FLAME UNIVERSITY

DISCOVER INDIA

Life at Munroe:

HOLDING ON TO THE SINKING ISLANDS OF KERALA

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Life at Munroe:
Holding on to the Sinking Islands of Kerala

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Certificate

This is to validate the research conducted for the report titled “Life at Munroe: Holding on to the Sinking Islands of Kerala” which was conducted under my mentorship.

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Abstract

The Kallada River and Ashtamudi Lake's silt accumulation process created Mundrothuruthu, also known as Munroe Island, in Kerala's backwaters near Kollam. The archipelago is made up of eight smaller islets and rising sea levels have lately posed a danger to the territory, resulting in a scientific debate about the sinking of the island. The study's primary goal is to comprehend how environmental risks affect different facets of life at Munroe. This study examined the effect of the island's infrastructure, the status of regulatory policies, living and working conditions, and other factors to gain a deeper knowledge of the same. Throughout the course of this study, data on these elements has been collected using both quantitative and qualitative methods.

The findings of the study indicate that the environmental conditions have impacted livelihood and infrastructure of the island, in turn impacting the lifestyle of the people. Additionally, it has been concluded that current policies for the island have contributed positively towards solving the problems being faced by the locals. However full-fledged implementation stands to be a problem.

Furthermore, the research findings are derived from perspectives of different stakeholders of the island. These are put in contrast with public information and previous research of environmental and socio-economic factors, ultimately highlighting knowledge discrepancies and in-depth qualitative inferences about the island.

Keywords: *Munroe Island, Policy Implementation, Environmental Vulnerabilities, Life of locals, Tourism, Sinking*

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Chapter 1: Introduction

Munroe Island, known colloquially as Mundrothruthu, is a small island group of 8 islets located in the backwaters of Kollam district in Kerala, India. Named after Colonel John Munroe of the British Army, it is situated at the confluence of Ashtamudi Lake and Kallada River. The island is home to a large variety of mangrove forests that form an ecosystem with the surrounding waters and vegetation, nurturing a comfortable habitat for several birds and animals. It has become a popular tourist destination in recent years and is also known for its rich cultural heritage, temples, churches, and other historical sites.

Figure 1. Landscape of the Island. The backwaters and palm trees in the image.

Munroe Island has been plagued with both natural and human-induced calamities and is currently facing the threat of complete submergence, leading it to be called 'The Sinking Island of Kerala' by many. The livelihoods of the island's residents are affected as a result of the same issues that threaten submergence and the socio-economic troubles that follow. The primary issues they face are recurring floods, the lack of employment opportunities, improper infrastructure facilities, and the possibility of a mass exodus (Sudhishi, 2020).

The administrative village of Mundrothuruthu has a total population of 9,599 people as per the 2001-2011 census. The vast majority of the residents are Malayali and Malayalam is the most prominently spoken language. One can reach the island through road, rail, and inland water transportation, and it is situated approximately 25 kilometres away from the city Kollam (Parvathi, 2016). The island is 13.4 square kilometres in area, some parts of which are higher than the sea level while some are low lying and hence more susceptible to environmental damage and submergence. In the raised areas of the island, settlements are interspersed with coconut groves, and crops are the major land use. The land to the west of the railway track is predominantly low-lying, adjacent to several water bodies and tidal creeks. Various natural species such as coconut trees and mangroves flourish on the banks of these low-lying areas.. In earlier periods, the area was actively engaged in large-scale coir retting practices, but these are now limited to very few locations (Prathapan & Rajendran, 2022). In the present day, the residents of the area primarily practise aquaculture, fish-farming, shrimp farming, backyard agriculture and most importantly working in the local tourism industry.

In recent years, there have been multiple studies and research projects conducted by university students and geoscientist groups to shed light on the environmental history of the region and analyse its current state. However, their findings often differ and a general consensus on what the contributing factors and extent of the ‘sinking’ phenomenon are is yet to be reached.

Rationale:

The available literature about Munroe Island is sparse. Literature about the environmental conditions of the island is available, but information on the overall living conditions of the people on the island is exceedingly scarce. This includes a lack of details on the type of infrastructural facilities available, the implementation of policies, the lifestyle they follow, and the forms of livelihood. Hence, the aim of this research is to understand the impact of environmental changes on the different aspects of the lives of the residents. The most prominent of these changes include the 2018 floods, the tsunami of 2004, recent climatic changes and the construction of the Thenmala Dam.

Therefore, this report aims to bridge the gap in knowledge and correlate the essential factors of environment, livelihood and lifestyle, infrastructure and policy to better understand the island and the life of its residents.

Figure 2. Sunset on the Ashtamudi Lake with a Fish Trap

Scope Of The Study:

The scope of the study focuses on five main areas- environment, lifestyle, livelihood, infrastructure and policy, each with their respective objectives.

Environmental research is limited to secondary research, along with primary information on perceptions and awareness levels obtained through the administering of qualitative and quantitative questionnaires on-field. Scope of the study in this area is limited as the researchers are not equipped with the necessary knowledge or resources to conduct any form of tangible research on aspects of the environment such as salinity and tidal levels.

The scope of study related to livelihood and lifestyle includes desk research, surveys, and interviews about healthcare, transport, personal finance, education, awareness levels and migration and immigration.

The infrastructural study involves desk research, interviews with authoritative bodies, and interviews and surveys of the inhabitants of the island. This provides an understanding of the limitations of authorities to improve the situation and also the needs and concerns of the people.

The policy section of our research involved interviews with authoritative figures and inhabitants of the island themselves. By employing this approach, the research seeks to comprehensively understand the rationale behind the policies currently in place and to gather the opinions of key stakeholders about the effects of such policies and areas that future policies should seek to address.

Lastly, the scope of the study is limited by the resources available to the research group, including time availability, language barriers and literature available to establish a strong pre-field understanding of the research question at hand.

Chapter 2: Gap in Literature

Amongst the several tourist destinations of Kerala, Munroethuruthu stands out as an area with low volume of research and documentation .

While it is true that there are numerous articles and recommendations on development projects, climate effects, infrastructural layout, etc., at Munroe, much of these reports seem to broadly summarise aspects about the island only to a factual and limited extent. One can easily note that these multiple reports and research papers seem to quote the same government reports, population data, field- research report, and map layouts that have been done earlier in the decade. This indicates a scarcity of officially updated information about the island that is easily accessible.

For example, the most recurrent administrative ward maps, contour maps and other topographical representations that could be found for the island, were all traced back to a single spatial planning master-proposal done by Indian researchers (Joseph, 2017). The same maps were found in smaller climate reports and news media, all dated two to three years before or after this report.

Similarly, the primary source of information about existing housing structures initially came from proposals from different universities for building climate-sensitive, alternative housings that would be sustainable for Munroe's soil and weather. These reports have based much of their suggestions from a research proposal by Indian engineers from TKM College, Kerala, who had initially suggested alternative structural designs for flood resilience (Hashim, 2021).

This also highlights how dependency on secondary data is the other factor contributing to the wide gap in literature about the island. Several reports that offered up-to-date, relevant data about Munroe were found to be research articles that were covering completely different subject matters - such as shrimp farming in Kerala backwaters, the water flow in the Ashtamudi estuary, and the soil changes on the banks of Kallada river. Much of what there is to know about the

reality of climate or livelihood at the island, cannot be found via literature that directly reports about Munroe, but rather through information about phenomena that are especially common or geographically parallel to Munroe.

Consequently, the third and most notable feature is the tone of existing literature about Munroe, which lacks an investigative or interpretive direction in its report. Locations that have more public visibility and better community coverage by the media, tend to be subjected to more opinion pieces, discourse research and analysis, and in-depth probing by those studying it. There are also more source verifications, periodic observations and public opinions that can be reported in high-visibility locations.

The opposite of this was observed most prominently in news articles about Munroe. Only a handful of articles reported about new government elections and new developmental projects that were confirmed for the urbanisation and welfare of the island. Additionally each of these articles simply stated the order of events ,certain quotes from officials, and future plans that were underway. Theycompletely skip over public opinion and local perspectives on the developments at Munroe. There were also no media updates about whether or not certain projects and policies were fully implemented in the subsequent years. Similarly, certain informative reports that documented climate, culture and occupational changes at Munroe, mostly covered environmental factors that were influencing the changes. They did not delve into local sentiments about the socio-political factors at play, or even a citizen-level opinion which could confirm whether environment was the only factor of change on the island to begin with.

Hence, much of the accessible literature on Munroe provides knowledge on only one or two dimensions about the island and limited information about opinions and perceptions of the citizens. Since primary public interest lies in the debate of whether or not the island is sinking, the environmental conditions are thoroughly researched in multiple reports. Factual reports about the livelihood and government proposals also offered in-depth insights before field-research was conducted. What remains unexplored territory in literature is modern developmental aspects of the island, and even more importantly, the bottom-up direction of social perspective - both local and external - that add to the environmental, historical and political context of the island.

The research report below includes a literature review integrated with on-field qualitative and quantitative data collected which aims to fill the gaps identified, and document comprehensive insights on aspects of Mundrothuruthu that were previously unexplored in mainstream research.

Chapter 3: Research Questions and Objectives

This research aims to learn about the different environmental vulnerabilities, the status of the regulatory rules, living circumstances and the quality of the island's infrastructure while understanding the effect and perspective of the residents. This also bridges the gap of knowledge and resolves the critical need to address challenges regarding environmental changes, infrastructure development about housing and transportation, policy implementation and its impact on their livelihood.

The main question the research aims to answer is:

"How have Munroe Islands' environmental and socio-economic vulnerabilities impacted the livelihood and lifestyle of its citizens?"

The sub-research questions answered across the different aspects of the research project are as follows:

History and Geography:

"What is the influence of the British in the history of Munroe Island?"

"What are the physical characteristics of the island, such as its size, shape, and topography?"

Environment:

"What is the influence of the construction of The Thenmala Dam on saltwater intrusion?"

"How has global warming impacted climate change on the Island?"

"How has exploitation of resources by humans affected the environment?"

Infrastructure:

"How is the Industrial Infrastructure on the Island coping with the environmental changes?"

"What is the current state of connective infrastructure on the island and how is it impacting the residents?"

"How sustainable are the houses on Munroe against the climatic forces?"

Lifestyle and Livelihood:

"How do the residents of Munroe Island view the future of their community in terms of development and the phenomenon of mass exodus?"

"How has tourism taken over as an important source of livelihood for the island?"

"How have the environmental vulnerabilities impacted traditional forms of livelihood on the island? What are the alternative emerging industries?"

"What impact have the changing environmental conditions of Munroe Island had on the availability and quality of healthcare, education and finance facilities?"

Policy:

"What is the status of implementing the regulatory policies employed at Munroe?"

"What is the satisfaction level of the residents with the government's response to the situation on the Island?"

The main objectives of the research include:

- To study the influence that environmental vulnerabilities have had on all aspects of life on the island i.e. lifestyle, livelihood, policy creation and implementation and infrastructure.
- To examine the socio-economic vulnerabilities of the island and their causes.
- To give useful insights into designing successful strategies for long-term growth of the island- economically, environmentally, socially, and culturally- while exploring the future prospects of tourism on the island.
- To investigate the true public narrative and differing perceptions about the island's conditions.

Chapter 4: Research Methodology

The study's purpose has been explored through data obtained across 5 parameters:

1. Environment
2. Policy
3. Infrastructure
4. Lifestyle
5. Livelihood

Primary data was collected during the on-field research period and online through verbal questionnaires, surveys, phone calls and emails. This data was used to answer questions about lifestyle, policy, livelihood and infrastructure. Secondary data was acquired through newspaper articles, magazine articles and research papers (JSTOR, ResearchGate.net, Google Scholar) available online alongside print archives, manuscripts and books available at the libraries in Kollam. This has predominantly been used to gain an understanding on the environmental aspect of the research but also contributed widely to all other parameters as well.

Research Type:

This research employed inductive theory along with a mix methods approach as it is exploratory in nature and theory and understanding has been developed based on the data collected over the length of the research; by collecting both qualitative and quantitative data were used.

Research Strategy:

Three strategies were employed for this research:

1. Phenomenological Research
2. Interpretive Research
3. Descriptive Statistical Analysis

The phenomenological research approach has been utilised to explain and understand the environmental aspects of the research. This includes the building of the Thenmala dam, the Tsunami of 2004, climate change and other environmental changes that have occurred.

The interpretive research approach has helped gain insights about life in Munroe in finer detail by understanding the subjective perspective of the locals. Through this technique, it's been studied that the current situation of Munroe residents with respect to their socio-historical context as this form of research is based on the idea that reality is constructed through social interactions and cultural backgrounds.

Lastly, descriptive statistics were used to analyse and represent the quantitative methods of data collection to help identify patterns, averages and deviations.

Time horizon:

Cross-sectional i.e. the data of the study has been collected during a stipulated time of 6 months starting in September 2022 and ending in March 2023.

Sampling:

Snowball sampling was used to connect with professors, government officials and other authoritative figures at the island and neighbouring city of Kollam.

Convenience sampling was used to acquire data from the entire target population. The variables that impacted this were the ease of conversing (due to the language barrier), the comfort of participants to share details about themselves, their lives and their opinions; and the availability of the people on the island when researchers went on-field to conduct primary research with the citizens and tourists of Munroe Island.

Data Collection:

Before conducting any interviews or surveys all participants (adults) provided verbal consent. They had the freedom to withdraw from the study at any point, during or after the interview/ survey. Each participant was given detailed explanations about the purpose of the study and how the information they provide will be used, so that they could make an informed choice about their participation, as well as how selectively they want to answer the questions the researchers had prepared. Lastly, none of the participants were cajoled or coerced into taking part in the interviews.

As described above, qualitative and quantitative methods of research were employed depending on the factor being studied.

The following qualitative data collection methods were administered:

One-on-one interviews (semi-structured): To gain an understanding of aspects of lifestyle and livelihood, and understand opinions on the environment, policy and infrastructure. The interviews were conducted using semi-structured questions that were adjusted according to the responses given by the participants.

Close-ended questionnaires: These were administered to a larger part of the sample population to get demographic information, opinions on policies and to gain an understanding of their lifestyle.

Observation: Through observation, the researchers gained a personal perspective and comprehended the state of the infrastructure, the environment, the day-to-day schedules and the general working of the island and its ins and outs.

The following quantitative data collection methods were administered:

The main form of data collection here was surveys collected through different types of questionnaires that will utilise different types of scales to obtain data.

Likert scale: This was primarily used to obtain data on satisfaction levels for infrastructure, policy, lifestyle and livelihood.

Guttman scale: This was used to obtain multiple-selection responses across different parameters and gauge the general intensity and agreeability of social views, ideologies and opinions.

Data Analysis:

For all qualitative (open-ended) questions and documented conversations, the following was administered:

1. Thematic Analysis: To study recurrent themes, keywords and topics of interest across participant responses.
2. Discourse Analysis: To study contextual views, ideologies, and social views and/or imbalances
3. Narrative Analysis: To build on subjective interpretations from personal accounts, anecdotes and life stories recounted by participants.

For quantitative questions and secondary metrics data it administered descriptive statistics analysis - via mean and mode score visualisations.

Limitations:

1. The field research was subjected to major time constraints and budget limitations that make total representative (probabilistic) sampling impossible. As a result the researchers were not able to reach out to citizens on a random, non-biased basis to get their views.
2. The sample size was not representative of the population as it was 100 out of a population of 9599.
3. Collating secondary data (past records and research metrics) for analysis might lead to data redundancy or time overlaps, which made some visualisations inflated in obtained scores.
4. Language barriers between researchers and the sample participants were reduced greatly by the use of a translator who accompanied us to the necessary field research sites. However, a single translator was less than optimal for assisting in every interview that

research members independently conduct. Although it presented a challenge, it did not impede the process of conducting interviews to a degree that would severely affect the research.

5. The researchers were unable to go very in-depth with the questionnaire because of the time limit and language barriers, which is why critical data points were missed out. As a result the analysis and result also have that information missing.
6. The use of convenience sampling and interpretive research strategy reduces generalizability and replicability and therefore impacts the validity of the results obtained.

Chapter 5: History and Geography

The aim of this chapter is to establish the significance of intersectionality between the geography of a place and its history. The former is necessary to understand its environmental aspects, climate change and topography, whereas the latter gives us why, what and when of a place and the reasons that is the way it is. Therefore having a major effect on the island's characteristics and history, highlighting why it is essential to study these in tandem.

History

"What is the influence of the British in the history of Munroe Island"

The History Of Munroe Island, Kollam (district to which Munroe Island belongs to) with respect to the relevance of this study can be traced back to the Rule of Ruler Avittom Thirunal Bala Rama Varma. He ruled over the kingdom of Travancore from 1798 to 1810, succeeding his uncle Maharajah Dharma Raja on 12 February 1798. His reign was a turbulent period with both internal and external issues. Velu Thampi, the Dewan of Travancore negotiated the formal alliance between Travancore and the British East India Company during his rule, as a way to revolt against the monarchy. Raja Balaram Varma ruled over a diverse population of extremely old sects of Muslims and Syrian Christians that were inhabiting the region since the first millennium. He also ruled over low-caste fishermen, who got converted into Roman Catholics and a highly stratified Hindu Society.

Increasing British Influence In The Kingdom of Travancore

At a time in which the kingdom of Travancore was suffering an acute mismanagement in revenue collection, corruption and empty royal coffers, along with Cochin, it decided to enter into a treaty with the British government. The treaty demanded a fixed pay-out in return for the protection of the British forces. When Maharaja Balaram Varma passed away in 1810, Gowri Lakshmi Bai took over as the ruler. Kerala Varma, a distant cousin of Maharaja Balaram Varma, is the most noteworthy of the conspirators she dealt with. Simultaneously a resident was chosen by the East India Company to serve as Travancore's administrative leader starting in 1800.

Colonel Colin Macaulay was the first Resident, and Colonel John Munro was the second. During Gowri Lakshmi Bai's rule she became aware that her Deewan Ummini Thampi was behaving independently and not in the best interests of the state. It was after a concerning amount of the royal treasure was lost that the Rani was alerted. And a year after ascending to the throne, she fired U.Thampi and chose the British Resident Colonel John Munro as her new Deewan. John Munro worked diligently keeping in mind both the parties' interests and making sure that the government's records are in order and that the corporation is paid on time.

"A new chapter began in Travancore when Colonel Munro (popular even today among an age group of Malayalis who studied in school about 'Munro Sahib') arrived as Resident in Trivandrum in 1809." (Pillai) It is under Munro's leadership that a lot changed in the island. Munro managed the land reclamation projects in the delta where the Kallada River joined the Ashtamudi Lake during his tenure. And it was then that the reclaimed island was given his name.

Figure 3. Portrait of Colonel John Munro

(John Munroe Portrait, n.d.)

Colonel Munro brought about much-needed administrative reforms. He limited the power of the district and village officials responsible for collecting tax revenues only to tax collection and stripped away all other authority that the officials enforced unlawfully. In case of misconduct or corruption these officials could now be subjected to judicial trials. For the judicial system he selected officers among the natives; the Brahmins, the Nairs and the Syrian Christians, maintaining a balance among these powerful sects of the society. Travancore thus became the first kingdom where the judicial system of the 20th century was introduced.

Colonel Munro re-organized and re-energized the police department. He also took initiative to fight the deadly smallpox disease and in order to eradicate it from Travancore, he started India's first vaccination department. However, it was soon realised that the vaccination department and the team supporting the program had aroused suspicion among locals. He then requested Maharani Gowri Laxmi Bai to get vaccinated. Maharani whole-heartedly agreed to the cause and followed through.

Travancore was an oppressive caste system and an equally oppressive tax regime for the downtrodden. Each strata in the society was oppressed by its upper strata, and in turn, oppressed its lower strata with equal vehemence.

The reforms brought about by John Munro helped set a precedent for the region for years to come. The history of Munroe is interlinked to a larger history of British India and its role in India. From religion to culture, the British influence in Munroe has played a significant role in shaping the lifestyle of the island.

Geography

The following section answers “What are the physical characteristics of the island, such as its size, shape, and topography?”. Munroe Island is a group of eight small islets located at the confluence of Ashtamudi Lake and the Kallada River in Kollam district of the Indian state of Kerala. The islets are situated about 27 kilometres from the city of Kollam (Munroe Island - Ideal Spot for Canal Cruise in Kollam | Kerala Tourism, n.d.) and cover an area of around 13.4 square kilometres. The island consists of many small islands including Munroe

Island,Perungalam, Pattamthuruth, Pezhumthuruth. It is located between the latitudes of 8° 59' 37.6" N and 76° 36' 35.9" E. In this section of the chapter, the question “What are the natural features of the islands and how do they affect the way of life” has been answered. Munroe has a unique geographical standing due to the fact that these are inland islets. Some of the natural features of the island include backwaters, which act as a crucial means of connectivity throughout the island and mangrove forests, proving to be an integral part of the ecosystem. The coconut groves that are a part of the islands’ natural landscape are an important part of their livelihood and lifestyle. All these natural elements contribute tremendously to their livelihood and lifestyle. The Island was made from reclaimed land due to natural slit accumulation along with reclamation processes in the 17th century, per the order of Resident Colonel John Munroe of the state of Travancore, the namesake of the island. Despite being referred to as an island, it is composed of eight individual islets and other much smaller islets.

The islets are separated from the mainland by a narrow channel that is navigable by small boats. The landscape of Munroe Island is characterised by a network of canals, lagoons, and backwaters, which are interconnected and form a unique ecosystem. The canals are used for fishing and transportation, while the lagoons and backwaters are home to a variety of aquatic flora and fauna, including fish, crabs, and water birds.

Figure 4. Picture of Kallada River

The climate of Munroe Island is tropical, with hot and humid summers and mild winters. The monsoon season, which lasts from June to September, brings heavy rainfall to the region, and the island is prone to flooding during this time.

The geography of Munroe Island is the most important aspect to look at when it comes to researching the region from any aspect, especially the environment and the changes it has encountered. One needs to keep in mind that the geography of the island is constantly changing due to various factors and will influence all other aspects of the island including livelihood, lifestyle etc.

Figure 5 . Picture of Palm Trees on the bank of the Kallada River

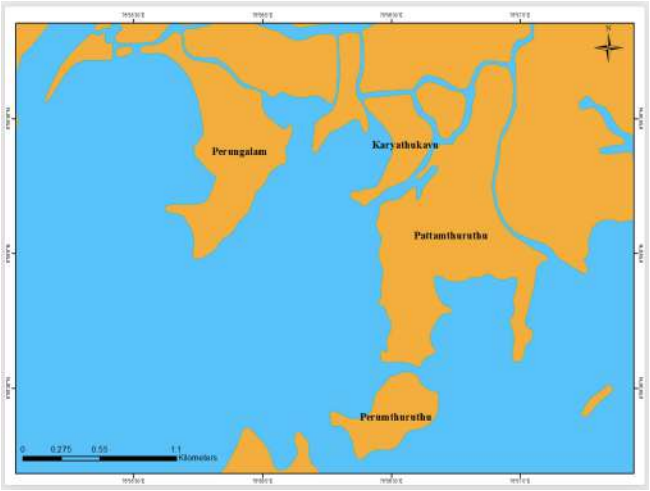

Figure 6 . Islets of Mundrothuruthu

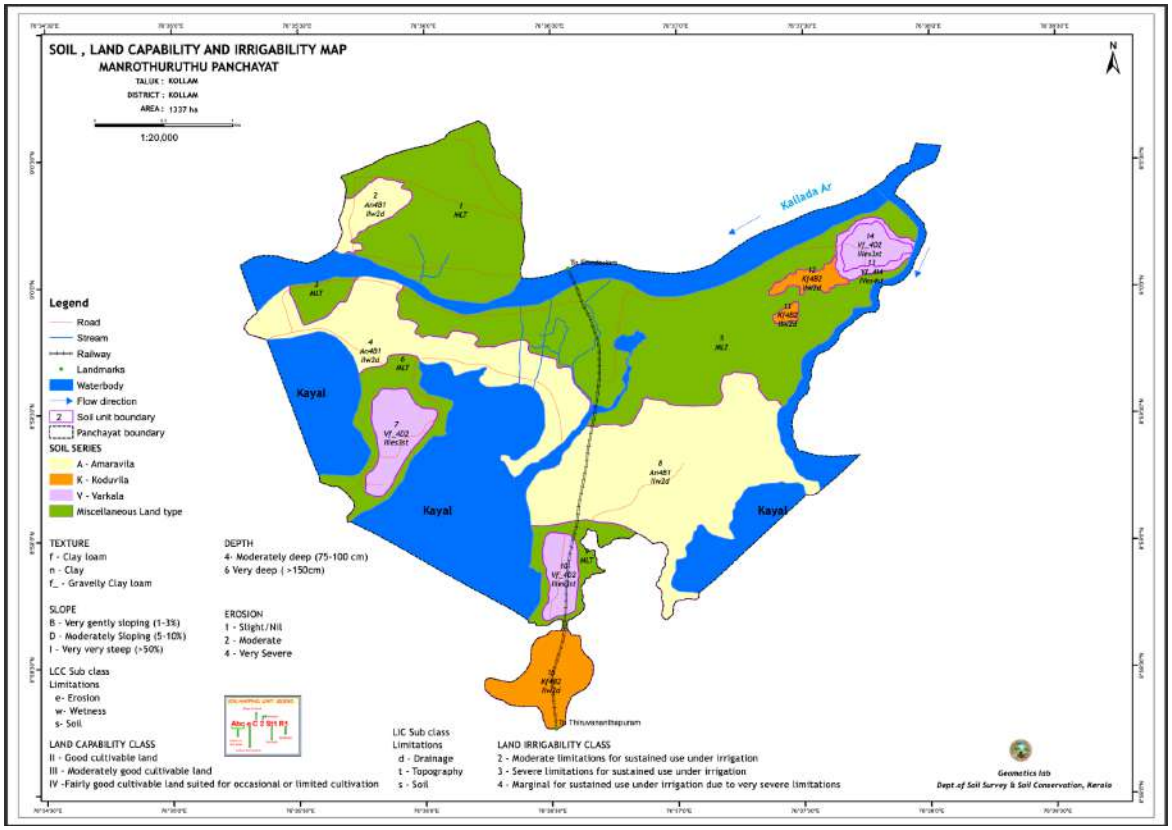

Figure 7. Map explaining the Soil, Land Capability and Irrigability of the Mundrothuruthu Panchayat

Chapter 6: Environment

Figure 8 . Coconut trees at the banks of Kallada River.

Environmental vulnerability is the capacity of a community to handle, resist, and recover from the effects of particular environmental occurrences. It also refers to the sensitivity to the detrimental socioeconomic effects of environmental changes. Due to climatic circumstances brought on by global warming, unsustainable structures, the island's limited ability to accumulate silt, floods of 2018 and 2019 and the tsunami of 2004, Munroe Island's ecosystem is now considered as an endangered one. Resultantly, low-lying portions of the island are now at risk of being submerged at high tides.

The director of the Indian Institute of Infrastructure and Construction (IIIC) in Kollam - Dr Sunil Kumar, has researched extensively about the living and environment at Munroe, having visited the island numerous times for various research projects. In conversation with him, he provided a lot of information and insights about the environmental conditions of the island.

According to Mr Kumar, every region has an "environmental threshold", that is, a certain capacity of change can be sustained (natural or artificial). The rate at which Munroe is being exploited, he predicts that the island will vanish in the next five years. The reason behind this argument is that the government and the locals are focusing more on commercially developing the island rather than looking out for the environmental detriments which these developments are causing. There is also a lack of awareness about the vulnerability of the island to its environmental situation.

Climate Change

This particular section answers the following sub-research question, "*How has global warming indirectly or directly impacted climate change at Munroe?*"

Climate change is a long-term alteration of temperature and weather patterns that is primarily caused by human activities such as burning fossil fuels. These activities lead to the emission of greenhouse gases, like carbon dioxide and methane, that trap heat and raise global temperatures. (Nations, 2020)

A very important cause of the environmental issues on the island is climate change. A study in 2017 showed that global warming has caused ice in the polar regions to melt, leading to an increase in ocean water levels and the submergence of vast areas of land. It is predicted that cities such as Mumbai and Kochi will be among the first affected, but some local residents claim that Munroe Island has already been impacted by submergence. The area is reported to have sunk by 1 metre between 1996-2006 and 3-4 metres between 2006-2016 due to an increase in saltwater level (Prathapan & Rajendran, n.d.). The Arabian Ocean is connected to the Ashtamudi Lake via a strait that is located around 12 km away from the Munroe Island system. Near the waterfront areas, the ingress of tides creates pressures in the sand and clay layers that can dislodge particles, leading to the settling of structures in the nearby backwaters (Jha & Sahib, 2016).

A study by Kerala Sasthra Sahithya Parishad also found that Munroe Island is sinking as a result of rising water levels caused by global warming. The increase in sea surface temperature and the formation of low-pressure systems in the Arabian Sea also leads to more frequent cyclones and

heavy rainfall, exacerbating the flooding and submergence of the island. The rise in sea level due to global warming poses a significant threat to the environment, population, and landscape of the island. (Prathapan & Rajendran, n.d.)

Recently, experts have observed a worrying trend where more and more cyclonic storms are forming over the Arabian Sea, similar to those that typically form over the Bay of Bengal. These storms have a direct impact on the state of Kerala, unlike those from the Bay of Bengal. Out of the 23 cyclonic storms that made landfall on the Indian coast since 2018, 11 originated over the Arabian Sea. This is a significant increase from the one or two storms that were typically reported over the Arabian Sea in the past. Additionally, the intensity of these storms has been increasing, with Super Cyclonic Storm Kyarr reaching speeds above 222 kmph and other storms like Mekunu, Maha, and Tauktae reaching speeds between 160 kmph and 222 kmph. Climate change and global warming have been identified as the main causes for this trend, as the increase in water temperature in the Arabian Sea by an average of 1% is leading to more cyclonic storms (Saha, n.d.).

During a visit to Kidaparam, a local claimed that during heavy rainfall, it starts flooding, as a result of which there are high tides and extremely high temperatures (about 32°C). Erratic rainfall in the area is a result of climate change, other than that, the months of June, July and August are when the rains are rigorous. The water in the Kallada river is collected in the Thenmala Dam. When the water from the Ashtamudi lake, Palaka lake and the oceans come together, they increase the tidal levels and cause flooding in the island.
The land of Munroe is loose and weak because the wood floods into the mainland from the jungle after which the wood gets submerged under the soil. The soil then forms over the wood and the wood starts to decay, hence the soil collapses.This is when the land level sinks deeper and the aforementioned causes justify the noticeable rise in water levels.

Flora and Fauna:

Munroe island is comparatively untouched by urbanisation which has allowed them to maintain a rich biodiversity to this day. The island is one of the three main mangrove sites in Kerala, and with the state losing 95% of its mangroves in the last 30 years, the conservation of the island and its wildlife has become all the more important (Sreelekshmi et al., 2022).

The island had extremely fertile soil, suitable for growing paddy. The alluvium deposited by the Kallada river during the monsoons is what replenished the soil and kept it fertile. The main food and cash crops grown on the island were coconut, paddy, cloves, cocoa, and tubers. However, in recent years the topography of the island has become extremely vulnerable as the salinity of the soil is increasing steadily (Jha & Sahib, 2016). The fish farmers on the island are suffering due to the same problem as the marine life populations are on a decrease due to a plethora of reasons.

The island is still famous for fishing and is known for its shrimp population. The intertwining water bodies house a number of species of crabs, prawns, bivalves, and more. Shrimp farming is carried out by a large percentage of the island's residents and has been a highly prevalent and practised profession for years (Shakir et al., 2010), but that has only accelerated the decline in the shrimp population in recent years. Girilal, a 53-year-old fisherman, who has been fishing for the past 34 years, processes fish at the Harbour Union. As for someone who has been in the fishing industry for years, he claims that there are more fish in the water now, as compared to the time before the floods in Munroe. As a fisherman, he commenced his work in the fish farming industry very recently (3 years ago). He mentioned that rains are very beneficial to the island since it increases the number of fish in the waters of Munroe.

On field, while talking to Mr. Karunakaran, the former president of the Gram Panchayat of Mundrothuruth, mentioned coconuts were a good source of income for the locals. But, because of the lack of potassium and the mandari disease affecting the root (wilt), which completely cripples the coconut palm. The yield has fallen drastically since 1999 affecting the copra and the husk, thus affecting coir production. Premature dropping of fruit, fruit with wilted appearance, crown of the coconut turning yellow, and yellow leaves turning brown are some effects of the disease. This makes the trees bend down and eventually fall because of the disease and the tides. The 'land mafia' (corrupted government/municipal officials, politicians who sell or buy land illegally to make personal profit) took out fertile and nutrient rich soil from the river beds for construction, so much so that this activity lowered the level of the river bed even more, causing easy flooding. It is not prevalent in Peringalam but very much present in the other islets.

On the way to Peringalam, Mr Karunakaran showed the various kinds of mangroves in the vicinity. Avicennia marina and Rhizophora mucronata are the most abundant species. There are policies and restrictions in place to protect the mangroves and encourage their growth. Mangroves also tend to grow on the marshy paddy fields which are abandoned after flooding. He believes that mangroves are the protectors of the island as they act as a natural impact-absorbing semi-barricade of floods and improve the granular stability of riverbed soils.Thus, he suggests planting them all around the island could be beneficial to the overall ecosystem of the island. Because of the seed dispersal (the seeds from the parent mangrove falling into the water), they need not be planted manually everywhere. They perpetuate the growth of their species independently.

Figure 9. Roots of the Rhizophora mucronata

Figure 10. Mangrove forest in the Ashtamudi lake.

The tsunami of 2004 affected the flora of Munroe severely. Mr Kumar, a resident of Peringalam, one of the affected islets, brushed upon how the tsunami affected the coconuts and damaged them, whereas the soil in the other islets continue to support the growth of coconuts. Additionally, there is a lot of salt water seepage in Peringalam. A barrier needs to be created in between the uppermost layer of clay and the lower layer of soil to stop the saltwater from seeping into the soil and damaging it completely. As far as the plant life in Peringalam is concerned, the plants are untamed and not taken care of.

Construction of the Thenmala Dam and Saltwater Intrusion

The following section answers the question *"The direct influence of the construction of Thenmala dam on saltwater intrusion in the island?"*

The Thenmala Dam is the first ever planned eco-tourism destination in Kerala. It is also a 'UNESCO World Heritage Site'. Started in 1961 and built by 1986 under the Kallada Irrigation and Tree Crop development project, it is the second largest irrigation project in Kerala. The dam

is a government-managed facility, and essentially a tourism spot for all. It has been selected as one of the best eco-friendly projects in the world by the World Tourism Organisation. Thenmala's construction plays a very crucial role in managing the backwaters of the island. The dam is at a distance of 68 km from Kollam, also referred to as the Kallada Dam or Parappara Dam located in Thenmala village and is built across Kallada River.

Thenmala is a Malayalam word - *Then* means *honey* and *Mala* means *hill.*

Figure 11. The Kallada river connects the isles of Munroe

The dam and the Kallada irrigation project are regarded as one of the biggest reasons for saltwater intrusion in the lands of Munroe. Mr Binu Karunakaran said "The threat of tidal surge became aggravated after the [Indian Ocean] tsunami in 2004. It also accelerated the whole sinking phenomenon. Earlier, it took decades for a building to deteriorate. Now it will happen in a couple of years." He mentioned an island named, 'Ekkappuram' where eight families used to live, but now the island is completely submerged. Dr Sunil Kumar, Director at IIIC, explained - Munroe receives about 6-8 months of rainfall every year, and as a watershed region, it is more prone to soil erosion. Because of the heavy rains, there is an increased velocity in the flow of water due to which sediments are carried down; after the flow has decreased, finer sediments like silt and clay get deposited making the area marshy and muddy. The building of Thenmala dam

led to the accumulation of the sediments which remained stuck in the dam, due to which, the rest of the river bed could no longer get those nutrients or minerals. Thus, the remaining clear water, void of any rich sediments, flows out of the dam. There is ongoing erosion of the prevalent sediments because of the varying tidal flows, but after the creation of the dam, there is no silt deposition to replenish the river bed at all. As a result, Munroe goes through high tides, which increases the groundwater in the wells.

Salinity intrusion is one of the biggest menace to the island. This is a looming threat that the island has been facing for the past one and a half decades, continuously affecting the groundwater quality of the island. The topsoil of the island is acidic saline soil which is a type of soil commonly found in low-lying marshes, waterlogged surfaces, and poorly drained areas near rivers and streams subject to tidal waves (Jha & Sahib, 2016). This changes with the seasons as the rainwater and freshwater from rivers decrease the salinity during the monsoons (Jha & Sahib, 2016). Saltwater intrusion into the Kallada River and Ashtamudi Lake in recent years has increased the salinity of the soil and made it unfit for farming.

Figure 12. Submerged Ekapuram Island

Subsidence of the Island

Organic substances that form mulch can be found in the river flow or runoff. The quality of these substances along with pollutants determines the colour of Kallada's waters. Over time, organic matter putrefies into gases such as methane, which may crumple down into the soil and cause subsidence. The effects of this phenomenon are seen as the railway lines seem to sink downwards into the soil every time a train passes by, strongly suggesting the instability of the island as it floats over marshy water. But, not every part of the island is subsiding. The Director of IIIC suggests that if the foundations of the Munroe highlands are built on laterite soil, it may have more longevity than the surrounding islets. This is due to the fact that laterite gets stronger and more firm as it ages over time. Speaking of water intrusion, a resident at Peringalam claimed that their side of the island had no major problems of water intrusion due to high tides, only during floods. The headmaster at the secondary school at Peringalam reported that the school premises are used as shelter during floods because of its advantageous altitude.

However, the island might soon reach its "environment threshold" as mentioned before, since the government continues to rapidly plan urbanisation projects, primarily to promote tourism in the area, without properly auditing all the critical necessary parameters, says Dr Kumar. He says that "Munroe is a gold mine for tourism. If we properly pick this up with scientific intervention, it can be an international tourist spot." The approach for any policies or plans should be highly sensitive and comprehensive.

A similar thought was put forward by Mr Karunakaran. While talking about the Thenmala dam, he said the government had a major planning error in the building of the dam. They did not research or take into account the after effects of it and no analysis or consultation was done before the beginning of such a massive project. This irresponsibility can prove to be a major reason for the subsidence of the island.

Tsunami of 2004

Many Asian countries were left devastated by the December 2004 Tsunami generated by the Sumatra Andaman earthquake and its unprecedented effects across countries. The Kerala coast is essentially at sea level and is characterised by extensive expanses of lakes, lagoons, and ponds

that are connected by a system of canals known as "backwaters" particularly in the impacted districts. Due to the proximity of these lakes' points diverging with the sea- where just a few coastal roads stand between them- the tsunami's impacts are aggravated.

Two slender land strips in Kerala, which are bordered on the east and west by a system of backwaters and the Arabian Sea, sustained significant damage. The second strip that has been most severely impacted in Kerala is a 40 km long shoestring isthmus that runs from Trikunnapuzha in the Alappuzha district to Karunagapalli in the Kollam district, south of the city of Alappuzha.

Due to the tsunami's arrival coinciding with high tides, the damage was at its highest. The power of the waves caused rocks and stones to be thrown as far as 30 metres, while some of the uprooted boulders, fishing boats, and vehicles were swept into the nearby flooded Thiruvananthapuram–Shoranur (TS) canal in Kollam, others were stranded in the coconut plantations parallel to the coast.

Large amounts of sand and other debris were also left behind by the tsunami, obstructing the highways. The tsunami left behind significant sand deposits, which decreased the allowable draught in these backwaters, affecting ferry navigation and necessitating dredging. It deposited a lot of material in some areas while eroding the sea floor in others.

After the tsunami, it was discovered that the island was sinking, putting the lives of approximately 13,000 residents in peril. Over 300 families had left the area because their homes were permanently flooded (Deccan Chronicle, 2023). Based on field research, Kollam scientist Sainudeen Pattazhi came to the conclusion that Munroe Island will vanish within a short period of time due to the post-tsunami tectonic shift and dam building (Lancelet, 2019).

According to Mr V.K. Madhusoodanan, an environmental activist and the chairman of the Kerala Sastra Sahitya Parishad's environment subcommittee, the flooding in Munroe Thuruthu occurred after the tsunami. Before the Tsunami, tides only touched the island twice a year; today, they do so eight times annually. Munroe Island's actual height, which was 3 metres above mean sea level

prior to the 2004 Tsunami, was believed to have decreased to 0.5 to 1 metre after the tsunami (Deccan Chronicle, 2023).

The tsunami in 2004 accelerated the entire sinking situation on Munroe, but there is a huge conflict of opinion on whether or not the island is truly sinking. The high tides started getting recurrent right after the tsunami. Most places on the island are waterlogged and damaged, the most important one being - the hospital. The current PHC (Primary Health Centre) building is a temporary construction to treat emergency cases, as the actual hospital is yet to be rebuilt after being destroyed in the floods. Mr Subin, manager at the local Canara Bank, said that floods during heavy rains is the main issue faced at the island, which is making people migrate.

Human Interventions

This section answers, "*How has exploitation of resources by humans adversely affected the environment?"*

Faulty agricultural practices on the island have led to a decrease in soil fertility and water availability, resulting in decreased crop yields and reduced income for farmers. The monoculture of certain crops, such as coconut and paddy, has played a significant role in soil degradation. Furthermore, the use of chemicals and fertilisers in agricultural production has had a negative impact on the island's soil and water quality. These chemicals often find their way into the island's water bodies, resulting in the contamination of drinking water, and the destruction of aquatic habitats and species. Furthermore, the use of inorganic fertilisers has also caused an increase in soil salinity, leading to crop failure and soil infertility. Cultivating the land by tilling it also resulted in a higher rate of soil erosion.

Meanwhile, construction activities on the island have resulted in the drastic deepening of the Kallada River due to extensive sand excavation. It was revealed on a boat trip to one of the Munroe Islands that the boats of the illicit riverbed mining organisations were sunk by the government vessels by forcible anchoring and can now be seen in the bottom of the Kallada River, which flows near to the mainland. Several of those boats are still submerged vertically, their noses poking out of the water as a sombre reminder of what happened to those who

accelerated the sand extraction. The depth of the Kallada River increased drastically from 5 feet to 20-30 feet in 2010 due to extensive sand excavation. Despite legal enforcement, the practice continues, leading to the destruction of mangroves, marshy areas, and unscientifically constructed roads, bridges, and rail lines. Hundreds of heavy vehicles and more than 62 trains traverse through the area without recognizing its environmental sensitivity, causing soil erosion underneath the Kallada River and Ashtamudi Lake due to vibrations.

Effects on Living Conditions

There is a contrasting narrative about the living conditions at Munroe. The locals are mostly satisfied with the living conditions and have tried to adapt to the erratic nature of the climate and the river, while outsiders think it is not a livable place. It is only a problem during floods and water intrusion, said one of the locals at Peringalam. Through the data collected and research, it is understood that 38% of people have had their homes flooded by high tides, while 62% have not.

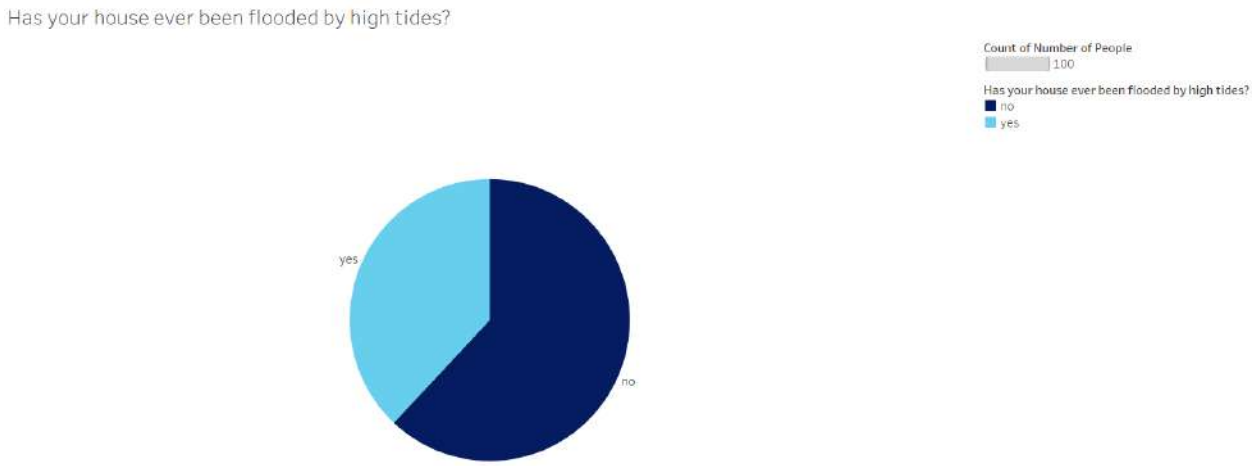

Figure.13 Graph depicting the number of people who had their house flooded or not out of 100

Based on secondary research, there was a notion that the living conditions for the whole island were atrocious because of the environmental changes and exploitation, but that was not the case when spoken to the locals. Most residents are satisfied with their living conditions. People in the

high-lying areas do not face problems with flooding and water intrusion into their homes, whereas it is totally opposite for residents of the lower-lying areas. Some residents have migrated while some refuse to leave due to the attachment to their homeland. There is also a subset of people who wish to move away from Munroe but cannot do so due to their financial situation.

In conclusion, the environment of the island is vulnerable to the aforementioned problems, but it is still not clear how many of these are direct causal factors. It is extremely important to thoroughly consider all the major decisions related to every realm which might worsen the current situation of the island and its environment, making it difficult for the residents as well as the flora and fauna.

These environmental issues are further exacerbated by the unfettered growth of tourists, unrestrained construction, and inadequate waste management techniques. Without proper planning and implementation, these vulnerabilities can swiftly develop, causing severe environmental damage and threatening the island's subsidence. Like, unregulated roadway construction and development can result in the loss of wetlands and mangroves, increasing the danger of floods, soil erosion, and biodiversity loss.

Acknowledging the significance of the island's environmental vulnerabilities and taking measures to reduce their effects is critical. This may be accomplished through the promotion of sustainable tourism practices, regulation of development and construction activities, and implementation of appropriate waste management systems. Such actions will aid in the preservation of the island's natural resources, the protection of its biodiversity, and the long-term viability of the island.

Chapter 7: Lifestyle and Livelihood

Observation and interviews conducted on the island helped the researchers gain valuable insight into the lifestyle and livelihood of the people in Munroe. Life on an island that is susceptible to flooding is very different from that in a normal city in India and therefore, there were several useful viewpoints gained about the common professions, how they have changed over the years and how they differ across the expanse of the island itself. This section of the paper covers daily life, family life, cultural aspects, education, finances, health and sanitation and forms of livelihood observed at the island.

Life as a local:

As an island, the general lifestyle of the community in Munroe is closely interconnected and interdependent. The small community lives in harmony with each other whether it is related to their occupational or personal needs. Most people here live self-sufficient lives when it comes to their basic needs. Despite the occupation of an individual, the days of the locals begin early and end early as well. The island as a whole shuts down as the sun goes down around 7-8pm.

Coming to people's homelife, newer family sizes range from 4-6 however older families are bigger. People on the island live a private life with their families. Most families who live in the rural parts of Munroe own livestock such as hens, cows, rabbits, goats, ducks, etc. However, this is not seen in a prevalent manner on the main island of Munroe.

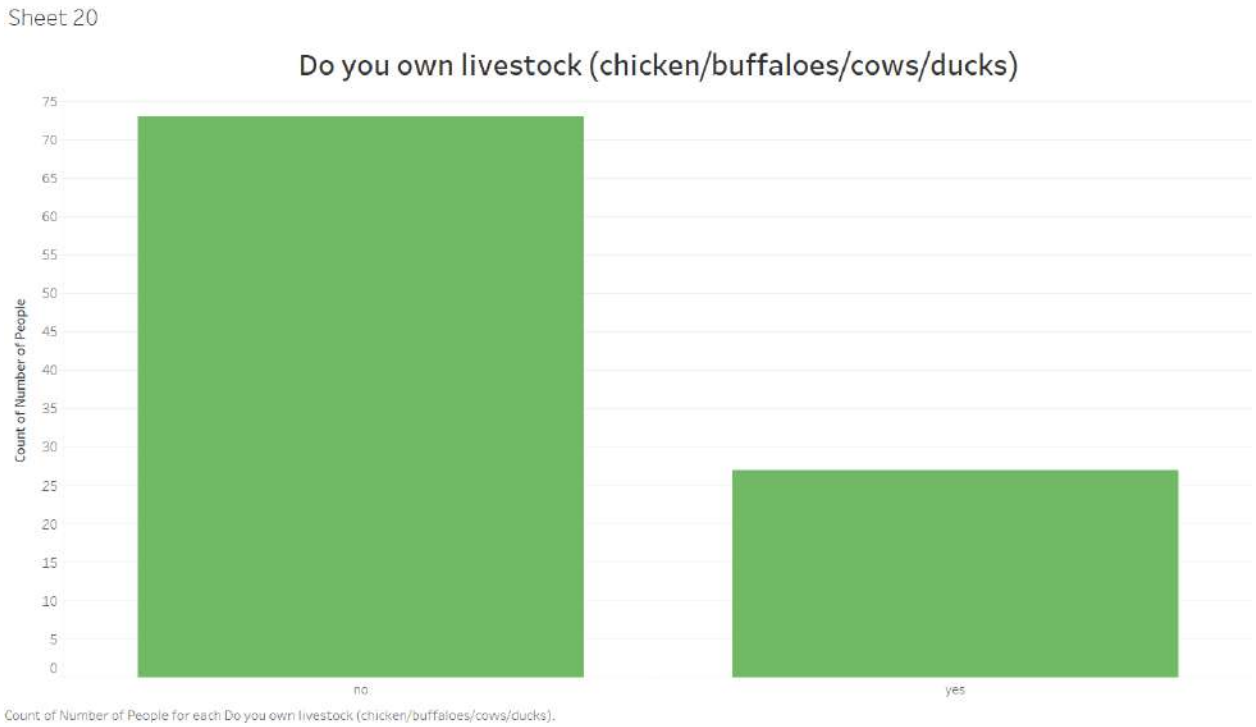

Figure 14. Ownership of livestock

Basic supplies such as fruits, vegetables, packaged snacks, ready-made meal mixes, pulses, lentils, toiletries, etc., are all available on the island, and so are clothes and other necessities. It is difficult to obtain freshwater on the island thus, locals boil the tap (52%) or well (28%) water they receive; from the research, it was concluded that 77% of people have access to drinking inside or right outside their house, 10% get water 250m and 8% between 250m-1km. Only 2% of people had to travel more than 1km to obtain drinking water. Apart from this, water is available at ₹4 per litres.

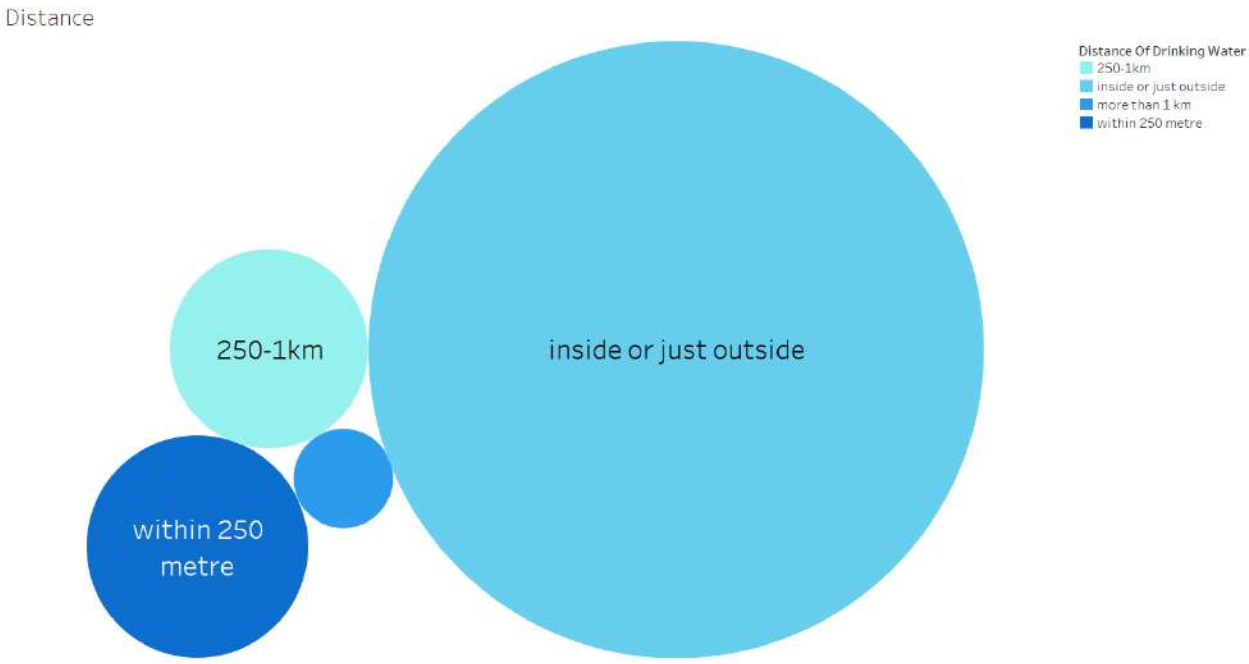

Figure 15. Circular graph representing the distance of drinking water

Cultural Aspects:

The way people dress in Munroe is standard to the norm in south Indian states keeping in mind the extreme heat and humidity. Most men wore a lungi and a shirt while women wore a saree or kurti. But it is to be noted that the increasing number of foreigners in the town due to tourism has led to a shift in clothing styles and their perception amongst the younger generation. They prefer a more western style of dressing as compared to the traditional way. Coming to the festivals celebrated on the island- Onam and the Kallada River Race, annual church festivals of Palli Perunnal are actively celebrated with food and decorations.

Munroe observes a traditional Kerala cuisine with organic farm produce and local seafood. Locals consume beef, rabbit and other meat from their own livestock. Their meal culture remains standard to certain timings of the day, making it harder for tourists to find food at all times in restaurants as well. The food widely contains coconut oil and pieces. Their snacks consist of packaged tapioca chips as they are easily available and grown on the island.

Figure 16. Local dressed in traditional attire running a small shop near the fisherman's dock

Figure 17. South Indian Thali

Delving into *"What impact have the changing environmental conditions of Munroe Island had on the availability and quality of healthcare, education and finance facilities?"*

Education:

The literacy rate, as in the state of Kerala itself also stands to be high on the island. Interviews with locals act as proof of this fact as the research conducted also indicates that 62% of the population has passed 12th grade. Sadeesh, who has been living on Peringalam for 10 years now, claims that most of the people on the island are educated. A visit to the headmaster at LPS (Lower Primary School) Munroe Island informed the researchers of the relevant data and information about the education provided on the island. According to the interview taken with the headmaster of LPS, most families of the students studying here are poor, therefore, the students have encountered the suffering that comes with flooding and water intrusion, especially during high tides.

There are 2-3 lower primary schools, 1 primary school and 1 high school and all of them follow the curriculum of the Kerala Government. All students are taught English and Malayalam and some schools with Muslim students also are taught Arabic. After the 4th grade, they can choose between Malayalam, Urdu, Sanskrit and Arabic. Additionally, students performing well are given grants by the state and local governments. There are 60 students studying from kindergarten to 4th grade (27 boys and 20 girls from 1st-4th grade) and have 4 teachers including the headmaster. During covid, online classes were also provided to the students.

Mr Karunakaran states that it's easier to get into schools on the island therefore, children take boats from the mainland (Kollam) to Munroe Island. However, students travel to other cities and countries to acquire their preferred choice of high school and higher education. Those with the ability to do so, move out of the state and go abroad to study and work in order to earn money. Anganwadis (rural child care centre in munroe island led by the Integrated Child Development Services) across the islets provide non-formal education for preschoolers free of charge.

Personal Finance:

Banks are an essential component of the economic infrastructure of small towns in India, and their importance cannot be overstated. As per an interview conducted with Mr Subin (Manager of Canara Bank, Munroe Island), among the 3000 families in Mundrothuruthu, there are about 10,000 bank accounts in existence. Out of which, 3-4 accounts are opened per family, indicating a higher literacy and awareness rate. Among the existing banks, it is Canara Bank which is the most prominent and is used by almost everyone on the island. S*avings Accounts, Pension Accounts, Salary Accounts, Panchayat Accounts, and Churches accounts* are the most prominent types of accounts used. The majority of the population has adopted UPI, only the elderly and uneducated haven't. Mr Subin expresses that "one of the problems we face is that there are fewer deposits in CASA (current account and savings account). Income on the island is highly seasonal due to the reliance on tourism and flora-fauna-related remunerating activities.

The policies and schemes in place allow for a lot of locals to receive bank loans without much inconvenience. However, due to the uncertainty of collateral as a result of the environmental conditions and the impact it has on houses, they are hesitant to do so under certain circumstances.

Examples of income levels include earning ₹1000-1500 from fishing and ₹2500 from an AC room in a homestay per month. The minimum daily wages for women are ₹311. The most common loan given out is a Mudra Loan- a loan of Rs.10 lakhs with no security deposit, no guarantees and no mortgage or collateral. Only up to 10L, GCT (Government Coverage Tax); a loan beyond 10L will be reimbursed up to 50% in case the property/ land is damaged or lost due to environmental conditions. For migration, they mortgage property to claim loans. Additionally, the Gram Panchayat uses funds given by the bank.

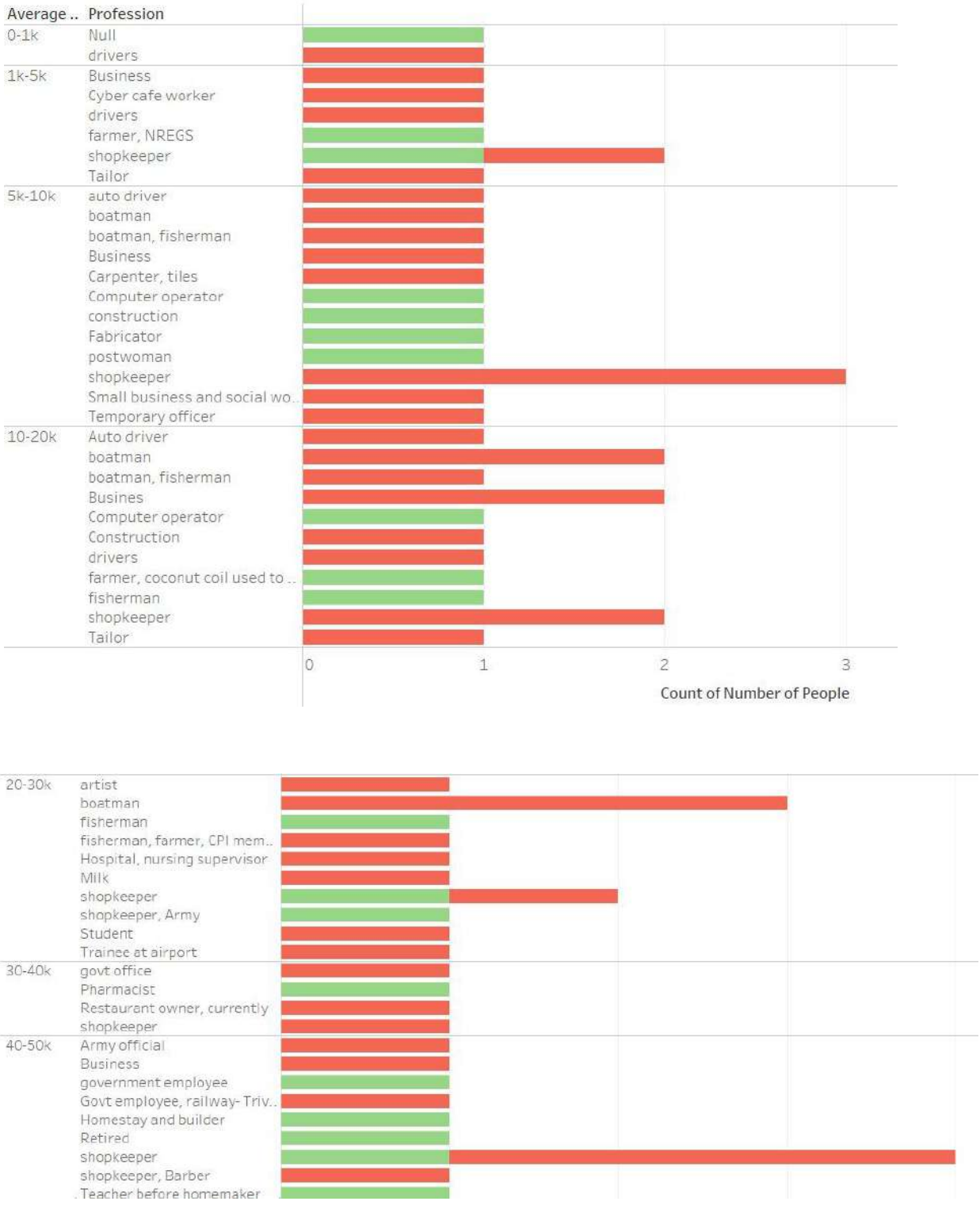

Figure 18. Income brackets and their correlation to receiving financial aid

The graph above, therefore, displays that most citizens of Munroe fall under the income brackets of 5000-10,000 and 10,000-20,000 per month. Additionally, the ones to receive the most financial aid are those in the 40,000-50,000 income bracket and the 5-10k bracket. As seen above, the major occupations falling under the 40-50k income bracket are government officials and employees and teachers which explains why the financial aid has been given to them. Additionally, the 5000-10,000 bracket consists of a large amount of Munroe's population and of lower economic status therefore do receive help from the government.

Healthcare and Sanitation:

Healthcare on Munroe Island covers all aspects of health issues experienced on the island and the healthcare facilities cater to all the citizens of the island in a satisfactory manner. The information mentioned below has primarily been obtained from interviews conducted with the two doctors in charge at the Primary Health Centre and Dr Manju Shah (an Ayurvedic practitioner in Munroe).

The public health centre is directly under the state and local government and has 2 medical officers along with one person in charge of the administration present at the centre. The island of Peringalam does not have medical facilities thus, the villagers need to be taken to a different island in case of an emergency. The PHC (Primary Health Centre) does not handle casualties, the hospital in the neighbouring city of Kollam is used for more serious cases. There are approximately 70 patients that visit the OP (outpatient) each day. During the flood, the hospital was affected and is being rebuilt as of February 2023, and thus the medicines were moved for keepsafe. Suspected dengue cases in 2022 stand to be 3 and 2 as of January 2023.

Leptospirosis and Dengue are not observed on the island as otherwise expected. This is because both Leptospirosis and Dengue are water borne diseases. One disease that is observed across the island due to the water is Tinea. Overall, the doctor’s mentioned that the people of the island are healthy and no unique or fatal diseases are spread on the island. Other common lifestyle diseases include hypertension, diabetes, NCD, allergies and fever and do not differ when compared to the affected areas of the island also owing to the higher immunity levels seen in the locals. Coming to water and sanitation, chlorine tablets are provided to the locals to purify the water.

Ayurveda is also regularly followed by the locals. Several policies and government schemes have been implemented to make ayurveda accessible. “The people trust Ayurveda more than modern medicine” explained Dr Shah

Covid- 19 Pandemic:

The Covid-19 pandemic played a huge role in altering the lives of citizens across the world, and the same occurred at Munroe Island. Due to the lower population and limited interaction with city life, the number of covid cases observed on the island were limited to 13. The revenue departments fund the relief camps that take place during emergencies such as covid, however, they did not require any large-scale measures due to the limited number of cases and high level of curability. Vaccines were applied all across the island, one of the main centres being the Public Health Office near the Kallada Station.

Apart from the measures taken during Covid and the condition of the island during the 3 year pandemic, the locals expressed their disappointment about the real estate and tourism business encountering a downfall.

Overall, the pandemic did not leave the island and its people suffering and was a rather easier period to tackle for them compared to the rest of the world.

Crime and Safety:

Munroe has been described as a safe and secure place to live by both the police authorities and locals interviewed by the researchers. Compared to the higher crime rates of the rest of the state (Kerala), the island encounters a relatively lower rate of crimes. Mr Madhukuttan and Mr Sunil (Police officers) both expressed how there are very few murder cases on the island and the villagers are civil people who do not engage in crimes. Additionally, caste and religion based crime is not committed on the island.

Lastly, when it comes to the crimes committed on the island; there is the presence of the land mafia and estate mafia. The availability of data on the same has been limited however, police officers did mention that the land mafia used to exist in 2012. They still do engage in mafia but have weaker and fewer incidences of reported activity after the government actively targeted them in 2012. There is also a history of terrorising certain locals and manipulating them into helping them with their sand mining / land mining activities, which is much less reported now.

An important part of the research is gaining an understanding of the perceptions and opinions of the people and simultaneously also taking into account their knowledge and awareness level of the situation of the island. Therefore, the following section of the report will aim to answer the question- *"How do the residents of Munroe Island view the future of their community in terms of development and the phenomenon of mass exodus?"*

Awareness amongst the Locals:

Awareness levels amongst the locals about the current condition of the island and the reasons behind it are relatively high however, the knowledge about policies and measures being taken stands low; where only 52% of people were aware of government schemes and policies. Through the interviewing and interaction process with the locals, the researchers came to the conclusion that most locals are aware of the changes in occupations, land conditions, living conditions, environmental conditions of the island, and the fact that the low-lying parts of the island are more affected. There is also wide-spread knowledge about the causes of the same being the building of the Thenmala dam, climate change and other human activities causing water intrusion. However, when asked about their understanding of government intervention there were relatively fewer responses. Thus, concluding that the high literacy rate as seen across the island has led to a high level of awareness amongst the locals about the condition of the island. The locals for the most are aware as to which parts of the island are suffering and why. The locals had a limited understanding of the legal measures being implemented, attributed to the unavailability of easily accessible information.

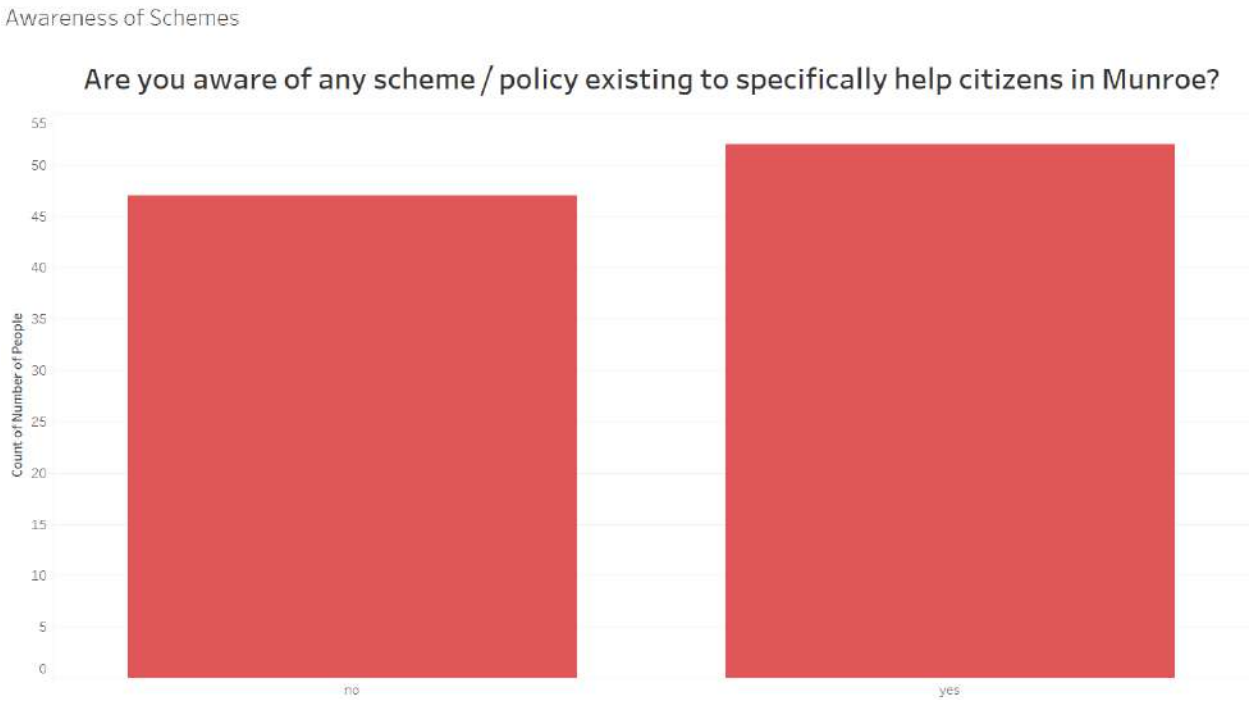

Figure 19. Awareness level for Schemes present

Immigration and Migration:

In Munroe A large volume of the working population that was interviewed during the on-field research period spoke about their time working in the Gulf in several different industries such as the oil extraction, technician roles and construction work. Multiple middle-aged men in Munroe have worked as technicians somewhere abroad at some point in their life. Additionally, locals and government officials expressed that people do not tend to return to the island once they've secured a job elsewhere unless visa renewal becomes an issue.

For centuries, people here have been dependent on fishing, coir and coconut farming, and tourism for their livelihood on the island. However, in recent times, these traditional livelihoods have been impacted by several factors, including the environmental conditions, COVID-19 pandemic, changing weather patterns and subsequent government policies and lifestyle changes. During the course of this research, it was found that 57% of people did not want to migrate from the island, whereas 30% wanted to migrate from the island. 12% of people were unsure whether they wanted to move or not.

The question- *"How have the environmental vulnerabilities impacted traditional forms of livelihood on the island? What are the alternative emerging industries?"* reveals a complex web of factors at play about the challenges related to their livelihood.

Coconut Farming and Coir Production:

Coconut farming and Coir production are historically significant to the people of Munroe Island. Coir production is integral to their culture and handicrafts, adding value to the usability of coconuts. But the industry has faced challenges, with profitability and demand being major issues. The abundance of coconut trees led to an overall lack of demand, and environmental factors have made tree maintenance increasingly difficult.

The spread of the Mandari disease has disrupted the coconut farming industry in Munroe Island, leaving behind a livelihood that was once essential to the locals. The significance of coconut farming in the area can be seen in the anecdotes shared by the people. Mandari, also called Aceria guerreronis, is an eriophyid coconut mite that causes economic devastation by ingesting coconut plantations, reducing production by up to 60%. The immature nuts are infested and injured by mites that feed on the perianth portion, leaving coconut trees in an unhealthy condition, unfit for consumption or use. Consequently, the number of coconut trees has significantly decreased. The surviving infested trees can be seen growing by the riverbanks, either half submerged or unsteadily waterlogged at their roots. They lean diagonally downwards, their coconuts and barks covered in white, powdery patches. The coir production industry has also suffered as coconuts in Munroe Island produce less coir than those in Kollam. Though the technology was eventually developed in Munroe, it was more profitable to import coir from Kochi and process it on the island due to the economic advantage in large cities, further exacerbating the situation.

Mr Karunakaran's words reflect the harsh reality of the situation, where people have lost their jobs due to the reduction in coconut farming. Mr Saiju's[1] story also paints a picture of how coconut trees used to be abundant in the past, but have now become rare. Therefore, it is crucial

[1] Grocery Shop Owner at Munroe Island

to consider the impact of climate change and diseases on coconut trees and take necessary steps to protect the livelihood of the people.

As per research conducted in 2020, an industrial sector has been set up with a handful of cashew mills, sawmills, brick kilns and coir units. Cashew mills of Munroe have been exposed by European tourists for their unhygienic conditions and poor treatment of workers as workers developed several skin issues.

Fishing and Fish Farming:

Coming to another prominent aspect of livelihood on the island; fishing is a major source of livelihood in Munroe Island. However, it has been facing challenges in recent years due to salt-water intrusion harming the fish, leading to locals leaning towards fish farming if their financial condition permits it. As per research, currently, 70% of the shrimp farms in the Kollam district are located on Munroe Island.

Despite the challenges, there are still many who continue to rely on fishing for their livelihood. Girilal, a nearby fisherman, peddles fish both wholesale and retail. He cultivates fish and vends hefty quantities to prominent events at a prearranged cost, and believes that the fish in the zone burgeon particularly when it rains. On the flip side, there are also advanced fish cultivators who put in approximately 4-5 lakhs in fish, with a 40-lakh comprehensive investment. The harvest is solely twice a year, but it totals an average profit of 60 lakhs.

Figure 20. Fisherman's Dock

The financial state of the fishing sector is anything but satisfactory, as the typical fish farmer earns a modest sum of 30,000 rupees monthly. Nevertheless, the government's allocation of subsidies towards pisciculture is a constructive measure to encourage the durability of the sector.

Shrimp cultivation is practised twice a year with updated techniques. They majorly export to the US and Europe. Increased fertilisers have led to outbreaks of shrimp diseases and in order to fight these diseases, antibiotics have been used before, but were invariably stopped as they were being refused by the international markets. Continuous disease outbreaks, high capital investment, variable market value and operating costs have led to the shutdown of many small shrimp businesses. Munroe Island has all the necessary resources to produce large quantities of shrimp but lack of market knowledge and sustainability measures holds it back.

It is noteworthy that the proceeds from fishing are subject to seasonal variations, and a majority of fishermen prefer to sell their catch to destinations outside Munroe Island. The manager of a local bank attests that fishing revenue fluctuates and is frequently insufficient to satisfy the basic needs of the fishers and their families. However, fishermen themselves swear by the profession,

categorising it as one of the more stable and profitable income sources after tourist-engagement jobs,

The fishing industry in Munroe Island has encountered numerous impediments but remains an essential source of income for many natives.

Tourism:

The backwaters of Kerala are a major tourist destination for travellers all across the world. The primary and most important focus of Munroe in recent years has been its tourism. Boating in the lakes and canals is the main activity and this makes Ashtamudi Lake a prominent destination for the same. But the district of Kollam and Munroe Island overall have a lesser number of visitors due to improper planning, management, and lack of marketing efforts of the destinations. (Jamal, Ashina & John, Annie.) The group of islets are serene and aesthetically pleasing with a lot of activities. Tourists can participate in coir weaving, visit coconut farms on the lakeshore, try fishing during boat rides, and explore the canals and waterways along the mangroves.

As said by many of the locals and officials interviewed on the island and mainland, tourism is the future of Munroe Island and therefore a large number of people are seen moving towards the tourism sector as a source of income. This does not only involve hotel chains and homestays but also tour guides, boatsmen, restaurant owners, and small businesses such as grocery stores and souvenir shops. As per an interview with a law enforcement official, the surge in the tourism sector commenced in 2012, and since then, multiple construction ventures, recreational boating pursuits, and homestay rentals have arisen to cater to visitors. Nevertheless, the emphasis of growth has mostly centred on ephemeral undertakings and grand-scale schemes, rather than on ecological preservation and sustainable advancement. This is especially significant because travellers come to the island exclusively for its unblemished natural charm. The paradox, as stated both by the director of IIIC and the SHO of East Kallada Police Station, is that the very natural beauty that makes Munroe popular with tourists, is threatened by the boom of unsustainable urbanisation which facilitates tourism itself. The economy of Munroe Island is run by tourism majorly with over 40% of the working population earning their livelihood from the industry.

Figure 21. Boating at S Curve

Furthermore, it is worth noting that the COVID-19 pandemic has had a significant impact on tourism in Munroe Island. Numerous visitors had cancelled their trips and government authorities imposed travel restrictions, leading to a substantial setback for the industry. Nevertheless, it is essential to highlight that the pandemic has had unintended positive consequences on the island. The decline in tourist activities has encouraged many locals to revert to their customary means of subsistence, such as fishing and agriculture, to support themselves during these trying times.

"How has tourism taken over as an important source of livelihood for the island?"

Munroe Island's potential as a tourist destination has been acknowledged by both local and international investors in the tourism industry. However, the pandemic caused disruption to the plans for further expansion and funding in the industry, such as the proposed holiday spots and aviation strips that were to be financed by the Japanese administration. The lack of sustainable maintenance of previous projects and plans for the future also impeded the progress of the sector. It's noteworthy that, despite the challenges posed by the pandemic, Munroe Island has remained somewhat unscathed by the virus, with a very low count of cases reported. This is presumed to

be due to the island's isolated location and the stringent measures enforced by the local authorities to control the transmission of the virus.

As one reaches the culmination, it becomes apparent that the Munroe Island community has been affected by a plethora of economic, environmental, and social aspects. The once flourishing coconut farming business has undergone a downturn owing to the debilitating mandari disease and the volatile climate patterns. Further, the fishing enterprise has not remained unscathed to the effects of human intervention, with the development of dams leading to contamination and overfishing contributing to a reduction in fish stock. Nevertheless, it is crucial to take note of the instances of victory that shine through, including successful fish cultivation and ingenious fishermen who have displayed perseverance and adaptability in response to the altering circumstances.

The diverse facets of tourism create a dilemma for the Munroe Island society, who strive to maintain an equilibrium between promoting economic progress and conserving the environment. While tourism has certainly furnished economic opportunities, the probable negative impact on the island's natural habitat must be taken into account. Hence, it is crucial that the district administration concentrates on devising sustainable schemes that would not only enhance the well-being of the community but also safeguard the exceptional ecosystem of the island.

In conclusion, it is of significance to note that beyond conventional streams of revenue like agriculture and fishing, career paths such as teaching and government jobs have surfaced as lucrative options in Munroe Island. Nevertheless, the inception of the Thenmala dam triggered a chain reaction that was unpredictable, as saline water permeated into the nearby lands for 10 months of the year. This led to the transformation of paddy fields into shrimp farms, which resulted in the displacement of several fishermen who had no option but to find work elsewhere, such as in the construction industry. Consequently, agriculture has taken a backseat as a means of earning a livelihood for many members of the community.

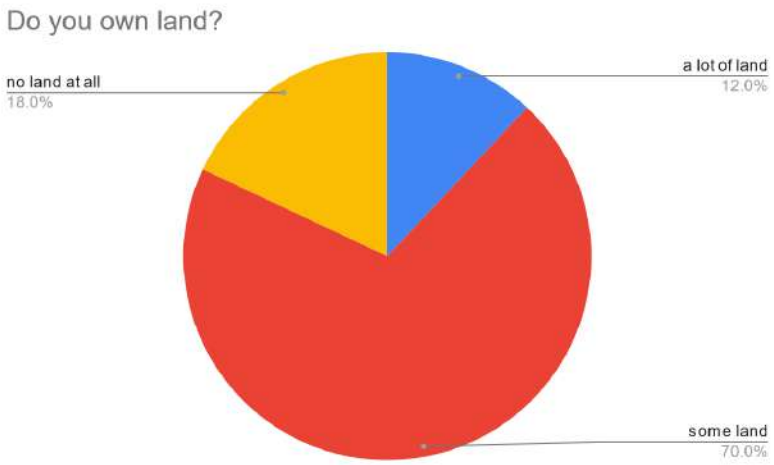

Figure 22. Ownership of Land

Through this chapter an understanding about the various aspects of lifestyle and livelihood that play a crucial role in defining the day-to-day lives of the locals living in the region. Factors such as education, banking, and healthcare were discussed in order to justify the role that they play alongside the professions prevalent on the island and how they play a relevant role in studying the island.

Chapter 8: Infrastructure

This part of the paper covers the Infrastructural condition on the island which is subdivided into Industrial, Connective and Social Infrastructure. This is an important part of the research conducted as it focuses on the impacts and preventive infrastructure that can and has been made to help tackle the impacted living condition of people on the island due to the several environmental vulnerabilities observed.

Industrial infrastructure on Munroe Island mainly includes the Manufacturing and Energy units that provide a source of livelihood to the residents. Considering the geographical location and situation of the Island, the condition of the industrial set-up is subpar but literature on the same is lacking. The resident's main source of livelihood is derived from the tourism industry, aquaculture, agriculture, and minimally the coir industry. Hence with the on-field research the question- "*How is the Industrial Infrastructure of the Island coping with the environmental changes?*" is answered.

There is continual reference to multiple on-field primary and secondary sources and research in this section of the paper. The most recent source is an appraisal done in 2020 by post graduate engineering students, Dr Annie John and Dr Ashina Jamal of T.K.M College of Engineering, Kerala. Followed by sources ranging from 2016 to 2019 onwards. There has been a preliminary inspection and a brief report performed by an expert committee and the report was amended in a meeting conducted by the Secretary of Environment in August 2016.

Tourism is considered the island's strongest suit in pursuit of livelihood and a spot for attraction in Kerala. There are numerous statistics and census (pre-field and on-field) that back up the fact that tourism on Munroe Island is a strong ongoing factor but definitely requires a lot more assistance. "About 80% of the total tourists visiting Kollam, mainly go to Munroe Island as a holiday destination", says Secretary District Tourism Promotion Council, Kollam. Out of the overall 35 homestays in the Kollam district, 25 of them are in the island. After conversational and recorded Interviews with the position holding residents of the island such a members of

ICDS (Integrated Child Development Services), PWD (Public Works Department), Canara Bank Manager, Dr Annie John as well as the Welfare Head at the Sarpanch Office, all are of the opinions that tourism is the future of the island but still requires infrastructural support. Multiple local residents also noted the various benefits that could ensue if the government aided the tourism industry and economy. Due to tourism's continual growth over the years and visibly gaining traction, now more than 40% of the residents are involved in the industry after the gradual decline of the mining and coir industry in the area.

The resident's various sources of energy and power units are in injured condition. LPG primarily powers their cooking fuel while only 1% of the population utilises firewood. Streetlights are unavailable in 46% of the area while there is a lack of internal connective roads, especially near railways lines, etc. There have been instances of construction and activities violating the CRZ notification (Coastal Regulation Zones). Keeping in mind the geographical presence of the island, the quality of drinking water is moderate, only seeming to be worse in affected areas during high tides, otherwise remaining drinkable after boiling and purification. The primary source of water is KWA (Kerala Water Authority). Water harvesting is not a widespread practice in any of the houses. Recalling the constant environmental happenings, specifically during high tide in low-lying areas, the water supply to homes is complicated due to the lack of resistant infrastructure. The main island and a few better-off islets were noted to have borewell pipelines to their taps while the rest had access to wells and hand pumps etc.

As for the manufacturing and business industry units in the area, they range from cashew factories, sawmills, brick kilns, country boats manufacturing units, small-scale commercials, and textiles to widely known coir industries. All of these are well within the constraints of small-scale production. The primary source of livelihood after tourism is derived from aquaculture as the other previous sources of livelihood have seen a gradual decline. Aquaculture is practised in modern and traditional aqua farms. They have all scales of developed technology for this purpose and were noted to be a sustainable source of income for most though there is a strong disparity on the islets for the same.

According to the local residents of the island, there are multiple suggestions and spaces for improvement of the energy infrastructure of the island. There is a need for an efficient streetlight network throughout the day as there is an absence of the same. The usage of alternative energy sources should be assisted and encouraged such as solar energy, biogas, etc. The only possible obstacle for electrical transmission possible in the area other than the unexpected natural causes is the extensive,natural growth of vegetation. The government needs to craft detailed and economically feasible solutions to the declining industries, namely coconut cultivation and new salt-tolerant varieties of paddy while simultaneously firmly aiding and pushing the tourism industry to support and revive the livelihood of the residents.

This section of the chapter focuses on Munroe's connective infrastructure which refers to the roads, railways, bridges, sea transport, inter-ward canals, WiFi, telecommunications, additional public transport facilities, local paths, landmarks, and key entry-exit routes of the island.

A spatial-planning research paper by Joseph (2017) identified that all 13 wards of the island have either lake water, river or backwater edges and all of them are connected by multiple intersecting canals. It can be inferred and verified from on-field research that intra-island connectivity is heavily dependent on these water routes (via canal boating circuits). In comparison, the developing roads are described as "in need of improvement in terms of surface quality and total road length". The Peringalam island remains inaccessible by any road. This was further confirmed by on-field research. A recorded interview was conducted of Mr Binu Karunakaran on February 20, 2023, on the boat ride to the Peringalam island. He addressed the lack of connective infrastructure between the mainland to other islets. The region is heavily dependent on water transportation for inter-island travel. According to Mr Binu, the construction of a bridge to Peringalam is unable to proceed due to the objection of the railway department. He quoted the cost of boat conveyance for material transportation to be 8 crore rupees, while the cost of bridge construction would have totally amounted to 3 crore rupees.

The railway line, measuring 3.4 kilometres, divides the island village into two, with pedestrian paths on the left and more vehicular activity on the right.

Figure 23. CPIM Protest

On 23rd February, a protest was led by the CPIM party against the inadequate railway infrastructure at Munroe Island. The protest was attended by Ms Mercykutty Amma, Ex-Minister for Fisheries and Harbour Engineering. After attending the protest, the researchers were informed by a covert operator of the railway brand and a CPIM party member about the protests demands. They demanded conversion of Munroe station from a halt station to a main station. Train 16366 Kottayam Express ran every day at 5:15 p.m., allowing students, labourers, office workers, police officers, and other professionals to return to Munroe from Kollam after work. This train was rendered inoperable during COVID-19 and has not been operational since. The train station is severely underdeveloped with no proper lighting and lacks a foot-over bridge between the two platforms. This makes the crossing between platforms extremely dangerous for travellers, especially at night.

Figure 24. Munroe Railway Station

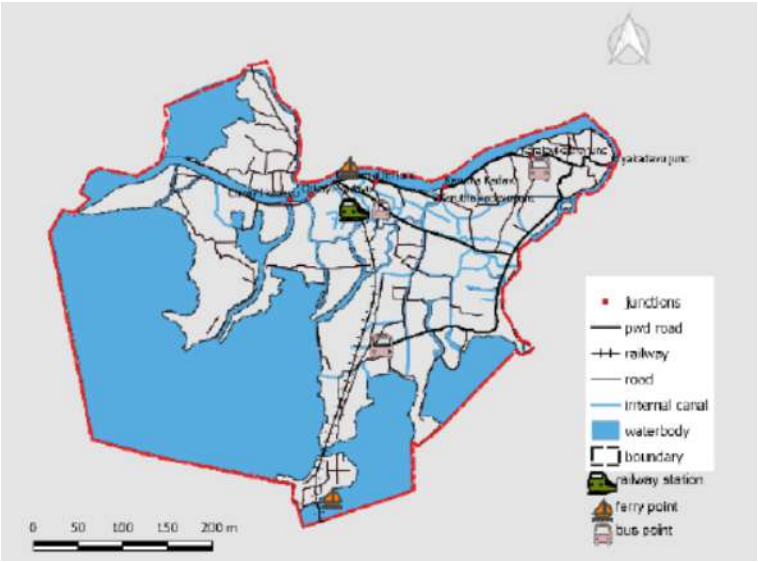

Figure 25 Map of types of Infrastructure on the Island

Note: This map shows the accessibility and major junctions on Munroe Island.

From Figure 8 of 'Appraisal of Munroe Island in Perspective of Tourism Development' by A. Jamal and Dr A. John, 2020, International Journal of Science, Engineering and Management (IJSEM), 5(4), p. 22, All Rights Reserved © 2020 IJSEM

Faulty infrastructures inhibit Peringalam locals from availing of emergency medical assistance. The locals need to travel to the mainland to seek medical services, and the state of transportation increases travel time posing a risk to public health. There is growing public outrage over the condition of the Perumon bridge. The bridge acts as a link between Munroe mainland and Kollam which reduces travel time drastically. According to Father Rajeev Subhu of Peringalam, a sizable population of Mundrothuruthu commute daily between Kollam and Munroe. The commute is up to one hour by bus, but if the Perumon bridge was constructed, it would extraordinarily reduce commute time benefiting the locals.

According to the Bureau(2023), there is no official clarity on the completion of the Perumon bridge. There is growing public concern and outrage citing the delay of work which had to be stopped due to technical issues. Locals are dependent on water transport for commuting and ferries are overburdened. The completion of the bridge reduces travel distance by 10km. The estimated costs add up to 42 crore rupees. The bridge is partly constructed on either side but there is a portion unfinished in the middle. The uncertainty surrounding the technical issues halted the construction of the approach roads as well. There is a construction procedure dispute between the contractor and the Kerala Road Fund Board. The contractor claimed an increase of 10 crore rupees to resume as there was a difference between the specifications of the bridge and the detailing.

Very little is known about the telecommunications and digital infrastructure of Munroe. Informal tourist reports suggest that there is a general lack of WiFi on the island. Additionally, multiple government plans for further connective infrastructure and improvements on Munroe have been drafted over the last decade, but there are no follow-up status reports on such plans - and whether or not they were even commenced on schedule. Hence, with the aforementioned information, it explains the current situation of the connective infrastructure on the island thus acknowledging and answering the sub-research question of, “What is the current state of connective infrastructure on the island and how is it impacting the residents?”.

This section of the chapter covers the aspects of social infrastructure on Munroe island. Published information and secondary data in this section are limited hence on-field research is imperative to shed light on the present state of affairs. Social infrastructure refers to, “The availability of social services through the presence of adequate social assets.”

The islets have an adequate social infrastructure concerning waste disposal and management. According to Jamal & John (2020) backed by on-field research, most houses and residential complexes in the Mundrothuruth Panchayat in less affected areas have access to in-house biodegradable waste disposal and management facilities. Waste management facilities play an important role in the panchayat as they reduce the burden on the land, especially with the sudden increase in human footfall due to tourism activities. The survey area sheds further light on the waste disposal systems and pipelines getting waterlogged during high tides. Municipal non-biodegradable waste collection is irregular and residents resort to burning their waste which in turn affects the environment due to pollution. During the rainy season, leachate often percolates into the local water bodies such as drinking water wells. The drinking water supply in the island region is supplied by the KWA. The region is characterised by heavy rainfall, but water harvesting is not carried out by residents.

Joseph(2017) drafted a master plan segregating Munroe Island’s into specialised clusters. Religious infrastructure is concentrated in three regions: Old Mathoma and Catholic churches are located on Peringalam island, and Hindu temples are located on Pattamthuruthu and Pezhamthuruthu islets. These areas are marked by seasonal visitors and footfall rises during festivals.

The region is characterised by heavy seasonal rainfall which wreaks havoc on the vulnerable infrastructure capabilities of the island. Lancelet(2019) and field observation notes shed the gravity of the rainfall and high tide situation. High tides range from 0.2 m to 1m, which enables water to enter the land and remain waterlogged. This flood water enters residential housing and other buildings. Sadeesh, a 45-year-old resident of Peringalam mentioned how during high tides water enters his house but he does not believe high tides are a matter of grave concern. The Mundrothuruth panchayat reported that as many as 150 families were affected due to residential damage caused by high tides. A report written by Planning Board Member Jayaram(2018) claims

that around 1400-1500 houses spread across five wards in the Mundrothuruth Gram Panchayat are at severe risk and might have been affected by climate change.

Figure 26 - Flooded House due to high tide

High tides and rainfall cumulatively cause newly built houses to sink by almost half a metre in 2-3 years, if the foundations used are not of special quality. The report gauges the presence of countless abandoned residential houses in the aforementioned wards. These houses usually contain just a single pit toilet which is unhygienic as the water table is at or near the surface of the house.

The high tide claims numerous residential and commercial buildings under its fury and compels residents to live in ankle-length water in low-lying areas. Damaged foundations of residential houses and coconut cultivation also have caused increased pressure that leads to settlement; referring to the change in the elevation of buildings due to excessive pressure on land or other causes according to the Centre for Advanced Maintenance Technology (2017).

Mr Binu and Prof. B. Sunil Kumar (Civil Engineer at the Indian Institute of Infrastructure and Construction) had opinions about the housing foundation on the island and hence provided some

suggestions to reduce the burden of faulty construction. Prof. B Sunil Kumar mentioned Piling as a form of house foundation technique- N-bearing Piling, Friction Piling and Coconut Piling. Out of which, Coconut Piling is suspected to be the only relevant technique while being locally most feasible. The implementation of weightless roofing or the construction of one-storied housing can reduce the burden on the land. There have been multiple suggestions of projects by position holders such as Mr Binu, but none see any execution, which is said to be primarily due to lack of funds for the same.

Figure 27 - Wall of a house damaged due to seepage

The key findings of on-field research and pre-field reading of Jha & Sahib (2016) recorded that the houses in the region have transitioned away from traditional to concrete structures. These new methods of piling techniques against the traditional lightweight methods from wood are more expensive, something that most fishermen and locals cannot afford. Due to this, the layer of clay seeps away into local water bodies, reducing the foundations of houses in the region. This damage is especially excessive next to water bodies. Residential houses in the Mundrothuruthu panchayat underwent foundational damages that cause day-to-day seepage into their walls and flooding of water into the housing infrastructure in low-lying affected areas. The researchers conducted a field survey and the results indicated that 62% of the participants reported that they never faced tidal flooding in their homes, while the remaining 38% had experienced flood water entering their homes at some point during their stay on Munroe. Residents have tried increasing the floor level but this in turn lowers the roof level and increases foundational damage due to the sudden increase in stress. The above section tackles and answers, “How sustainable are the houses on Munroe against the climatic forces?”.

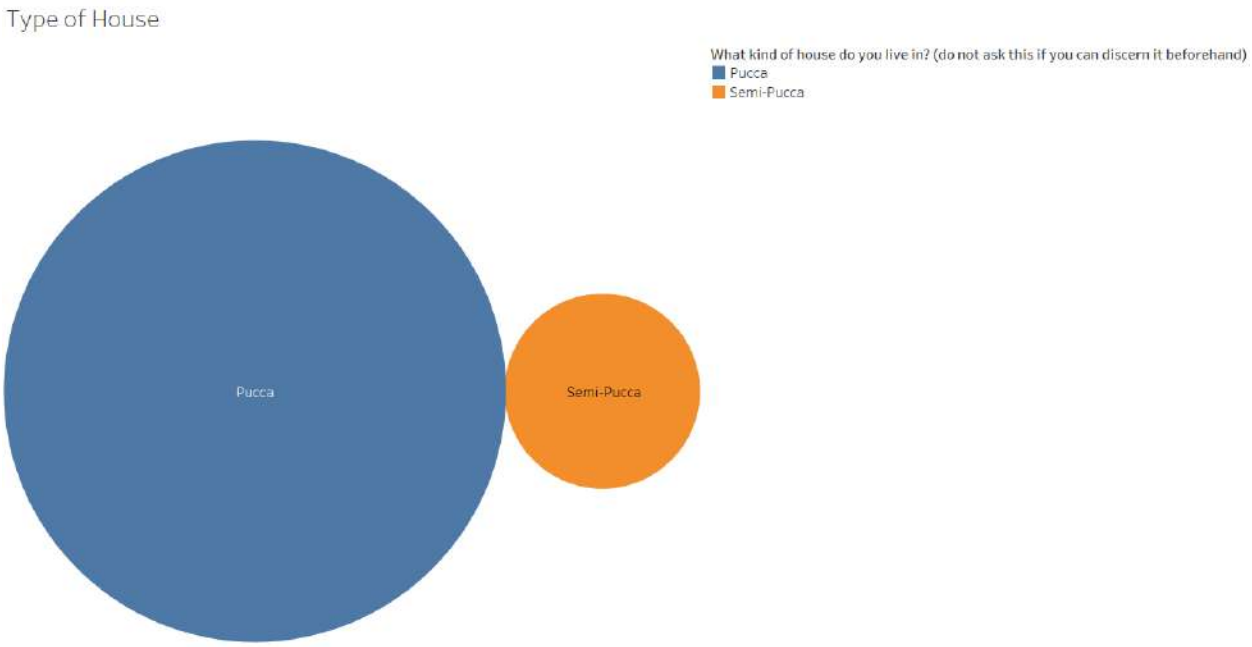

Figure 28. Pie chart representing types of houses on the Island

Hence, as per the aforementioned information it is entirely understood how the Industrial Infrastructure on the island is coping with the detrimental environmental changes and the current state of the connective infrastructure on the island with its impact on the residents. Additionally, now there is awareness about the social infrastructure on the island, especially the houses and their sustainability against the climatic and socio-economic changes.

Chapter 9: Policy

The aim of this chapter is to answer two essential questions:

a) What is the status of the implementation of the regulatory policies employed at Munroe?

b) What is the satisfaction level of the residents with the government's response to the situation on the Island?

Since the region started to observe the drastic effects of the 2018 floods, the authorities of Munroe Island have been hard at work identifying the problems of the region and taking initiatives to stop them and reverse their effects. Media coverage about the region also increased drastically, painting the island to be in a pitiable state. This led to multiple research groups and colleges from the district, and even other parts of the country, studying the various environmental issues that Munroe faces. The findings and conclusions from many of these researches are available as scientific papers on the internet and in the colleges that conducted them. Several renowned media outlets have also analysed the current policy structure present in the area and suggested improvements.

Development

Year 2020

The Grama Panchayat of Munroe Thuruthu drafted a master plan in order to tackle the challenges posed by environmental changes which were approved by the District Planning Committee. This includes the building of multiple bridges, "The Perumon-Pezhham Thuruth bridge, Kannangattu bridge, Munroe Thuruthu-Thevalakkara bridge, Arinallur bridge, Pattam Thuruthu East Kidapparam South bridge" along with a number of roads in an effort to increase tourism on the island by making travel more convenient. Areas vulnerable to subsidence were to be protected through the means of lightweight construction. In the "near future", 50% of the people residing on the island will need to be shifted as specified by the Coastal Regulation Zone (CRZ) rules. One of the recommendations made was to construct more houses and facilities to equip the island with the capacity to host more residents and tourists. (The Hindu, 2020)

Year 2022

In June, it was reported that a special district development committee meeting, presided over by District Development Commissioner Asif K. Yusef, had prepared an elaborate calamity mitigation and growth strategy for the island. Special initiatives in agriculture, hospitality, environmental preservation, and infrastructure will be developed so that the plan can be realised without affecting the island's existing ecosystem. For each, a review panel of representatives from different departments will be created. The committee members will develop projects in their respective fields, which will be integrated to form the overall plan. The plan was to be executed in only three months, with the support of various Central and State schemes. Every month, the committees will meet to examine the project's progress. (The Hindu, 2020)

Panchayat's Financial Crisis

The impact of the devastating 2004 tsunami and recurrent flooding since 2018 caused a steep decline in tourism, which was one of the main sources of income on the island. The onset of COVID-19 only made matters worse, and the region is yet to recover from the setback. A dire need for a boost in the economy has been identified by Kerala State Human Rights Commission (KSHRC). This could potentially be addressed with a monetary stimulus or increased advertising. Certain studies found the housing pattern to not be suitable for the island's climate conditions (Hashim & Surajuddin, 2021). Construction and infrastructure are pivotal areas of concern left largely unaddressed by policymakers. To overcome the current situation, the government must provide special financial support and draft a concrete plan for the future if tourism is to be the primary source of income for the island. When funds are distributed in proportion to the population, Munroe Island continues to receive the smallest monthly allocation. The panchayat president has also requested that norms be relaxed and that funds be increased (The Hindu, 2022).

Relevance of Policy Research on the Island

Munroe Island's local government is eligible for a subsidy from the Government of India, meant to aid in bettering the living conditions on the island. In order to obtain this subsidy, they are required to submit a four-year master plan. This master plan is made up of a project and a budget

for developing the area over the next 4 years. This master plan is therefore vital for identifying and solving the problems on Munroe Island.

The local government of the island has not done a satisfactory job of identifying the problems the region faces. Munroe Island has been researched multiple times before but it has been claimed that the local government seldom sees the results of this research, as the results are usually not revealed by the conducting institutions. The data collected during studies and the conclusions reached often fail to reach the local government of Munroe Island. Therefore, a strong need for data and solutions based on contextually appropriate data has been identified on the island (Dr Sunil Kumar, Director of Indian Institute of Infrastructure and Construction), Kollam, 2023). Even though several states have already begun to seek support through the Green Climate Fund (GCF), which was set in place as per the United Nations Framework Convention on Climate Change (UNFCCC), Kerala is yet to feel the effects of the fund, which is intended to assist developing countries in implementing actions to mitigate the effects of climate change. Munroe, being a very small part of the state, is far from being positively affected by the GCF. For at least the present and the near future, the policies employed for the benefit of Munroe and its residents are in the hands of the local and state governments. The ones in place currently and the ones planned for the future are discussed below.

Environmental Policy

According to a report from the Department of Civil Engineering of TKM College in Kollam, Munroethurutthu is facing the threat of sinking and soil settlement. The crisis of soil settlement on the island is extremely severe, and according to the results provided by CHNS analysis, carbon, hydrogen, nitrogen and sulphur are the crucial pollutants of the soil. A noticeable percentage (13.054%) of organic carbon is present in the soils of Munroe, specifically in the Pattam Thuruthu East area. However, the least amounts of organic carbon are also found on the same island, towards the Pattamthuruthu-Pooppani region. Although the soil settlement in Munroe seems concerning, it has been concluded that the value of soil breathing on the island, in comparison to other regions, is much higher. (Udayakumar et al, 2020)

Climate change has been cited as one of the main reasons for Munroe's soil decline. Being an extremely vulnerable ecosystem, the estuary is majorly affected by ecological processes of the land and sea and also as a result of anthropogenic environmental stressors such as deforestation and even climate change, as mentioned earlier (Rafeeque et al, 2023). Since 2015, The Department of Revenue and Disaster Management, Government of Kerala, has been implementing a project for Enhancing Institutional and Community Resilience to Disasters and Climate Change under the banner of the GoI-UNDP. The chairperson(s) of the District Disaster Management Authorities have selected Munroe Thuruthu in the Kollam district and Peringara in the Pathanamthitta district for implementation of the Community Based Disaster Risk Management Programme (CBDRM) which also requires participation and active involvement from the community (Department of Revenue and Disaster Management, 2015).

As far as the conservation of the mangroves of Munroe Island is concerned, the government is planning to take over the mangrove plantations to ensure their preservation. The island categorises itself as an eco-sensitive zone on the recommendation of the advisory committee. This project will be funded by the Rebuild Kerala Initiative, and the action will be taken in accordance with the Management of Ecologically Fragile Lands Act, 2003. Initially, Munroe Island, along with Vincent Island and Ayiramthengu in Kollam, and Thathampally and Chettuva in Thrissur were to be taken up as a part of the project. This was done under a strong demand to protect the mangroves of the state. The Kerala government also implemented a scheme wherein it provided Rs. 4,000 per acre to those landowners who helped preserve the mangroves of the areas. (Kumar, 2021)

Figure 29 . Picture of a Dead Mangrove

Figure 30. Picture of a Dead Coconut Tree

Social Welfare Schemes

Kerala boasts a commendable literacy rate of 94% and despite Munroe's lack of colleges and universities, there echoes a very positive sentiment among the locals regarding the importance of education. It was not uncommon to see 50-year-old widows still being part of the workforce. Upon inquiring further, a list of women-centric empowerment schemes came up, Kudumbashree being the most prominently referred. A few local men did comment that female participation is not very visible in the job market and is restricted to cashew farms or tailor shops, but were able to hear a different story from the women running their own businesses and who were placed in cyber cafes through the initiative of Kudumbashree. Kudumbashree is a Kerala-wide program made to eradicate poverty and generate livelihood opportunities given the state of unemployment in the country, which stands at 7.74% (CMIE, 2023). This program was launched in 1997 and this membership is open to all adult women of Kerala given that only one member can partake from one household (State Poverty Education Mission, n.d.). There exist multiple opportunities in this mission however, the one that was most utilised was the National Urban Livelihood Mission, which is reportedly responsible for creating at least 592 jobs (New Indian Express, 2022). The women that were heard from about this program spoke highly of it and acknowledged the effect it had on their lives.

Health Policies

There was one emergency healthcare centre and one holistic medical facility on Munroe Island with the nearest hospital being in Kollam, less than an hour away. A doctor at the PHC (Primary Health Centre) who wishes to keep their identity undisclosed provided information about medicines being provided free of cost. The island has good availability of medicines that are funded by the state and local government. These government bodies also offer separate funding for cancer and dialysis patients. All medicines are provided to citizens free of cost, and medical assistance and ambulances are provided as per need. Health Awareness programs happen daily in each ward and are sometimes conducted in groups. Clinical training programmes are also conducted to help propagate knowledge of how to manage diseases, public health issues and preventative measures.

However, the public healthcare system is looked down upon by the people who have lived and worked in bigger cities. They prefer and trust private healthcare providers more than the government. However, for those who cannot afford such amenities, protection in the form of insurance has been granted, an example being the Karunya Arogya Suraksha Padhathi Scheme, which “aims at providing a health cover of Rs. 5 lakhs per family per year for secondary and tertiary care hospitalisation to over 42 lakhs poor and vulnerable families (approximately 64 lakhs beneficiaries) that form the bottom 40% of the Kerala population” (State Health Agency Kerala, n.d.). According to PHC doctors, a ward sanitation committee has been set up. A priority issues team visits each ward and provides the required medicines and necessary assistance, and conducts routine checkups door-to-door, free of cost. According to the doctor that was spoken to, there are two more projects in the region: a specific allocation of 1.5 lakhs provided by the government for medicine purchases for the elderly, and an allocation of 2 lakhs for medicine purchases for gynaecological problems. Though not all the residents are particularly fond of or content with the healthcare facilities available on the island, they do not have any urgent concerns and are all hopeful that things would improve soon.

Local policies in the area are set up by the doctors along with the Gram Panchayat. They then identify the problems of the people and accordingly work on implementing solutions. In 2014, the Government of India launched NAM, a centrally sponsored scheme under the 12th 5-year plan, which is also very important locally. The scheme wants to bring the systems from the Ministry of AYUSH into the mainstream and streamline healthcare services, to develop evidence-based protocol through proper documentation for nationwide access to these resources. NAM has been active in Kerala since 2015. The Central Government provides 60% of the funds whereas the remaining are fulfilled by the State Government. The State Medicinal Plant Board allows NAM to support the ASU&H (Ayurveda, Siddha, Unani & Homeopathy) drug sector along with medicinal plant cultivation. It also supports four line departments under AYUSH. For the financial year 2021-2022, the State Annual Action Plan was proposed for a cumulative sum of Rs. 35 crores which would help in running a variety of projects on healthcare and support other institutions under the department. In Munroe, they have a project for medicines that are sourced from the ayurveda dispensary for a sum total of Rs. 6.5 lakhs. This includes oils, kashayams, churans, tablets, etc. It is essential to note that the medicines thus provided are with

the help of the panchayat fund, as the panchayat is responsible for giving a sum of Rs. 10 lakhs to this cause (Indian Systems of Medicine Department, n.d.).

Transport and Connectivity

Munroe's residents are happy with the quality of the roads that have been built on the island itself, but unsatisfied with the lack of those that connect the mainland with other islands. There was an instance where a woman from one of the islands had to take an hour-long boat ride just to be able to obtain a physical copy of an important government document, a facility in Munroe Island provided only at cyber cafes. With the existence of a bridge, the time and inconvenience would have been substantially reduced for her and many others who face these issues daily. The general public is also excited about the building of a highway from East Kallada to Kollam. They are aware that a tender was issued to the public and that construction has been promised to begin soon. However, there is a trend of government infrastructure projects being initiated but not completed. Multiple development plans made by the Gram Panchayat (as commented by Mr Suresh Babu, Member of Panchayat) and the Indian Institute of Infrastructure in Kollam (as mentioned by Mr Sunil Kumar) have been stuck in the pipeline for close to a year. For years, there has been a lack of a foot-over bridge at the Munroe railway station. In order to cross the platforms, one needs to walk over railway tracks, which is an extremely dangerous practice. In a protest arranged to address related safety concerns, it was highlighted by the ruling Communist party that their demand for increasing the number of trains that stop in Munroe as well as the absence of a foot-over bridge has been a result of the state government's oversight. The lack of the foot-over bridge at the only station in Munroe is highly concerning since legally trespassing across railway tracks is a punishable offence under Section 147 of the Railways Act, 1989 (Indian Kanoon, n.d.). This trend of explicit neglect leads the citizens of Munroe to believe that their safety is not a priority.

Figure 31. Picture of a makeshift wooden bridge in Munroe Railway Station

Birth Control

Munroe's population has drastically dropped from about 12,000 to 8,000 (Press Trust Of India, 2022) in the past decade. The residents believe that birth control policies which changed the trend of having 5 children per household to a maximum of 2 kids per household could have played a part in this. The birth control policies in Kerala were not restrictive but were very successful in contributing to the state's population stability. According to the residents, this can be attributed to factors such as the Marxist government, education and a marriageable age policy. The Marxist government introduced multiple land reforms which dissolved the previous land ownership system and the culture of landlords; this effort compelled people to take up education in order to earn a living. Education has arguably led to the comparatively late age of marriage (around 25 for women based on conversational interviews). This has aided awareness about effective contraception and family planning.

Law Enforcement

Reports show that case reportage is very high and the crime rate for major offences is extremely low on the island. Suo Moto offences such as drunk driving or driving without a registered licence are among the most common. Other crimes include the illegal circulation of synthetic drugs such as MDMA amongst tourists. The local police have set up training programmes such as the Student Cadet Initiative which, according to the S.H.O of East Kallada Police station, Mr Sudesh Kumar (2023), was a successful way to involve the youth in law enforcement and introduce them to the ropes of bureaucracy. They are mainly tasked with carrying out drug and traffic awareness drives. The general public, however, views the police force with a sense of fear and distrust. There is an attempt from the police office to combat this fear and change the perception of people regarding law enforcement. According to the S.H.O., there are genuine efforts to do so such as setting up successful health camps during COVID, conducting safety awareness drives as well as being prompt in responding to crimes if and when they do occur.

Sand Mining

In the quaint and quiet town of Munroe, with its low crime rate, the land mafia had an overwhelming presence. Before 2012, they gained a significant amount of control over the islets in Munroe due to their work at the banks of Ashtamudi lake and Kallada river, mining the valuable sand from the banks of the river and lake and selling it. Then the government launched the Sand Mining Protection Act, which criminalised mining sand from river banks and the sale of the same. There have been some restrictions for soil filling as well because when done excessively, it changes the geography of the land. The mafia operates in marshy land with the purpose of filling sand in water to reclaim land and make it more expensive. Most of the landfilling is done to build more homestays or resorts. This is not recommended for the health of the ecosystem and will burden the island and add to its environmental vulnerability (Institute of Land and Disaster Management, 2001).

The Views of the People

Through survey data collection that was conducted (results visualised in Figure X), it has been found that participants between 18 to 40 years of age opted for the agricultural sector and urbanisation/infrastructural development as important aspects that the government should focus on. Participants over the age of 40 opted majorly for boating and tourism, climate and nature preservation, urbanisation and infrastructure as important aspects.

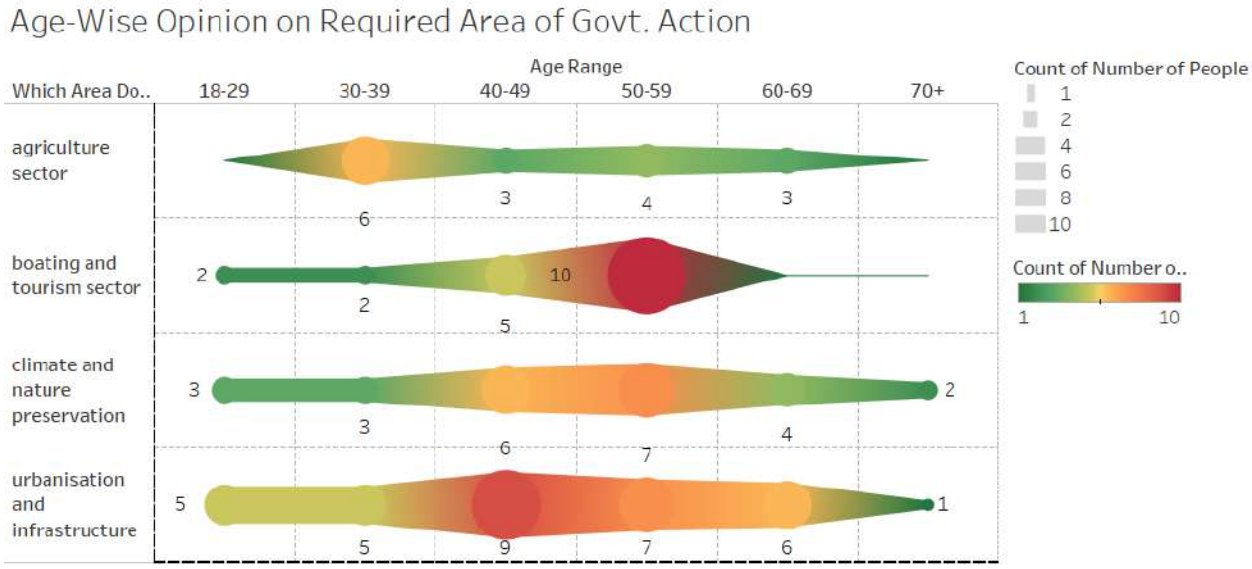

Figure 32. Graph on Opinion of required area of Governmental action- age wise

Through on-field interviews, a need for more monetary assistance has been identified for the residents of Peringalam and more disaster-stricken areas on the island. The mainland dwellers of Munroe make a conscious effort to divert the attention of researchers and policymakers to the lands at greater risk. Employment opportunities there are slim and the residents feel neglected. They are unable to relocate as the property prices and cost of living are higher in nearby islets and even if it will make them feel safer, they simply cannot afford that shift. The mainlanders also demand an increased promotion of tourism. The emergence of tourists there has been positively received, and many believe it should be among the top priorities of policymakers. However, there are next to no policies regarding tourists in play and no planning for the same has borne results yet. French and Israeli tourists were among those chiefly seen on the island and

upon interacting with them, it was revealed that there are a series of famous French blogs about the beauty and alluring reclusiveness of Munroe that attract international tourists. It is certain that the promotion of the island as a quiet retreat will boost the economy, however, regulation will be required to not disregard the capacity of the island and the potential for it to be overexploited due to excessive commercialisation.

Figure 33. Peringalam Housing Situation in 2023

The Future of Munroe Island

The efforts to revitalise Munroe Island and its residents are still far from being dead in the water, but there definitely exists a disconnect between people vulnerable to the loss of their livelihoods due to rising seas and the state government, and such is not the case in only Munroe Island. Kerala, being a coastal state, has its fair share of areas that were hit massively by the tsunami of 2004 and the floods of 2018, and each of these areas' respective communities has sought help

from the government for the benefit of all who are dependent on it. One such example is the much larger Kuttanad region, around 70 km north of Munroe Island.

Kuttanad, the largest producer of rice in Kerala and one of the only places in the world where agriculture is carried out below sea level, is a waterlogged region that has suffered greatly due to the deluge in 2018 and rapid flooding and torrential rains in the years since. The incessant floods cause water to breach the bounds of the paddy fields and flow freely into houses, leaving them submerged for weeks at a time. Many houses have been swept away or left uninhabitable, forcing the families who lived there to seek refuge in other towns. The plight of these refugees is severe, as they've lost their homes and sources of income, and cannot even sell their land for profit as nobody is willing to buy it (Shaji, 2022). In an effort to restore the ecosystem and develop the area further, a fund of Rs. 2,400 crores was announced by the government in 2020 (A. and Hiran, 2022), a sum that could not only bring Kuttanad back up on its feet but also serve as a symbol of hope for other communities such as the people of Munroe Island who are also under the threat of losing their livelihoods due to floods. However, recent reports state that the locals believe the promised days for Kuttanad are still a distant dream as most of the proposals regarding the region remain stuck on paper. After the failure of the first package, a second and much smaller fund of Rs. 140 crores was allocated for the region's paddy industry at the start of 2022, but even that has not seen much success (TNN, 2022).

The example of Kuttanad, where the exodus continues to this day, serves as a cautionary tale for governments when faced with the issue of how to handle areas affected by climate change and natural calamities. The allocation of large amounts of money would be welcomed by Munroe authorities with open arms, but there have to be proper methods of implementation in play to ensure that these funds are utilised effectively, efficiently, and in the areas where they are most needed. The eyes of the world are on Munroe Island, patiently anticipating the Kerala state government's next moves, as what happens on the island can be an example to learn from for all the world when it comes to effective ways of managing and preserving areas impacted by climate change.

Chapter 10: Data Acquisition and Analysis

To gain a holistic understanding, the researchers conducted both quantitative and qualitative research.

They used interviews to acquire information for the research of the Munroe Island's on a range of issues pertaining to island living. Using a question bank of roughly 40 items, it was aimed to comprehend the complex experiences of persons who resided on the island. Many facets of life on Munroe Island, including the environment, the economy, social dynamics, and cultural traditions, were the focus of the research topics. Through these interviews, the researchers were able to learn more about the island and its inhabitants and pinpoint important problems that need more research.

They conducted a survey to gather information about the people living on Munroe Island and their way of life. The survey was divided into three sections.

Section 1 provided demographic information about the population, including age range, marital status, education level, and language/s spoken. The data includes questions about the type of housing, cooking fuel used, and ownership of land to get an idea of the standard of living and economic circumstances of the residents.

Section 2 mentions the environment and migration, including whether the person's house had ever been flooded and the reasons why people may choose to leave or stay on the island. This information can help policymakers and community leaders understand the risks and opportunities associated with living on Munroe Island.

Section 3 provided information on lifestyle and livelihood, including family size, number of children, and income level. They were asked about financial support from the government and awareness of schemes or policies specifically for citizens of Munroe Island to get an idea of the level of government involvement and support for the local population.

A sample size of 100 individuals may be considered small in relation to the population size of 6,500. However, the statistical analysis allows the researchers to draw conclusions about the

population based on the data collected from the sample. Through random sampling, it was ensured that the individuals selected for the survey were representative of the larger population and that each person in the population had an equal chance of being selected. This minimises any potential bias that may have arisen if the sample was not representative.

Using software tools like Excel and Tableau allowed the data to be efficiently analysed, identify patterns and trends. Factors such as the prevalence of water scarcity and the need for government attention in specific areas were identified. These insights can then be used to make informed decisions and recommendations for policies and programs that address the needs and challenges faced by the residents of Munroe Island.

Survey Data Report

After obtaining all the raw data from the survey, removing null values and cleaning it up for analysis, the data source was processed in Tableau (a visualisation software). Using this tool, the researchers managed to come up with 30+ individual graphs and 4 concept dashboards using all the questions in the survey. Some of the responses to original questions were reformatted and coded as different labels for a more coherent analysis of the data. This section will mainly focus on explaining the 4 dashboards and a handful of the individual graphs that display significant trends.

The Demographics Dashboard:

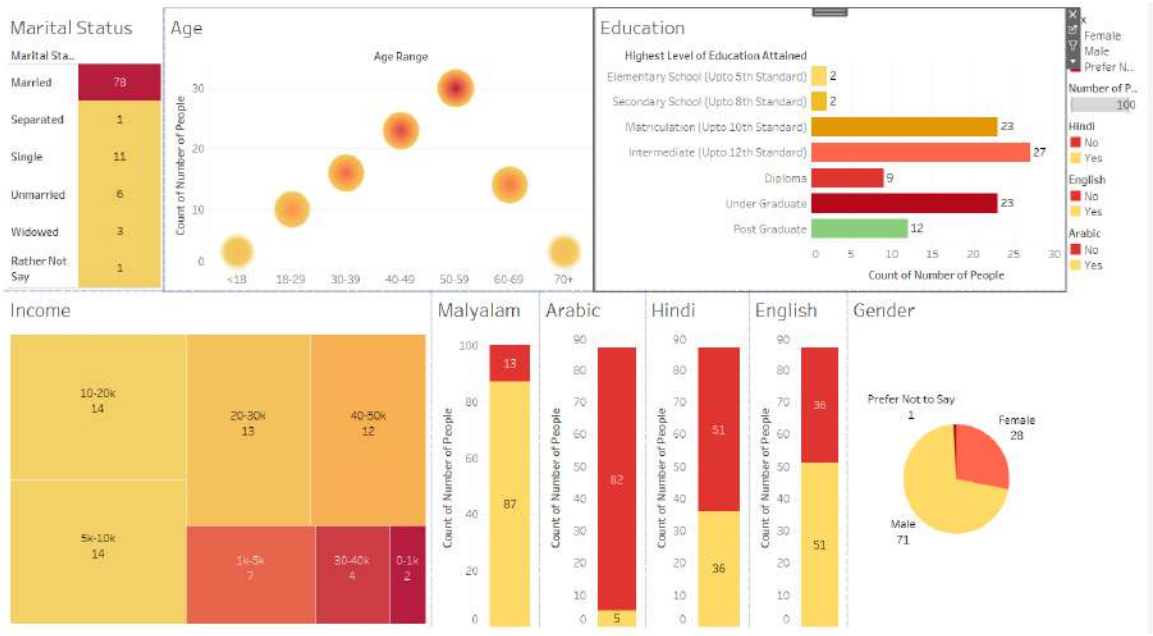

Figure 34. Survey Participants' Demographics Dashboard

Age Group: 30% of the participants belonged to the 50-59 years age group. In totality, 86% of the participants were older than 30 years of age.

Marital Status: 78% of the participants were married while 17% of the participants were single or unmarried.

Education: The majority of the participants, i.e, 27% of them had studied up till 12th standard. 23% of them had finished their undergraduate studies and 12% of them completed their postgraduate studies.

Income Category: The majority, 28%, was equally distributed as 14% each in the income categories of 10,000-20,000 rupees and 5,000-10,000 rupees. 12% of the participants belonged to the highest income bracket of 40,000-50,000 rupees.

Language: 87% knew the local language of Malayalam while English was the second-most known language amongst them, spoken by 51% of the participants. Bengali and Gujarati were some other languages that participants mentioned being fluent in during the survey. These have been left out of the dashboard as they were at negligible percentages. However, Arabic was relatively significant, prevalent in exactly 5% of the participants.

Gender: Most of the participants that were interviewed were males. On the other hand, the researchers could only carry out full-fledged surveys with 28% female participants.

The Water Dashboard:

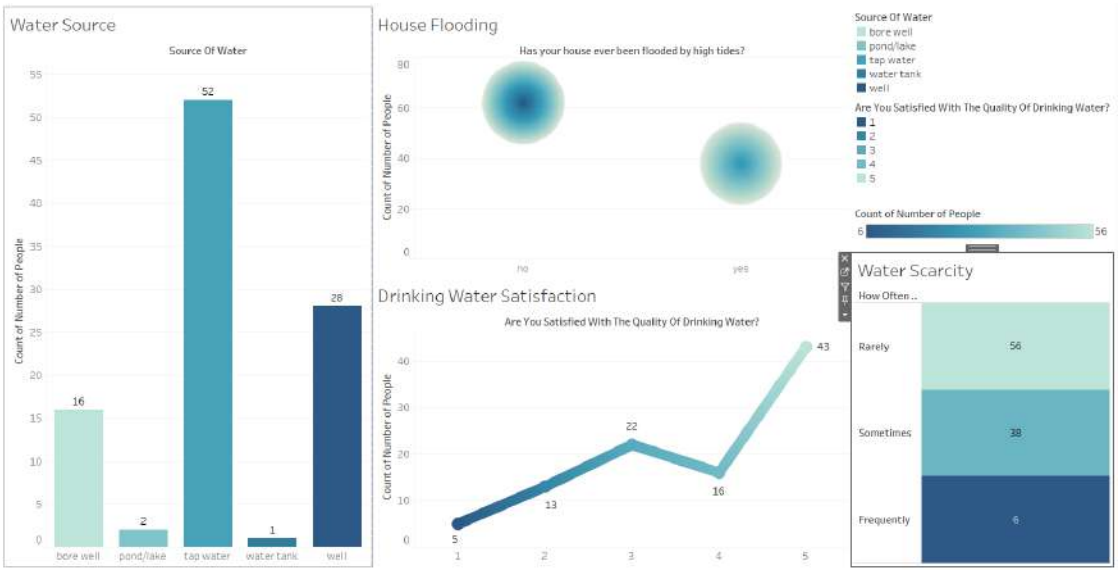

Figure 35. Survey Participants Water Dashboard

Source of Water: 52% of the participants got their primary supply of water from taps, whereas 28% reported sole dependency on wells.

House Flooding: 62% of the participants reported that they never faced tidal flooding in their homes, while the remaining 38% had experienced flood water entering their homes at some point during their stay on Munroe.

Water Scarcity: Only 6% of the participants reported that they frequently faced water scarcity while the majority, 56%, reported that they rarely or never faced such a problem. A substantial 38% described it as an issue that occurred 'sometimes' or 'occasionally'.

Drinking Water Satisfaction Rate: A majority, 43%, of the participants rated their drinking water quality at 5. The second-highest majority of 22% rated it at 3. Overall, 59% of the

participants were satisfied with their drinking water supply (4 and 5-point raters), whereas 40% of them gave sub-par or below-average ratings. 1% of the participants did not respond to this question.

The Socio-Economic Dashboard:

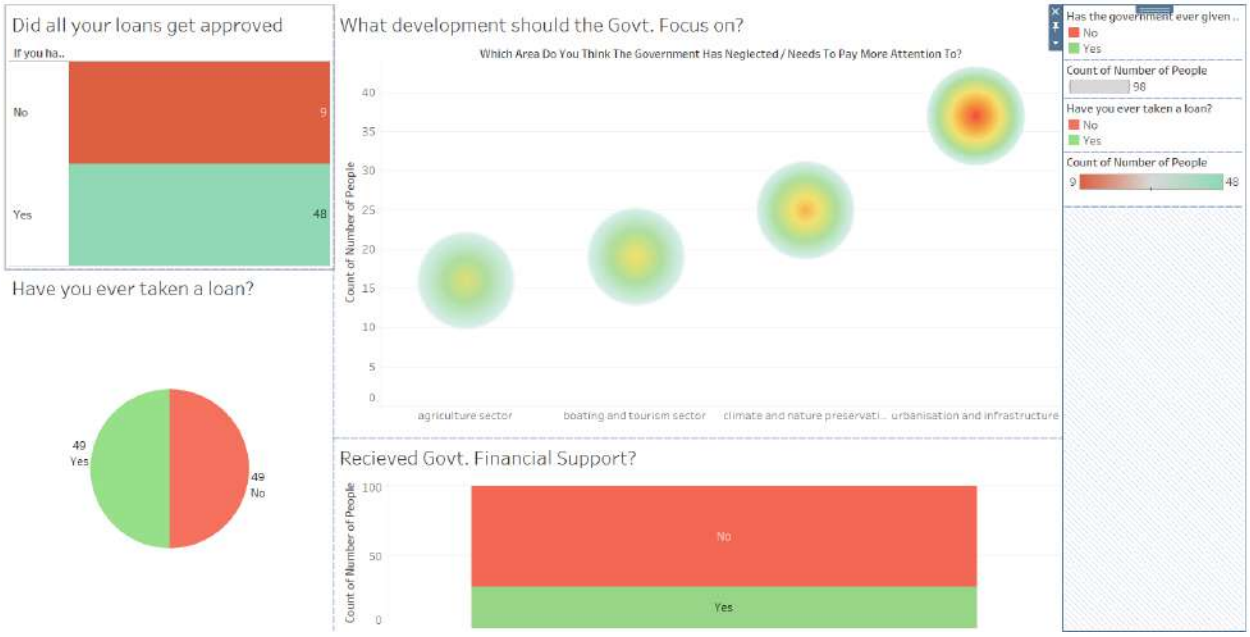

Figure 36. The Socio-Economic Dashboard

Obtaining answers from 100% of the participants for these questions was particularly difficult, as some of them were not comfortable answering this part of the survey.

Loan Data: Majorly, 49% of them had taken a loan at some point. 48% of all participants responded that they were able to get loan approval. The other 9% in the visualisation reported that their loan requests were denied.

Opinion on the Type of Development the Government should Focus on: There were four categories of development, included with the density graph percentage of people that voted for a specific category:

1. Agricultural Sector - 16%
2. Boating and Tourism Sector - 19%

3. Climate and Nature Preservation - 25%
4. Urbanisation and Infrastructure - 37%

Based on pre-field research, it was concluded that these four aspects were the most prevalent problem areas of the island's development in previous literature, which is why those categories were chosen. Participants were free to let the researchers know if there was any other category apart from the ones listed that they thought needed government attention. From the survey, there were no such additional suggestions given by participants.

Receiving Financial Support from the Government: 70% of them responded that they had never received government financial support. This trend was analysed against the average monthly income of the responding participants - which resulted in the generation of the following graph.

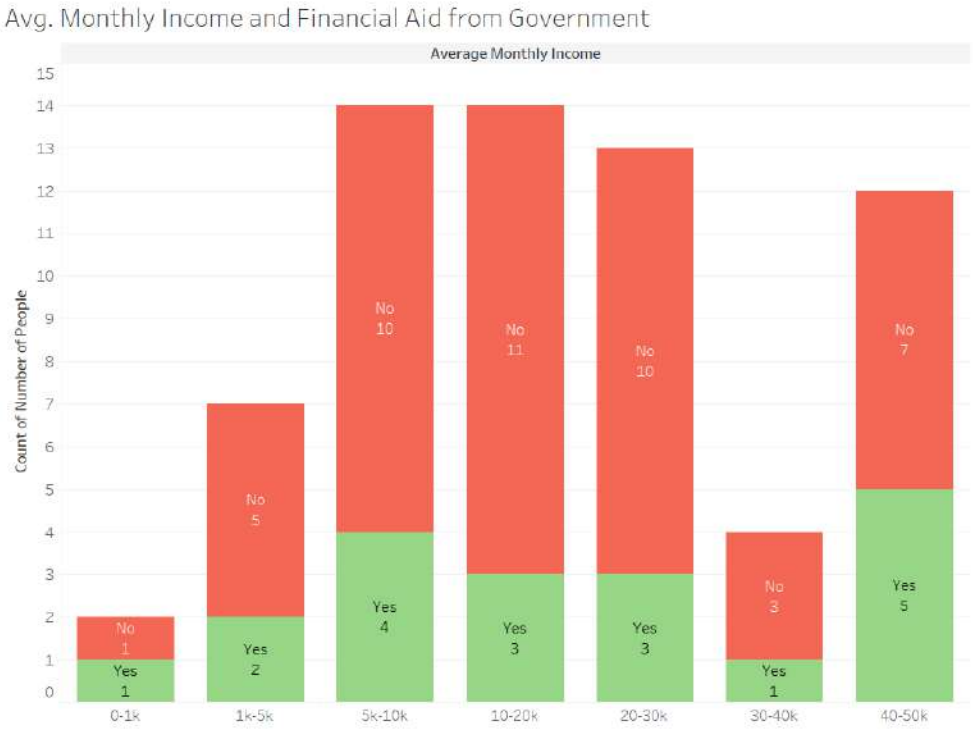

Figure 37. Average Monthly Income and Receivers of Government Financial Aid

This indicates a significant lack of financial aid across 6 out of 7 income brackets.

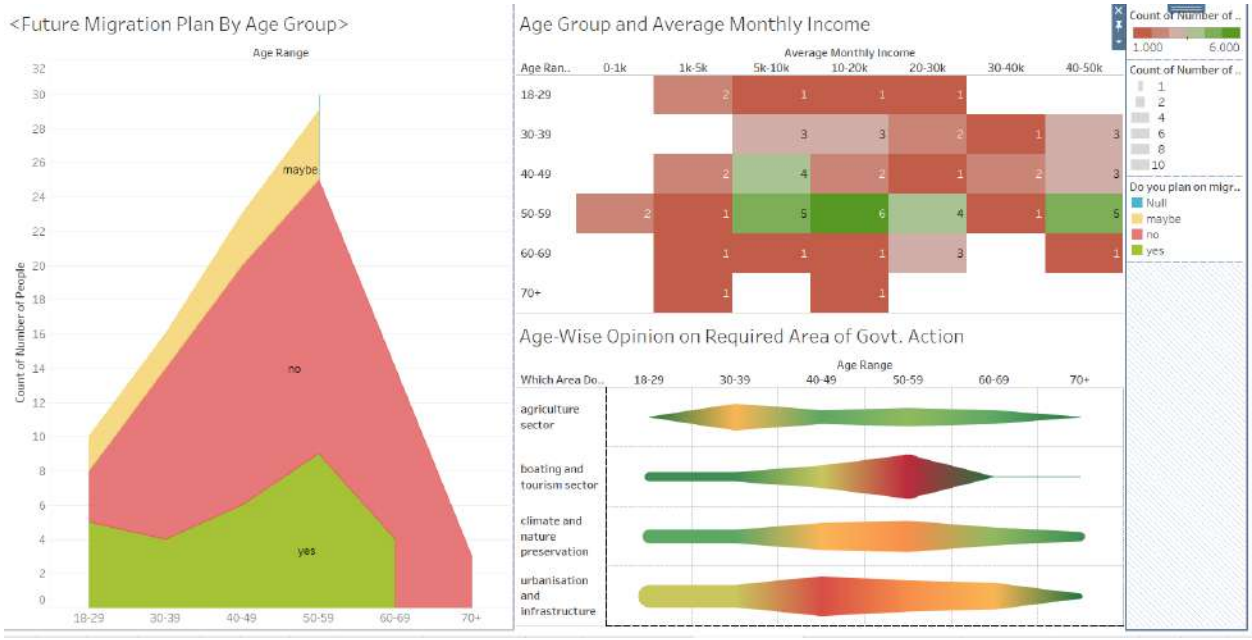

Figure 38. Age Group Dashboard

Future Migration Preference: 28% of responding participants below 60 years of age would prefer to migrate out of the island if given the opportunity. Meanwhile, 56% of participants (across all age groups) preferred to stay on the island in the future. 11% of the people below 50 years were unsure about this and answered 'maybe'.

Average Monthly Income across Age Groups: Participants between 40-60 years of age reported comparatively higher average income levels compared to those below forty and those aged above 60. As shown by the heat map on the top right, the majority of those belonging to the highest income bracket were in the 50-59 age group.

Opinion on Developmental Aspects Requiring Governmental Attention: Participants between 18 to 40 years of age opted for the agricultural sector and urbanisation/infrastructural development as important aspects that the government should focus on. Participants over the age of 40 opted majorly for boating and tourism, climate and nature preservation, urbanisation and infrastructure as important aspects. .

Qualitative Interpretations of Analysed Data

Demographics

Throughout the interviews, it was observed that there was a higher occurrence of younger family members in their house moving out for higher education or employment. This could explain why it was easier to find and interview middle-aged and elderly citizens throughout the island. The elderly population didn't go to college, however, they sent their children to college to gain higher education. In some cases, both local shopkeepers and government officials in high posts reported the same highest income level: 40-50k per month. Most of the interviewees were boatmen or had been boatmen at some point. The tourism industry was observed to be the most stable income source, even more than agriculture.

Arabic is significant even at 5% because, in multiple qualitative interviews, it was found out that many of the middle-aged boatmen and farmers used to work in technical roles in the Middle East. After a certain age, their visas were not renewed so they decided to come back to the island. In consequence, they retained the Arabic language.

Most of the women did not communicate in English and Hindi. They were reluctant to speak and would often send their husbands as proxies to speak, which is why there is a significant lack of primary data for women on the island.

Water

Even though there is a majority usage of tap water, on-field observations revealed that almost every home has a borewell/well next to it. Residents reported that during seasonal change, water quality deteriorates, but does not cause any notable health issues, which could explain the high satisfaction ratings. Although most participants reported that they never faced flooding, it is believed that the researchers were unable to reach the most water-affected, as more than 50% of the interviews were conducted on the mainland due to time and connectivity constraints.

Socio-Economic Parameters

The difference between people who took loans and people who didn't was evenly split. Many residents (across different income levels) who did not apply for loans mentioned that they did not feel that it was important or necessary for them to take loans. Similarly, many residents stated that they were not aware of financial aid schemes on the island. This could suggest a communication gap between the governing authorities and the residents on the island, resulting in residents not really reaching out for financial assistance or loan opportunities, even if they really need it.

While urbanisation and infrastructure had the most votes for future development, many authority figures on the island confirmed that it is already in motion, and perhaps the most accelerated development aspect right now. The discrepancy of stakeholder opinion is stark here because the citizens in the high-land of Munroe are satisfied with continuous development in their wards, while citizens in Kiddaparam and Peringalam have been demanding the construction of connecting bridges and urban reforms for unused land on their islets. The demands of these two islets have been unfulfilled for more than a decade. Citizens of different ages also differ on what is the most important developmental aspect in Munroe right now. Agricultural development seems to be a recognized concern by younger residents, but majorly overlooked by most respondents. Meanwhile, the police officers in East Kallada, college professors in Kollam, and even the former president of the Panchayat, all have voiced a concern for rapid, unsustainable urbanisation- that could negatively impact Munroe's natural foundation in irreversible ways. The director of the Indian Institute of Infrastructure emphasised on how urban structures in metropolitan cities are not suitable for such a marshy, backwater, due to their sheer weight and material composition. Those who are actually observing modern implementation, from a five-year perspective, fear drastic ecological consequences arising from the same.

Despite certain sections of the island being unsatisfied with development, the data clearly shows that migrating out of the island is not a preference for most of the residents. They stated emotional attachment, ease in property ownership and monetary stability as their primary reasons for this preference. The minority of people who did want to move out of the island in the future had already secured admissions to educational institutions or employment opportunities in

Kollam or abroad. The younger population of the island may be venturing out to forge their future in bigger cities, but observations of families on the high-land suggest that this will not necessarily reduce the population in the island. Several men on the island informed the interviewers that their wives were not native to the island, and had only moved to the island to settle down after marriage and start families of their own. They also mentioned that many children and relatives in the community continue to stay on the island because they can't always adapt to the fast lifestyle of Kollam and other big cities.

Chapter 11: Discussion

The research done on Munroe Island revealed a clear contrast between the pre-field findings and the actual situation on the ground. The on-field research revealed an alternative side of the island, one that is relatively wealthy, safe and has not been impacted by environmental vulnerabilities, in contrast to the image painted by the pre-field research of a sinking and destroyed Munroe Island facing mass migration.

Due to the higher altitude of these parts of the island, the homes there are safe from being swamped during high tides and floods. It was concluded from interactions with the residents that those who live on this side of Munroe lead a more content life on the island. However, observations and interviews also confirmed the existence of the side of the island that is explored in research papers and articles available online: one that is overrun with desperate families looking towards migration in the hopes of better living conditions.

Below are some suggestions the researchers deem useful after conducting extensive research about the island:

There are several schemes already in place whose implementation has started to benefit the environment alongside more that are currently in the drafting phase, waiting to be greenlit. Other measures could also be taken, the realisation of which would further assist the island and its residents, such as the preservation and plantation of mangroves, construction of lightweight buildings with a strong foundation in a manner mindful of the soil sustainability, controlling certain human activities such as deforestation and sand-mining and if permitted, a man-made sedimentation process to preserve the remaining soil sediments/clay/silt from the Thenmala Dam.

In regards to the infrastructure of the island, the three types of infrastructure have shown that they require separate and focused efforts given their respective current states. For industrial infrastructure, the tourism industry requires an economic boost which can be supported by basic

tourism facilities for the tourists and the workers. This may include better structures for landscape viewing, transportation to the hotspots etc. Consequently, connective infrastructure requires major work in terms of connectivity within and between the islets, a better railway system and infrastructural plan, increased public transport in addition to the building and completion of bridges.

Social infrastructure, the number of dilapidated houses dotting the streets show a need for smarter construction of housing such that the foundations are strong, the load on the soil isn't too great, and that the effects of torrential rain or deluges can be withstood. Many locals demand better transportation to and from schools and healthcare centres and the availability of safe drinking water across all islets through pipelines or bore wells over the reliance on bottled water.

The administrative aspect will lead to the development of better facilities when it comes to increasing the smooth functioning of the tourism capacity of Munroe Island. With improved systems in place, Munroe will be able to attract more tourists and cope better with their increased inflow. Another area of note is the ecological aspect in terms of the economy and livelihood. The primary focus should be on protecting the ecological phenomena, chiefly the mangroves, but in order for tourism to thrive alongside these measures, monitored and regularised eco-tourism can be conducted. The rich culture and history can be used to promote the island as a niche locale, where potential visitors can experience a true Keralan experience. Another area with potential is the commercial aspect of Munroe Island. With mindful planning and proper connective infrastructure, the island can also thrive as a viable commercial centre. Keeping in mind that Munroe is primarily an ecological site, eco-tourism is the ideal way to go about developing opportunities.

It is pivotal to harness the potential of Munroe in becoming a premier tourist destination. This would ensure the employment of residents, increase population retention, and naturally boost the economy, benefitting the lives of the locals. The lack of major hospitals and colleges compels the youth to settle outside of the island, but this concern can be mitigated by increasing government spending and investing in infrastructure, especially in the field of public welfare. Moreover, close attention needs to be lent to calamity-stricken islets such as Peringalam. Job creation is

desperately required in order to establish basic living conditions in such parts of Munroe. There is an imperative need for better connectivity to the main island and to nearby cities, which calls for the building of bridges and increasing the number of trains that half at the Munroe Railway Station en route.

It is most important to keep in mind that the needs of the people are first and foremost for all authorities involved, and should be given priority over everything else. If there are economically beneficial opportunities present on the island but they come at the cost of the livelihoods or peace of the residents, then they need to be replanned, worked around, or scrapped altogether.

Limitations:

One of the main limitations this study carries is that due to the lack of literature available online, the bulk of the necessary research required conduction on field. Due to the time constraint it was not possible for the research team to be able to obtain results that portray all the aspects of the island well enough and do full justice towards answering the research questions. Discovering another perspective of life at Munroe as explained above resulted in the research plan being altered, affecting the depth of detail in every aspect. Insufficient socio-political insights were found that conclusions could be drawn from and people were reluctant to express their views on the same. Lastly, the limited time available to spend on the mainland (Kollam, Kerala), created an impediment in understanding what the perceptions of the island are outside its vicinity and what government officials are doing, have done or are planning to do for the island based on their understanding of the situation there. The researchers were also unable to establish an understanding of how the island's lifestyle differs from the mainland’s lifestyle in terms of the social and cultural aspects.

Chapter 12: Conclusion

The study conducted on Munroe Island has shed light on several important aspects that impact the lives of its citizens. By focusing on four key areas, namely lifestyle and livelihood, environmental conditions, policies, and infrastructure, the study has attempted to provide an in-depth understanding of the challenges faced by the region, complete with their implications for the residents and proposed solutions for their betterment. It has also succeeded in drawing a picture of how life is for the inhabitants of the different isles that make up Munroe Island and has highlighted issues specific to different areas and communities within the region.

The findings of the study indicate that tourism is widely perceived to be the fastest-growing industry on the island, with many locals having already changed professions to those that could benefit from the boom. On the highland islets of Munroe, there are homestays and resorts on almost every street and boating places along every river bank. There are hotspots on the island that cater specifically to tourists and are fully packed on the weekends. Though restaurant owners don't mind, homestay owners express regret that the majority of tourists who find themselves in Munroe are backpackers from Kollam who visit and return during the day itself. So, a well-formulated plan needs to be drawn up and enacted by local and state policymakers if Munroe Island's full potential as a tourist destination is to be realised and visitors from other parts of the state, country, or world are to be attracted.

The study has also drawn attention to the environmental conditions in the region, highlighting the urgent need for measures to mitigate the impacts of climate change and protect the fragile ecosystem. Though there does not exist a proper consensus in the opinions of people about the severity of the issues faced or the reasons for them coming into being, the need for change is nonetheless very real. The study's findings emphasise the urgency for policies that can promote environmental sustainability and biodiversity conservation, which can only happen once the findings of different researches conducted on the island find their way to the relevant authorities. Proper funding and enforcement methods are equally important here because while these plans

may act as a blueprint for the future, they are bound to perform poorly without the necessary systems in place to back them up.

Finally, the study has identified several infrastructure-related challenges that impact the region, such as inadequate transportation, waste management, and water supply systems. Connective infrastructure is the biggest issue the citizens have to face repeatedly, as improving connectivity in terms of both road and railway will “completely change the fate of the island”, as quoted by one of the interviewees. The reliance on boats for travel between islets is inconvenient for many as it is both slow and unreliable when tides rise or rains hit, and more roads will support tourism and make the amenities available in neighbouring cities more accessible. More than 54% of the citizens want an improvement in the overall infrastructure of the island and have said it is the one key area where the authorities need to focus their policies.

In conclusion, the study provides a comprehensive overview of the challenges faced by Munroe Island’s and highlights the urgent need for concerted efforts to address them. The findings of the study provide a valuable resource for policymakers and other stakeholders working towards sustainable development in the region.

Future Study

Future studies on sustainable tourism in Munroe Island could focus on several areas to improve the industry without compromising the natural beauty or existing ecosystem of the region. One potential area of exploration could be finding ways to overcome the lack of connective infrastructure. This could involve working with the government to implement policies that support eco-tourism and provide funding for infrastructure development. Another area of focus could be on approaches to address the impacts of climate change. This could involve working with local communities or external research groups to identify and implement sustainable practices that reduce the negative impacts of tourism on the environment.

Additionally, it may be important to explore different tourism categories that prioritise environmental protection and sustainable use of natural resources. Finally, future studies could examine the direct impacts of environmental vulnerabilities on Munroe Island, with a specific focus on the affected parts of the island. This could involve working with local stakeholders to

identify potential solutions and strategies for reducing the impact of tourism on these vulnerable areas. Overall, these areas of exploration could help develop a sustainable tourism industry in Munroe Island that simultaneously benefits the local community and protects the natural environment.

Closing Remarks

This study proved to be a very thought-provoking and enriching experience for the research team. The residents of Munroe Island were unbelievably kind when interacting with the research group and were eager participants in all of them, whether as researchers or simple visitors. After the first four days of research visits in different locations of the island, every research member became a familiar face for Munroe residents, and was greeted with warmth and enthusiasm.

Owing to the small population, everyone is familiar with their fellow residents and the bond between neighbours is close to a familial level. Those born on Munroe Island may often go to other parts of the state to study and other parts of the world to work but they never seem to forget their roots and always return for important family events and post-retirement life. Many residents from the younger generations, when asked, said they would ideally prefer spending their entire lives on the island.

Munroe Island proved to be split in a harmonious dichotomy. The people of the highland, villagers of the lowlands, and official stakeholders from Kollam, all offered vastly different perspectives about quality of life on the island. Some feel that a part of the island might be left behind in development plans, while others predict socio-economic prosperity from the growing tourism sector.

But all islanders showed united resilience and fearlessness to one scientific debate: whether or not the island may sink one day. Those who wish to stay, remain undisturbed about their future life on the island. They have weathered many storms in the last decade, and are represented as climate-refugees in peril by the media. However, our research's most fruitful finding was that the citizens of Munroe do not see themselves as victims of change, but as close-knit community members who take pride in their strength and adaptability to the unpredictable future. The people

of Munroethuruthu remain optimistic as they continue to make the best of the situations they face in their island.

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Appendices

Appendix A - List of people and organisations interviewed

1) **Locals of Munroe**
    - Shyam
    - Saiju
    - G Suresh Babu
    - Sadheesh
    - Rejithlal
    - Father Matthew
    - Father Rajeev
    - Kumar
    - K.Sudhakaran
    - Grilal
    - Silu
    - Johnson Serel

2) **Professionals**
    - Dr/ Prof Sunil Kumar
    - Prof K Raghavan
    - Rakman
    - Prof. Uday Kumar
    - Subin
    - Dr Manju

- Dr Ashwin
- Dr Annie John
- Binu Karunakaran
- Dr Manju Shah
- SHO Sudheesh Kumar

3) **Organisations**
    - Metal Workshop
    - Gram Panchayat
    - Integrated Child Development Services
    - Police Station
    - Public Works Department
    - Sarpanch Office
    - Coir factory

Appendix B - Survey questionnaire Used for the Interviews

Munroe Island Questionnaire:

1. Name of Person
2. Sex
    - Male
    - Female
    - Prefer not to say
3. Age Range
    - <18
    - 18-29
    - 30-39
    - 40-49
    - 50-59
    - 60-69
    - 70+

4. Marital Status
    - Single
    - Unmarried
    - Married
    - Divorced
    - Separated
    - Widowed
    - Rather Not Say
    - Other:
5. Current Place of Residence
    - Munroe
    - Kollam
    - Other:
6. Place of Birth
    - Munroe
    - Kollam
    - Other:
7. Languages
    - Malayalam
    - English
    - Hindi
    - Other:
8. Highest Level of Education Attained
    - N/A
    - Primary School (Upto KG-II)
    - Elementary School (Upto 5th Standard)
    - Secondary School (Upto 8th Standard)
    - Matriculation (Upto 10th Standard)
    - Intermediate (Upto 12th Standard)
    - Diploma
    - Undergraduate

- Post Graduate
- Doctorate
- Other:

9. Current Working Status
    - Unemployed
    - Employed
    - Homemaker
    - Student
    - Retired
    - Unable to Work
10. What kind of house do you live in?
    - Kuchha
    - Semi-Pucca
    - Pucca
11. Cooking fuel
    - Sticks and Firewood
    - Coal Stove (Angithi)
    - Kerosene Stove
12. What things are present in the household?
    - Cell phone
    - Electric fan
    - Air cooler
    - Fridge
    - Telephone
    - TV
    - COMPUTER
    - Wi-Fi
    - Other:
13. Transportation
    - None
    - Bicycle

- Motorcycle
- Car
- Truck
- Cart
- Autorickshaw
- Other:

14. Livestock
    - Goats
    - Sheep
    - Cows/Buffaloes/Oxen
    - Chicken
    - Ducks
    - Rabbits
    - Fish
    - NA
    - Other:
15. Do you own land?
    - No land at all
    - A lot
    - Some land
    - Don't know
    - Other:
    -
16. source of water
    - Tap water
    - Hand pump
    - Bore well
    - Well
    - Reservoir
    - Pond/lake
    - Canal

- River
- Other:

17. Distance of drinking water
    - Inside or just outside
    - Within 250 metre
    - 250-1km
    - More than 1 km
18. Do you face water scarcity
    - Yes
    - No
    - Maybe
19. How often do you face water scarcity
    - NA
    - Rarely
    - Sometimes
    - Frequently
    - Almost all the time
    - Other:
20. Are you satisfied with the quality of drinking water?

- Fully Dissatisfied
    1
    2
    3
    4
    5

  Fully Satisfied

21. Do you have a bank account?
    - Yes
    - no
22. Where is your bank account
    - NA

- Bank
- SHG's/cooperatives
- Post office
- Other:

23. Profession
    - Shopkeeper
    - Boatman
    - Fisherman
    - Farmer
    - Drivers
    - Other:
24. Which area do you think the government has neglected / needs to pay more attention to?
    - Climate and Nature Preservation
    - Urbanisation and Infrastructure
    - Agriculture sector
    - Boating and Tourism sector
    - Other:
25. Has your house ever been flooded by high tides?
    - Yes
    - No
26. If yes, how many times has water entered your house?
27. Do you leave the island often?
    - Yes
    - No
28. What are the reasons you leave the island
29. How many people are in your family?
    - 1
    - 2
    - 3
    - 4
    - 5

- 6
- 7
- 8
- 9
- 10
- 10 or more

30. How many children do you have?
    - 1
    - 2
    - 3
    - 4
    - 5
    - 6
    - 7
31. Have you ever taken a loan?
    - Yes
    - no
32. If you have taken a loans, have they been approved?
    - Yes
    - no
33. Has the government ever given you financial support? (grant, scheme, aid)
    - Yes
    - no
34. Are you aware of any scheme / policy existing to specifically help citizens in Munroe?
    - Yes
    - no
35. If yes, do you feel that any of them have benefited you directly?
    - Yes
    - no
36. Average Monthly Income
    - N/A

- 0-1k
- 1k-5k
- 5k-10k
- 10-20k
- 20-30k
- 30-40k
- 40-50k

37. Do you plan on migrating to some other location in the future?
    - Yes
    - No
    - Maybe

Kollam Questionnaire:

1. Field of Occupation of person being interviewed:
    - Government Service
    - Academia
    - Other:
2. Are you aware about Munroe Island / MunroeThuruthu?
    - Yes
    - no
3. Are you aware about speculation and research on Munroe Island possibly sinking?
    - Yes
    - no
4. If yes, do you have any ideas / assumptions about why it could be sinking - or why it might not sink?
5. Do you know anyone who lives on Munroe Thuruthu?
    - Yes
    - no
6. Have you ever been to / or lived in Munroe?
    - Yes

- no

7. Are you aware of any specific resources that are imported to the mainland from Munroe?
8. Are you aware of any specific resources that are exported from the mainland to Munroe
9. Would you ever live in Munroe?
    - Yes
    - no
10. What do you think the government should do for Munroe's welfare and development?


~To the people of Munroe~