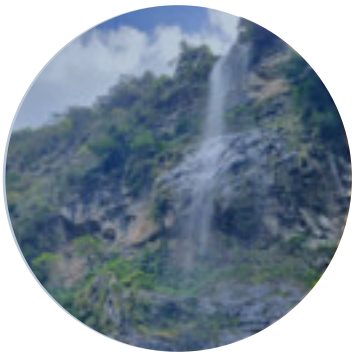

Resilient Heritage

TRINIDAD + TOBAGO

THE NATIONAL TRUST OF TRINIDAD AND TOBAGO

THE CRAIG GROUP

UF | Historic Preservation UNIVERSITY of FLORIDA

U.S. AMBASSADORS FUND for CULTURAL PRESERVATION

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Resilient Heritage: Trinidad and Tobago has been made possible through funding provided by the U.S. Embassy through the Ambassadors Fund for Cultural Preservation (AFCP). This Fund supports projects to preserve a wide range of cultural heritage in developing and less developed countries, including historic buildings, archaeological sites, ethnographic objects, paintings, manuscripts, indigenous languages, and other forms of traditional cultural expression. Through the Ambassadors Fund, the United States demonstrates American leadership in the preservation of cultural heritage around the world and shows its respect for other cultures. More than 1,000 cultural heritage projects have been supported by the AFCP since 2001.

Project Website:

https://resilientheritagett.com/

Cover: (Top) Maracas Waterfall, Angela Schedel; (Middle) Red House, Kimberly Rose; (Bottom) KHAW: T&T speakers and participants in discussion, Adriela Benjamin.
Inside Cover: View from an overlook, Cleary Larkin.

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FOREWORD

by Morris "Marty" Hylton, III

The *Resilient Heritage: Trinidad and Tobago* initiative began on a different island nearly a decade ago. In 2014, Kara Roopsingh, now the Senior Preservation and Research Officer at the National Trust of Trinidad and Tobago (NTT&T), attended the University of Florida Preservation Institute Nantucket (PIN) as part of the US/ICOMOS International Exchange Program.

America's longest, continually operating program for applied research in historic preservation, PIN had long engaged the residents and stakeholders of Nantucket to preserve its heritage. The small island, some 30 miles off the coast of Massachusetts, had once been the epicentre of a global whaling industry that quickly collapsed in the mid-1800s. Following this decline, Nantucket reinvented itself as a sought-after recreational and tourist destination in the mid-twentieth century. Conserving the island's architectural heritage and natural environment – its cultural and urban landscape – was critical to this successful reinvention.

The powerful lessons of Nantucket were not lost on Kara. She and I kept in contact, and she returned to Nantucket in 2019 as a guest lecturer. That summer, PIN was wrapping up the first phase of a multi-year project that began with digitally documenting, assessing the vulnerability, and offering adaptation considerations for the Town of Nantucket – one of the largest U.S. National Historic Landmark Districts on the East Coast. The results of this first phase of work were presented at Keeping History Above Water: Nantucket Workshop (June 2019). That gathering of local and outside experts served as a catalyst for elevating awareness of coastal resilience and the need to plan for resilience.

In a discussion with Kara, it was obvious that the "resilient heritage" framework developed and piloted on Nantucket had relevance for Trinidad and Tobago. This was validated by the enthusiastic support of the National Trust of Trinidad and Tobago, the U.S. Embassy of Trinidad and Tobago, and U.S. Ambassadors Fund for Cultural Preservation.

Among the many takeaways, the success of *Resilient Heritage: Trinidad and Tobago* demonstrates the need to share the model approach with other island communities globally. To state the obvious, there is much to learn through international exchange. It just takes commitment. I will end by sharing one of my favorite quotes by renowned anthropologist Margaret Mead: "Never think that a small group of committed people can't change the world. In fact, it is the only thing that ever has."

Resilient Heritage

INTRODUCTION

The project goal is to advance the resilience and long-term preservation of heritage sites affected by climate change.

In 2021, the United Nations Educational, Scientific and Cultural Organisation's (UNESCO) World Heritage Convention released their findings that "One in three natural sites and one in six cultural heritage sites are currently threatened by climate change." The National Trust of Trinidad and Tobago (NTT&T) lists 59 *Properties of Interest*, defined as any monument, fossil, place, or site of natural beauty of national, historical, scientific or archaeological interest, whether above or below the surface of the land or the floor of the sea. In Port of Spain, for example, sea levels are projected to rise between 37.74 cm (approximately 14.5 inches) at the lowest predictions and 43.15 cm (17 inches) at the highest over the next three decades. Potential storm surge from cyclone events is estimated to be up to 1.2 meters (nearly 4 feet) in the short-term to 2.5 meters (approximately 8 feet) in the long-term when accounting for sea level rise. The impacts of a changing climate and rising seas are wide-ranging, threatening the quality of life for Trinidad and Tobago's residents, the twin-island nation's economic well-being, and the country's *Properties of Interest*.

One in three natural sites and one in six cultural heritage sites are currently threatened by climate change.

The National Trust of Trinidad and Tobago collaborated with the University of Florida Historic Preservation Program and The Craig Group Partners, LLC. on *Resilient Heritage: Trinidad and Tobago* – a two-phase initiative to advance the resilience and long-term preservation of the nation's historic places and cultural resources as they are impacted by climate change and sea level rise. This initial phase included documenting two highly visible and visited heritage areas: Downtown Port of Spain and Nelson Island.

The "Assessment and Planning Phase" applied an integrated methodology for digitally documenting, assessing, and developing management frameworks for conservation and adaptation—a values-based approach embedded in community and stakeholder engagement throughout the process, including disseminating outcomes. A second "Implementation Phase" would include executing prioritised recommendations from this initial planning phase. The two phases are intended to serve as a model that can be replicated to strengthen the resilience of historic sites and resources across Trinidad and Tobago and the Caribbean region.

Employing a values-based approach to heritage management, a wide range of stakeholders was engaged throughout and informed the process. The results were widely distributed through public presentations and engagement activities, including a regional *Keeping History Above Water* conference, *America Adapts* podcast, a workshop, lectures, and online touch points. The feedback and results of all feedback have helped determine the values and interests in protecting the vulnerable heritage sites of Trinidad and Tobago.

The approach to achieving the project goal and advancing the second "Innovation Phase" included:

1. Model framework for conserving and adapting heritage sites across Trinidad and Tobago and the Caribbean Region to be more resilient to climate change and sea level rise;
2. Public and stakeholder engagement strategy for enhancing awareness of climate change, sea level rise and their impacts on heritage places and cultural resources;
3. Digital documentation and coastal hazard risk assessment for two initial, varying types of heritage areas – Downton Port of Spain (historic urban landscape) and Nelson Island (cultural landscape);
4. Conservation and adaptation management framework with prioritised recommendations for the preservation and ongoing maintenance of Downtown Port of Spain and Nelson Island.

The framework, findings and actions discussed in the following chapters establish a baseline for future work on vulnerable heritage resources. This Plan prioritises four focal areas with a total of 22 actions identified; 6 of those actions are considered feasible in the near future and will be prioritised for implementation. Additionally, this plan acknowledges that heritage and cultural heritage often need to be integrated into national and local disaster risk reduction strategies and vice-versa. This plan moves Trinidad and Tobago closer to an integrated climate resilience effort that addresses all aspects of the human condition.

Context of Research

Trinidad and Tobago is part of the global effort to address climate change meaningfully. The international partnerships that stem from global participation come with resources, data, and other information which Trinidad and Tobago can adapt and apply to local contexts. Below is an exploration of just some of those resources.

The *Sendai Framework 2015-2030* works alongside the *Paris Agreement* in advocating for:

> *The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities and counties.*

As stated, the integration of heritage and cultural heritage into climate resilience and disaster risk reduction efforts has yet to be fully realised in many national and local efforts. The *Sendai Framework* recognizes the importance of including cultural heritage in disaster risk reduction policies and that, by doing so, the resilience of people and their assets will become more intrinsic to society. To assist with this process, the United Nations Office for Disaster Risk Reduction (UNDRR), which oversees the administration of the *Sendai Framework*, published a *Cultural Heritage Addendum* to guide cities in making heritage and cultural sites resilient. Trinidad and Tobago has yet to report for the *Cultural Heritage Addendum*, but the other global targets in the 2021 report are still marked in progress.

Trinidad and Tobago, through NTT&T, is also an Associate Member of the International National Trusts Organisation (INTO). INTO brings the common goal of the National Trust family together, to share knowledge and tools for protecting cultural and natural heritage. INTO hosts a climate webinar series as well as resources and conference sessions.

The United National Convention of Climate Change (UNFCCC) oversees the *Paris Agreement*, which Trinidad and Tobago played a prominent role in developing. Trinidad and Tobago is listed as a Non-Annex I party, a classification that recognizes the nuance of the fossil-fuel-reliant economy paired with the vulnerabilities of climate change. Kishan Kumarsingh, Head of the Multilateral Environmental Agreements Unit of the Ministry of Planning and Development, has been the lead climate negotiator for Trinidad and Tobago since 1998, representing the nation to multiple international boards, such as UNFCCC. He served as Co-Chair in the negotiations on the *Paris Agreement* in 2013-2014.

Part of the UNFCCC and the *Paris Agreement* requires countries to establish a climate action plan, or a Nationally Determined Contribution (NDC), that communicates the goals and actions to meet the *Paris Agreement* goals in the timeline. The first NDC was submitted in 2018, and an update is underway. This plan briefly discusses the climate effects, economics, and changes needed to reach the *Paris Agreement* goals.

Locally, Trinidad and Tobago has made considerable efforts towards understanding and planning for climate change. *Resilient Heritage: Trinidad and Tobago* references numerous documents to determine what research areas needed to be fulfilled and how this plan may fill gaps. Below is a list of those documents:

- Integrated Coastal Zone Management Policy Framework, Integrated Coastal Zone Management Inter-Ministerial Committee, 2019
- Vulnerability and Capacity Assessment Report: Technical Assistance for The Environment Programme, European Union Delegation to Trinidad and Tobago, 2019
- Understanding The Economics of Climate Adaptation in Trinidad and Tobago, Inter-American Development Bank, 2014
- National Climate Change Policy

However, many of these documents define loss in terms of economics but neglect the social-emotional impact. Following a disaster, people frequently feel stunned, disoriented, powerless, and overwhelmed by what to do. Unfortunately, disasters are an inevitable truth of life. Every year, individuals and communities are affected by disasters, adding additional stress to their lives thus affecting their mental health. This is especially true when community touch points, such as beloved monuments, landmarks, landscapes, or buildings, are irreplaceably changed or gone altogether. The documents above stress adaptation and the mitigation of potential damage, but they do not illustrate the importance of prioritisation based on community input. By understanding what is essential to a community's socio-cultural dynamics, planning efforts can be prioritised and actions can be taken to decrease impacts on those prioritised resources.

National Trust of Trinidad and Tobago: Mission

Trinidad and Tobago legislation (Act No. 11 of 1991) recognises the National Trust of Trinidad and Tobago as the national agency responsible for safeguarding the natural and tangible heritage of Trinidad and Tobago. The National Trust's main goal is to legally protect properties of interest through a listing process and by educating the public and engaging stakeholders on the importance and significance of these properties. Objectives of the Trust include:

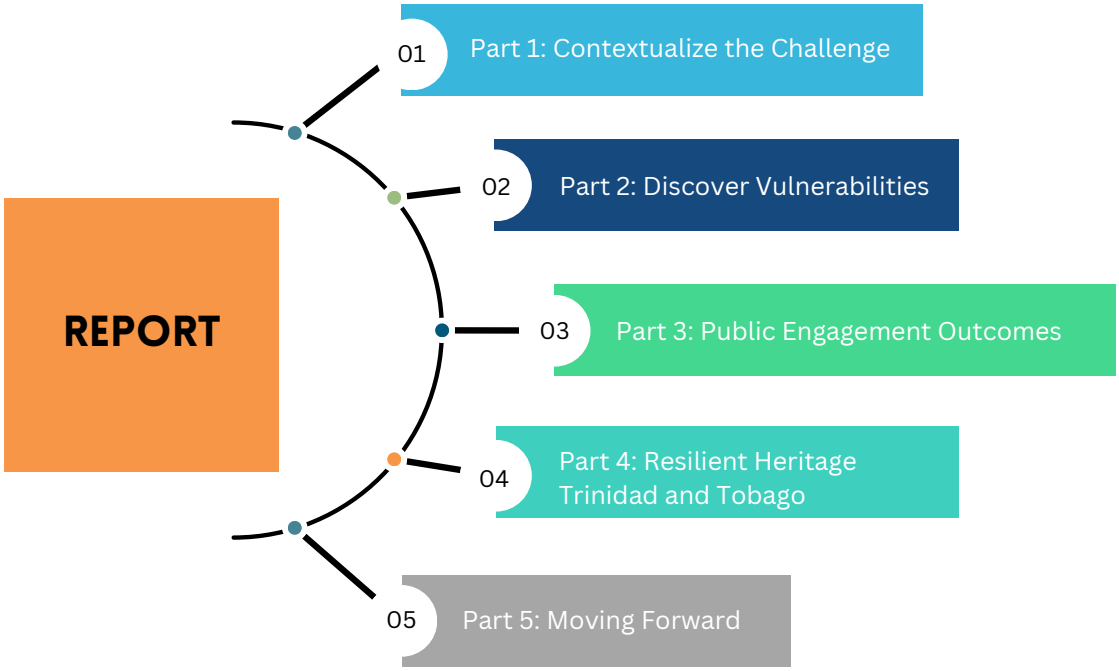
- To protect and promote the care and preservation of significant examples of Trinidad and Tobago's built and natural heritage.
- To promote access for all Trinidadians and Tobagonians to their heritage.
- To foster a greater awareness and understanding of Trinidad and Tobago's heritage and of its significance and richness.
- To encourage the continued development of, and participation in the Trust.

Of the sites included in this phase of *Resilient Heritage: Trinidad and Tobago*, the National Trust holds direct management responsibility for only one: Nelson Island – which, along with the other islands composing the Five Islands, has been under the Trust's jurisdiction since 2003. The Trust has since embarked on a programme of restoration, redevelopment and implementation of sustainable energy techniques on Nelson Island, in an effort to leverage the site as a historical, cultural and environmental treasure available to the wider public. Furthermore, the Trust successfully added Nelson Island to the national List of Properties of Interest in 2019 and continually aims to provide visitors to the island with an experiential learning opportunity and the opportunity to participate in environmentally responsible recreational activities.

While the National Trust does not hold responsibility for the management of the downtown Port of Spain heritage sites, it is undeniable that the St. Vincent Jetty Lighthouse, Fort San Andres and the PTSC building are located in an historical, social and economic hub of significant importance to the resident and transient population of the capital. In 2017, the Trust launched a series of walking tours in downtown Port of Spain called "Orange Umbrella Tours: OUT with the Trust," giving the public the opportunity to discover or rediscover historic downtown Port of Spain properties. The Trust envisages that integrating findings and outcomes of this *Resilient Heritage: Trinidad and Tobago* project into the public education programming promoted by these tours will enrich this tour and highlight the issue of climate resilient heritage preservation in the minds of patrons.

Report Organisation & Use

This *Resilient Heritage: Trinidad and Tobago* report consists of five parts. The project team recognizes that certain aspects of the report are relevant to specific individuals or organisations that make up the project's larger audience beyond those associated with the NTT&T.



Part 1: Contextualize the Challenge is a broad analysis of the threats to and vulnerabilities of Trinidad and Tobago and explores why historic properties and cultural resources are valued and considered for adaptation.

Part 2: Discover Vulnerabilities details the specific vulnerabilities of the selected sites, narrates the LiDAR Visualizations, and addresses the current conditions.

Part 3: Public Engagement Outcomes discusses the results of the project website, Community Values Survey, *Keeping History Above Water* Conference, *Resilient Heritage: Trinidad and Tobago* Workshop, *America Adapts* podcast, and Prioritisation Survey.

Part 4: Resilient Heritage discusses the recommended resilience actions and applicable resources for the NTT&T.

Part 5: Moving Forward briefly summarizes the resilience actions and provides the report's conclusion.

Who is the Report's Audience?

NTT&T Staff: Staff members are vital to the operation, maintenance, preservation, research, and promotion of the NTT&T. Parts 2, 3, 4, and a quick reference to Part 5 provide beneficial guidance to Staff. Part 2 addresses vulnerabilities to heritage now and in the future. Reviewing this section establishes an understanding of prioritisation of specific actions and where Staff input is essential. Part 3 provides insight into participants' concerns about climate change and proposed resilience action for heritage sites. Part 4 shares the actions informed by Parts 2 and 3. These actions and resources advise Staff on specific work-related tasks where resilience has a role. Part 5 is a summary and quick reference tool.

Government Officials / Employees: Country employees are essential to the operation, maintenance, preservation, and administration of all heritage sites. The report Methodology, Parts 1, 2, and 4, and a quick reference to Part 5 are useful resources. The Methodology section details how the project team approached the *Resilient Heritage: Trinidad and Tobago* scope of work, and can be replicated in future vulnerability assessments and historic property adaptation plans. Part 1 takes a broad view of climate and disaster threats to heritage properties and cultural resources. Part 3 provides insight into participants' concerns about climate change and proposed resilience actions. These responses can apply to and be ground-truthed for relevance to other Trinidad and Tobago sites. Part 4 shares the actions informed by Parts 2 and 3. By reviewing these actions and resources, government employees can be better informed on means for incorporating resilience into projects and daily tasks. Part 5 is a summary and quick reference tool.

Resident/ Property Owner: Residents and property owners who visit heritage sites and other open spaces benefit from those properties being protected against loss from climate-related disasters. However, those same individuals may work in, reside in, or own a property they must protect against storms, wind, and flooding events. Parts 1 and 4 can assist these individuals with preparing and recovering from disasters. Persons residing in close proximity to heritage sites can benefit from a review of Part 1, which includes a country-level vulnerability assessment. This section provides the baseline from which property owners and residents can better drill down in assessing their own properties' vulnerability. Part 4 provides a template for setting goals and actions that may apply to privately owned properties in the area. The resilience and climate change vocabulary is not typical to most individuals' day-to-day discussions, hence the usefulness of the report's glossary and links to websites, checklists, and images that explain terms and inspire action.

METHODOLOGY

SITE SELECTION

Climate change and sea level rise are threatening historic coastal communities and sites across the Caribbean region including Trinidad and Tobago. In Port of Spain, for example, sea levels are projected to rise between 37.74 cm (approximately 14.5 inches) at the lowest predictions and 43.15 cm (17 inches) at the highest over the next three decades. Potential storm surge from cyclone events is estimated to be up to 1.2 meters (nearly 4 feet) in the short-term to as much 2.5 meters (approximately 8 feet) in the long-term when accounting for sea level rise. The impacts of a changing climate and rising seas are wide ranging, threatening the quality of life of Trinidad and Tobago residents and the twin island nation's economic well-being. For example, the country's heritage tourism is dependent upon recreational activities associated with the island nation's natural environment and cultural sites and traditions.

The *Resilient Heritage: Trinidad and Tobago* project is an initiative to advance the resilience and long-term preservation of the nation's historic places and cultural resources as they are impacted by climate change and sea level rise. This phase includes the documentation of two highly visible and visited heritage areas: Downtown Port of Spain and Nelson Island, two heritage areas prioritised by NTT&T. These locations represent, respectively, an active urban context with significant historic landmarks (defined as a *historic urban landscape*) and an island with a natural landscape marked by human impact over time (defined as a *cultural landscape*), a dedicated heritage site open to visitation and managed by NTT&T. Collectively, the cultural resources that make up these heritage areas relay important moments in the historical development of Trinidad and Tobago.

For histories of the sites, please refer to the project website: https://resilientheritagett.com/project-sites/

Downtown Port of Spain Heritage Area Description

The Downtown Port of Spain heritage area is among the country's largest land and sea public transportation hubs, banking centres, and commercial enterprises. Port of Spain and Carenage, the village near Nelson Island, account for a significant residential and transient human population, which makes understanding the risks of sea-level rise all the more important. Within the Downtown Port of Spain area are three important sites: the St. Vincent Jetty Lighthouse, Fort San Andres, and the Public Transport Service Corporation (PTSC) building.

The St. Vincent Jetty Lighthouse is a reminder of the where the shoreline was once located, as it is now landlocked due to land reclamation activities on the foreshore. The lighthouse is listed by the NTT&T as a property of interest, which gives it legal protection, requiring any maintenance to the building or changes to go through the Trust for review. However, beyond the role of the listing, the responsible Ministry for the property is currently unknown, creating a conflict for any recommendations needed for resilience.

Fort San Andres, built in 1787 and also now landlocked, is the last surviving fortification from the period of the Spanish occupation of Trinidad, which ended in 1797 with the capture of the island by the British. Fort San Andres is not listed by the Trust, but is owned by the National Museum and was converted in 1995 for use as a museum. Currently the building is not open to the public and not in use.

The PTSC building is the old railway station building formerly known as the Trinidad Government Railway (TGR) building and was the metropolitan hub for the railway lines which connected Port of Spain to various parts of the country. It is protected and listed as a property of interest by the Trust and today it is locally known as “City Gate” because it is the main transportation hub for all buses and maxi taxis leaving the city (Heritage Areas Overview Report, 2021).

Nelson Island Description

Nelson Island is a microcosm of the country’s history and is one of the most layered historic properties in the Trust’s care. Nelson Island is a legally protected heritage site managed by NTT&T. Nelson Island features buildings, ruins, and objects that are the physical remnants of the twin-island nation’s multifaceted history. The First Peoples and colonial powers used the island as a waystation, then a naval outpost to protect the growing Port of Spain harbour. Subsequently, the island became a quarantine station and then a depot for Indian immigrants. In World War Two, the island was occupied by U.S. military forces, an internment camp for German and Jewish enemy alien internees, and a detention centre for labour leader Tubal Uriah “Buzz” Butler. In 1970, the island was again used to isolate and detain fifty individuals associated with Trinidad and Tobago’s Black Power Revolution (Heritage Areas Overview Report, 2021).

Nelson Island is one of a cluster of six small islands called the “Five Islands.” They are, in descending order of size: Caledonia, Nelson, Lenagan, Rock, Pelican and Craig. The Five Islands are the remnants of an ancient coral reef extending from the hills of Laventille in east Port-of-Spain all the way to Patos Island (administered by Venezuela) to the west. For this reason, limestone is the major constituent in the

geomorphology of Nelson Island and the other five islands of the group. Along with the other islands of the cluster, Nelson Island is low and arid.

Nelson Island's topography consists of a relatively flat and weathered western portion, and an eastern steeper portion which contains a jagged and notched outcrop of limestone. Nelson Island is somewhat unusual in that unlike most of the other islands, its deciduous vegetation was largely removed for much of its history of occupation.

"The Islands are also considerably weathered with only a thin clay soil. Rainfall is typical of the general area with an estimated 1500mm per year, but there is no natural standing or running water" (Kenny, 1999). "The Five Islands" are exposed to sustained winds from the east and south east for much of the year. Additionally, the waters surrounding the island cluster are of a considerable depth. "They sit barely within the five fathom (30 foot) contour" (Kenny, 1999).

Due to the similarities in the geology, ecology, flora and fauna across the Five Islands, Nelson Island can be viewed as a model for how to document and implement adaptive strategies for the remaining Five Islands, which all contain natural and cultural heritage assets.

Satellite image depicting the Five Islands In relation to the north-western peninsula of Trinidad. The Five Islands; Surveys and Mapping Division GORTT 2018. www.surveys.gov.tt/publicmap [November 4, 2018].

Cultural Heritage Assets

Due to its long history of use, Nelson Island features several intact and ruined structures, and objects of varying age, design, and provenance. The intact, and historically significant, structures on the island were known as the "Main Buildings." They are arranged from north to south and are now known as the Mess Hall, 1802 Building, and the "Jail Cells" Building. These structures are built of island mined blue limestone, cast in mortar of burnt lime and sand in rough timber boxing and all measure approximately 25m x 7m. The central building which bears the inscription "AD 1802" is reportedly the oldest building in continuous use in Trinidad; it was built by a group of enslaved Africans called the "Kings Negroes" (Nelson Island: Legacy of the Enslaved African, 2008). The two additional buildings, the "Mess Hall" and "Jail Cells" building, were probably constructed around 1860. These three buildings have been modified several times during their 200-year history. The most recent modifications occurred in 1970 when the southernmost structure was converted into a series of prison cells.

Photograph showing the eastern elevation of the 1802 Building. Source: National Trust of Trinidad and Tobago

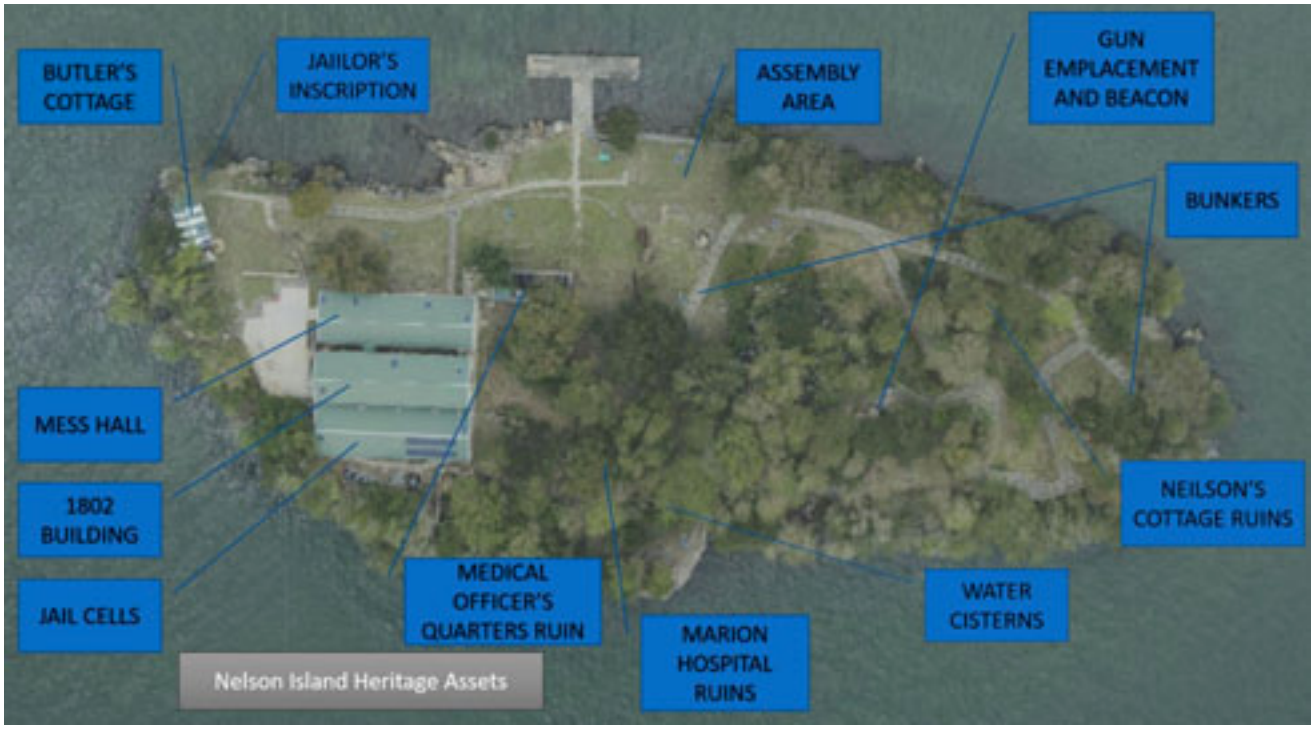
Photograph showing the eastern elevation of the Mess Hall. Source: The National Trust of Trinidad and Tobago

Nelson Island also contains significant structural ruin sites, Marion Hospital, the Medical Officer's Quarters, and Butler's Cottage, among other unidentified structural foundations. The ruin of Marion Hospital is situated just east of the three main buildings. This structure was built to facilitate convalescence operations during the period of Indian Indenture. It was reportedly a wooden structure built on a concrete stilt foundation. All that remains is the basement level, concrete stilts and three concrete stairways which led to ground floor of the structure. Ballast brick of Scottish origin can also be found in the context of the ruin site.

Photograph depicting the ruin of the Marion Hospital. Source: National Trust of Trinidad and Tobago

The ruin of Medical Officer's Quarters is also located near the three main buildings. These remains were the foundation level of the original structure. They are made of pulverized blue limestone and mortar of burnt lime. Butler's Cottage is located near the western edge of the island. In keeping with other structural remains on the island, only the concrete stilt foundation and stairway remains from the original structure. The National Trust built a replica of the cottage using the original foundation and stairway. The building was intended to be viewed from the outside only; the historic interior layout was not documented and there is currently a modern plan layout.

In addition to intact structures and ruin sites, the island also boasts a plethora of historically significant objects such as the Gun Emplacement Area, water cisterns, Signal Beacon, and others. The Gun Emplacement Area and the Signal Beacon are located at the highest point on the island. These are two relics of Nelson Island's role in the twentieth century World Wars. The Gun Emplacement was designed for the operation of the 4.7-inch howitzer naval rifle. It is made of thick reinforced concrete. The Signal Beacon is made of steel and is still operational; it has been retrofitted to operate using solar power. There are several metal riveted water cisterns located on the islands, needed due to the island's lack of a fresh water source.



Satellite image overlaid with the locations of Nelson Island's Cultural Assets. Source: The National Trust of Trinidad and Tobago

DATA COLLECTION

The University of Florida Historic Preservation (UFHP) team's digital documentation and analysis were twofold. First, the team conducted architectural documentation for Nelson Island. The documentation aimed to prepare accurate architectural and landscape records, including 3D laser scans and measured existing-condition drawings, to inform the preservation of the heritage island and its historical resources. Second, UFHP undertook 3D flood simulation and visualization, and elevation analysis GIS (geographic information system) mapping to understand the vulnerability of three architectural heritage resources in Port of Spain: Fort San Andres, St. Vincent Jetty Lighthouse, Old Railway Station (current Public Transport Service Corporation or PTSC), and their immediate urban context around the South Quay and Broadway intersection. The 3D works and mappings aimed to inform the public workshop and discussion by helping the stakeholders visualize the climate impacts and issues with the urban infrastructure and topographical conditions.

For 3D laser scan data acquisition at the two locations, the UFHP team visited Trinidad and Tobago and conducted the first fieldwork from April 25, 2022, to May 3, 2022. The team used two terrestrial laser scanners, FARO Focus S 350 and X 130. The first fieldwork focused on Nelson Island's three heritage buildings: the 1802 Building, Mess Hall, and Jail Cells, and the western contexts, including structures and landscapes. The Port of Spain scan data included streetscapes and building exteriors, such as the Old Railway Station's street elevations, St. Vincent Jetty Lighthouse's all sides, and Fort San Andres' four elevations and wraparound veranda. UFHP undertook the second fieldwork to record the eastern section of Nelson Island from November 15 to 17, 2022. 3D laser scanning helped capture visible surfaces with millimeter metric accuracy and baseline color information at 360 degrees. The team captured 3D scans from 107 locations at the Port of Spain site and 235 locations on Nelson Island.

The processed scan data generated virtual replicas of the built and natural environments, informing the UFHP team’s documentation and analysis tasks. The virtual replicas are point clouds, which are collections of laser-measured floating points with color representation. Nelson Island's scan data provided architectural information, such as measurements, cross-sections, and spatial configurations. Based on these data, UFHP created Nelson Island's building plans, elevations, cross-sections, and site plan. The team cross-referenced the 3D scan data with photographs taken by a hand-held camera and drone camera, as well as field sketches and notes.

The virtual replica also allowed the UFHP team to simulate and visualize flood impacts on the urban environment of the Port of Spain site. In combination with analytical GIS elevation mapping, the 3D simulation helped to understand and communicate past flood events, sea level rise projections, and the characteristics of topography and urban environments increasing flood frequency and severity. To facilitate the analysis, the UFHP team cross-referenced news media photographs and articles about past flood events that happened around Old Railway Station (PTSC) and South Quay and flood susceptibility assessment by Trinidad and Tobago's Office of Disaster Preparedness and Management (ODPM). The team also unitized GIS digital elevation model (DEM) ground elevation survey data provided by Trinidad and Tobago's Institute of Marine Affairs (IMA).

Regarding the rise in sea level, the team reviewed the worst-case scenario, Representative Concentration Pathway (RCP) 8.5, presented in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, 2014. RCP provides a series of projections based on how the concentrations of greenhouse gases in the atmosphere will change in the future as a result of human activities. RCP 8.5 represents the very high concentration of greenhouse gases by 2100. IMA had interpreted RCP projections into local GIS data, and the UFHP team incorporated them into the team's analyses. Additionally, during fieldwork, the UFHP team observed floods around South Quay after a few hours of rainfall.

Laser Scanning Training

During the second visit in November 2022, the UFHP team provided the NTT&T staff, government researchers (e.g., IMA staff), graduate students, and other local experts with a training workshop in 3D imaging technology and architectural heritage condition assessment. Technology training included 3D photogrammetry (i.e., the technique of overlapping 2D digital photographs by 66% to create 3D representations) for small objects (e.g., National Trust's archaeological artifacts), 360-degree virtual tour development exercise, and terrestrial laser scanning demonstration.

The training participants also visited Nelson Island in person, learned about the heritage site and the challenges it faced, participated in historic building condition assessment and discussion, and explored how technology would be used for documentation. The workshop helped augment the understanding of the technologies and raise the awareness of the heritage site and the need for efforts and collaboration on preservation and use.

Staff from the Trust and other local organisations visited Nelson Island for a laser scanning and conditions assessment training. Trainings can build local capacity for future projects to be undertaken by local residents and advocates.

PUBLIC ENGAGEMENT

Subject Focus Groups

"Focus groups are a form of strategy in qualitative research in which attitudes, opinions, or perceptions towards an issue, product, service, or programme are explored through a free and open discussion between members of a group and the researcher." (Kumar, 2010, p. 127-128). The project team chose this method for its relatively low cost, allowing for formative evaluation, low time requirements, and high information yields. There are seven steps to initiating focus groups:

1. Determine the Topic and Goals

Having a clear plan for focus group members is necessary to receive clear and relevant information and select members for attendance. The topics for the *Resilient Heritage* focus groups were initially heritage tourism, building adaptation, nature-based adaptation, land use policy, adaptation strategies for the future, and structural engineering. The goal of each focus group was to gather information from key stakeholders as to the previous and current condition of each subject area, as well as hear feedback on project branding.

2. Identify Potential Participants

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3. Question Development and Discussion Guide

As the participants were identified, the research team developed questions that included general questions asked across all focus groups and focus-specific questions. The twelve focus group questions were:

- How are you, your government agency, or your private organisation engaged in cultural heritage or conservation?
- What are Natural Hazard "seasons" in Trinidad and Tobago?

- Which of these hazards of disasters have you, your community, or your industry experienced?
- Heritage Tourism: What cultural heritage assets would you identify as critical to the Heritage Tourism industry?
- Land Use Policy: What would you like to see your community or industry adopt as a disaster policy priority for heritage resources?
- Building Adaptation: What built adaptation strategies are feasible for historic buildings in your community?
- Nature-Based Adaptation: Which nature-based approach could work in your home, business, or community?
- Adaptation Strategies for the Future: How can disaster resilience & recovery be incorporated into education activities in your community?
- Adaptation Strategies for the Future: What concerns do you have, if any, for structural adaptation strategies (sea walls, levees, raising roads) in your community?
- In the case of disaster, what historic place(s) or cultural resource(s) would you want the government to prioritise for recovery in your community?
- What barriers exist to taking action?
- Please select the logo you believe best brands the issue of cultural heritage in planning for disaster resilience in Trinidad and Tobago.

4. Focus Group Implementation

The focus groups were held from April 27, 2022, through April 29, 2022. Researcher Kimberly Rose, Preservation Manager with The Craig Group, and Kara Roopsingh, Senior Heritage Preservation and Research Officer, NTT&T, were present in person for all groups. Lisa Craig, Principal with The Craig Group, was present virtually for Heritage Tourism and Building Adaptation. The following page is a breakdown of the participants and their special content, the results of which are included in Section 3.

Group 1: Heritage Tourism

Time: April 27, 2022 (10:00 - 11:30 a.m.)

Participants: Chaguaramas Development Authority, Chamber of Industry, National Museum of Trinidad and Tobago, United Fisherfolk Association, Tourism Trinidad Ltd., Tour Guides Association, Yacht Services Association of Trinidad and Tobago, Culture Division, and NIDCO/ Water Taxi.

Special Content: The Travel Cost Method was presented for some background information for this session. This method seeks to estimate a monetary value based on the amount people pay (in money and time) to access beautiful sites. Additionally, participants learned more about the impact of disasters on tourism.

Group 2: Building Adaptation

Time: April 27, 2022 (2:00 - 3:30 p.m.)

Participants: East Port of Spain Development Company, Port of Spain City Corporation, Anglican Diocese, Public Transportation Service Corporation, Roman Catholic Archdiocese, Citizens for Conservation, and Trinidad and Tobago Prison Service.

Special Content: The U.S. Secretary of the Interior's *Standards for Rehabilitation & Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* was presented for ideas on adaptation alternatives.

Group 3: Nature/ Nature-based Adaptation

Time: April 28, 2002 (10:00 - 11:30 a.m.)

Participants: Institute of Marine Affairs, Thornes & Roses, Port of Spain City Corporation, Trinidad and Tobago Meteorological Office, Environmental Management Authority, and Forestry Division.

Special Content: The Craig Group presented a case study of the Llambias House from St. Augustine, Florida, which is highly vulnerable to flooding and is a case study for natural adaptation alternatives to intercepting water. This case study was used to talk about types of nature-based adaptation and brainstorm others.

Group 4: Land Use Policy

Time: April 28, 2002 (2:00 - 3:00 p.m.)

Participants: Office of Disaster Preparedness and Management, Environmental Policy and Planning Division, Sea Lots Community, Town and Country Planning Division, Trinidad and Tobago Society of Planners, Maritime Division, Ministry of Works and Transport, and Marine Unit of the Trinidad and Tobago Police Service.

Special Content: The Craig Group presented approaches to policy and planning for communities and industries to encourage ideas and flow of discussion. The participants were asked about what policies they think are feasible for Trinidad and Tobago or local municipalities, as well as how those policies would or could affect heritage resources.

Group 5: Adaptation Strategies for the Future

Time: April 29, 2002 (10:00 - 11:30 a.m.)

Participants: HIT RESET Caribbean, Parvenir Heritage Restoration, UNESCO Commission for Trinidad and Tobago, Maxi Taxi Association, Yoruba Village, National Trust of Trinidad and Tobago, WOMANTRA, Civilian Conservation Corps.

Special Content: The researchers presented public awareness and education strategies to advance citizen knowledge and action. Concerns about adaptation alternatives, such as sea walls, levees, and raised roads, were also discussed.

Resilient Heritage: Trinidad and Tobago Community Values Survey

This survey was designed to facilitate the sharing of Trinidad and Tobago's most vulnerable resources and to collect data on community values regarding historic, natural, and cultural places, sites, and landscapes. Community Values Surveys allow researchers to learn about communities' perceptions, opinions, and needs. This survey asked participants to determine their relationship with the heritage sites, the NTT&T, individual experiences, and concerns for climate-related vulnerabilities and resilience approaches.

The research team distributed the survey through the established NTT&T network of members and users via social media, websites, and email newsletters. The survey was open from January 29, 2023, to March 13, 2023. The summary of the survey responses is included in Part 3. This survey informed the content for the in-person community workshop and the Prioritisation Survey in the Spring of 2023.

Keeping History Above Water (KHAW)

The two-day KHAW Trinidad and Tobago conference, held in March 2023, was hosted by NTT&T through funding from the US Ambassadors Fund for Cultural Preservation. Modeled on the *Keeping History Above Water* (KHAW) conference format developed by the Newport Restoration Foundation and a previously hosted workshop in Nantucket, Massachusetts (USA) in June 2019 (https://historyabovewater.org/2019-nantucket/), this conference brought together heritage specialists, scientists, government officials, residents, and others from Trinidad and Tobago, other Caribbean nations, and beyond, both in-person and virtually, to examine the impacts of climate change and sea level rise on the island nation.

Participants shared knowledge and experiences via case studies and best practices in adaptation and resilience planning, policy, and practice. The *Resilient Heritage* team presented the vulnerability assessment analysis and preliminary recommendations for the Downtown Port of Spain and Nelson Island project sites, and led a half-day community values workshop for local residents and NTT&T staff. Participants developed action items to raise awareness of climate-related threats and offer specific resilience measures for adaptation of cultural heritage sites in Trinidad and Tobago.

Resilient Heritage: Trinidad and Tobago Workshop

The *Resilient Heritage: Trinidad and Tobago* workshop followed the two-day KHAW conference. Registrants to the conference were able to request a spot at the workshop and NTT&T invited students and NTT&T staff to participate. The workshop aimed to collect additional information regarding the island nation's vulnerability to climate change and natural disasters, and determine actionable resilience strategies and adaptation approaches for cultural heritage sites in Trinidad and Tobago, specifically the most vulnerable properties as the focus of the *Resilient Heritage: Trinidad and Tobago* project.

The first ninety minutes were spent reviewing the project to provide the necessary groundwork for the workshop–breakout session:

- Welcome, Project Background and Workshop Goals: Lisa Craig, The Craig Group Partners; Kara Roopsingh, National Trust;
- Project Sites Vulnerability Assessment: Dr. Cleary Larkin and Dr. Sujin Kim, University of Florida Historic Preservation Program;
- Community Values Survey findings: Kimberly Rose, The Craig Group;
- Adaptation strategies: Lisa Craig and Dr. Angela Schedel, Taylor Engineering.

Breakout participants selected the topic they were most interested in addressing and joined the respective table, where a facilitator from the project team led the discussion and prioritisation exercise.

- Group #1: Land Use and Environmental Policies – Kara Roopsingh;
- Group #2: Adaptation Strategies for Buildings & Infrastructure – Dr. Angela Schedel;
- Group #3: Public Awareness & Preparedness – Kimberly Rose;
- Group #4: Cultural Heritage Planning and Protection – Lisa Craig;
- Group #5: Nature-based Mitigation Strategies – Dr. Cleary Larkin.

The groups had a worksheet with seven questions guiding discussion: identify actions, barriers, approaches to those barriers, milestones to overcome barriers, resources, leaders and partners, and immediate next steps. After a break, the participants were asked individually to prioritise six actions identified on any or all of the breakout groups' worksheets. Doing so allowed the researchers to understand what actions, across all topics, were of the highest priority to the participants.

America Adapts Podcast

America Adapts is hosted by Doug Parsons, who has a background in climate change, science communication, and policy discussions around adaptation. With this background, Parsons has developed *America Adapts* into one of the forefront podcasts by interviewing experts in adaptation globally. The project team created the *America Adapts* and *Resilient Heritage: Trinidad and Tobago* partnership with the idea that this project can be an example for other small-island developing nations and in the region. Presenting the ideas from the *Keeping History Above Water* conference within the podcast adds a deeper dimension of engagement.

Parsons selected participants and speakers to interview at the conference. The topics covered include:

- Climate change is threatening historic and coastal communities across the Caribbean region, including Trinidad and Tobago;
- Challenges faced by island communities due to climate change;
- The role of the National Trust of Trinidad and Tobago;
- How to advance the resilience and long-term preservation of Trinidad and Tobago's historic sites and cultural resources;
- The U.S. State Department support of climate adaption.

The experts featured are:

- Lisa Craig, Principal, The Craig Group;
- Cheri-Ann Pascall, Tour guide, Trinidad and Tobago Tour Guides Association;
- Margaret McDowall, Chairman, National Trust of Trinidad and Tobago;
- Martin Perschler, Program Director, U.S. Ambassadors Fund for Cultural Preservation, U.S. State Department;
- Dr. Cleary Larkin, Director, Historic Preservation Program, University of Florida;
- Kishan Kumarsingh, Head of the Multilateral Environmental Agreements Unit, Ministry of Planning and Development, Trinidad and Tobago;
- Ambassdor Candace Bond, Chief of Mission, U.S. Embassy Port of Spain;
- Dr. Jay Haviser, Director, St. Maarten Archaeological Centre;
- Dr. Angela Schedel, Vice President, Coastal Resilience Planning, Taylor Engineering;
- Dr. David Guggenheim, Marine Scientist;
- Vernaire Bass, Manager, National Museum of Montserrat;
- Jeff Goodell, Author of "The Water Will Come";
- His Worship Joel Martinez, Mayor of Port of Spain;
- Kara Roopsingh, Senior Heritage Preservation and Research Officer, National Trust of Trinidad and Tobago.

[Listen to America Adapts Podcast episode here]

Resilient Heritage: Trinidad and Tobago Prioritisation Survey

Following up on the initial Community Values Survey, the *Keeping History Above Water* conference and the *Resilient Heritage: Trinidad and Tobago* Workshop, the project team formulated a second survey focused on priorities to protect historic, natural, and cultural sites in Trinidad and Tobago. Each section briefly described what the questions covered to ensure adequate responses. Survey respondents were asked to rank specific actions and approaches to implementing or completing those actions from the workshop. The project team used the input from this second survey to prioritse the resilience actions in Part 4 of this report.

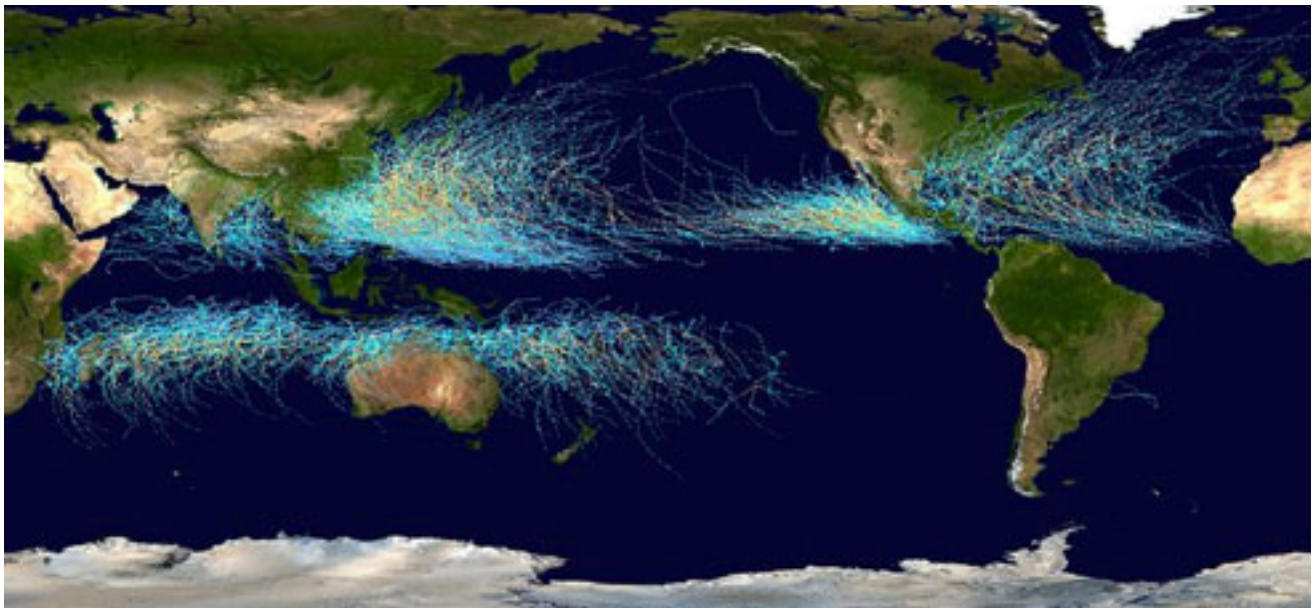
PART 1: CONTEXTUALIZE THE CHALLENGE

WHAT ARE THE GENERAL THREATS TO TRINIDAD AND TOBAGO?

To many, it is unsurprising that Trinidad and Tobago is at risk for rising sea levels, flooding, and storms. However, there is a misconception that Trinidad and Tobago lies outside the Atlantic hurricane belt. Mr. Kishan Kumarsingh, the Head of the Multilateral Environmental Agreements Unit in the Ministry of Planning and Development, dispelled this misconception in his presentation at the KHAW conference, and also listed several other Caribbean observations on the horizon due to ongoing climate change.

- Mean surface temperatures in the Caribbean have increased by about 1.0 degrees Celsius over pre-industrial times. Warming is occurring at about 0.2 degrees Celsius per decade. 1.5 degrees Celsius of warming may occur by 2030.
- Sea level rise at the equator will be higher than the global mean.
- The Caribbean Sea and the Atlantic Ocean are becoming more acidic.

For Trinidad, Mr. Kumarsingh presented that climate change will cause higher temperatures and lower rainfall, but when it does rain, it will be in significant amounts, with warmer water temperatures and higher sea levels. These challenges pose a large threat considering that 80% of Trinidad's economy and 70% of the population is located in coastal areas. Addressing these challenges are important to protecting the Trinbagonian economy and way of life. This section will briefly explain the current understanding of Trinidad and Tobago's future through the exploration of science and data-driven research.



This map shows the tracks of all Tropical cyclones from 1985 to 2005.
Source: National Hurricane Centre

VULNERABILITIES

Vulnerability is a complex topic that plays a large role in assessing risk, alongside hazard and exposure. It is the component that includes the human dimension of disasters and it ranges from physical (built) to natural, social, and economic. These factors are dependent on the political, cultural, historical, and natural processes that determine the conditions and range of vulnerability. An area may have buildings in good condition, but if the location is on an eroding shoreline, then the vulnerability of those structures can be high. In the context of different hazard types, such as those experienced in Trinidad and Tobago, some groups are more susceptible to damage and loss than others, depending on where the vulnerability exists.

Built

Built vulnerability involves what is physically at risk of being affected, such as land use, zoning, structures, transportation, and infrastructure. This component is generally examined through three profiles-- geography and climate, infrastructure, and population. By understanding these three profiles of Trinidad and Tobago, researchers can determine the hazards most likely to occur and how the effects will manifest.

Geography and climate are agreeable in many locations, yet, some locations are more susceptible to hazards (flooding, erosion, mudslides) than others. For example, focus groups and survey respondents noted that the coastal areas of Cedros, Carrera Island, and the eastern coast of Trinidad are susceptible to heavy erosion.

Infrastructure is based on the physical profile, understanding what exists and how it would respond to a disaster. Infrastructure includes zoning and regulations, emergency management, hospitals and public health facilities, government buildings, hazardous material management, food and agriculture, and more. Infrastructure systems within Trinidad and Tobago are vulnerable to sea level rise depending on proximity to the coast. Additional items that determine infrastructure vulnerability are maintenance, community access, criticality, redundancy, and geographic range.

Population is the physical profile of where people live, work, and move throughout time. For example, during rush hour traffic, if there is an extremely high tide flooding event, then the population on that flooded road is highly vulnerable. Urbanization, as in Port of Spain, also creates higher vulnerabilities due to the density and movement of people.

Natural

Natural vulnerability refers to the health and welfare of the natural environment. Essentially, these are natural processes and practices helping or hindering an affected population. For example, filling in wetlands gives water less places to go, thus increasing flooding risk. Alternately, protecting wetlands and supporting the inclusion of water-tolerant landscaping can increase the natural capacity to store water, thus decreasing vulnerability to flooding. A healthy and productive natural environment provides protection from a variety of hazards, including wave action, hydrodynamic force, wind, flooding, and more. By understanding the direct link between a healthy and productive natural environment and an area's vulnerability to specific hazards is essential to assess risk.

Social

Social vulnerability measures the individual, societal, political, and cultural factors that increase or decrease a population's vulnerability to harm or damage from a hazard. Sometimes, a close-knit community can naturally reduce harm's effects. Other times, some groups, like the elderly, young, or people experiencing a disability, are more vulnerable due to their reliance on other people or systems for assistance. Socio-economic status plays a significant role in the vulnerability of groups as it can influence who receives assistance, what assistance is provided, how much, and when. Additionally, accessing information about assistance varies significantly across groups depending on their ability to access and use technology, social media, television, and newspapers. How the information is provided is another potential help or hindrance to getting information into a community. Trinidad and Tobago has a linguistically diverse population, meaning that materials should be released in multiple languages, as well as accessible formats for blind or deaf residents. It is essential to recognize when social interactions are helping or hindering a population, thus reducing their vulnerability and increasing the need for flexible outreach and engagement possibilities.

Economic

Economic vulnerability refers to the financial ability of individuals, towns, cities, communities, or a country to protect themselves from hazard consequences. Governments' and individuals' ability to financially afford protections will greatly affect their vulnerability. Factors include business vitality, insurance coverage, funds for disaster recovery assistance, continuity planning, and access to credit. Economically disadvantaged communities tend to live in vulnerable locations in structures constructed with materials that are not able to withstand extreme forces

during a natural hazard. That community may have a lower tolerance for prolonged recovery as they rely on work, business, grocery stores, etc., for food and daily resources to live. Economically advantaged communities are better able to prepare and adapt prior to a hazard and can put recovery mechanisms in place faster due to lower reliance on goods and services provided by others.

Vulnerability can be assessed and used as a diagnostic tool to understand challenges and causes, a planning tool to prioritise actions, a risk assessment tool to view specific risks, and a tool to empower vulnerable communities and mobilize resources. Just like the colloquial statement that a chain is only as strong as its weakest link, so too is a community only as resilient as its most vulnerable.

By identifying and acting to improve vulnerable components, local communities can experience longer-term risk reduction and immediately reduce their risk. Since the threat of natural hazards cannot be reduced, communities must work together to reduce vulnerability and, thus, disaster risk, damage, and loss. Rather than focusing on what is limiting people from resilience actions, government policy and subsequent action should emphasize people's capacity to resist and recover from disasters and how that capacity can be developed.

Local and traditional knowledge should be centred in all conversations as a basis for outside interventions and the maintenance abilities of the community. Finally, ensuring an enabling environment for communities to safely and comfortably learn with the assistance of strong political stewardship and commitment is a high priority.

THE ROLE OF HERITAGE & CULTURE

Cultural and historical resources are non-renewable resources of human making. Much of their meaning is tied to their specific location and engagement with the land and people around them. After all, it is people who place significance on these resources. Current trends suggest that the rates, combinations, and intensity of hazardous events are already increasing, and irreplaceable resources will need alteration or otherwise be allowed to deteriorate or demolish. These resources are solely dependent on people to help them withstand climate change.

Cultural resources are our record of the human experience. How did people use resources around them to settle, hunt, farm, fish, survive, and thrive? Who used these resources? Archaeological sites, landscapes, collections, and historic buildings and structures connect generations through time in a place significant to that memory. It is the duty of people to further steward this connection into the future through sensitive and thoughtful approaches to climate adaptation by ensuring that the tangible and intangible qualities are upheld and centred for preservation.

The U.S. National Park Service provides four goals in its Cultural Resources Climate Change Strategy, which set resources in relation to climate change and the possible directions that can be taken to support those vulnerable resources.

Goal 1 - Connect Impacts and Information: Set the broad scope of cultural resources and climate change response by connecting the concepts of impacts and information with the four pillars of climate change response: science, adaptation, mitigation, and communication.

Goal 2 - Understand the Scope: Coordinate science, management, and communication to identify and improve understanding of the effects of climate change on cultural resources.

Goal 3 - Integrate Practice: Incorporate climate change into ongoing cultural resources research, planning, and stewardship.

Goal 4 - Learn and Share: Collaborate with partners to grow and use the body of knowledge and practice for cultural resources and climate change.

For Trinidad and Tobago, the dependence on the coastline throughout time is evident in the presence of coastal archaeology and modern cities. Generations of Trinbagonians have made homes along the water, pursuing maritime interests and finding food and living from those same waters. The waters supporting the settlements and cities now threaten those resources. By stewarding historic and cultural resources, this connection to the past can be brought to light and used to create a resilient future.

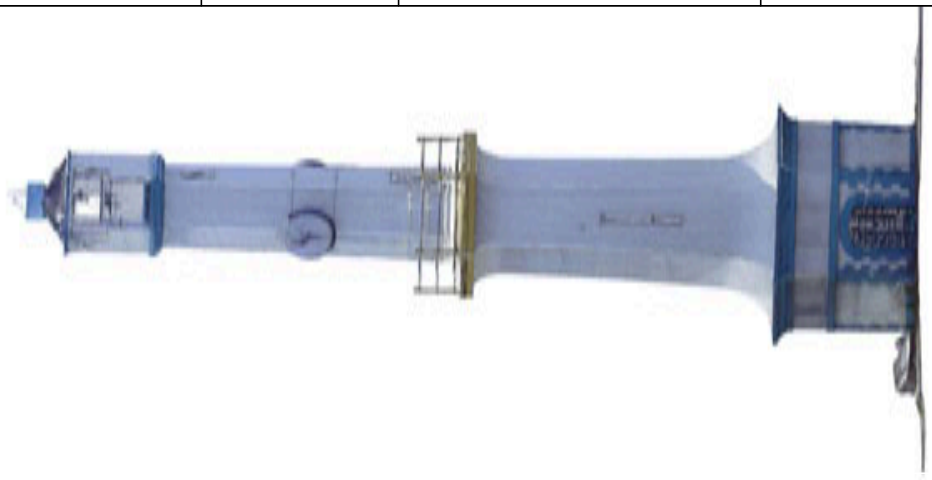
PART 2: DISCOVER VULNERABILITIES

PORT OF SPAIN SITES: ST. VINCENT JETTY LIGHTHOUSE, FORT SAN ANDRES, PTSC (OLD RAILWAY STATION)

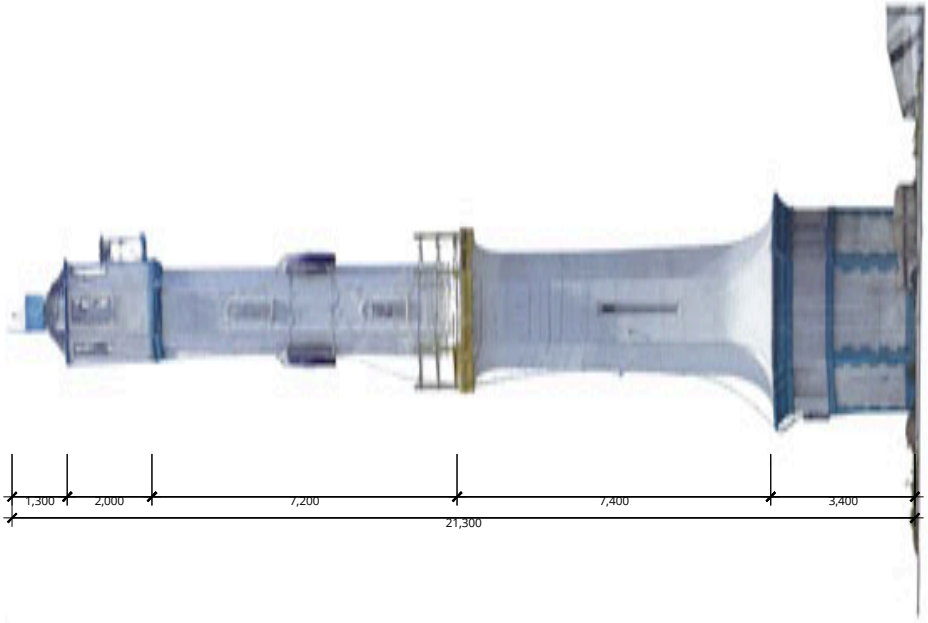
Orthographic Documentation

The UFHP created orthographic representations of the three Port of Spain heritage sites using 3D laser scanning. The documentation provides the National Trust of Trinidad and Tobago with line drawings and photogrammetry of existing conditions of these three buildings for future preservation needs by the country.

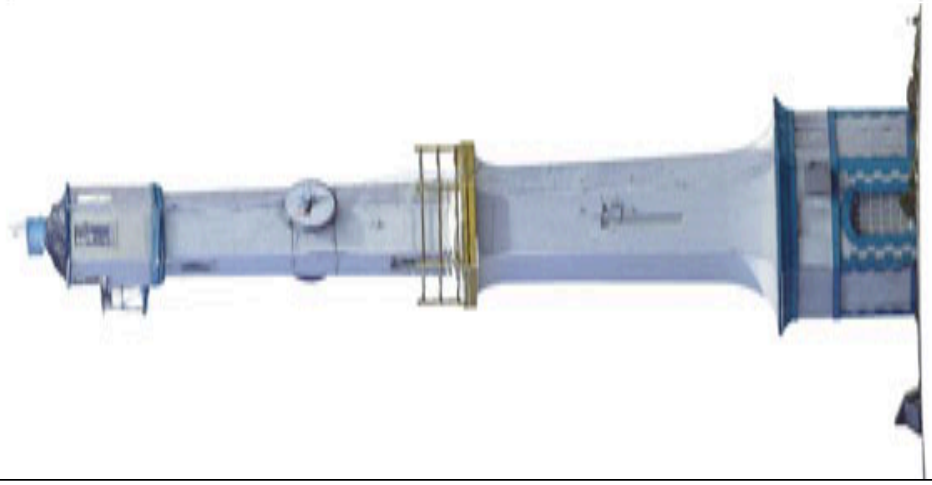
LASER SCANNING: 2022, APRIL 25 - MAY 3 IMAGES: 2022, DECEMBER 15	SHEET 1 OF 1 SHEET	ST. VINCENT JETTY LIGHTHOUSE PORT OF SPAIN, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO



SOUTHWEST ELEVATION



NORTH ELEVATION



SOUTHEAST ELEVATION

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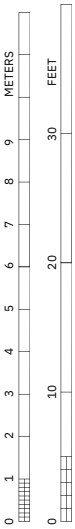
LASER SCANNING: 2022, APRIL 25 - MAY 3 IMAGES: 2022, DECEMBER 15	SHEET 2 OF 7 SHEETS	OLD RAILWAY STATION PORT OF SPAIN, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO

NORTH EASTERN ELEVATION



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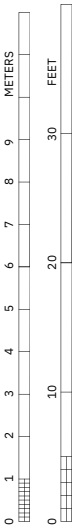
NORTH CENTRAL ELEVATION



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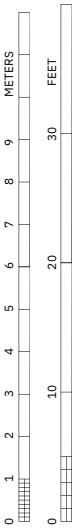
NORTH WESTERN ELEVATION



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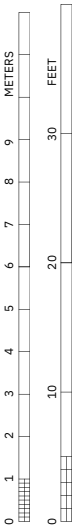
SOUTH WESTERN ELEVATION



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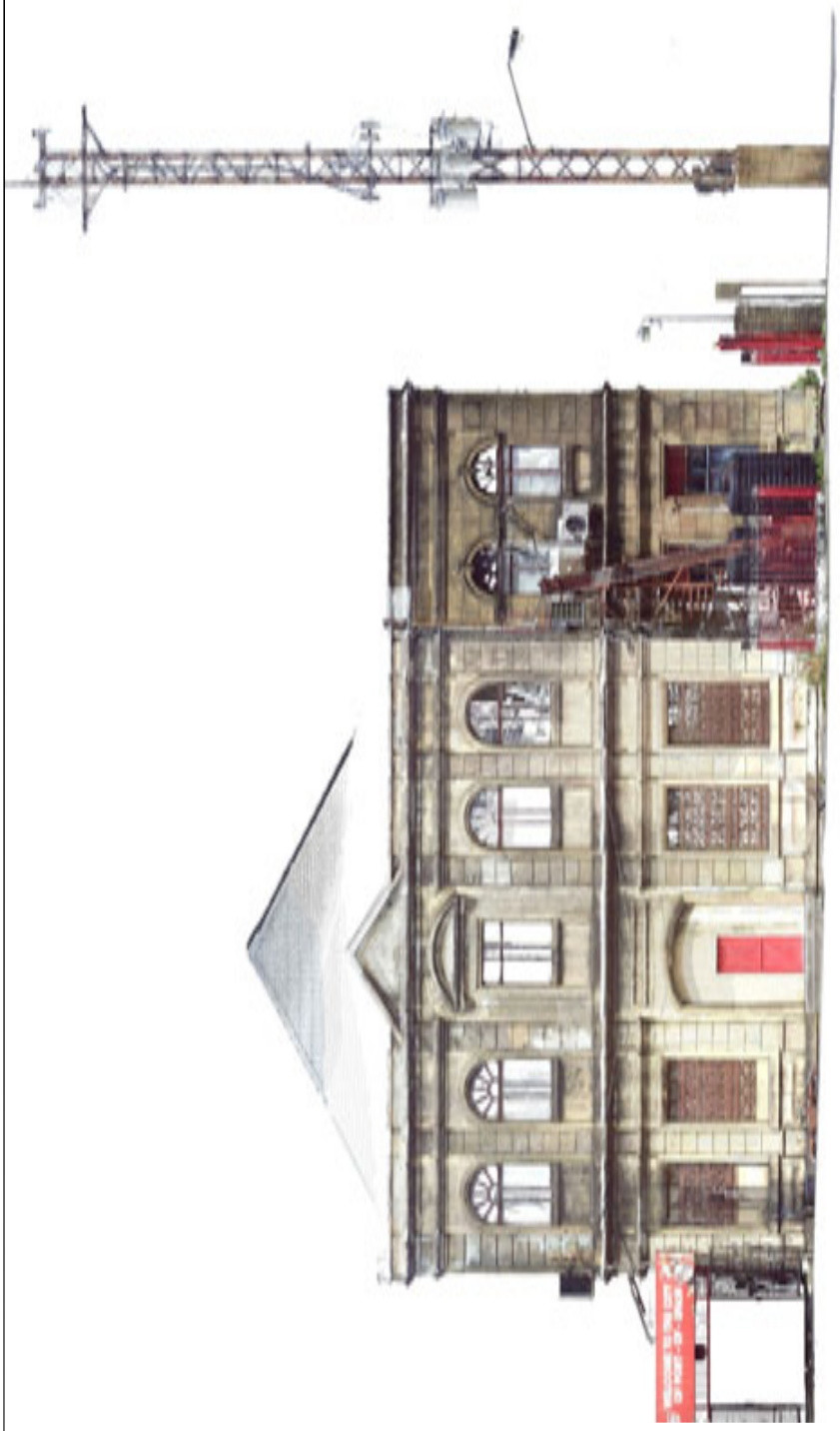
WEST ELEVATION

LASER SCANNING: 2022, APRIL 25 - MAY 3 IMAGES: 2022, DECEMBER 15	SHEET 7 OF 7 SHEETS	OLD RAILWAY STATION PORT OF SPAIN, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO



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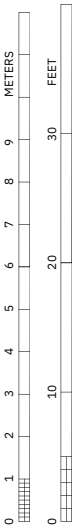

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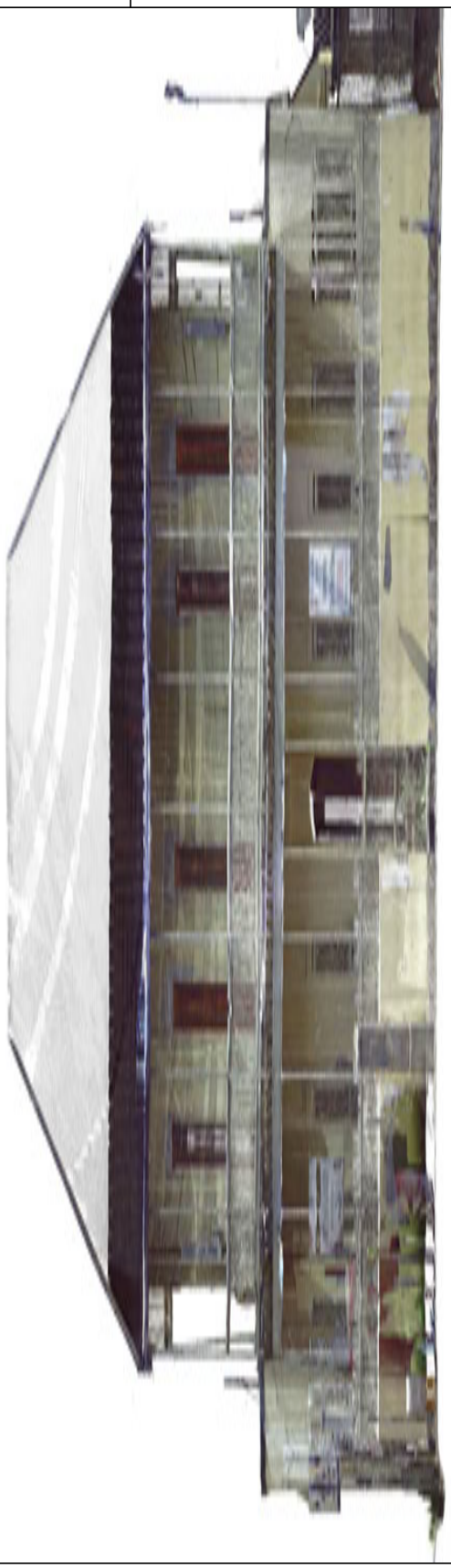
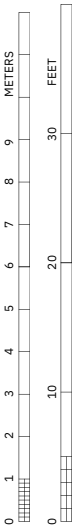


NORTH ELEVATION



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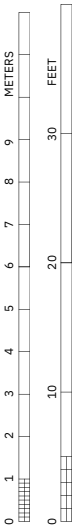
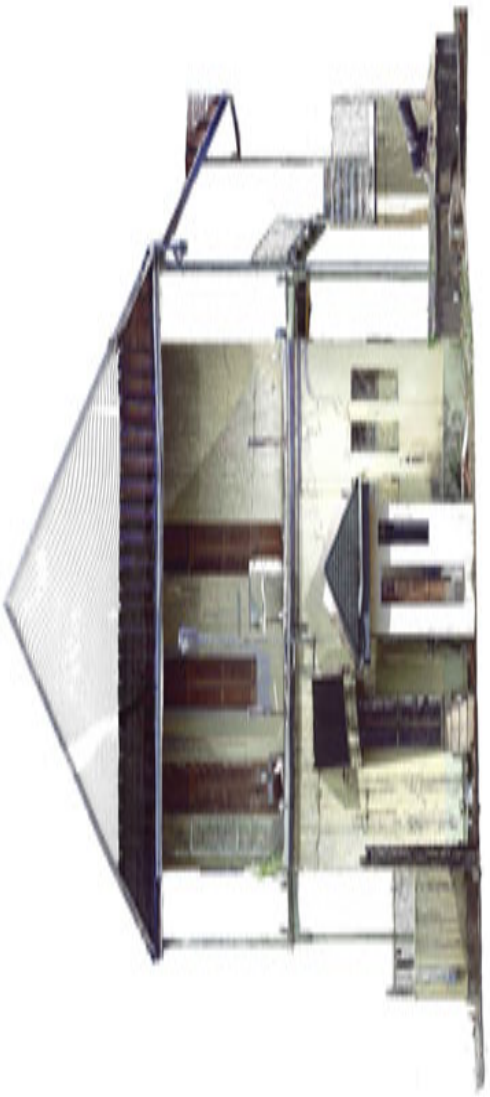
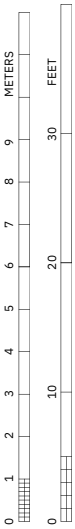
SOUTH ELEVATION



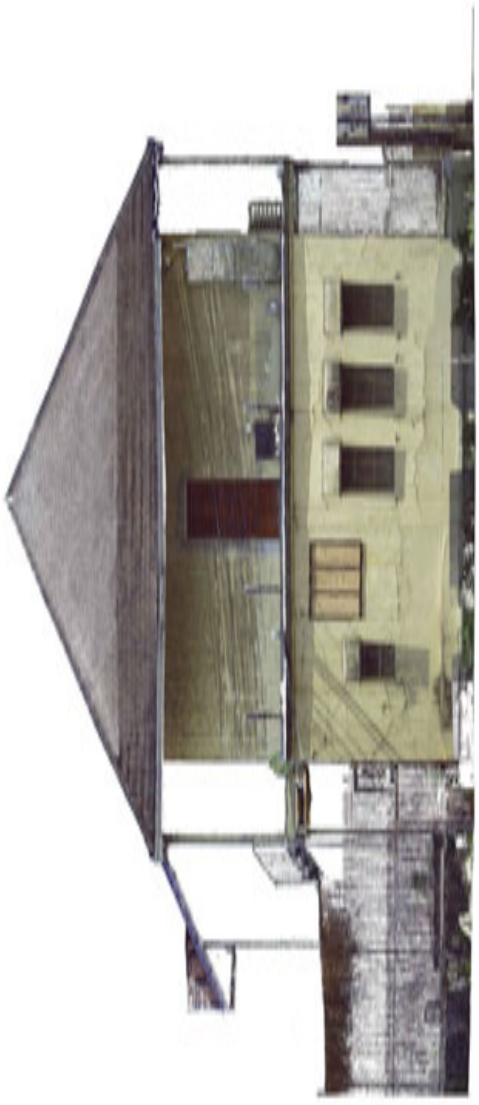
LASER SCANNING: 2022, APRIL 25 - MAY 3 IMAGES: 2022, DECEMBER 15	SHEET 3 OF 4 SHEETS	FORT SAN ANDRES PORT OF SPAIN, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO



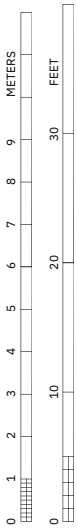
WEST ELEVATION



LASER SCANNING: 2022, APRIL 25 - MAY 3 IMAGES: 2022, DECEMBER 15	SHEET 4 OF 4 SHEETS	FORT SAN ANDRES PORT OF SPAIN, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO



EAST ELEVATION



Existing Flood Conditions

Figure 1. Peter Richards, May 2013. South Quay Road, looking southwest toward Old Railway Station. In Jewel Fraser, "Caribbean Economies Battered by Storms," Inter Press Service News Agency, Aug 19 2013. https://www.ipsnews.net/2013/08/caribbean-economies-battered-by-storms/.

The UFHP team used the orthographic documentation to interpret and simulate the May 2013 flood, among other past excessive flood events on South Quay Road. The news article photograph (Figure 1) shows a retail store on South Quay Road and Charlotte Street where young students escaped from the contaminated flood water. The retail store is visible in the lower right corner of the image from the 3D laser scan point cloud (i.e., virtual replica) (Figure 2). The simulations matched virtual water to the May 2013 flood level.

The granular visualization of water behavior showed that the flood barely reached Beetham Highway and the St. Vincent Jetty Lighthouse at the waterfront (Figure 4). This indicated that the highway formed a dam preventing water runoff from draining toward the ocean, trapping any flood water against the PTSC Railway Station and Fort San Andres (Figure 3). The area significantly relies on the underground storm drain system and it is presumed that the increasing severity and frequency of rainfall have exceeded the infrastructure's capacity, as rainfall amounts have increased and the existing street drains become full as well as blocked with trash.

Figure 2A. 2022 Condition of South Quay and Old Railway Station (PTSC), Trinidad and Tobago

Figure 2B. Simulation of Flood in May 2013

Figure 3A. 2022 Condition of South Quay and Broadway, Trinidad and Tobago. Old Railway Station, St. Vincent Jetty Lighthouse, and Fort San Andres, clockwise.

Figure 3B. Simulation of Flood in May 2013

Figure 4A. 2022 Condition of Beetham Highway and Broadway, Trinidad and Tobago. Old Railway Station and St. Vincent Jetty Lighthouse.

Figure 4B. Simulation of Flood in May 2013

Dry Storm Drain, April 2022

Multiple layers of asphalt built up on the street creates a slope for all water on the street to the gutter. Gutters are also not well maintained, and often have weed growth that will trap debris and trash, preventing water from running cleanly to the drain.

Port of Spain's streetscapes tend to utilize impervious surfaces, such as asphalt, concrete and stone, leading all water to drain to the gutters.

Stormwater infrastructure is old and has not been upgraded to meet needs.

Sea Level Rise Projections

The UFHP team's ground elevation analyses and mappings confirmed that the combination of the natural topography and reclaimed land added to the historic coastline for the creation of the Beetham highway has made South Quay Road act like a bathtub bottom where rainwater runoff collects (Figure 4B). The localized mapping in Figures 5A and 5B show that the South Quay Road area's elevation is lower than the surroundings and waterfront highway. The RCP 8.5 sea level rise projections (the blue area in Figure 5B) for 2050 and 2100 indicated that no direct tidal inundation may occur in this area by 2100; however, we anticipate the sea level rise's impacts on the underground infrastructure and broad climate change worsening floods.

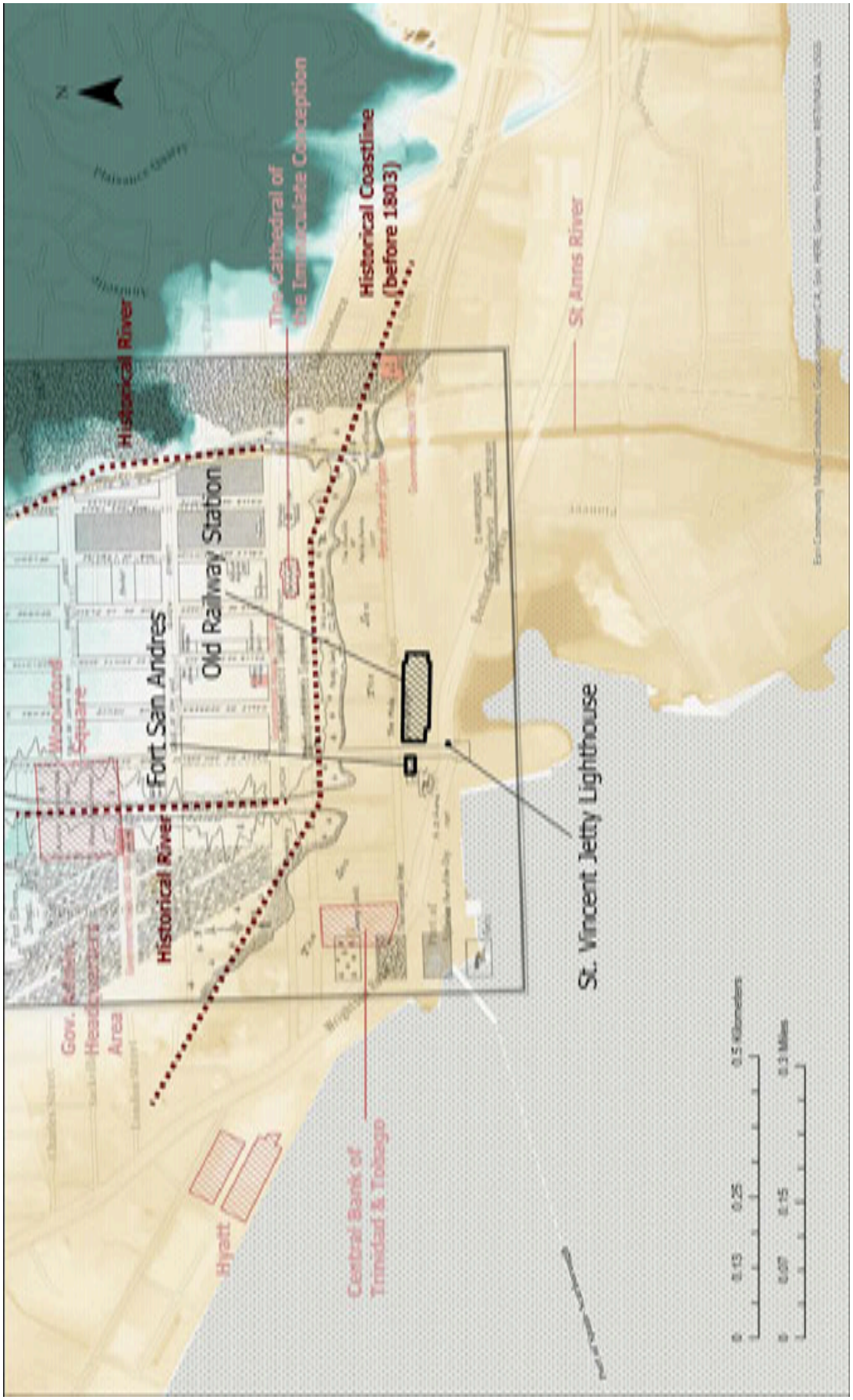


Figure 5A. Ground Elevation GIS Mapping and Historical Map Overlay, showing the historical coastline before 1803. The green represents a higher elevation, and the brown is lower.

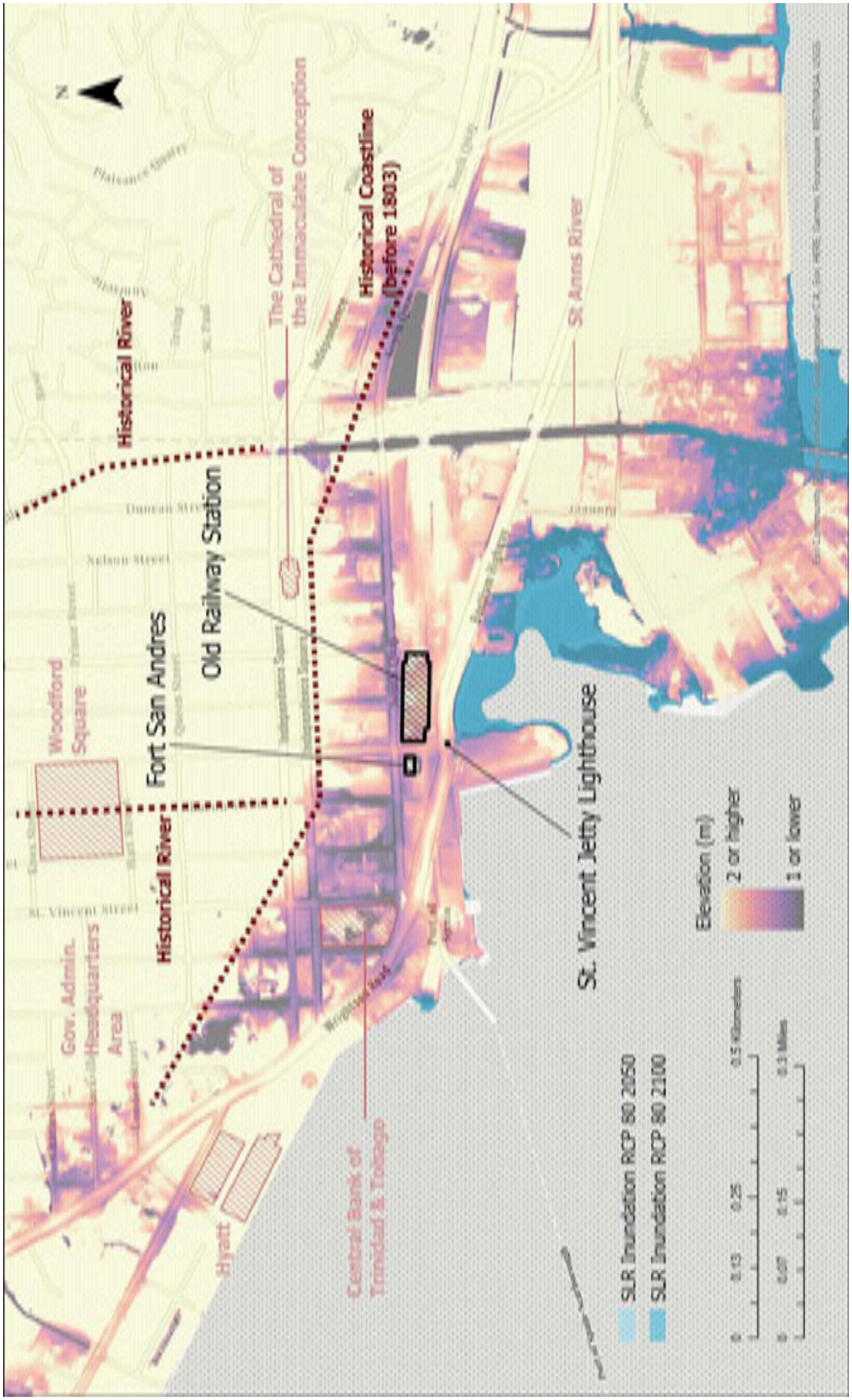


Figure 5B. Localized Elevation Mapping for South Quay Combined with Sea Level Rise Projections, showing levels inundating adjacent to Beetham Highway, which will still act as a dam to rising seas.

Public Education & Heritage Tourism Opportunities

The public education and heritage tourism opportunities at Port of Spain and Nelson Island should involve a holistic agenda that centres of all three important factors for Trinidad and Tobago: history, culture and environment. This agenda should represent the Past, Present and Future for interpretation and make use of Trinidad and Tobago's built heritage as well as intangible heritage and traditional knowledge. Information should be presented in multiple languages, and through methods accessible for hearing- and sight-impaired users. Methods of interpretation can include a mix of permanent interpretive signage, media and digital formats, takeaways, and special displays for particular holidays or celebrations. These opportunities will be relevant for tourists and residents of all ages and should be required for school-age children, in particular, as they will be the next generation to steward the heritage of Trinidad and Tobago.

Port of Spain

As the current configuration of downtown Port of Spain was essentially created by a land reclamation project, there are multiple opportunities for public education centred on the natural (pre-reclamation) landscape, the infrastructure projects that created the Beetham Highway and surrounded the St. Vincent Jetty Lighthouse and Fort San Andres with hardscape and traffic. As this infrastructure compounds the drainage and flooding problem in the area, public education should also centre on explaining the flooding patterns, the amount of hardscape and impermeable surfaces, and what the future will look like for these historic buildings without mitigation and infrastructure improvements.

Access to the Lighthouse is impossible with the amount of vehicular traffic surrounding it, and much of the PTSC building is continuously occupied with travelers and commuters in a hurry. As such, opportunities for interpretive installation may need to be explored for the promenade of S. Quay Road. Interactive media, guided tours and even digital projections are good examples of other public education examples for this area. Interpretive artwork should stand out from other signs and plaques in the area for maximum impact.

Lastly, the museum at Fort San Andres could be open more regularly to allow for heritage tourism opportunities, such as explaining the history of the Fort as the last surviving fortification from the Spanish occupation of Trinidad, the development of the adjacent Trinidad Government Railroad Building and the growth of Port of Spain

as a governmental and economic hub for the country. These topics for public outreach are relevant to both residents of Trinidad and Tobago, as well as tourists and visitors. Any tourism maps or guided walks should include these three significant architectural resources as part of the tour, and as such, they should be programmed with information to educate both residents and visitors.

Conditions Impacts & Recommendations

The Port of Spain sites are situated on landfill, creating a dense and active downtown transportation hub that includes Beetham Highway, South Quay Road and the PTSC terminal for bus transportation. As climate has changed, Trinidad has frequently been impacted by storms, with a notable increase during the rainy season, June to December, impacting this transportation hub. Downtown Port of Spain is a vast site of asphalt and concrete, at the base of the hills and with antiquated stormwater infrastructure, creating a large amount of surface rainwater that backs up in the storm drains and the gutters. During the rainy season, storms occur daily, dropping increased amounts of rain annually, which is not being met by the existing capacity of the stormwater. The lacking infrastructure is also exacerbated by the lack of maintenance, weed growth, and the large amounts of trash, such as plastic bottles, and other debris that float down the streets and collect at the “bathtub” that was created by the construction of Beetham Highway.

This ponding of water not only creates traffic congestion on roads, but also leads to massive trash collection in the stormwater system, which dumps directly into the ocean. Further, the damming of surface water between South Quay Road and Beetham Highway floods the structures at the PTSC site and Fort San Andres. Repeated flooding will create material damage of these structures, requiring additional maintenance on top of what is required for regular maintenance of a historic building. Lastly, as shown in the orthographic imagery of the St. Vincent Jetty lighthouse, the structure has a large, visible lean, possibly due to subsidence (land sinking, impacted by water movement) and exacerbated by vibrations from traffic and water infiltration.

As the sea level rise projections show, the Beetham Highway also will act as a dam for sea level inundation at street level. Increased sea levels and high tides are already raising the level of the ocean to the levels of the stormwater output drains, adding additional blockage of the stormwater system. In essence, the surface water during a rainstorm already has no place to go, as the stormwater drains are too small for increased rain levels and are blocked by debris and trash. Adding in the blockage of the drains at the ocean only exacerbates the problem.

Solutions for preservation of this heritage area will need to incorporate scalar, interdisciplinary solutions that work in conjunction with each other. At the urban level, significant infrastructure engineering will be needed to address outdated stormwater infrastructure, to increase capacity for surface water, and to address the rising sea level at outfall locations. Nature-based solutions can be incorporated with the hard engineering of the stormwater infrastructure. Greening of the shoreline and streetscapes are recommended; these efforts should include a studied replacement of locations of asphalt and concrete with pervious materials for better drainage, assessments of implementing stormwater holding areas to slow the release of surface water to the ocean, and a study of the edge condition for future softening of impacts of sea level rise, which may ultimately affect the stability of Beetham Highway. Further, we recommend a study for consistent public works efforts to clean street trash and reduce weeds and debris to keep the capacity flow. Addressing the prolific plastic bottle use in the country, and trying to reduce plastic trash through recycling, reuse or replacement with reusable bottles, will assist with reduction of trash that impacts stormwater drainage and adds to ocean waste.

At the building scale, the historic sites of the PTSC Building and Fort San Andres will need regular maintenance scheduling that addresses repeat flooding, including adaptive measures such as wetproofing or dryproofing, and material cleaning of any damaging substances trapped against the buildings during a flood. An in-depth conditions and flood assessment of the three buidlings should be undertaken to determine existing interior and exterior materials, which areas receive repeat flooding, and which areas show damage. Only after the building assessment is complete can solutions for adaptibility, such as wetproofing and dryproofing, be determined by the responsible party with recommendations from the assessment. Assessment of the subsidence at the St. Vincent Jetty lighthouse should be undertaken to discover the root cause, and regular monitoring should be a part of the solutions developed for this structure's preservation.

However, the larger-scale improvements at the urban infrastructure level must be implemented in order for the building-scale preservation efforts to make an impact. As the root of the problem lies in infrastructure, this must be addressed for any building-scale problems to be conclusively addressed.

NELSON ISLAND

Documentation

The UFHP team visited Nelson Island in April 2022 with the NTT&T team. Field condition assessments were undertaken on a walk around the island and through the buildings with the NTT&T Facilities staff, who live on the island and maintain the property. Alongside fieldnotes, the team took reference photographs using a hand-held camera and drone. Drone photographs focused on the island's edge conditions, roofs, and upper exteriors of the buildings.

The UFHP team also created orthographic representations of the Nelson Island heritage sites using 3D laser scanning. The documentation provides the National Trust of Trinidad and Tobago with line drawing elevations of the three main buildings, the 1802 Building, the Mess Hall, and the Jail Cells, for future preservation needs by the country.

The only access to the island is on a boat ride, which can be impacted by weather.

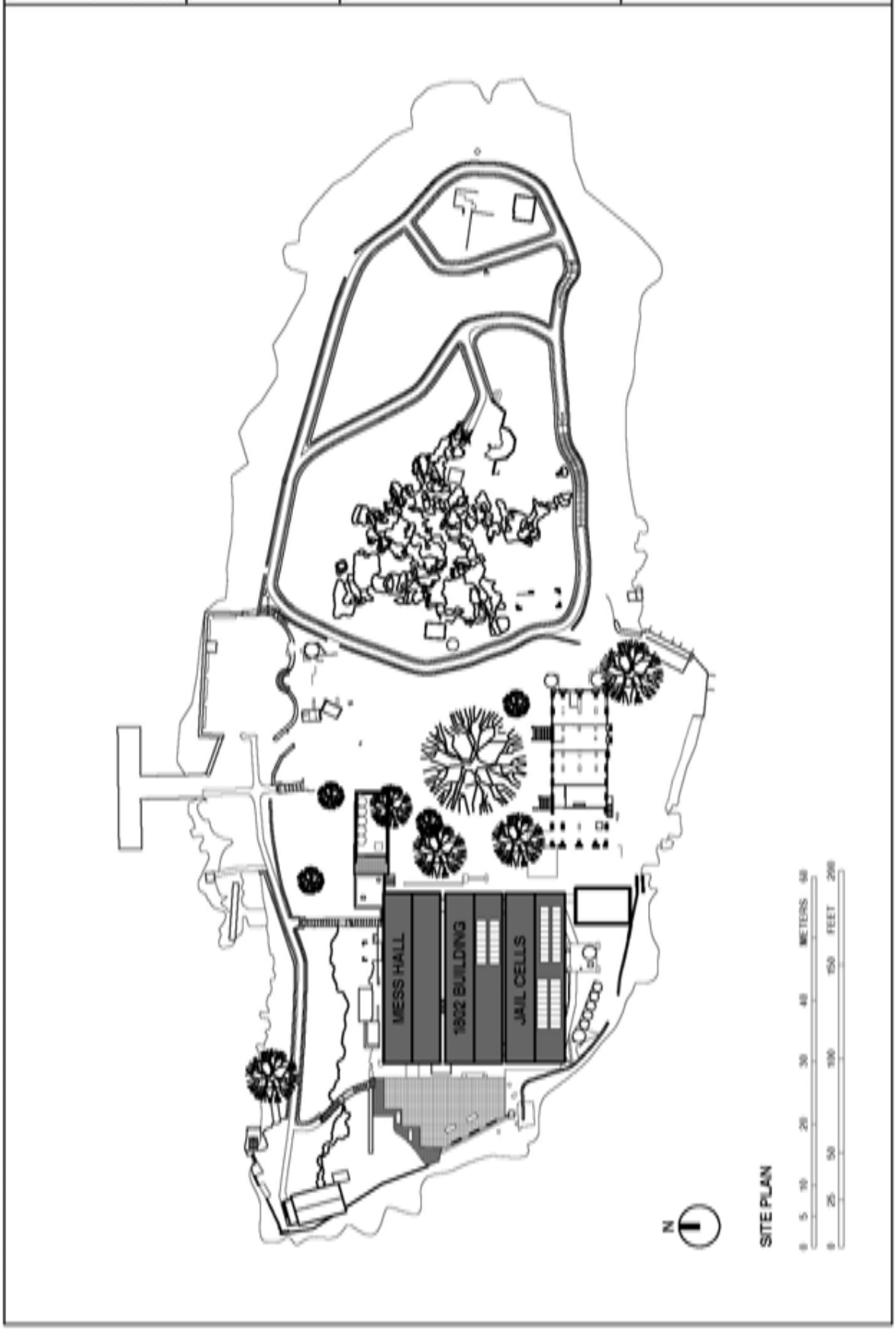
Drone image of Nelson Island from the northwest, showing the landing dock at centre, trails to the left, the three main buildings in the upper right, and Butler's Cottage, where staff live, on the far right bottom.

Drone image of Nelson Island from the west, showing the ends of the three main buildings, with solar panels and water capture visible. Also of note is the topography and natural edges of the island.

Drone photo of the west end of the island, showing the three main buildings and Butler cottage. An outdoor interpretive area is at the far end of the island, and the rugged terrain and trails are visible near the edge on the right.

Drone photo of the southwest view of island, showing solar panels, water capture, and one of the abandoned structures used by the Facilities team for storage.

LASER SCANNING: 2022, APRIL 25 - MAY 3 & NOV 15-17 **DRAWINGS**: 2022 - 2023	SHEET 1 OF 8 SHEETS	NELSON ISLAND GULF OF PARIA, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO



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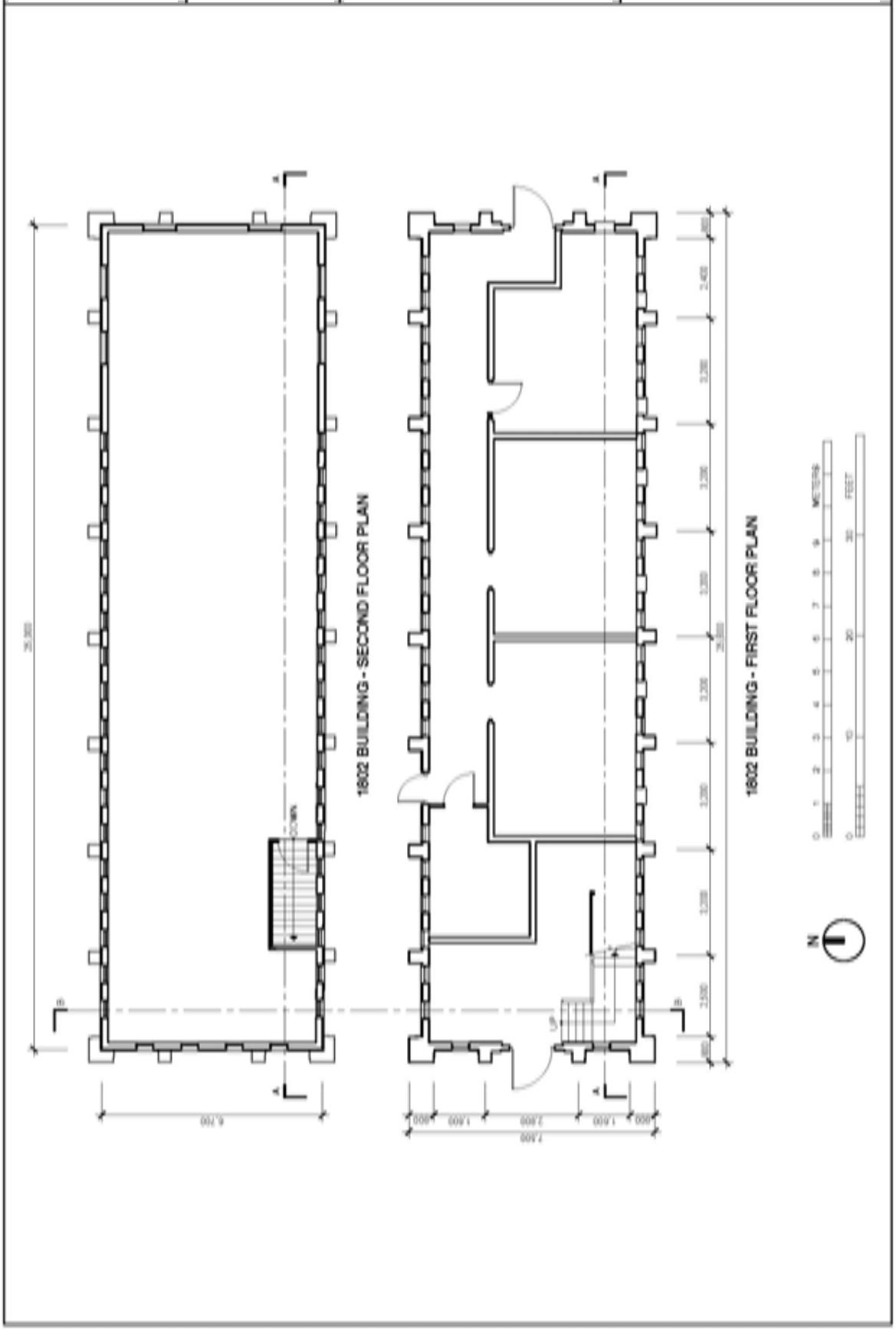

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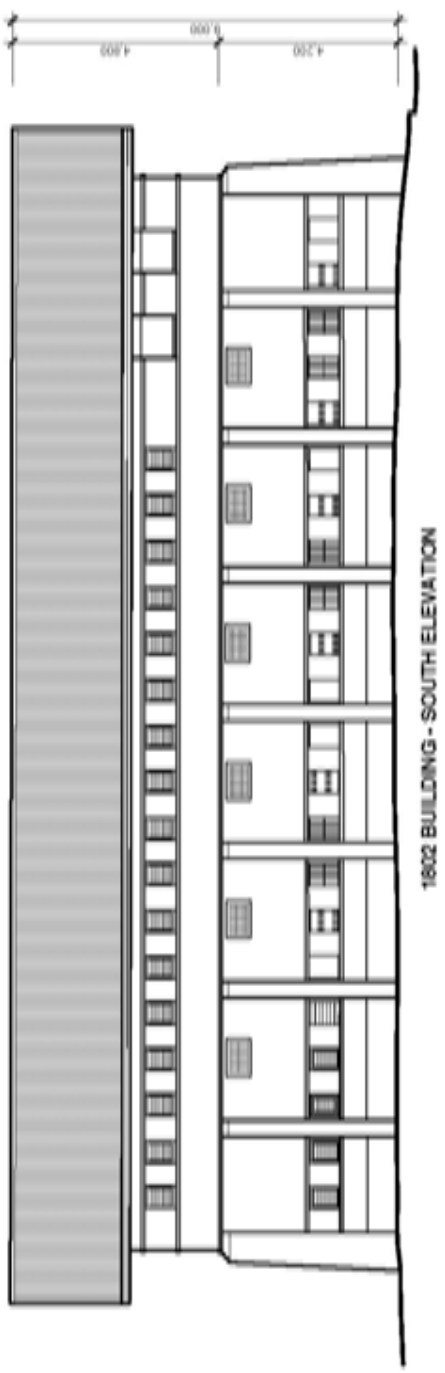

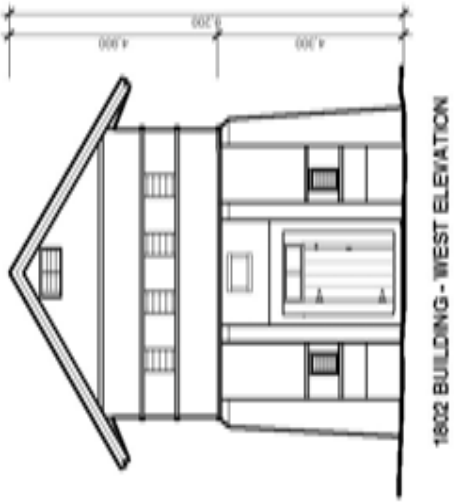

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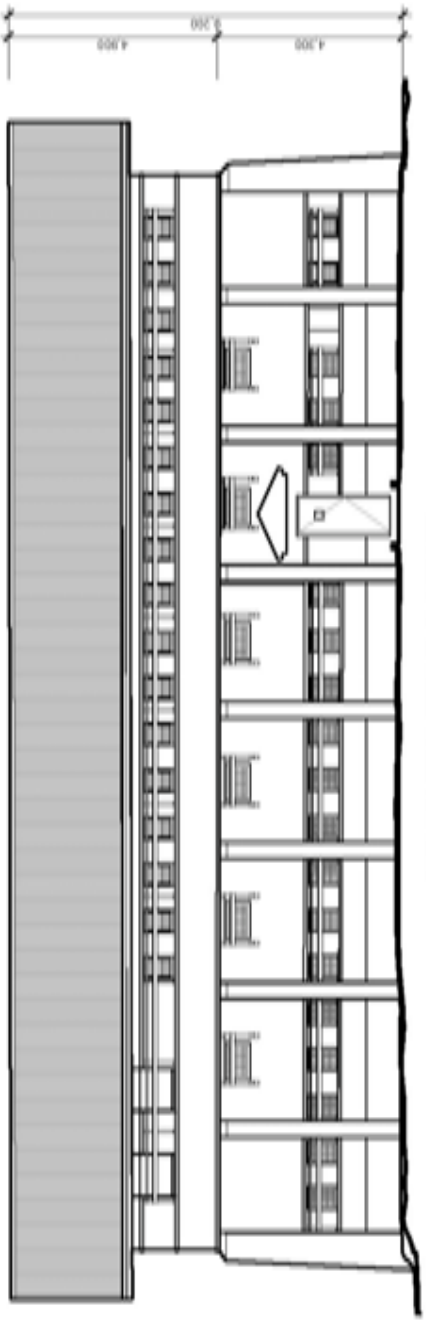

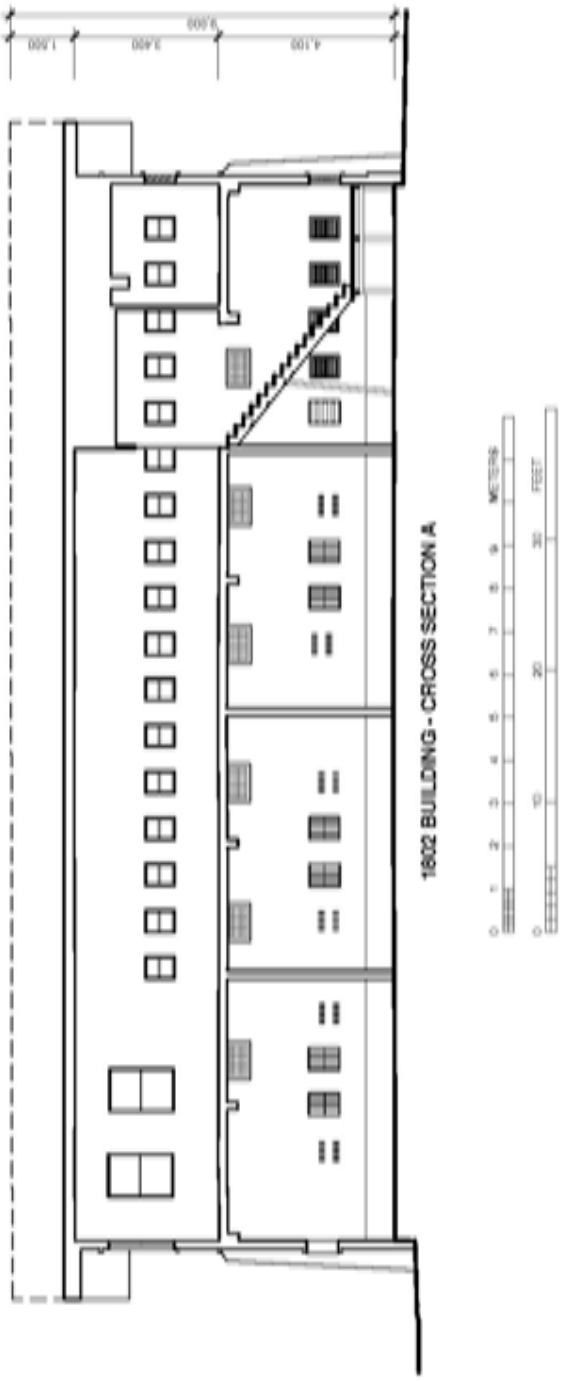

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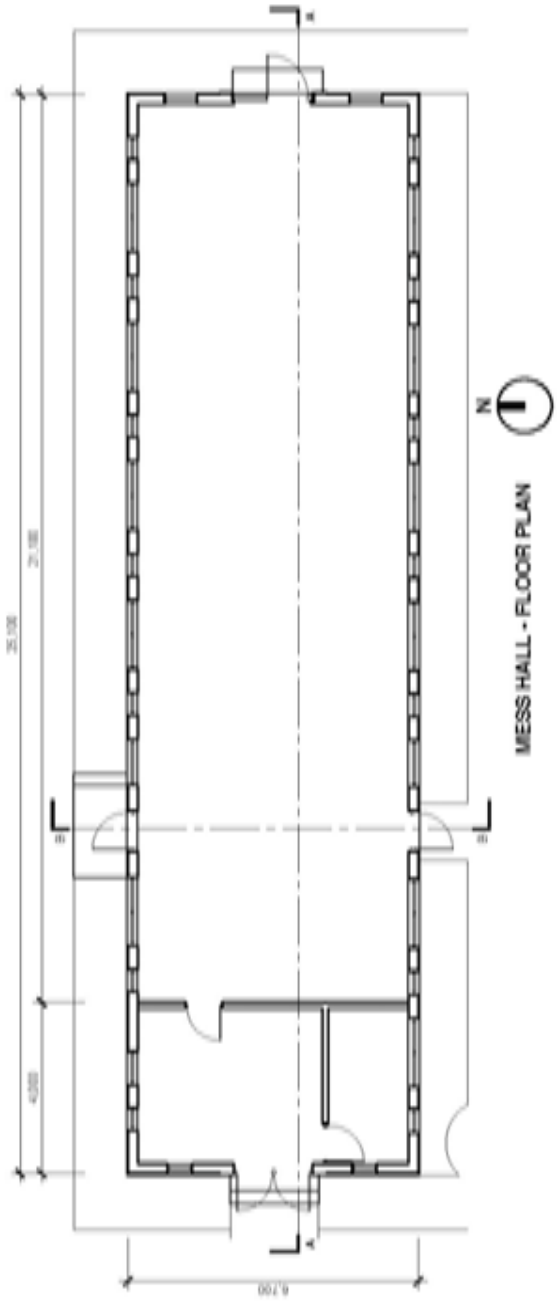
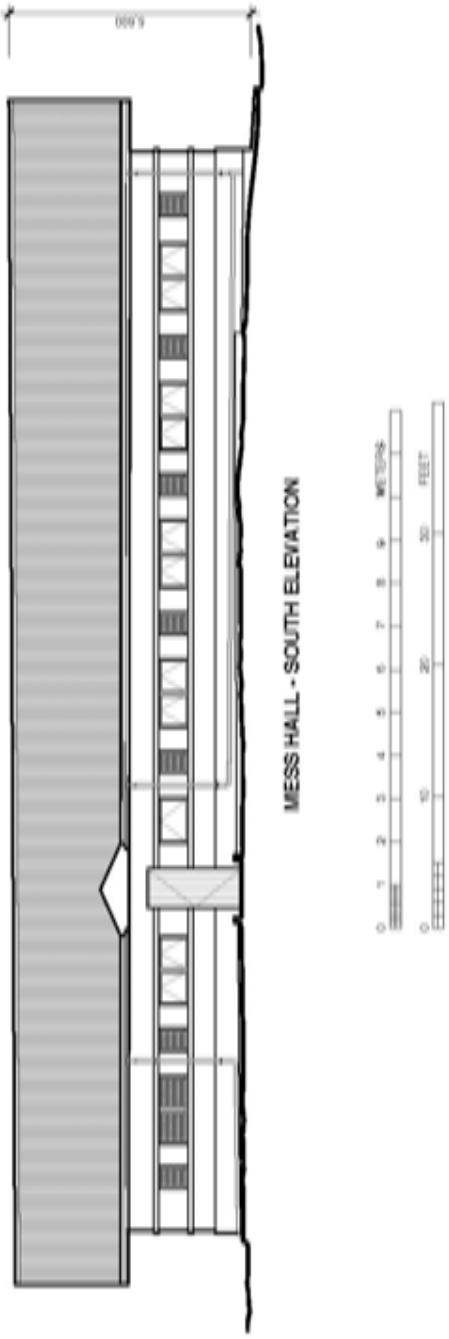
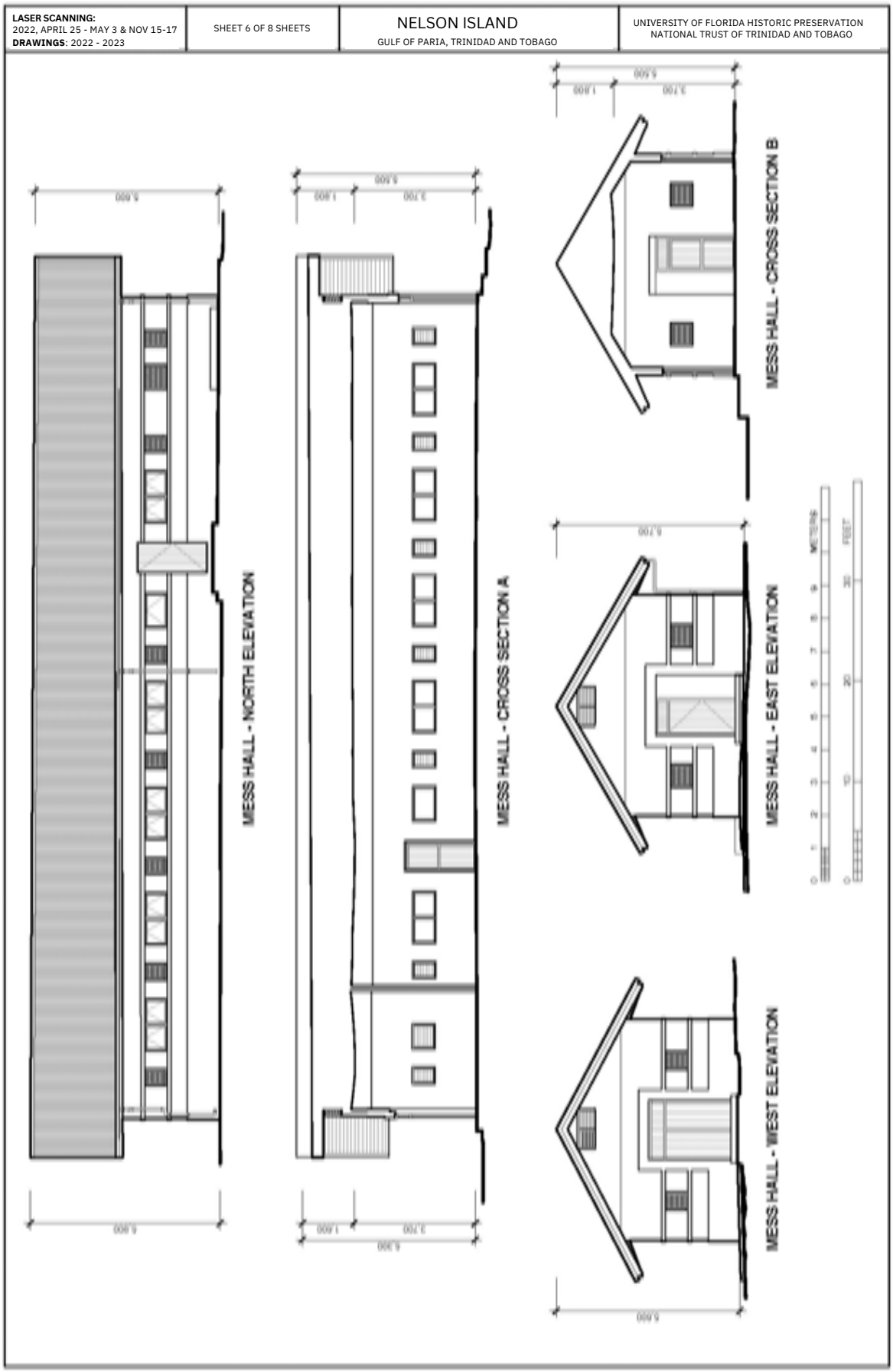


MESS HALL - FLOOR PLAN



MESS HALL - SOUTH ELEVATION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2022, APRIL 25 - MAY 3 & NOV 15-17
DRAWINGS: 2022 - 2023
SHEET 6 OF 8 SHEETS
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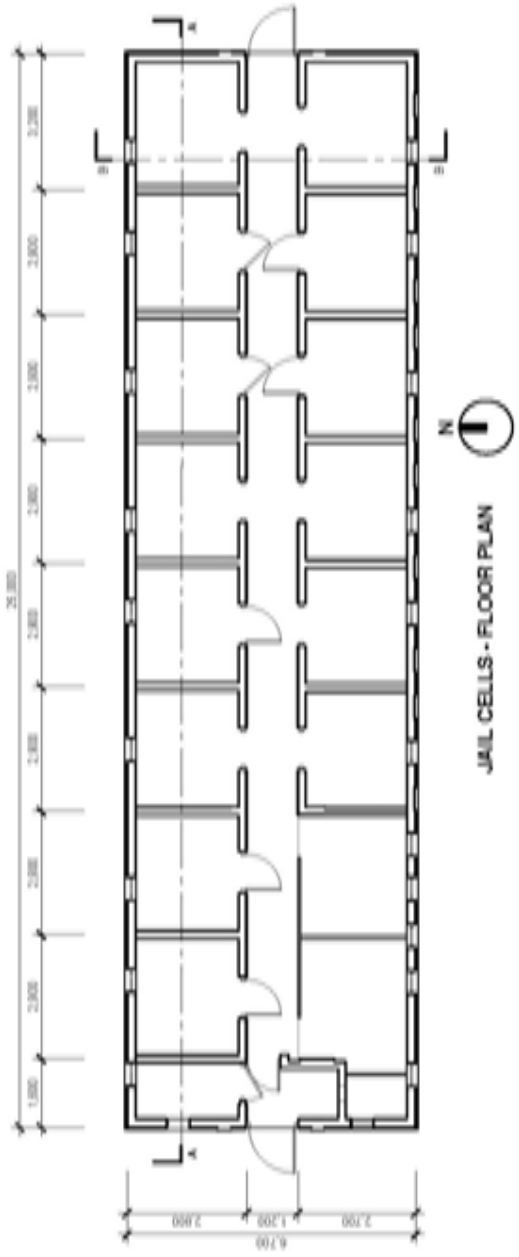
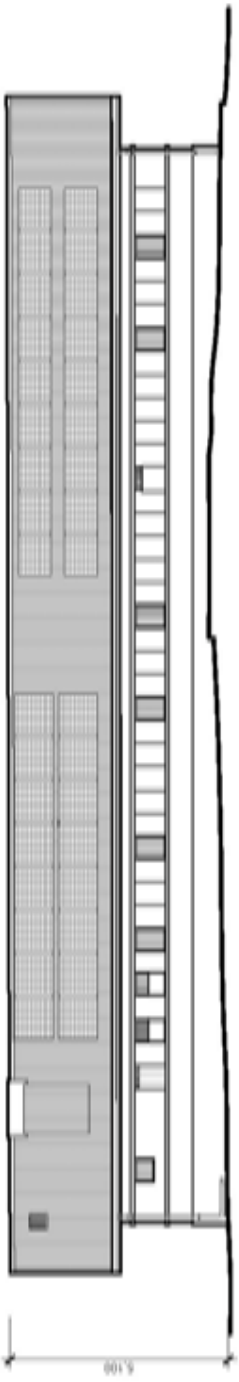
GULF OF PARIA, TRINIDAD AND TOBAGO
UNIVERSITY OF FLORIDA HISTORIC PRESERVATION
NATIONAL TRUST OF TRINIDAD AND TOBAGO
MESS HALL - NORTH ELEVATION
MESS HALL - CROSS SECTION A
MESS HALL - CROSS SECTION B
MESS HALL - EAST ELEVATION
MESS HALL - WEST ELEVATION

LASER SCANNING: 2022, APRIL 25 - MAY 3 & NOV 15-17 DRAWINGS: 2022 - 2023	SHEET 7 OF 8 SHEETS	NELSON ISLAND GULF OF PARIA, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO

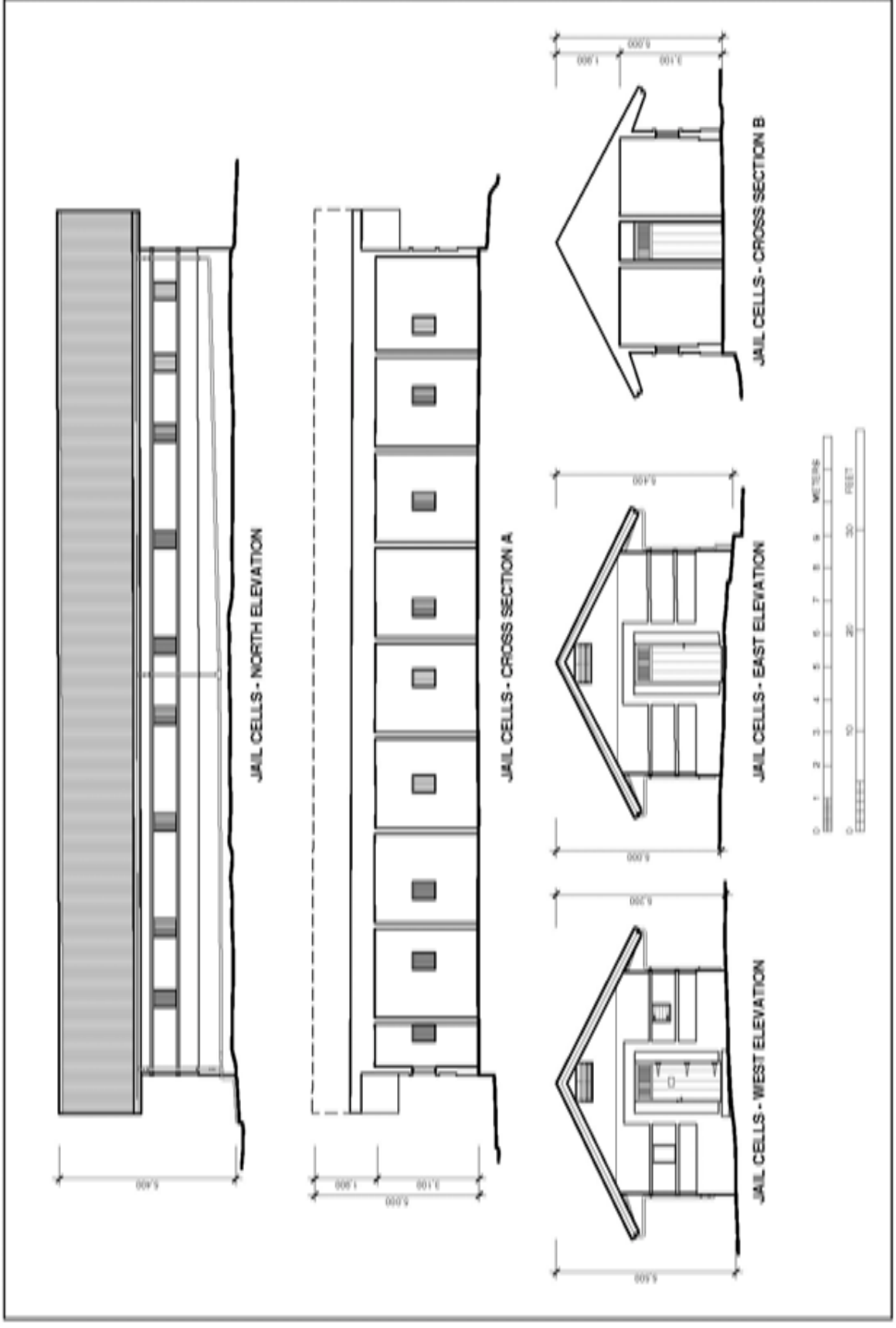


JAIL CELLS - FLOOR PLAN



JAIL CELLS - SOUTH ELEVATION

LASER SCANNING: 2022, APRIL 25 - MAY 3 & NOV 15-17 DRAWINGS: 2022 - 2023	SHEET 8 OF 8 SHEETS	NELSON ISLAND GULF OF PARIA, TRINIDAD AND TOBAGO	UNIVERSITY OF FLORIDA HISTORIC PRESERVATION NATIONAL TRUST OF TRINIDAD AND TOBAGO



Cultural Landscape Framework

The assessment framework for Nelson Island is as a *cultural landscape*, a historically significant place that shows evidence of human interaction with the physical environment, or as UNESCO defines it, the "combined works of nature and of man (culture)." UNESCO has defined three main *cultural landscape* categories: *historic defined landscape*, *organically evolved landscape*, and *associative cultural landscape*. A historic designed landscape is a purposeful artistic creation that exemplifies the work of a notable designer, often including formal gardens and park. An *organically evolved landscape* results from social, economic, administrative or religious interactions with the environment. They can include a *relic landscape* that came to the end at some time in the past, or a *continuing landscape* that retains an active social role in contemporary society, often closely associated with the traditional way of life. The *continuing landscape* holds both significant material evidence of its evolution over time, and its contemporary use that illustrates the evolutionary process is still in progress. *Associative cultural landscapes* reflect powerful religious, artistic, or cultural associations with the natural element rather than material cultural evidence.

Defining Nelson Island as an *organically evolved, continuing cultural landscape* helps to distinguish the values of the site (the significance as held and understood by the local and related community) and the determination of how resources should be maintained, managed, and interpreted. The island holds many layers of history and reflects these layers through evolution of design and use over time. It is important to remember that with a *continuing cultural landscape*, current and future use will add to the evolution of a site and become part of the site values. Hence, decision-making about management and interpretation will be factors in defining the site values for this era of use, and may change with stewardship by future generations.

Recommendation: Undertake a formal Cultural Landscape Report (CLR), compiling all documentation, analysis, and evaluation of historical, architectural, archeological, ethnographic, horticultural, landscape architectural, engineering, and ecological data. A CLR analyzes the landscape's historical development, evolution, modifications, materials, construction techniques, geographical context, and use in all periods, including those deemed not significant. Based on the analysis, it makes recommendations for detailed treatment consistent with the landscape's significance, condition, and planned use.

Opportunities & Recommendations

Summary of Opportunities

As Nelson Island represents the diverse and multi-faceted history of Trinidad and Tobago, this historic resource is critical to any public outreach and heritage tourism agenda. The first consideration should be the dock where one takes the boat to the island. A new plan might consist of connecting this location to other heritage sites on the mainland through a larger tourism map or guided walk, or even relocating the departure to a place more accessible by tourists and adjacent to other heritage resources. Accessibility of the boat trip to the island, as well as the paths to and around the island, is also currently a concern, and will need to be explored for all ages and abilities.

As the island holds multiple periods of significance, the interpretive study should assess which periods and stories will be told, and how they might connect to particular locations on the island. For example, a current exhibit on the 1970s detainees is located within the jail cells, an appropriate place for a visitor to consider what that experience may have been like. A second exhibit on the Indian immigration period is held upstairs, which may be difficult to access and may be more valuable on display in another part of the island. In addition to being used for history education, the island is also used for cultural events and celebrations, a great opportunity to expand upon the diversity of the culture of the country, and a significant reason to greatly expand access to the island.

The island is a wonderful experiment in sustainable maintenance and conservation of natural resources. The caretaking team holds a strong ethic in considering re-use of materials, reduction of waste, and conservation. Not only is this valuable in making the island sustainable and resilient in the long-term, but it is also a great opportunity for education on topics such as solar power and water conservation. Nelson Island could be used as a demonstration project for residents to learn about sustainability and take back and apply to their own homes and yards. Additionally, the multiple historic buildings, ruins and masonry walls will need to be maintained and conserved with appropriate craft and trade measures. Trades training workshops could be held on the island using the buildings as a means of educating the next generations of builders and conservators.

Lastly, the sustainability projects on this island are a compatible fit for education on the ecology and environment of the ocean and the surrounding islands, and their future within a changing climate. If possible, trips to or around the other islands could be part of the education plan or even fundraising for Nelson Island. Nelson Island is a great example of how one small place can make a positive impact in reducing the human footprint.

Opportunites & Recommendations

Approach

Opportunities for Nelson Island interpretation begin even before the visitor is on site. Access to the island is by boat, from the Water Taxi terminal and Chaguaramas.

- How might the embarkment point be connected to Nelson Island's history? Was there a historic landing location on the island of Trinidad that could be identified? Can the interpretation begin here?

- What is the approach to the island? What does the visitor see, hear, anticipate? What does the visitor already know? How can we think about "heritage" in a way that is easy for the public to understand? How can the island be promoted as a special place, only accessible by boat?

- The ride to the island is beautiful, with multiple opportunities to enjoy the natural environment, see the impacts of climate change and the surrounding islands, or, as we saw in April 2022, degradation of the environment from a stream of plastic trash washing into the ocean after a storm. Opportunities exist at every moment, and with every occurrence that happens on the trip.

Interpretation & Education

Existing Conditions

Nelson Island is the second-largest of the Five Islands in the Gulf of Paria, and highly illustrative of the layers of history in Trinidad and Tobago. It is believed to have been used by the First Peoples as a stopover for fishing, as a strategic defense base during the Spanish period, as Quarantine, garrisons, and indentured labour processing during the British period; and in the twentieth century, as a prison for multiple periods including the 1930s Labour leader Uriah Butler, and 1970s Black Power Movement, a youth camp, and a marine biology station. Existing structures on site span from 1802 through the World Wars and include contemporary renovations for current use. The National Trust of Trinidad and Tobago was given jurisdiction over Five Islands in 2003; the design and implementation of adaptation, maintenance, and interpretation strategies will be the next significant phase of history for the island, as is fitting for a continuing cultural landscape.

Existing interpretation on the island includes walking tours with docents, and exterior signage and plaques that note particular facets of the island's history. The first floor of the Jail Cells building is currently used for museum-style interpretation of the Black Power Movement history. The second floor of the 1802 Building currently houses an exhibit on the Indian indentured labor migration. Existing historic photos are framed and displayed indoors. There are numerous ruins and industrial artifacts around the island, as well as scattered benches. The island is sometimes used for performing arts events.

Opportunities

Develop a Master Plan for interpretation, to illustrate the intentional use of different elements on the island. Providing a purposeful interpretive plan and planning seating for different types of events will not only add to the visitor educational experience but will also create a more intentional atmosphere to the island site.

Discussions with the National Trust team and with stakeholders in the November 2022 workshop have provided numerous ideas for interpretation and education. Some examples of opportunities for consideration are listed on the following pages.

Top: Existing signage for the island's heritage site. Bottom: Historic images are framed and displayed indoors. Image courtesy of the Michael Goldberg Post Card Collection, West Indiana Collection, The Alma Jordan Library, The University of the West Indies at St Augustine

The island contains many existing ruins and industrial relics, as well as scattered seating. Developing a Master Plan for interpretation as well as seating arrangements for different kinds of events will provide a more purposeful appearance to the island.

Interpretive outdoor plaques and signs are exposed to harsh ocean weather, creating quicker deterioration. Investigation of weather-resistant materials is an opportunity for new signage.

Opportunities for new programming and interpretation exist over the entire island, from the arrival and landing to existing ruins and trails.

How will sea level rise and storm surge affect resources? Consider this 1939 etching by E.L. Celestine, guard for Butler's incarceration. This stone is part of the edge condition, down near the rising ocean tide. Resources can be documented, interpreted, but also relocated or lost dependent upon the priorities and values of the stakeholders. Digital documentation of resources such as this can be used in the future for virtual or augmented reality.

Opportunities (cont.)

- Describe the evolution of the physical assets on the island, perhaps through a timeline of the island's periods and with use of historic photographs to illustrate past conditions.

- Provide an explanation of the ruins and their former uses. The island is currently fairly unpopulated; how can interpretation illustrate the crowding and population of previous eras?

- The reconstruction of Butler's Cottage was an important decision made for this island; views from the cottage porch can provide visitors with an understanding of Butler's time on the island.

- Exterior plaques and physical interpretive methods will need to consider weather and impacts over time. The existing Nelson Island signage and educational plaques are showing deterioration. Undertake an investigation of new weather-proof materials and precedents for new exhibits. New designs should include a standard marketing color palette and graphics that will provide a consistency throughout exhibits.

- Adding use of digital and virtual interpretation methods may assist in longer-lasting installations, as well as building off-island interest. Funding for marketing, design, and new interpretive methods would be a good singular grant application.

- The island is a meteorological gold-mine for weather and climate data. Introduce scientific measurement tools for documenting wind speed, rain amounts. Use students as Citizen Scientists to collect, record, and analayse the data.

- Install cameras that show the island and its surroundings. Use video from storms on the Trust's website, to illustrate the conditions that Nelson Island is affected by during storms. Web streaming during storms, and sharing video with local news outlets will assist with dissemination of the island's conditions.

Future Considerations

Some assessment questions for any future considerations for new interpretation and education methodology include:

- What is significant? What are the site values? Who are the stakeholders?

- Defining stakeholders and the audience will be critical in determining accessibility of the new projects: How can the interpretation and education be accessible to on-island and off-island visitors, visitors of different ages, with different language and mobility skills?

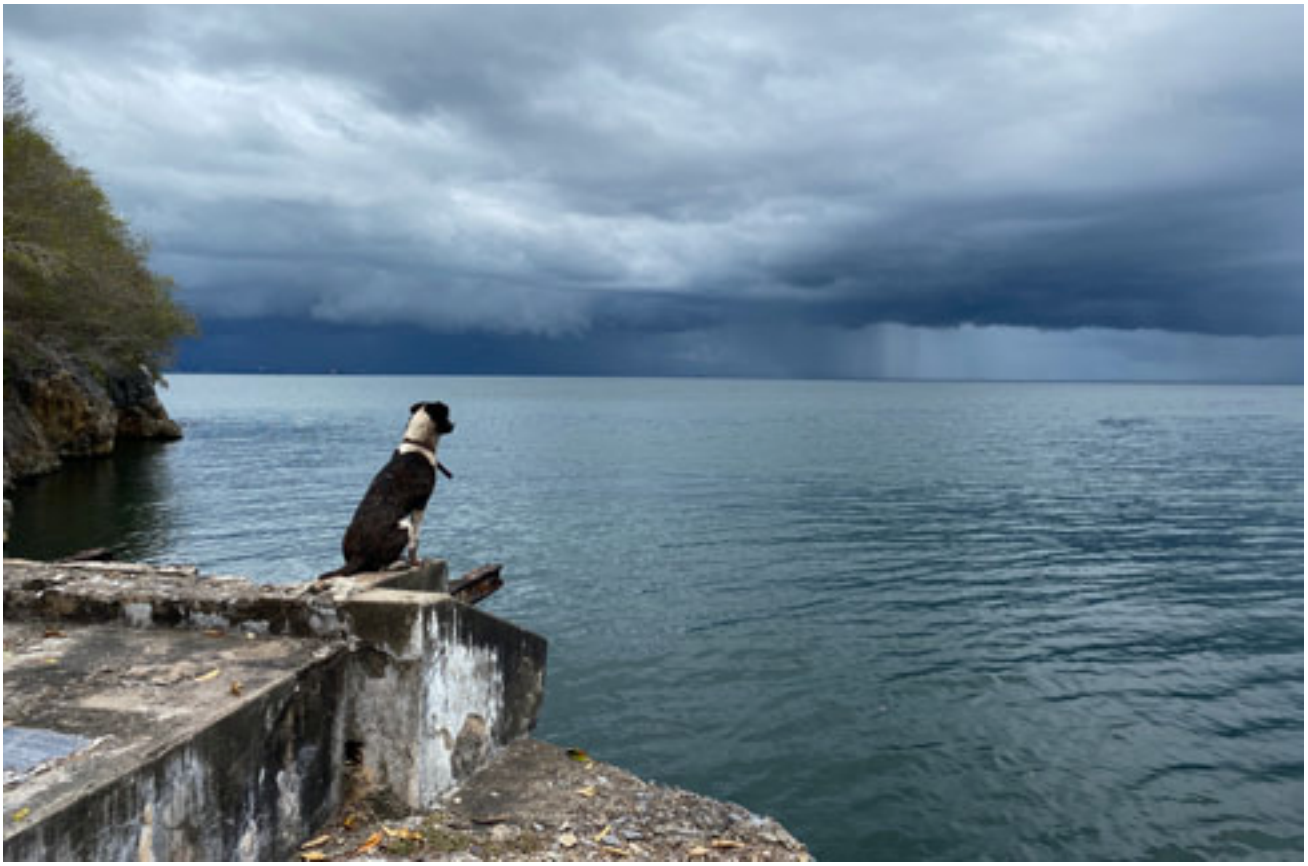
- What is the understanding of history by the public, Trinidad and Tobago residents, descendants of those with history on the island, tourists, visitors, and even those who work for the National Trust of Trinidad and Tobago?

Future Considerations (cont.)

- How should the interpretation express both the tangible and intangible heritage of the site? How can interpretation make use of arts, language, music and other intangible heritage rituals and knowledge relevant to Trinidad and Tobago?

- How can the public feel this island is relevant to their lives? Garnering public interest is critical in maintaining political support and funding for any heritage site. How can "citizen science" be used to involve school children?

- The National Trust has a strong team of educators and interpreters who build programming through multiple tours, including the Heritage Keepers Youth Programme, tours of Paramin, Orange Umbrella downtown Port of Spain walking tours, and others. Of key importance to retaining this strength of programming is finding funding for new technology and updating interpretive methods, as well as connections to Heritage Tourism for the country.



Blackie the island dog, watching an afternoon storm roll in.

Conditions Assessment

Adaptive Reuse

When considering adaptive reuse and interpretation of historic resources, it is important to consider which uses are appropriate. How intact is the original resource - i.e. what is its level of integrity and authenticity? New uses similar to original uses are the most appropriate, yet this isn't always possible nor desirable.

For the three existing buildings, the Mess Hall, the 1802 Building and the jail cells, the Mess Hall has been the most changed, with new interior finishes, while the other two buildings remain mostly intact. The Mess Hall has been converted to a large meeting space with a small kitchen and storage area. These are appropriate uses for the building, as the main space retains the openness of the historical hall.

The 1802 Building has been converted for public restrooms on the first floor, and a museum exhibit upstairs in the large second floor space. These are also appropriate scale uses for the building, though the accessibility of the public to the second floor is difficult due to the steepness of the existing stairs. If public accessibility is a priority for the exhibit spaces, the second floor of this building may be better used for the organisation's needs, such as employee use, storage, infrastructure, etc.

The jail cells have also been retained for use as public exhibit space and for new utility infrastructure. These are great opportunities to offer education of the sustainability of the island, as well as visitor experience of the small scale of the cells, as former prisoners may have experienced them.

Recommendations:

- For future programming, how do the overarching interpretive goals match the spaces and original uses of the buildings?

- Consider public accessibility to spaces.

Accessibility of sites to visitors should be considered. Above is the set of stairs to the second floor of the 1802 Building, where the current Indian Arrival exhibit is held. Exterior tours occurs on natural landscape, and the island is fairly hilly.

How to appropriately design for new and repair existing?

Nelson Island's challenges emphasize the difficulty in creating and maintaining a heritage tourism site in the ocean, with minimal access for the public, need for maintenance funding, salt water, wind and other environmental threats, as well as the encroaching threat of storms, waves impacts and sea level rise.

The buildings are in good overall condition with some need for specialized assessment and repair. Cracking is visible in a few places and should be assessed by a certified architect for proper repair methodology and ongoing observation to determine cause. As the number of trades and craftspeople has diminished globally, there is an opportunity to use the site and buildings for trades and craft workshops and training, considering the vernacular materials and the normal impacts of weather in the region. Grant applications could include funding for maintenance as well as regular training workshops.

Bird roosting is a large challenge for Nelson Island. Bird deterrents such as spike systems have been installed on the roofs of the buildings with no success. Further research into other methods and new technologies, as well as research into other precedents for local bird deterrents, will be needed.

Water drainage is the biggest threat to the three main buildings. Concrete between the Mess Hall and the 1802 Building traps water between the buildings, causing wicking up the masonry wall, damaging the interior plaster finishes. The vinyl base and floor covering inside the Mess Hall is not a breathable material and will continue to trap moisture in the masonry and concrete walls and floor. The large patio outside of the Mess Hall is covered with a modern tile, creating a hard, slippery surface and not in keeping with the time period and character of the site. Positive drainage and reduction of hard surfaces against the exterior of the buildings will assist with removal of water infiltration. Removal of vinyl and linoleum inside the Mess Hall will allow for the walls and floor to breathe, letting the moisture evaporate.

The site and landscape of Nelson Island present some similar challenges as the buildings: hard surfaces create a drainage problem, accessibility of paths, and edge erosion and destabilization caused by wave impacts and storms. Safety and security of human activity on the island should be a top priority. While the island's character as an informal landscape is critical to telling its history, a

How to appropriately design for new and repair existing? (cont.)

professional landscape design can be created to reflect that history, retain character-defining features, as well as provide new installations for edge stability, green infrastructure and adaptive landscape design for continued landscape stability and access. Edge conditions should be assessed by an engineer for stability and future recommendations, which should consider the softening of edges with landscape and green solutions, as well as a water perimeter installation for wave attenuation. Interdisciplinary solutions that involve engineering and landscape will be the best opportunity for a resilient and safe edge condition.

The caretakers of Nelson Island provide creative and innovative sustainable solutions to keep the island off-grid. Their efforts create a unique opportunity to educate on the intersection of the natural and built environment. The off-grid sustainable efforts of the Facilities team are innovative and commendable. Not only do they reflect the past nature of the island is being off-grid, they consider the need to reduce impacts on the grid and be self-sustainable in case of a weather emergency.

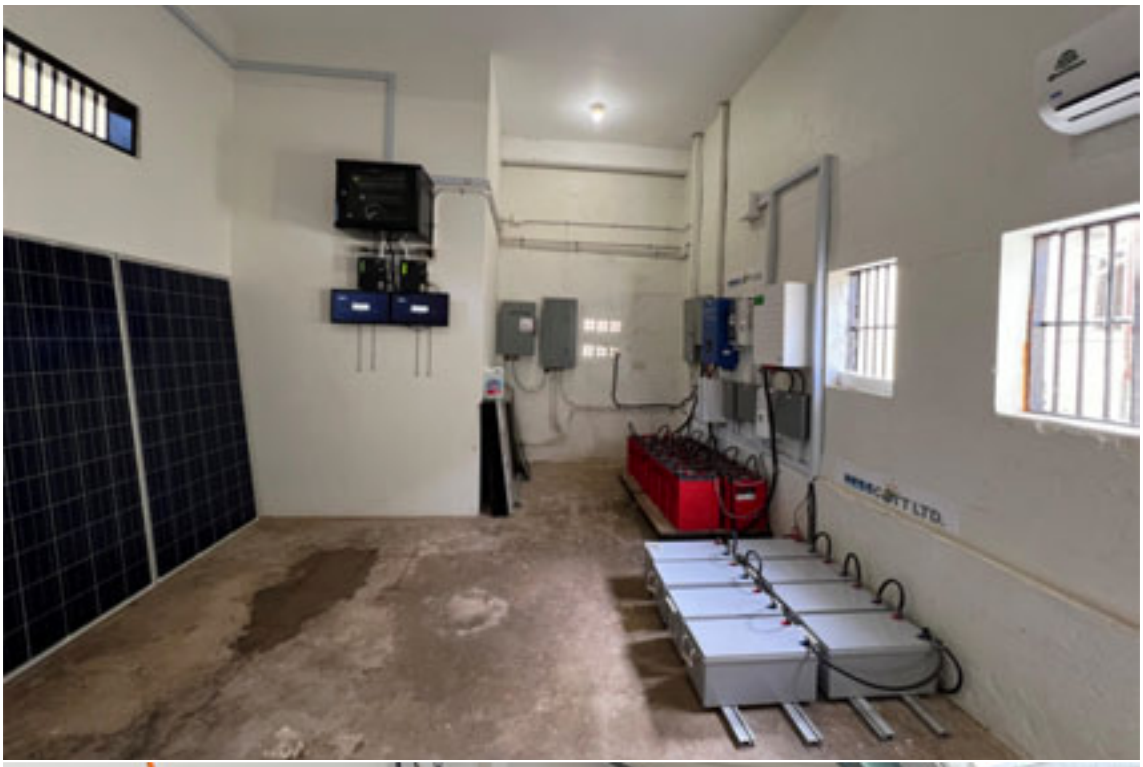
It is recommended to develop a Master Plan for the off-grid approach, so that design is deliberate and thoroughly considering joint impacts before installation. The Master Plan should make use of the innovative, latest technologies combined with expertise about thoughtful and appropriate installations. For example, after identifying the site's prioritised programmatic areas, key locations can be identified that provide support space and installation for off-grid adaptations. If installations require large visibility due to location, programming should be developed that includes sustainability in the curriculum.

Integration of adaptation scales will be essential for the future of Nelson Island. Coordination of efforts at the material, building, landscape and infrastructure scales will provide a holistic approach to preservation, interpretation and sustainability, ensuring that one installation won't negatively impact a different goal. All team members responsible for decision-making will need to coordinate plans for new projects and programming.

Site drainage and landscape material permeability are one of the top challenges that affect the buildings' maintenance. Consideration of new landscape should include green infrastructure and natural materials that drain water away from buildings. Shown above are the space between the buildings, consistently damp as illustrated by the moss growing, and the patio outside of the Mess Hall.

Buildings are in fairly good condition, with only a few places where serious cracking should be assessed. Nuisances such as bird roosting create a challenge for building maintenance.

Edge conditions at Nelson Island are precarious and could pose danger to visitors. Consistent wave action causes edge erosion and destabilization, damaging existing walls such as seen here. The pipe and cistern system is part of sustainability efforts by the caretaking team.



Sustainability efforts are a primary goal for the Nelson Island caretaking team. New equipment, such as inverters, batteries, and solar panels, has been installed throughout the three buildings for keeping the island off-grid.

PART 3: PUBLIC ENGAGEMENT OUTCOMES

FOCUS GROUP OUTCOMES

The focus groups provided general insights on Trinidad and Tobago and the actions, thoughts, and emotions on climate change, adaptation, and mitigation. Below are summaries of each focus group.

GROUP 1: HERITAGE TOURISM

When asked about hazards in their community, participants identified **precipitation, landslides, and earthquakes** as the top ones. **Wildfire and high wind** were identified as moderate hazards. **Hurricanes, erosion, drought, and extreme temperatures** were identified as low hazards. Another hazard was the incoming **sargassum** around the coasts, affecting beach outings and tourism.

The next question touched on assets the participants wanted the government to prioritise for resilience planning. These included sites related to the **First Peoples, Cleaver Woods, storage in the National Museum, historic houses (specifically in St. Joseph and St. James), waterfront access, and the Chaguaramas peninsula**.

GROUP 2: BUILDING ADAPTATION

When asked about hazards in their community, participants identified **precipitation, landslides, and erosion** as the top ones. **Wildfire and high wind** were identified as moderate hazards. **Hurricanes, drought, and extreme temperatures** were identified as low hazards.

The next question touched on assets the participants wanted the government to prioritise for resilience planning. These included sites related to the **First Peoples, archaeological sites, the 1854 Carrera convict Prison, the Temple in the Sea, endangered communities, burial grounds, and religious/spiritual environments.**

Regarding feasible adaptation strategies, the history of architecture was the initial focus. Participants stated that historically, the houses were built on stilts, and even 50 years ago, the houses were not typically found at ground level. Another adaptation suggested was impact-resistant glass to protect stained glass windows in churches, as well as requiring hurricane clips in old and new buildings. Participants also identified the need for better drainage systems to move water below ground quickly.

GROUP 3: NATURE-BASED ADAPTATION

When asked about hazards in their community, the participants' answers **aligned with Group 2** regarding the top and moderate hazards. The only low hazard identified was **extreme temperatures**, as they are used to it currently.

Regarding nature-based adaptation in their communities, the top agreement was the **need for urban green space** to capture flood water and relieve **the heat island effect**. Another agreement amongst participants included planting and **supporting native plant life that absorbs and filters water, and holds soil in place**.

GROUP 4: LAND USE POLICY

When asked about **hazards in their community,** the participants identified **high winds, flooding, landslides, and earthquakes** as the top hazards for their communities. Moderate hazards included **erosion, hurricanes, wildfires, and extreme temperatures**. Like the first group, this group also identified **sargassum** as a natural hazard.

Regarding cultural assets, the participants wanted the government to prioritise resilience planning; the group named **natural sites, gingerbread houses in Belmont, reefs, mangroves, Chaguaramas peninsula, lighthouses, Fort King George, burial and cremation sites, and quarry sites.** More specific to land use planning and policy, the participants identified the **need for greener infrastructure, standardized building codes, increased density, and code enforcement in flood-prone areas.**

GROUP 5: ADAPTATION FOR THE FUTURE

After a review of other groups' responses to the question of natural hazards in their community, this group added **mud volcanoes**, which have been known to decimate villages.

Regarding cultural assets the participants wanted the government to prioritise for resilience planning, the group named **cultural practices such as the East Indian use of the Marianne River, oral traditions, the East Port of Spain, African culture, Yoruba Shrines, and the Petroglyphs.**

Regarding strategies for future adaptation, the participants focused on communities and public engagement, ensuring that communities had agency over what was happening and were informed and actively involved in planning processes and policy decisions.

DIGITAL MEDIA OUTCOMES

Website Creation and Metrics

The team designed a multipage website for *Resilient Heritage* on a WordPress platform, allowing the website to be transferred over to the NTT&T team and managed when ready. The website showcases Project Partners, Project Details, Project Sites, Resources, Conference Details, customized Cognito Forms for registration, and much more. Metrics for the project webpage from January through April 4, 2023 show an international audience with approximately 3,200 unique visitors to the site over the three month period, with the peak page views during March, the month of the conference. The metrics illustrate the importance of social media and the website to disseminate information to a wide audience.

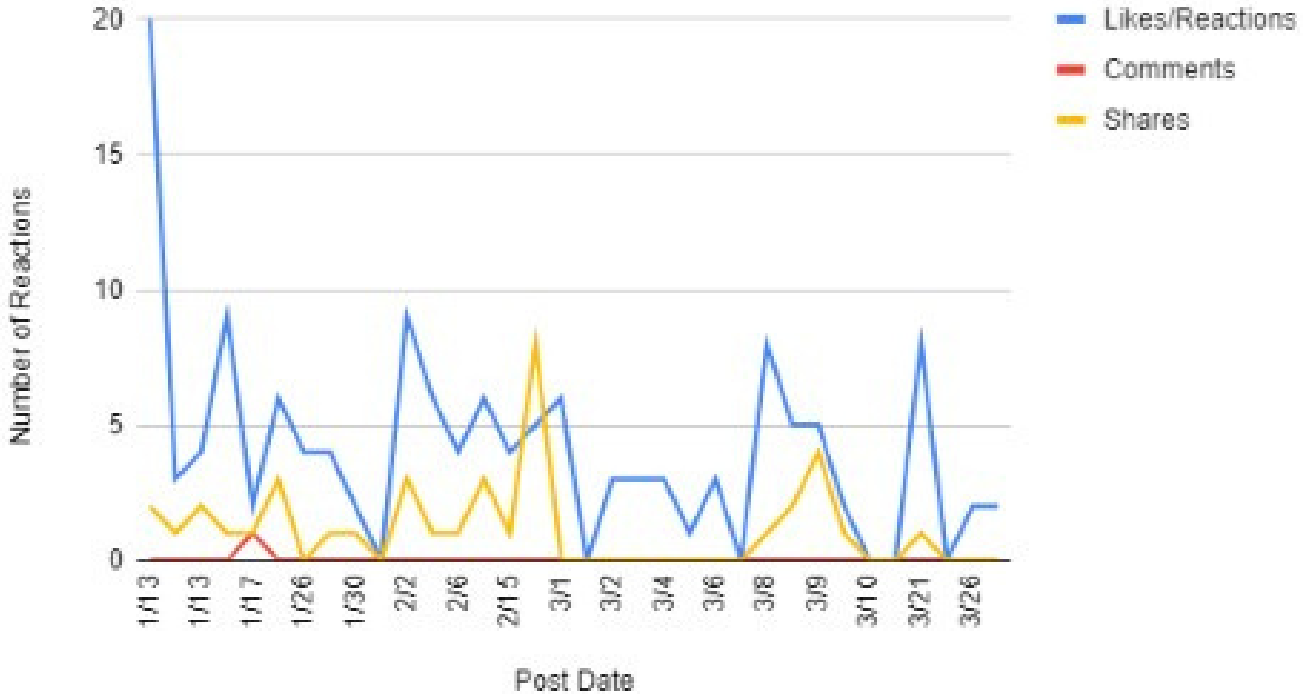
	January	**February**	**March**	**April 4, 2023**
Countries	United States	United States	United States	United States
	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago	Trinidad and Tobago
	United Kingdom	United Kingdom	United Kingdom	Canada
	Canada	Cayman Islands	Ireland	Taiwan
	Aruba	Jamaica	Netherlands	Netherlands
	Netherlands	Germany	Cayman Islands	United Kingdom
	Cayman Islands	Canada	Jamaica	Ireland
	India	France	Canada	Luxembourg

Social Media Posts

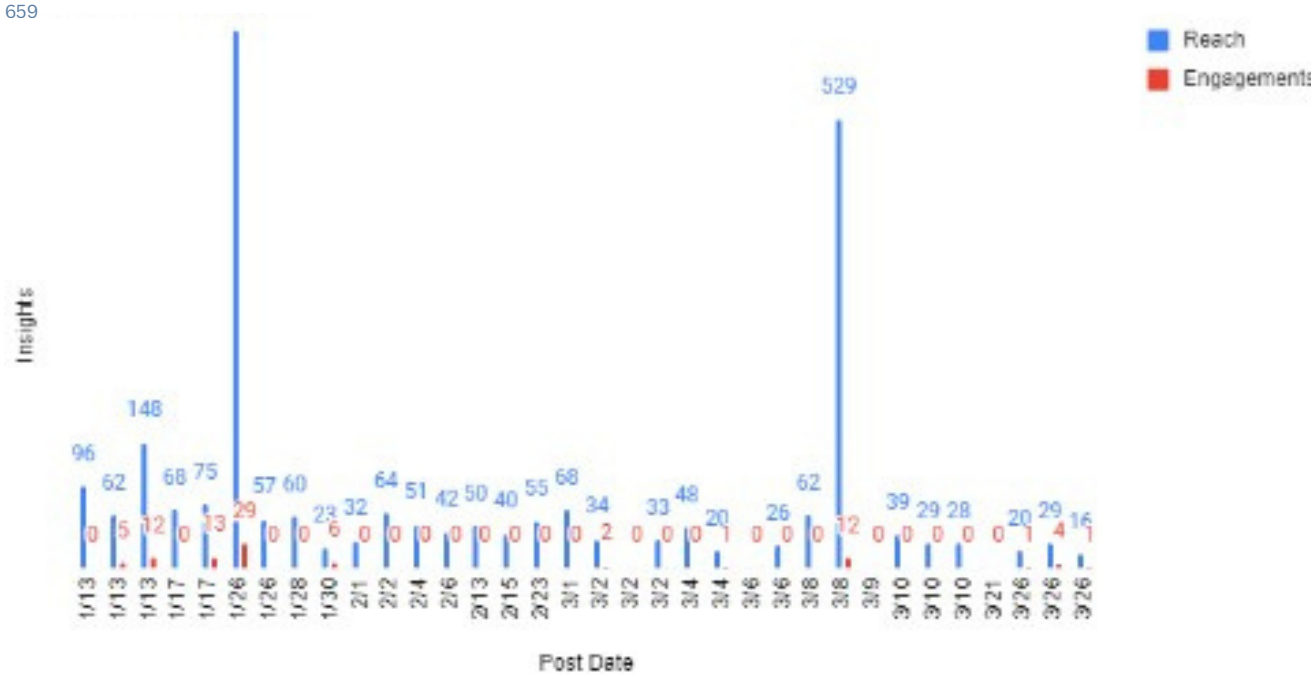
The approach to the social media aspect of the KHAW branding was to post twice weekly once speakers had been confirmed, over a time span of 90 days leading up to and including the conference. These posts featured information about the conference, a link to register, and a graphic of the featured speaker, along with their bio. The same post was shared across the team organisations' Facebook and Instagram. These posts were then shared with conference speakers and the *Keeping History Above Water* team at the Newport Restoration Foundation for each partner to share with their followers as they saw fit. The results fluctuated from post to post, likely a result of the tags and hashtags utilized, and influenced by the number of followers of those sharing.

Facebook Analytics

Facebook Reactions

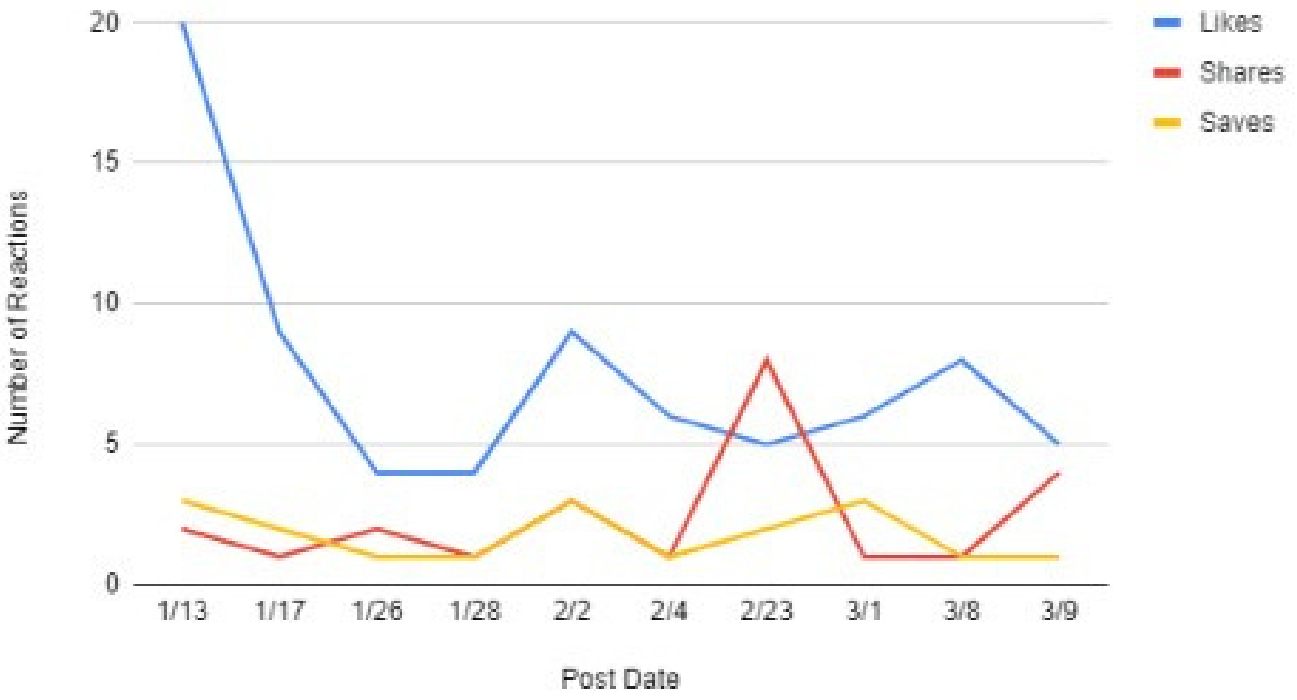


Facebook Insights

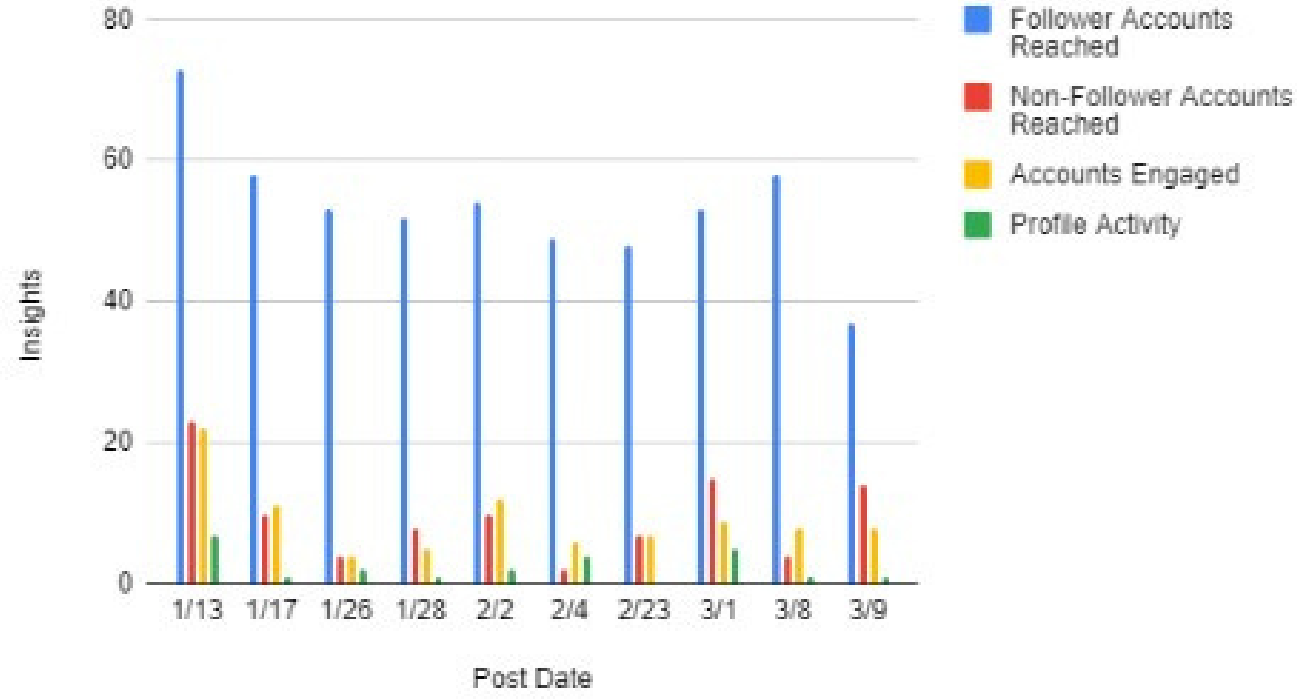


Instagram Analytics

Instagram Reactions



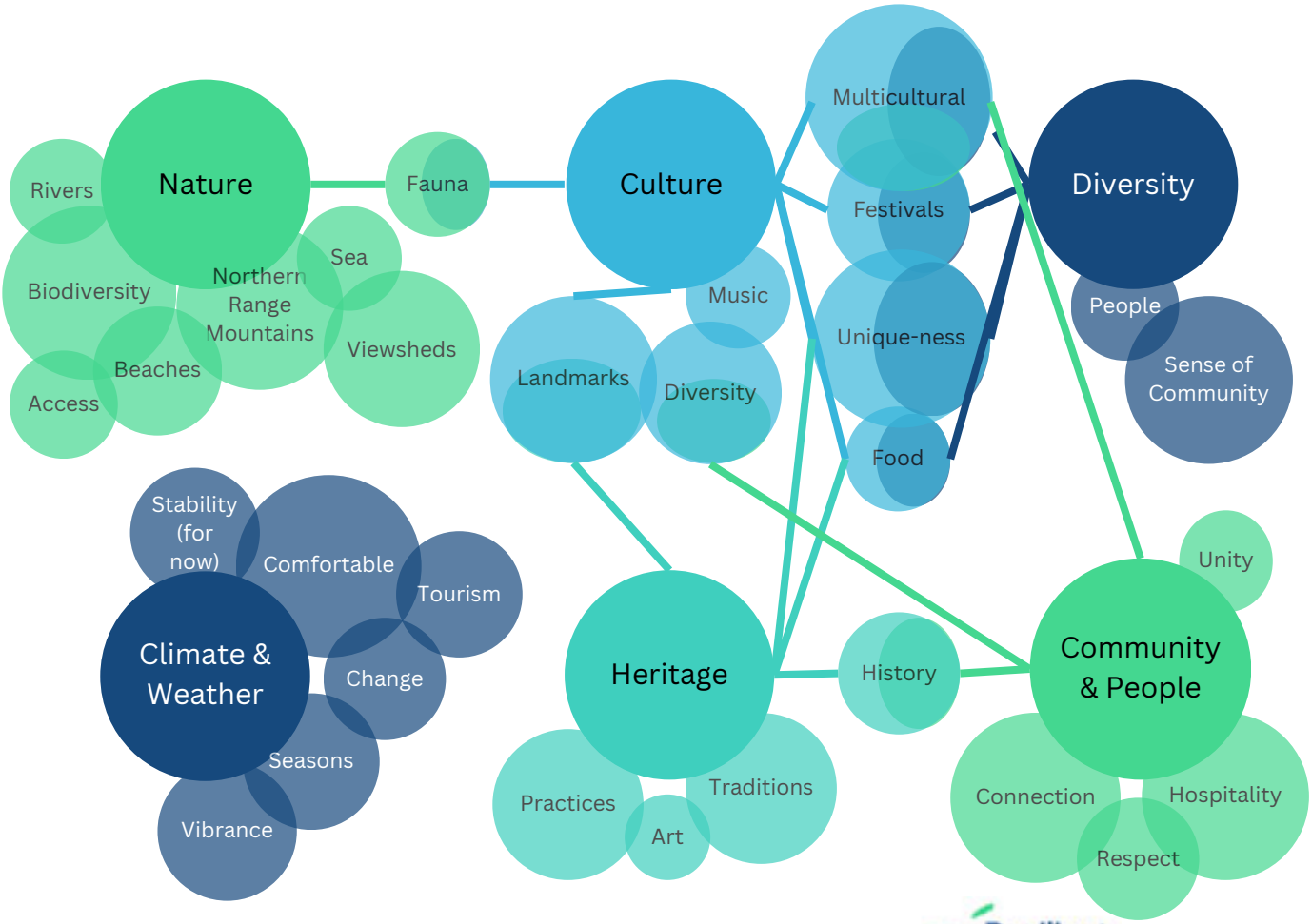
Instagram Insights



COMMUNITY VALUES SURVEY

This initial survey was developed from the findings of the focus groups and standard practice questions to ask. The results of this survey informed the *Keeping History Above Water* conference, workshop, and subsequent Prioritisation Survey (discussed later in the report). This survey received 132 responses with a 66% completion rate. This was an extended survey with several open-ended questions, which may not have applied to everyone; therefore, this completion rate was acceptable. The survey was distributed through the NTT&T's social media, newsletters, and email lists. Unfortunately, there was no representation in the survey demographics from Tobago, which informed researchers that Tobago outreach is necessary in the future. There was a good distribution of age, with the largest represented age bracket being 25-34-year-olds (32.8%) and the lowest being Under 18 (1.6%).

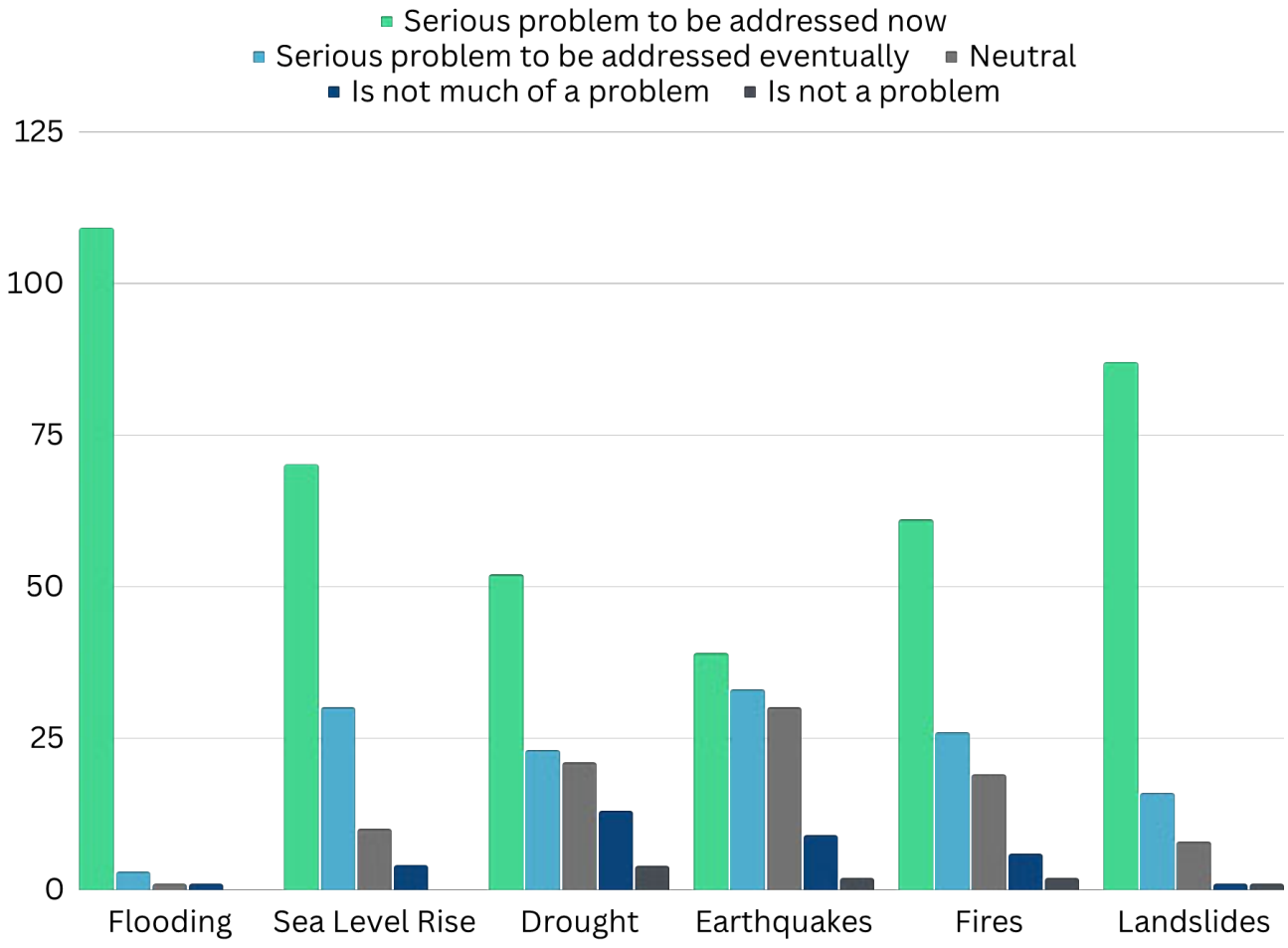
The initial questions established a baseline of values and tone for the survey. When asked what participants valued most about living in Trinidad and Tobago, their responses were coded into the following categories and ranked based on frequency: **Nature, Culture, Diversity, Heritage, Community & People, Climate & Weather**. Within those categories, more specific identifications are illustrated below:



After this understanding of baseline values, the next set of questions focused on climate change. **64% of survey participants have experienced a significant hazard or natural disaster event**. The next question assessed participants on the adversities, if any, they have experienced as a result of the hazards or disasters they experienced:

- 23% of participants experienced a business interruption;
- 25% of participants experienced property damage;
- 15% of participants experienced financial adversity;
- 52% of participants have never experienced problems.

Participants were then **asked to rank the Office of Disaster Preparedness and Management's natural hazards of greatest concern**. The results identify in order flooding, landslides, sea level rise, fires, drought, earthquakes as serious problems to be addressed now.



Participants **identified who they believed was responsible for protecting the irreplaceable historic and cultural resources from flooding and erosion**; their answers, respectively, were: the national government, local governments, property owners, major industries, and NGOs. They **ranked order or responsibility for climate change effects** as: national government, local government, NGOs, major industry, and property owners. **Regarding property owners, 73% of participants would be more likely to adapt their property if offered technical assistance, and 82% would be more likely to adapt their property if offered financial assistance.** Participants also provided information on actions they have already taken, with the **highest taken action being landscaping to reduce flooding.**

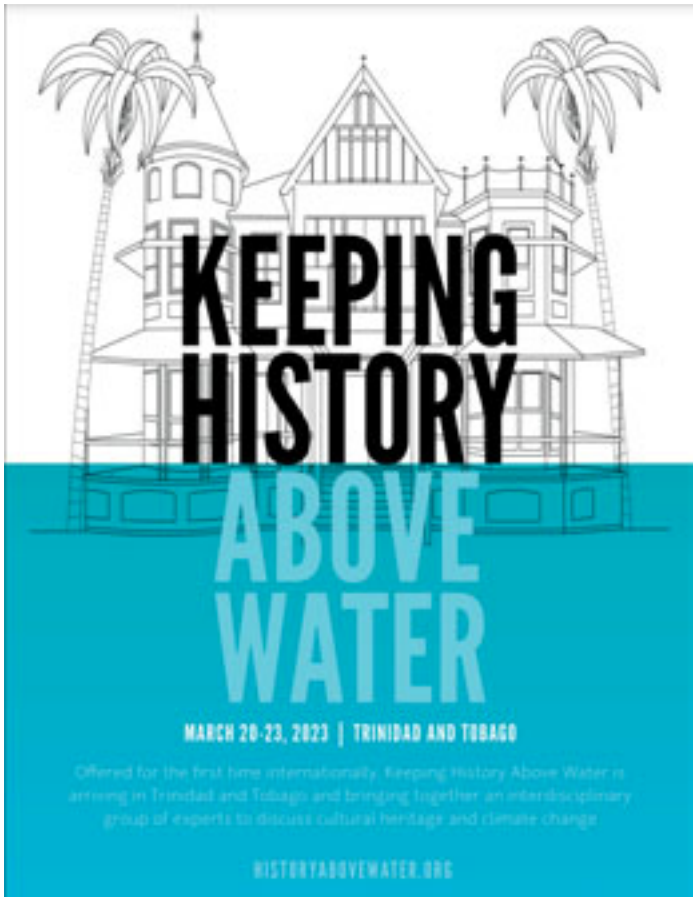
The following section touched on **heritage preservation sites for prioritisation**. Like the baseline question, natural spaces ranked top, followed by indigenous resources and artifacts, religious/spiritual sites, educational institutions, residences, agriculture, industry, military installations, government sites, and commercial districts. Other sites participants listed beyond available options were emergency sites, sugar estate remains, and coffee estates. **When asked for specific sites for prioritisation, the most frequent responses were: Buccoo Reef, Digity Mud Volcano, Caurita Petroglyphs, Fort George, Brechin Castle Factory, Nariva Swamp, Temple in the Sea.**

The final section focused on heritage preservation as a discipline in the country. The top view on heritage preservation was that **preserving heritage strengthens the country's quality, character, and vitality**. Participants ranked issues they believe are **most important to preservation efforts, from highest to lowest: environmental sustainability, education and training, rehabilitation, indigenous peoples' stories and history, disaster preparedness, economic development, and housing affordability.**

Participants **identified tools that were most helpful**, leading with design guidance for adapting buildings and sites to reduce flood risk (74%), followed by workshops for local governments and property owners on methods for adapting historical buildings & sites (70%), a disaster preparedness toolkit for historic properties and cultural institutions (64%), and information on flood insurance and financial resources to assist in flood risk reduction or flood recovery (63%). Finally, participants **identified resources they thought would be most helpful** to protecting T&T's heritage resources, which included training for museums and cultural institutions on preparedness and recovery, online maps and visualizations demonstrating flood risk, and materials for businesses.

KEEPING HISTORY ABOVE WATER OUTCOMES

Conference speakers were asked to identify within their presentations some key takeaways for the audience and for the purposes of reporting. Below is a list of those takeaways.



- **Scale & Partnerships**
  - If larger-scale heritage research is desired, then cooperation programmes should be initiated, with a strong emphasis on regional networks among the islands, as well as, with other nations.
  - Thinking regionally, act locally (climate change doesn't care about national borders).
  - Maximise your organisation's potential by joining with others.
  - Forming partnerships can grant access to resources.
  - Respect and dignity are to be provided to the islands in their approaches to Heritage Development, even in contradictions with colonial or larger nations.
- **Actions**
  - Implementation must be held accountable with international professional standards, including the Valetta Treaty and climate treaties.
  - Take preventative action (more cost-effective to identify and reduce risk than to rebuild afterward).
  - Come to terms with trade-offs (which is more important: authenticity or durability?).
- **Foundation**
  - Respect and dignity are to be provided to the islands in their approaches to Heritage Development, even in contradictions with colonial or larger nations.
  - Local leadership is the key to success.
  - Maximise the potential of the places in your care.
  - Prioritise the youth as the future custodians.
  - Don't reinvent the wheel.

RESILIENT HERITAGE: T&T WORKSHOP OUTCOMES

Workshop participants were able to select the breakout group they were most interested in and relocate to the respective table. (See **Methodology** for more information on workshop formation.) Each group had a facilitator from the project team, who took notes for the report-out session.

Group #1: Land Use and Environmental Policies – Kara Roopsingh
Group #2: Adaptation Strategies for Buildings & Infrastructure – Angela Schedel
Group #3: Public Awareness & Preparedness – Kimberly Rose
Group #4: Cultural Heritage Planning and Protection – Lisa Craig
Group #5: Nature-based Mitigation Strategies – Cleary Larkin

These groups had a worksheet with seven questions to answer if they could: identify actions, identify barriers, approaches to those barriers, identify milestones to overcome barriers, identify resources, identify leaders, and note immediate next steps. After a break, the participants were asked to take six stickers and put them next to any actions they thought should be prioritised. Doing so allowed the researchers to understand what actions were of the highest priority. **The following chart identifies the actions based on this prioritisation exercise. The number of stickers received is in the far right column.**

Priority Area		Actions	#
Government and Policy	#1	Create data-sharing pathways across public and private sectors, particularly spatial data infrastructure (geographic information systems.	20
	#2	Revise outdated legislation, policy, codes, and guidelines.	19
	#3	Pass building codes	12
	#4	Develop a Collaborative Planning Strategy Framework	12
	#5	Develop a Disaster Plan	8
	#6	Develop a floodplain/stormwater management plan in culturally significant locations	4
	#7	Create policy that supports nature-based approaches	3
	#8	Create Evacuation Plans for sites and people	3
	#9	Develop a cultural heritage management and adaptation plan for downtown	1
Public Engagement	#1	Educate about resilient and sustainable building practices.	13
	#2	Consult with communities in accessible places and formats to break communication silos.	11
	#3	Build public awareness of the importance of nature-based solutions	10
	#4	Host various awareness activities to reach as many people as possible	9
	#5	Understand community capacity and conditions of resources through benchmark surveys	6
	#6	Complete a demonstration project of nature-based approaches	4
	#7	Use art and media to communicate and raise awareness of climate change and resilience concerns	2
	#8	Build awareness in enforcement agencies and communities of policies and enforcement.	1

Priority Area			Actions	#
Adapt	Protect	#1	Plant vegetation or install netting to decrease water and wind erosion	8
		#2	Plant coastal vegetation for storm surge protection	5
		#3	Create wave breaks to reduce shoreline erosion	5
		#4	Prevent egress of water at historic buildings	2
		#5	Install bilge pumps to pump/divert water	0
	Accommodate	#1	Change paving materials to permeable materials	3
		#2	Maintenance of stormwater culverts	2
Mitigation Strategies		#1	Engage surveyors to perform topographic surveys to understand water flow, drainage, and storage capacities and recommendations for designs or redesigns	9
		#2	Identify native and indigenous plants and their built-in climate resilience	5
Education and Youth Engagement		#1	Engage youth and schools through outreach programmes and prepared curriculum	12

In **discussing barriers**, those most commonly brought forward included outdated policies, aligning with Government and Policy action Priority #2. Additionally, participants identified the lack of enforcement of regulations and codes as a barrier that aligns with the Public Engagement action Priority #8. Not having access to technology in a technology-centric world is detrimental to efforts and was identified as such by workshop participants, which is also reflected in the Government and Policy action Priority #1.

However, if all three of these items were addressed, the capacity of communities, businesses, individuals, and educational institutions to effectively use, access, or dedicate time to is another barrier. This is why the next barrier identified was the lack of baseline assessments concerning capacity (Public Engagement action Priority #5) as well as personnel commitments and awareness. The capacity of awareness also affects a community's ability to engage or have an active role in an issue, which was identified as a barrier and aligns with the entire Public Awareness action category.

On the other side of this issue are communities that are continually engaged by various groups for projects, which creates the barrier of engagement fatigue. This is when audiences begin to develop a weariness of engagement due to various sources including, but not limited to, cyclical nature, frequently changing information, or lack of follow-up actions, resulting in a lack of engagement and, over time, engagement only coming from those who have strong interests (i.e., strongly supportive or strongly opposed.) Finally, participants identified that a change in government administration often means that an initiative could get lost and lose momentum or funding depending on the priorities of the incoming administration and the changes being made.

The teams then identified **approaches to the barriers and actions they had discussed.** Below are those approaches listed by the breakout group.

Group	Approaches
1	Enforcement and incentives, mandatory codes, technology logistics, resources subsidy
	Public awareness and education campaigns
	ESA rules of EMA to apply to heritage sites or amending the National Trust Act

2	Investigate/provide information to property owners on alternative building materials which are historically appropriate but more floodproof/sustainable/resilient.
	Maintaining clean gutters and downspouts
	Add backflow preventers at main outfalls, which drain into tidally influenced waters to prevent sunny-day flooding
	Investigate how to pump stormwater upland more quickly during the rainy season.Move away from low-lying areas into the “dry rivers.”
	Stop deforestation and unchecked development of upland areas, thus decreasing landslides and impermeable surfaces
	Educate people developing land about greenspace and water filtration and drainage options
	Enforce stormwater laws in new developments
	Reduce impervious and replace with green
	Create recreational green space, which can be a flooded area/park/basin in the rainy season
	Update watershed management and stormwater master plans (particularly in urban areas to prevent flooding caused by inadequate storm sewer systems.)
3	Know how to reach communities, including technology access, knowledge levels, how to convey information, and accessible language.
	Encourage political buy-in, which does not have to be financial but can be in the form of presence or endorsements
	Record oral histories and encourage storytelling traditions to understand what happened in the past
	Raise awareness of enforcement and policies in the communities and the enforcement agencies
	Develop community task forces to assist in the enforcement
	Develop interagency task forces to ensure coverage and awareness and avoid duplication of efforts or over-policing.

4	Collect technical and historical data to understand vulnerabilities according to science and stories of those who have experienced them.
	Interview NTT&T staff and volunteers to document their stories
	Identify resources needed to prepare/protect the sites and what is needed to assist individuals at risk
	Develop a publication including lessons learned and actions taken to put information in one accessible place
	Update the publication on a regular basis or after a significant flooding event
5	Get people to buy in and have a voice in processes
	Lobby government and provide a community voice for less prioritised areas
	Introduce curriculum to schools so children develop an appreciation of nature and pass along information to parents
	Respond to the most-vulnerable voices by ensuring representation
	Use art and technology
	Understand cost-benefit analysis for decision-makers, engineers, and economists
	Use existing networks and partnerships to avoid duplication of efforts and resource depletion

Milestones and resources were the next topics for each group to identify. These are meant to be stepping stones to achieve the actions and remove barriers.

Group	Milestones	Resources
1	Spatial Data Infrastructure should be centralized and maintained by a regulatory agency	Monitoring
		Staff inspection officers in local government
		Data storage and sources (open source)

Group	Milestones	
3	Draft updated policies	
	Work with enforcement agencies on policy execution	
	Adapt engagement approach to audiences Access technology capabilities How do they prefer to be approached–through a familiar entity? in a formal or informal setting? Avoid professional jargon and abbreviations while including local colloquialisms where appropriate	
	Update assessments Include comparisons with what other places are doing and identify best/good practices	
	Create a regional forum or clearinghouse for people to discuss and share information A digital repository of information, documents, reports, policies, and practices for everyone to reference and use	
	Create a memorandum of understanding to maintain expectations and priorities, particularly during a change in the administration so items cannot be deprioritised	
	Use media such as murals or art, comic strips, or podcasts to reach broader audiences Give create control to youth and provide a sense of ownership	
5	Identify areas in cultural celebrations to include more sustainable practices and materials, if possible.	Direct and transparent funding accountability
		Green Fund (improve access, management, and process)
	Create reforestation programmes	Heritage Fund for emergencies
	Develop a country-wide approach	Incentivise corporate sector responsibility
		Technical assistance for implementation
		Documentation of Indigenous and traditional knowledges

Participants listed many entities, ranging from government to professional associations, non-governmental organisations, and corporations when asked who would be a natural lead or partner in the above-mentioned efforts. Below is the list of potential leaders or partners:

- Board of Engineering of Trinidad and Tobago;
- Trinidad and Tobago Society of Planners;
- Downtown Owners and Merchants Association;
- Santa Rosa First Peoples;
- Churches;
- Tour Guides;
- Influencers;
- International Aid Agencies;
- Government: approvals, funding, planning. Can also provide tax incentives for cultural heritage preservation/flood protection/resilience -
  - Office of Disaster Preparedness and Management;
  - Ministry of Transportation;
  - Public Transport Service Corporation;
  - National Spatial Data Infrastructure for Trinidad and Tobago;
  - Ministry of Agriculture, Director of Surveys;
  - Environmental Management Authority of Trinidad and Tobago;
  - Institute of Marine Affairs;
  - Ministry of Planning and Development;
  - Government contractors;
  - Taxi Association;
  - Ministry of Education;
  - Ministry of Health;
- Corporations: sponsorship/monetization of heritage sites;
- NGOs: buy-in, inform, educate, provide technical expertise and advice, grant writing, funding help -
  - Environmental NGOs;
  - Association of Real Estate Agents of Trinidad and Tobago;
- Private land owners: use their voice and resourcefulness;
- Education: Heritage and Sustainability curriculum -
  - University of the West Indies Department of Geomatics.

Finally, the last question asked participants to think of the next steps. Data collection and analysis was the top item, followed by investigating strategies to engage different stakeholder groups and finding funding avenues. Group 2 Adaptation Strategies for Buildings and Infrastructure identified completing a benefit-cost study of doing nothing to show the impact on the local economy if heritage sites are not adapted, protected/rehabilitated/restored as a next step. Group 4 Cultural Heritage Planning and Protection outlined a proposal that included identifying vulnerabilities of other National Trust properties and prioritising others for adaptation, establishing a partnership with Citizens for Conservation, approaching First Peoples communities about prioritising indigenous sites and traditions, securing involvement of organisations and individuals associated with Nelson Island, and securing interests of enthusiasts for other historic sites.

AMERICA ADAPTS PODCAST

Doug Parsons, creator and host, when asked about his podcasting experience had this to share:

“During my visit to Trinidad and Tobago, I was captivated by the rich history that these twin islands hold. From the indigenous Arawak and Carib communities to the Spanish and British colonial influences, Trinidad and Tobago's history is a mosaic of diverse cultures and experiences. It was awe-inspiring to witness how this historical tapestry has shaped the vibrant culture and traditions of the island’s people.

As I engaged with the local community, I was privileged to immerse myself in their culture, which is a beautiful blend of African, Indian, European, and indigenous influences. The music, dance, and cuisine were nothing short of spectacular, offering a sensory journey through the heart of Trinidad and Tobago. Moreover, it was encouraging to learn how they are thinking about climate change and sea level rise and starting the necessary adaptation planning in response. Conversations with the locals shed light on their concerns and the proactive measures taken by the government in collaboration with international partners for adaptation planning. It was evident, however, that there's still much work to be done to mitigate carbon emissions, a challenge not unique to these islands but shared across the Caribbean region. My trip also exposed me to the other adaptation efforts happening on other Caribbean islands, emphasizing the need for collective action in the face of climate change.”

As of September 2023, the podcast has gotten nearly 2800 downloads, which, based on industry standards, would place it in the top 15% of all podcasts. For a niche, policy-oriented podcast, these are excellent numbers.

RESILIENT HERITAGE: T&T PRIORITISATION SURVEY

This second survey was developed from the findings of the focus groups, *Keeping History Above Water*, and *Resilient Heritage* Workshop. The results of this survey informed the development of objectives and actions found in this report. This survey received 140 responses with a 72% completion rate. This survey had twenty-two questions with an estimated completion time of 14 minutes. The survey was distributed through the NTT&T's social media, newsletters, and email lists. Unlike the initial survey, the Prioritisation Survey did receive responses representing Tobago. The age distribution of survey participants was 65+ (36%), 55-64 (23%), and 35-44 (22%) with the remaining categories (18-24, 25-34, and 45-54) fulfilling the remaining 20% with no representation from individuals under 18.

The initial questions established a baseline of background knowledge and engagement with project events. When asked if participants attended the *Keeping History Above Water* conference or *Resilient Heritage* Workshop the majority of professionals answered "No" (83%).

The opening section explained that the participants at the *Resilient Heritage* Workshop were asked to list three or four actions that fell within their group topic. The survey participants were asked to **rank the adaptation categories in order of importance for the enhanced resilience of historical or cultural sites**. Their responses are as follows:

1. Government and Policy;
2. Public Engagement;
3. Education and Youth Engagement;
4. Adaptation Strategies;
5. Mitigation Strategies.

The next set of questions focused on actions within the previously listed categories. They prioritised actions on a scale of one (1) as their highest priority to six (6) as their lowest priority.

When asked about actions under Government and Policy to improve the resilience of historic and cultural sites, the participants most valued encouraging the revision of outdated legislation, policies, building codes, and guidelines. They also showed a second priority for developing a collaborative planning strategy framework.

1. Encourage revision of outdated legislation, policy, building codes, and guidelines
2. Develop a Collaborative Planning Strategy Framework
3. Develop a Disaster Plan and Evacuation Plans for sites and people
4. Develop a Floodplain / Stormwater Management Plan in culturally significant locations
5. Encourage the creation of policies that support nature-based approaches to sea level rise and natural hazards
6. Develop a cultural heritage management and adaptation plan for downtown Port of Spain

The follow-up question asked if the participants had any other adaptation actions for Government and Policy. Of the responses, the majority included student engagement and inclusion of adaptation into school curriculum, development of public-private partnerships, and rigorous stakeholder and community engagement.

When asked about actions under Public Engagement to implement for historic and cultural sites, the participants most valued education on resilient and sustainable building practices. They also showed a second priority for consulting with communities in accessible places and forms to build open communication.

1. Educate about resilience and sustainable building practices
2. Consult with communities in accessible places and forms to build open communication
3. Build awareness of the importance of nature-based solutions
4. Complete a demonstration project of nature-based approaches
5. Use art and media to communicate and raise awareness of climate change and resilience concerns
6. Build awareness in enforcement agencies and communities of policies and enforcements.

The follow-up question asked if the participants had any other actions for Public Engagement. Of the responses, the majority included student engagement and inclusion of adaptation into the school curriculum, hosting town halls and dialogues to share information in communities, encouraging local representation on projects to galvanize the community, and creating incentives such as awards and prizes to give those who are engaging in resilience practices.

When asked about actions under Adaptation Strategies to improve the resilience of historic and cultural sites, the participants most valued planting vegetation or installing netting to decrease water and wind erosion. They also showed a second priority for planting coastal vegetation (mangroves restoration, beach grass) for storm surge protection.

1. Plan vegetation or install netting to decrease water and wind erosion
2. Plant coastal vegetation (mangroves restoration, beach grass) for storm surge protection
3. Create wave breaks to reduce shoreline erosion
4. Prevent ingress of water at historic buildings
5. Install bilge pumps to pump / divert water
6. Change paving materials to permeable materials

The follow-up question asked if the participants had any other adaptation actions for Adaptation Strategies. Of the responses, the majority included capturing rain water, public engagement opportunities, laser scanning heritage resources, and continued maintenance.

The question on Mitigation Strategies to improve the resilience for historic and cultural sites only had two actions to prioritise from. The majority of votes (72%) supported the engagement of surveyors to perform topographic surveys to understand site water flow, drainage, and storage capacities and recommendations for designs and redesigns. The second option received 28% of responses to identify native and indigenous plants and their climate resilience.

The follow-up question asked if participants had any other actions for Mitigation Strategies. Of the responses, the majority included renewable or alternative energy installations, doing both options together, and regular maintenance of environmental resources such as waterway cleaning.

Finally, the last category -- Education and Youth Engagement -- had one action from the workshop: Engage youth and schools through outreach programmes and prepared curriculum. Participants were asked if there were any other actions they would like to include, and they responded as follows:

- grant or scholarship programmes for students studying resilience topics locally;
- utilizing visual and performing arts as a form of communication;
- social media campaigns;
- site tours with focus on resilience efforts and needs;
- create internships to develop interest in resilience and heritage.

The final set of questions addressed the approaches that came out of the Resilient Heritage Workshop. The participants were asked to rank the approaches as **High**, **Medium**, or **Low** priority based on the topic.

Public Engagement and Planning Approaches	H	M	L
Research how best to reach communities, including technology access, knowledge levels, how to convey information effectively, and accessible language.			
Encourage political buy-in through endorsement and physical presence if financial support is not possible.			
Record oral histories and encourage storytelling traditions to understand history from primary perspectives.			
Raise awareness of enforcement and policies in the communities and the enforcement agencies.			
Develop interagency taskforces to ensure coverage, awareness, and avoid duplication of efforts.			
Nature-Based Mitigation Approaches			
Encourage public buy-in and ensure voices are heard in various processes.			
Lobby government and provide a community voice for less prioritised areas.			
Introduce curriculum to schools about resilience, sustainability, and nature.			
Use art and technology to raise awareness			
Understand cost-benefit analysis for decision-makers, engineers, and economists.			
Use existing networks and partnerships to avoid duplication of efforts and resource depletion.			

Land Use and Environmental Policy Approaches	H	M	L
Encourage the creation of enforcement and incentives, mandatory codes, technology logistics, and/ or resources subsidy.			
Public awareness and education campaigns.			
Environmentally Sensitive Area (ESA) rules of the Environmental Management Authority (EMA) to apply to heritage sites or amending the National Trust Act.			
Adaptation Strategies for Buildings			
Investigate/ provide information to property owners on alternative building materials that are historically appropriate but more floodproof/ sustainable/ resilient.			
Maintaining clean gutters and downspouts.			
Educate people about greenspace, water filtration, and drainage options.			
Adaptation Strategies for Infrastructure			
Encourage re-forestation and responsible development of upland areas to decrease landslides and impermeable surfaces			
Enforce stormwater laws for historic and cultural sites			
Reduce impervious and replace with green spaces			
Encourage the creation of greenspace, which can be flooded in the rainy season			
Encourage update of watershed management and stormwater master plans to include resilience measures			

PART 4: RESILIENT HERITAGE TRINIDAD AND TOBAGO

RESILIENCE ACTIONS PRIORITISED

The *Resilient Heritage: Trinidad and Tobago* project served as the 'assessment and planning' phase which aimed to advance the resilience and long-term preservation of the nation's historic places and cultural resources as they are impacted by climate change. The project applied an integrated methodology for digitally documenting, assessing, and developing management frameworks for conservation and adaptation. The use of terrestrial 3D laser scanners for the purpose of documentation and climate change modelling was a first for the nation. The pilot heritage sites and historic resources on the island nation are also threatened by a number of human-induced and natural impacts, including deferred maintenance and, increasingly, flooding due to tidal events, storm surge, and sea level rise. A values-based approach that embedded community and stakeholder engagement and training throughout the process including disseminating outcomes, was also successfully implemented.

Many of the suggestions from the communities and stakeholders are beyond the mandate of the NTT&T, the implementing body of this grant. Nonetheless they are worth mentioning to give voice to the citizens who participated in this study and perhaps another implementing agency can find them useful. Some of these suggestions could form the basis of a proposal for a second phase of this project.

Priority #1 – Outreach and Education

Encourage youth, schools, and the general public to learn about climate change and participate in climate adaptation and mitigation. Work with other government agencies to encourage understanding of how climate and heritage fit within their organisational mission.

Action: Incorporate climate change adaptation and mitigation into National Trust programming, targeting youth - primary and secondary schools and youth groups - especially in the execution of the Heritage Keepers programme and in regular school tours hosted by the National Trust.

Action: Pursue tours of Port of Spain, centred around *Resilient Heritage: Trinidad and Tobago* project sites, some can specifically target students, to encourage youth engagement in the development of risk reduction strategies. Others such as OUT (Orange Umbrella Tours) and Nelson Island tours can utilize the signage created from this project to target the general public.

Action: Train youth as tour guides for National Trust sites so that they can tell the story of heritage and resilience from their perspective to their peers, friends, and family.

Action: Scale up promotion of *Resilient Heritage: Trinidad and Tobago* on social media platforms with messaging specifically targeting youth.

Action: Partner with NGOs and national agencies such as the Tobago Emergency Management Agency (TEMA) and ODPM on their National Disaster Prevention and Preparedness Month to encourage education around climate change and heritage site resilience.

Priority #2 – Improvement of Regulations, Policies and Partnerships

These will act collectively to enable implementation of regulations that better protect heritage assets which benefit the nation's economy and people.

Action: Encourage drafting legislation and regulations that prioritise nature-based approaches and wetlands protection to mitigate sea level rise and natural hazards.

Action: Partner with ODPM Emergency Response and Disaster Plan specific to each cultural heritage site or district that includes pre-disaster readiness, checklist for property management during disasters, evacuation protocols, and recovery priorities for people and property.

Action: Develop a Cultural Heritage Adaptation Plan for downtown Port of Spain.

Action: Promote importance of adaptation strategies that use nature-based approaches, structural diversions, and building protection measures to reduce flood risk to culturally significant sites and properties.

Action: Encourage planting beach grass and restoring mangroves to protect significant cultural and natural resources against storm surge.

Priority #3 – Documentation & Adaptation

Assess the vulnerability of flood risk and develop appropriate adaptation strategies for all National Trust historic buildings to best protect them against flooding, water infiltration, and high winds.

Action: Conduct laser scanning of National Trust properties that are at greatest risk.

Action: Engage knowledgeable professionals and volunteers to assist with risk assessment.

Action: Conduct annual basic preventive maintenance such as cleaning gutters and downspouts.

Action: Replace surrounding impervious surfaces with permeable paving materials on Nelson Island.

Action: Promote adaptation of privately held culturally significant properties through promoting best practices in adaptation from National Trust properties.

Priority #4 – Conservation

Address climate mitigation in tandem with climate adaptation by encouraging property owners to make heritage buildings carbon neutral to support the reduction of greenhouse gases while better protecting vulnerable historic properties.

Action: Promote increased climate resilience using natural vs. mechanical methods.

Action: Develop a toolkit on adaptation to identify suitable replacement building materials, floodproofing measures, and structural diversion strategies that do not impact the historic integrity of properties, while also advising property owners about possible avenues to access financial assistance for such works (tax incentive programme, Commission for self-help, etc.)

Action: Support agencies that promote the use of native and indigenous plants throughout the islands.

Action: Advocate for reforestation and reduced development of upland areas to reduce landslides and impermeable services.

Action: Support a greening of the towns and cities green spaces by Local Government to reduce the urban heat island effect.

Action: Encourage use of small-scale renewable energy installations at historic buildings.

Action: Create more greenspace around or adjacent to culturally significant sites to serve as areas for catchment areas during the rainy season.

CONSTRAINTS TO RESILIENCE ACTIONS

1) Governance Structures

It would be ideal that Trinidad and Tobago establish climate and disaster policies and implement regulations that better protect cultural heritage assets. However, the current governance structure of the agencies mainly responsible for these policies and regulations does not allow for efficiency and smooth operational activity. The local level response to disasters is well set up for on the ground mobilization at the Regional Corporation level. However, the national coordinating body for disaster management and preparedness is under a different Ministry with different policies and legislation. This does not allow for a streamlined mobilization of resources where needed as they both serve different agendas and answer to different Ministers.

2) Political Continuity

In Trinidad and Tobago, general elections are held every five years and local elections are held every three years in Trinidad and every four years in Tobago. This often results in either a complete change of administration or an internal cabinet shuffle. This presents a hurdle as the priorities and often the office holders change. The inability of different administrations even within the same party to have continuity on issues such as climate change can lead to incomplete projects.

3) Lack of appropriate enabling legislation and policies

The country has made strides in setting up disaster preparedness units at the local government level and national coordinating bodies that work at a larger scale. However, none of these agencies have policies or legislation that speaks specifically to heritage under their "built environment" classifications. Under the category of "critical facilities" infrastructure such as schools and churches are named because they serve as shelters for a disaster. Yet there remains no classification within this for the agencies to be aware that some of these buildings may be historic and have different needs. Many policies are stuck in the draft stage unable to get approved because of various differences in priority between agencies dedicated to improving disaster awareness, preparedness and policy and the political agendas. The experience is that it takes decades to get policy implemented or legislation amended.

CONSTRAINTS TO RESILIENCE ACTIONS

4) Budget and capacity limitations

Competing priorities and budget allocations often leaves the disaster mitigation and planning side underfunded. Workforce training and expertise in Trinidad and Tobago centres around “response.” Before any action to improve preparedness, mitigation, adaptation and resiliency policies there needs to be an awareness of the needs of each agency for these positions and not only the post disaster cleanup and response.

5) Lack of Evidence-Based Decision Making

It is well documented that Trinidad and Tobago leaders often base knowledge and decisions on ad hoc, reactionary policy that often lacks research and needs further consultation. The Vision 2030 document of the country noted that this lack of evidence-based policy hinders the country’s development.

6) Public Attitudes and Culture

To adopt adaptation and resilience strategies, change needs to happen with buy-in from the communities the policies are meant to serve. The Trinidad and Tobago public is slow to accept new ways of doing things and there is a resistance to change without extensive education and awareness campaigns. Traditional local knowledge is often esteemed and held sacred in small islands, necessitating unique, aggressive, context-specific educational campaigns, along with community buy-in; otherwise, achieving the desired outcomes and outputs becomes difficult or impossible.

STAKEHOLDERS

STATE

Board of Engineering of Trinidad and Tobago
Carenage Fishing Facility
Carrera Prison
Central Bank of Trinidad and Tobago
Chaguaramas Development Authority
Civilian Conservation Corps
Diego Martin Regional Corporation
East Port of Spain Development Company
Environmental Management Authority
Institute of Marine Affairs
Ministry of Agriculture, Land and Fisheries:
- Forestry Division
- Surveys and Mapping Division
Ministry of Education
Ministry of Planning and Development:
- Environmental Policy and Planning Division
- Town and Country Planning Division
Ministry of Public Utilities
Ministry of Rural Development and Local Government:
- Disaster Management Unit
Ministry of Tourism, Culture and the Arts:
- Culture Division
Ministry of Works and Transport:
- Maritime Division
- Coastal Protection Unit
- Drainage Division
National Archives of Trinidad and Tobago
National Infrastructure Development Company Limited
National Institute of Higher Education, Research, Science and Technology
National Museum and Art Gallery of Trinidad and Tobago
Office of Disaster Preparedness and Management
Port-of-Spain City Corporation
Public Transport Service Corporation
The Tobago House of Assembly:
- Division of Food Security, Natural Resources, the Environment and Sustainable Development
- Division of Tourism, Culture, Antiquities and Transportation, Tobago House of Assembly
Tourism Trinidad Ltd.
Trinidad and Tobago Coast Guard
Trinidad and Tobago Meteorological Services
Trinidad and Tobago Police Service
UNESCO Commission for Trinidad and Tobago
Water and Sewerage Authority
Water Resources Agency

STAKEHOLDERS

NON- STATE

Anglican Church in the Diocese of Trinidad and Tobago
Archdiocese of Port of Spain
Association of Maxis Taxis of Trinidad and Tobago
Association of Professional Engineers of Trinidad and Tobago
Bankers Association of Trinidad and Tobago
Bhagwansingh Hardware
Citizens for Conservation
Climate Analytics Caribbean
Coconut Growers Association
Downtown Merchants Association
Energy Chamber of Trinidad and Tobago
Fondes Amandes Community Reforestation Project
HIT RESET Caribbean
Renewable Energy Supplies and Services Company of Trinidad Tobago
Rotary Club of Central Port of Spain
Sea Lots Community Council
Success Laventille Networking Committee/ Yoruba Village
The Beacon Insurance Company Limited
The Cropper Foundation
The University of the West Indies, St. Augustine
Trinidad and Tobago Chamber of Industry and Commerce
Trinidad and Tobago Manufacturers Association
Trinidad and Tobago National Petroleum Marketing Company Limited
Trinidad and Tobago Society of Planners
Trinidad and Tobago Tour Guide Association
Trinidad and Tobago United Fisherfolk Association
UNDP Trinidad and Tobago
United Nations Trinidad and Tobago
Yacht Services Association of Trinidad and Tobago

PART 5: MOVING FORWARD

CONCLUSION: RESILIENCE PRIORITIES & NEXT STEPS

When assessing the prioritised goals from stakeholder input, recommendations by the project team, and internal Trust discussion, criteria for the next steps of the project were deemed actions that are attainable and implementable within the next year. These actions rely on existing partnerships and building more collaboration between the Trust and its partners. The actions can be further implemented into short-term and long-term projects. Lastly, these actions do not require additional funding, and may be used as catalyst projects for next grant applications. The remaining prioritised action items will be considered for Phase II funding.

Priority #1 – Outreach and Education Actions:

- Pursue tours of Port of Spain, centred around Resilient Heritage: Trinidad and Tobago project sites, some can specifically target students, to encourage youth engagement in the development of risk reduction strategies. Others such as OUT (Orange Umbrella Tours) and Nelson Island tours can utilize the signage created from this project to target the general public.
- Partner with NGOs and national agencies such as the Tobago Emergency Management Agency (TEMA) and ODPM on their National Disaster Prevention and Preparedness Month to encourage education around climate change and heritage site resilience

Priority #2 – Improvement of Regulations, Policies and Partnerships

- Partner with ODPM Emergency Response and Disaster Plan specific to each cultural heritage site or district that includes pre-disaster readiness, checklist for property management during disasters, evacuation protocols, and recovery priorities for people and property.

Priority #3 – Documentation & Adaptation

- Conduct annual basic preventive maintenance such as cleaning gutters and downspouts.

Priority #4 – Conservation

- Support agencies that promote the use of native and indigenous plants throughout the islands.
- Support a greening of the towns and cities green spaces by Local Government to reduce the urban heat island effect.

CONCLUSION (continued)

The work undertaken in executing this first phase of Resilient Heritage Trinidad and Tobago has highlighted that there is a general interest in ensuring the preservation of national heritage for future generations, but there is also a crucial need for this interest to be channelled into cohesive and feasible actions. The National Trust believes that, in the face of a rapidly changing climate, the impetus to increase resilience should now be stronger than ever.

The Trust and its partners have welcomed and appreciated the participation, inputs and support received from stakeholders in bringing this first phase together. As custodian of national heritage, the Trust is eager to maintain the momentum of this first phase and prepared to maintain its leadership role in bringing together government agencies, subject matter experts, researchers and the public, as we work towards implementation of the priority actions defined in this report.

The time to act is now and we must continue to work together and strive to make Trinidad and Tobago, and the wider Caribbean, resilient.

BACK MATTER

ACRONYMS

Abbreviation	Meaning
ACS	Association of Caribbean States (vcar)
AFCP	US State Department Ambassadors Fund for Cultural Preservation
APETT	Association of Professional Engineers of Trinidad and Tobago
CAD	Computer-Aided Design (vcar)
CARBICA	The Caribbean Regional Branch of the International Council on Archives
CARICOM	Caribbean Community
CBO	Community Based Organisation
CBTT	Central Bank of Trinidad and Tobago
CCCCC	Caribbean Community Climate Change Centre
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CLUE-S	Change of Land Small Use and its Effects –Scale Model
COP21	The Paris Climate Conference for the 21st Century
CRM I	Caribbean Risk Management Initiative
CSO	Central Statistical Office
CVI	Coastal Vulnerability Index
CYEN	Caribbean Youth Environment Network
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EACC	Economics of Adaptation to Climate Change
ECA	Economics of Climate Adaptation
ECLAC	Economic Commission of Latin America and the Caribbean

Abbreviation	Meaning
EEZ	Exclusive Economic Zones
ECLAC	Economic Commission of Latin America and the Caribbean
EEZ	Exclusive Economic Zones
EIA	Energy Information Agency USA
EMA	Environmental Management Authority of Trinidad and Tobago
ESA	Environmental Sensitive Areas
FAO	Food and Agriculture Organisation of the UN
FAOSTAT	Statistical service FAO
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIS	Geographic Information System
GNI	Gross National Income
GORTT	Government of the Republic of Trinidad and Tobago
HURDAT	The North Atlantic hurricane database
IBC	International Building Code
ICZM	Integrated Coastal Zone Management
INTO	International National Trust Organisations
IPCC	International Panel on Climate Change
KHAW	Keeping History Above Water
KHAW:TT	Keeping History Above Water Trinidad & Tobago
LIDAR	Light Imaging, Detection and Ranging
LPP	Livelihood Protection Policy
MAC	Museum Association of the Caribbean

Abbreviation	Meaning
MPD	Ministry of Planning and Development
MUSD	Million United States Dollars
M$TT	Million Trinidad and Tobago Dollars
NBSAP	National Biodiversity Strategy and Action Plan
NCCP	National Climate Change Policy
NDC	Nationally Determined Contributions
NEP	National Environmental Policy
NGO	Nongovernmental Organisation
NIDCO	National Infrastructure Development Company Limited
NOAA	National Oceanic and Atmospheric Administration
NTTT	National Trust of Trinidad and Tobago
ODPM	Office of Disaster Preparedness and Management
OECD	Organisation for Economic Co-operation and Development
PTSC	Public Transport Service Corporation
RECCC	Review of Economics of Climate Change in the Caribbean
RRMC	Risk Reduction Management Centre
SDG	Sustainable Development Goals
SIDS	Small Islands Developing State
SLR	Sea Level Rise
SODA	Simple Ocean Data Assimilation
SUDS	Sustainable Urban Drainage System
T&T	Trinidad and Tobago
T&TEC	Trinidad and Tobago Electricity Commission

Abbreviation	Meaning
TEMA	Tobago Emergency Management Agency
TRINTOC	Trinidad and Tobago Oil Company
TRINTOPEC	Trinidad and Tobago Petroleum Company
TT$	Trinidad and Tobago Dollar
TTIA	Trinidad and Tobago Institute of Architects
TTBS	Trinidad and Tobago Bureau of Standards
UFHP	University of Florida Historic Preservation Program
UNDP	United Nations Development Programme
UNESCO	United Nations Educations, Scientific, and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
US or USA	United States of America
USD	United States Dollars
UTT	University of Trinidad and Tobago
UWI	University of the West Indies
VCA	Vulnerability Capacity Assessment
WHL	World Heritage List (UNESCO)
WOMANTRA	Woman Centred and Woman Led non profit organisation in T&T
WRA	Water Resources Authority

GLOSSARY

The following are provided for reference to aid in the general comprehension of terms, phrases, entities, and resources used in this publication. They do not necessarily constitute legal definitions that are adopted by the National Trust of Trinidad and Tobago.

A

Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. (IPCC, 2022)

Adaptation Treatments/ Options: The array of strategies and measures that are available and appropriate for addressing adaptation. They include a wide range of actions that can be categorized as structural, institutional, ecological or behavioral.

Adaptive Capacity: The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences. (MA, 2005 as cited in IPCC, 2020)

Adverse Effect: A negative effect that a policy or measure aimed at one objective has to another objective, thereby potentially reducing the net benefit to society or the environment. (IPCC, 2022)

Alternative Use/Adaptive Use or Reuse: The process of adapting old structures and sites for new purposes.

Archaeology: The study of the ancient and recent human past through material remains. It is a subfield of anthropology, the study of all human culture. Archaeology analyzes the physical remains of the past in pursuit of a broad and comprehensive understanding of human culture.

Authenticity: An Indicator of Significance, this concept assists in assessing whether the heritage value of a site is genuine or of undisputed origin. It only applies to cultural properties and to cultural aspects of mixed properties. There are a number of factors which can be used to assess authenticity: form and design, materials and substance, use and function, traditions, techniques, management systems, location and setting, language, intangible aspects, spirit, feeling, and other factors deemed appropriate. See: Indicators of Significance.

B

Behavioral Change: Refers to the alteration of human decisions and actions in ways that mitigate climate change and/or reduce negative consequences of climate change impacts. (IPCC, 2022)

Biodiversity: Biodiversity or biological diversity means the variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (UN, 1992 as cited in IPCC, 2022)

C

Cascading Impacts: Cascading impacts from extreme weather/ climate events occur when an extreme hazard generates a sequence of secondary events in natural and human systems that result in physical, natural, social, or economic disruption, whereby the resulting impact is significantly larger than the initial impact. (IPCC, 2022)

Co-benefit: A positive effect that a policy or measure aimed at one objective has on another objective, thereby increasing the total benefit to society or the environment. (IPCC, 2022)

Coastal Zone: The geological area covering both the maritime and the terrestrial parts of the shore, including off-shore islands, salt-water ponds and wetlands in contact with the sea. The coastal zone of Trinidad and Tobago shall mean all areas of sea extending to the limit of the Exclusive Economic Zone (EEZ) and includes the shoreline and coastal lands, which are inland areas above the high water mark that influence the quality or composition of coastal waters, or are influenced in some way by their proximity to coastal waters.

Zone T1- Immediate and direct impact area: This zone (T1) shall be delineated on the seaward side as the line of low-water at mean low-water spring tides and on the landward side as the five meter contour. The 5 m contour represents the limit of immediate and direct impact of sea level rise and storm surges.

Zone T2- Area of influence: This zone (T2) shall be the area contained between the 5 m contour and the 90 m contour. This area and Zone T1 contains most of the urban, industrial and agricultural areas of the county and influences the marine and coastal areas through direct and indirect impacts.

Zone T3- Immediate and direct impact are (3 nautical miles): This zone (S1) shall be delineated on the landward side from the low-water at mean low-water spring tides and shall extend to a distance of three nautical miles offshore parallel with the mean high water mark, consistent with the outer limit defined for the coastal nearshore in the Water Pollution Rules, 2001.

Zone S2- Territorial Sea: This zone (S2) shall extend outward from the three nautical mile seaward boundary of zone S1 to the outer limits of the territorial sea, not exceeding 12 nautical miles from the archipelagic baselines described in section 6 if the Archipelagic Waters and Exclusive Economic Zone Act, 1986.

Zone S3- Exclusive Economic Zone: The zone (S3) is the Exclusive Economic Zone (EEZ) of Trinidad and Tobago and is the area of sea between the outer limits of the territorial sea and a distance of 200 nautical miles seaward from the baseline from which the territorial sea is measured unless otherwise determined by agreement between Trinidad and Tobago and adjacent States concerned, on the basis of international law.

(taken from: Integrated Coastal Zone Management Policy Framework, April 2019)

Coastal Erosion: sometimes referred to as shoreline retreat, coastal erosion occurs when a net loss of sediment or bedrock from the shoreline results in landward movement of the high-tide mark. (IPCC, 2022)

Community-based adaptation: Local, community driven adaptation. Community-based adaptation focuses attention on empowering and promoting the adaptive capacity of communities. It is an approach that takes context, culture, knowledge, agency and preferences of communities as strengths. (IPCC, 2022)

Cost-Benefit Analysis: Monetary assessment of all negative and positive impacts associated with a given action. Doing so enables comparison of different interventions, investments or strategies and reveals how a given investment or policy effort pays off for a particular person, company, or country. (IPCC, 2022)

Critical Infrastructure: Systems and assets, whether physical or virtual, so vital that the incapacity or destruction of such may have a debilitating impact on the security, economy, public health or safety, environment, or any combination of these matters, across any local, State, Tribal and Federal jurisdiction.

Cultural Heritage: (CHNetwork define) IPCC

Cultural or Historic Resource: Any prehistoric or historic district, site, building, object or other real or personal property of historical, architectural or archaeological value. The properties may include, but are not limited to, monuments, memorials, Indian habitations, ceremonial sites, abandoned settlements, sunken or abandoned ships, engineering works, treasure troves, artifacts or other objects with intrinsic historical or archaeological value, or any part thereof relating to the history, government and culture of the city.

D

Design Flood Elevation (DFE): The elevation of the design flood relative to the datum specified on the community's FIRM. The design flood is associated with the greater of the area subject to the base flood or the area designated as a flood hazard area on a community flood hazard map. Communities may designate a design flood (or DFE) in order to regulate based on a flood of record, to account for future increases in flood levels based on upland development, or to incorporate freeboard.

Design Standards for Entry Corridors: Document(s) used to review, direct and regulate site improvements, rehabilitation, maintenance, new construction and demolition in the architectural review districts of Anastasia Boulevard, San Marco Avenue, and King Street. Their purpose is to protect and preserve the continuum of architectural heritage and in turn enhance the overall visual character of the corridors.

Disturbance, Archaeological: The cumulative digging, excavating, site preparation work or other such construction activities, regardless of the number of individual excavation or construction areas, related to an archaeological site.

Dry Floodproofing: Protecting a building through a combination of measures in order to prevent the entrance of floodwaters. Structural components of the building must have the capacity to resist the resulting flood loads.

E

Ecosystem-based Adaptation: The use of ecosystem management activities to increase the resilience and reduce the vulnerability of people and ecosystems to climate change (Campbell et al., 2009, as cited in IPCC, 2022)

Elevation: In retrofitting, the process of physically raising an existing building so that it is above the height of a given flood.

Emergency Listing: A site or property which may not be on the Inventory and is deemed to be under threat and/or requires urgent fast-tracked listing.

Enclosure: That portion of an elevated building below the lowest elevated floor that is either partially or fully shut in by rigid walls.

Equality: A principle that ascribes equal worth to all human beings, including equal opportunities, rights and obligations, irrespective or origins.

Equity: The principle of being fair and impartial, and a basis for understanding how the impacts and responses to climate change, including costs and benefits, are distributed in and by society in more or less equal ways. Often aligned with ideas of equality, fairness and justice and applied with respect to equity in the responsibility, for and distribution of climate impacts and policies.

F

Flood (also Flooding): A general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land areas. For flood insurance claim purposes, two or more properties must be inundated before flood damage will be covered.

Flood damage-resistant material: Any building product (material, component, or system) capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage.

Floodwall: Flood barrier constructed of manmade materials, such as concrete or masonry, to keep water away from or out of a specified area.

Floodplain Management: The operation of a programme of corrective and preventative measures for mitigating flood damage, including, but not limited to, emergency preparedness plans, flood-control works, and floodplain management regulations.

Freeboard: An added margin of safety, expressed in feet above a specific flood elevation, usually the BFE. In States and communities that require freeboard, buildings are required to be elevated or floodproofed to the higher elevation. For example, if a community adopts a 2-foot freeboard, buildings are required to be elevated or floodproofed to 2 feet above the BFE.

G

Geographic Information System (GIS): Computer system capable of assembling, storing, manipulating, and displaying geographically referenced information (data identified according to its location). Typically, a GIS is used for handling maps of one kind or another. GIS is becoming an important tool in promoting coordinated efforts between emergency management and historic preservation.

H

Hazard Mitigation: Sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards and their effects. Note that this emphasis on long-term risk distinguishes mitigation from actions geared primarily to emergency preparedness and short-term recovery.

Hazard Mitigation Plan or Local Mitigation Strategy: A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the planning area and includes a description of actions to minimize future vulnerability to hazards.

Historic Preservation: An approach to conserving buildings, structures, sites, objects and districts that represent a physical connection with people and events from our past. Historic preservation utilizes various land use planning strategies, governmental programmes, and financial incentive to protect historic resources.

Historic Architectural Review Board: The board which is responsible for determining the historical significance of the property and the appropriateness of the proposed work as submitted by an applicant in the City of St. Augustine.

Historic Character: Refers to all visual aspects and physical features that comprise the appearance of historic properties. Extends to the setting of historic properties to include a building's relationship to the environment and adjacent streets and buildings, landscape plantings, views, and the presence of accessory features.

Historic District (local): The portion of the City of St. Augustine that is designated on the official zoning map of the city as a Historic Preservation District.

Historic District (National Register): A significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development with associated documentation of integrity and significance.

Historic Landmark: A building, object, site or structure of the highest historical, architectural, cultural or archaeological importance as measured by the designating authority.

Historic Value: In Indicator of Significance, this concept refers to significant historic events, people, processes and moments that have had an impact on the county, i.e. it may have led to changes in the political, social, economic, or cultural spheres. It also refers to a special association with the life or works of a person (or group of persons), for its importance or events in cultural history or for its association with people, patterns of domestic life, events, places and themes. See: Indicators of Significance.

Hydrodynamic force: Force exerted by moving water.

Hydrostatic force: Force exerted by water at rest, including lateral pressure on walls and uplift (buoyancy) on floors.

I

Indicators of Significance: refers to the tangible and intangible values and means of a property of interest and can unlock the potential of a site by creating opportunities for communities to access and enjoy, and a space to understand the history, cultures and environments of Trinidad and Tobago. See: Authenticity, Historic Value, Integrity, Provenance, Rarity, Representativeness, and Social and Cultural Value.

Integrity: An Indicator of Significance, this concept consists of two main factors: wholeness and intactness. Wholeness refers to whether the side or object has all the elements necessary to tell the full story of the site in order to convey significance. Intactness refers to the condition of the site or object in relation to the threats to its existence, and any risks in the environment surrounding the site or object. See: Indicators of Significance.

Inventory: The Inventory of Heritage Assets is the official record of historic properties in Trinidad and Tobago that are of value to local communities and the nation and are worthy of notation and preservation. This was compiled by way of public consultations and nominations by NGOs, government agencies as well as the Trust and general public. This catalog is by no means exhaustive and any additions are subject to the approval of the Landmarks Sub-committee.

L

Landmarks Sub-committee: Council-appointed Special Committee responsible for the vetting of dossiers, as well as the identification of properties for inclusion in the Inventory of heritage assets and properties considered for listing. The Sub-committee meets at least once per quarter.

Listed Property: A property of interest that has completed the process of listing and is protected under the National Trust of Trinidad and Tobago Act, 40:53.

Long-Term Recovery: Phase of recovery that may continue for months or years and addresses complete redevelopment and revitalization of the impacted area, rebuilding or relocating damaged or destroyed social, economic, natural and built environments and a move to self-sufficiency, sustainability and resilience.

M

Major Disaster: Any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought) or, regardless of cause, any fire, flood or explosion, in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this act to supplement the efforts and available resources of local, State governments and disaster relief organisations in alleviating the damage, loss, hardship or suffering caused thereby.

Mitigation reconstruction: The construction of an improved, elevated building on the same site where an existing building and/or foundation has been partially or completely demolished or destroyed.

Monitoring, Archaeological: The observation after commencement of a disturbance to determine if archaeological resources exist in an area or, when such resources are known to exist, the observation, recording and incidental recovery of site features and materials to preserve a record of the affected portion of the site. Monitoring is applicable in locations where sites or features may occur but are generally not expected to be of such importance, size or complexity as to require lengthy work or project delays for salvage archaeology.

N

National Trust of Trinidad and Tobago Act Chapter 40:53: Establishment and incorporation of the National Trust of Trinidad and Tobago. This act outlines membership, purpose of the Trust, powers of the Trust, listing of properties, appeal listing process, establishes the Council and Council procedures, grants power to create committees and sub-committees, funding, and more.

P

Preservation: The act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.

R

Rarity: An Indicator of Significance, this concept can be applied to a property that has rare or surviving evidence of an event, phase, period, process, movement, or way of life that was considered distinctive, uncommon or unusual at the time it occurred. This criterion looks at whether a property has distinctiveness in demonstrating an usual historic, architectural, scientific, social, or technical attribute that is uncommon in its occurrence in the entire country, not just in the local area.

Reconstruction: The act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.

Rehabilitation: The act or process of returning a property to a state of utility through repair or alteration which makes possible an efficient contemporary use while preserving those portions or features of the property which are significant to its historical, architectural, cultural and archaeological values.

Relocation: The act of moving a building from its original location to another site, either on the same property or to another location entirely.

Resilience: Ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies.

Resource type: Building (created principally to shelter any human activity), site (location of a significant event, occupation or activity, or location of a building/structure where the location itself possesses historic value), structure (functional construction created for purpose other than sheltering human activity), object (construction that is artistic, small in scale, and/or of simple construction), or district (properties with a number of resources that are relatively equal in importance or property with a variety of types of resources).

Restoration: The act or process of accurately recovering the form and details of a property and its setting as it appeared at a particular period of time by means of removal of later work or by the replacement of missing earlier work.

Retrofitting: Making changes to an existing home or other building to protect it from flooding or other hazards.

Riprap: Pieces of rock or crushed stone added to the surface of a fill slope, such as the side of a levee, to prevent erosion.

S

Social Resilience: Social Resilience is the ability of a community to cope with and adapt to stresses such as social, political, environmental, or economic change.

Special Flood Hazard Areas: Represents the area subject to inundation by 1-percent-annual chance flood. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Federal floodplain management regulations and mandatory flood insurance purchase requirements apply in these zones.

Storm surge: Water pushed toward the shore by the force of the winds swirling around a storm. It is the greatest cause of loss of life due to hurricanes.

Substantial Damage: Damage to a building, regardless of the cause, is considered Substantial damage if the cost of restoring the building to its before-damage condition would equal or exceed 50 percent of the market value of the building before the damage occurred.

Substantial Improvement: Under the NFIP, an improvement of a building (such as reconstruction, rehabilitation, or an addition) is considered a Substantial Improvement if its cost equals or exceeds 50 percent of the market value of the building before the start of construction of the improvement.

Survey: A process of identifying and gathering data on a community's historic resources. It includes field survey- the physical search for and recording of historic resources on the ground-but it also includes planning and background research before field survey begins, organisation and presentation of survey data as the survey proceeds, and the development of inventories.

T

Testing, Archaeological: The limited subsurface excavation or remote sensing of a proposed disturbance (or a portion thereof) to determine the potential, type or extent of the archaeological site. Testing may include augering and establishing archaeological excavation units and will include the screening of excavated material for artifact recovery.

W

Wet floodproofing: The use of flood-damage-resistant materials and construction techniques to minimize flood damage to areas below the flood protection level of a building, which is intentionally allowed to flood. Usually, only enclosed areas used for parking, building access, or storage are wet floodproofed.

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APPENDIX : *KEEPING HISTORY ABOVE WATER* CONFERENCE LINKS

CONFERENCE WEBPAGE

PRESENTATION RECORDINGS

Conference Opening & Evening Plenary (1:26:10)
Opening Remarks & Welcome (32:50)

Leadership in Resilience (1:10:30)
Protecting Cultural Institutions (1:42:35)
Stories of Resilience (44:05)
Protecting Our National Heritage (1:43:26)
Protecting Our Cultural Heritage (1:36:11)
Protecting Our Built Environment (1:27:58)
From Here to There (58:02)
Overview of Day 3 (30:50)

Resilient Trinidad and Tobago (9:00)