A PILOT STUDY ON WASTE MANAGEMENT ATTITUDES IN CROATIAN NAUTICAL MARINAS

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Abstract

Purpose – As a world-renowned destination for yacht tourism, Croatia's extensive marina network plays an important role in reconciling environmental sustainability and operational efficiency. This pilot study explores the attitudes of key frontline stakeholders — professional skippers, private boat owners and charter guests — towards the effectiveness of waste management in Croatian marinas.
Methodology – The study utilised a multi-channel survey approach and collected data from 151 respondents via a self-administered online questionnaire.
Findings – The results show statistically significant differences between stakeholder groups in their assessment of aspects of waste management, including the effectiveness of environmental policies, operational strategies, infrastructure, penalties and initiatives to promote environmental awareness. Professional skippers consistently rated these aspects significantly lower than the other two groups, reflecting their increased operational awareness and direct involvement in the marina systems. The findings of the study emphasise the need for tailored strategies to address group-specific concerns.
Contribution – By identifying key challenges and opportunities, this study contributes to the development of comprehensive and effective green management solutions that support the long-term sustainability of the Croatian nautical tourism sector. In practise, it provides actionable recommendations for marina operators and other relevant policy makers, such as targeted investments in waste management systems and engagement strategies tailored to specific groups. On a social level, the study emphasises the importance of inclusion in green management practises and highlights the role of stakeholders in promoting sustainable tourism.
Keywords Waste Management, Nautical Marinas, Yachting Tourism, Environmental Sustainability, Stakeholder Attitudes; Croatia

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INTRODUCTION

Given their multifunctionality, coastal and marine areas remain the key natural settings for tourism and leisure activities worldwide (European Commission, 2021). Due to global changes in rising environmental awareness, perception of leisure time and institutional efforts in fostering sustainable tourism practices, the last two decades were marked by the flourishing of new, special interest tourism forms. Such forms of tourism strive to be aligned with principles of sustainability and, at the same time, provide tourists with a broad spectrum of specific person-focused leisure experiences (Sariisik, Turkay and Akova, 2011; Ioannidis, 2019). One of these alternative forms is yachting tourism.

While subject to varying interpretations, yachting tourism is generally understood as a sum of recreational boating activities that are closely linked to the charter industry and supported by marinas as essential service hubs (Mikačić et al., 2006; Diakomihalis, 2007; Luković, 2013). This form of tourism offers individuals the flexibility to design and adjust their itineraries according to personal preferences. Typically, it involves a multi-day sailing itinerary, exploring coastal or island destinations, and engaging in complementary recreational pursuits such as scuba diving, snorkelling, sightseeing, and sampling local gastronomy (Coccossis, Tsartas and Griba, 2011; Martínez-Vázquez, Valenciano and Milán-García, 2022).

The Mediterranean Basin stands out as a global leader in yachting tourism, boasting approximately 400 high-quality marinas and 400,000 berths along its extensive 48,000-kilometer coastline (Luković, 2013; ICF, 2016). This region accounts for nearly 70% of the global yacht charter industry, as highlighted by Grand View Research (2020). Recognising its substantial contribution to economic growth and social welfare, yachting tourism is prominently featured in various European Union developmental frameworks, including the EU's Blue Growth strategy (European Commission, 2021). This underscores its strategic importance in fostering sustainable development and economic opportunities within the Mediterranean region.

Nautical marinas are considered the most important asset of the yachting industry (Hojnik et al., 2020). Nautical marinas are designated facilities designed explicitly for the docking, mooring, and servicing of recreational and small commercial vessels and yachts. It typically provides a range of technical (berthing spaces, fuel stations, water and electricity hookups, maintenance and repair services) and leisure (e.g., restaurants, shops, toilets, recreational playgrounds, etc) amenities and services. Strategically located along coastlines, they play an important role in supporting local economies, tourism, and marine leisure industries while emphasising environmental stewardship and safety (Bizzarri and La Foresta, 2011; Martín and Yepes, 2022). However, due to their constant exposure to a high volume of vessels and visitors, marinas produce various types of waste, including solid waste (e.g. plastic, and organic materials), which is common liquid waste (e.g. fuel spills, sanitary wastewater, bilge water) and hazardous waste (antifouling paints, cleaning agents) that poses a significant threat to the fragile marine ecosystem and water

quality (Frančić, Njegovan and Maglic, 2009; Lapko et al., 2018). Besides, increasing mooring demands are projected for the following years, with impacts on energy and water needs, leading to higher environmental pressure (Herbst and Barner, 2024).

The concept of "green management" has gained significant momentum in the academic and decision-making communities since the 2000s (Azeem, 2019) and has evolved into a strategic approach to the supervision of corporate activities that interact with the environment (Sulich, 2019; Nassar and Tvaronavičienė, 2021). In the maritime sector, particularly in the context of nautical ports and marinas, "greening" refers to implementing practices and policies aimed at minimising the environmental impact of daily operations (Gonzalez Aregall, Bergqvist and Monios, 2018; Martínez-Vázquez, de Pablo Valenciano and Caparrós Martínez, 2021; Jugović et al., 2022). This frequently involves the development of strategies to mitigate ecological pressures through targeted initiatives, including the reduction of pollution and hazardous discharges, the improvement of waste management systems for vessel-generated waste, and the promotion of environmental awareness among boaters (Bukša et al., 2019; Sifakis and Tsoutsos, 2021).

The literature on green management strategies in recreational ports and marinas is extensive (Trstenjak, **Žiković** and Mansour, 2020; Botana, Fernández and Feijoo, 2023; Lam-González et al., 2023). However, there remains a conspicuous gap in the research that explicitly addresses marina users, such as professional skippers, private boat owners and charter guests. Due to their direct interaction with the marina environment, their operational experience, their influence on implementation processes, their role in customer advocacy and their contributions to data-driven policy decisions, these groups are key stakeholders in shaping sustainable green management strategies in marinas (Paker and Vural, 2016; Lam González, León González and De León Ledesma, 2017; Benevolo and Spinelli, 2021). From a theoretical point of view, the inclusion of these user groups is of particular importance. This is because their different functional roles and experiences are likely to shape different cognitive frameworks, behavioural orientations and evaluation criteria when assessing environmental management practises. This heterogeneity has important implications for stakeholder theory (Mahajan et al., 2023) and participatory environmental management approaches (Bennett and Satterfield, 2018), both of which often assume or strive for consensus among stakeholder groups. By exploring the valuation differences between these frontline users, this study contributes to a more nuanced and context-sensitive theoretical understanding of stakeholder engagement in sustainability transitions in a complex multi-actor maritime environment.

Accordingly, this case-specific pilot study aims to expand empirical and theoretical knowledge by capturing and comparing the attitudes of key nautical stakeholders (i.e. skippers, private boat owners and charter guests) towards the perceived effectiveness of waste management strategies in Croatian marinas. The results are expected to provide actionable insights into the practical challenges and opportunities in implementing effective green management solutions while enriching the theoretical discourse on the heterogeneity of stakeholders and their commitment to sustainable tourism development.

1. MATERIALS AND METHODS

1.1. Study area

Approximately 75.8% of the Adriatic coastline, which spans a total of 8,282 kilometres, is located within the Republic of Croatia. With its exceptional and unspoiled natural beauty, numerous islands, rich cultural heritage, favourable weather conditions, and consistent strategic investments in infrastructure and the promotion of yachting activities, Croatia has emerged as a global hotspot for yachting tourism over the past two decades (Poljičak, Hinić and Kalac, 2022; Brnić, Jugović and Aksentijević, 2024). Croatia has 224 nautical tourism ports, including 85 sea marinas that offer approximately 15,000 berths. More than 50 % are positioned in the area of Central Adriatic region. In 2023, there were 224,404 vessels in transit in nautical ports, of which sailboats made up the majority (59.7%), followed by motor yachts (31,7%) and other types of vessels at 8.6%. The total income generated by nautical ports, including marinas, amounted to 161 million euros, with the largest portion—115 million euros, or 71.6% of the total income—coming from the rental of moorings (Croatian Bureau of Statistics, 2023).

1.2. Sampling

The data was collected between May and October 2025 using an online self-administered questionnaire. A total of 600 survey invitations were distributed (e.g., public social reds and e-mails) among charter companies, private sailing clubs, skipper associations and crew boarding agencies. Additionally, professional skippers onboard during the sampling period were asked to share the survey link directly with their charter guests. Such a multichannel approach was implemented to maximise relevant responses within the limited sampling period. Overall, participation was regarded as acceptable, with 160 questionnaires submitted, of which 151 were deemed suitable for analysis.

1.3. Instrument

The original questionnaire comprised five primary components, although only two sections were employed in the present study. In the first part, visitors were solicited to express their attitudes regarding the perceived effectiveness of four waste management facets in the sea marinas they frequented throughout their sailing excursion (e.g., the effectiveness of waste disposal infrastructure). The 5-point Likert scale for perceived effectiveness ranges from one (strongly disagree) to five (strongly agree). The measurement items were custom-designed using insights from studies on sustainable management in nautical tourism (Dolgen, Alpaslan and Serifoglu, 2003; Lapko et al., 2018; Hojnik et al., 2020) and tailored to suit the present research context. The second section of the survey gathered information about participants' socio-demographic characteristics, including age, degree level.

1.4. Data analysis

The collected data were processed and analysed using the IBM Statistical Package for the Social Sciences 23.0 (SPSS). The analysis was carried out in two stages. First, descriptive statistics were used to examine the sociodemographic profile of respondents and the mean scores for rating the quality aspects. Second, the one-way analysis of variance (ANOVA) with the post-hoc Tukey HSD procedure was performed to identify statistically significant differences in the perceived effectiveness of waste management facets among the target groups.

2. RESULTS

2.1. Socio-demographic profile

A majority (63.1%) fell into the young to mid-age category. Regarding education, the group was highly educated, with 84.7% holding a university degree. Private boaters were predominantly aged 55-65 (43.7%), and exhibited high educational attainment, with 76.1% holding a university degree. Charter guests were the most educated group, with 85.1% holding a university degree. Their age distribution was similar to private boaters, with 44.4% aged 55-65, though a significant proportion (33.3%) fell into the 36-45 age group.

Table 1: **Descriptive Socio-Demographic Profile of Stakeholders**

Socio-demographics	Professional skippers	Private boaters	Charter guests	Total
	%	%	%	%
Age				
18-25	2.2	1.4	0	1.4
26-35	19.6	8.5	7.4	11.8
26-45	43.5	21.1	33.3	30.6
46-55	4.3	12.7	11.1	9.7
56-65	23.9	43.7	44.4	37.5
66 and older	6.5	12.7	3.7	9
Education				
High school degree	15,2	23,9	14,8	19,4
University degree	84,7	76,1	85,1	80,6

Source: Made by authors

2.2. Socio-demographic profile Two-way ANOVA: Stakeholder attitudes toward the quality of waste management aspects

The descriptive analysis of the overall mean scores revealed that the target groups generally exhibited a reserved outlook regarding the perceived effectiveness of waste management, with scores ranging from M=2.08 to M=2.40. Among the groups, charter guests consistently provided the highest ratings. The two-way ANOVA results revealed significant differences in stakeholder perceived effectiveness across all aspects, as further confirmed by Tukey's HSD post hoc analysis (Table 1). Professional skippers rated the effectiveness of environmental protection and supervision ($F(2,141) = 6.23$, $p \leq .01$) and waste management operational strategy ($F(2,141) = 6.15$, $p \leq .01$) significantly lower compared to private owners and charter guests. In terms of the perceived effectiveness of penalties ($F(2,141) = 3.78$, $p \leq .05$), professional skippers assigned a significantly lower average rating ($M = 1.98$) than charter guests ($M = 2.81$). Private boaters rated this aspect with a mean score of $M = 2.48$, positioning them between the two groups. A similar rating pattern was observed for the perceived effectiveness of waste disposal infrastructure ($F(2,141) = 4.04$, $p \leq .05$) and information delivery related to waste management and environmental awareness ($F(2,141) = 3.14$, $p \leq .05$).

Table 2: **Stakeholder attitudes toward the effectiveness of waste management facets**

Management facets	Professional skippers		Private boaters		Charter guests		Total		
	M	SD	M	SD	M	SD	M	SD	F
Effectiveness of environmental protection and supervision	1,67[a]	1,10	2,20[b]	0,98	2,48[c]	0,90	2,08	1,05	6,23**
Effectiveness of waste management operational strategy	1,67[a]	1,16	2,18[b]	0,94	2,48[c]	0,80	2,08	1,05	6,15**
Effectiveness of penalties	1,98[a]	1,34	2,48[ab]	1,44	2,81[b]	1,17	2,38	1,35	3,78*
Effectiveness of waste disposal infrastructure	1,89[a]	1,08	2,23[ab]	1,12	2,59[b]	0,90	2,19	1,05	4,04*
Effectiveness of waste management awareness info. delivery	2,11[a]	1,24	2,44[ab]	1,18	2,81[b]	1,06	2,40	1,20	3,14*

Note: ** p≤ .01; * p≤ .05; Means not sharing subscripts differ significantly as indicated by Tukeys HSD.
Source: Made by authors

3. DISCUSSION

The primary idea of this pilot study was to highlight the current perception of key stakeholder groups—professional skippers, private boaters, and charter guests- toward the effectiveness of waste management in Croatian nautical marinas. The observed disparities offer a compelling foundation for further discussion and comprehension of the barriers and prospects for enhancing waste management systems and promoting environmental sustainability within the yachting tourism sector.

Professional skippers consistently evaluated waste management facets, significantly lower than private boaters and charter guests. This finding may correspond with their heightened operational awareness and direct involvement with marina systems, indicating that they are more cognizant of their inefficiencies and shortcomings. Their critical viewpoint may also be perceived as the result of limitations encountered in daily routine interactions with marina waste management systems, including inadequate infrastructure or ineffective enforcement of environmental policies and regulations. In contrast, private boaters and charter guests demonstrated a more favourable attitude, possibly shaped by a less critical understanding or reduced exposure to waste management issues.

Further, the study's findings underline the necessity for tailored strategies to address diverse concerns within specific groups. Improved infrastructure, particularly for waste disposal and hazardous material management, may serve as an illustration. Professional skippers' feedback indicates an immediate need for investments in this area, especially as they are directly responsible for the management and disposal of waste from the boats. Likewise, the implementation of penalties and regulatory measures also seems to be a significant issue. Namely, the considerable disparity in the perceived effectiveness of penalties among stakeholders underscores the necessity for uniform and transparent enforcement to deter non-compliance effectively.

The results of the study have several practical implications. Firstly, the significant differences in stakeholder perceptions require customised waste management strategies that address the specific needs of each group. Secondly, the improvement of waste management infrastructure should be prioritised. Third, more consistent and transparent enforcement of environmental regulations is needed to increase compliance and trust. Fourthly, targeted environmental awareness campaigns can improve stakeholder engagement and responsible behaviour. Finally, involving direct users in the design of port policies can ensure more practical, accepted and effective sustainability measures.

The study's methodological approach, involving a multichannel survey of 151 respondents, proved an effective sampling strategy considering the relatively short sampling period. However, the limited sample size and the focus on a single country may constrain the generalizability of findings. Therefore, future research may investigate broader geographical contexts to corroborate these findings and evaluate the long-term effectiveness of waste management in yachting tourism.

CONCLUSION

This study aims to identify the main areas where waste management in Croatian marinas needs to be improved. Addressing infrastructure deficiencies, ensuring fair enforcement and conducting targeted awareness campaigns are key measures to achieve sustainable marina management. By incorporating stakeholder-specific aspects into green management strategies, Croatian nautical tourism can reconcile environmental protection and operational efficiency, thus improving the long-term sustainability of the yachting sector in the Mediterranean. This study lays the foundation for future studies and policy development and emphasises the importance of integrative and data-driven approaches to environmental management in yachting tourism.

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