RISK AWARENESS AND QUALITY OF LIFE OF A COASTAL COMMUNITY EXPOSED TO ENVIRONMENTAL HAZARDS (LUANDA, ANGOLA)

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ABSTRACT

Luanda Bay and Mussulo Lagoon, situated in Luanda (Angola), are two coastal ecosystems highly sensitive to environmental issues, such as climate change, water pollution, eutrophication, and harmful algal blooms. These environmental problems can severely affect the quality of life of coastal populations. In this study, we aim to evaluate several psychological variables, such as environmental risk perception and awareness, sense of place, environmental attitudes, and the overall quality of life of the coastal community in these areas, using a comprehensive questionnaire applied to residents and other ecosystem users. Results indicate that most respondents considered that they possess high knowledge about climate change, water pollution, and ingestion of contaminated seafood. However, regarding eutrophication and harmful algal blooms, most participants reported a low/moderate knowledge. Life experience and the media were reported as the most relevant sources of information on environmental problems. Respondents indicated a moderate risk perception towards environmental risks, and a moderate/high emotional attachment to the place. Residents' perceived quality of life was moderate/good in terms of physical and psychological health, and social relationships, but the environmental component was perceived as weak. Results suggest that improvements in the natural environment are needed to increase the quality of life in these ecosystems.

Keywords: Quality of Life, Risk Perception, Risk Awareness, Environmental Risks, Sense of Place, Coastal Community.

JEL Classification: Q54

1. INTRODUCTION

Extensive anthropogenic pressures make coastal ecosystems extremely vulnerable to several environmental problems (Agardy et al., 2005; Lloret et al., 2008). Climate change (Bindoff et al., 2019), water pollution, namely by plastics (Derraik, 2002), eutrophication (Lemley & Adams, 2019), and harmful algal blooms (Glibert & Burkholder, 2018), are some of the most pressing environmental issues in coastal areas. Regardless of the numerous environmental problems, coastal regions remain highly desirable areas for the human population to live and work. However, the environmental surroundings can influence the quality of life of the

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local population (Perlaviciute & Steg, 2019). Quality of life is defined by the World Health Organization as: *"an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns."* (WHOQOL Group, 1998). Due to the vulnerability of coastal areas to environmental issues it is important to determine the influence these may have on the health and quality of life of coastal populations.

Luanda Bay and Mussulo Lagoon (Figure 1), situated in Luanda (Angola), are two coastal ecosystems particularly sensitive to environmental problems. Luanda is the capital and largest city of Angola, with a total population of over 2.7 million people. The coastal zone of the city has been subject to decades of untreated waste (Leitão et al., 2016; Dinis et al., 2020), both industrial and domestic, discharged from the local municipalities, which has caused an excess of nutrients and various solid waste, including plastics. Harmful fishing activities and vessel presence further threaten the health of the ecosystem and the services it provides. These coastal areas are fundamental to the population, since it is an important economic area, providing the locals several ecosystem services that include food supply via local fisheries, wastewater purification, and nutrient cycling. Mussulo Lagoon also supports mangrove and seagrass growth, and provides shelter to several islands, including an area (Pássaros islet) that was recommended by the first Conference of the Parties to the Convention on Biological Diversity to be classified as an Integral Nature Reserve (Neto, 2020). Due to the biological importance of these ecosystems, they are also relevant from an academic point of view and, as such, are subjected to rigorous scientific research. Luanda Bay and Mussulo Lagoon also provide the population with a large range of cultural services, such as cultural and historical heritage, as well as group identity, connecting locals to their environment. These two areas of Luanda's coastline are also used by tourists and locals for recreational activities. In fact, the recent increase in tourism, coupled with urban expansion, is having a detrimental impact on the mangroves, facilitating an increase in pollution and threatening biodiversity and the health of the ecosystem, which could in turn alter the quality of life of the local community.

Given that the communities in these two coastal locations are exposed to several environmental threats, it is crucial to determine what their level of risk awareness is. Risk awareness refers to possessing information and knowledge about the issue and the subsequent risk (Gifford, 2014; Luís et al., 2016) and it is often considered to be related to risk perception. However, this connection is not always straightforward, since awareness does not always translate into concern about the issue or leads to behavioural changes (Domingues et al., 2018). Risk perception is an emotion-based psychological construct, related to a person's feelings, and an intuitive and subjective judgement people make about a risk (Sjöberg, 2000; Gifford, 2014; Domingues et al., 2021).

The large diversity of ecosystem services provided by these two important areas of Luanda could influence other psychological constructs such as individuals' sense of place, i.e., the emotional attachment between a person and a place (Jorgensen & Stedman, 2001; Domingues et al., 2021), which could in turn influence risk perception (Domingues et al., 2017). There is a severe lack of information regarding all these variables in these locations of Luanda's coast. A better understanding of these variables could provide valuable information for local management to better understand public concerns, and to promote pro-environmental attitudes and behaviours.

In this study, we aim to evaluate several psychological variables, namely environmental risk perception, risk awareness, sense of place, environmental attitudes, and the quality of life of the communities from these two vulnerable coastal ecosystems in Luanda, using a comprehensive questionnaire applied to residents and other ecosystem users.

Figure 1. Location of Luanda Bay and Mussulo Lagoon (Luanda, Angola)

Source: QGIS. 2021

2. METHODS

2.1 Instruments

A self-report questionnaire was developed and distributed to residents of Luanda Bay and Mussulo Lagoon. The questionnaire included sociodemographic data and specific instruments to measure the following variables: sense of place, risk perception and related constructs, environmental attitudes, and quality of life.

Sense of place, defined as an overarching construct that includes four sub-dimensions (*place*, *people*, *time*, *self*) related to the emotional attachment between an individual and a specific place, was measured using a short version of the Sense of Place Scale (SoPS) (Domingues et al., 2021). The questionnaire is composed of 32 Likert-type items, responded on a 5-point rating scale (from 1, *strongly disagree*, to 5, *strongly agree*); a short version composed of 16 items with high factor loadings was used in this study. The 32-item questionnaire has shown adequate psychometric properties, with an excellent internal consistency and good convergent-related and divergent validities (Domingues et al., 2021).

The Coastal Risk Awareness Scales were used to evaluate risk perception, psychological distance (perceiving risks as distant in time and/or space), trust in authorities, externalisation of responsibility regarding coastal problems, and willingness to participate in disaster risk reduction measures (Domingues et al., 2021), using 12 Likert-type items responded on a 5-point rating scale. The Coastal Risk Awareness Scales possess adequate internal consistency and show both convergent and divergent reliabilities (Domingues et al., 2021).

Specific items of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010; Domingues et al., 2019; Domingues & Gonçalves, 2020) whilst scales 5 (confidence in science and technology were used to evaluate respondents' trust in science and technology (scale 5), awareness of environmental threats (scale 6), anthropocentric concern (scale 4), personal conservation behaviours (scale 8), human dominance over nature (scale 9) and ecocentric concern (scale 11). Scales 6, 8, and 11 are included in the Preservation higher order factor (i.e., belief that nature should be preserved and protected) and scales 4, 5, and 9 in the Utilization higher order factor (i.e., belief that nature can be used and altered for human gain) (Milfont & Duckitt, 2004, 2010; McIntyre & Milfont, 2016).

The questionnaire also included questions to evaluate respondents' perceived knowledge and concern regarding different environmental problems (e.g., eutrophication, climate change, pollution by plastics, etc.). Questions on respondents' main sources of information on environmental problems and their perceived knowledge on environmental issues were also included.

Finally, the World Health Organization Quality of Life questionnaire (The WHOQOL Group, 1998a) was applied. The abbreviated Portuguese version of this questionnaire (WHOQOL-BREF) (Vaz Serra et al., 2006) was chosen to avoid anything too extensive that could have deterred the respondents from participating. This questionnaire provides a self-reported quality of life profile, and to our knowledge, this was the first time these variables were evaluated in these areas, targeting specifically the coastal communities. The questionnaire was comprised of 26 items; two items were evaluated separately and corresponded to questions on overall quality of life *("how would you rate your quality of life?"*) and health *("how satisfied are you with your health?"*). The remaining 24 items were grouped in four main domains: 1) physical health, 2) psychological, 3) social relationships and 4) environment. Each domain was comprised of several facets. Scores of the WHOQOL-BREF are scaled in a positive direction, meaning that higher scores translate into higher quality of life.

2.2 Participants and Procedure

The questionnaire was distributed door-to-door in Luanda Bay and Mussulo Lagoon in January 2019. Enumerators were trained to clarify any questions and to help respondents when needed but did not interfere with the responses. An online version of the questionnaire was also prepared using Google Forms and publicized through social media; the online version was available between January and March 2019. A total of 120 individuals completed the questionnaire (71 in paper, 49 online). Of these, 43.7% were female and 54.6% male. Respondents' age ranged from <18 to >65 years, with 62.5% of them ranging between the ages of 25 to 44 years old. Most participants (54.2%) had completed higher education and most of them (67.5%) have lived in the area for more than 10 years.

2.3 Data Analysis

Descriptive statistics, such as frequency distributions, means and standard deviation, were used to summarize the data. Depending on the number and size of the groups, significant differences were analysed using independent samples t-test or one-way analysis of variance (ANOVA). Effect sizes (Cohen's *d*) were calculated to quantify the strength of the differences between groups; *d* values of 0.2 indicated a small effect size, 0.5 a medium effect size, and 0.8 a large effect size (Cohen, 1992). Pearson's correlations were used to evaluate relationships between variables. All statistical analyses were considered at alpha = 0.05. Analysis on the WHOQOL-BREF followed the instructions provided by the WHOQOL group (WHOQOL Group, 1998a). All analyses were conducted with IBM SPSS Statistics

v. 22, with the exception of the effect sizes, that were calculated using an online calculator (https://www.polyu.edu.hk/mm/effectsizefaqs/calculator/calculator.html).

3. RESULTS AND DISCUSSION

This study focused on evaluating several psychological variables in vulnerable coastal communities in two locations of Luanda (Angola): Luanda Bay and Mussulo Lagoon. Each of these variables will be presented and discussed in the following sub-sections: (1) sense of place, (2) risk awareness, (3) risk perception, (4) environmental attitudes, and (5) quality of life profile.

3.1 Sense of Place

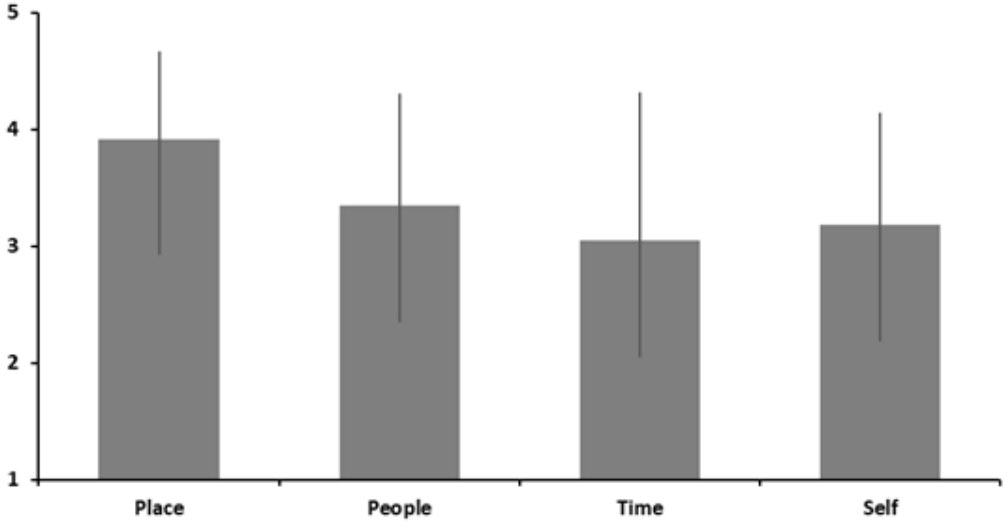
Sense of place was defined as an overarching construct that includes four sub-dimensions: *place*, *people*, *time*, and *self*, related to the emotional attachment between an individual and a specific place (Domingues et al., 2021). The dimension *place* refers to the emotional bond between people and a specific place, and includes items associated with place attachment, place identity, place dependence, and rootedness (Domingues et al., 2021). For this dimension, respondents from Luanda Bay and Mussulo Lagoon indicated moderate to high scores, with a mean value of 3.92 ± 0.75, in a 5-point rating scale (Figure 2). This was similar to values of place attachment found for other coastal communities (Mishra et al., 2010; Domingues et al., 2017, 2021). Place attachment is often thought to be related to risk perception (Hidalgo & Hernández, 2001) but the relationship between these two variables is not straightforward, and can often diverge depending on the research context (Bernardo, 2013). Different examples of positive, negative, or even null relationships between place attachment and risk perception can be found in the literature (see review by Bonaiuto et al., 2016). For instance, positive relationships were found in studies on volcanic eruption risk in Iceland (Bird et al., 2011) or hurricane risk in Louisiana, USA (Burley et al., 2007). On the other hand, negative relationships were found in studies focused on seismic risk in Romania (Armaş, 2006) and volcanic risk in Indonesia (Donovan et al., 2012). Regarding our study, no relevant correlation was found between place attachment and risk perception in the coastal communities of Luanda Bay and Mussulo Lagoon. Non-existing relationships between place attachment and risk perception are less frequent in the literature (Bonaiuto et al., 2016), however, a study in Churchill (Canada) focused on climate change also found no connection between place attachment and climate change risk perception (Groulx et al., 2014).

Three other dimensions of sense of place were evaluated (Figure 2). The dimension *people* (M = 3.35 ± 0.96) consisted of items related to the sense of community. The dimension *time* (M = 3.05 ± 1.27) is related to the length of residency and consisted of items associated with temporality and intergenerational transmission. And finally, the dimension *self* (M = 3.18 ± 0.96) included items associated with distinctiveness and self-esteem, and it is related with place identity (Domingues et al., 2021). A positive correlation ($r = 0.59$, $p = 0.01$, N = 115) between the dimension *time* and residency length of respondents was found. This is in line with the notion that the dimension *time* reflects the importance of residency length and rootedness (Domingues et al., 2021). No other relevant correlations were found for these variables.

Significant differences between sociodemographic groups regarding sense of place were found for education level, age groups, and residency length. Differences were found between people with higher education and people with primary/high school education, for both the *people* ($t(116) = 4.49$, $p < 0.001$, $d = 0.75$) and *self* ($t(116) = 4.73$, $p < 0.001$, $d =$

0.75) dimensions. For both dimensions, respondents with lower education indicated larger values than respondents with higher education levels. Significant differences between age groups <24 and >55 for the dimension *time* were also found ($Z(2,115) = 3.54$, $p = 0.03$, $\omega^2 = 0.04$), with younger respondents reporting moderate values (M = 3.62 ± 1.246) regarding *time* while older respondents indicated lower values (M = 2.39 ± 1.237) regarding this dimension. This could be related to the fact that the younger respondents indicated a residency length of more than 10 years while the same was not true for the >55 age group, as such, younger respondents, due to their high residency length in these two coastal locations, could have a higher degree of rootedness than some of the older respondents that have lived in these areas for a shorter period. Lastly, significant differences were also found when considering the residency length of respondents. As would be expected, respondents with a residency length of >10 years in either Luanda Bay or Mussulo Lagoon reported higher values for all the dimensions of sense of place (*place*: $t(113) = -2.54$, $p = 0.01$, $d = 0.51$; *people*: $t(113) = -3.83$, $p < 0.001$, $d = 0.77$; *time*: $t(113) = -5.95$, $p < 0.001$, $d = 0.99$; *self*: $t(113) = -3.55$, $p = 0.001$, $d = 0.71$) than respondents living in these areas for a shorter period (Raymond et al., 2010; Anton & Lawrence, 2014).

Figure 2. Four Sub-dimensions of Sense of Place for Respondents in Two Coastal Areas of Luanda (Angola). ***Place***, ***People***, ***Time***, **and** ***Self***. **Vertical Bars Represent Standard Deviation (±1SD)**



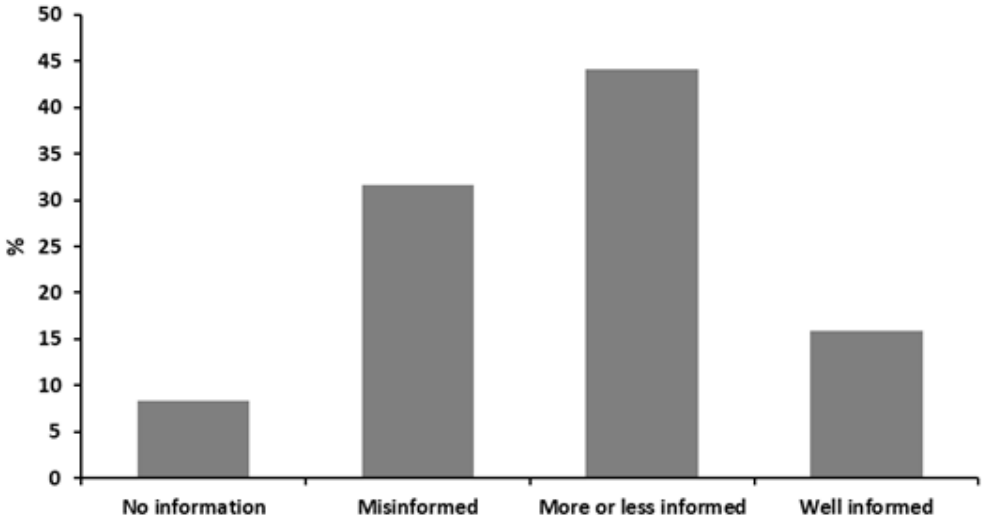
Source: Own Elaboration

3.2 Risk Awareness

Respondents were asked a series of questions intended to evaluate their awareness regarding environmental risks in Luanda Bay and Mussulo Lagoon. When asked how they perceive their overall knowledge regarding environmental risks, respondents were somewhat divided, with 60% reporting to be more or less informed or well informed, while 40% considered to be misinformed or not informed at all (Figure 3). No significant differences were found between different sociodemographic groups and no relevant correlations were found between the level of information and the other variables addressed.

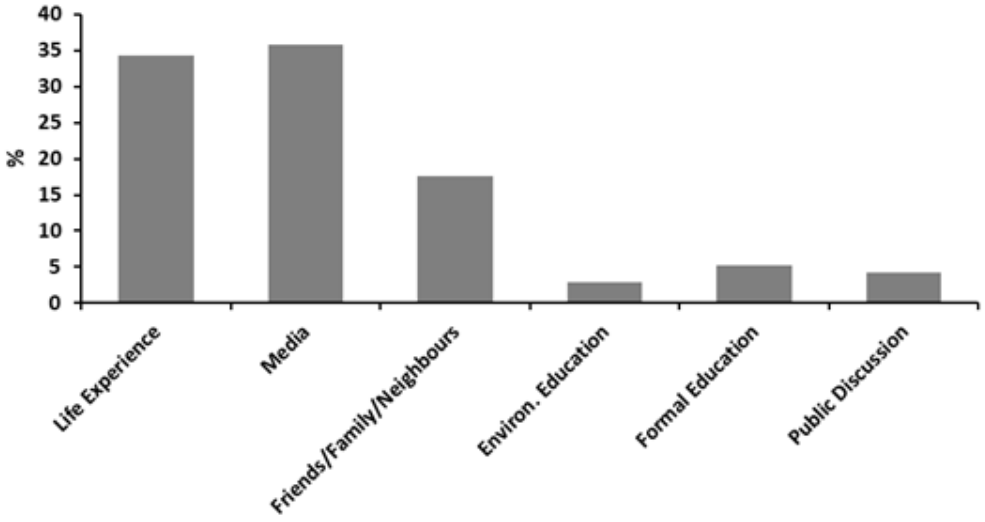
Respondents also indicated their main sources of information regarding environmental risks in these two coastal areas of Luanda. The media (34.7%) and life experience (33.3%) were referred as the main sources of information. Family, friends, and neighbours were also considered to be a relevant source of information (18.5%), while environmental education, formal education and public discussions were less relevant (Figure 4).

Figure 3. Level of information on environmental risks in Luanda Bay and Mussulo Lagoon



Source: Own Elaboration

Figure 4. Sources of information regarding environmental risks in Luanda Bay and Mussulo Lagoon



Source: Own Elaboration

The evaluation of perceived knowledge and concern regarding specific environmental problems that affect Luanda Bay and Mussulo Lagoon, namely climate change, water pollution including plastic-derived, eutrophication, harmful algal blooms, and seafood contamination by toxins, was also included in the questionnaire (Blanco et al., 2010; Castro et al., 2018; Amado et al., 2020). When asked about climate change, 80% of respondents considered that they know or know very well what climate change is, while only 5.8% indicated to have never heard of it or not knowing very well what it is. Regarding their concern about this issue, most respondents (86.7%) indicated that they are concerned or highly concerned about climate change, while only 8.3% indicated not to be concerned at all or only slightly concerned (Figure 5a). Significant differences in answers were found for some sociodemographic groups. A higher education level translated into a higher perceived knowledge ($t(116) = -5.92$, $p < 0.001$, $d = 0.93$) and concern ($t(78.12) = -5.20$, $p < 0.001$, $d = 0.97$) about climate change. Age also affected the answers given in regards to both

knowledge ($Z(2,115) = 5.08, p = 0.008, \omega^2 = 0.07$) and concern ($Z(2,115) = 4.64, p = 0.01, \omega^2 = 0.06$), with the younger age group (<24) indicating a moderate knowledge/concern, while respondents above this age group (>24) indicated a high knowledge/concern regarding climate change. Climate change is currently receiving a lot of attention and, as such, it is extremely common to hear about this in the news and on social media (Pianta & Sisco, 2020). Scientists have made a considerable effort to bring attention to this issue during the last decades and governments from all around the world have strategies in place to attempt to reduce carbon emissions and try to mitigate future impacts caused by climate change. Considering the extensive media coverage regarding climate change it is not surprising that most respondents claimed to know what climate change is. In this case, knowledge about the issue translated to concern as well, with over 80% of respondents indicating a high level of concern about this.

Water pollution is a very prominent problem in both Luanda Bay and Mussulo Lagoon; in particular, pollution by plastics is very easily observed in these two coastal areas of Luanda. When asked about their perceived knowledge on water pollution, 90% of respondents indicated to know or know very well what this problem is. In terms of concern, most respondents indicated to be concerned or very concerned about water pollution (92.5%), while only 5.8% indicated no concern or a slight concern about this environmental problem (Figure 5b). When asked specifically about water plastic pollution, most respondents also indicated that they know or know very well what this is (79.1%), with only a small part of respondents (8.3%) indicating they had never heard of this or know little about it. Most respondents indicated to be concerned or very concerned (94.2%) about water pollution due to plastics (Figure 5c). The answers provided by the respondents are aligned with the severity of these issues in the coastal area of Luanda (Nicolau, 2016). Life experience was indicated by respondents as one of the main sources of information regarding environmental problems and, as such, the high exposure these coastal communities to water pollution could justify the high percentage of respondents that claim to be knowledgeable about these issues. Furthermore, just like climate change, water pollution and in particular, pollution due to plastics, receive a lot of attention in the media, with several campaigns existing worldwide to raise awareness to these problems. Once again, high perceived knowledge translated to high concern, with over 90% of respondents expressing a large concern about these issues.

For both water pollution and water pollution by plastics, several significant differences were found between distinct sociodemographic groups. Gender related differences were found for concern about both water pollution ($t(113) = -2.17, p = 0.03, d = 0.41$) and water pollution by plastics ($t(113) = -2.01, p = 0.05, d = 0.38$), with men appearing to be slightly less concerned than women. When considering education level, significant differences were also found for both knowledge (*water pollution*: $t(116) = -6.20, p < 0.001, d = 1.12$; *water pollution by plastics*: $t(116) = -5.25, p < 0.001, d = 0.98$) and concern (*water pollution*: $t(72.42) = -5.68, p < 0.001, d = 0.93$; *water pollution by plastics*: $t(116) = -4.74, p < 0.001, d = 0.88$), with more educated individuals perceiving to be more knowledgeable and concerned than less educated people. Significant differences between age groups were also found, in regards to knowledge about water pollution ($Z(2,115) = 4.27, p = 0.02, \omega^2 = 0.05$) and concern about water pollution by plastics ($Z(2,115) = 4.82, p = 0.01, \omega^2 = 0.06$). In this case, younger respondents (<24) considered to be less informed about water pollution and less concerned about water pollution by plastics than older respondents (>55).

When asked about eutrophication, respondents' perceived knowledge and concern were much lower than scores for climate change and water pollution. Most respondents indicated not knowing what eutrophication is (56.6%), and only 26% of respondents from Luanda Bay and Mussulo Lagoon responded that they know or know very well what this is. However, when questioned about their concern regarding this problem, most respondents

are concerned or very concerned (55.2%) (Figure 5d). Gender significantly influenced respondents' concern about this issue ($t(109) = -2.70$, $p = 0.008$, $d = 0.52$), with women indicating a slightly higher level of concern about eutrophication than men. Education was also relevant, with respondents with a higher educational level expressing a higher level of concern regarding eutrophication than less educated people ($t(112) = -3.09$, $p = 0.002$, $d = 0.58$). Eutrophication is a very specific topic in marine and aquatic sciences, and even though it is very concerning, it is much more uncommon to hear about this issue in the news or social media. The media and life experience were considered by the respondents as the most relevant sources of information regarding environmental issues and, as such, it is expected that many respondents were unaware of what this problem. Interestingly, regardless of the lack of information about eutrophication by most respondents, over 50% of them expressed concern about eutrophication. It is possible that respondents attempted to give a socially desirable answer, meaning they responded in the way that they perceived to be socially desirable (Holtgraves, 2004; Domingues et al., 2021), which in this case was an expression of concern about environmental issues affecting Luanda Bay and Mussulo Lagoon, even though they might not be knowledgeable about them.

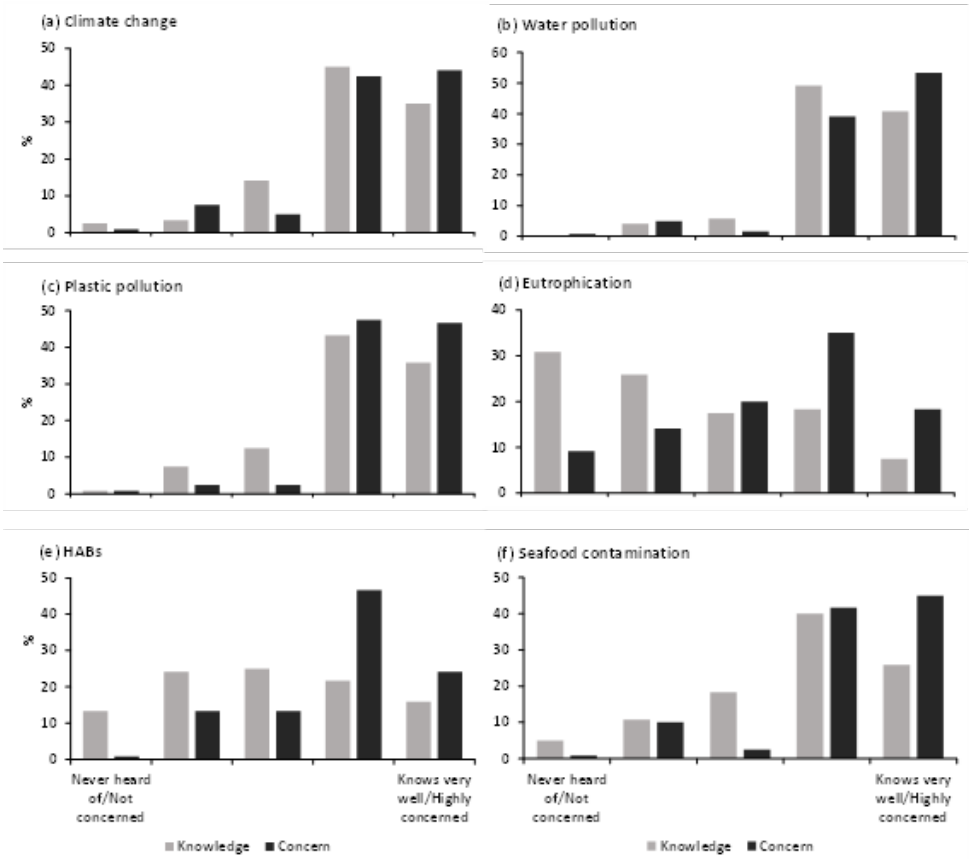
The occurrence of harmful algal blooms (HABs) or red tides was also addressed. Respondents were equally divided between knowing or knowing very well (37.5%) and never having heard of it or not knowing much about it (37.5%). However, like for eutrophication, when asked about their concern regarding this issue, 72.1% of respondents indicated they were concerned or very concerned about HABs (Figure 5e). Both HABs and eutrophication are topics that do not receive as much media attention as climate change and water pollution, which could explain the large difference in perceived knowledge between these issues in the coastal communities of Luanda Bay and Mussulo Lagoon. HABs are an environmental problem highly relevant in these areas, and can strongly influence both local economy and human health (Rangel & Silva, 2007; Blanco et al., 2010); however the knowledge of the community on this issue is apparently still low. Eutrophication and HABs are very specific topics and, therefore, it may be difficult for people with no formal education to understand what these issues are. However, regardless of the lack of understanding about HABs, respondents expressed once more a high concern about this topic (over 70%). It is possible that respondents attempted to give an answer that they perceived as socially desirable (Holtgraves, 2004; Domingues et al., 2021). The terminology used could be a factor influencing response, since the word "harmful" has a negative association, so regardless of not fully understanding what this is, people may be concerned about it. Gender differences were found, with women indicating a higher level of concern than men ($t(110.70) = -2.31$, $p = 0.02$, $d = 0.39$). More educated people also reported a greater perceived knowledge ($t(112.51) = -1.94$, $p = 0.06$, $d = 0.36$) and concern ($t(114) = -2.73$, $p = 0.007$, $d = 0.51$) about HABs than less educated people.

Lastly, respondents were also asked about ingestion of seafood contaminated by toxins. Most respondents indicated that they know or know very well what this is (65.8%). Once more, when asked about their concern regarding this topic, 86.7% indicated to be concerned or very concerned, and only 10.8% indicated not being concerned or slightly concerned (Figure 5f). Gender influenced the concern level expressed by respondents ($t(113) = -2.51$, $p = 0.01$, $d = 0.48$), with women reporting a higher level of concern than men. Education also affected responses, with more educated people indicating both a higher knowledge ($t(116) = -2.89$, $p = 0.005$, $d = 0.54$) and higher concern ($t(88.99) = -5.23$, $p < 0.001$, $d = 0.98$) than less educated people. Seafood contamination and HABs are two intertwined environmental problems, since the toxins produced by HAB species are the cause of seafood contamination (Anderson, 2018). Knowledge on HABs was lower than that of seafood contamination, which indicates that respondents may be aware of the potential for seafood

to be contaminated by toxins but are less aware of what causes the occurrence of toxins. Other studies have also addressed the lack of knowledge the public has on the causes and consequences of red tides (Kuhar et al., 2009; Nierenberg et al., 2010; Borbor-Córdova et al., 2018). Public misinformation regarding these risks could create issues for local management when attempting to implement mitigation measures. Seafood contamination is a very serious threat for local economics, due to shellfish harvest interdictions that can last for long periods of time, and for human health, if not properly monitored. As such, efforts should be made to provide the public with accurate and useful information on these events.

Most of the environmental issues addressed in the questionnaire showed positive correlations among each other. Knowledge about the issue was always positively correlated to concern, except for seafood contamination, where knowledge and concern presented a weak correlation. The relationship between knowledge and concern and is not always straightforward since more awareness about an issue does not always translate into more concern about it. In certain cases exposure to environmental risks could increase knowledge on environmental issues, but it may weakened the concern levels, due to the process of risk normalization (Luís et al., 2016; Domingues et al., 2018). In general, answers given in this questionnaire indicate that the coastal communities in Luanda Bay and Mussulo Lagoon are aware of the environmental issues they face and are, in general, concerned about them, which is in line with other studies focused on coastal populations (Schmidt et al., 2014; Domingues et al., 2018).

Figure 5. Respondents self-reported knowledge and concern regarding several environmental problems that affect Luanda Bay and Mussulo Lagoon. (a) climate change, (b) water pollution, (c) water pollution due to plastics, (d) eutrophication, (e) occurrence of harmful algal blooms (or red tides) and (f) ingestion of seafood contaminated by toxins. Graph bars are presented from the least knowledge/ concern to the highest knowledge/concern (left to right).



Source: Own Elaboration

3.3 Risk Perception

Respondents were asked a series of questions about their risk perception (and associated variables) towards environmental risks in Luanda Bay and Mussulo Lagoon. A moderate to high risk perception was reported, with a mean value of 3.64 ± 0.81, on a 5-point rating scale (Figure 6). Overall, our results show that respondents are aware of the environmental risks they face, with most of them recognising that those risks may pose a threat. Contrary to other studies where risk perception showed either positive (Bird et al., 2011; Stain et al., 2011) or negative (Armaş, 2006; Donovan et al., 2012) correlations with place attachment, for our sample no correlations were observed; in fact, risk perception showed no relevant correlations with any of the other variables addressed in this study. The relationship between risk perception and place attachment is not always straightforward and can vary depending on other factors (Bernardo, 2013). Regardless, respondents from Luanda Bay and Mussulo Lagoon indicated a relatively high risk perception towards environmental risks in general.

Potential determinants of risk perception were also addressed, such as psychological distance (i.e., perception of threats as distant in time or space). Overall, respondents' psychological distance was low, with a mean value of 2.47 ± 0.65 (Figure 6). Psychological distance can be problematic when the time comes to take action to deal with environmental risks (Domingues et al., 2018). If risks are seen as distant in time then it is more likely that they could be perceived as less relevant; this is common when addressing climate change, an environmental risk that is typically seen as distant in time, i.e., people perceive that climate change may be a problem in the future, but not now (Spence et al., 2012; McDonald et al., 2015). However, our results show that for Luanda Bay and Mussulo Lagoon psychological distance does not appear to be an issue, since most respondents indicated that they felt they were at risk currently.

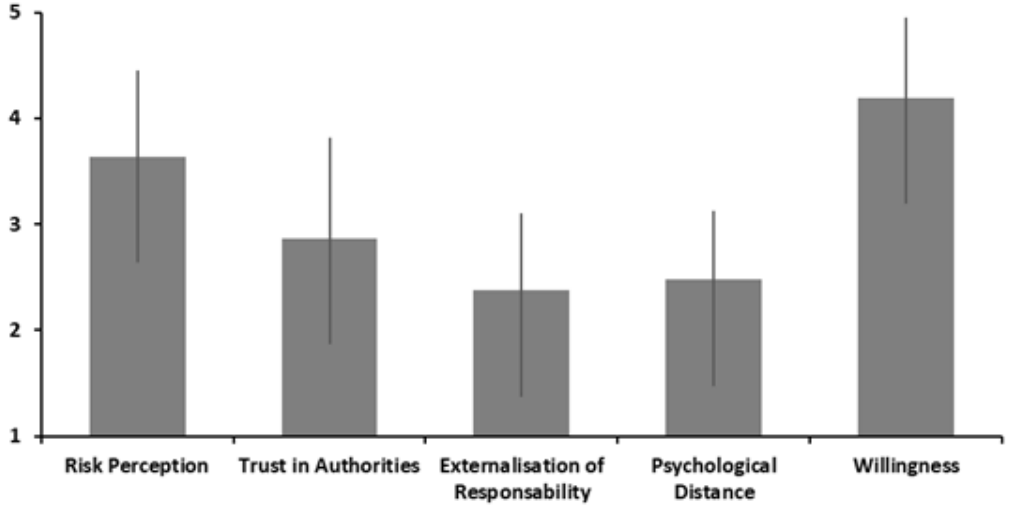
Variables that may be influenced by risk perception, such as trust in authorities, externalisation of responsibility, and willingness to participate in the implementation of disaster risk reduction (DRR) measures, were also addressed. Respondents' trust in authorities was low, with a mean value of 2.86 ± 0.96, on a 5-point rating scale (Figure 6). Regarding the externalisation of responsibility for environmental risks, most respondents disagreed or strongly disagreed, with a mean value of 2.37 ± 0.73 on 5-point rating scale (Figure 6). Lastly, when asked about their willingness to participate in the implementation of DRR measures, most respondents either agreed or strongly agreed, with a mean score of 4.19 ± 0.76 (Figure 6). The low trust in authorities that residents expressed is similar to other coastal communities (Domingues et al., 2017, 2018; Cumiskey et al., 2018). Mistrust in authorities could prevent behavioural changes and actions by the community, which could prove to be a challenge when attempting to implement DRR measures. However other variables, such as externalisation of responsibility (i.e., belief that authorities should be responsible for solving environmental problems) could also influence behavioural changes (Gifford, 2011). For respondents from Luanda Bay and Mussulo Lagoon, externalisation of responsibility does not seem to be an issue since it was low, indicating that respondents are aware that they must play an active role in mitigating the environmental problems they face. This is further emphasized by respondent's high willingness to participate in the implementation of DRR measures.

Some significant differences between sociodemographic groups were found for risk perception related variables. Gender differences were found only for psychological distance ($t(111) = 2.15$, $p = 0.03$, $d = 0.41$), with men (M = 2.58, SD = 0.64, N = 63) scoring higher than women (M = 2.32, SD = 0.64, N = 50). Education influenced responses for trust in authorities ($t(114) = 2.35$, $p = 0.02$, $d = 0.44$), psychological distance ($t(114) = 3.23$, $p = 0.002$, $d = 0.61$), and willingness to participate in DRR measures ($t(113.9) = -2.66$, $p = 0.009$, $d = 0.50$). Respondents with less education expressed a higher trust in

authorities and a higher psychological distance than respondents with higher education levels, but for willingness to participate in DRR measures the opposite was observed. Age groups influenced responses only for trust in authorities ($Z(2,113) = 4.84$, $p = 0.01$, $\omega^2 = 0.06$), with younger respondents (<24) being more trusting of authorities than respondents from the intermediate age group (25 to 54).

Overall, our results indicate that respondents from Luanda Bay and Mussulo Lagoon have a moderate/good level of risk perception, and even though their trust in authorities is low, respondents still reported to be willing to participate in the implementation of DRR measures and appear to understand that they must play an active role protecting the environment.

Figure 6. Mean values of risk perception, potential determinants of risk perception (psychological distance), and potential outcomes of risk perception (trust in authorities, externalisation of responsibility, and willingness to participate in the implementation of DRR measures). Vertical lines represent standard deviation (±1SD).



Source: Own Elaboration

3.4 Environmental Attitudes

Environmental attitudes can be roughly defined as an individual's concern about the natural environment as something deserving of protection, understanding, or enhancement (Gifford, 2014). Respondents were questioned on specific items of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010; Domingues et al., 2019; Domingues & Gonçalves, 2020) to evaluate different attitudes towards the environment.

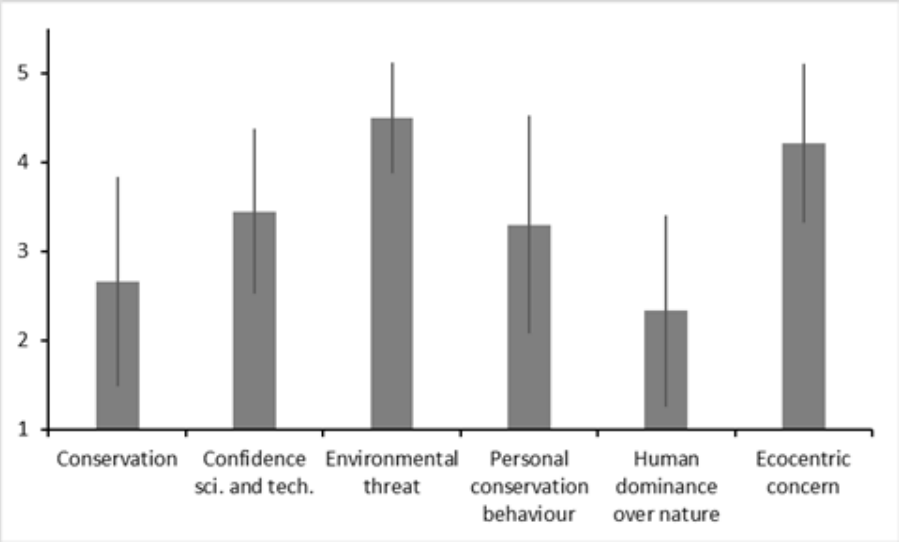
Regarding nature conservation motivated by anthropocentric concern, respondents were asked *"do you think one of the most important reason to keep Luanda Bay and Mussulo Lagoon clean is so that people can practice water sports?"*. Most respondents did not agree, with a mean value of 2.67 ± 1.18 (Figure 7), indicating that nature conservation is not motivated by potential human utilisation of the natural environment. To evaluate confidence in science and technology, respondents were asked *"do you think scientists and engineers will be capable of solving these and other environmental problems?"*. Respondents showed a moderate trust in the ability of science and technology to solve the environmental problems of their ecosystems (M = 3.45 ± 0.92) (Figure 7). Respondents were also asked if they *"think human beings are severely abusing the environment"*, to evaluate their awareness regarding environmental threats. Most respondents agreed, with a mean value of 4.50 ± 0.62 (Figure 7), indicating a high

awareness of environmental threats. Regarding personal conservation behaviour, respondents were asked if they *"normally make an effort to save resources (recycling, save water, save electricity, etc.)"*. Responses for this item were moderate, with a mean value of 3.30 ± 1.22 (Figure 7). Regarding the human dominance over nature, respondents were asked if they *"think human beings should dominate nature"*. Most respondents disagreed, with a mean value of 2.33 ± 1.07 (Figure 7). Lastly, respondents were asked if they *"think one of the most important reasons to keep Luanda Bay and Mussulo Lagoon clean is to preserve the animals (e.g., fishing resources) and plants that inhabit there"*, to evaluate ecocentric concern. Most respondents agreed, with a mean value of 4.22 ± 0.89 for this scale (Figure 7).

Some significant differences across sociodemographic groups were found. Personal conservation behaviour was the scale where more differences between sociodemographic groups were found, namely for gender ($t(113) = -2.42$, $p = 0.02$, $d = 0.46$), education level ($t(116) = 6.95$, $p < 0.001$, $d = 1.30$), age ($Z(2,115) = 13.33$, $p < 0.001$, $\omega^2 = 0.17$), and residency time ($t(113) = 3.98$, $p < 0.001$, $d = 0.80$). Women indicated a higher personal conservation behaviour than men, and so did respondents with a higher education level, and those that lived in these areas for less than 10 years. For age groups, the answers from the younger age group (<24) significantly differed from those older than 25 years, with younger respondents indicating a much lower personal conservation behaviour than older respondents.

Interpretation of these results must be done carefully, since we were only able to include a few items from the Environmental Attitudes Inventory, to avoid a questionnaire too extensive that would increase the rate of drop-out. However, these results provide a general view on environmental attitudes in Luanda Bay and Mussulo Lagoon, with respondents appearing to have a more ecocentric and less anthropocentric view of nature. Overall, considering responses given in other parts of our questionnaire, such as high environmental concern regarding risks, and a high willingness to participate in DRR measures, it appears that respondents in these coastal areas of Luanda are willing to engage in actions to increase the quality of their environment.

Figure 7. Mean values for specific scales of the Environmental Attitude Inventory (Milfont & Duckitt, 2010; Domingues et al., 2019; Domingues & Gonçalves, 2020): conservation motivated by anthropogenic concern, confidence in science and technology, environmental threat, personal conservation behaviour, human dominance over nature, and ecocentric concern. Vertical lines represent standard deviation (±1SD).

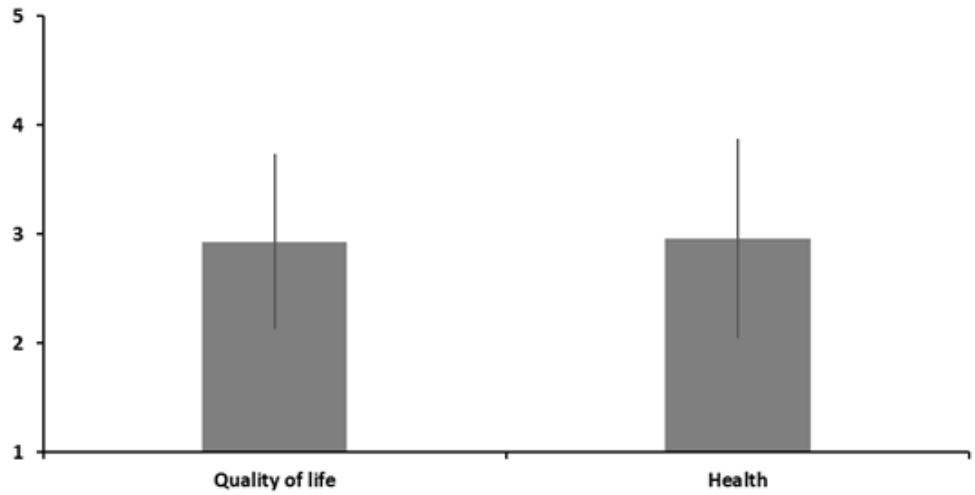


Source: Own Elaboration

3.5 Quality of Life Profile

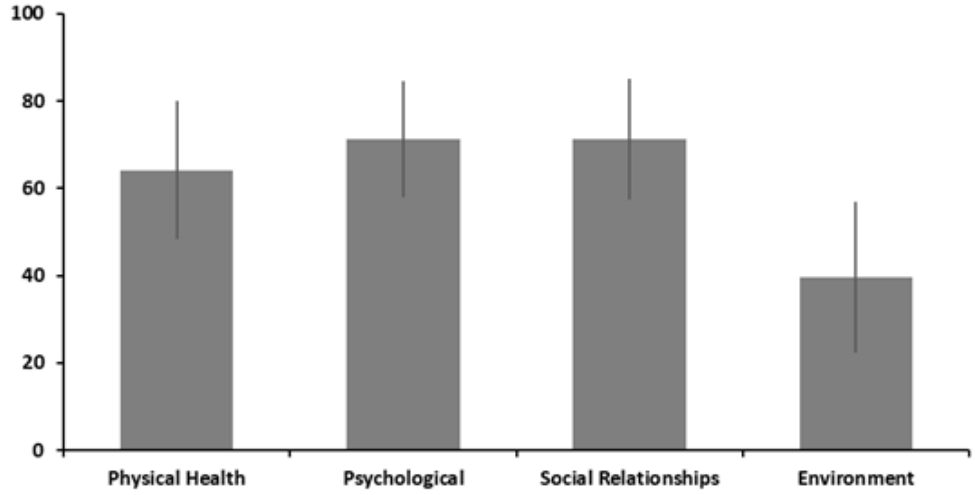
The coastal communities of Luanda Bay and Mussulo Lagoon are exposed to several environmental risks, which can have an impact in the quality of life of these communities (Silva et al., 2012; Perlaviciute & Steg, 2019). However, the quality of life profile for the communities living and working in these coastal areas of Luanda has never been addressed. Two independent items of the WHOQOL-BREF questionnaire allowed to determine the overall quality of life and health satisfaction of the communities in Luanda Bay and Mussulo Lagoon. Results indicated a moderate quality of life (M = 2.93 ± 0.80, in a 5-point rating scale) and a moderate satisfaction with health (M = 2.96 ± 0.92, in a 5-point scale) (Figure 8). Regarding the four main domains (physical health, psychological, social relationships, and environment) evaluated in a scale from 0 to 100, results showed a moderate to good quality of life in terms of physical (M = 64.2 ± 15.9) and psychological health (M = 71.1 ± 13.3), and social relationships (M = 71.3 ± 13.8). However, scores were much lower for the environmental component (M = 39.6 ± 17.2) (Figure 9). The lower values for the environmental component were anticipated, given that respondents also expressed that they are aware and concerned about the environmental risks they face. These results further emphasise that the physical environment plays an important role in a population's quality of life. If the physical environment in Luanda Bay and Mussulo Lagoon improves we would expect to see an increase in the overall quality of life of the communities that live or work in these areas. However, if no action is made to improve the environment and it continues to further deteriorate, the quality of life of these coastal communities may decrease even more.

Figure 8. Overall self-reported quality of life and satisfaction with health of the respondents in two coastal areas of Luanda (Angola), obtained by the application of the WHOQOL-BREF. Vertical lines represent standard deviation (±1SD).



Source: Own Elaboration

Figure 9. Scores for the four domains of QoL, namely (1) physical health, 2) psychological, 3) social relationships, and 4) environment), obtained through the application of the WHOQOL-BREF. Vertical lines represent standard deviation (±1SD).



Source: Own Elaboration

4. CONCLUSION

The questionnaire applied to residents and other ecosystems users of Luanda Bay and Mussulo Lagoon (Luanda, Angola) allowed the evaluation, for the first time, of several important psychological variables in these regions. These two coastal areas are exposed to several environmental issues, and results from our questionnaire indicate that the coastal communities are, in general, aware, and concerned about the environmental problems they face. Respondents were more familiar with some environmental problems than others. Most respondents perceived to be highly knowledgeable about climate change, water pollution (including by plastics), and ingestion of contaminated seafood. However, their self-reported knowledge on eutrophication and harmful algal blooms or red tides is more limited. Risk perception towards environmental risks was moderate, and a moderate/high sense of place was reported by respondents. Residents' quality of life was perceived as moderate/good in terms of physical and psychological health, and social relationships, but the environmental component was perceived as weak.

These results suggest that improvements in the natural environment are needed to increase the quality of life in these ecosystems. If the natural environment is allowed to further deteriorate, the impact in the quality of life of these coastal communities could increase. Steps should be taken by local management to attempt to improve the quality of the physical environment in these areas. Participants in this study indicated a high willingness to participate in disaster risk reduction measures, which could be very useful for local management if they attempt to implement measures to improve environmental quality.

This study presents some limitations, mainly related to the low number of respondents. In future work, a larger sample should be sought to strengthen the results. Regardless, this study is a relevant contribution to understanding how the physical environment may be influencing the quality of life of coastal communities in Luanda Bay and Mussulo Lagoon. It is also pertinent for local management to better comprehend public concerns about environmental problems in these two coastal areas.

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