Cyprus Report

Statistical Analysis of Survey questionnaire

Sea Level Related Hazards Risk Perception

2023

Statistical Analysis of Sea Level Related Hazards Risk Perception in Larnaca, Cyprus

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The 2023 Risk Perception Survey was implemented by Frederick University, Nicosia, Cyprus in collaboration with the Geological Department of Cyprus.

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The contents of this report are the sole responsibility of the authors and not necessarily reflect the views of the project partners.

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1. Acronyms and Abbreviation page

UNESCO	United Nations Educational, Scientific and Cultural Organization
GSD	Geological Survey Department of Cyprus
FU	Frederick University, Cyprus
ALCHEMER	Cloud-based survey software platform

2. Map of Larnaca (Cyprus Community)

Larnaca is a coastal city located in the southeast region of the island of Cyprus (Figure 1), which is known for its rich history and beautiful beaches, [1]. The city has a population of around 51,500, according to the 2015 census, and is a popular destination for tourists due to its sandy beaches, cultural attractions, and historical sites, [1]. Most of the city's hotels are built on shore while the central business district of Larnaca is located about 2 kilometers away from the coastline. The city is also home to the major international airport of Cyprus, Larnaca International Airport, which is also situated on shore. It is the largest airport in Cyprus, serving millions of passengers every year, and plays a crucial role in the island's tourism and economy.

However, being situated close to the shore and having major infrastructure along the coastline, makes Larnaca vulnerable to sea level-related hazards, particularly tsunamis, coastal flooding and storm surges during extreme weather events. Climate change and rising sea levels pose a significant threat to the city, as they can increase the risk of flooding and erosion along the coastline that could endanger lives and property. This makes it important for the city to take measures to reduce the risks associated with these hazards, such as implementing effective coastal management strategies, investing in infrastructure improvements, and raising awareness among local communities and businesses about the potential impacts of sea level rise.

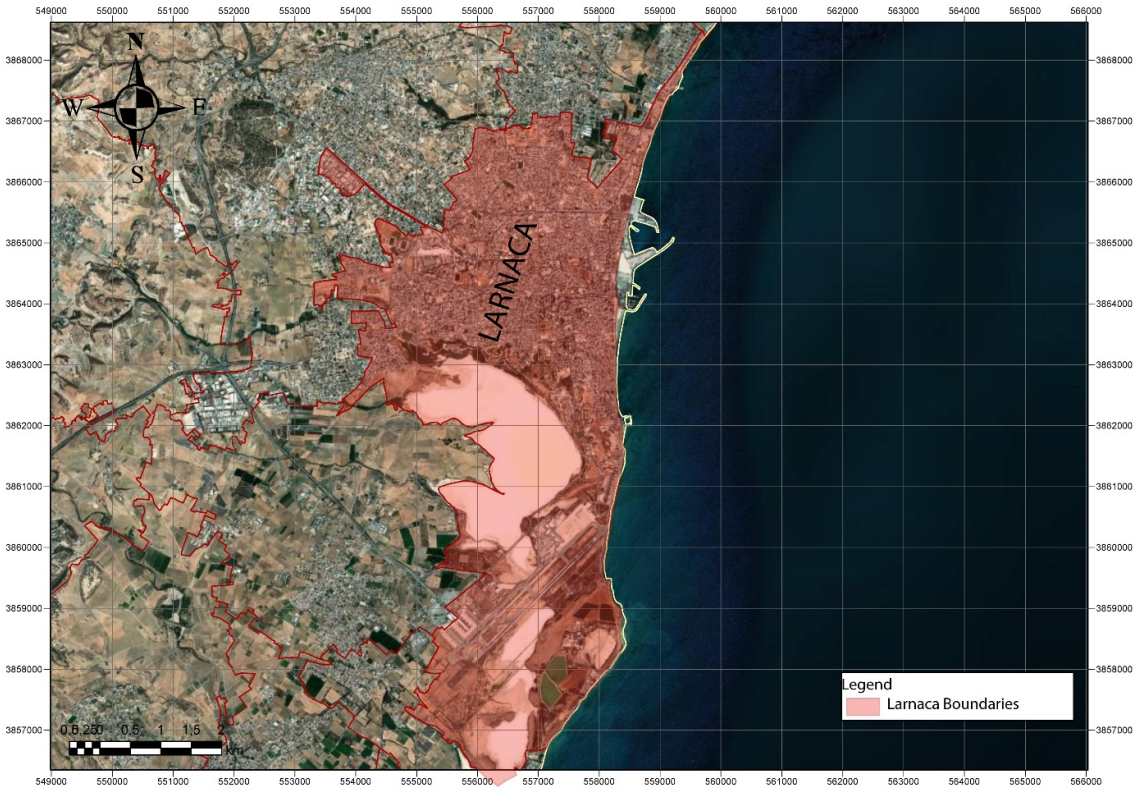

Figure 1: Map of Larnaca Municipality.

3. Introduction

Coastal communities worldwide are facing challenges posed by rising sea levels and natural hazards like tsunamis, storm surges, and sea level rise, [2,3,4]. These hazards could put human lives, property, and infrastructure at risk, in areas such as the Mediterranean and North Eastern Atlantic. To address this, it is crucial to understand how these communities perceive the risks and how well they are equipped to handle them [5,6].

A tsunami is a large and powerful ocean wave that is usually caused by an underwater earthquake, volcanic eruption, or landslide. Tsunamis can also be generated by meteor impacts or other rare events. When a tsunami is created, the energy of the disturbance propagates outwards from the source, creating a series of large waves that can travel across entire ocean basins at high speeds. When these waves reach shallow water near the coast, they can increase in height and cause devastating damage to coastal communities, [7].

A storm surge is an abnormal rise of water levels in coastal areas caused by the strong winds and low atmospheric pressure associated with storms such as hurricanes and cyclones. Storm surges can cause flooding, erosion, and damage to infrastructure and buildings near the coast. The height of the storm surge depends on the strength of the storm, the size and shape of the coastal area, and the tidal conditions at the time of the storm, [8].

Sea level rise refers to the long-term trend of increasing average sea levels around the world, primarily as a result of global warming and the resulting thermal expansion of the oceans, as well as the melting of large masses of ice. Sea level rise has numerous impacts on coastal communities and ecosystems, including increased flooding, erosion, saltwater intrusion, and damage to infrastructure such as roads, buildings, and ports. It also affects marine ecosystems by altering the distribution of species and changing the characteristics of habitats, [9].

The “Sea Level Related Hazards Risk Perception Survey Questionnaire” was conducted in the Mediterranean and North Eastern Atlantic region to gain a better understanding of how coastal communities perceive these hazards and to recommend improved risk communication strategies and actions in the region. The main goal of the study is to help enhance early warning and mitigation systems and preparedness in the Mediterranean region to save lives, reduce losses, and damages in the event of a natural disaster.

This report outlines the survey's findings in Larnaca, Cyprus, including important trends and recommendations to help improve risk communication and preparedness in the Mediterranean region. We believe that policymakers, emergency managers, and other stakeholders working to enhance resilience in coastal communities affected by sea-level-related hazards will find this report to be a valuable resource.

In Section 4, we outline the survey methodology and describe how the questionnaire was designed to effectively address the main purpose of this study. In Section 5, we provide a detailed description of the sampling techniques used to obtain responses, and explain the rationale behind the choices made. Section 6 provides the survey results together with the main question findings. In section 7 we provide an in-depth discussion, drawing comparisons between the various survey questions as well as responses from open ended questions and we end the report with a conclusion section. In Appendix 1 there is a sample of the questionnaire.

4. Survey Methodology

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5. Survey Implementation

The questionnaire seeks to gather information about the personal experiences and views of people on sea-level related hazards, namely tsunamis, sea level rise, and storm surges. The aim is to determine the extent to which people are aware of these hazards and assess their understanding of the possible causes, impacts, and methods to prepare for and respond to them. Additionally, the questionnaire explores the respondents' familiarity with emergency policies, communication channels, as well as awareness of warning signs and evacuation procedures.

In addition, the questionnaire explores the people's sense of exposure to these hazards, including their perception of their own risk and vulnerability, and their ability to handle a potential disaster event. Understanding people's sense of exposure can provide valuable insights into how they view and react to natural hazards, and this information can help improve policies and practices related to disaster management. By gathering information on awareness and sense of exposure, the questionnaire can highlight potential gaps in knowledge or preparedness and provide crucial data to enhance community resilience to sea-level related hazards.

The researchers at Frederick University with the collaboration of the Geological Survey Department of Cyprus conducted a statistical survey considering diverse preferences of their respondents. To this end, they offered the questionnaire in both electronic and paper forms, identifying that some people find it easier to complete surveys online, while others prefer the traditional paper format.

To gather responses through electronic form, the researchers used a technique called snowballing sampling, [10]. This involves asking participants to share the survey link with their contacts or networks, which helped to reach a larger audience. This approach is particularly useful when trying to target a population that's difficult to reach through traditional sampling methods.

For the paper format, the researchers deployed a team of people to the relevant area to distribute the questionnaires in person. This method, known as face-to-face surveying, [11], is often used when targeting a specific geographic area or demographic.

It is worth noting that the online questionnaire was created using Alchemer software, [12]. ALCHEMER is a cloud-based survey software platform that allows users to create and distribute online surveys, quizzes, polls, and forms. It provides a range of tools for survey design, data collection, analysis, and reporting, making it a popular choice for businesses, researchers, and individuals who need to gather and analyze data from their target audience. Further, the research team manually entered the responses from the paper format into ALCHEMER, ensuring that all data was organized and analyzed in a standardized manner.

Overall, the Frederick University's use of both electronic and paper formats, along with the snowballing technique, [10], led to a robust and varied dataset that's crucial for conducting meaningful statistical analysis.

6. Results and Key Findings

6.1 Personal Information

Three hundred and forty-five people (345) completed the survey in Cyprus. Out of the 345 individuals who completed the survey, 183 (53.0%) identified as female, 157 (45.5%) identified as male, and 5 individuals chose not to provide their gender. This indicates an ideal gender mixture with slightly higher representation of females in the survey.

The majority of survey respondents were between the ages of 35 and 54, with 27.2% of respondents falling into the 35-44 age range and 24.3% falling into the 45-54 age range, as shown in Figure 2. The remaining age groups were less represented, with 16.5% of respondents aged 25-34, 13% aged 14-17, 11% aged 55-64, 3.8% aged 18-24, 2.6% aged 65-74, and 1.4% aged 75 or older. The age distribution indicates a misrepresentation of older people in the sample that might create some bias in the findings of the survey.

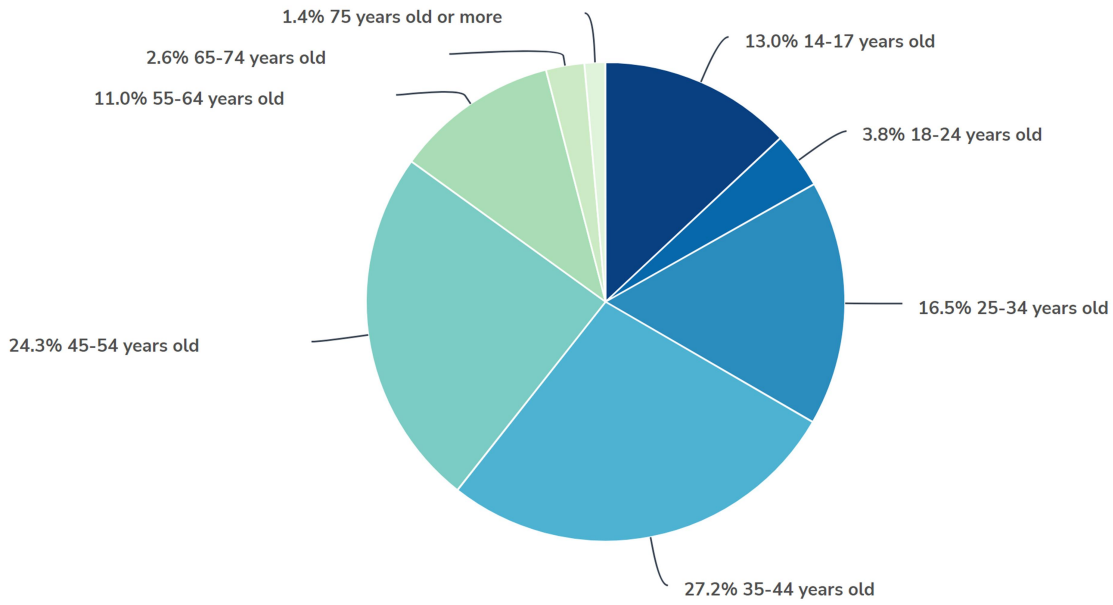

Figure 2: Survey Respondents' Age Distribution.

Based on the survey results, the educational background of the respondents appears to be heavily focused on higher education, with a significant majority of respondents having attended university. Specifically, 62.9% of respondents reported having attended university, as shown in Figure 3. A smaller percentage of respondents, 20.2% reported having completed high school, 11.1% reported completing secondary school while 5.6% responded other. Only 1 person, reported having completed only primary school. This suggests that the sample is very well-educated, with the majority having attended higher education.

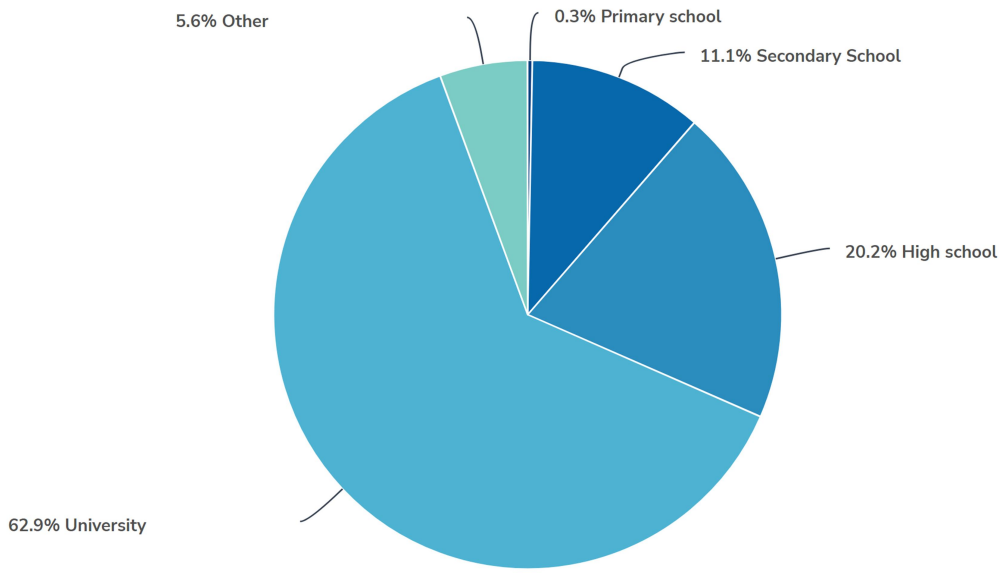

Figure 3: Educational Background of Survey Respondents.

Figure 4 indicates that respondents are primarily affiliated with the education and public sectors. In detail, the public sector had the highest percentage of respondents, with 49% or 169 individuals reporting affiliation with this sector, including government employees, civil servants, and other public servants. The educational sector had the next highest percentage, with 35.1%. The emergency responder sector that includes firefighters, police, coastal guards, and civil protection agencies had a smaller percentage of respondents, with 10.1%. Finally, the tourism sector had the lowest percentage of respondents, with 5.8%. It would have been beneficial if the percentage of the tourism sector was higher as a large part of the tourism industry is along the Cyprus coastline and as a result in the case of an incident these people will find themselves on the frontline of events.

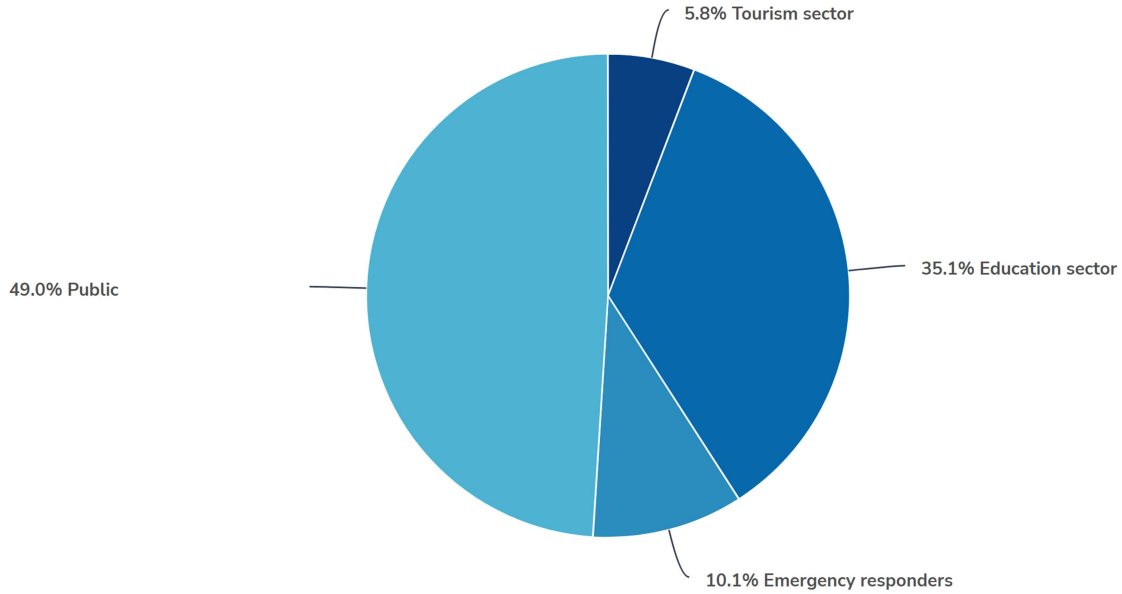

Figure 4: Work Sector Affiliation.

6.2 Awareness/Knowledge

The majority of survey respondents (92.4%) reported being aware of the hazard of tsunamis (Figure 5). Sea-level rise was also well-recognized by 76.8% of respondents while storm surge was the least recognized of the three hazards, with only 42.4% of respondents reporting awareness of this hazard. These findings suggest that there is a high awareness of the hazard for tsunamis and sea-level rise, while at the same time there is a need for more efforts to raise awareness about the other hazards, especially storm surge.

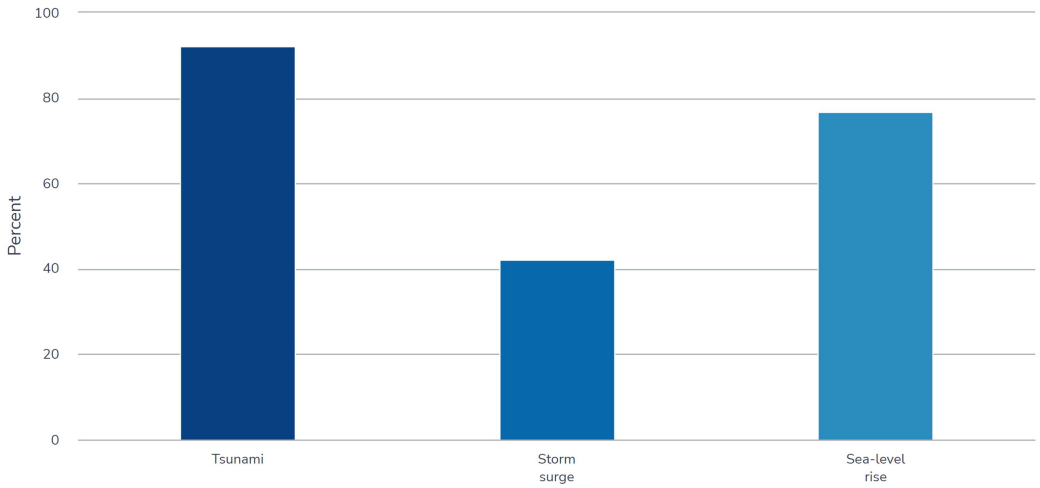

Figure 5: Public Awareness for Tsunami, Storm Surge and Sea-level Rise.

Despite the relatively high public awareness for Tsunami, Storm Surge and Sea-level rise, very few respondents (less than 3%) reported that they actually have experienced one of these hazards in an actual event. The latter suggests significant lack of experience of the public in real events that could be addressed by special education seminars.

Although there have been no actual events in Larnaca, when asked to evaluate the likelihood of an actual event occurring in their community within the next decade, 27.5% of respondents reported a positive outlook for a tsunami, 39% for storm surge, and 50.8% for sea-level rise. These results are summarized in Figure 6.

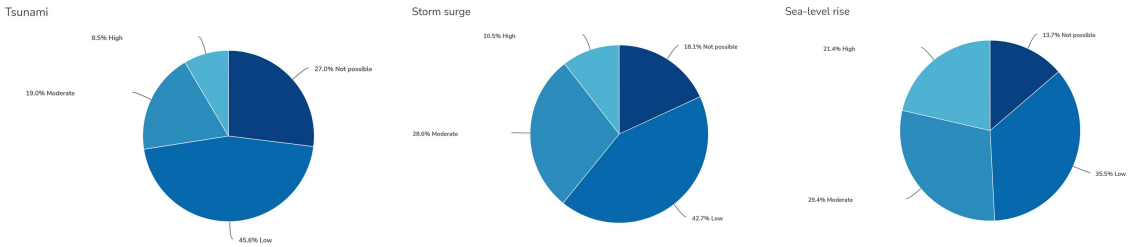

Figure 6: Perception of Likelihood of a hazard event in Larnaca within the next decade.

Figure 7 shows that the perception of the respondents for the potential impact of different hazards varies. For tsunami, the majority believed it could have high impact on loss of life and property

damage, while for storm surge, respondents' perceptions were divided between moderate and high impact. Regarding sea-level rise, respondents' perceptions were relatively balanced across all three levels of potential impact.

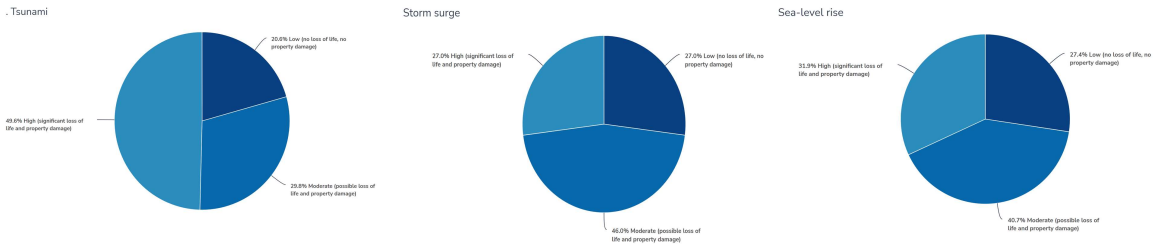

Figure 7: Respondents' perceptions on the severity of impact of hazards on loss of life and property damage.

Figure 8 indicates that respondents were almost evenly split when asked to estimate the potential height of a tsunami that could occur in the North-eastern Atlantic and Mediterranean coastal regions. Specifically, 22.6% estimated the height to be less than a meter, 23.8% estimated it between 1 and 2 meters, 31.5% estimated it between 2 and 5 meters, and 22.2% estimated it to be higher than 5 meters.

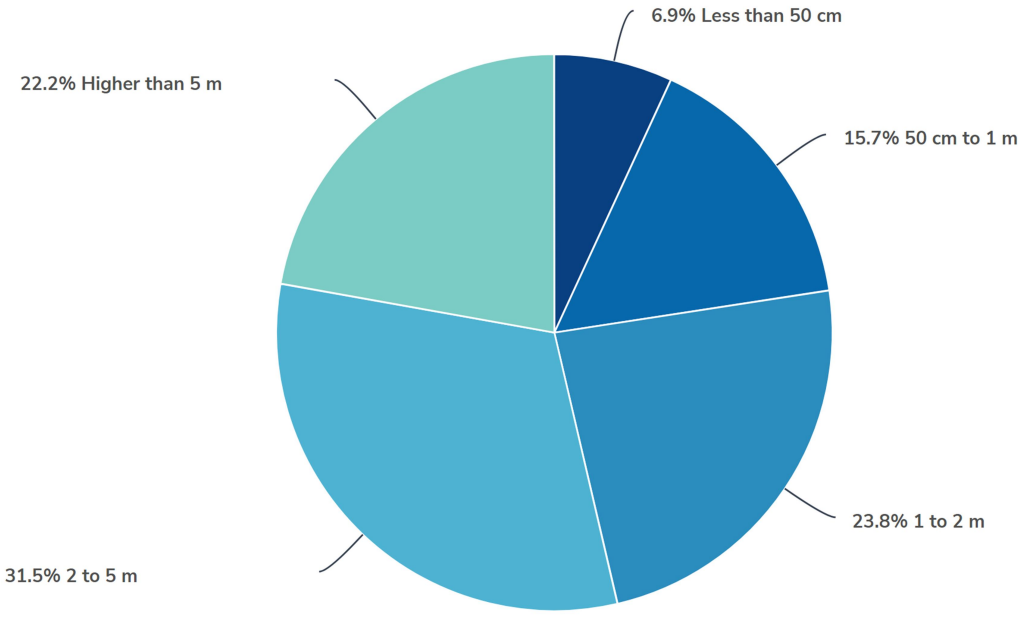

Figure 8: Respondents' expected height of a possible tsunami event.

The survey results indicate that when asked about their estimation of how long it would take for a tsunami to reach the coastal region of their community, the majority of respondents (66.5%) estimated the arrival time to be within the first 20 minutes. In detail, 36.3% estimated it to be less than 10 minutes, while 30.2% estimated it to be between 10-20 minutes, as shown in Figure 9. Only a third of respondents expected the arrival in more than 20 minutes. These results suggest that the respondents have a good understanding of the relatively short time frame in which a tsunami could impact their community.

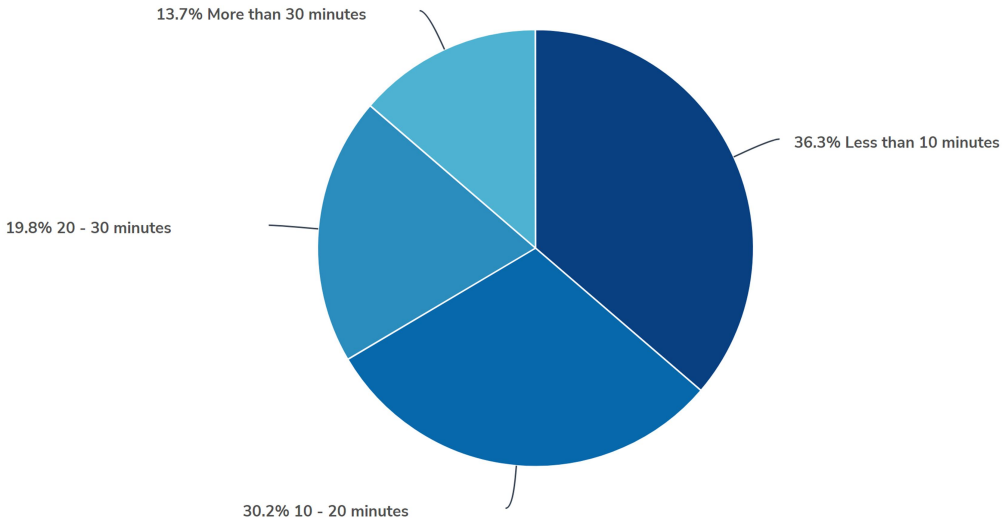

Figure 9: Perception on estimated Tsunami arrival to coastline.

Next, the respondents were asked about their municipality's alert and information systems in place for a number of natural hazards. Based on the responses, a significant proportion of the survey respondents were not aware if their municipality had the necessary capacities and infrastructure to alert and/or inform the local population about potential natural hazards. Specifically, for earthquake, tsunami, storm surge, and sea-level rise, the percentage of respondents who answered "No" or "I am not aware" ranged from 69.8% to 87.1%, with the highest percentage being for tsunami. These results indicate a lack of awareness or information about the capacities and infrastructure in place for natural hazard preparedness and early warning systems.

Based on the survey results, less than 2.5% of respondents reported that their municipality displays evacuation signs to indicate the best evacuation routes to take and/or what to do in case of sea level rise. This is a concerning finding as such signs are an important tool for informing the public about evacuation procedures and safety measures during natural disasters such as tsunamis and storm surges.

6.3 Exposure and Sense of Exposure

The results of the survey, as shown in Figure 10, suggest that the majority of respondents (66.9%) live more than 10 minutes away from the seashore/coast on foot, which may indicate that they are less likely to be directly affected by sea-level related hazards. However, it's important to note that even those who live farther away from the coast could still experience indirect effects such as flooding or other types of damage that can result from these types of disasters, [7,8,9]. Additionally, the fact that one third of respondents do live within a 10-minute walking distance or less of the seashore/coast indicates that an important part of the population could be at greater risk of experiencing the direct effects of natural disasters.

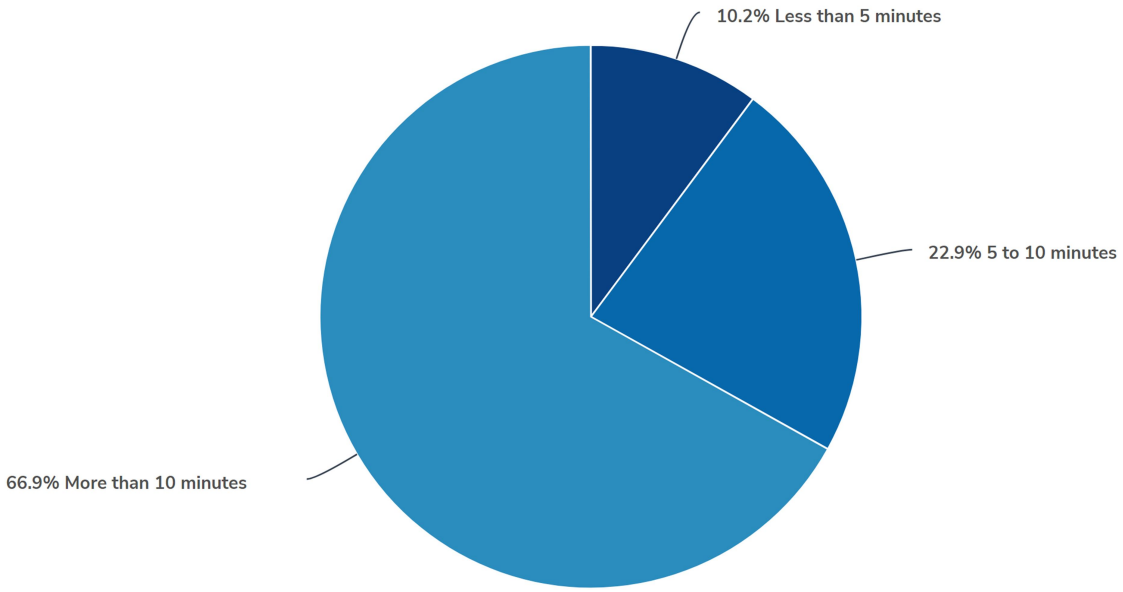

Figure 10: On Foot Proximity of Living Space to Seashore.

As shown in Figure 11, it appears that a significant percentage of the respondents (34.7%) live with people who are dependent on them, such as children, disabled or elderly individuals. This finding suggests that these individuals may need to take additional actions to ensure their safety in the event of a natural disaster. For example, they may need to develop a comprehensive emergency plan that takes into account the specific needs of those who are dependent on them.

It is also noteworthy that 32.2% of the respondents are part of a family or couple with no dependent people. These individuals may have different priorities and concerns when it comes to natural disasters. For example, they may be more focused on protecting their property and possessions rather than ensuring the safety of vulnerable individuals.

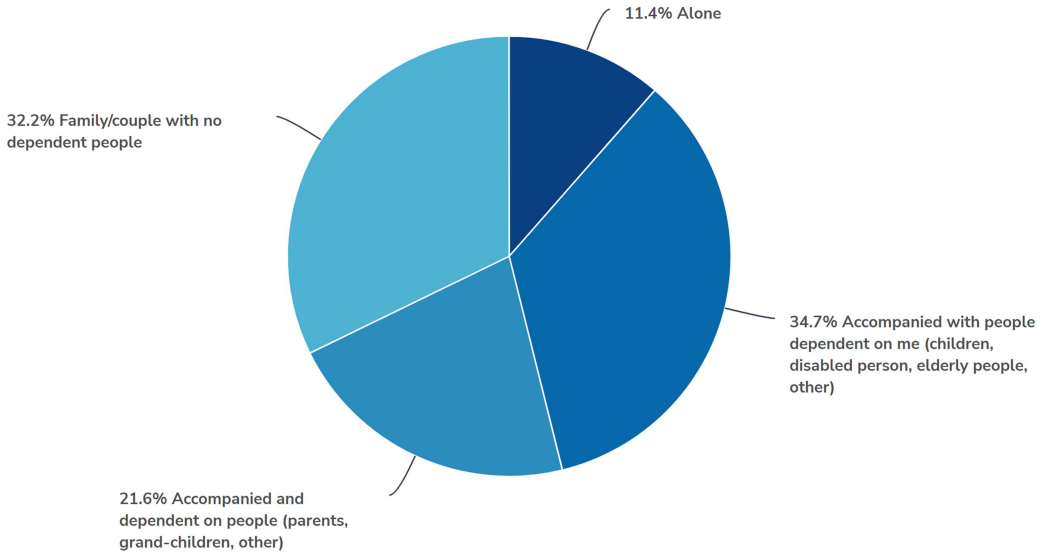

Figure 11: Respondents were Asked to Identify Who They Live With.

According to the survey responses, a significant percentage of respondents (40.4%) indicated that their workplace/school/university is not reachable on foot, meaning that it is more than 2 km away from the coast. These individuals may be at a lower risk of being affected by coastal disasters. However, it is concerning that some respondents (14.7%, Figure 12) reported that their workplace/school/university is less than 5 minutes away from the seashore on foot, which highlights the potential risk of being affected by coastal disasters for these individuals. On the other hand, 32.2% of respondents indicated that their workplace/school/university is more than 10 minutes away from the coast on foot, which may provide sufficient time for evacuation if necessary.

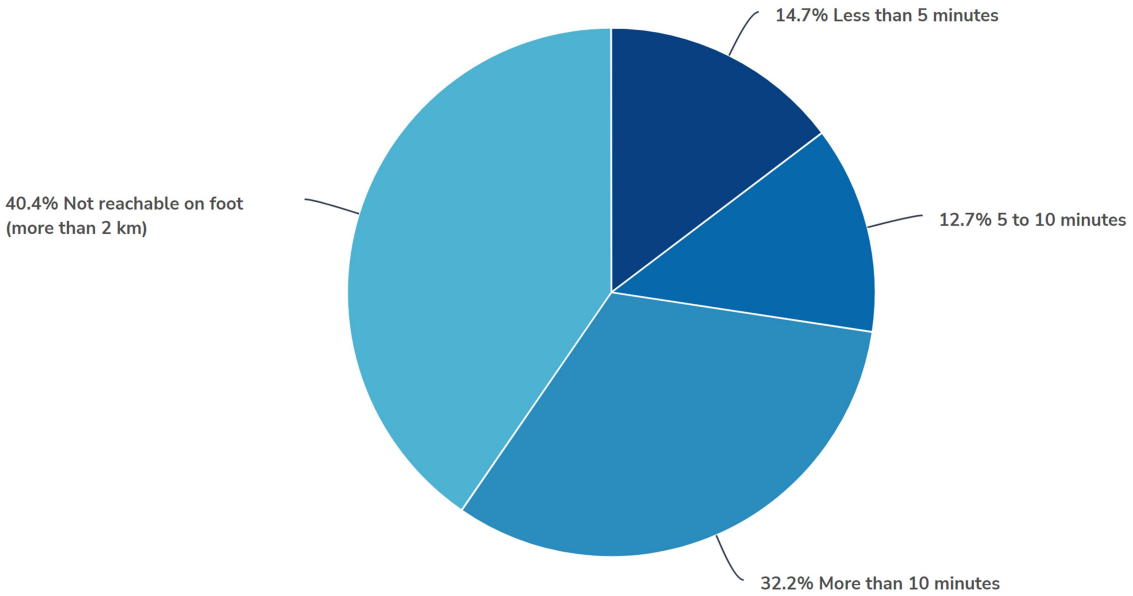

Figure 12: On foot Proximity of Work Space/School/University from coast.

6.4 Assessment, Preparedness and Response

It is encouraging to see that the majority of respondents (75.6%) recognized the importance of collective actions in reducing or avoiding the impact of sea level related disasters, as shown in Figure 13. This suggests that the respondents understand that everyone has a role to play in disaster risk reduction and that working together can lead to more effective outcomes. However, it is concerning that a significant proportion of respondents (23.1%) still believe that the impact of a natural disaster cannot be reduced. While it is true that natural disasters can be unpredictable and sometimes unavoidable, there are measures that can be taken to mitigate their impact and reduce the risk to people and infrastructure.

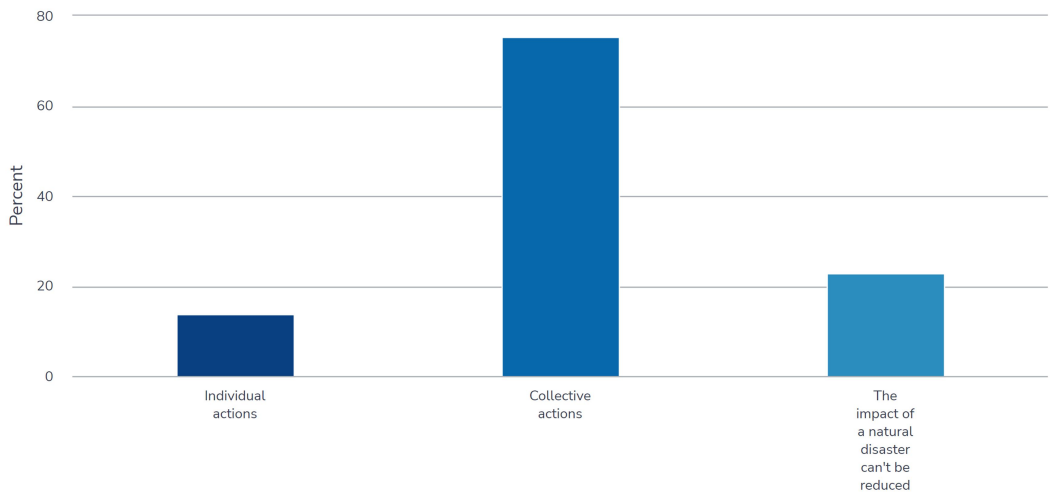

Figure 13: Actions for Reducing Impact of Sea-level Related Disasters.

After being asked about their level of concern towards the three natural hazards, the results show that more than 55% of the respondents are concerned about the risks and impacts of tsunamis, storm surges, and sea level rise in their communities. However, the findings also indicate that at least a third of the respondents reported no concern towards these hazards.

Despite their concern, the majority of the respondents (59%are not aware if their municipality has an evacuation or resettlement plan in place for tsunamis or storm surges. Only a small percentage of respondents (between 3.7% and 4.5%) reported that their municipality has a plan for these hazards, as shown in Figure 14. These results highlight the need for increased awareness and preparedness measures in coastal communities to minimize the potential impact of these hazards.

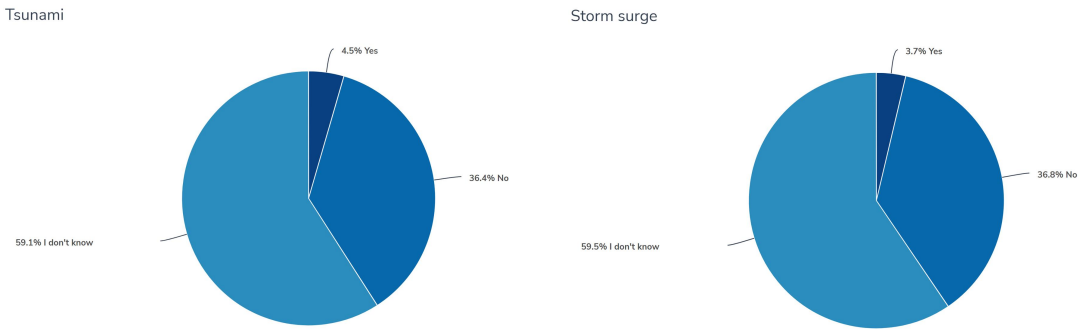

Figure 14: Awareness of Existence of Municipality Evacuation or Resettlement Plans.

It is concerning to note that almost all of the respondents (95%) have not taken any personal precautions or measures against the three natural hazards under study. Furthermore, less than 10% of respondents report having insurance coverage for any of these hazards. In addition, 95% report that have never participated in any evacuation exercises, drills or other actions related to tsunamis, storm surges, or sea level rise. Based on these results, it is recommended that community authorities take action to inform residents about their evacuation and resettlement plans, as well as implement exercises and drills to ensure preparedness in the event of a natural disaster.

The respondents were also asked about factors that could affect their ability to evacuate to a safe area. The most common reasons selected were caring for disabled and/or young people (43.8%) and having

animals under their care (23.6%), as shown in Figure 15. Other reasons cited included personal health conditions, needing to continue running their business or activity, and other unspecified reasons.

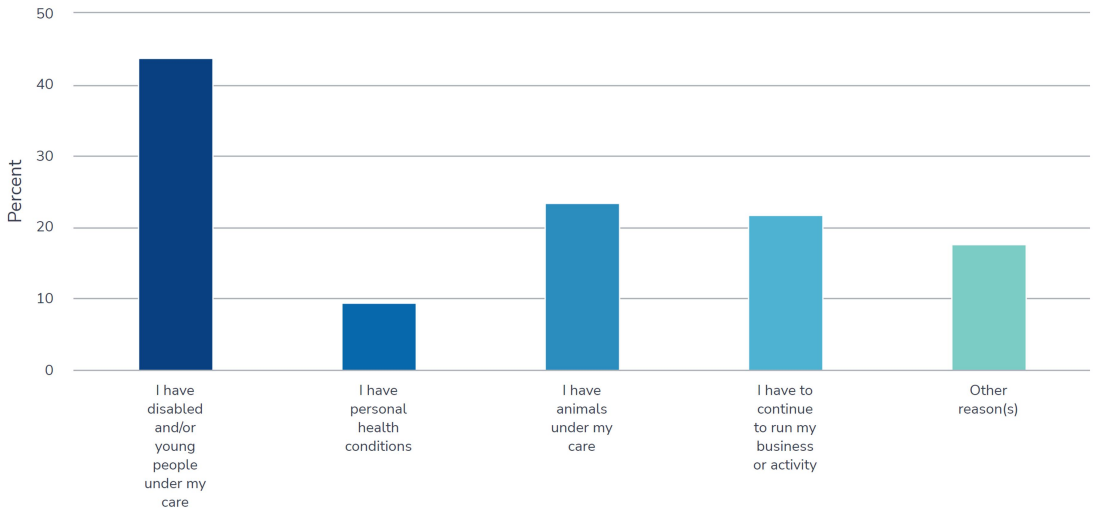

Figure 15: Factors Affecting Evacuation Ability to a Safe Area.

6.5 Governance

The survey asked respondents to express their preference by ranking six types of communication channels they would like to be used for receiving alert messages. In detail, participants were asked to order *Television, Radio, Internet (Social Media), Audible Alerts, SMS* and *Email*, with *1 Count* indicating their most favorable notification media and *6 Count* there least preferred choice. The heatmap in Figure 16 summarizes the results, showing that SMS messages and audible alerts, such as sirens and loudspeakers, are the most favored channels among the respondents, being indicated mostly as *1 Count* or *2 Count* preferences. These are followed by social media, which is also considered a highly preferable option for receiving alert messages. Overall, the results highlight the importance of quick and reliable communication channels, especially for urgent alerts.

	Television	Radio	Internet (social media)	Audible alerts (sirens, loudspeakers)	SMS	E-mail
1 Count	19	5	17	66	96	2
2 Count	22	20	26	52	53	16
3 Count	25	40	58	25	11	20
4 Count	46	46	37	16	7	25
5 Count	45	42	36	12	16	21
6 Count	23	23	10	16	9	89

Figure 16: Communication Channels Preferences.

According to the survey, a small proportion of respondents believed that their municipality was capable of effectively managing emergency response operations during possible hazard events. Specifically, only 11% of respondents believed their municipality was capable of managing emergency response operations during a tsunami, while just 16% believed their municipality was capable of managing such operations during a storm surge. Similarly, only 19% of respondents believed their municipality was capable of managing emergency response operations during sea level rise.

According to the survey, the majority of respondents (46.4%) were uncertain whether more could be done in terms of disaster risk reduction or management, as shown in Figure 17. However, 40.5% of respondents believed that more could be done, while only 13.2% believed that nothing further could be done. These results suggest that there may be room for improvement in disaster risk reduction and management efforts, and more research and collaboration among various stakeholders may be necessary to identify and implement effective strategies.

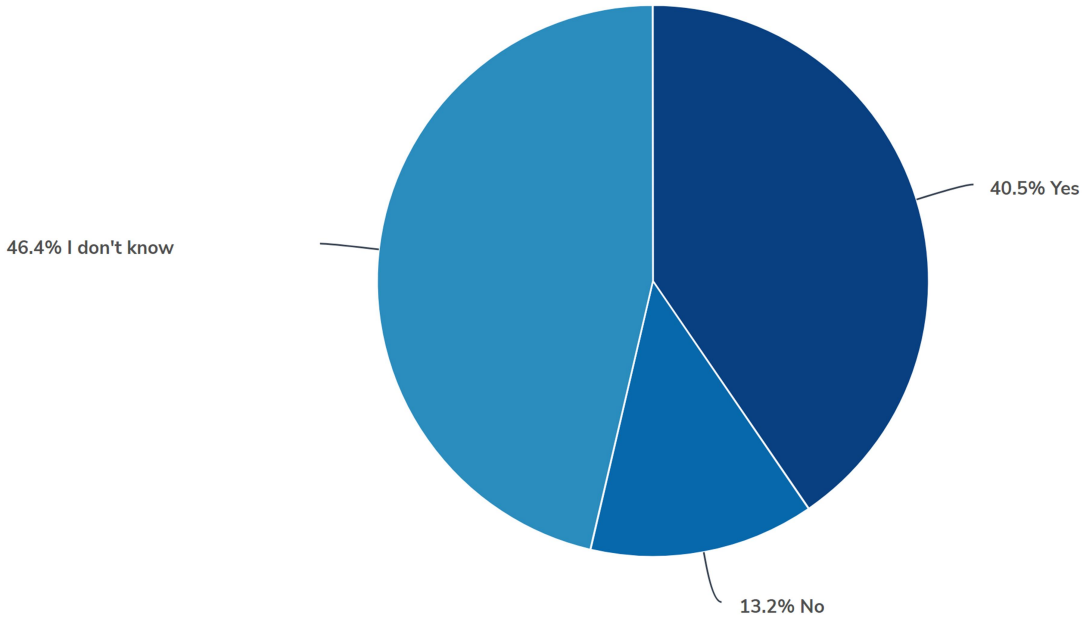

Figure 17: Perception of whether more can be done in terms of disaster risk reduction or management.

The respondents were also asked to identify who they believed was responsible for managing a crisis related to sea-level hazards in their municipality. As shown in Figure 18, the majority of respondents believed that either civil protection agencies (58.6%) or firefighters (57.7%), are responsible for managing the crisis. Other groups identified by respondents as responsible for managing the crisis included the municipality itself (51.4%), coastal guards (44.1%), and the police (44.1%).

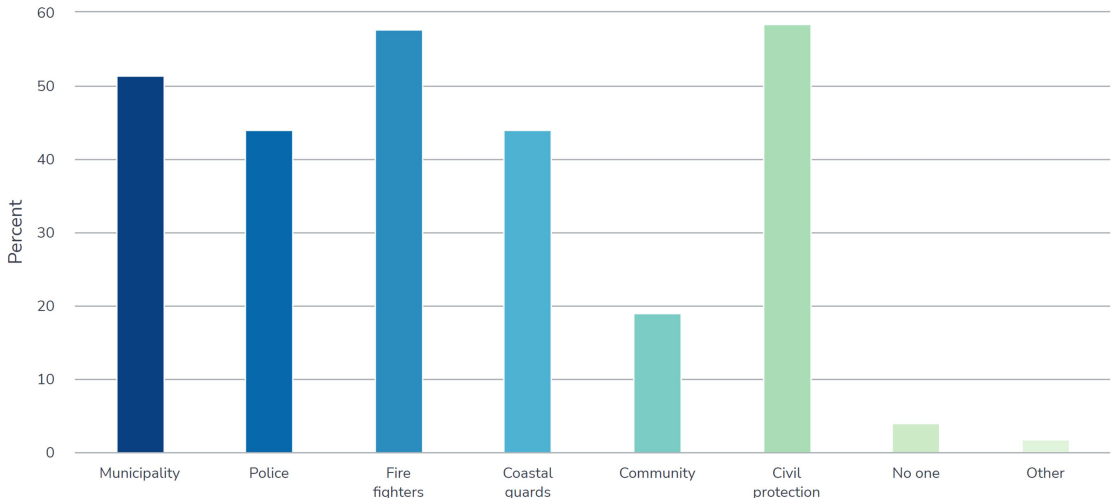

Figure 18: Perception for Responsibility for Managing a Crisis Related to Sea-level Hazards.

The same question in a slightly different context was asked to the 20 members of emergency services that completed the questionnaire. In detail they were asked to identify besides their agency, which in their opinion was also involved in the emergency response or disaster risk management and reduction. Of the 20 respondents, the majority identified civil protection agencies and fire fighters as being involved, while half of them named the municipality and the coastal guards, as presented in Figure 19. Additionally, 35% of respondents reported that the police were involved, and 30% identified the community as being involved. Only 5% of respondents believed that no one else was currently involved in emergency response or disaster risk management. These findings suggest that there are multiple stakeholders involved in responding to emergencies and reducing disaster risks in the area, highlighting the importance of coordination and collaboration among various organizations and groups.

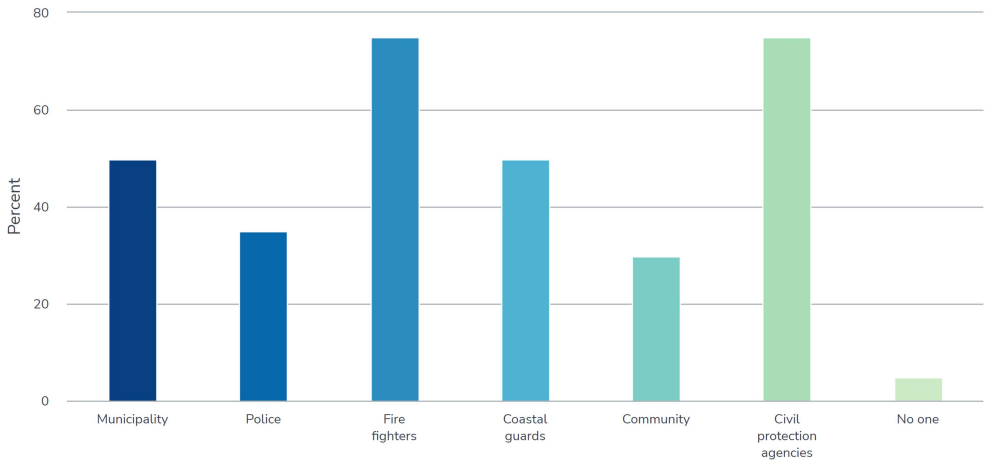

Figure 19: Perception for Responsibility for Managing a Crisis Related to Sea-level Hazards by members of Emergency Services.

The majority of emergency services members also reported that Early Warning Systems and Emergency Responders are well-integrated into decision-making processes, national development

plans, and actions. This indicates a positive trend towards more streamlined and coordinated efforts in disaster risk reduction and management.

7. Discussion

According to the survey, most of the participants demonstrated an understanding of sea-level related hazards, such as tsunamis and sea level rise, Figure 5. This is an important finding as it reflects the population's recognition of the dangers associated with residing in coastal regions. Such awareness enables people and communities to be better prepared for potential threats and implement proactive measures to minimize their effects. It is also worth noting that a significant part of the population reported a lack of awareness regarding storm surges, Figure 5. Although it is true that many respondents have a solid understanding of the attributes of sea-level related hazards and their potential resulting consequences, Figures 6-9, there remains a considerable amount of work to be done in order to ensure that all members of a community are fully informed and aware of the dangers they face. This result highlights the need for increased education and outreach efforts to ensure that all individuals are aware of the potential risks associated with living in coastal areas.

The results also suggest that a considerable percentage of individuals live, or their work/school/university is, less than 10 minutes away from the coast on foot, Figure 10 and Figure 12, indicate a potential risk from a possible sea-level related hazard event. Moreover, a significant percentage of individuals live with dependents, Figure 11, highlights the need for comprehensive emergency plans that consider the specific needs of vulnerable people.

Another finding is that municipalities do not display evacuation signs to indicate the best evacuation routes to take and/or what to do in case of sea level rise, Figure 14. This is concerning, as such signs are an important tool for informing the public about evacuation procedures and safety measures during natural disasters such as tsunamis and storm surges. The lack of such signs could indicate a lack of preparedness on the part of local authorities, which can have serious consequences in the event of a sea-level related hazard. Without clear evacuation routes and instructions, residents may be confused about what to do and where to go in the event of an emergency, which can result in delays and potentially endanger lives.

As a result, it is of imperative importance that municipalities take proactive measures to prepare for sea-level related hazards and to communicate these measures clearly to their residents. This should include installing evacuation signs, conducting regular drills and exercises, and providing education and outreach programs to increase awareness and preparedness. By doing so, communities can help minimize the impact of sea-level related hazards and protect the safety and well-being of their residents. The communities' efforts will be welcomed by people as despite the absence of past hazard events, many participants identify the risk of a future event, Figures 6 and 7.

In addition, respondents highlight the importance of quick and reliable communication channels, especially for urgent alerts, Figure 16. They also felt that government agencies should be responsible for addressing sea-level related hazards, Figure 17. This suggests that individuals and communities may need more support from government agencies in developing and implementing strategies to prepare for and mitigate the impact of these hazards. It also highlights the importance of effective communication and collaboration between individuals, communities, and government agencies to address these hazards.

When the members of emergency services were asked in an open-ended question to report which key preparation measures are currently being undertaken, the responses included creating a Civil Defense

Rescue Team in Larnaca, conducting Civil Defense exercises with essential services, educating and informing volunteers for emergency incidents, national disaster plans, informing the population for evacuation, and self-protection measures. It appears that there is a significant difference between the perceptions of the emergency services and the general public regarding the key preparation measures being undertaken for disasters, Figure 14. Effective disaster preparedness and response require collaboration and communication between all stakeholders. If the general public is not aware of the preparation measures being taken by emergency services, they may not be adequately prepared themselves, which could lead to delays and potentially endanger lives in the event of a disaster. At the same time, if emergency services assume that the public is aware of their preparation measures, they may not communicate the necessary information effectively in the event of an emergency. This could lead to confusion and panic among the public, which could further hinder disaster response efforts. The latter, highlights the need for better communication and information dissemination from the emergency services to the public, so that they can be better prepared for disasters.

The members of emergency services were also asked to identify the biggest challenge to effectively managing coastal hazards/risk, and the responses included the lack of national development plans and actions, changing weather conditions, incorrect estimation of situations, collaboration among all services, natural obstacles, and panic.

Overall, the responses suggest a range of measures being taken and challenges faced in managing coastal hazards and risk, highlighting the importance of coordination, communication, and education in ensuring effective disaster risk reduction and management.

It is important to note that the emergency services members generally expressed that there is effective integration of Early Warning Systems and Emergency Responders into decision-making processes, as well as national development plans and actions. This suggests a promising shift towards greater coordination and integration of initiatives for reducing and managing disaster risks.

8. Conclusion

The survey's findings suggest that there is a need for increased education and outreach efforts to ensure that all individuals are aware of the potential risks associated with living in coastal areas. It is also important for municipalities to take proactive measures to prepare for sea-level related hazards and communicate these measures clearly to their residents.

Furthermore, the survey highlights the importance of effective communication and collaboration between individuals, communities, and government agencies to address these hazards. Efficient and reliable communication channels are important, especially for immediate alerts, and respondents felt that government agencies should be responsible for addressing sea-level related hazards.

The survey also suggests that there is a significant difference between the views of the emergency services and the general public regarding the key preparation measures being undertaken for disasters. While emergency services are taking measures, the general public seems to be unaware of these actions. This highlights the need for better communication and information dissemination from the emergency services to the public, so that they can be better prepared for disasters.

The survey findings suggest that effective coordination, communication, and education are crucial for successful disaster risk reduction and management. Members of emergency services who participated in the survey reported a high degree of integration between early warning systems, emergency responders, national development plans, and decision-making processes. This indicates a positive trend towards better coordination and integration of efforts aimed at reducing and managing disaster risks.

To sum up, government agencies should work collaboratively with individuals and communities to develop and implement strategies to prepare for and mitigate the impact of sea-level related hazards. This may include developing emergency plans, securing infrastructure, and investing in infrastructure projects that can withstand these hazards.

9. References

1. Wikipedia contributors. (2023, March 4). Larnaca. In Wikipedia, The Free Encyclopedia. Retrieved 13:02, March 19, 2023, from https://en.wikipedia.org/wiki/Larnaca
2. IPCC. (2021). Climate Change 2021: The Physical Science Basis [online]. Available at: https://www.ipcc.ch/report/ar6/wg1/ [Accessed 3 March 2023].
3. Hallegatte, S., Green, C., Nicholls, R. J., & Corfee-Morlot, J. (2020). Future flood losses in major coastal cities. Nature, 588(7839), 504-508.
4. UN. (n.d.). Goal 11: Sustainable cities and communities. United Nations Sustainable Development. Available at: https://www.un.org/sustainabledevelopment/cities/ [Accessed 3 March 2023].
5. Adger, W. N., Hughes, T. P., Folke, C., Carpenter, S. R., & Rockström, J. (2005). Social-ecological resilience to coastal disasters. Science, 309(5737), 1036-1039.
6. Nelson, L. K., Leiserowitz, A., & Lockwood, B. (2023). Understanding perceptions of climate vulnerability to inform more effective adaptation in coastal communities. PLOS Climate, 1000103.
7. NOAA. (n.d.). The Tsunami Story. Available at: https://www.tsunami.noaa.gov/tsunami-story [Accessed 17 March 2023].
8. National Hurricane Center. (n.d.). National Hurricane Center. Available at: https://www.nhc.noaa.gov/index.shtml [Accessed 17 March 2023].
9. IPCC. (2021). Climate Change 2021: The Physical Science Basis [online]. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf [Accessed 17 March 2023].
10. Wikipedia contributors. (2023, February 22). Snowball sampling. In Wikipedia, The Free Encyclopedia. Retrieved 13:03, March 10, 2023, from https://en.wikipedia.org/wiki/Snowball_sampling
11. Doyle, J. K. (2005). Face to Face Surveys. In Encyclopedia of Statistics in Behavioral Science. John Wiley & Sons, Ltd.
12. Alchemer. (n.d.). Online Survey Software. Available at: https://www.alchemer.com/ [Accessed 3 March 2023].

Intergovernmental Oceanographic Commission (IOC) of UNESCO

Tsunami Early Warning and Mitigation System in North-Eastern Atlantic, Mediterranean and Connected Seas (ICG/NEAMTWS)

Sea Level Related Hazards Risk Perception Survey Questionnaire

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Within the framework of the Intergovernmental Coordination Group for the North-Eastern Atlantic, the Mediterranean and Connected Seas Tsunami Early Warning and Mitigation System (ICG/NEAMTWS) and IOC EU DG ECHO CoastWAVE Project, IOC-UNESCO is carrying out a survey with selected Member States on the perception of coastal risks and preparedness to tsunami, storm surge and sea level rise to better understand how coastal populations perceive these natural hazards and risks and develop recommendations for enhanced risk communication strategies and products in the region.

The goal of the survey is to improve sea-level-related early warning and mitigation systems and preparedness in the Mediterranean region in order to save lives, reduce losses and damages in the event of a natural disaster of that kind.

Note: All information given in this survey will be anonymous and confidential. The questionnaire will take about 15 minutes. We thank you for your contribution.

Questionnaire is for people in the education sector (teachers, students etc.) except people under the age of 14, the tourism sector (restaurant-bar, store, and hotel owners, employees of these sectors, guides, etc.), the emergency responders (fire fighters, police, coast guard, civil protection agencies etc.) and the public

☐ I consent to the information I provide in this questionnaire can be used anonymously in publications.

N°	Question	Choise
	1- Personal Information	
1	Where do you live?	□ Spain - Chipiona □ Turkey - Buyukcekmece □ Malta - Marsaxlokk □ Cyprus - Larnaca □ Egypt - Alexandria □ Greece - Samos □ Morocco - El Jadida □ Other, please mention the city:
2	What is your gender?	□ Female □ Male □ Prefer not to answer
3	How old are you?	□ 14-17 years old □ 18-24 years old □ 25-34 years old □ 35-44 years old □ 45-54 years old □ 55-64 years old □ 65-74 years old □ 75 years old or more

4	What is your highest level of school completed?	□ Primary school □ Secondary school □ High School □ University □ Other, please specify:
5	Are you part of one of the following sectors?	□ Tourism sector (hotel/restaurant/bar owners/employees, tourist guide, shop owner etc.) □ Education sector (teacher, student, etc.) □ Emergency responders (fire fighters, police, coast guard, civil protection agency etc.) □ Public
5 for ER	Which organization do you work for?	Please specify:
2- Awareness / Knowledge		
6	Have you ever heard of any of the following hazards? Please select all that apply.	□ Tsunami □ Sea-level rise □ Storm surge
6 for ER	What kind of measures and actions do you take for each of the listed hazards?	□ Tsunami, please specify: □ Storm surge, please specify: □ Sea-level rise, please specify:
7	Have you ever experienced one or more of these hazards?	a) Tsunami: □ Yes, please indicate briefly when and what happened: □ No □ I don't know b) Storm surge: □ Yes, please indicate briefly when and what happened: □ No □ I don't know
8 To be removed for ER	Describe each hazard with 3 words (use adjectives, nouns, etc.)	a) Tsunami: _____ _____ _____ b) Storm surge: _____ _____ ____ c) Sea-level rise: _____ _____ _____
9 To be removed for ER	In your opinion, what are the causes of these hazards?	Please specify for each with keywords (leave it blank if you do not know): a) Tsunami: b) Storm surge: c) Sea-level rise:

10	How likely, in your opinion, the coastal zones of **the Mediterranean region** can experience a tsunami, storm surge or sea-level rise in the next 10 years?	a) Tsunami □ not possible □ low □ moderate □ high b) Storm surge □ not possible □ low □ moderate □ high c) Sea-level Rise □ not possible □ low □ moderate □ high
11	How likely, in your opinion, the coastal zones of **your community** can experience a tsunami, storm surge or sea-level rise in the next 10 years?	a) Tsunami □ not possible □ low □ moderate □ high b) Storm surge □ not possible □ low □ moderate □ high c) Sea-level Rise □ not possible □ low □ moderate □ high
12	What do you think could be the impacts (loss of lives and property damages) of the listed hazards in coastal regions **of the Mediterranean**?	a) Tsunami □ low (no loss of life, no property damage) □ moderate (possible loss of life and property damage) □ high (significant loss of life and property damage) b) Storm surge □ low □ moderate □ high c) Sea-level Rise □ low □ moderate □ high

13	What do you think could be the impacts (loss of lives and property damages) of the listed hazards in coastal regions **of your community**?	a) Tsunami □ low □ moderate □ high b) Storm surge □ low □ moderate □ high c) Sea-level Rise □ low □ moderate □ high
14	According to you, what are the natural signs of a tsunami?	Please specify at least one:
15	In your opinion, what is the expected height of a tsunami that can happen soon (e.g., in the next 10 years) in coastal regions of the **Mediterranean**?	□ Less than 50cm □ 50cm to 1m □ 1 to 2m □ 2 to 5m □ Higher than 5m
16	In your opinion, how long do you think it will take for a tsunami to arrive to coastal region **of your community**?	□ Less than 10 minutes □ 10-20 minutes □ 20-30 minutes □ More than 30 minutes
17	Do you know if your municipality has the necessary capacities and infrastructure to alert and or inform the local population for earthquake, tsunami, storm surge and where sea level rise is happening or likely to happen?	a) Earthquake □ Yes □ No □ I am not aware b) Tsunami □ Yes □ No □ I am not aware c) Storm surge □ Yes □ No □ I am not aware d) Sea Level Rise □ Yes □ No □ I am not aware
18	Do you know if your municipality displays evacuation signs to indicate the best evacuation routes to take and or what to do in case of sea level rise?	a) Tsunami □ Yes, there are displayed signs □ No, there are none □ Not aware if there is any b) Storm surge □ Yes, there are displayed signs □ No, there is none □ Not aware if there is any b) Sea Level Rise □ Yes, there are information □ No, there is none □ Not aware if there is any

3- Exposure and sense of exposure		
19	How far do you live from the seashore/coast on foot?	□ Less than 5 minutes □ 5 to 10 minutes □ More than 10 minutes
20	Who do you live with?	□ Alone □ Accompanied with people dependent on me (children, disabled person, elderly people, other) □ Accompanied and dependent on people (parents, grand-children, other). □ Family/couple with no dependent people
21	How far is your workplace / school / university from the seashore/ coast on foot?	□ Less than 5 minutes □ 5 to 10 minutes □ More than 10 minutes □ Not reachable on foot (more than 2km)
22	Do you have other properties within 10 minutes walking distance from the seashore/coast?	□ Yes, please specify □ No □ I don't know
4- Assessment, Preparedness, and Response		
23	The impact of sea-level-related disasters could be reduced or avoided by:	Select one or more: □ Individual actions □ Collective Actions □ The impact of a natural disaster can't be reduced.
24	How do you feel about the risk and impact of a tsunami in your municipality?	□ Not concerned, because: □ Concerned, because: □ Highly concerned, because:
25	How do you feel about the risk and impact of storm surge in your community?	□ Not concerned, because: □ Concerned, because: □ Highly concerned, because:
26	How do you feel about the risk and impact of sea-level rise in your community?	□ Not concerned, because: □ Concerned, because: □ Highly concerned, because:
27	Do you know if your municipality has an evacuation or resettlement plan in place for tsunamis, storm surge and sea level rise?	a) Tsunami □ Yes □ No □ I don't know b) Storm surge □ Yes □ No □ I don't know b) Sea Level Rise □ Yes □ No □ I don't know

28	Have you taken any precautions or measures of your own against any of these hazards?	a) Tsunami □ Yes, please specify: □ No b) Storm surge □ Yes, please specify: □ No c) Sea-level Rise □ Yes, please specify: □ No
29	Do you have any kind of insurance against any of these hazards?	a) Tsunami □ Yes □ No □ I don't know b) Storm surge □ Yes □ No □ I don't know c) Sea-level Rise □ Yes □ No □ I don't know
30	Have you ever heard of, or participated in an evacuation exercise, drill or other actions related to tsunami, storm surge and sea level rise?	□ Yes, please specify: □ No
31	Imagine you are on the coast. What would you do first if you feel a strong shaking due to an earthquake?	□ Do nothing and continue my business □ Observe my surroundings / the sea □ Move away from the shore, please specify where: □ Call / talk to someone to confirm what happened □ Other, please specify:
32	What could affect your ability to evacuate to a safe area? Please, select all that apply.	□ I have disabled and/or young people under my care □ Because of my personal health conditions □ I have animals under my care □ I have to continue to run my business or activity □ Other reason(s), please specify:
5- Governance		
33 To be removed for ER	Which communication channel would you prefer for receiving alert messages? Please order from most important to least important (1 is the most important, 6 is the least important)	□ TV □Radio □Internet (social media) □Audible alerts (sirens, loudspeakers) □SMS □E-mail
34	Do you feel that your municipality is able to manage emergency response operations during listed hazards and	a) Tsunami □ Yes □ No b) Storm surge

	doing anything to reduce sea level rise impacts (adaption)?	□ Yes □ No b) Sea Level Rise □ Yes □ No
35	In case of a sea-level-related hazard, who do you think is responsible for managing the crisis in your municipality? You can select more than one answer.	□ Municipality □ Police □ Fire fighters □ Coast guard □ Community □ Civil protection agencies □ No one, □ Other, please specify:
35 for ER	In your opinion, besides your agency, who is currently involved in the emergency response or disaster risk management and reduction? You can select more than one answer.	□ Municipality □ Police □ Fire fighters □ Coast guard □ Community □ Civil protection agencies □ No one □ Other, please specify:
36 Change it for ER	Do you think that more can be done in terms of disaster risk reduction or management? If yes, by whom?	□ Yes, please specify: □ No, please specify:
37 To be added for ER	Which key preparation measures are currently undertaken?	Please specify:
38 To be added for ER	What do you think is the biggest challenge to effectively managing coastal hazards/ risk?	Please specify:
39 To be added for ER	What do you believe regarding the following statement: The impact of different hazards is considered in decision-making processes?	□ Strongly disagree □ Disagree to some extent □ Neither disagree, nor agree □ Agree □ Strongly agree
40 To be added for ER	Do you agree that Early Warning Systems and Emergency Responders are streamlined and integrated into decision making, national development plans and actions?	□ Yes, please specify: □ No, please specify:

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