

VETIVER SYSTEM FOR BEACH EROSION REHABILITATION



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Some examples of Vetiver planting for erosion control and landscaping on beach and estuary around the world



China: Estuary erosion control against waves and storm surges

Vietnam: Estuary and beach erosion control against waves



India: Chennai Beach Resort

Landscaping and sand blast control



Landscaping and sand blast control





**At planting and
six months later**

**Landscaping and
sand blast control**



**Ten months after
planting**



Very simple maintenance



Philippines: Vetiver planting to protect the bank of Abra River

**estuary against
flood erosion and
tidal surge**



**One year after planting,
the bank was
successfully stabilised**

Philippines

Vetiver planting to protect the estuary bank against beach erosion and tidal surge



Philippines

Vetiver planting to prevent sand drift

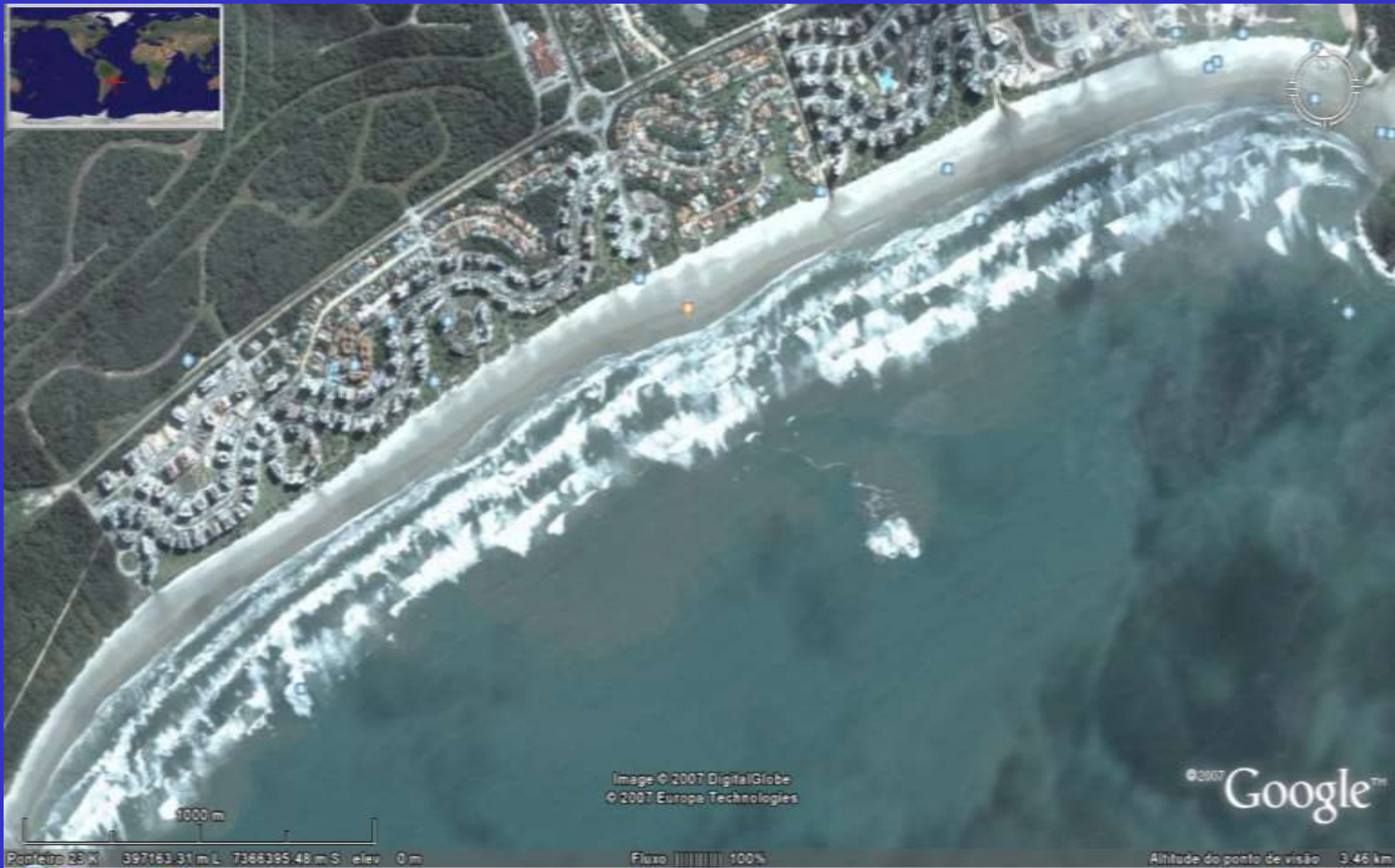


Vetiver planting to prevent sand drift



Brazilian Beach

The **Riviera de São Lourenço – Bertioga, Sao Paulo** is an upmarket coastal residential resort of Brazil, with more than 2,500 houses and over 220 buildings between six and ten floors and a large **Riviera Shopping Center** operating with 50 stores



Beach Erosion



Erosion of beach dune protected by “Sweet Grass”- *Paspalum maritimum*,



Deflor Bioengineering / Paula Pereira

Beach Erosion



Erosion of beach dune
protected by “Sweet
Grass”- *Paspalum
maritimum*,



Beach Erosion



Erosion of beach dune
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Traditional Solution

In 2008 the initial solution was to build a rip rap using raffia bags filled with a mixture of soil-cement in the proportion of 12% cement and 88% of local soil



Although this measure worked partially, it had very low landscape appeal for an urbanized condominium settlement on Brazil number one beach. Eventually, due to concerns of the local Community Association and environment authorities, who wanted a most environmentally friendly method for the region, which lead to the search of a new concept of beach protection combined with landscaping.

Solution Selection

The selection committee looked for a beach protection technology that is sustainable, with low establishment, operating and maintenance cost and green, which can be incorporated to local landscaping. The following technologies were considered:

Traditional hard engineering methods: Rock riprap, Rock mattresses, Rock groyne, Concrete pile wall *were considered but rejected for high cost and unsustainability.*

Bio-engineering methods: Native vegetation and Marram grass, *Sweet Grass was rejected due to previous failure and Marram grass was rejected as it is not effective in protecting eroding sandy beach*

Bio-engineering with Vetiver grass: Using Cocologs in low risk area and wooden palisade in high risk area to increase security factor of the structure anticipating sea level rise due to climate change in the future.



Cocologs in low risk area

Wooden palisade in high risk area to increase security factor of the structure anticipating sea level rise in the future.



Project Implementation

Cocologs in low risk area, with biodegradable jutemesh to protect sand surface during vetiver establishment phase





**Wooden palisade in high risk area,
before and after biodegradable
jutemesh installation.**

July 2009



16/7/2009 16:00

November 2009

**4 months after
planting**



November 2009, good growth four months after planting



January 2010

**7 months after
planting**



January 2010

**7 months after
planting**



March 2010

**10 months after
planting**





March 2010

**Regrowth after
maintenance
trimming**



March 2012

**3.5 years after
planting**



April 2015 : 8 years after planting





April 2015 : 8 years
after planting

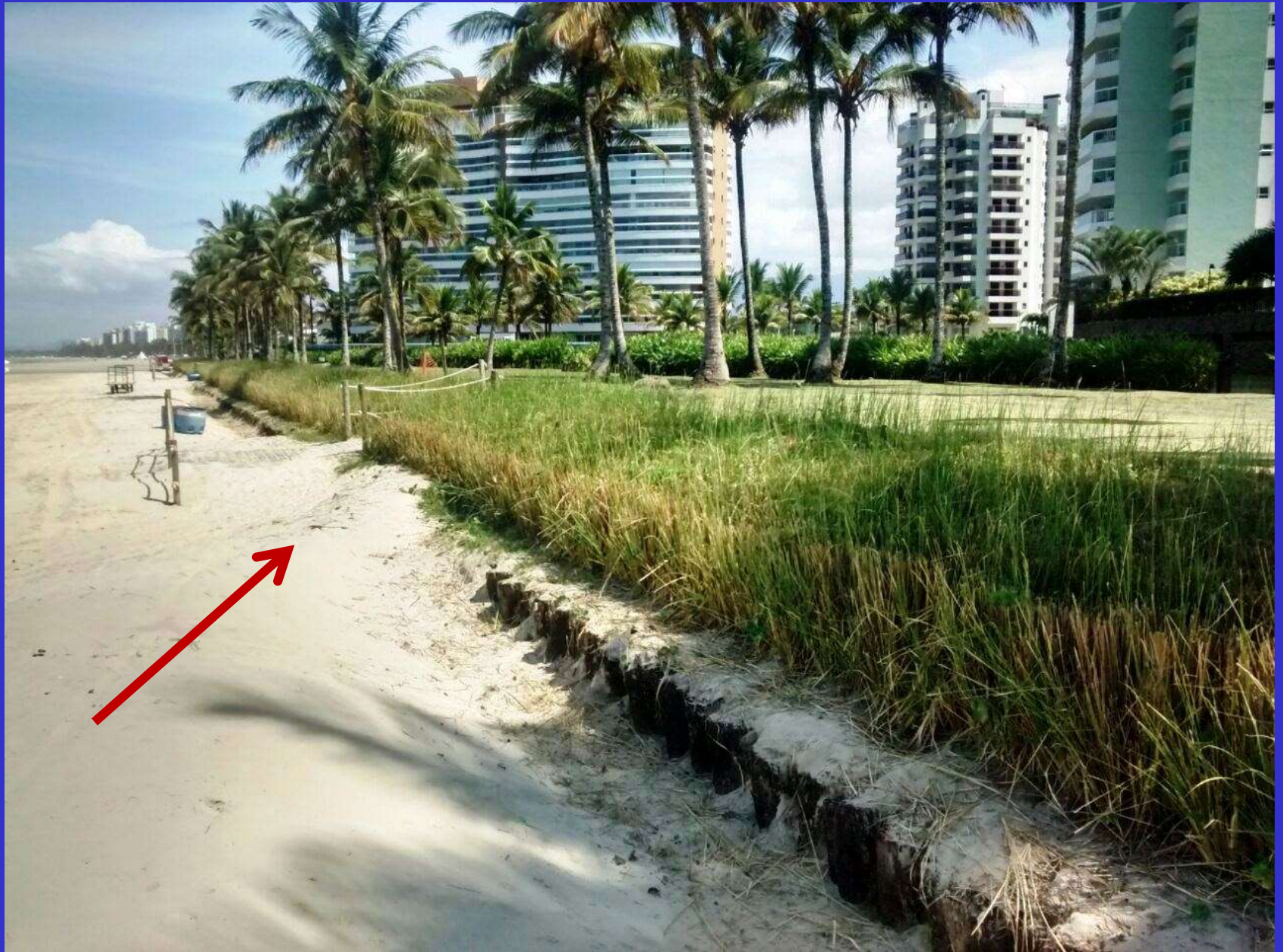
**Beautifully maintained
for erosion control and
landscaping**



**April 2015: 8 years
after planting**



Additional benefit: Control of sand drift



Storm Surges

The highest tides in Brazilian coast usually occur during August and September. In September 2009, there were some major sea storm surges leading to strong surf and wave hitting the site just six weeks after the installation of stage one.

These storm surges badly damaged Vetiver plants in the first hedgerow but they recovered naturally.

Strong surf and wave bent the first few Vetiver hedgerows



**Badly damaged
Vetiver plants in the
front rows but they
recovered naturally.**



No soil loss occurred in the first 3 Vetiver rows at the worst area where the waves hit



Frontal view of the beach showing Vetiver integrated completely to landscaping.



Beach view showing Vetiver completely integrated to landscaping.



RESULTS AND CONCLUSION

After the failure of mitigating coastal erosion through the use of a native grass and later through the construction of soil cement rip rap, the planting of Vetiver grass, associated with sediment retainers and biodegradable blanket was very successful. It was a low cost and effective technique to control erosion and prevent landscape destruction during strong surf and high tides.

The strong and deep roots of Vetiver allowed it to bide the coastal sandy soil. Vetiver has also proved its tolerance to long term exposure to salinity.

Two year after installation recolonization of native vegetation of herbaceous and grasses, which shows the quality of the recovery process of the site, with soil biodiversity and stability.

The stability of this site nine years after implementation proves that Vetiver System is a very sustainable and green solution to the beach erosion problem in the Brazilian coast line.