

EARTHQUAKE PREPAREDNESS FOR IMMIGRANTS AND REFUGEES

In Iceland

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This report represents the work of one or more WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on the web without editorial or peer review





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Abstract

Iceland is home to a large population of immigrants. With a high quantity of earthquakes due to the geologic setting of the country, it is essential that those entering receive accurate information to be prepared for the inevitable. We focused our research on furthering this endeavor; by meeting with experts in the field and conducting a preparedness survey, we have determined a significant difference between the preparedness of those born in Iceland and those who were not. To solve this issue, we propose that the Icelandic Red Cross and the Department of Civil Protection work to improve the SMS-based alert system. In addition, the Icelandic Meteorological Office should provide earthquake briefings to the Multicultural Information Center to improve accessibility and build trust. Finally, we propose that future research groups develop an informational source and examine implementation methods while collecting feedback to evaluate success.

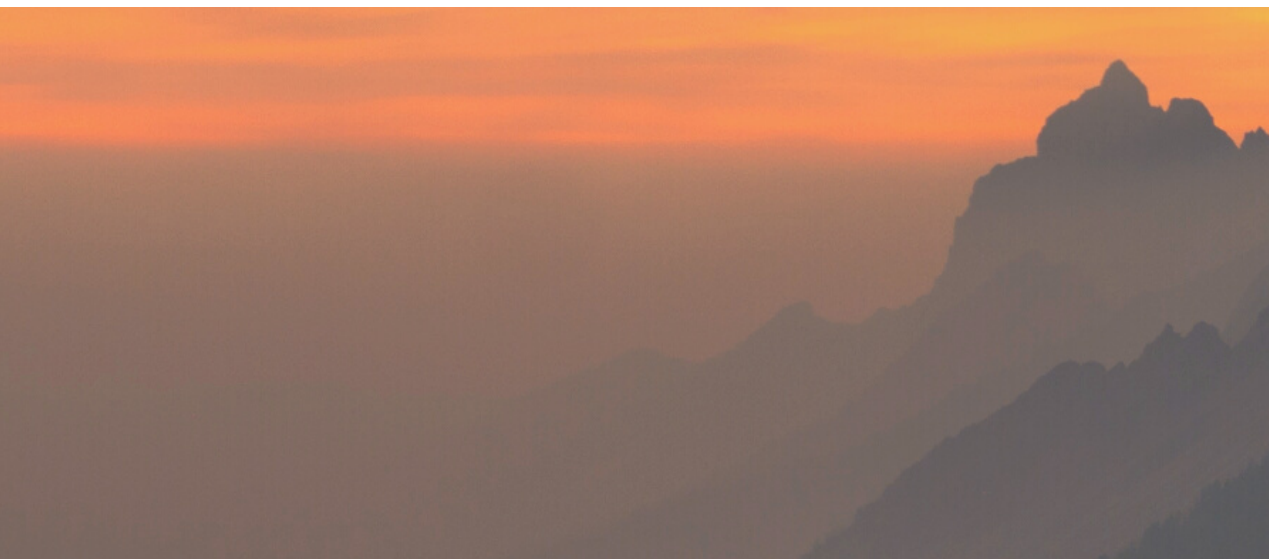




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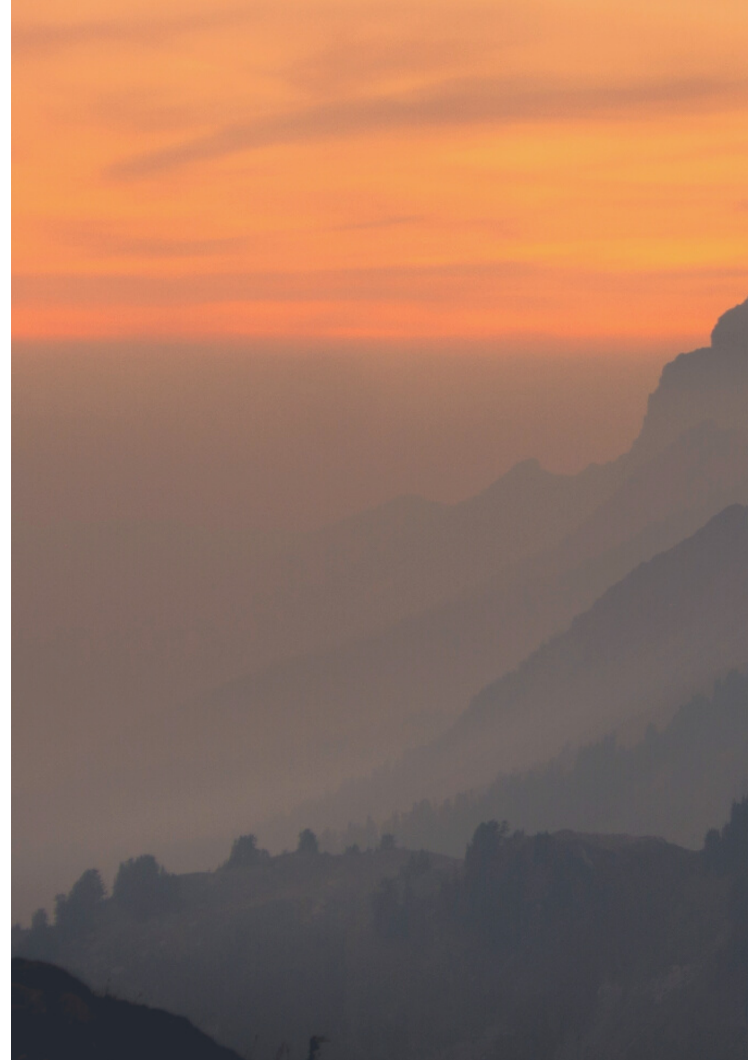
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1.0

Introduction

Some of the most notable qualities of Iceland are the significant immigrant and refugee populations and the frequent earthquakes. As different as these two topics are, the communication of natural disasters to incoming residents of Iceland is a crucial step in the immigration process. Those traveling from other countries might not have the same exposure to these hazards, and the lack of pre-existing knowledge can be potentially traumatizing for people who do not know what to expect. The focus of our project was to determine the accessibility of hazard information and make suggestions for improvement to fill the gaps where information may be needed.

In our background, we examined in more detail the geological setting of Iceland and the harmful effects of earthquakes to better understand the underlying risks of Iceland's natural hazards. After determining why a lack of information could be a serious issue, we studied Iceland's immigrant and refugee populations, starting with basic statistics before looking at the immigration process as a whole. Next, we effectively retraced the steps of someone moving to Iceland to understand what organizations are involved and where communication about earthquakes occurs. Finally, we determined the organizations that work with earthquake information and met with them to understand their work. This helped us decide where the immigration process can connect with the geologic hazard information already in place and where we were able to deliver our recommendations.



Our overall goals for this project were to determine the current status of earthquake hazard communication to immigrant and refugee populations in Iceland and determine the most effective way to deliver informational sources to these populations. To accomplish this, we developed three distinct goals:

- Meet with the organizations responsible for communicating earthquake hazard information and those working closely with people who have recently settled in Iceland to understand the current information communication systems.
- Gather a collection of experiences from immigrants, refugees, and natives about earthquakes and hazard communication in Iceland through qualitative and quantitative data.
- Make recommendations to the organizations involved based on the results from our various data collection methods.




2.0 Background

2.1 Introduction

This section assesses existing knowledge on earthquakes, immigration, and hazard communication in Iceland. First, we will briefly overview Iceland's geological setting to explain the earthquake frequency and severity and cover the potential harm of these earthquakes. The next step is to examine how Iceland and other regions communicate disaster risks to understand why an improved information system might be needed. Finally, Iceland's immigrant population is constantly growing, and people who are new to Iceland might not know about the high frequency of earthquakes. While there may be information systems already in place, improving them is one crucial step to ease stress during the immigration process.

2.2 Earthquakes in Iceland

Iceland falls on the Mid-Atlantic Ridge, one of Earth's largest fault lines, running 65,000 km long (Strickland, 2010). Volcanic eruptions activated by the collision of the two faults formed the country over 24 million years ago. These continued collisions are why the country experiences so many earthquakes (Elvar & Siggí, n.d.). One specific event in 2021 from February 24th to March 5th involved Iceland experiencing over 20,000 earthquakes in those ten days alone (Flis, 2021). The numerous earthquakes also cause more volcanic activity, which can lead to potential eruptions of the volcanos located on the island. The increased volcanic activity can cause a catastrophe if these volcanoes reach the eruption point. The Katla and Hekla volcanoes have shown more activity due to fault collisions in recent years. They are the main reasons for Iceland's volcanic risk mitigation strategies (Flis, 2021).



Most Icelanders living in rural and urban areas know the mitigation strategies, though their opinions on how closely these strategies should be followed differ. Due to the increased seismic and volcanic activity, the Chief of Police and the Civil Protection Department requested a reassessment of the hazard plans by an engineering consulting company. If the Katla volcanic eruption were to occur, citizens would receive an automated call informing them of the need for evacuation and basic information about the next steps (Bird, 2011). Different regions would evacuate at different times to circumvent possible traffic issues. The department created these mitigation plans to keep as many citizens as safe as possible. To do so, officials and committee workers collected first-hand accounts from residents living in different areas to understand what strategies worked best for the community as a whole (Bird, 2011).

2.3 Immigrants and Refugees in Iceland

Iceland has been accepting groups of refugees since 1956, providing them resettlement opportunities, and the potential for a better life. Since 1956 Iceland has continued to receive groups of immigrants and refugees to the point where in 2020, 15.2% of Iceland's population consisted solely of those seeking a new place to settle (Statistics Iceland, 2020). The Icelandic Refugee Committee, established in 1966, oversees the immigration and refugee processes. As a part of the UNHCR Resettlement Program, the Ministry of Foreign Affairs and the Ministry of Social Affairs established a quota for how many refugees and immigrants were resettled each year. As much as Iceland attempts to maintain the quota of refugees, sometimes it is not economically feasible (The UN Refugee Agency, 2011).

There are many different reasons why refugees, immigrants, and asylum seekers move to Iceland. The ministries and committees in Iceland in charge of the resettlement process for immigrants and refugees provide a plethora of helpful resources and programs. Though there are many resources online for the target audience, the information may be inaccessible to those that are not actively searching for it.

2.4 Immigration Process

The Ministry of Justice, the Ministry of Social Affairs, and the Directorate of Immigration handle immigration in Iceland. The Ministry of Justice handles everything related to applications for international protection. Once someone has been granted international protection in Iceland, the Ministry of Social affairs handles immigration. The Directorate of Immigration is the agency responsible for processing applications and granting permits, visas, and citizenships (Foreign Nationals, n.d.).

If a person immigrating to Iceland is a citizen of a state that is within the European Economic Area (EEA) or the European Free Trade Association (EFTA), they are allowed to stay in Iceland for up to three months without needing a permit. If they are seeking employment, they may stay up to six months. However, they must register with Registers Iceland for their right to stay. Those whose state is not a member of the EEA or EFTA and plan on staying longer than three months must apply for a residence permit (Residence Permits, n.d.).

There are many different types of permits that people can apply for ranging from work to family reunification. Each different type of permit has specific requirements. The permanent resident permit has its own set of special requirements (Residence Permits, n.d.). People who are at risk in their country of origin may seek asylum as refugees in Iceland. A person who is seeking asylum but is not accepted as a refugee may receive a residence permit given they have a strong argument (Asylum and International Protection, n.d.).

Immigrating to any country can be a confusing process, but the Directorate of Immigration has a phone number and email for support and inquiries. The Government of Iceland website directs people towards the Iceland Multicultural Information Center for additional information. We will explore the Multicultural Information Center further in the following sections, but in terms of immigration support, they answer frequently asked questions and offer a live chat and phone number for assistance. There is also a section dedicated to professionals working with refugees and immigrants. Beyond this they also offer a wide variety of information regarding life in Iceland to help people adjust. However, while this was true during the spring of 2022, as of September of 2022 the Directorate of Immigration's website moved to island.is, and because of this the same resources may not be available or as easily accessible.



2.5 Disaster Communication

Earthquakes are unavoidable, therefore it is crucial for people to have the information regarding the potential dangers and safe practices during and after the event. Understanding how an earthquake can be dangerous is important for people so that they can be comfortable and prepared during smaller earthquakes as well. According to research, the responsibility of preparing residents for natural disasters in Iceland falls on the government, as well as the responsibility of working with immigrants and refugees to prepare them before they enter the country (Natural Disaster Preparedness, n.d.).

We can use California as an example of comprehensive communication to migrants regarding natural disasters, including earthquakes. Information on the “pros and cons” of moving to California is easily accessible to the public via an online search. Moving companies such as PODS have blogs that include details on the wildfires, earthquakes, and landslides that occur often in California. They also have articles that educate citizens, as well as guides on creating emergency plans and disaster kits. There is also a government-run app that sends alerts indicating the risk of a natural disaster (PODS Blog, n.d.). The app has emergency contacts and gives the location of disaster shelters. California’s natural disaster preparation system is one of many that Iceland could look to as an example. Showing both pros and cons of moving to a certain location can be useful to showcase the beauty of Icelandic culture and scenery, as well as warn immigrants to be prepared for natural disasters and other risks. Unlike immigrants, who have the opportunity to plan before moving to the country, refugees may have to make more last-minute decisions and may not get the chance to research the conditions of the place they move to. The app system could be adapted to aid refugees or immigrants through education, relieving stress and ensuring everyone is informed.



2.6 Existing Information in Iceland

To determine where improvements are needed, we must assess the current level of communication to immigrants and refugees within Iceland. The Icelandic government runs a site called Digital Iceland that aims to convey information between the government and the citizens of Iceland (Immigrating to Iceland, n.d.). On this website, there are numerous pages about working in Iceland, obtaining a visa, residence permits, and steps to get citizenship. Additionally, there is a page containing useful links to other websites such as the Icelandic police and resources for learning Icelandic. None of these links contain any information regarding possible geologic hazards in Iceland.

On the main site for the Government of Iceland, there is a service called New in Iceland where immigrants can communicate with representatives confidentially. New in Iceland could be very useful for people who prefer to obtain information through conversation, but there is no guarantee that they receive geologic hazard information (New in Iceland, n.d.). Featured on this same page is a link to the Multicultural Information Center which provides a multilingual search engine for people to find information about moving to Iceland. The information on this site is accessible and well organized into numerous categories. There is a safety brochure where people can find basic safety information including a section about earthquakes and volcanoes, but this page is hard to find within the site and does not have a direct link to it unless you search for it in the multilingual search engine (Safety Brochure, n.d.).

After assessing the available knowledge through web searches, there seems to be a lack of accessible information about earthquake hazards for immigrants and refugees. Where they provide this information, it is hard to find and not presented through intuitive page menus. The research covered in this section should not be considered in isolation as immigrants and refugees likely receive more support in person, from peers, or from organizations like the Red Cross of Iceland

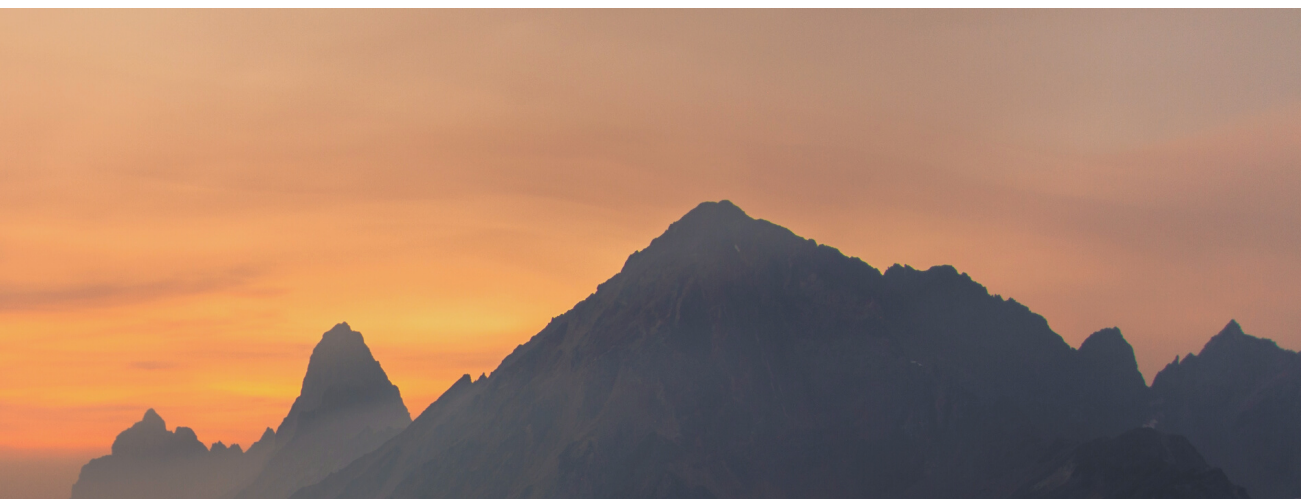
2.7 Conclusion

Iceland's unique geological setting causes frequent earthquakes as well as volcanic eruptions. This, in combination with the growing immigrant and refugee populations, can cause difficulties in maintaining effective communication about the various hazards. When those new to the country first go through an earthquake for the first time without any previous knowledge it can be a stressful experience, so making sure there are adequate informational resources and effective communication methods is important.

3.0 Methodology

3.1 Introduction

This section overviews the methods we used to gather information and answer our primary research questions. We aimed to determine the following: What does the current hazard communication system for earthquakes in Iceland look like, specifically how are immigrants and refugees accounted for in this system? How do the modes of hazard communication and levels of knowledge about hazards in Iceland differ between native Icelanders and those who immigrated or are seeking asylum? What are the ways that organizations can more effectively convey information about geologic hazards? We interviewed experts in hazard communication to understand the systems for conveying information about earthquakes to immigrants and refugees. Finally, we examined how much information about earthquake hazards the immigrant and refugee populations receive using a public survey. The following sections describe our process for determining methods and include details about the execution of surveys and interviews.





3.2 Understanding the Communication Systems

3.2.1 Expert Interviews

We used interviews in our work with experts in the field of hazard communication and social affairs pertaining to the immigration and refugee resettlement process. Through our background research, we identified numerous organizations and stakeholders that could benefit from or contribute to our research, and interviewing employees at each organization was the most effective way to understand their work. We reached out to the Red Cross of Iceland (IRC), the Icelandic Meteorological Office (IMO), the Multicultural Information Center (MCC), and the Civil Protection Department (CPD). In these interviews we asked employees about their roles in their organization, the role their organization plays in the hazard communication field, and how they work with people entering the country.

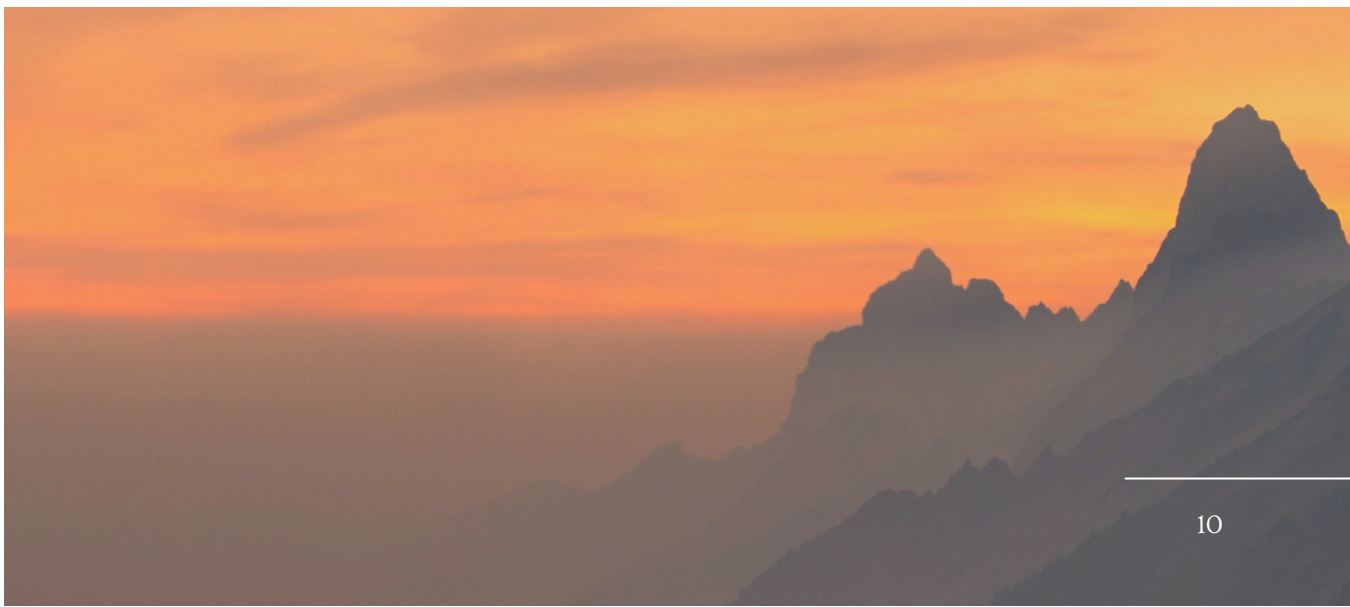
3.2.2 Surveys


In order to better understand the hazard information system, we needed to hear from those receiving the information. We chose to ask our survey participants the following question: Where have you received information about earthquakes in the past? Based on our background research, we provided multiple options for participants to select: Icelandic Red Cross, friends or family, social media, Icelandic Meteorological Office, Multicultural Information Center, Civil Protection Department mass SMS/text alert, New in Iceland website, and travel guides. In addition, we gave respondents the ability to provide an open answer response in case our options do not cover every system.

3.3 Evaluating Differences in Earthquake Knowledge

3.3.1 Surveys

To compare the knowledge of earthquakes from immigrants and refugees to the knowledge of native Icelanders, we utilized specific questions within our survey. We asked each group where they receive information, allowing us to determine if certain resources are more likely to reach either immigrants and refugees or native Icelanders. An important step in collecting this data was to determine the living situations of the respondents to know whether or not they had grown up in Iceland. This information was gathered by asking whether they were an Icelandic citizen/permanent resident, visiting, or on an extended stay, and if they answered extended stay we asked what the purpose of their stay was. We then asked the following question to determine the difference in preparedness levels between natives and non natives: How prepared do you feel to handle an earthquake?





3.4 How to More Effectively Convey Earthquake Hazard Information

3.4.1 Expert Interviews

In order to determine what improvements in hazard information systems are needed to promote more effective hazard communication, we developed a set of questions to ask each of our subject matter experts. These questions elicited information about their positions in their organizations and what their organizations do with respect to hazard communication. With the answers they provided we then were able to formulate recommendations for what each organization could do to better their role with the hazard communication system.

3.4.2 Surveys

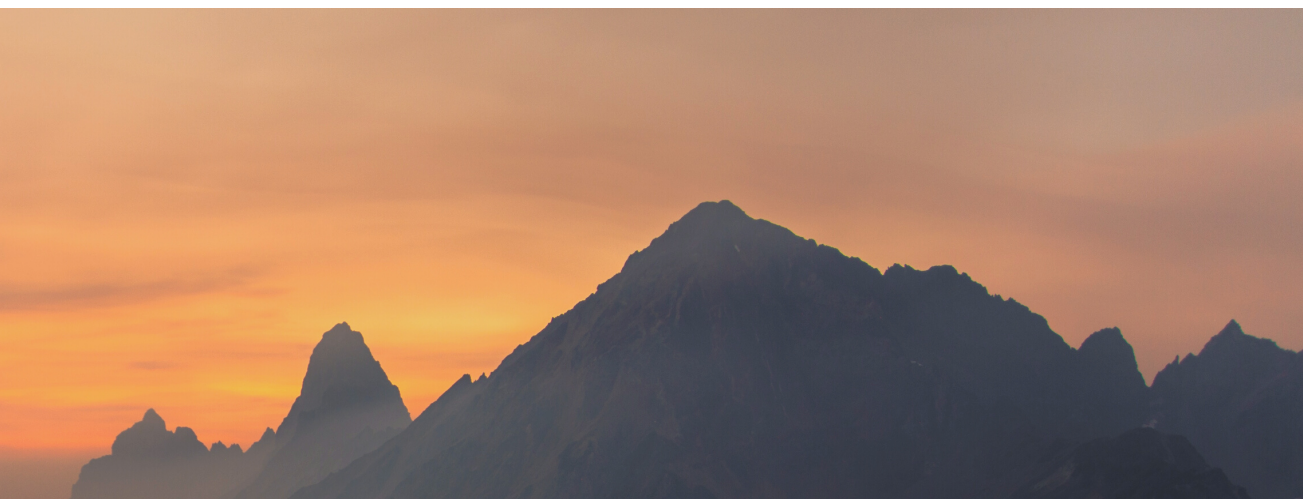
Providing suggestions to organizations required us to gather preferences from our survey participants. We chose to include the following questions: What kind of information or resources would have helped or will help you be more prepared for an earthquake? How would you like to receive information about earthquakes? Knowing what resources were most popular among both populations helped us make well guided recommendations for the potential improvements for the existing communication system. Leaving an open answer section at the end of our survey also allowed us to gather any suggestions that our questions may not have covered.

3.5 Survey Distribution

To garner responses from our target audiences we shared our survey on social media. We identified popular online pages that receive traffic from people living in Iceland. Most notably, the r/Iceland Reddit page, and the Living in Iceland Facebook group. We utilized our contacts in Iceland to create a broader network of responses, but received a limited number of responses through these means due to the short time frame of the project. Our contact at the IMO was able to distribute our survey on her personal Twitter account. In addition, we posted QR codes linking to the survey in public spaces around Reykjavik.

3.6 Conclusion

Our methodology consists of three main steps to answer our three research questions. To begin, we will conduct surveys, focus groups, and interviews to assess the existing knowledge about earthquakes among immigrants. This process will be repeated for native Icelanders to assess the severity of the gap in knowledge between the two groups. We will continually conduct database research to learn more about the field of hazard communication, specifically in Iceland. Finally, we will interview experts to determine what the best course of action is to remedy this information gap.



4.0 Results

We received valuable data from our interviews and surveys that aided our understanding of the current systems in place to communicate earthquake hazard information with the public. Our survey data gave us significant insight into how different groups of people in Iceland feel about earthquake preparedness, and how accessible this information is. Additionally, after meeting with experts in the field, we learned about methods such as text alerts and online guides that are currently used to convey information. We also discovered how current events helped them to improve their present information systems.

4.1 Communication with Experts

A significant portion of our research required understanding the information communication systems that currently exist in Iceland. Meeting with experts in the hazard communication field in Iceland allowed us to understand these systems while also developing a social network to aid in survey outreach and future IQP work. This section will include details and visuals from these meetings.

4.1.1 Red Cross Iceland

We conducted a meeting with our contact, the Refugees and Immigrants Team Leader at the Icelandic Red Cross, to understand the work that their organization does and determine if our project would be of interest to them. Their work is primarily focused on refugees in Iceland. Recently, the Red Cross has been under stress due to the ongoing effects of COVID-19 and the war in Ukraine. With the prevalence of false information online, we agreed that it was all the more important to have information that is widespread, uniform, and accessible to all populations.

In this interview we also discussed the importance of the IMO and the information system they created. When living in a country that can suffer from many different kinds of natural disasters with serious consequences, having experts to monitor, predict, and provide subsequent warnings is extremely important to keep people safe. Our contact also added that while there is good information on many websites in different languages, people who have recently moved to Iceland might not be used to getting information from these resources or actively searching for other sources. We also learned that they have a rigorous volunteer program for the resettlement process of the refugees to provide key contact personnel the refugees can use as a source for aid while they learn more about the Icelandic area and culture. This interpersonal program helps inform those who may not be inclined to research hazards online.

They also mentioned that they may be able to aid in our outreach efforts to get more of the foreign population in Iceland to take our survey. This would have allowed us to have a wider variety of participants in order for us to make the most accurate comparison and conclusion about how the different populations in Iceland feel about the hazards. The Icelandic Red Cross has contact information for the refugees they work with. In our meeting, we discussed the potential of sending a brief SMS message to gather survey responses from this population. Our contact was also very interested in reviewing the results of our survey as the information we receive would be extremely helpful for the work they are doing in the Red Cross. We believe that the Red Cross might be a possible sponsor in the future, and future groups should continue to stay in contact with them.

4.1.2 Iceland Meteorological Office

One of the most valuable organizations in Iceland related to hazard communication is the Icelandic Meteorological Office (IMO). Our contact at the Icelandic Meteorological Office graciously offered to show our research group around their building in Reykjavik and meet with us regarding our project. During our tour of the building, we learned the inner workings of Iceland's earthquake and weather monitoring system, which is composed of specially trained employees who analyze data from weather and earthquake stations around the country. The IMO works primarily with other news organizations and on social media to provide the public with up-to-date information on current meteorological events. Their methodology of communication aims to directly connect the public with the experts in geology to provide accurate information, limiting the quantity of outreach but maximizing the quality. Our contact believed that the most important information to convey to people was Iceland's history of earthquakes so that they know what to expect, and that nothing is out of the ordinary when an earthquake occurs. We learned that the Department of Civil Protection in Iceland is one of many important communicators of information regarding earthquakes, in addition to providing resources such as search and rescue and emergency aid. The COVID-19 pandemic proved to be a comprehensive test of not only the health care and response system in Iceland but also various systems of information communication.

As an expert in the field of hazard communication, our contact at the IMO confirmed that communicating information to immigrants and refugees about earthquakes is a difficult but important task. They informed us that the town of Grindavik, south of Reykjavik on the Reykjanes peninsula, had recently undergone a severe earthquake swarm. Additionally, the immigrant population of Grindavik is large, making it more important to have a comprehensive information system. They offered to contact the Mayor of Grindavik to see if they would be able to post our survey on their town's website, allowing us to reach more of our target audience.



Image 1: A picture of the Earthquakes Preparedness University Research Project (EP URP) Team on their visit to the Icelandic Meteorological Office. From left to right: Sam, Lasya, Mikayla, and Natalie

4.1.3 Department of Civil Protection and Emergency Management

The Civil Protection Department of Iceland is a part of the Ministry of Justice and is in charge of the daily administration of different Civil Protection matters. They work closely with local police departments and maintain a national command center, which is active more often in emergency situations. Through this command center, they are able to use cell towers in different areas threatened by more severe hazards in order to send out a systematic SMS text alert to all the phones in close proximity to a hazard. However, this system does not always work as intended as the use of the cell towers to reach individuals in a certain area will sometimes exclude people in the area of concern or include people outside of the intended area.

The Civil Protection Department also works closely with the Meteorological Office, especially when anticipating a severe natural disaster. They collaborate on the text sent out in the SMS system as well as what information is posted on social media to ensure that the information across platforms remains consistent to minimize confusion and anxiety. The CPD does provide a significant amount of information about different hazards on their website, but their main focus is providing aid in response to the hazards that occur. One way they accomplish this is by providing support stations in the regions that recently suffered from a hazard. They provide counseling services, meetings with hazard experts, and translators for those who do not speak Icelandic or English.

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4.1.3 Multicultural Information Center

During our stay in Iceland, we maintained contact with the Multicultural Information Center and visited their office to meet the team and review our project. We showed them the progress of our survey and expressed how we were receiving a lot of responses from native Icelanders, but not many from immigrants or refugees. They helped us understand that the main platform on which we distributed our survey was more accessible to native Icelanders than others. In addition to this, we only provided the survey in English, meaning we may not have received responses from our target demographic. Our contact at the MCC informed us that a large portion of the immigrants they work with directly do not speak English, so this is consistent with our limited response rate from non-natives. We learned that the MCC is merging with an organization they have worked with closely in the past called New in Iceland. This organization is where immigrants can go to get information about the practicalities of life and culture in Iceland to help them in the settlement process. New in Iceland and the MCC have their respective websites accessible to a large population of immigrants as the MCC offers their website in 27 languages and New in Iceland's provides 6 languages. Though these websites mainly consist of information about immigration and the resettlement process, after our meeting with our contact at the MCC earlier this year they added a link on their website that directs the user to an informational resource about earthquakes and different hazards.

The MCC acts primarily as an intermediary between municipalities in Iceland and incoming immigrants and refugees. When permitted to enter the country, people are given the opportunity to have sessions with the MCC where they can learn the most important information about life in Iceland. Our contact confirmed that information about earthquake hazards is part of these briefings, but admitted that they could do a better job of communicating the information on their website. It was also beneficial to learn that they are in the process of redeveloping their website.

4.2 Survey Data

Through the various platforms we used to distribute our survey, the platform that resulted in the highest response rate was the r/Iceland Reddit page. We were able to collect over 100 responses, although the main demographic that participated in our survey were native Icelanders who generally were not concerned with earthquakes. Through our conversations with the MCC, we learned that many of the immigrants and refugees that come to Iceland do not speak English, which we found was one of the barriers for us receiving survey responses from these populations.

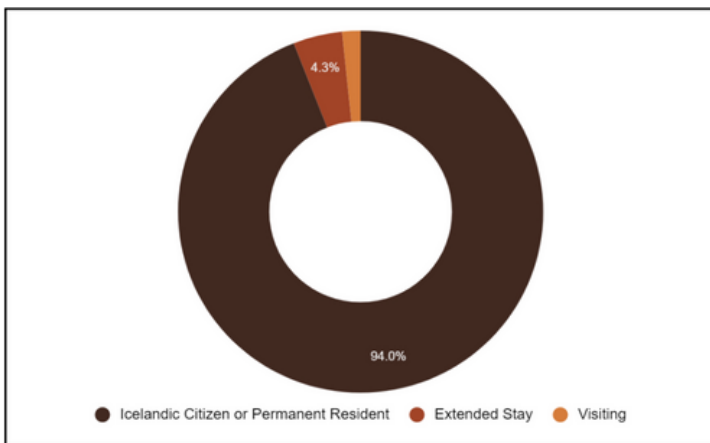


Figure 1: Pie chart categorizing respondent's living situation in Iceland

As shown in Figure 2, of those who were visiting Iceland, or were on an extended stay and intend to leave, 36% were on work visas, 36% were here for asylum, and 27% were on vacation.

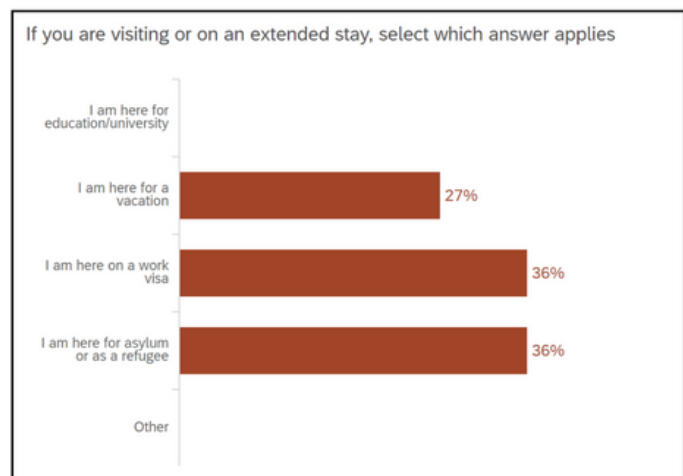


Figure 2: Chart representing survey respondent's reasonings for residing in Iceland

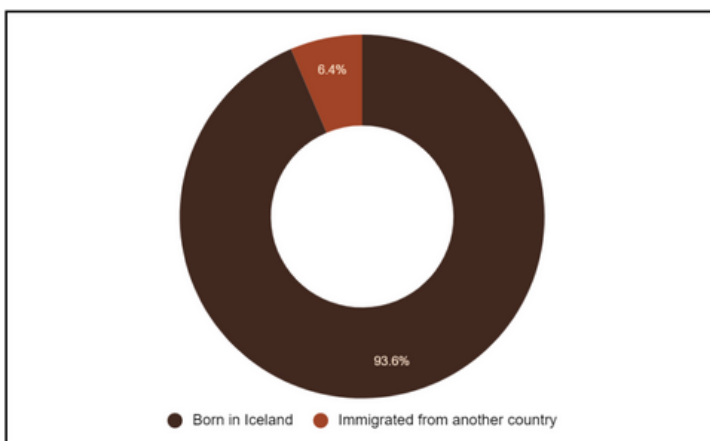


Figure 3: Pie chart depicting place of birth

Of those living in Iceland permanently, in Figure 3 we can see that 93.6% of them were born here, and 6.4% immigrated from another country.

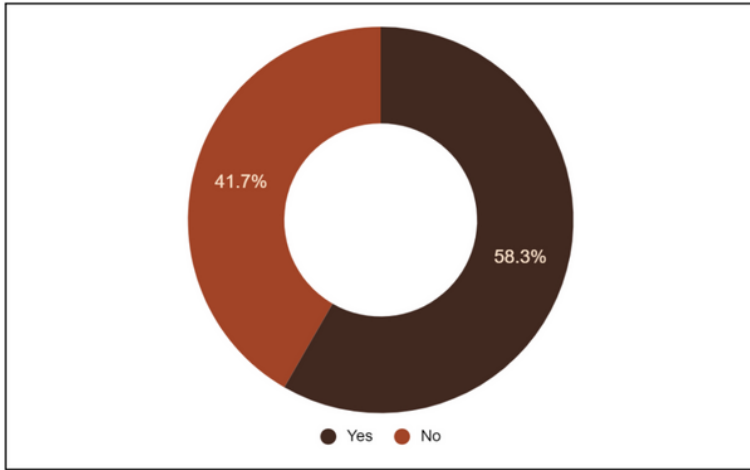


Figure 4: Pie chart depicting the question: "Did you have any prior knowledge about the natural disasters in Iceland?"

One goal of the survey was to get a rough idea of the effectiveness of information campaigns directed toward people moving to the country. We gathered responses asking whether or not respondents had information about the earthquakes before moving to Iceland, and our results were mixed. As shown in Figure 4, about 58% of respondents claimed to know about the earthquakes before moving, and about 42% did not.

We also collected data about whether or not respondents have experienced an earthquake, giving us an idea of how important it might be to provide information. The results in Figure 5 show that an overwhelming majority of respondents have experienced an earthquake.

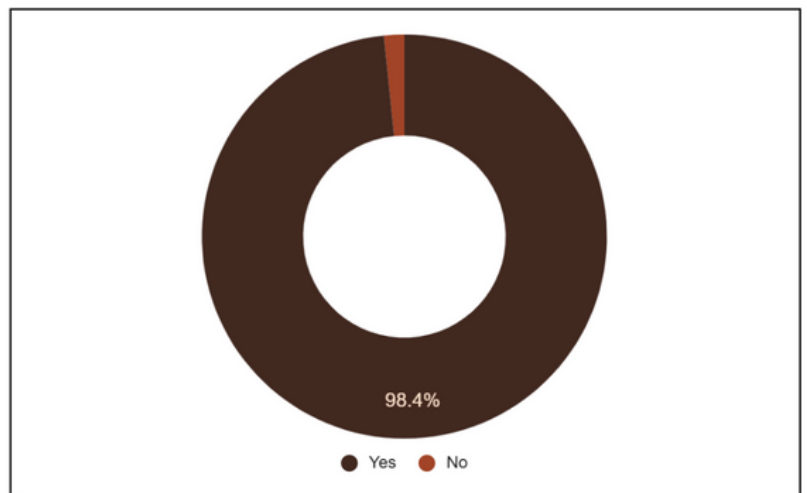


Figure 5: Pie chart depicting the question: "Have you felt an earthquake in Iceland?"

In order to determine the comfort level of respondents during earthquakes, we asked how people felt during the event, giving options ranging from very calm to very stressed. In Figure 6 below, the left bar chart represents respondents born in Iceland and the right chart represents people visiting, on an extended stay, or those who immigrated. The results show that those born in Iceland were significantly more calm during an earthquake as 26% reported being very calm, versus only 6% of those not born in the country reported being very calm.

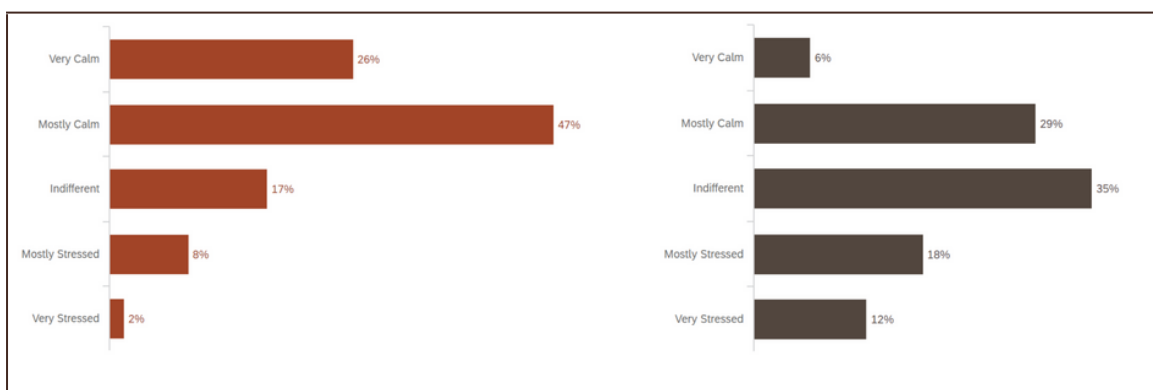


Figure 6: Bar charts comparing answers to the question: "If you have experienced an earthquake, how did you feel?" (Left: Born in Iceland, Right: Not Born in Iceland)

To help us comprehend if people were comfortable in their current understanding of earthquake information, we asked how prepared people feel to handle an earthquake. As shown in Figure 7, people born in Iceland tend to feel significantly more prepared.

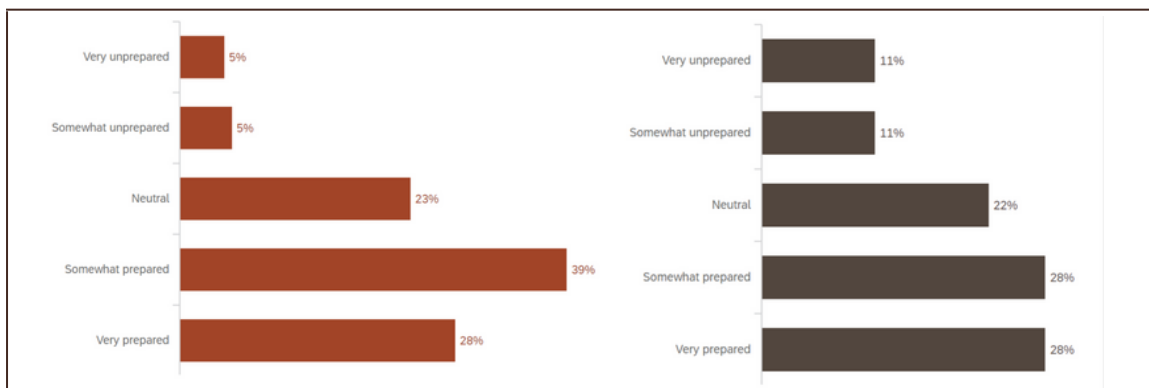


Figure 7: Bar charts comparing responses to the question: "How prepared do you feel to handle an earthquake?" (Left: Born in Iceland, Right: Not Born in Iceland)

In addition to evaluating how prepared people feel for an earthquake, we wanted to know where they have obtained information to determine the effectiveness of the outreach of certain organizations. **The chart in Figure 8 shows that the primary source for earthquake information was the IMO, with social media and friends/family being almost equally utilized.** Additionally, we wanted to understand where people prefer to obtain information. The data in Figure 9, suggests that respondents prefer SMS messages.

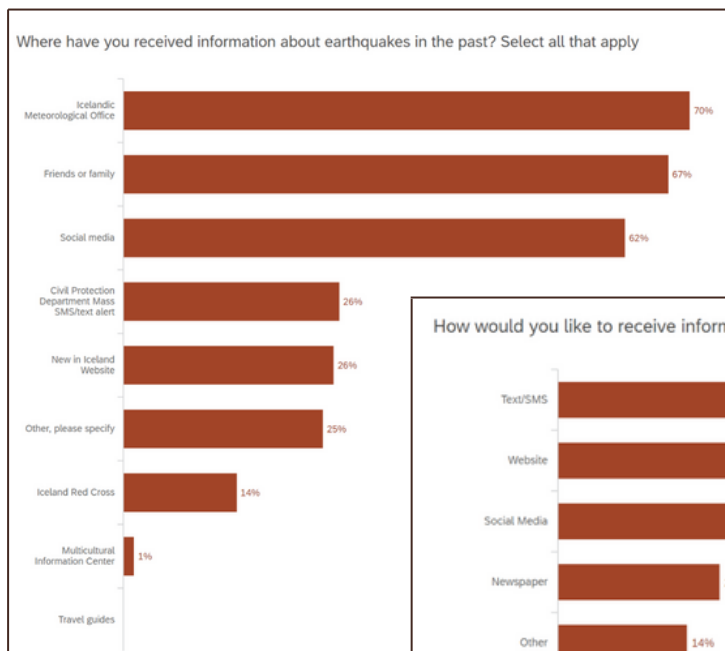


Figure 8: Chart showing the survey respondents most used earthquake information sources

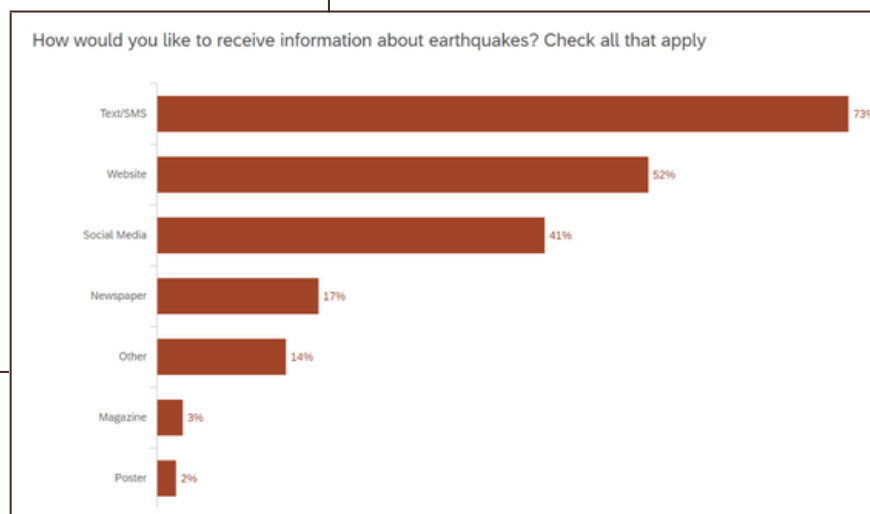


Figure 9: Chart showing respondents preferred method to receive information about earthquakes

Information that people would have found useful before an earthquake was also important. This will help organizations understand what information to prioritize in their communication methods. Figure 10 shows that information regarding what to do in the event of a natural disaster is the most desired.

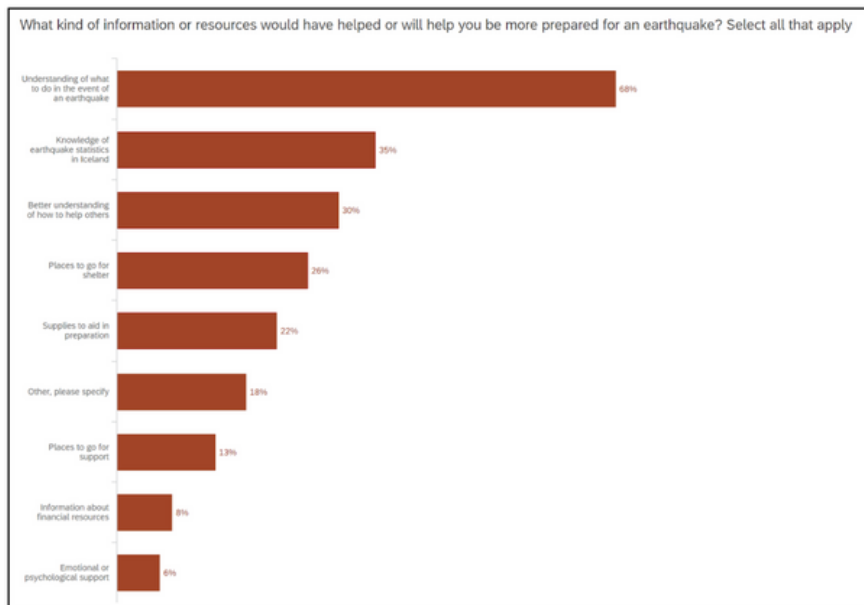


Figure 10: Chart showing what type of information about earthquakes respondents would prefer to receive

Additional information gathered in the survey comes as additional comments in our open response section. Figure 11 visually represents these additional comments.

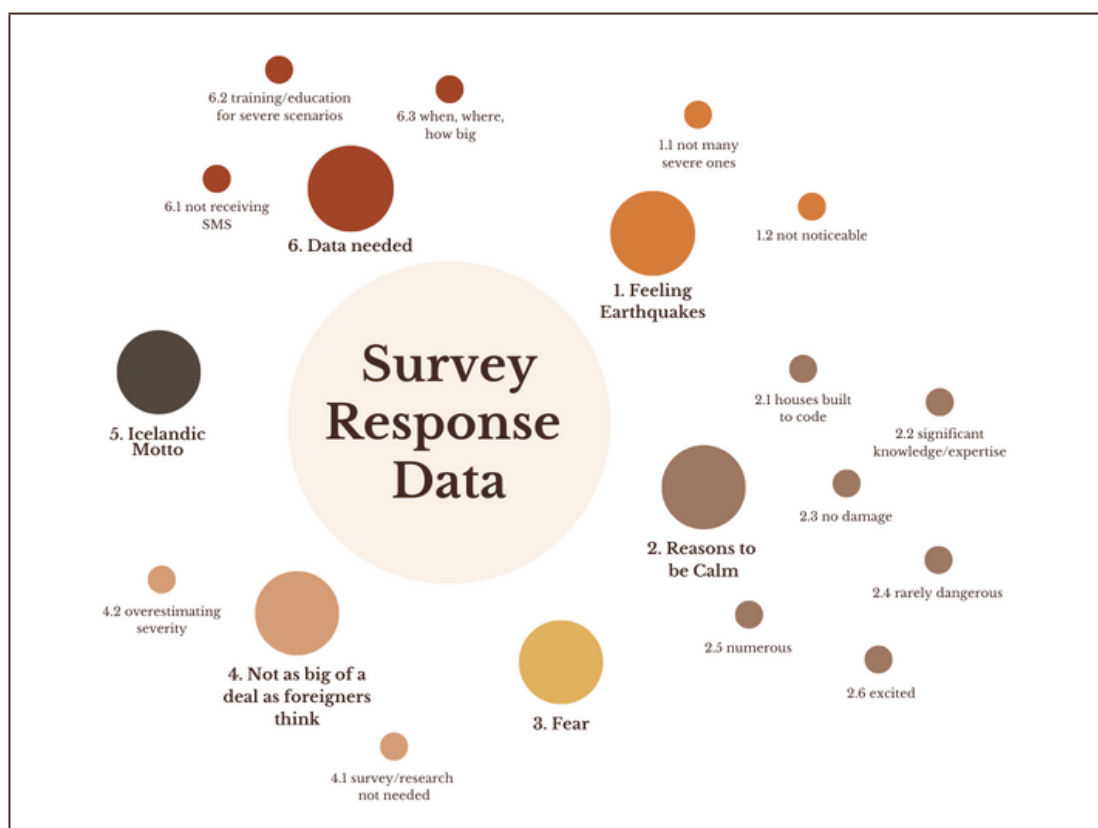


Figure 11: Image visually representing the open response comments. The size of the circle is irrelevant.

At the end of our survey, we provided the space for our participants to enter their preferred method of communication if they are comfortable with meeting us for an interview or a focus group. While the survey gave us valuable quantitative data, interviews would have allowed us to learn about more detailed stories and experiences of the different groups of people. Unfortunately, at the time of assembling our final report, we could not get in contact with any respondents for an interview or focus group due to time constraints.



5.0 Discussion

Here, we will make the final comparisons to analyze hazard information communication to the different populations in Iceland. We also look at how the data reveals what systems need improvement in order to further improve the communication of hazard information.

Research Questions:

- What does the current hazard communication system for earthquakes in Iceland look like? Specifically, how are immigrants and refugees accounted for in this system?
- How do the modes of hazard communication and levels of knowledge about hazards in Iceland differ between native Icelanders and those who immigrated or are seeking asylum?
- How can we more effectively convey information about earthquakes and geologic hazards to immigrants?

5.1 Question 1: The Existing Hazard Communication Systems


After meeting with the IMO, the MCC, the CPD, and the IRC they were able to provide us insight into what resources are available and what communication methods are in place. The Red Cross has a volunteer program where native Icelanders are partnered with refugees to act as their main informational source, such that they can build a social network while becoming more familiar with the country and the culture. These volunteers do not focus specifically on providing information about earthquakes and other hazards, but they have the potential to provide emotional support if there is a specific hazard occurring. The partnership system has been extremely successful but the number of volunteers available holds the program back. Our contact at the Red Cross also informed us about their utilization of the SMS text system to contact refugees quickly and directly.

The CPD's website houses a lot of information about earthquakes and other hazards. This information includes what to do during an emergency, as well as what resources the affected populations have in the aftermath of the emergency. When the CPD receives an imminent hazard alert, the department takes a systematic approach to alerting certain populations in areas that are or will be directly affected. This approach involves sending an SMS text alert to populations threatened more by different hazards using cell towers. SMS text is the quickest and most direct way to distribute information, but is technologically limited. Due to the SMS system utilizing cell towers, messages may reach too far outside the area of interest, or may not reach far enough, causing unnecessary confusion. The CPD support centers are extraordinary resources for those in hazard-affected areas, but they are resource intensive, and it can be difficult to alert the public that these centers are available.

The information we received from the IMO was mainly about their website. They track the location and magnitude of the earthquakes, but only offer the information in Icelandic. They maintain another page containing a 24-hour live feed of earthquakes, which is offered in both Icelandic and English. The main IMO website is the main destination to learn about weather and hazards in the country, and there is no lack of information available about earthquakes. The accessibility of the information is their main concern, with language and outreach being the main barriers.

After talking with the Multicultural Information Center, we learned more about how they directly communicate with immigrants settling in Iceland. They also provide resources about necessary information the immigrant and refugee population may need while settling in. The information they share on their website ranges from general information about living in Iceland to the ins and outs of the citizenship process. They do not necessarily include much information about earthquakes and other hazards, though they did add a link to hazard resources earlier this year. They are continuing to look for different ways to include more hazard information on their website as it is the most accessible (providing 27 language options).





5.2 Question 2: Differing Modes of Communication

The language barrier limits the immigrant and refugee population's level of knowledge about hazard information as many of the resources are not offered in their language. Many immigrants and refugees request that these resources be available in many more languages than are offered currently. Compared to the limited population of those not native to Iceland, individuals born and raised in the country have access to a wider range of different information sources and have access to these sources from a young age. The few responses we received from the population not native to Iceland expressed that the limited nature of the information they received about the hazards. Despite our survey data revealing that natives and non-natives get their hazard information mainly from the same three sources.

Looking at the results from our survey question about where the respondents received information about earthquakes, those native to Iceland mainly get their information from the IMO, social media, or friends and family. Comparing this directly to our participant population of those not native to the country, our survey responses revealed that this population got most of their information from the same 3 sources. With the IMO website and various social media sites being the main sources of information, it is imperative to maintain the consistency and accessibility of these resources.

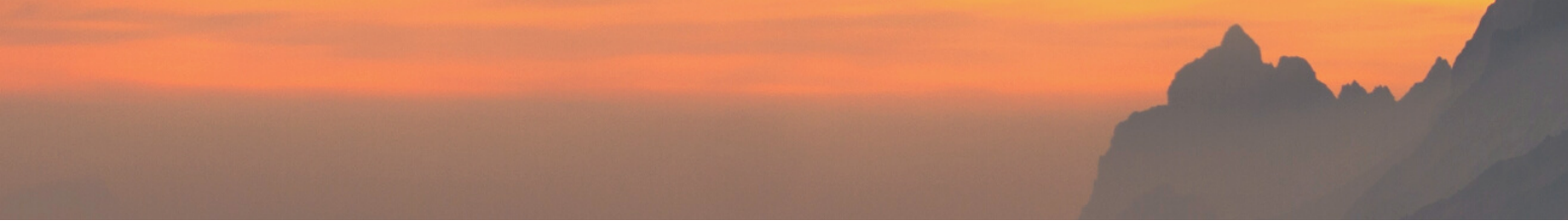


6.0 Recommendations

From all of the data we collected from the responses to our survey and interviews with experts, there are a few recommendations we can make at the moment. We found that there are plenty of in-depth informational sources about earthquakes. The focus now is more on the communication aspect of these resources. We found that close communication could improve the efficiency of hazard information transmission by connecting all of the organizations involved. Future student research groups studying in Iceland would benefit from conducting research to determine when in the resettlement process hazard information should be shared and a comprehensive informational source.

The Red Cross of Iceland and the Civil Protection Department should work closely with the IMO to improve the SMS-based alert system. If done properly, alert systems during earthquakes can keep the public informed, easing stress and increasing safety. This would be helpful because the IMO consistently has the most up-to-date information pertaining to not only earthquakes and volcanoes but also other weather hazards. In combination with the social outreach done by the Red Cross and the CPD, the IMO could provide updates to a larger population, specifically refugees.

The Red Cross of Iceland and the Directorate of Immigration (Dol) should provide the MCC website as a resource for immigrants and refugees. The MCC is the most accessible website for immigrants and refugees out of the main informational sources as it provides 27 different languages. Looking at the current website for the Dol, it has recently been updated and no longer provides an easily accessible link to the MCC's website. This could be to their website as it is not as readily available in as many languages as the MCC's site. If the Red Cross adds a link to the MCC website it could also be very beneficial as they handle a lot of the hands-on portion of the refugee resettlement process through the volunteer program the Red Cross facilitates. Linking the MCC website could help lighten all of the information the volunteers need to know as the MCC provides most of it as well as extra resources for the resettlement process.



Additionally, the IMO should provide earthquake hazard briefings for the MCC to post on their website. Our contact at the MCC informed us that their website is currently under construction as they are merging with the organization New in Iceland, an additional immigration resource in Reykjavik. During this update, or after the merge, the MCC could include a small news section on their website driven by the IMO's constant surveillance of the weather and other hazards to provide basic information about the more severe hazards for those who do not speak English or Icelandic.

Finally, future student groups should conduct research to determine when and how in the resettlement process earthquake information should be provided such that it is useful and internalized. These research groups should also construct a comprehensive informational source. The resettlement process can be very stressful, so it is important to minimize any unnecessary information. Adjusting the timing of when they receive information depending on location and earthquake frequency can help balance the two stresses. If a family is moving to a place that experiences frequent earthquakes they may want to be informed earlier, whereas a family moving to a place that does not experience frequent earthquakes can be informed later in their resettlement process.

Having an informational source that is short but dense with important hazard information could be a helpful resource for the immigrants and refugees who are in the early stages of resettlement. With this information in one place it could be much less stressful to try and search around many different websites and other sources to try and find relevant information. Student groups could then send out a prototype of this informational source along with a survey to collect feedback about the resource's effectiveness in conveying the intended information in an easily digestible manner. One of the most significant difficulties we ran into was the limited time period to work in Iceland. We recommend future groups reach out to organizations as soon as possible, preferably prior to arrival in Iceland to organize meetings.



7.0 Conclusion

From our background research, we gained a better understanding of earthquakes and the immigration process in Iceland. This helped us construct a comprehensive methodology. We found that Iceland experiences an unusual number of earthquakes and that the immigrant population is large, especially considering the small population of the country. There is a plethora of information covering the earthquakes in Iceland, but a significant lack of communication with our target population. Fortunately, there is a robust immigration system in Iceland made up of many reputable organizations, which all have the potential to communicate earthquake hazards. We have developed relationships with the Icelandic Meteorological Office and the Multicultural Information Center, which have the potential to be valuable in improving the accessibility of information.

We continued to stay in contact with our initial stakeholders, as well as form new connections with the Civil Protection Department and the Red Cross in Iceland. This has helped us to gain an understanding of the informational resources and systems that are currently in place for the public to refer to. Using what we learned from our interviews and the data collected from our survey, we were able to come up with recommendations that we will give to some of our stakeholders as well as to future student research groups to continue improving hazard communication in Iceland. Moving forward, future groups should work with the stakeholders to implement our suggestions as well as form their own using new research and new data. We hope that this research can continue to help improve earthquake hazard communication and make a significant impact on the lives of the immigrant and refugee populations in Iceland.



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