning, management, maintenance, and inspection—for each identified competence.

The surveys were distributed directly to the environment departments of each CCM to ensure effective communication. Data collection occurred between November 2020 and April 2021, with systematic follow-up efforts, including phone calls and reminders to increase the participation rate achieving a response rate of 55,7 % despite resource constraints reported by some municipalities.

The structure and content of the questionnaire were developed based on insights from peer-reviewed papers and findings from the semi-



**Fig. 3.** Experts and practitioners identified and interviewed (\*). The stakeholders marked (+) were members of the Independent Commission for Decentralization (CID).

structured interviews with experts. Additionally, to generate theoretical insights grounded in empirical data that could be easily consulted, we collected all the responses from interviews and surveys and analyzed them using an abductive approach (Timmermans and Tavory, 2022) aided by the field notes. Themes frequently mentioned (at least twice) across responses were extracted to inform the conceptual framework proposed. These elements formed the basis for the framework proposed in this paper. We also reviewed existing theory to supplement the framework by explaining the essential elements depicted in the framework. By employing the abductive approach, we proposed elements for enhancing environmental management in the context of administrative decentralization.

### 2.5. Ethical considerations

All research activities were conducted in accordance with ethical research standards. Informed consent was obtained from all participants, who were made fully aware of the study's aims, procedures, potential risks, and their right to withdraw at any time. Participant anonymity was maintained throughout.

## 3. Results and discussion

### 3.1. Portuguese administrative decentralization: a multi-decade process

The comprehensive analysis of Portuguese administrative decentralization reveals a complex, 60-year process. Regarding environmental governance implications, Portugal's environmental administration has traditionally been a highly centralized system, with key competences managed by national bodies such as the Portuguese Environment Agency (APA) and the Institute for Nature and Forests Conservation (ICNF). The 2018 administrative decentralization reform (Decree-Law No. 50/2018) marked a shift by formally and gradually transferring certain environmental responsibilities to municipalities. Therefore, Portugal's environmental governance system operates through a multi-level administrative structure, influenced by European Union, which combines central coordination (Ministry of Environment and Energy), regional oversight (CCDRs—Comissões de Coordenação e

Desenvolvimento Regional), and municipal-level implementation (municipalities with specific environmental competences under Law 50/2018).

This administrative decentralization process differs from sector-specific environmental decentralization in that it occurs within broader administrative reforms aimed at improving overall governance effectiveness and municipal autonomy, rather than solely focusing on environmental outcomes. Consequently, the system retains strong central control over strategic environmental decisions — such as climate policy, protected areas, and major infrastructure projects — while delegating operational and implementation responsibilities to municipalities. This results in a shared governance model in which environmental management responsibilities are distributed across multiple administrative levels. This hybrid approach reflects Portugal's historically centralized administrative culture while attempting to enhance local responsiveness to environmental challenges, particularly in coastal municipalities where urbanization pressures and environmental vulnerabilities are highly pronounced.

This hybrid approach reflects what Hooghe and Marks (2021) describe as multi-level governance tensions between centralized control and local autonomy. The Portuguese case illustrates how administrative decentralization creates new institutional spaces for environmental action while maintaining strategic oversight—a balance that Ostrom (2005) identified as crucial for effective polycentric governance. However, our findings suggest that this institutional design success depends critically on local capacity and implementation conditions, supporting Andersson and Gibson's (2007) emphasis on local institutional context in determining decentralization outcomes.

### 3.2. Portuguese decentralization timeline: a recap of a spiny process

The timeline presented in Fig. 4 highlights key events from the 20th and 21st centuries. It begins with the decree law on regional planning enacted during the dictatorship in 1961 and concludes with the increased transfer of competences to converted commission to institutes, the Regional Coordination and Development Commission (*Comissões de Coordenação e Desenvolvimento Regional, I.P.* - CCDRs), in 2023. This timeline illustrates the lasting presence of administrative

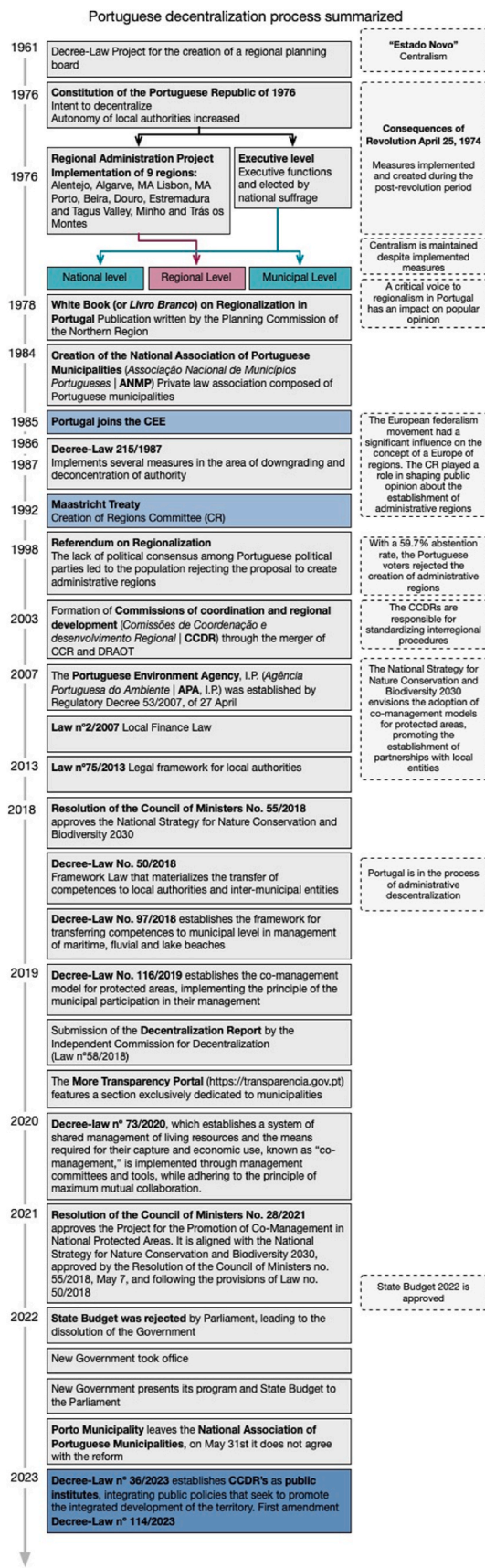


Fig. 4. Portuguese administrative decentralization process timeline.

decentralization within the Portuguese political agenda, a process shaped by the complex interplay of cultural, economic, political, geographical factors (Danby and Slocombe, 2005). The failed regionalization referendum and persistent municipal preference in Portugal demonstrates public resistance to certain decentralization forms, which has significant implications for environmental governance. This resistance may reflect concerns about institutional fragmentation and capacity limitations that our research subsequently confirmed through expert interviews and municipal surveys.

The timeline shows that environmental competences have been largely absent from Portuguese administrative decentralization discourse, despite specific environmental mandates assigned to CCDRs since 2023. This marginalization parallels findings from other European contexts where environmental concerns remain secondary in administrative reforms (Chatzopoulou and Poulsen, 2016). Our study addresses this gap by illustrating how designed administrative decentralization processes can enhance local environmental management and strengthen governance capacity.

Portuguese administrative decentralization has evolved from centralized authoritarian system, having institutional services within major urban centers, to a system change after the 1976 Constitution (CRP). Local democratic governance was established in 1979 (Cabrita, 1997; S.E.A.R.L., 1980). In 2018, the Decree-law 50 marked a major shift by transferring competences from the central government to lower levels. Key milestones include the establishment of the Regional Planning Commission in 1969 and the creation of Regional Coordination and Development Commissions (CCDRs) in 2003 (Decree-Law no. 104).

In 2023, the CCDRs were established as public institutes for five regions: Algarve (Portaria 403/2023), Lisboa e Vale do Tejo (Portaria 404/2023), Centro (Portaria 405/2023), Alentejo (Portaria 406/2023), Norte (Portaria 407/2023). Since 2023, each institute has four (4) vice-presidents, though there are no direct elections for these positions (Decree-Law n° 114/2023, 4th December).

While decentralization has focused mainly on education and health, environmental management has largely remained secondary. Nevertheless, CCDRs have specific competences related to environment and territory, including biodiversity conservation, regional environmental policy, licensing, and environmental monitoring (Portaria 403–407/2023). CCDRs thus play a crucial role in shaping regional environmental strategies alongside the APA (Portuguese Environment Agency, I.P.) and ICNF (Institute for Nature and Forests Conservation, I.P.).

The timeline of Portuguese administrative decentralization (Fig. 4) provides a clear overview of a complex, decades-long process involving both central and local governments and marked by events such as the rejected referendum on regionalization. These milestones highlight the importance of municipal-level governance and the *municipalism* in Portugal's administrative culture.

Improving environmental management within this decentralized structure requires transformative approaches that go beyond technical reforms, even in reforms that do not seem, at first glance, directly related to the environment, such as administrative decentralization. Transformative change recognizes historical and social dynamics shaped by the collective efforts of diverse participants over time (Schot and Steinmueller, 2018). Environmental issues often cross administrative boundaries, adding complexity and necessitating continuous reflection and adaptation at multiple scales. Therefore, the timeline is a crucial tool for understanding the historical trajectory, changes and complexity of local environmental management.

### 3.3. How to improve environmental management during administrative decentralization process at local level? Experts' perspective

The exploratory semi-structured expert interview (n = 15, 60 % response rate) revealed a sectoral bias in decentralization discourse, with 90 % of respondents initially associated decentralization more with healthcare and education than with environmental issues, stating:

"Decentralization is more focused on healthcare and culture than on the environment." Also, some individuals declined to participate, citing that the topic was outside their expertise or mandate, as also observed by Bouwer et al. (2021).

This sectoral bias reflects the compartmentalization of environmental governance within broader administrative systems (Meadowcroft and Fiorino, 2017). The marginalization of environmental concerns in Portuguese decentralization discourse may explain why administrative reforms often fail to achieve environmental benefits, despite creating new institutional opportunities for local environmental action. This finding supports our argument that explicit attention to environmental outcomes is necessary for administrative decentralization to strengthen environmental governance.

Interviewees expressed criticisms regarding environmental management in Portugal. The interviews revealed participants' frustration with environmental issues, echoing findings from other countries (Spain, Netherlands, UK and Germany) where people expressed significant uncertainty about environmental hazards, climate change and the danger it poses (Hagen et al., 2016). However, these criticisms, concerns, and frustrations can be addressed by adopting sustainability approaches integrated into all state reforms.

Experts also voiced critics. They noted that "Portuguese centralism is very sectorial, with no articulation, coordination", and that "centralism hinders good governance" because "it is blind to the territorial diversity and imbalances, applying uniform rules and laws across all regions." As a result, they explained, "[under centralism], it doesn't matter whether it's the Alentejo region or the Minho region," leading to the management of a diverse territory as if it were homogeneous. This perspective underscores the need to recognize the importance of addressing regional diversity in the territory management.

Interviewees highlighted perceptions related to the low priority attributed to environmental management and protection in Portugal "environmental management and protection are not priorities in Portugal;" "there are no incentives for sustainability, economic development, or innovation." Additionally, respondents noted that "alternative solutions to environmental problems are not being considered, and there is no support for those working on such issues." These inconsistencies make it challenging to determine whether existing regulations hinder the transformation process. As a result, there is a need to initiate processes aimed at creating innovation systems (Schot and Steinmueller, 2018).

Some of the experts' perceptions pointed a limited focus on environmental management and sustainability, attributing this to inadequate incentives and governmental support, in contrast to countries that implement targeted policies. Numerous initiatives, including programs, plans, policies and measures, have been implemented in other countries and could serve as references. However, such initiatives should not be regarded as definitive solutions, as their effectiveness depends on context-specific factors. Consequently, countries should develop national innovation systems that integrate systemic changes and support sustainable outcomes (Fernandes et al., 2022), considering stakeholder roles and country-specific factors influencing environmental innovation practices. Although innovation systems may encounter challenges in addressing environmental issues due to restrictive regulations (Schot and Steinmueller, 2018), research suggests they remain a viable approach to improving environmental sustainability at the national level (Fernandes et al., 2022).

The interview findings indicate a tendency within the central government to apply uniform reforms and national policies across regions with varying characteristics. One respondent noted that the government often treats territories with significant inequalities in a similar manner. Another comment emphasized this point, citing how environmental authorities, such as governors responsible for environmental portfolios, often regard distinct areas as equivalent, failing in acknowledging the diversity and unique characteristics of their landscapes. A way to address this issue is by developing local initiatives, bottom-up strategies, and intermunicipal collaboration (Silva et al., 2018) co-creating

strategies and local policies with different stakeholders.

One expert further elaborated on the issue, noting, "Neither centralism nor decentralization is inherently ideal; one can advocate for either depending on the specific context. My interpretation of the Portuguese reality is that it remains highly centralized. Apart from Madeira and the Azores, we lack administrative regions, resulting in significantly weaker local governance compared to other European countries." The expert expressed support for decentralization but emphasized a preference for subsidiarity, explaining, "Subsidiarity involves carrying out tasks as close to the people as possible. For instance, some responsibilities are best handled by a parish council, while others may exceed the capacities of a municipality or even a region." The expert concluded by stressing that "decentralization has clear implications for environmental management and protection."

The interviewees emphasized that collaboration between municipalities and organizations plays a key role in addressing environmental challenges. They also highlighted the importance of decentralization in fostering territorial development, municipal competitiveness, and effective environmental management. Research has demonstrated that collaborative management enhances the environmental performance of local authorities (Kerret and Menahem, 2016). However, insufficient collaboration, particularly between urban and rural areas, hinders transformative adaptation at the regional level (Leck and Simon, 2018). Thus, careful selection of projects aimed at attracting local investment, along with implementing improved management tools to prevent environmental degradation, can help mitigate the risk of greenwashing in environmental projects, policies, and incentives while strengthening local capacities and promoting local development (Galeano-Barrera et al., 2022).

Although experts interviewed highlighted negative aspects of the country's environmental management and its low priority on the political agenda, they also offered several recommendations for improving environmental management during administrative decentralization. These include: (1) increasing coordination between different levels of government; (2) enhancing collaboration between municipalities, organizations and government tiers. While local networks such as *ClimAdaPT.Local* and the *Iniciativa Nacional Cidades Circulares* exist, this collaboration must be expanded to address the diversity of the territory. Lastly, (3) being critical and careful when selecting local projects by thoroughly evaluating their environmental, economic, social, and political impacts.

Although this study does not focus on specific environmental impacts, it is important to note that improved local environmental governance—as promoted through well-designed administrative decentralization—can significantly benefit a range of concrete challenges faced by coastal municipalities. These include, for instance, climate adaptation efforts, marine spatial planning, coastal erosion control, and biodiversity conservation. Strengthening local capacities and autonomy thus lays the foundation for more effective, place-based responses to these pressing environmental issues.

To enhance local environmental management during administrative decentralization, we argue that the reforms that are not exclusively focused on environmental issues, such as administrative decentralization reform, should include strategies to optimize environmental management and biodiversity conservation. To achieve this, we propose the participatory development of a clearly defined, list of competences to be transferred during such reform. This process should integrate technical expertise with local knowledge and the capacities of local governments through participatory methods, such as surveys, focus groups, living labs, participatory mapping, collaborative scenario building and collaborative workshops. In this study, we introduced and implemented an initial approach to leverage environmental management in the context of administrative decentralization, which resulted in a list of competences to be transferred.

3.4. List of competences built from experts' perspective to enhance environmental management when there is a decentralization process

A list of competences was developed based on both, interviews and the literature review. This list met the following criteria: (1) the competences were identified by experts as significant responsibilities and (2) experts recognized the competences as critical challenges within Portugal's environmental policy framework. The list of competences (Fig. 5) was later presented to coastal municipalities to gather their perspectives on it.

The list of competences presented in Fig. 5 marks an initial step toward demonstrating the feasibility of creating a participatory process to create a list of competences to be transferred, that involves stakeholders, specialists, and relevant literature. In line with Ostrom's (1990) framework, both the list and the formulation process can facilitate collective action by coordinating various levels of government. This approach effectively integrates local knowledge and fosters a deeper understanding of specific environmental and social contexts, potentially resulting in more effective policies and practices.

3.5. Competences on environmental management that municipalities might assume according to their own perspective

The online survey was distributed to 61 Continental Coastal Municipalities (CCMs) achieving a response rate of 55.7 %. One CCMs noted that "municipal councils receive hundreds of surveys daily and lack the human resources to respond to all of them", which may explain the response rate despite significant efforts to encourage participation. Given the challenges CCMs face in completing surveys, the obtained percentage represents a reasonable and workable outcome.

The survey collected perspectives from the CCMs regarding the creation of an additional administrative level, and administrative decentralization relation with environmental management in their territory, as well as, how they see the transference of the different competences from the presented list (Fig. 5).

3.5.1. Continental Coastal Municipalities exhibit no consensus regarding the establishment of an additional administrative level

The survey revealed differing perspectives on the introduction of a

new level of government between central and local levels. 39.3 % (n = 13) of CCMs respondents indicated it was not necessary an additional administrative level; 45.4 % (n = 15) indicated it was necessary, and 15.1 % did not answer (n = 5).

Most coastal municipalities inquired indicated their ability to assume roles such as management, maintenance, planning, inspection, within the proposed competences. This suggests that municipalities perceive themselves as capable of managing areas at local level such as sustainable tourism, sustainable transportation, habitat conservation, biodiversity protection, soil function management, coastal erosion mitigation and adaptation, coastal water quality, and wastewater management (Fig. 6). However, there is no consensus among municipalities regarding the necessity of an additional administrative level between the municipal and central levels. Instead, there is a general preference for central authority to retain a primary role in planning. This preference may stem from the inherent challenges of addressing environmental issues, which often depend on the nature and scale of the problems involved.

A CCM expressed that "the role of municipalities should be strengthened rather than creating another administrative level." They argued that "the current system functions tolerably; it is more important to clarify competences at the municipal level and create autonomy than to establish a new level." Additionally, another CCM noted that "the creation of an additional intermediate tier might introduce even more bureaucracy than currently exists."

On the other hand, a CCM expressed that an additional level would provide "greater proximity for risk assessment and increased efficiency in management and access to financial resources." They believed this change "would enhance supervision and support for community funds, strengthen municipal governance, and facilitate solutions for environmental issues that typically require supra-municipal approaches. The introduction of an additional level "would help address issues that span regions and extend beyond municipal boundaries." Furthermore, they noted that "an intermediate level could improve communication and coordination between the two decision-making levels, which is particularly necessary for overseeing and supporting community funds." A CCM also emphasized the "need for faster decision-making at both regional and local levels."

3.5.2. There is consensus on the potential roles associated with multiple competences outlined in the list

The survey results revealed mixed perspectives among CCMs regarding the roles they preferred to assume for each presented competence. The majority considered the municipal level appropriate for most competences across various roles, including management, maintenance, planning, and inspection. Notably, however, CCMs expressed a strong preference for assuming the "maintenance" role, particularly with respect to competences related to "waste management".

Municipal institutional capacity depends on local contexts (Lagunes-Gómez et al., 2022) and effective environmental management during administrative decentralization entails strategies aligned with municipal capacities. Therefore, varying CCMs capacities, including knowledge, resources, and social capital, require tailored and evidence-based strategies. Municipal capacities and collaborations need to be aligned with the problem's scale, as transferring competences to an unsuitable scale can hinder resolution. Consequently, co-creating strategies with stakeholders promotes transparency and collaboration while addressing the specific challenges of each CCM and varying municipal capacity.

The Fig. 6 illustrates the perceptions held by each CCM regarding the presented list of competences that result from the literature review and exploratory interviews.

The survey identified significant disparities in human resource allocation for environmental management across CCMs, with personnel ranging from 3 to 93. These variations likely stem from factors such as municipality size, government tiers (Ivanyna and Shah, 2014), financial resources, and environmental management roles. Disparities were also found by Leon-Moreta and Totaro (2021) in metropolitan areas. As such,

Competences
Air quality
Air traffic noise mitigation
Bathing water quality
Biodiversity protection
Circular economy strategies
Coastal erosion mitigation and adaptation
Conservation of natural habitats
Climate change mitigation and adaptation
Drinking water quality
Energy efficiency
Noise and vibration
Quality and quantity of forest
Reuse and recycle of urban differentiated waste
Reuse and recycle of urban undifferentiated waste
Support of soil function
Sustainable management of wastewater
Sustainable tourism
Sustainable transport

Fig. 5. List of competences developed based on interview responses and the literature reviewed.

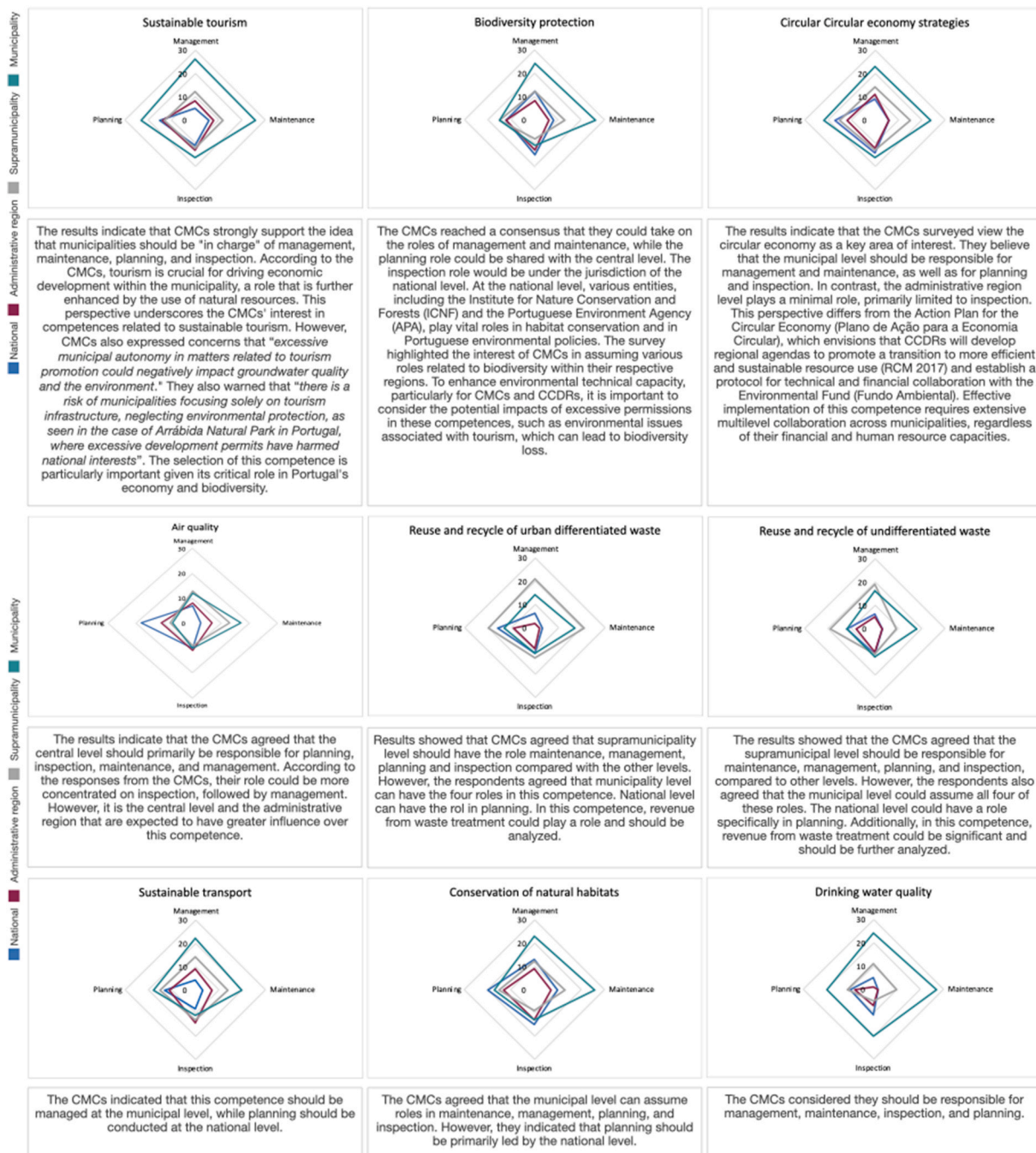


Fig. 6. Spider-net diagram of CCMs perspective about the role (management, planning, maintenance, inspection) municipalities could assume regarding the constructed list of competences.

discrepancies in human resource allocation may intensify existing territorial disparities.

In Portugal, tourism is vital but is not explicitly linked to environmental management by CCMs. Despite tourism's contribution to pollution, sustainable practices emphasizing awareness and responsible resource consumption are essential (Oliveira et al., 2015). Integrating tourism within environmental management is critical to mitigating its ecological impacts. Therefore, we propose to do it through the transference of participated and measurable competences within administrative decentralization reforms.

Administrative decentralization has a strong link to environmental

management at the local level. It is an administrative process that grants municipalities authority over environmental issues, giving them decision-making power over natural resources within their territories. This shift presents both risks and opportunities. While there is a risk that "local authorities may implement projects that undermine ecological integrity", decentralization also offers increased autonomy for municipalities and the opportunity to address environmental concerns more effectively through locally tailored initiatives.

Additionally, municipalities with the capacity, will and sustained commitment can pursue long-term environmental strategies that differ from traditional centralized approaches in Portugal. This link is

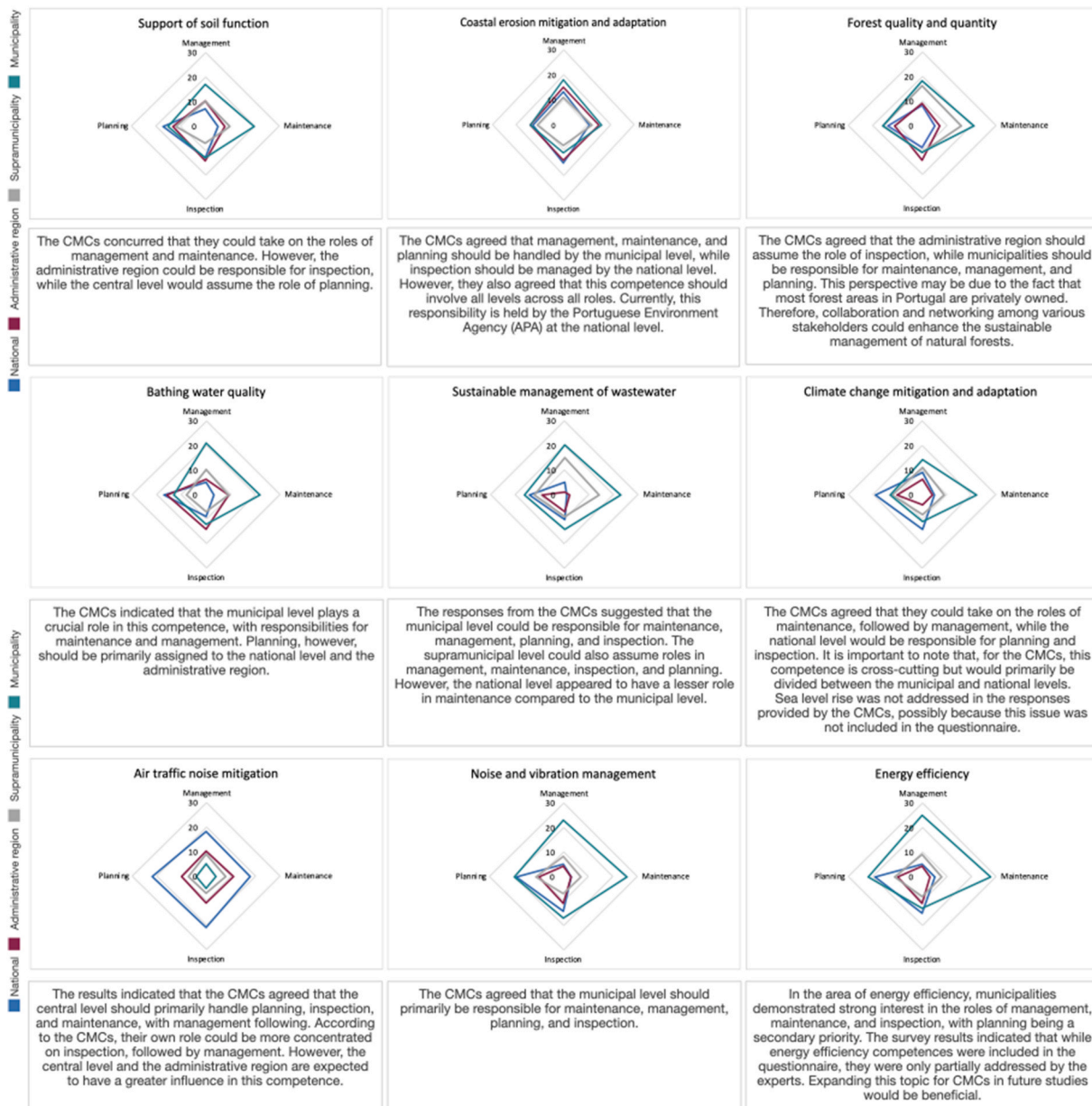


Fig. 6. (continued).

particularly important as much of the academic debate has focused on sectoral decentralization, while administrative decentralization, the focus of this paper, has received less attention in discussions on environmental governance. Therefore, to enhance understanding on how to improve environmental management during administrative decentralization—and to contribute to the academic debate—it is essential to identify the key elements that enable environmental management to be leveraged.

Indeed, beyond the well-documented differences between coastal and inland municipalities in urban and rural areas—highlighted in the literature (e.g., Boix et al., 2012; Gao et al., 2025; Sutiyo and Maharjan, 2017; Tang et al., 2023) particularly pronounced in Portugal; it is also important to consider the significant differences among coastal municipalities themselves, namely between those that are predominantly urban (e.g., metropolitan areas, high-density tourist regions) and those with predominantly rural characteristics.

Differences in size, administrative capacity, and financial resources among coastal municipalities—whether urban, rural, or

metropolitan—significantly shape how local environmental management is conducted. Large coastal municipalities often benefit from higher revenues (e.g., from tourism and larger resident populations) and possess more professionalized administrative structures, enabling them to implement initiatives such as climate change adaptation programs more effectively (Ahern, 2011). In contrast, small and rural coastal municipalities face severe budgetary constraints and often limited specialized technical staff. This disparity was clearly reflected in our survey results, where one municipality reported having three staff members dedicated to environmental management, while another had 93 personnel assigned to this area. These differences limit smaller municipalities' capacity to enforce environmental management plans and respond to extreme events (Tompkins and Adger, 2004).

Similarly, while metropolitan areas have stronger financial and organizational resources, they also face complex jurisdictional conflicts and pressures from urban development. These structural and financial disparities highlight that local environmental governance cannot follow a one-size-fits-all approach; instead, strategies must be tailored to the

specific capacities, challenges, and contexts of each municipality.

Thus, while decentralization exerts differential impacts depending on a municipality’s profile (Öztürk, 2025), it also provides a strategic opportunity to develop innovative approaches that strengthen environmental governance and prevent environmental degradation. Examples of opportunities include capacity-building workshops for municipal technicians, collective community-based coastal management actions, co-production of knowledge through collaborative sessions between municipal environmental staff and academic experts, and the creation of specialized metropolitan agencies—such as urban forestry brigades to establish intermunicipal green corridors or metropolitan climate change authorities to coordinate regional adaptation and transformation efforts. Although decentralization carries the risk of fragmented governance due to competing interests, it can equally serve as a catalyst for promoting targeted, context-sensitive, and adaptive local environmental management solutions.

3.6. Four elements to be considered for leveraging environmental management in coastal municipalities when administrative decentralization is in place

Building upon the outcomes of previous stages, we identified four main elements that are crucial to enhance environmental management in coastal municipalities during a process of administrative decentralization. These four elements are depicted in Fig. 7, which illustrates their interactions across different administrative levels—central, regional, supramunicipal, and municipal—acknowledging the unique capacities and interests of each municipality (Arroyave, 2019) and the heterogeneity of response in decentralization (Faguet and Pal, 2023).

The framework outlines a strategic approach to advancing

environmental management in contexts where municipalities operate under a unified, top-down administrative decentralization reform that do not solely intent to improve local environmental management. The framework seeks to boost environmental stewardship when specific competences are transferred to local level, based on the premise stated by Fischer and Riechers (2019) that paradigm shifts and societal transformation are possible, particularly when the motivation for change aligns with practical methods to implement concrete actions.

The identified key elements are: i) political, human, and resource capacity (institutional capacity); ii) financial and political autonomy; iii) multi-level participation and collaboration, and iv) the willingness of local government officials and leaders to strengthen environmental management supported by administrative decentralization. The first three elements come from interviews and survey results. Willingness (iv) comes from literature; it encompasses leadership and is influenced by factors such as institutional incentives, political interests (Küpper and Kundolf, 2021), but also political cycles (Ricci et al., 2015). As illustrated in Fig. 7, these elements interact dynamically across different administrative levels. The framework explicitly recognizes that governance processes can involve both bottom-up and top-down flows, while also emphasizes continuous learning and knowledge sharing among levels. The arrows in the figure represent these reciprocal interactions, highlighting that effective environmental management under decentralization depends not only on structural reforms but also on ongoing multi-level dialogue and adaptive capacity.

We are aware that there are other complementary elements to be considered, such as social capital, values (Abson et al., 2017), informal networks, institutional entrepreneurs (Westley et al., 2011), political culture, corruption (Fukuyama, 2013), incentives, ecosystems

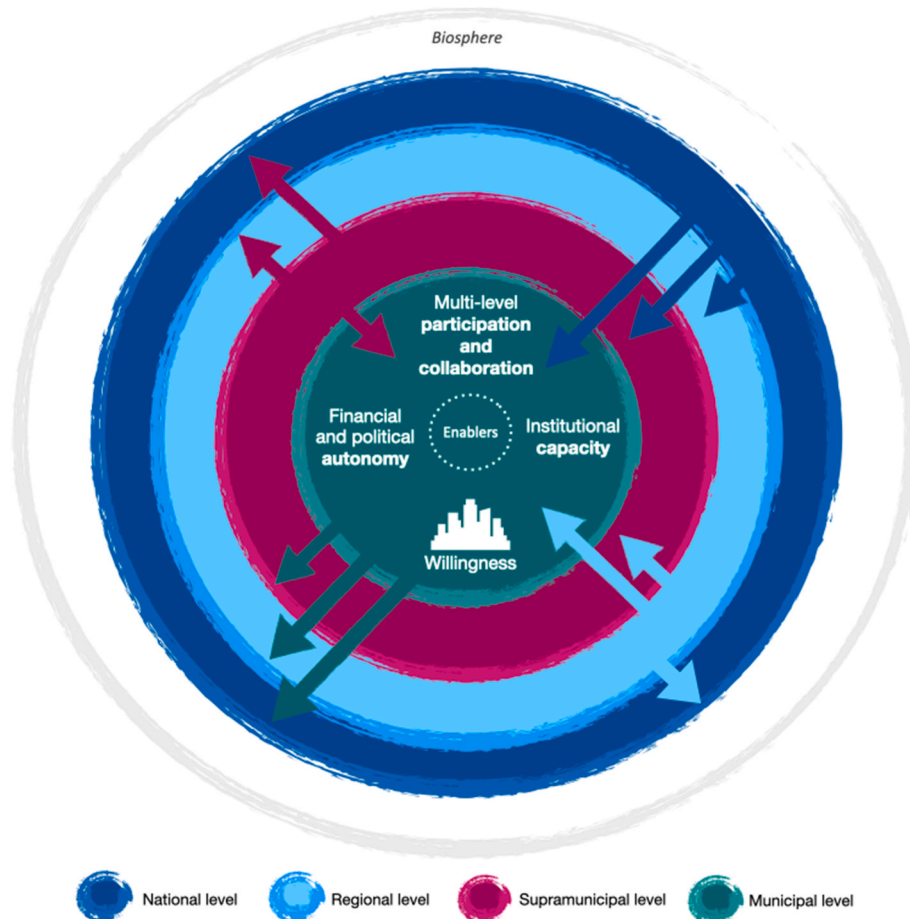


Fig. 7. Conceptual framework for enhancing environmental management under administrative decentralization.

boundaries within local governments, leadership, power dynamics, and other social factors; however, based on our results, these four stand out as critical ones for leveraging local environmental management under administrative decentralization (Fig. 7).

Decentralized natural resource governance relies on institutional factors at multiple levels, including investments in environmental governance driven by clear incentives (Andersson and Ostrom, 2008), the local institutional context (Andersson and Gibson, 2007), private sector financial contributions (Nishimura, 2022), political cycles and human capital. Also, it relies on leaders that may strategically implement certain initiatives only at specific times in their term to minimize political costs.

Those elements influence when and how local leaders engage in better environmental governance. Despite opportunities arising from political cycles, many local governments encounter barriers such as limited technical expertise and insufficient political will (Susskind and Kim, 2022), limiting environmental management and biodiversity protection with biological and ecological integrity (Karr et al., 2022). Addressing these challenges requires integrating these elements when decentralizing competences to local governments in contexts of inequalities.

### 1 Institutional capacity

Municipalities require sufficient political, human, and technical resources to perform environmental functions effectively. Capacity-building initiatives should address skill gaps among staff, technical infrastructure deficits, and knowledge-sharing mechanisms to improve operational and strategic competences.

Experts observed that while central governments transfer responsibilities to municipal councils, these councils frequently lack adequate financial and technical resources: "(...) *the central government transfers responsibilities to municipal councils (...) but these councils (...) face limitations in both financial and technical resources (...)*" Furthermore, "(...) *some municipalities have a technical structure and financial resources, but smaller municipalities lack both the structure and these resources. These smaller municipalities would need to hire external companies to fulfil the transferred responsibilities.*"

Political, human, and financial capacities are crucial in asymmetrical territories, where municipalities often differ in their ability to manage decentralized competences. Many local institutions face barriers to effective service delivery due to limited incentives, funding, technical expertise, and management capacity. Interviewees indicated that when comparing municipalities inside and outside metropolitan areas, we find that "*Metropolitan have the technical structure, as well as the human, financial, and political resources to take on various responsibilities in any field.*" These challenges persist in both low-income countries (Rondinelli and Ruddle, 1978; Nishimura, 2022) and high-income nations (de Freitas, 2012), where services are often concentrated in national capitals.

The qualitative analysis of interview data revealed several specific barriers faced by municipalities in adopting and implementing environmental competences. Beyond the general concern of "*lack of capacity*", interviewees emphasized structural issues, such as the rigidity of central government structures and the scarcity of technical staff specialized in environmental planning. As one municipal representative noted, "*We are given new environmental responsibilities without sufficient technical teams or budgetary autonomy to act effectively.*" Another interviewee highlighted the limited space for local innovation, stating, "*Even when we try to develop our own environmental initiatives, we face restrictions and few support from national-level.*" These insights underscore the complex interplay between formal decentralization policies and reforms, and actual local readiness, pointing to the need for more context-sensitive implementation strategies.

Municipal capacity is essential for environmental management and effective decentralization. This has been evidenced in contexts such as

forest governance in Latin America (Andersson et al., 2014) and the Congo Basin in Cameroon (Oyono, 2005; Ofoulhast-Othamot, 2018). Studies in India and Europe further underscore the importance of local government capacity in environmental management and sustainability (Véron et al., 2024; Leal Filho et al., 2016), requiring different bureaucratic capabilities (Cavalcante and Lotta, 2022) to address mismatched resources and responsibilities alongside urban decentralization (Véron et al., 2024).

Although decentralization is context-specific (Rondinelli et al., 1989), political capacity appears in the literature as a critical feature. Equally essential is human capacity, encompassing skills, knowledge, attitudes, and institutional quality. Skilled officials, informed citizens, and visionary political leaders are critical for strategic decision-making and accountability (Fukuyama, 2013). Alongside financial resources, these factors are indispensable for municipalities assuming competences under top-down processes.

Interviewees emphasized prioritizing financial strength in decentralization, as restructuring government tiers requires robust funding. However, local organizations often lack sufficient support (Colenbrander et al., 2018), exacerbating disparities between large and small municipalities, such as those in metropolitan versus non-metropolitan areas.

### 2 Financial and political autonomy

Expanding local autonomy within administrative decentralization requires overcoming financial and technical constraints (Nishimura, 2022) while maintaining central oversight. Financial autonomy refers to the ability of local governments to independently manage their financial resources and to be accountable to their citizens for how those resources are used (Cifuentes-Faura et al., 2024). Political autonomy means local governments making independent political decisions without external interference. Both, play a crucial role in leveraging municipal environmental management.

Experts emphasized that the central focus of decentralization efforts should be on strengthening regional and local governments. This approach not only enhances local political capabilities, but also supports competitive politics, consolidates democratic practices, and fosters the emergence of *locally-based* civil society organizations capable of challenging centralised and authoritarian structures.

However, as one interviewee noted: "*As we do not have administrative regions, apart from Madeira and the Azores, all levels of government below the central level are very small compared to those in other European countries.*" This structural limitation implies that, without robust financial and political autonomy, local authorities may remain too weak to effectively assume new environmental responsibilities or to drive transformative local initiatives.

Ultimately, promoting genuine autonomy — underpinned by sustained central-level support and collaborative structures — is essential for municipalities to fully leverage decentralization as a means of advancing effective and context-sensitive local environmental management.

### 3 Multi-level participation and collaboration

Collaboration across government levels and sectors is vital for aligning local initiatives with national and regional environmental objectives as actors rarely operate in isolation. This concept has been extensively explored by scholars, and in the context of managing common resources by Ostrom (1990) and in learning organizations. These elements are linked to citizens participation and public perception about local government, being crucial for strengthening municipal environmental management.

The environmental governance literature further underscores their importance (e.g. Sandström et al., 2020). Literature shows that collaboration thrives within supportive institutional frameworks and

environments that prioritize continuous learning to foster experience, capacity-building, and trust (Folke et al., 2016). As emphasized by Lopes and Videira (2016, 2019), participatory processes facilitate the integration of diverse knowledge by incorporating stakeholder perspectives through bottom-up approaches. Since mobilizing actors catalyze innovation (Nilssen and Hanssen, 2022), future research in leveraging environmental management in municipalities during decentralization can open participation channels with actors building the path for a sustained commitment to multi-level participation and collaborative approach over an extended duration.

Empirical evidence from climate studies demonstrates that integrating local knowledge can yield culturally relevant and practical solutions (Pearce et al., 2009; Hahn et al., 2020). Although participants may assume varying roles, such as individuals, group members, volunteers, or paid contributors (van der Arend and Behagel, 2011), participatory initiatives often deviate from their theoretical or official descriptions. Nonetheless, stakeholder insights remain valuable for improving local environmental management during competence transfer and enhancing public service quality.

Multi-level participation and collaboration at the local level is fostered by social bonding, coordination, and network formation (Barnes et al., 2022; Rockenbauch and Sakdapolrack, 2017; Colenbrander et al., 2018; Bouwer et al., 2021; Graziano et al., 2019; Iniguez-Gallardo and Tzanopoulos, 2023). These efforts are supported by capacity-building initiatives, cross-jurisdictional networks, frequent communication among municipalities (Cosens et al., 2018; Nishimura, 2022), and effective information exchange (Andersson, 2004). However, effective biosphere management transcends the dichotomy of top-down or bottom-up approaches (Folke et al., 2016).

Administrative decentralization, as a complex multi-level task, promotes increased participation (Manor, 2011). Also, environmental governance literature advocates for participatory decision-making (Newig and Fritsch, 2009), networked governance that links local, regional, and international authorities (Cosens et al., 2018), and for robust participation, coordination, and collaboration among institutions across multiple jurisdictional levels and spatial scales (Hohbein et al., 2021).

We propose that multi-level participation and collaboration are key elements during administrative decentralization processes for strengthening local environmental management. These elements can provide greater transparency into the needs and interests of each stakeholder, and facilitate understanding, knowledge sharing among stakeholders, and to contribute to overcoming bureaucratic barriers that transcend political and administrative fluctuations. Political changes such as administrative decentralization thus provide opportunities to enhance environmental management and shape multi-level collaboration toward this goal.

Our findings confirm that a one-size-fits-all approach to the transference of competences is inappropriate, as governance structures are context-specific (Andersson and Ostrom, 2008). Consequently, our research indicates that administrative decentralization represents an opportunity to enhance environmental management, even when its success relies on a complex interplay of factors that vary significantly across municipalities.

#### 4 Willingness

Political willingness and local leadership play a fundamental role in administrative decentralization, as local governments are tasked with assuming new responsibilities following this process and local leaders' commitment to environmental agendas determines the actual uptake of transferred competences. Furthermore, willingness serves as the driving force that translates intentions into tangible actions. In this context, the determination and commitment of local government officials, the governing political party during each electoral cycle, and the political leaders of each cycle are essential for effectively leveraging local

environmental management during internal reforms, such as transference of competences.

Moreover, establishing a comprehensive list of shared competences (e.g. Fig. 5) requires meaningful interaction with stakeholders, characterized by an openness to new ideas, behaviors and a readiness to embrace change. Such an approach fosters enhanced learning and engagement (Tevapitak and Helmsing, 2019; Cho et al., 2023; Du et al., 2024). Consequently, willingness emerges as the fourth key element in improving local environmental management during the process of administrative decentralization.

Finally, this study engages with broader theoretical debates on polycentric governance, subsidiarity, and multi-level governance to better understand how administrative decentralization can shape local environmental management outcomes. Polycentric governance theory emphasizes the importance of multiple, overlapping decision-making centers that operate autonomously but interact through networks of cooperation, learning, and conflict resolution (Andersson and Ostrom, 2008; Carlisle and Gruby, 2019). By transferring environmental competences to municipalities, administrative decentralization creates new local decision centers that, when effectively empowered, can enhance flexibility, context-specific responses, and innovation in addressing environmental challenges. Our findings resonate with this theoretical perspective, illustrating that municipalities' capacity, autonomy, and willingness are crucial determinants for adopting initiatives and measures that avoid environmental harm and, ultimately, improve local environmental management.

Moreover, the principle of subsidiarity underlines that governance responsibilities should be allocated to the lowest possible level capable of addressing a given issue effectively (Hooghe and Marks, 2021; Jal-senjak, 2023; Koller, 2024). This principle justifies the transfer of environmental competences to local governments, as they are often closer to citizens and local ecosystems, and thus better positioned to tailor solutions to specific environmental and social contexts. However, our results also highlight the risk that, without sufficient capacity and resources, subsidiarity may inadvertently lead to governance gaps or environmental degradation instead of improved outcomes. Thus, our framework emphasizes the need to match decentralization with strong institutional support and capacity-building efforts.

By synthesizing these four elements, the framework offers a practical guide for policymakers and practitioners aiming to translate formal decentralization into effective local environmental governance. Furthermore, it provides a theoretical contribution to debates on how structural reforms interact with local agency and capacity in environmental policy implementation.

While our study did not formally operationalize these factors as structured variables, the framework developed provides a conceptual foundation for future studies aiming to assess the specific effects of administrative decentralization on local environmental governance. Subsequent research involves translating these conceptual elements into measurable indicators to enable comparative assessments across different contexts.

#### 3.7. Opportunities and constraints related to the key elements for improving environmental management in the context of administrative decentralization

Experts identified both opportunities and constraints related to the key elements for improving environmental management during administrative decentralization, summarized in Table 1. The element *willingness* is not included here, as it was derived from literature and added through analytical reflection. Literature shows that there are constraints, particularly in the presence of weak public institutions, can lead to fragmentation, which may ultimately result in re-centralization (Kyvelou and Marava, 2017; Sakowicz, 2017). Decentralization can also lead to issues such as reduced equity and transparency and more complex accountability structures, although it can improve efficiency

and responsiveness to users (Pollitt, 2007). Therefore, maintaining a balance between centralization and decentralization is often desirable, but this balance may only be temporary (Pollitt, 2007). Identifying these constraints and opportunities is crucial for navigating environmental challenges and informing long-term strategies for administrative decentralization and improved environmental management practices that maintain ecological integrity.

In the context of administrative decentralization, it is essential that the competences to be transferred are clearly defined, measurable, and supported by a high impact level of participation (See IAP, 2024; Videira et al., 2006), meaning that there is the need to go beyond information and consultation, and conduct processes where citizens and stakeholders are involved and engaged. This may sustain long-term processes and outcomes that can improve effective and meaningful environmental management policies, plans, programs, and initiatives at local level. Empowering municipalities requires that these competences be collaboratively designed, time-bound, and independent from electoral or political agendas while recognizing each municipality’s unique characteristics.

The current ecological crisis can drive policy changes, thus, necessitates innovative governance, new decision-making processes, diverse knowledge (Meadowcroft and Fiorino, 2017) and the inclusion of effective citizen participation, in line with polycentric governance theory (Carlisle and Gruby, 2019). This also means the importance of place-based research and management, integrating tacit knowledge and the experience of who live and work in the territory.

Place-based research and collaborative governance are increasingly seen as effective for addressing local environmental challenges, requiring local governments to adopt new roles and methods. However, the success of these local initiatives is influenced by decisions made at different levels of government (Greenway, 2021) and by the separation between scientific and political spheres (Evans, 2006) affecting innovative outcomes.

Our study encountered limitations, such as the complexity of decentralization and the lack of adequate measures to track its effects. However, its significance lies in being an important initial step toward understanding and discussing the link between administrative decentralization and local environmental management through analysing the

**Table 1**  
Opportunities and constraints associated with the identified key elements, according to the interviewees.

Elements	Opportunities	Constrains
Institutional capacity	Demographic and municipality structure employ as an advantage	Asymmetric demographic dimension and structure Lack of technical capacity on lower administrative tiers
Financial and political autonomy	Increased financial and technical capacity  Greater local autonomy	Symmetric process of transferring competences for asymmetric territory Financial shortage on lower administrative tiers Lack of incentives for innovation Loss of power at the central administrative level
Multi-level participation and collaboration	Institutional conflict acknowledgement and management Deeper cooperation between municipalities Creation of new collaboration models More cooperation between government tiers Creation of a “culture of commitment” More equity	Excessive institutional conflict  Fragmentation  Disarticulation between the administrative tiers Regional level disconnected with the other levels

Portuguese case. Our study suggests that an environmental governance, that respects natural resources, can be enhanced at local level by integrating it more closely with broader state reforms and political changes, such as the administrative decentralization and the transference of specific competences. Therefore, future research should focus on fostering innovation in administrative decentralization process by incorporating participatory approaches in designing tools to effectively co-create competences to be transferred and to analyze its change.

Our research addressed a significant gap in decentralization literature by demonstrating that administrative decentralization’s environmental implications cannot be assumed to be positive without careful attention to institutional design and implementation conditions. The originality of our four-factor framework lies in its synthesis of theoretical insights with empirical evidence from both policy experts and municipal practitioners, providing a comprehensive understanding of the conditions necessary for effective local environmental governance under administrative decentralization. The practical value of this framework extends beyond the Portuguese context, offering guidance for other centralized states pursuing administrative decentralization reforms where environmental competences are transferred to local governments.

Given that administrative decentralization is implemented across multiple European countries as part of broader governance modernization efforts, understanding its environmental implications is crucial for ensuring that these reforms support rather than undermine environmental protection and climate adaptation goals.

#### 4. Conclusions

This study investigated how administrative decentralization influences local environmental management. Understanding this relationship is critical, as decentralization reforms can facilitate local governments to either strengthen environmental management and protection, and social well-being or, conversely, pursue projects that undermine environmental integrity. Thus, it is essential to optimize the design and implementation of administrative decentralization processes to ensure that the transfer of competences supports, rather than jeopardizes, local environmental management.

Based on qualitative data from expert interviews and municipal surveys, we developed a conceptual framework identifying four key elements necessary to leverage local environmental management when competences are transferred from central to local levels: institutional capacity, financial and political autonomy, multi-level participation and collaboration, and political willingness. This framework contributes to the academic debate by illustrating how top-down state reforms can effectively enhance local environmental governance if properly tailored.

Our findings suggest that to foster local environmental management, administrative decentralization processes should be context-specific, recognizing the diversity in capacities and willingness among municipalities. Participatory processes, although time-intensive and complex, play a crucial role in facilitating knowledge integration, advancing stakeholder engagement, and clarifying and adapting competences in a locally relevant manner.

This research makes three key theoretical contributions to environmental management literature. First, it extends polycentric governance theory by demonstrating how administrative decentralization creates new institutional spaces for environmental action, but only when supported by adequate capacity, collaboration, willingness and autonomy. Second, it contributes to multi-level governance scholarship by revealing how vertical competence transfer processes must be complemented by horizontal collaboration mechanisms to achieve positive environmental outcomes. Third, it advances institutional theory in environmental management by identifying the specific conditions under which administrative decentralization translates into effective local environmental governance.

Our four-factor conceptual framework —integrating institutional

capacity, financial and political autonomy, multi-level collaboration and participation, and local political willingness— provides a theoretical foundation for understanding how top-down administrative decentralization reforms can effectively strengthen local environmental management. This framework bridges the gap between the theory of administrative decentralization and the practice of environmental governance, providing a systematic approach to analyzing and enhancing the transfer of competences.

From a managerial perspective, this study highlights the importance of co-developing competences with municipalities, drawing on expert knowledge, stakeholder experiences, and comprehensive literature reviews. Our approach demonstrates that it is feasible to collaboratively define competences and subsequently engage municipalities to understand their perceptions and preferred roles on those defined competences. This not only helps align transferred responsibilities with local realities but also integrates diverse knowledge systems into State reforms, even when such reforms are not exclusively aimed at environmental outcomes.

Although our interviews revealed that administrative decentralization in Portugal has been primarily associated with sectors such as education and health, its implications for environmental management are significant. Granting municipalities specific environmental competences and greater autonomy requires systematic monitoring and long-term evaluation to ensure intended outcomes.

Looking forward, future research should focus on designing competences that are explicitly tailored to each municipality's characteristics and on involving a wider range of stakeholders to capture evolving needs and capacities over time. Additionally, exploring the dynamics in smaller or depopulating municipalities — an increasingly relevant trend in mainland Portugal, but also in other European countries — could provide further insights into how administrative decentralization shapes local environmental governance under diverse demographic and institutional conditions. Future studies could also operationalize the conceptual framework proposed here, translating key elements into measurable variables for comparative analysis. Moreover, examining the role and effectiveness of participatory processes in co-designing competences, as well as analyzing policies developed through this perspective, would deepen understanding of how to align decentralization reforms with robust, context-sensitive environmental management.

#### CRedit authorship contribution statement

**Lina Ortiz Arroyave:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Rita Lopes:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Rui Santos:** Writing – review & editing, Supervision, Methodology, Conceptualization.

#### Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used Generative AI tools (Chat GPT 4-o; DeepL Write) to improve the writing in a non-native language (English). After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Data availability

The authors do not have permission to share data.

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