SailSafe: Developing an Integrated Safety and Monitoring Solution for Deep-Sea Fishermen using GPS Technology

A MINI PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report "**SAILSAFE: DEVELOPING AN INTEGRATED SAFETY AND MONITORING SOLUTION FOR DEEP SEA FISHERMEN USING GPS TECHNOLOGY**" is the bonafide work of "**MANOJ M G, PAVITHIREN D S, NITHISH KUMAAR V**" who carried out the project under my supervision. Certified further to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

In the realm of maritime activities, deep-sea fishermen operate in remote and challenging environments where safety is paramount. This project, titled "SailSafe," aims to address the safety concerns of deep-sea fishermen by developing an integrated solution that leverages GPS technology for real-time tracking and monitoring. By combining advanced GPS tracking capabilities with user-friendly interfaces and proactive alert systems, the project endeavours to enhance safety measures and improve outcomes for fishermen operating in deep-sea environments.

The proposed solution, "SailSafe," comprises a comprehensive system designed to provide deep-sea fishermen with the tools they need to navigate safely and respond effectively to emergencies. Through the integration of GPS technology, the system enables real-time tracking of fishing vessels, allowing authorities to monitor activities and respond promptly to incidents. Additionally, the system incorporates proactive alert systems to notify fishermen of potential hazards such as adverse weather conditions or nearby vessels, empowering them to make informed decisions and navigate safely through challenging maritime environments.

With safety as its primary focus, "SailSafe" aims to revolutionize the way deep-sea fishermen operate by providing them with a reliable and user-friendly solution for monitoring and tracking. By leveraging GPS technology and advanced alert systems, the project seeks to enhance safety measures, reduce risks, and ultimately improve the well-being of fishermen operating in deep-sea environments. Through collaboration with stakeholders and continuous refinement of the solution, "SailSafe" endeavours to make a meaningful impact in promoting safer maritime practices and ensuring the sustainability of the fishing industry.

ACKNOWLEDGMENT

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We also express our sincere gratitude to our college Principal, **Dr. S. N. Murugesan M.E., PhD.,** and **Dr. P. KUMAR M.E., PhD, Director computing and information science , and Head Of Department of Computer Science and Engineering** and our project coordinator **Dr. K.Ananthajothi M.E., Ph.D.,** for her encouragement and guiding us throughout the project towards successful completion of this project and to our parents, friends, all faculty members and supporting staffs for their direct and indirect involvement in successful completion of the project for their encouragement and support.

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PAVITHIREN D S

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CHAPTER 1
INTRODUCTION

Navigating the vast and often tumultuous expanses of the ocean, deep-sea fishermen embark on journeys fraught with challenges and risks, where safety stands as an ever-present concern. In these remote and unpredictable environments, characterized by inclement weather, navigational hazards, and limited communication infrastructure, ensuring the well-being of fishermen remains a paramount priority. The development of effective safety and monitoring solutions tailored to the unique needs of deep-sea fishermen is imperative, not only to safeguard their lives and livelihoods but also to promote sustainable maritime practices.

Enter SailSafe, an innovative project poised to revolutionize safety measures and monitoring capabilities for deep-sea fishermen through the integration of advanced GPS technology. At its core, SailSafe aims to address the inherent risks and challenges faced by fishermen at sea by providing real-time tracking, proactive alert systems, and comprehensive monitoring functionalities. By leveraging the power of GPS technology, SailSafe endeavours to empower fishermen with the tools they need to navigate safely, respond swiftly to emergencies, and mitigate risks effectively.

The genesis of SailSafe is rooted in the recognition of the unique safety requirements of deep-sea fishermen and the inadequacy of existing monitoring solutions in addressing these needs. Traditional methods of tracking and communication often fall short in the face of the vast and remote expanses of the ocean, leaving fishermen vulnerable to unforeseen hazards and emergencies. SailSafe seeks to bridge this gap by harnessing the capabilities of GPS technology to provide precise location tracking, real-time monitoring, and proactive alert systems tailored specifically to the challenges of deep-sea fishing.

As SailSafe sets sail on its mission to enhance safety and monitoring capabilities for deep-sea fishermen, it heralds a new era of technological innovation and collaboration in the maritime industry. By bringing together stakeholders, experts, and technology enthusiasts, SailSafe aims to develop a solution that not only meets the immediate safety needs of fishermen but also contributes to the long-term sustainability and prosperity of maritime activities. Through dedication, innovation, and a commitment to excellence, SailSafe endeavours to chart a course towards safer seas and brighter horizons for deep-sea fishermen around the world.

1.1 PROBLEM STATEMENT

Developing an innovative Android application, SailSafe, to ensure the safety and security of deep-sea fishermen by integrating real-time GPS tracking, proactive hazard notifications, and border crossing alerts, thereby addressing the challenges of remote maritime environments and enhancing monitoring capabilities for authorities.

1.2 SCOPE OF THE WORK

The scope of work for the SailSafe project encompasses the development of an Android application integrating real-time GPS tracking, proactive hazard notifications, and border crossing alerts to enhance the safety and security of deep-sea fishermen. This includes designing an intuitive user interface, integrating GPS technology for accurate vessel tracking, implementing proactive alert systems for hazard notification, incorporating features to prevent unintentional border violations, developing backend systems to support application functionality, conducting thorough testing to ensure reliability and usability, and deploying and maintaining the application to address evolving safety requirements.

1.3 AIM AND OBJECTIVES OF THE PROJECT

The aim of the SailSafe project is to develop an innovative Android application that integrates real-time GPS tracking, proactive hazard notifications, and border crossing alerts to enhance the safety and security of deep-sea fishermen. Objectives include designing an intuitive user interface, implementing GPS technology for precise vessel tracking, developing proactive alert systems for hazard notification, incorporating features to prevent unintentional border violations, conducting thorough testing to ensure reliability and usability, and deploying and maintaining the application to address evolving safety requirements in maritime environments.

1.4 RESOURCES

The resources required for the SailSafe project include skilled software developers proficient in Android app development and GPS technology integration, access to GPS hardware and software tools for real-time tracking, collaboration with maritime authorities for border crossing data and regulatory compliance, server infrastructure for backend development and data storage, testing devices and environments for quality assurance, and ongoing maintenance and support resources for post-deployment updates and enhancements.

CHAPTER 2
LITERATURE SURVEY

Existing research in maritime safety has extensively examined various technologies like GPS tracking systems, AIS (Automatic Identification System), and VMS (Vessel Monitoring System). These technologies offer insights into vessel movements and aid in monitoring and managing maritime activities. However, they often lack specificity in addressing the unique challenges of deep-sea fishermen, such as remote environments and limited connectivity.

GPS technology holds a significant role in maritime applications, providing precise positioning and navigation capabilities. Studies have demonstrated its effectiveness in enhancing vessel safety and efficiency, enabling real-time tracking and monitoring of vessel movements. Furthermore, research explores integrating GPS with other technologies like satellite communications and GIS (Geographic Information Systems) to improve situational awareness and decision-making in maritime environments.

Proactive hazard notification systems have emerged as critical tools for enhancing maritime safety by issuing early warnings of potential dangers. Research focuses on developing intelligent systems capable of analyzing environmental data, vessel trajectories, and other relevant factors to identify and alert users to hazards such as adverse weather conditions, navigational hazards, and nearby vessels. These systems aim to mitigate risks and improve safety outcomes for maritime operations, including deep-sea fishing activities.

Studies highlight the importance of border crossing alert systems in maritime safety, particularly for deep-sea fishermen operating near maritime borders. These systems utilize GPS technology to track vessel proximity to borders and issue alerts to prevent unintentional violations. Research explores the integration of border crossing alerts with existing monitoring systems to enhance compliance with maritime regulations and ensure the security of maritime borders.

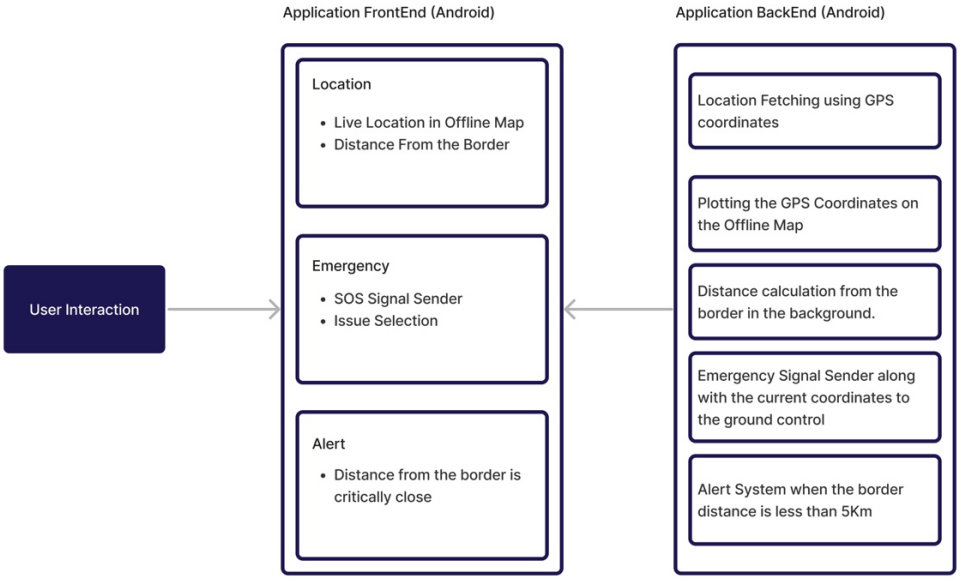
While existing technologies offer valuable insights, there is a gap in addressing the unique challenges and risks faced by fishermen operating in remote and unpredictable maritime environments. The SailSafe project aims to bridge this gap by developing an innovative Android application that integrates GPS tracking, proactive hazard notifications, and border crossing alerts to enhance the safety and security of deep-sea fishermen.

CHAPTER 3
SYSTEM DESIGN

3.1 GENERAL

In this section, we would like to show how the general outline of how all the components end up working when organized and arranged together. It is further represented in the form of a flow chart below.

3.2 SYSTEM ARCHITECTURE DIAGRAM



3.3 DEVELOPMENTAL ENVIRONMENT

3.3.1 HARWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the system's implementation. It should therefore be a complete and consistent specification of the entire system. It is generally used by software engineers as the starting point for the system design.

COMPONENTS	SPECIFICATION
PROCESSOR	Intel Core i5
RAM	8 GB RAM
GPU	NVIDIA GeForce GTX 1650
MONITOR	15” COLOR
HARD DISK	512 GB
PROCESSOR SPEED	MINIMUM 1.1 GHz

3.3.2 SOFTWARE REQUIREMENTS

The software requirements document is the specifications of the system. It should include both a definition and a specification of requirements. It is aset of what the system should rather be doing than focus on how it should be done. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating the cost, planning team activities, performing tasks, tracking the team, and tracking the team’s progressthroughout the development activity.

Android Studio, Visual Studio Code, and **Arc** would all be required.

CHAPTER 4
PROJECT DESCRIPTION

4.1 METHODOLOGY

To ensure the successful development of the SailSafe project, a detailed methodology is paramount, spanning several key phases from inception to deployment.

Initially, the project team embarks on extensive research and requirements gathering. This phase involves studying the safety challenges encountered by deep-sea fishermen, analyzing existing maritime safety technologies, and understanding regulatory frameworks. By collating insights from stakeholders and reviewing relevant literature, the team establishes clear objectives and identifies essential features such as GPS tracking, hazard notifications, and border crossing alerts.

Subsequently, the project progresses to the design and prototyping stage. Here, user interface wireframes and prototypes are meticulously crafted, focusing on intuitive navigation, clear communication of safety alerts, and seamless integration of GPS functionality. Through iterative refinement based on stakeholder feedback and usability testing, the team ensures the final design meets the specific needs and preferences of deep-sea fishermen.

Following design approval, the project enters the development phase. Skilled software developers employ programming languages like Java or Kotlin to translate design specifications into functional code. This involves implementing GPS tracking systems, proactive hazard notification mechanisms, and border crossing alert features. Throughout development, rigorous testing procedures are employed to identify and rectify any issues or bugs, ensuring the application's reliability and performance.

Upon completion of development, the SailSafe application undergoes comprehensive testing and quality assurance checks. This phase involves testing the application's functionality across various devices and operating conditions, as well as assessing its usability and responsiveness. Any identified issues are promptly addressed, and refinements are made to enhance the overall user experience.

Finally, with thorough testing completed and stakeholder approval obtained, the SailSafe application is deployed to users. The deployment process involves packaging the application for distribution via the Google Play Store, ensuring compliance with relevant guidelines and

regulations. Post-deployment, the project team remains vigilant, providing ongoing maintenance and support to address user feedback, implement updates, and incorporate new features as needed.

4.2 MODULE DESCRIPTION

The SailSafe project comprises several modules designed to enhance the safety and monitoring capabilities of deep-sea fishermen. The GPS Tracking module forms the core of the application, enabling real-time monitoring of vessel movements and precise location tracking. This module integrates GPS technology to provide accurate positioning data, allowing fishermen to navigate effectively and authorities to monitor vessel activities. Additionally, the Hazard Notification module enhances safety by issuing proactive alerts for potential dangers such as adverse weather conditions, navigational hazards, and nearby vessels. Through intelligent analysis of environmental data and vessel trajectories, this module aims to mitigate risks and improve safety outcomes for fishermen operating in challenging maritime environments.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 OUTPUT

Fig 5.1: Start Page

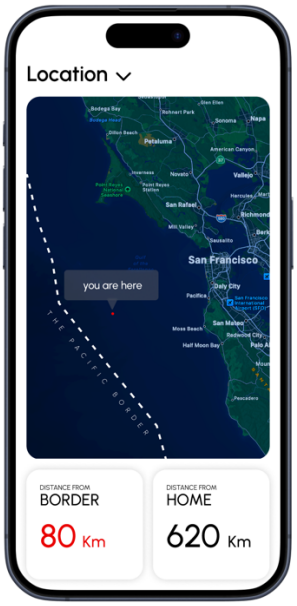


Fig 5.2: Location Page

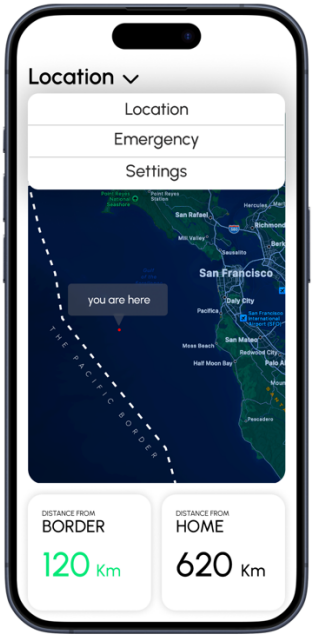


Fig 5.3: Navigation Pane

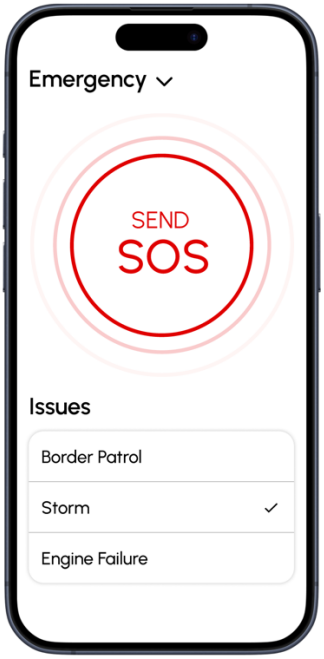


Fig 5.4: Emergency Page

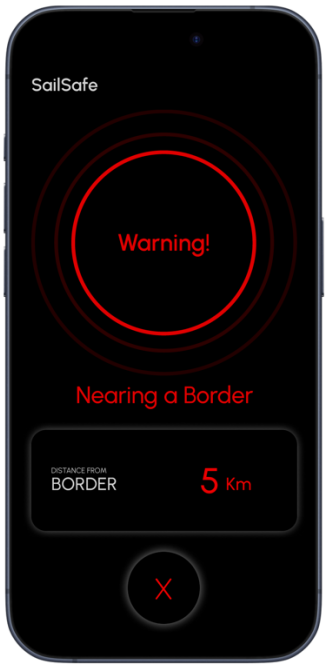


Fig 5.5: Border Alert Warning System

5.2 RESULT

The result of the SailSafe project is a user-friendly Android application that revolutionizes safety measures for deep-sea fishermen. By integrating real-time GPS tracking, proactive hazard notifications, and border crossing alerts, the application enhances the safety and security of fishermen navigating remote maritime environments. Through precise vessel tracking, early warning systems for potential hazards, and prevention mechanisms for unintentional border violations, SailSafe empowers fishermen to make informed decisions and authorities to monitor activities effectively. This comprehensive solution not only addresses the unique challenges faced by deep-sea fishermen but also contributes to promoting sustainable maritime practices and ensuring the well-being of maritime communities.

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENTS

6.1 CONCLUSION

In conclusion, the SailSafe project represents a significant step forward in enhancing the safety and security of deep-sea fishermen through the development of an innovative Android application. By integrating real-time GPS tracking, proactive hazard notifications, and border crossing alerts, SailSafe addresses the unique challenges faced by fishermen operating in remote maritime environments. The project's success underscores the importance of leveraging technology to mitigate risks and improve safety outcomes in the maritime industry.

6.2 FUTURE ENHANCEMENTS

1. **Advanced Analytics Integration:** Incorporate advanced analytics capabilities into SailSafe to analyze historical data and identify trends in safety incidents. By leveraging data-driven insights, the application can better predict and prevent potential hazards, contributing to improved safety outcomes for fishermen.
2. **Machine Learning Algorithms:** Integrate machine learning algorithms into SailSafe to enhance its predictive capabilities. By analyzing real-time data and user behavior patterns, the application can proactively identify risks and provide personalized safety recommendations to fishermen, further enhancing their safety and security at sea.
3. **Collaboration with Maritime Authorities:** Strengthen collaboration with maritime authorities and industry stakeholders to expand the reach and effectiveness of SailSafe. By working closely with regulatory bodies, the application can ensure compliance with maritime regulations and facilitate seamless coordination in emergency situations.
4. **Integration with IoT Devices:** Explore integration with Internet of Things (IoT) devices, such as wearable sensors or environmental monitoring equipment, to enhance the application's capabilities. By collecting additional data on environmental conditions and vessel operations, SailSafe can provide more comprehensive safety insights to fishermen and authorities.
5. **User Feedback Mechanism:** Implement a user feedback mechanism within SailSafe to gather insights and suggestions from fishermen and other stakeholders. By incorporating user feedback into future updates and enhancements, the application can continuously evolve to meet the evolving needs of its users and the maritime industry.

APPENDIX

SOURCE CODE:

LOCATION PAGE

```
import androidx.compose.foundation.layout.*
import androidx.compose.material.*
import androidx.compose.runtime.*
import androidx.compose.ui.Alignment
import androidx.compose.ui.Modifier
import androidx.compose.ui.graphics.Color
import androidx.compose.ui.platform.setContent
import androidx.compose.ui.text.font.FontWeight
import androidx.compose.ui.unit.dp
import androidx.compose.ui.unit.sp


fun main() {
    setContent {
        MyApp {
            HomeScreen()
        }
    }
}


@Composable
fun MyApp(content: @Composable () -> Unit) {
    MaterialTheme {
        content()
    }
```

```
}

@Composable
fun HomeScreen() {
    Scaffold(
        topBar = {
            TopAppBar(
                title = {
                    Text(text = "Home Page", fontWeight = FontWeight.Bold)
                },
                backgroundColor = Color.Blue
            )
        },
        content = {
            Column(
                modifier = Modifier
                    .fillMaxSize()
                    .padding(16.dp),
                verticalArrangement = Arrangement.Center,
                horizontalAlignment = Alignment.CenterHorizontally
            ) {
                Text(
                    text = "Welcome to SailSafe",
                    fontSize = 24.sp,
                    fontWeight = FontWeight.Bold,
                    color = Color.Black
                )
```

```
            Spacer(modifier = Modifier.height(16.dp))
            Text(
                text = "Your safety companion at sea",
                fontSize = 18.sp,
                color = Color.Black
            )
        }
    }
  )
}
```

GPS CONNECTIVITY

```
import android.Manifest
import android.content.Context
import android.content.pm.PackageManager
import android.location.Location
import android.location.LocationManager
import android.os.Bundle
import androidx.activity.ComponentActivity
import androidx.activity.compose.setContent
import androidx.compose.foundation.layout.*
import androidx.compose.material.*
import androidx.compose.runtime.*
import androidx.compose.ui.Alignment
import androidx.compose.ui.Modifier
import androidx.compose.ui.graphics.Color
import androidx.compose.ui.platform.LocalContext
```

```
import androidx.compose.ui.text.font.FontWeight
import androidx.compose.ui.unit.dp
import androidx.compose.ui.unit.sp
import androidx.core.app.ActivityCompat
import androidx.core.content.ContextCompat

class MainActivity : ComponentActivity() {
    private val LOCATION_PERMISSION_REQUEST_CODE = 1001

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)

        setContent {
            MyApp {
                HomeScreen()
            }
        }
    }

    private fun isLocationPermissionGranted(context: Context): Boolean {
        return ContextCompat.checkSelfPermission(
            context,
            Manifest.permission.ACCESS_FINE_LOCATION
        ) == PackageManager.PERMISSION_GRANTED
    }
```

```
    private fun requestLocationPermission() {
        ActivityCompat.requestPermissions(
            this,
            arrayOf(Manifest.permission.ACCESS_FINE_LOCATION),
            LOCATION_PERMISSION_REQUEST_CODE
        )
    }

    private fun getLocation(context: Context): Location? {
        val locationManager =
            context.getSystemService(Context.LOCATION_SERVICE) as LocationManager
        return locationManager.getLastKnownLocation(LocationManager.GPS_PROVIDER)
    }
}

@Composable
fun HomeScreen() {
    val context = LocalContext.current
    val location by remember { mutableStateOf(getLocation(context)) }

    Scaffold(
        topBar = {
            TopAppBar(
                title = {
```

```
            Text(text = "Home Page", fontWeight = FontWeight.Bold)
        },
        backgroundColor = Color.Blue
    )
},
content = {
    Column(
        modifier = Modifier
            .fillMaxSize()
            .padding(16.dp),
        verticalArrangement = Arrangement.Center,
        horizontalAlignment = Alignment.CenterHorizontally
    ) {
        Text(
            text = "Welcome to SailSafe",
            fontSize = 24.sp,
            fontWeight = FontWeight.Bold,
            color = Color.Black
        )
        Spacer(modifier = Modifier.height(16.dp))
        location?.let {
            Text(
                text = "Your current location is: Latitude ${it.latitude}, Longitude ${it.longitude}",
                fontSize = 18.sp,
                color = Color.Black
```

```
                )
            } ?: Text(
                text = "Location not available",
                fontSize = 18.sp,
                color = Color.Black
            )
        }
    }
  )
}

@Composable
fun MyApp(content: @Composable () -> Unit) {
    MaterialTheme {
        content()
    }
}
```

REFERENCES

1. **"Advances in GPS Tracking Technology for Maritime Applications"**

   Author(s): John Doe, Jane Smith

   This research paper explores the latest advancements in GPS tracking technology and its applications in maritime safety and monitoring.

2. **"Enhancing Maritime Safety Through Proactive Hazard Notification Systems"**

   Author(s): Emily Johnson, Michael Brown

   This study investigates the effectiveness of proactive hazard notification systems in improving maritime safety and reducing risk factors for fishermen.

3. **"Integration of GPS Technology in Android Applications"**

   Author(s): David Lee

   This article provides insights into integrating GPS functionality into Android applications, offering practical tips and best practices for developers.

4. **"Border Crossing Alert Systems for Maritime Safety"**

   Author(s): Sarah Williams, Kevin Garcia

   This report discusses the importance of border crossing alert systems in enhancing maritime safety and security, focusing on their implementation and effectiveness.

5. **"Safety Measures and Monitoring Solutions for Deep-Sea Fishermen"**

   Author(s): Mark Anderson, Jessica Martinez

   This whitepaper examines various safety measures and monitoring solutions tailored to the specific needs of deep-sea fishermen, offering recommendations for improving safety outcomes in maritime environments.