CHAPTER 1
INTRODUCTION

1.1. Background

The smallest nation in South America, Suriname is situated in the Guiana Shield, on the northern Atlantic coast. The country's sustenance hinge primarily on the exploitation activities of its abundant natural resources that produce a majority of its gross domestic product (GDP) (Paiva & Bacha, 2019). Nearly half of the public sector revenue comes from mining and gold represents 80 percent of total exports (Keersemaker, 2020). As a developing country, nation-building propositions are challenged by the combination of a traumatic colonial history, a multi-ethnic population, and economic or political instability has made it difficult to implement successful nation-building policies (Hoefte & Veenendaal, 2019; Khadan, 2018). Rapid urban expansion in the northern coastal plain causes detrimental impacts on real estate value, and pressure inland towards forested areas (Koorndijk, 2019).

The Chenier plains of Suriname, as part of the coastal Guiana Shield region, experience sediment exchange through an intricate combination of oceanic waves and tides. This can result in either erosion or the accumulation of muddy debris originating from the Amazon River, forming a low-level plain in the Holocene (Anthony et al., 2019; Augustinus et al., 1989; Baltzer et al., 2004; Christine et al., 2015). The physical properties of mud and the resistance within the structure prevents itself from washing away, where it accumulates along the coast and eventually provide rapid vegetation growth, significantly the mangrove habitat. This is the definition of mud banks present along the coast, protecting itself against erosion and forming a natural barrier against the sea (Anthony et al., 2010).

Flood disasters in the Republic of Suriname have exacerbated in recent years by a rise in affected residential areas (ReliefWeb, 2022). The emergency is reoccurring in an annual trend and peaks during the rainy season (Pfeffer et al.,

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2015), which poses an important socioeconomic issue for the developing and economically dispositioned nation . The country has a population of a little above half a million, with most development, commerce, and government infrastructure located in the low-lying coastal plain along the Atlantic Ocean, concentrated in and around the capital city of Paramaribo.

Suriname has had to deal with these losses and damages, undertake adaptation interventions and build climate resilience mainly from its small national budget. Moreover, recognizing the vulnerability of the coast and ever-increasing impacts on a significant percentage of the population, Suriname's dilemma is whether to continue to invest heavily in adaptation or relocate and rebuild its entire economy away from the threat of the rising sea. This would mean shifting inland, a massive costly venture which would also put pressure on the country's forest resources and which could be jeopardizing Suriname's contribution of maintaining 15 million ha forest as both a huge carbon sinks and the "lungs of the Earth" for the global community.

It is evident that the country must find ways to manage the implications to take timely measures to prevent big losses. Resulting from this, policy makers, governmental bodies and national institutes especially, have drawn more attention to the preservation of the coastal areas, but also non-governmental organizations, national university and the Surinamese society itself in general are aware of the consequences. As a result, resources are sought and activities undertaken by these parties to address environmental impacts on the coast. However, there is still no evidence of a generalized approach for basic assessment of these environmental impacts, and no strong enforcement of the environmental law (Milieu Raamwet, 2020) and designated model or system that deals with all aspects of monitoring the coast (Berrenstein, Haydi. J and Gompers-Small, 2016; United Nations Development Programme in Suriname, 2016).

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Organizations involved in mitigation efforts, individually act on their own best interests. This also means that their monitoring products are proprietary or limited to a project framework. At time of writing, the environmental legislation passed in 2021 is in early stages of being enforced, and lacking fundamentally in a national flood monitoring model or platform. Additionally, the Republic of Suriname has a poor academic representation (including this theme) which covers only a handful of research papers and reoccurring researches. Suriname is a developing country which currently is experiencing economic difficulties, and therefore a cost-effective approach would be most appropriate to ensure the continuity of the flood risk assessment model. Remote sensing and the geographical information system (GIS) for geo-processing are the basis for such an approach.

1.2. Research Objectives

There are three research objectives formulated for this research, namely:

1. Analyze the flood frequently event based on Sentinel-1 SAR (Synthetic Aperture Radar) multi-temporal satellite image processing 2021 to 2023.
2. Generating a Coastal Flood Vulnerability Index (CFVI) for flood using geospatial multi criteria analysis approach based on exposure, sensitivity and adaptive capacity components.
3. Assessment of the mitigation strategy for flood on the settlement areas based on integration analysis of CFVI and stakeholder perception.

1.3. Hypothesis and guiding question

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A guiding question and derived hypothesis can elaborate on the main purpose of the research, explore the state of the art and to confirm or refute the hypothesis (Barroga & Matanguihan, 2022). The proposed guiding question for this research is as follows:

- How can multi-temporal satellite image processing and geospatial multi-criteria analysis be utilized to assess flood susceptibility and guide mitigation methods in coastal areas?

- According to Barroga & Matanguihan (2022), we propose the following complex hypothesis, which predicts the relationship between one dependent variable with multiple independent variables:
- Through the development of a Coastal Flood Vulnerability Index (CFVI), the integration of Sentinel-1 SAR multi-temporal satellite image processing and geospatial multi-criteria analysis can provide a comprehensive assessment of flood vulnerability and inform effective mitigation strategies in coastal settlement areas.

1.4. Research benefits

The following benefits are perceived:

1. Can provide insight for researchers into flood monitoring systems that are currently being installed or evaluated for deployment.
2. Provides a comprehensive insight for governmental organizations and other agencies with public policy roles into the real-world problems for flooding
3. Providing continuity to a freely accessible remote sensing based flood vulnerability protocol. Low resource and independent monitoring in order to improve flood mitigation and better preparedness to its socioeconomic consequences.
4. This research would aid in the development of a monitoring system and ensure its continuity by overcoming the nation's economic and technical limitations.

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