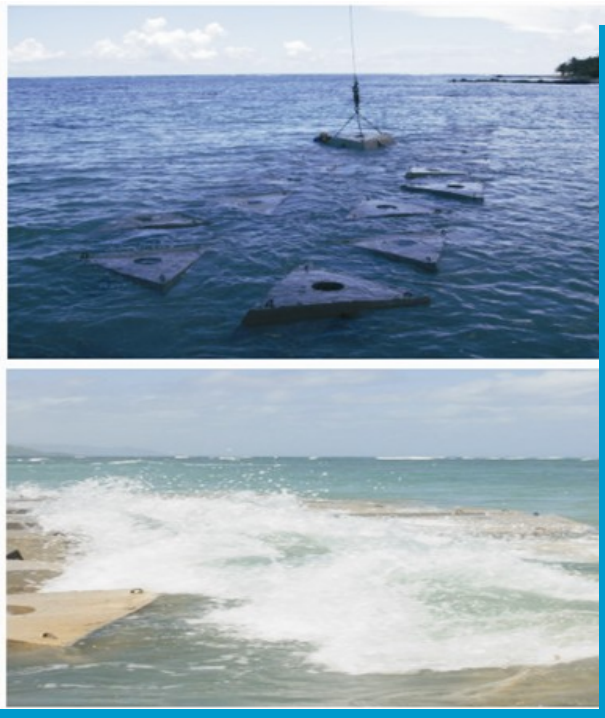
TEMN
TECHNOLOGICAL AND ENVIRONMENTAL MANAGEMENT NETWORK LIMITED

Local Representatives for Artificial Reefs and Coastal Restoration Inc.

NEGRIL – BUILD BACK THE BEACH

"Ensuring Sustainability of the Negril Hospitality Industry"



TOTAL BEACH & SHORELINE MANAGEMENT SYSTEM

Undermining the Jamaica

Negril has a reputation to uphold, in terms of what is marketed internationally. A huge part of this expectation is linked to the seven (7) miles stretch of white sand beaches. The continuing loss of beach must therefore be viewed as a potential catastrophe, for this jewel of the Jamaica tourism product. The loss of beachfront over the past two (2) decades is well documented and by and large, continues unabated. Within this there is a success story that provides a source of hope.

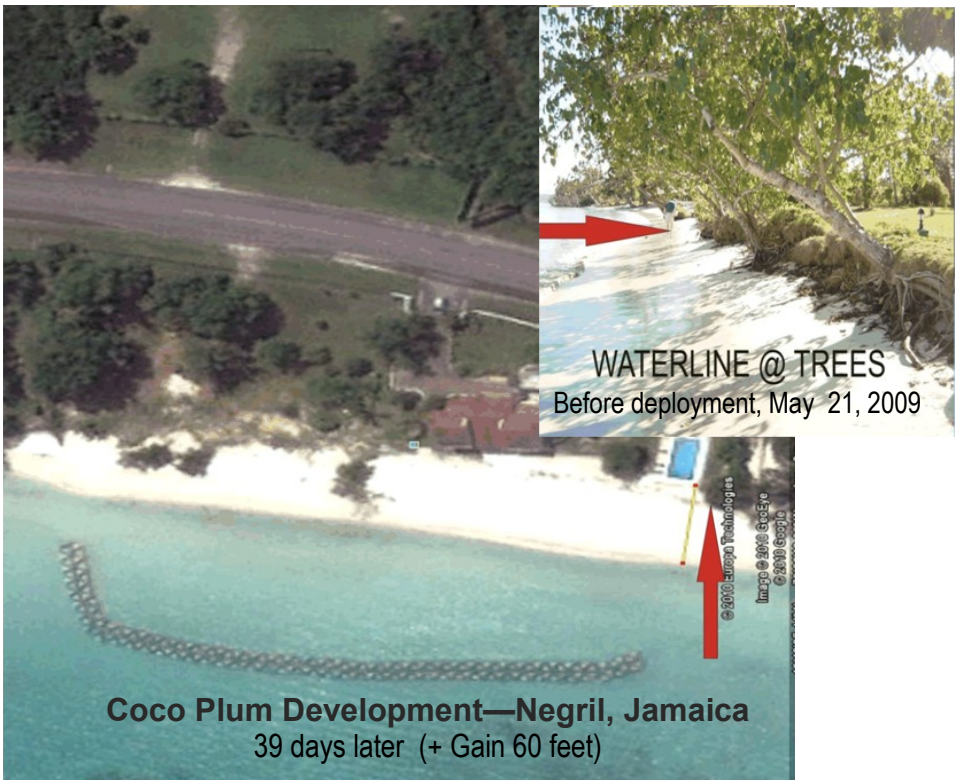
Prime Real Estate Threat-

On May 23, 2009, one hundred and sixty (160), Wave Attenuation Devices (WADs) were placed in a "barrier reef design", forty-five (45) meters offshore and parallel to the foundation of Villa Lido on the North side of Long Bay, Negril, Jamaica, West Indies.

"WAD"s are pyramid shaped, hollow concrete units about 2 metres high and weighing about 2 tons each. Their size varies as they are custom built for each individual application.

The deployment of the WADs was the culmination of scientific studies to characterise the coastal dynamic environment. At the time of deployment of the WADs, high - tide waves were breaking on the foundation of the Villa and its pool deck, threatening millions of dollars of real estate development.

Shoring up Investment



Eighteen (18) months later and after several heavy tropical storms and a hurricane, over twenty-three (23) meters of stabilised beach now exists along those one hundred and twenty-two (122) meters of property. In addition, two hundred (200) meters North and South of the WAD array have benefitted, with over 4 meters of new, stabilised beach formed. The beach continues to grow towards the WAD array through natural sand accretion promoted by offshore storms, wiping out a 0.5 meter scarp in just one small storm, covering previously exposed root systems of many trees along the shoreline. Given it's close

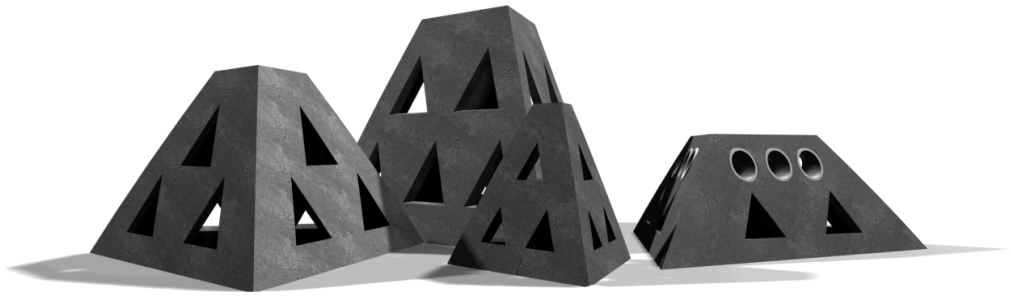
proximity to the main thoroughfare, protection of this property is ultimately linked to protection of the main road. At some time in the near future those WADs can easily be repositioned further from the foundation offshore or moved up and down the beach to promote natural accretion in other areas.

The WAD Team

In December 2007, TEMN Associates, Artificial Reefs & Coastal Restoration Inc. (ARI & CRI) from Pensacola, Florida were contracted to prevent further undermining of the foundation by wave action at Villa Lido. ARI & CRI's patented WAD technology has been used for over fourteen (14) years throughout the World with tremendous success. The team was brought in to evaluate the conditions surrounding the Villas through extensive wave modeling to support WAD design. A WAD System and a WAD system array were engineered site-specifically for the conditions at the Villas. The mold systems as well as the concrete WADS were locally manufactured, utilizing local labour and materials!

Why WADs?

Unlike rock breakwaters, seawalls and groynes, WADs attenuate wave energy by reflecting the wave, while maintaining circulation. The designed openings and engineered shapes of the systems still allow waves to transmit through the structures, but they slow the wave energy through engineered design. This slowing of the wave energy and reduction in the steepness of the wave, causes the waves to deposit sand particles on the beach. There is also positive impact on adjoining properties as can be seen by the effects both two hundred (200) meters North and South of the project site. Littoral transport is not impeded.



WAD™ (Wave Attenuation Device)

The systems are designed to be very stable and over their fourteen (14) year history have never been moved or negatively impacted by category 4 and 5 hurricanes. They are easily adjustable as well to changing hydrodynamic conditions and can be moved further offshore or along shore in a cost effective manner as project needs dictate. In shallow and deep water applications WADs have proven durable and stable, with marine life habitats producing over .45 metric tons of marine biomass per square meter of WAD substrate on an annual basis. At the 18-month survey the beach profile at the Villas had changed significantly for the better with a net natural accretion of sand from offshore the site of fourteen thousand (14,000) cubic meters. Today the beach continues to grow seaward towards the WADs.

Looks Can be Deceiving

Technically the WADs have been proven! Detractors focus their dislikes on aesthetic issues, however, compared to the end results: restored beach, protection of property and shoreline stability, this issue can be regarded as 'minor' and can be easily addressed by either submerging the WADs initially, or removing them completely once the desired reclamation has been achieved. Also, the top of the WADs can be rounded smooth or rock added to the surface to match typical rip-rap. Additionally, the concrete can be dyed to closely match the color of the water.

Ready and Able

As local representatives, TEMN stands ready with CRI & ARI, to implement this solution on a wider scale to address the problem of continued erosion in Negril, as a path to ensuring sustainability of the Negril hospitality industry.

In addition to deployment at Villa Lido, WADs are gaining acceptance as an alternative to other traditional forms of engineered structures as evidenced by the following:

- Successful application at Peakes Point, Gulf Breeze, Florida post Hurricane Ivan
- Project Greenshores, Pensacola , Florida, recipient of the 2003 Presidential Coastal America Award
- Restoration of Dauphin Island Alabama — Western Marshlands near Ferry Landing
- U.S. Fish and Wildlife Service project to re-establish seagrasses in West Bay of St. Andrews Bay, Bay County Florida

20 West Kings House Rd.
Kingston 10
Telephone: (876) 920-6012; Fax: 968-3260
mailto:temn@cwjamaica.com

Local Representatives For: