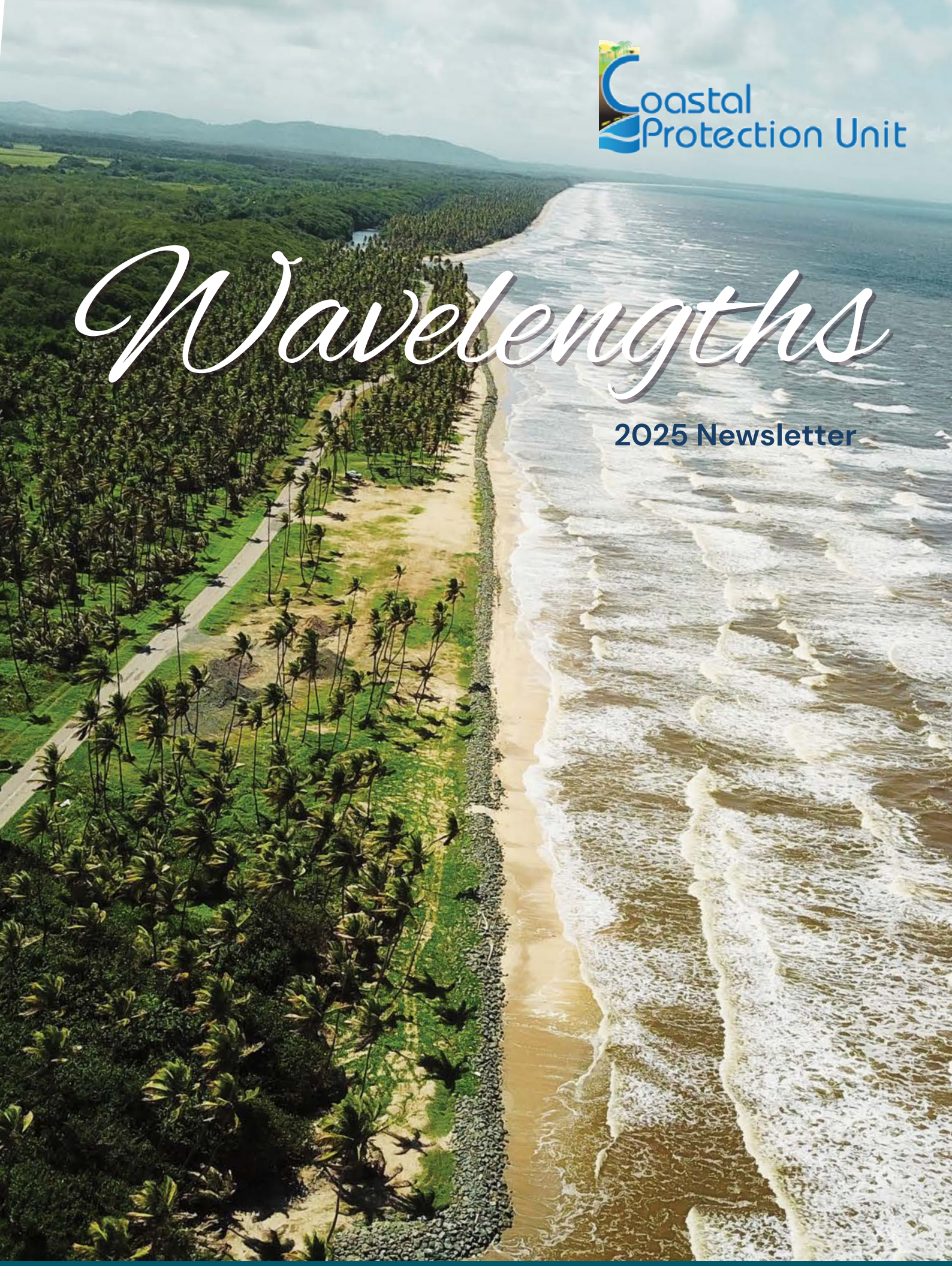


Coastal Protection Unit

Wavelengths

2025 Newsletter

Connecting People | Connecting Communities | Connecting a Nation

DIRECTOR'S ADDRESS

Mr. Kerry Sheppard
Director

As we reflect on the work completed and the initiatives currently underway, I am reminded that the strength of this Unit lies not only in the projects we deliver, but in the people who carry them forward. Over the past period, the Coastal Protection Unit has continued to advance its mandate through careful planning, technical excellence, and a shared commitment to protecting our coastlines for present and future generations. Each milestone reached is a testament to the dedication, adaptability, and quiet perseverance of our team.

Looking ahead, our focus remains on strengthening collaboration, refining our processes, and ensuring that our work continues to respond meaningfully to the challenges of climate change and coastal vulnerability. As we move into the next phase of our journey, I encourage each member of the Unit to remain engaged, curious, and proud of the role you play in safeguarding our nation's coastal environment. Together, we will continue to build solutions that are thoughtful, resilient, and impactful.

EDITOR'S NOTE

This edition not only celebrates our collective progress but honours the hands and minds behind it. You'll find updates from the field, project milestones, collaborated efforts, community outreach highlights, and reflections from each section within the Unit.

It is a reminder that coastal protection is never a single action — it's a continuous rhythm of learning, adjusting, and moving forward with purpose.

As we welcome a new year, may we carry the same resilience as our coastlines: shaped by changing conditions, yet standing strong through every wave. Thank you for being part of the journey.

Ms. Maritsa Harry
Senior Research Specialist

"Protecting our coastline isn't just about infrastructure—it's about awareness, collaboration, and long-term care. This edition reflects the work being done today for tomorrow's shores." - Maritsa Harry

VOICES OF THE COAST

A SPOTLIGHT CONVERSATION: UNIVERSITY OF THE WEST INDIES

Dr. Deborah Lamb
University of the West Indies

Protecting the coastlines of our Caribbean must rely on solutions that focus on better integrating our natural environmental into designs, while still ensuring that people remain the central focus. When faced with a changing climate, achieving coastal resilience in these multifaceted and dynamic areas appears to be intractable, and coastal planners and engineers default to what is familiar. However, hazard mitigation measures that augment the destruction of our environmental resources cannot be the solution to assure that the needs of our present and future generations are adequately met. While hard engineering can offer the levels of protection on our coasts with greater certainty, they should not be the only options considered to satisfy technical, social, economic and environmental objectives. Coastal engineers in the Caribbean must rise to the challenge and embrace innovative methods even when faced with limited resources and datasets.

It is from this perspective that the University of the West Indies' (UWI) project team on the Future Earth funded NBS-ENGROSSED project decided to work with regional entities to begin to fill some of these knowledge gaps in our understanding of the design and implementation of nature-based solutions. The project team has actively collected physical, numerical and field data to develop a data-driven design framework for nature-based solutions.

We collected data on how the hydrodynamic forces are altered by the presence of ecosystems such as coral reefs and seagrass beds, and the resulting changes to the coastal morphology. These datasets create the opportunity to better quantify the level of protection provided by coastal ecosystems, and in so doing, improve the design of coastal solutions through an augmented emphasis on long-term impacts. The concept of a nature-based design is not new but for us in the Caribbean region, this is a critical step towards sustainably managing our coasts.

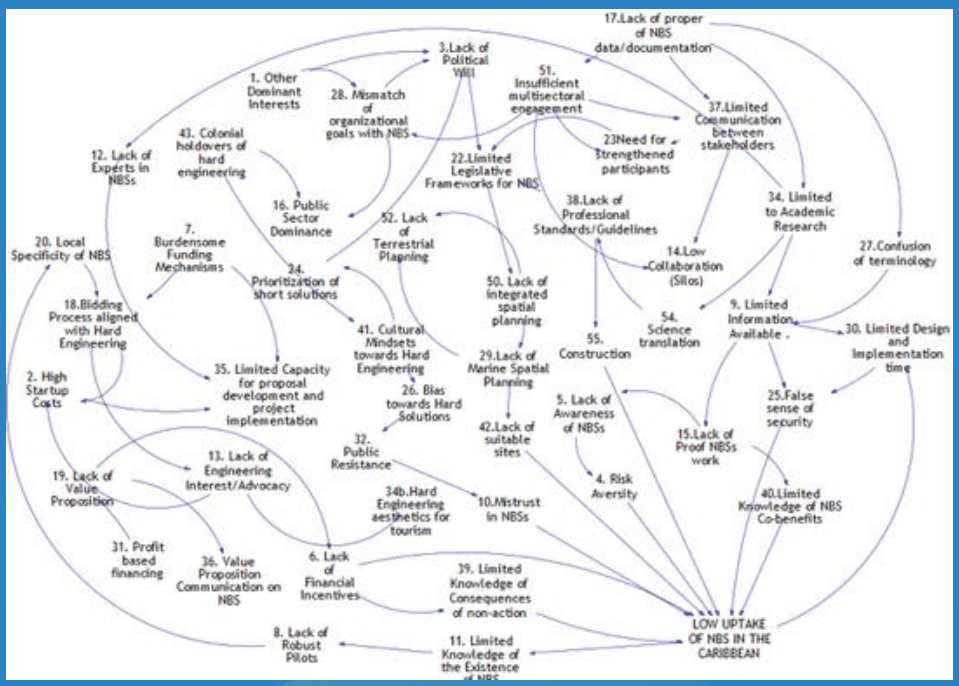
VOICES OF THE COAST

A SPOTLIGHT CONVERSATION: UNIVERSITY OF THE WEST INDIES

One of the pillars of sustainability is the social factors that can determine project success, and necessitates engineers work across disciplines, sectors, societal groups and institutional levels; and engage stakeholders at all stages of the design process- from conceptualization to operation. This also was a central theme of the NBS-ENGROSSED project which sought to understand the complexity of the problem we face.

The intricacy of optimizing a nature-based solution is clearly demonstrated from the systems mapping exercise completed during the project; the causal loop diagram being an attempt to illustrate the difficulty in finding a straightforward path to fully adopting nature-based designs.

However, together, we have taken a step forward, and our progress as a region will be determined by continually advancing our understanding and knowledge- no matter how small the step - we will eventually reach our goal as long as we continue to work together. We are profoundly grateful to all our partners, like the Coastal Protection Unit in Trinidad and Tobago, who have given invaluable support to this cooperative effort.



NATURE BASED SOLUTION

Written by Renelle Bernard

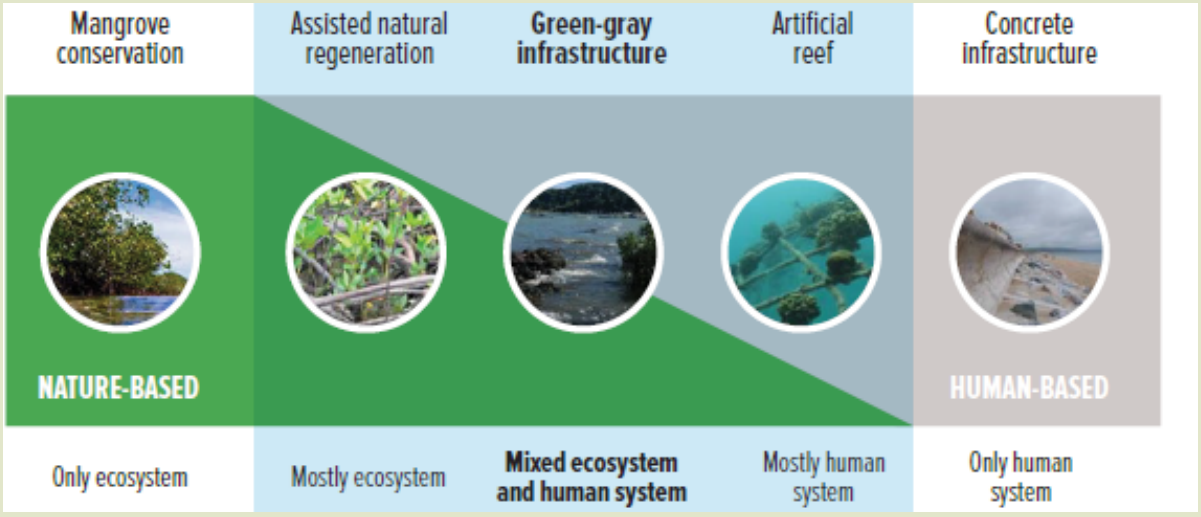
Nature has been solving problems for thousands of years. Now, instead of always relying on built infrastructure, nature based solutions are all about using nature and what it can already do to help tackle some of our coastlines biggest challenges like climate change, flooding, inundation and even pollution.

Ecosystems such as mangroves, vegetation, seagrasses and coral reefs have natural processes that can be leveraged to help protect our coastlines to reduce risks of rising sea levels and strong wave action. Nature based solutions are also multi-functional and provided sustainable cost effective solutions. They can do this because:

- NbS like mangroves can reduce wave heights by up to 66%, providing natural protection against storm surges and coastal erosion
- Mangroves act as carbon sinks, improve water quality and provide habitats for diverse species.
- Trees can transpire gallons of water per day, cooling its surrounding environment from rising temperatures.
- NbS often create critical habitats for endangered species of marine life.
- Seagrasses beds can increase fish catches by up to 50%, benefitting local communities reliant on fishing
- Coral reefs not only provide a place for fish to live but they also protect coastal communities by breaking up strong waves before they hit the shore.

NATURE BASED SOLUTION

When it comes to protecting our shorelines, a number of measures can be considered depending on the severity of the issue, the location for implementation, the receiving natural environment and the existing and proposed land use. To address the need to protect critical infrastructure, the Coastal Protection Unit sought the use of hard engineering solutions to offer immediate relief for ongoing/severe concerns. As we prepare for future works and align our goals to the Government's environmental plans and international obligations, we look toward a future which incorporates solutions which works with, enhance the natural environment and tackles the main issues of climate change and resilience. We are going green-gray!



Green-gray infrastructure is where natural ecosystems - such as mangroves, salt marshes, seagrasses and coral reefs - are combined with gray infrastructure such as breakwaters, to combine the values of wave attenuation and flood control of natural ecosystems with the benefit of engineered structures (Conservation International). They draw upon the best of engineering achievements to create hybrid solutions along the green-to-gray spectrum.

The goal of green-gray projects are to provide:

-Flood management
-Erosion control
-Water security
-Coastal Protection
-Food security
-Clean Water

They provide a cost effective and longer lasting alternative compared to a purely gray infrastructure solution increasing the value provided by including social, environmental and economic benefits (Conservation International).

NATURE BASED SOLUTION

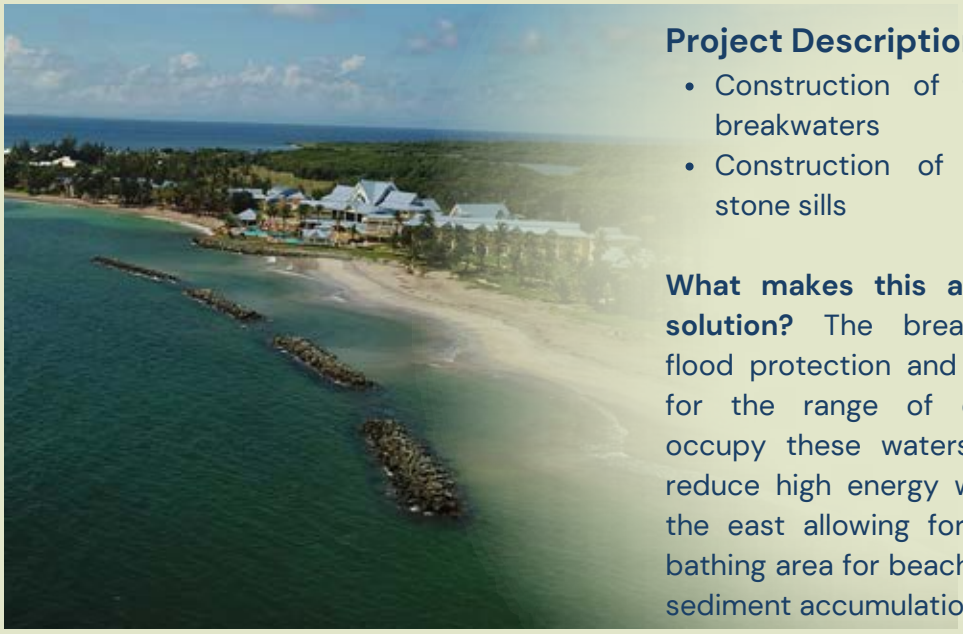
ROCK REVETMENT, GABION BASKET AND COASTAL VEGETATION - QUINAM BEACH FACILITY

Project Description:

- Construction of a 200m rubble mound revetment
- Construction of a 48m sea wall and boardwalk
- Cliff stabilization works
- Landscaping, drainage and ancillary works

What makes this a good green-gray solution? The rock revetment and gabion baskets provide stabilisation at the base of the hill preventing erosion. The vetiver, silver mangrove and coastal shrubbery assist the stabiisation slope.

OFFSHORE BREAKWATERS LITTLE ROCKLY BAY, TOBAGO



Project Description:

- Construction of four (4) emergent breakwaters
- Construction of three (3) armour stone sills

What makes this a good green-gray solution? The breakwaters combines flood protection and habitat restoration for the range of ecosystems which occupy these waters. The breakwaters reduce high energy waves coming from the east allowing for a more sheltered bathing area for beachgoers and facilitate sediment accumulation.

NATURE BASED SOLUTION

ROCK BUND - CALMAPASS, GUAYAGUAYARE

Project Description:

- Construction of 300m of rock bund

What makes this a good green-gray solution: The rock bunds slows the rate of beach and cliff erosion and expand the sediment retention allowing coastal vegetation to be restored in the area. This protects and stabilises the base of the cliff.

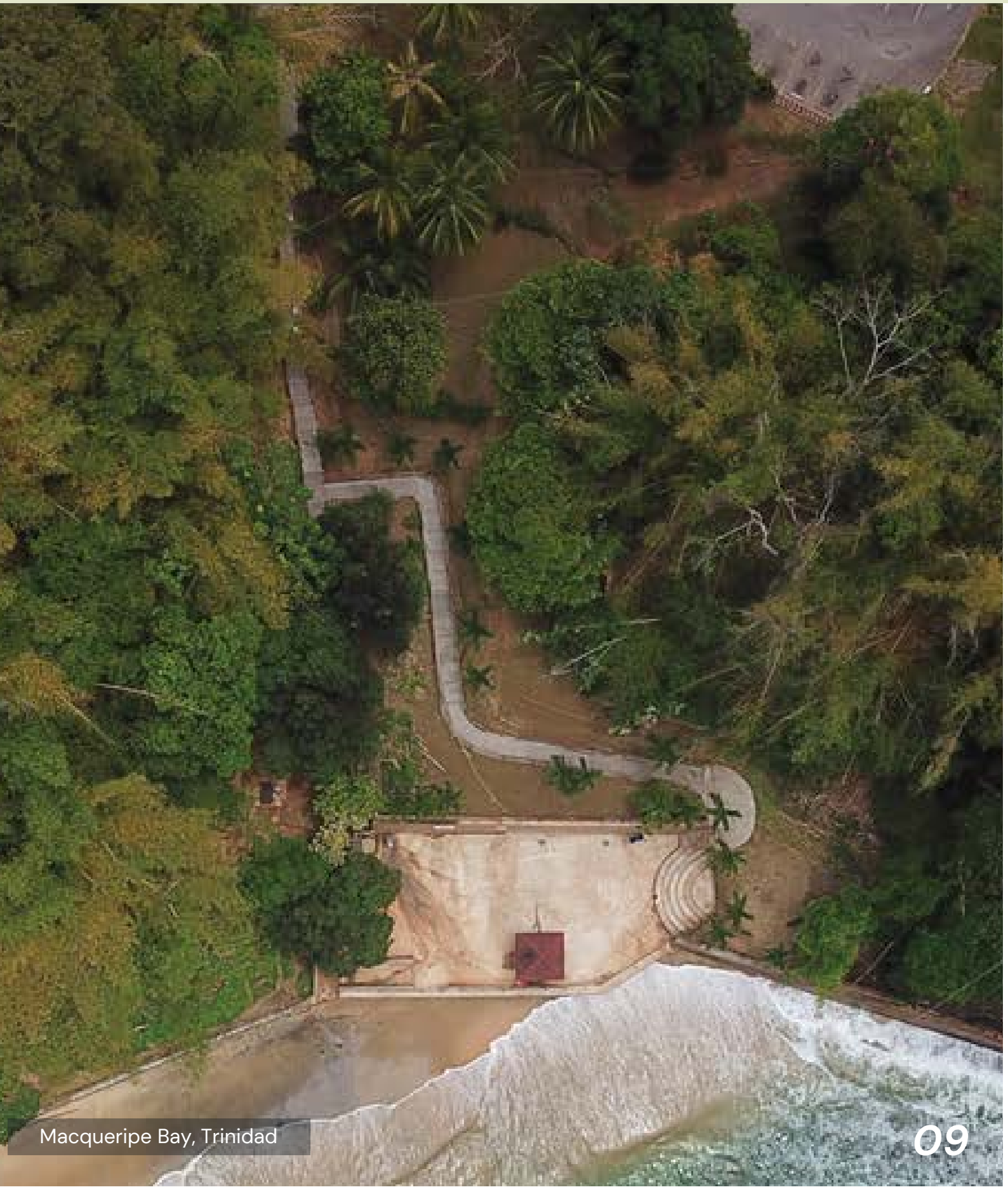
BURIED ROCK REVETMENT AND COASTAL VEGETATION COVER SOUTH MANZANILLA

Project Description:

- Construction of 400m of Buried Revetment with sand nourishment and coastal vegetation
- Construction and installation of perimeter fences
- Construction of approximately 140m of rubble masonry seawall with toe protection

What makes this a good green-gray solution? This project is a first for the Unit since it incorporates covering the revetment with imported sand to blend into the natural aesthetic of the Manzanilla Shoreline. It is a hybrid approach to address sea-level rise and coastal erosion. The engineered core, provides protection from high energy storm events and, when planted with native beach grass, also enhances habitat.

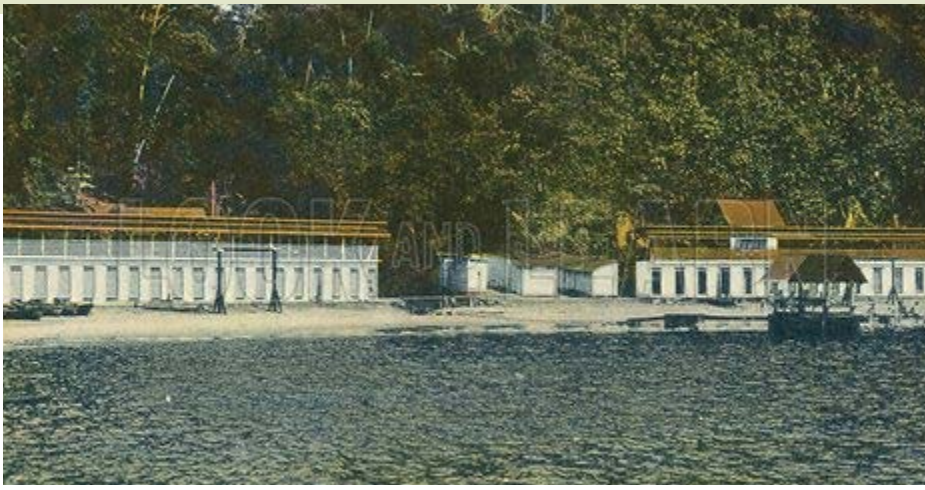
MACQUERIPE STORY



Macqueripe Bay, Trinidad

MACQUERIPE STORY

A Historical and Modern Transformation..



Written by Nirvana Dass

Macqueripe Bay, nestled in the heart of Chaguaramas, Trinidad, stands as a testament to the island's rich cultural and natural heritage. Over the centuries, this picturesque bay has transformed from an indigenous and colonial settlement area to a thriving modern location that plays an integral role in Trinidad's tourism, military history, and maritime activities. From its early settlers to contemporary developments, the story of Macqueripe Bay is one of adaptation, innovation, and resilience

The Arawaks and Caribs were the bay's early settlers, using its rich resources for fishing, trade, and survival. Its strategic location provided easy access to the Caribbean Sea and nearby coastal villages, making it a key hub for transportation and communication.

By the late 15th and early 16th centuries, Macqueripe Bay was an essential part of indigenous trade routes. By the 18th century, under British control, the bay became a key naval site, with the British Navy developing its harbors for military use, particularly around the Chaguaramas Peninsula.

1941-1972: During WW II, the US leased the Chaguaramas Peninsula, including Macqueripe Bay, transforming it into a restricted military zone. The bay's natural depth made it ideal for use as a submarine base. The existing beach club was repurposed to serve U.S. military personnel and their families.

1970's: After the U.S. military's departure, Macqueripe Bay was returned to Trinidad and Tobago's jurisdiction. The area transitioned back to public use, with the beach becoming a favored destination for locals and tourists alike.

Early 20th Century: In 1914, Sir William Ingram sold the Macqueripe Estate to Sir George F. Huggins, a prominent businessman. Huggins developed the area, establishing the Macqueripe Beach Club, which included a hotel and several cottages, making it a popular recreational spot.

MACQUERIPE STORY

The beauty of the west coast

The Chaguaramas Development Authority (CDA), established in 1975, has spearheaded this transformation. Under their leadership, the area has been redeveloped to foster eco-tourism, waterfront activities, and greater community engagement. Many of the old military and industrial buildings have been repurposed for businesses, restaurants, hotels, and recreational spaces. The bay itself is now a focal point for water-based activities such as yachting, boating, and marine tourism. The location is also home to the popular Chaguaramas Boardwalk and the nearby Boardwalk Marina, which draws locals and tourists alike for walks, leisure, and entertainment.

Additionally, Macqueripe Bay has seen improvements in its infrastructure with new facilities aimed at supporting tourism and business. The Chaguaramas area has become a popular destination for both international and local visitors seeking to enjoy the bay's natural beauty, as well as its mix of modern amenities. The redefined Macqueripe Bay now attracts yacht enthusiasts, scuba divers, and eco-tourists, all of whom appreciate the area's tranquil waters, lush landscapes, and variety of activities. The Macqueripe Steps are home to playful monkeys that can often be seen swinging through the trees or curiously watching hikers and beach goers.

MACQUERIPE STORY

Preserving a Coastal Treasure

Environmental Significance: As part of the broader efforts to protect the environment and preserve local heritage, the new developments at Macqueripe Bay are also focused on sustainability. With the bay being home to marine ecosystems and significant wildlife, eco-friendly initiatives are at the heart of its redevelopment. Conservation efforts have included preserving the mangroves and coral reefs that thrive around the bay, ensuring the health of the ecosystem for future generations.

Conserving Macqueripe Bay: Protecting Nature's Beauty

Macqueripe Bay has seen various coastal conservation efforts aimed at preserving its natural charm and biodiversity. Reforestation projects help prevent erosion, while regular beach cleanups reduce pollution. Marine conservation measures, including fishing restrictions, protect local species, and sustainable infrastructure limits human impact. Additionally, environmental awareness programs promote responsible tourism. These initiatives ensure that Macqueripe Bay remains a pristine and thriving coastal haven for generations to come.

MACQUERIPE STORY

COASTAL TECHNOLOGIES

Written by Ayoola Nicholls

Tracking the Shoreline

How DSAS Helps Shape Coastal Protection

Coastlines are dynamic systems. Waves, tides, storms, and rising seas constantly reshape the shoreline, sometimes gradually, sometimes dramatically. For communities and infrastructure near the coast, these shifts can pose serious risks.
To better understand and manage these changes, the Coastal Protection Unit (CoPU) uses a powerful coastal monitoring tool: the Digital Shoreline Analysis System (DSAS).

Why this Matters?

Shorelines in some locations can retreat by more than 1 metre per year.
Without long-term monitoring, these changes can go unnoticed until damage occurs.

What is DSAS?

Developed by the U.S. Geological Survey, DSAS is a software extension for ArcGIS that measures how shorelines move over time.

By analysing historical maps, aerial photography, drone imagery, and survey data, DSAS calculates not just how far the shoreline has shifted — but how fast it is changing.

Instead of a simple "before and after" comparison, DSAS produces measurable erosion and accretion rates, typically expressed in metres per year.

"DSAS transforms shoreline history into engineering foresight."

COASTAL TECHNOLOGIES

How does it work?

1
Gather Shoreline Data

Historical maps, aerial photographs, satellite imagery, drone surveys, and field data are compiled and digitised.

2
Establish a Baseline

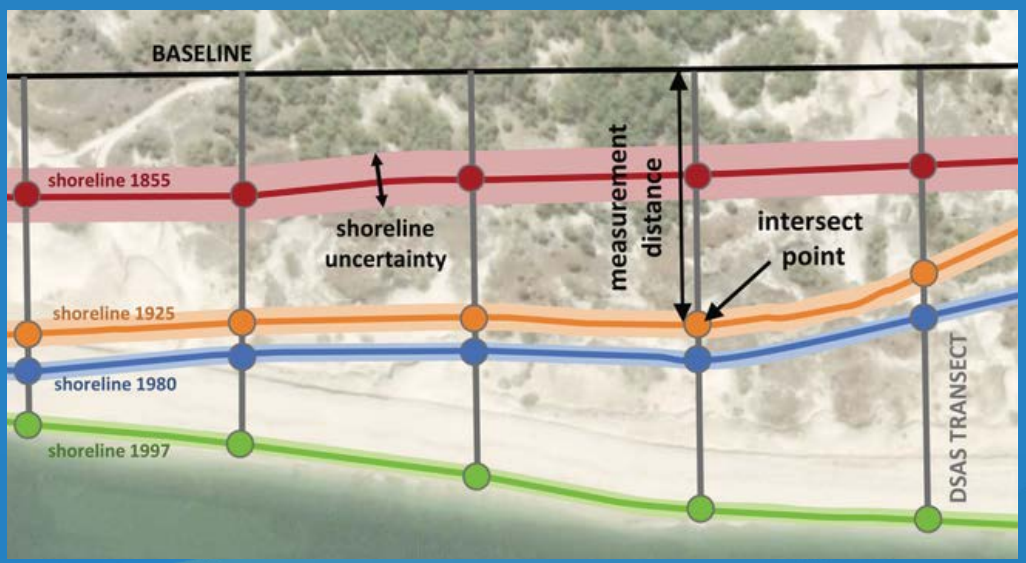
A reference line is drawn along the coast from which all shoreline change measurements are made.

3
Generate Transects

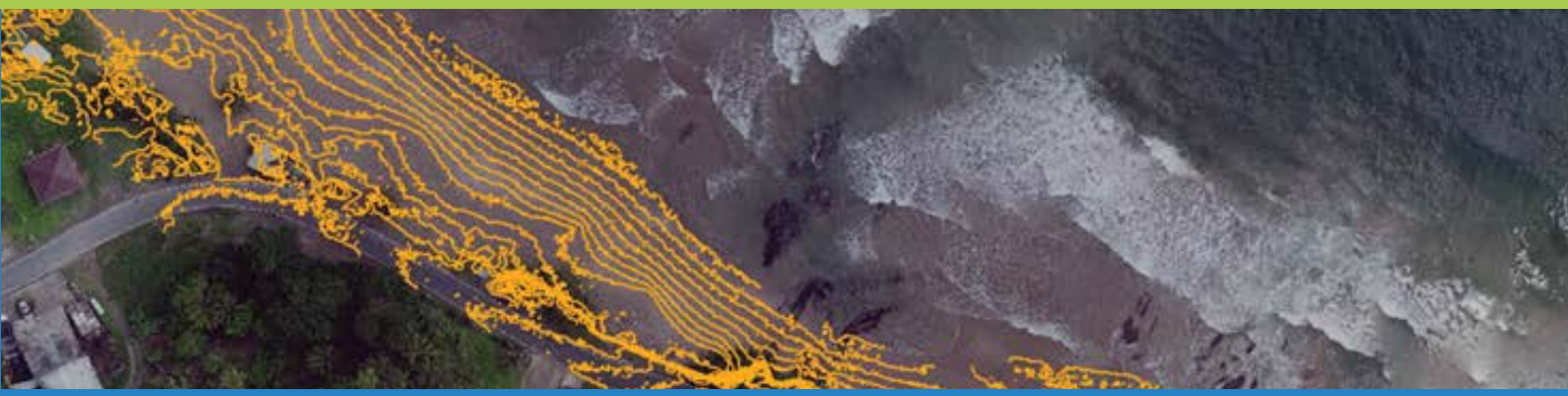
The software creates evenly spaced lines perpendicular to the shoreline to ensure consistent measurement points.

4
Calc. Rates of Change

DSAS computes shoreline movement and produces statistical change rates such as erosion and accretion in metres per year.



COASTAL TECHNOLOGIES



FROM DATA TO DECISIONS

Why it matters for Coastal Protection

Evidence-Based Design
Projects are informed by long-term shoreline behaviour, not short-term observations.

Prioritisation of High-Risk Areas
Erosion hotspots can be identified early, allowing targeted intervention.

Post-Project Evaluation
New shoreline surveys can be compared to historical trends to assess project performance.

Sustainable Coastal Management
Data-driven decisions strengthen resilience planning in the face of climate change.

Real-World Application

In areas where shoreline retreat has been suspected, DSAS analysis has confirmed measurable erosion exceeding one metre per year in some sections.

These quantified rates directly inform:
- Shoreline stabilization design
- Selection of hard or nature-based solutions
- Long-term management strategies
- Funding justification and project planning

COPU HIGHLIGHTS

Staff Christmas Lunch

The holiday season is a time for joy, appreciation, and camaraderie, and the Coastal team embraced this spirit at our annual Christmas Luncheon in December 2025. The event was a wonderful opportunity for staff to unwind, connect, and celebrate another successful year together.

Amidst the warm ambiance and delicious meals, laughter and good cheer filled the air as colleagues shared stories, reflected on the year's accomplishments, and strengthened bonds outside the workplace. The afternoon was a perfect blend of relaxation and team spirit, reinforcing the strong sense of community that defines our organization.

As we step into the new year, we carry forward the camaraderie and positive energy from this special gathering, looking ahead to new opportunities and continued success. Here's to another great year with the Coastal family!

COPU HIGHLIGHTS

National School Tour

So far we have gained a total of 400+ Official Coastal Warriors!

Manzanilla Government Primary School

COPU HIGHLIGHTS

National School Tour

The School Tour commenced on 14th January, 2025 and was designed to engage primary and secondary school students through informative and interactive presentations. To date, a total of 37 schools have been visited.

The initiative focuses on raising awareness, fostering knowledge-sharing, and strengthening connections between the organisation and the school community. Through direct engagement, the tour provides students with valuable insights into our work, while encouraging dialogue, participation, and informed decision-making.

Overall, the tour represents a structured outreach effort aimed at expanding impact and deepening educational engagement across participating institutions.

Breakdown:

Start Date - 14th January, 2025
No. of schools - 37 schools

COPU HIGHLIGHTS

International Men's Day

What does International Men's Day mean to you, and why do you think it's important to celebrate it in the workplace?

"International Men's Day is a chance to celebrate the positive contributions men make to their families, workplaces, and communities. It also offers an opportunity to reflect on the challenges men face, such as mental health stigma, and encourages open conversations. In the workplace, recognizing this day fosters inclusivity and highlights the value of diversity, helping everyone feel seen and appreciated." - Austin Noel

What is one piece of advice or life lesson you would share with younger men starting their careers?

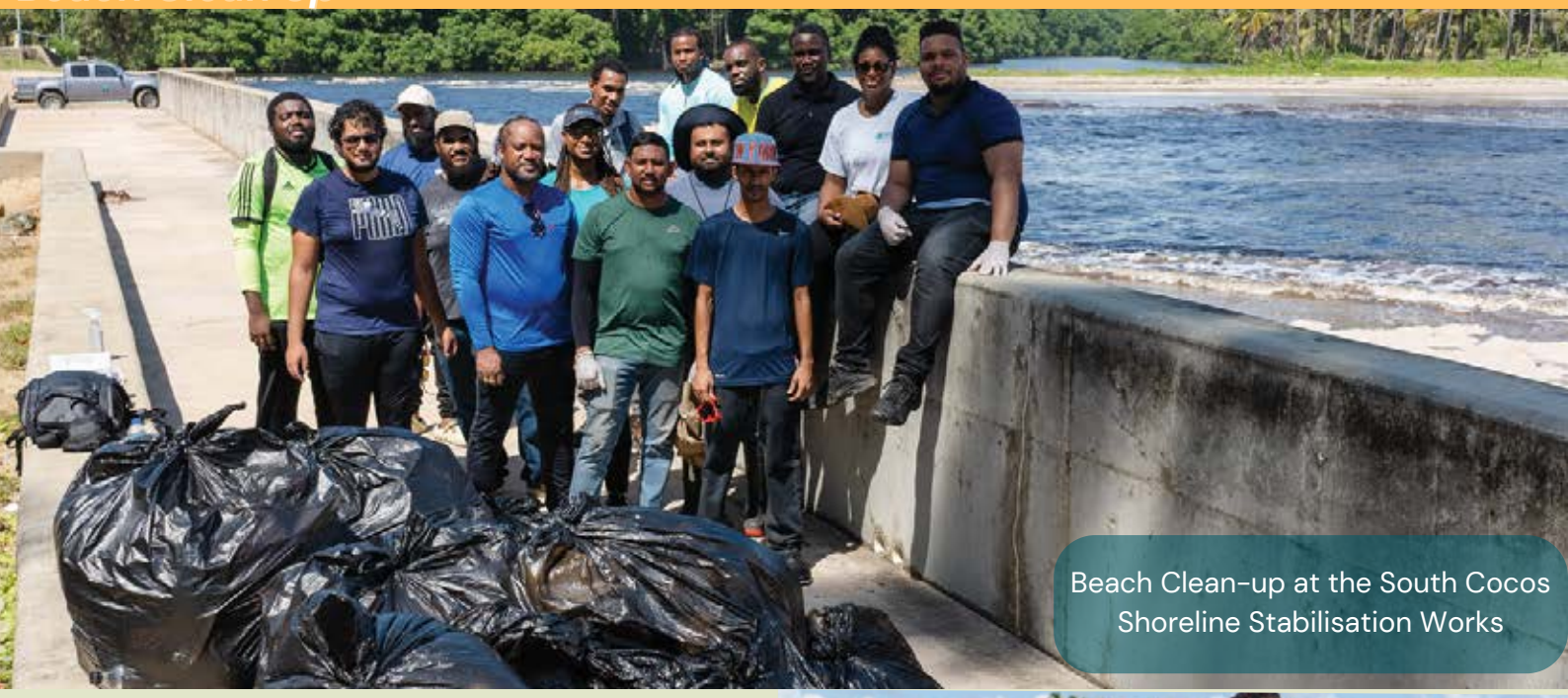
"Don't be afraid to pursue what you love, but pursue it wholeheartedly, intentionally and with a solid plan in mind." - Roger Wason

What challenges do you think men face today that are often overlooked, and how can we as a society or workplace address them?

"I believe it is getting harder for men to find meaningful career guidance and opportunities that will provide them with the direction and means to meet the societal expectations placed on them. Workplaces and society may contribute to addressing this challenge by maintaining a positive environment with a focus of personal and professional growth through the availability of training, guidance and mentorship opportunities." - Julio Brian

COPU HIGHLIGHTS

Beach Clean Up



Beach Clean-up at the South Cocos Shoreline Stabilisation Works

As stewards of our environment, the Coastal team remains committed to not only developing but also maintaining and preserving the areas where we work. One of our flagship projects: the South Cocos Shoreline Stabilization Works, was the area of focus of a meaningful coastal cleanup effort, reinforcing our dedication to sustainability and environmental responsibility.

In collaboration with the Environmental Health and Safety Unit and the Institute of Marine Affairs, our team took to the shoreline, collecting approximately 50kg of garbage—a significant portion of which consisted of plastic waste. To our surprise, we even discovered a $100 bill among the debris, a small but unexpected find that added a lighthearted moment to the day's efforts.

This cleanup was more than just an environmental initiative—it was a testament to our pride in the projects we undertake.

By ensuring that our work sites remain clean and well-maintained, we uphold our commitment to sustainable development and responsible coastal management.

Moving forward, we remain dedicated to preserving our coastal environments, fostering partnerships, and taking proactive steps to keep our project areas pristine. Every effort counts, and together, we are making a difference!

THE WAY FORWARD

As we continue our efforts to bolster resilience to climate hazards, we are prioritizing initiatives that safeguard our coastlines and communities. Here's what lies ahead:

- Drafting Coastal Setback Distance Guidelines

To provide guidance for future developments along the coastline, we are drafting Coastal Setback Distance Guidelines. These guidelines aim to reduce the exposure of critical infrastructure, properties, and ecosystems to coastal erosion and flooding, ensuring sustainable development practices.

- Advancing Shoreline Management Plans

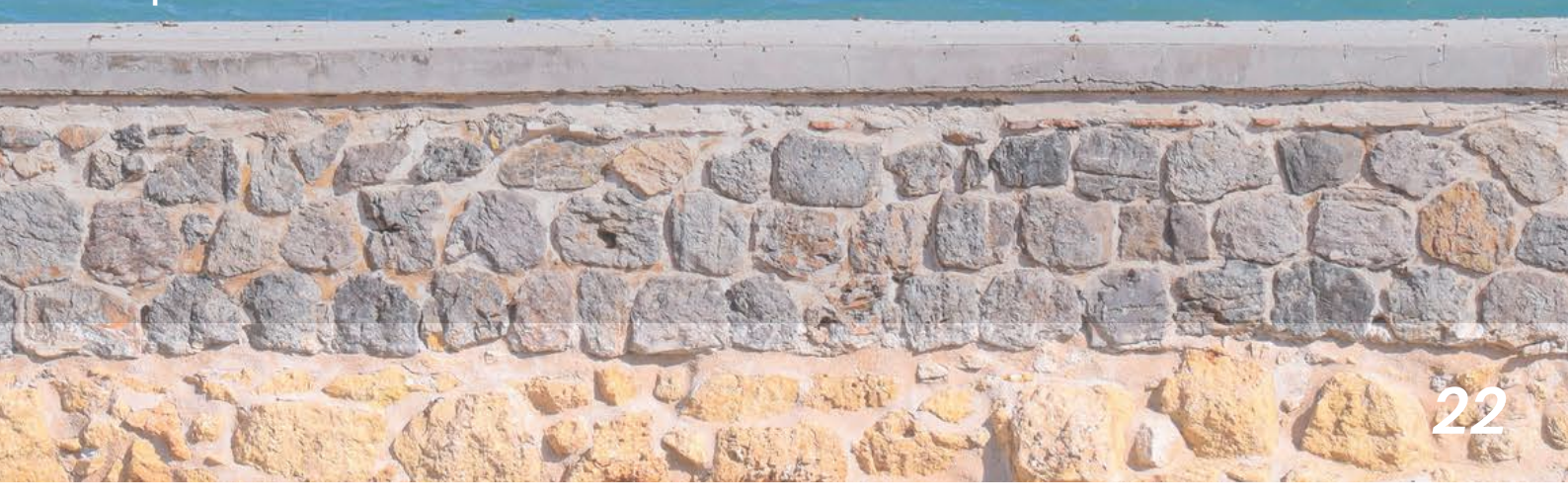
In alignment with the National Spatial Development Strategy (NSDS) and the National Adaptation Plan (NAP), we are developing Shoreline Management Plans. These plans will offer comprehensive strategies for protecting and managing specific stretches of the coastline, enhancing coastal resilience and adaptive capacity.

- Implementing The E-Coast Initiative Programme

Keeping in line with our drive to implement more "green to gray" solutions, we are launching a Green Engineering Programme in collaboration with the Civil Engineering Department at the University of the West Indies (UWI). This initiative will focus on addressing erosion challenges in Watchspot and other vulnerable areas, using environmentally friendly engineering techniques to create sustainable, nature-based solutions.

By pursuing these initiatives, we reaffirm our commitment to creating a more resilient and sustainable coastal environment for future generations.

This version provides a more structured and comprehensive outline while tying everything back to the overarching goals of coastal resilience and sustainable development.



ACTIVITY CORNER

Guess the Beaches found in Trinidad

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Riddle me this

I'm built from nature, yet
my strength is unseen,
I protect the shore without
a wall in between.
I grow in clusters, my roots
dig deep,
And though I'm alive, my
work's yours to keep.
What am I?

Created by Sapphire Rahim

MATCH GAME

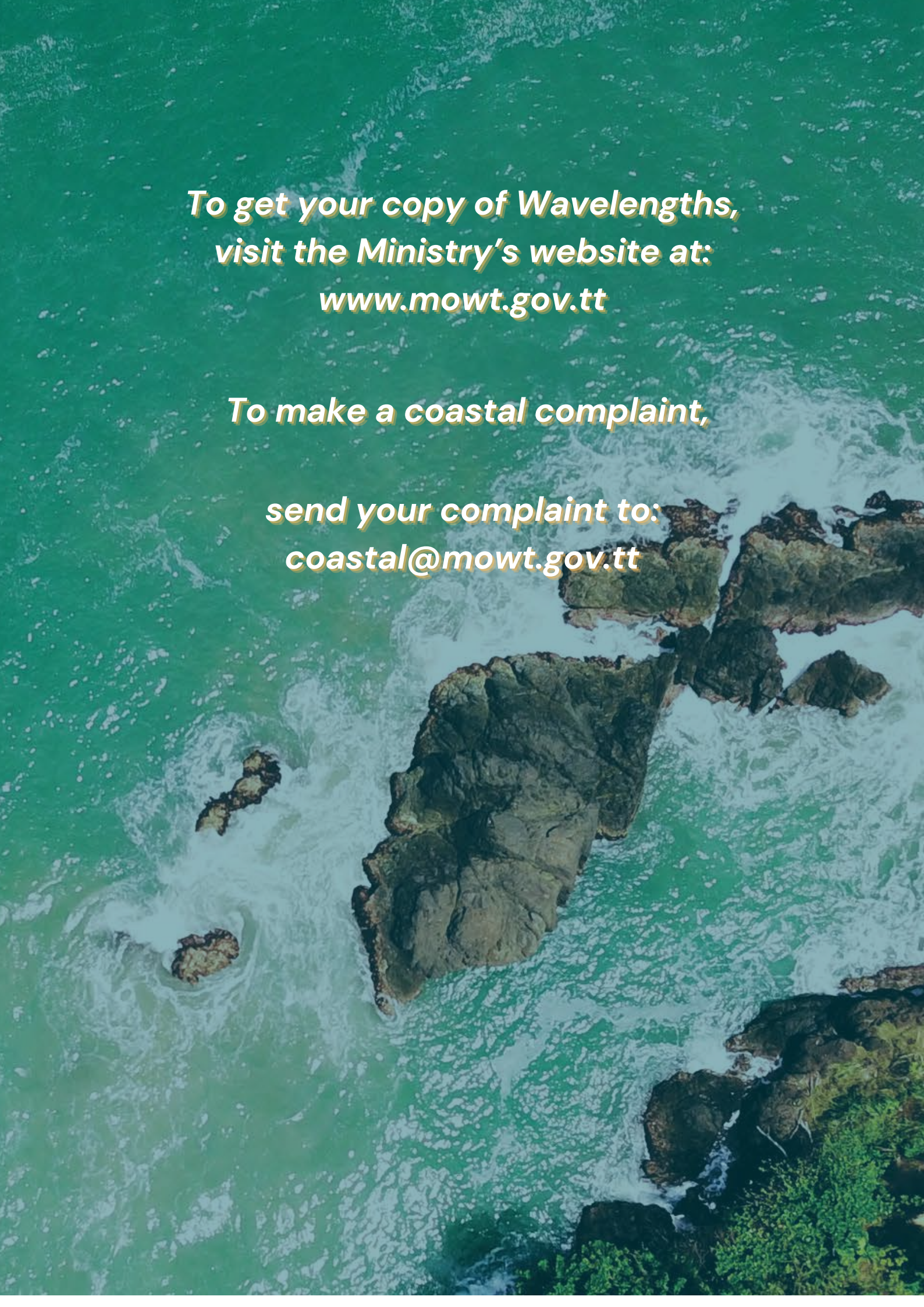
Draw a line to match each coastal protection strategy to its primary function

Seawall	A. Dissipates wave energy before it reaches the beach
Revetment	B. Stabilises sand using root system
Offshore Breakwater	C. Reflects wave energy at the shoreline
Mangrove Restoration	D. Traps sediments and reduces wave energy
Dune Vegetation	F. Protects shoreline using rocks
Coral Restoration	G. Provides habitat while reducing wave force

Answers:
maracas
macqueripe
manzanilla
morugа
clifton hill
salybia

Answers:
Seawall C
Revetment F
O/Breakwater A
Mangrover Rest. D
Dune Veg. B
Coral Rest. F

Answers:
Mangroves



To get your copy of Wavelengths, visit the Ministry's website at: www.mowt.gov.tt

To make a coastal complaint,

send your complaint to: coastal@mowt.gov.tt