WAVE BUMPER

SOLUTIONS FOR PROTECTION AGAINST CLIMATE HAZARDS

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INTRODUCTION

WAVE BUMPER is an innovative concept for adaptation to climate change.

Every year, all around the world, different weather hazards (storms, floods, hurricanes, cyclones, etc.) disturb our ecosystems. According to IPCC reports, these trends are accelerating and such natural phenomena are becoming more intense. We are likely to witness a permanent rise in sea level by two meters between now and the end of the century.

This should result in more frequent and more powerful storms which will lead to an increase in risks (erosion of beaches, submersion and flooding of low areas), more serious damage and an imbalance of our territories.

Between December 2013 and March 2014 a series of violent storms caused a great deal of damage. Biarritz, as well as a major portion of the Atlantic coastline, were hit and damaged several times. Serious environmental and economic consequences occurred. This was when we began to think about the WAVE BUMPER concept.

How could we protect property and people without degrading the environment?

To answer this issue, we created the first removable self-ballasted seawall which can be installed in the event of weather alerts, then reused easily for a new weather hazard.

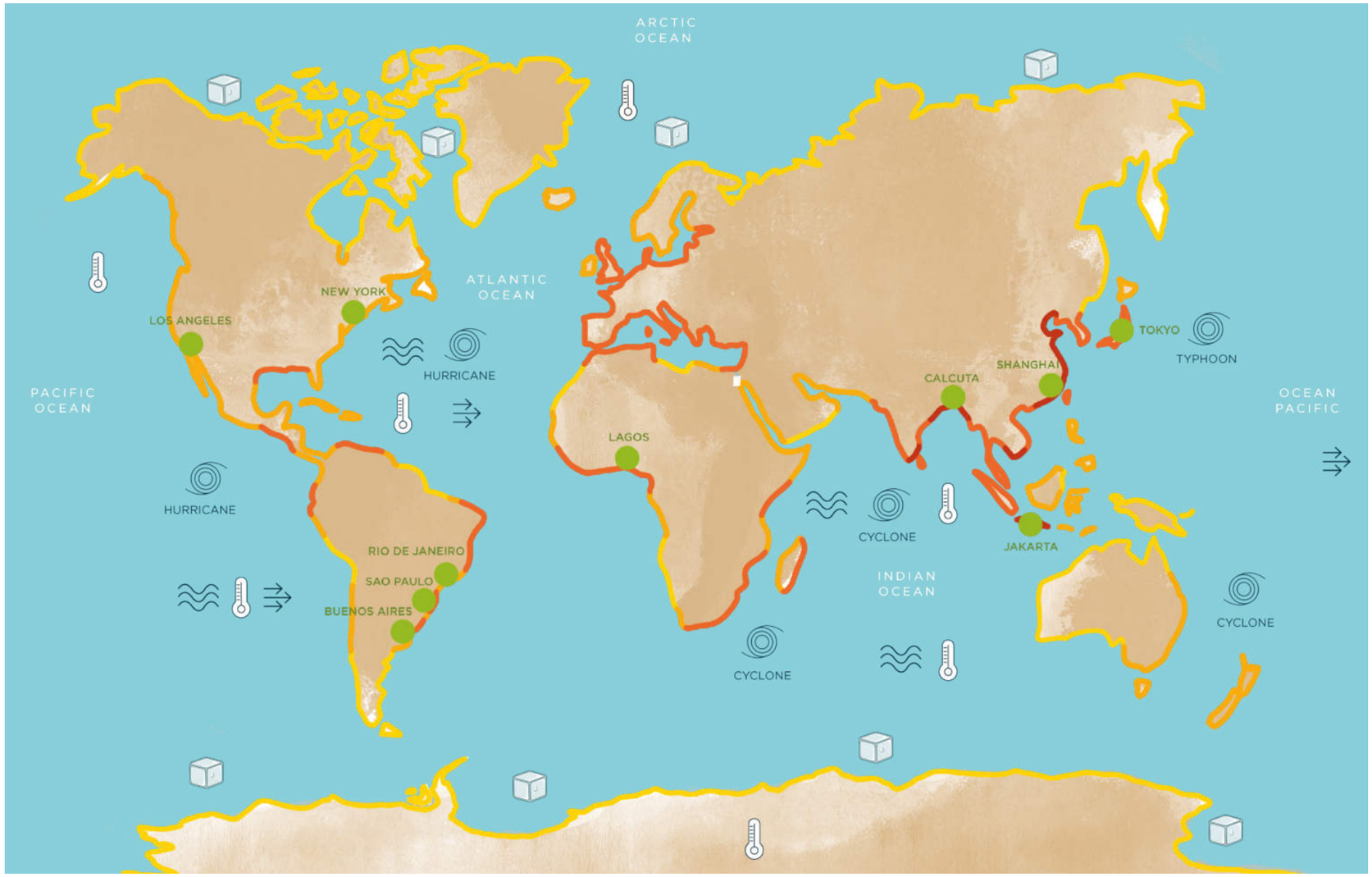
We adapt our solutions to your specific problems. Whether it be phenomena connected to seasonal re-occurring events or to specific meteorological circumstances.

These removable solutions developed by WAVE BUMPER have all been imagined, designed, developed and made in France. We control manufacturing of our products from the design stage until delivery.

"At WAVE BUMPER we have solutions for today, ideas and ambitions for tomorrow, and we are ready to play our part in this large-scale collective effort".

“WAVE BUMPER is a removable seawall which is installed when storms occur and which is removed after the event so as not to deface the environment”.
Romain CHAPRON, Founder of WAVE BUMPER

A SENSITIVE CLIMATE CONTEXT



Climate hazards are natural phenomena which are part of seasonal cycles. **Around 90% of catastrophes recorded in the world over the last 20 years have been caused by climate connected factors**[1]. The number of meteorological catastrophes has tripled in the last thirty years. Moreover, we are now witnessing a new level of destruction. **The rise in air and water temperature is resulting in a rise in the sea level (3.3mm/ year on average**[2]) thus reinforcing the intensity of these climate-related occurrences.

In 2019, seven catastrophes[3] caused damages estimated at more than 10 billion dollars, like Hurricane Dorian in North America (USD11.4B), Typhoon Hagibis in Japan (USD15B) or flooding from June to August in China (USD12B). Flooding is one of the major natural hazards in the world. In 2011 it caused 57% of deaths due to natural disasters. **Coastal flooding alone represents an 18% increase in flooding**[4]**.** Coastal areas have been identified as hazard areas given their morphological dynamics, their vulnerability and the socio-economic issues they represent. With a dozen megalopolis located in coastal areas[5], more than **60% of the world's population lives less than 150km away from the coast**[6]. Erosion rates along sandy coastlines vary from between 10% to 75% globally[5]. In metropolitan France, almost a quarter **of the coastlines are being subjected to erosion**, and are gradually declining at the rate of 50cm/ year[7].

Today, insurance companies are faced with a major part of the costs engendered by these events and this highlights how important it is to adapt prevention measures and develop a risk culture (4). It is generally estimated that **one euro invested in reinforcing resilience saves seven euros once the damage has been done**[8].

[1] "The human cost of weather-related disasters", 2018, ONU
[2] IPCC Report, 2019
[3] OXFAM, 2019
[4] French Federation of Insurance Companies, 2016
[5] "The State of the World's Beaches", 2018, Nature
[6] UICN - International Union for the Conservation of Nature
[7] Ministry of Ecology and Solidarity
[8] Senate, 2018

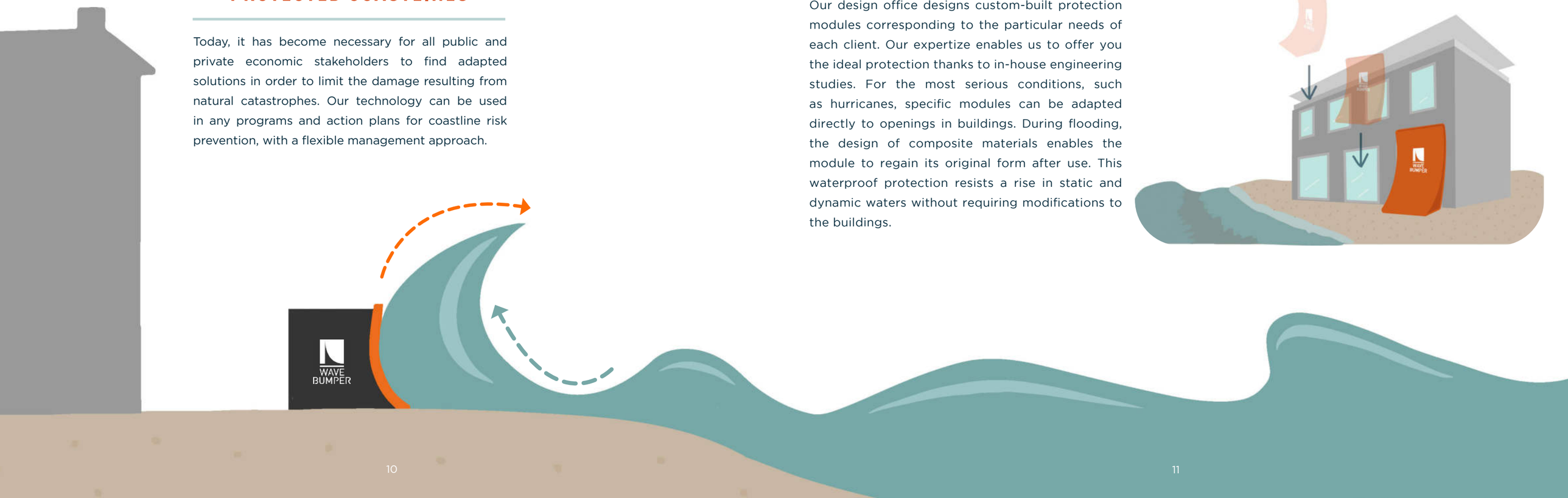
WAVE BUMPER TECHNOLOGY

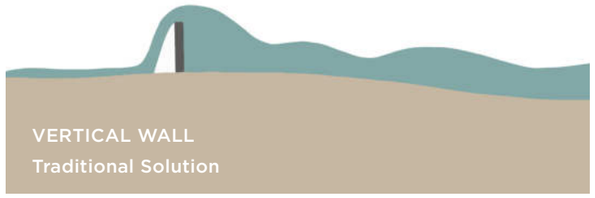
REMOVABLE PROTECTION

WAVE BUMPER came up with a radically new idea to protect coastlines from the destructive impact of the sea: a range of removable protection modules. The system can be installed and removed quickly and leaves a very low environmental impact. The WAVE BUMPER team has also adapted the concept to resist flash flooding and the intense conditions of hurricanes.

PROTECTED COASTLINES

Today, it has become necessary for all public and private economic stakeholders to find adapted solutions in order to limit the damage resulting from natural catastrophes. Our technology can be used in any programs and action plans for coastline risk prevention, with a flexible management approach.





A PATENTED CURVE

One of the innovations is a distinctive curve which absorbs the energy of the wave and sends it back towards the ocean. The WAVE BUMPER curve limits overflow more efficiently than a system equipped with a vertical wall.

ENGINEERED SOLUTIONS

Our design office designs custom-built protection modules corresponding to the particular needs of each client. Our expertize enables us to offer you the ideal protection thanks to in-house engineering studies. For the most serious conditions, such as hurricanes, specific modules can be adapted directly to openings in buildings. During flooding, the design of composite materials enables the module to regain its original form after use. This waterproof protection resists a rise in static and dynamic waters without requiring modifications to the buildings.

A PATENTED RANGE

STANDARD

CUSTOMIZED

BIGBUMP
coastal flooding, erosion

BUMPERBLOCK
coastal flooding

FLATFRONT
coastal flooding, cyclone, hurricane, typhoon

WATERBLADE
flooding

BUMPERBLADE
coastal flooding, erosion

FRONTBLADE
coastal flooding, cyclone, hurricane, typhoon

FENCEBLADE
coastal flooding

SHUTTERBLADE
cyclone, hurricane, typhoon

BIGBUMP

This is the first level of defence. Reusable ballasted bags have been specifically designed and reinforced to protect coastlines. They can be installed individually or in one or several rows, according to the expected intensity of the flood hazard. Our BIGBUMP modules are equipped with girths enabling them to be attached to one another, thus creating a uniform seawall.

TECHNICAL FEATURES

- Polypropylene
- 1100 x 900 x 900 mm
- Removable
- No anchoring to the ground required
- Colors
- ± 1,6 T ballasted

CHARACTERISTICS

- Channels sand
- Possibility to customize
- Resists ocean-related hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Low ground surface footprint
- Ballasted with sand or other material
- Delivered with instructions for use

OPTIONS

- ✓ Drainable
- ✓ Anti-scouring mat
- ✓ Funnel
- ✓ Possible customization

WE PROTECT YOU AGAINST

- ✓ Coastal flooding
- ✓ Erosion

On the right – The town of Biarritz


WAVE
BUMPER

BUMPERBLADE

This anti-submersion patented system is made up of curved deflectors made in composite material which absorb the energy of the waves and generate a return movement towards the ocean. Associated with ballasts called BIGBUMPs, it constitutes a removable seawall protecting the shore from submersion waves. The elements of the seawall are light, and easy to handle and store.

TECHNICAL FEATURES

- Composite material
- 1100 x 1000 x 300 mm
- Removable
- Not anchored to the ground
- Colors
- ± 15 kg empty
  ± 1,6 T ballasted by a BIGBUMP

CHARACTERISTICS

- Channels sand
- Possibility to customize
- Resists ocean-related hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Low ground surface footprint
- Ballasted with sand or other material
- Delivered with instructions for use

OPTIONS

- ✓ Drainable
- ✓ Anti-scouring mat
- ✓ Funnel
- ✓ Tarpaulin
- ✓ Possible customization

WE PROTECT YOU AGAINST

- ✓ Coastal Flooding
- ✓ Erosion

On the right – The town of Mauguio-Carnon

BUMPERBLOCK

This self-ballasted version in concrete was designed to cater for beaches which do not have enough sand to be able to ballast the BIGBUMP modules. Positioned at the top of the beach and assembled together using mounting plates, they constitute a stable, sturdy seawall.

TECHNICAL FEATURES

- Concrete
- 1200 x 1000 x 1000 mm
- Removable
- Not anchored to the ground
- Colors
- ± 900 kg

CHARACTERISTICS

- Channels sand
- Possibility to customize
- Resists ocean-related hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Self-weighted
- Mounting plates
- Delivered with instructions for use

OPTIONS

- ✓ Adaptable shape
- ✓ Possible customization

WE PROTECT YOU AGAINST

- ✓ Coastal flooding
- ✓ Erosion

On the right – The town of Saint-Brevin-les-Pins

FRONTBLADE

This is a series of modules specifically developed to protect the windows and doorways in buildings exposed to the risk of marine submersion and cyclone hazards. This innovation consists of a series of modules designed and manufactured individually, which are placed against the façade of a building.

TECHNICAL FEATURES

Composite material
For a window or doorway: 1000 x 3000 m FRONTBLADE module: 1000 x 3200 x 1500 mm
Removable
Attached to the building
Colors
± 80 kg

CHARACTERISTICS

Resists ocean-related and cyclone hazards (wind, floating debris, etc.)
Resists physical alteration (UV, sand, salt, etc.)
Low ground surface footprint
Delivered with instructions for use

OPTIONS

✓ Adaptable shape
✓ Possible customization

WE PROTECT YOU AGAINST

- ✓ Coastal flooding
- ✓ Cyclone, hurricane, typhoon

On the right – Private property, Saint-Barths

FLATFRONT

Referred to as second line protection, adapted to smaller windows and doorways which are not directly facing the swell. They have a convex shape in composite material enabling them to be attached to a surface without being anchored to the ground.

TECHNICAL FEATURES

- Composite material
- For a window or doorway : 1000 x 1000 mm
- FLATFRONT module : 1300 x 1300 x 300 mm
- Removable
- Attached to the building
- Colors
- ± 70 kg

CHARACTERISTICS

- Resists ocean-related and cyclone hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Low ground surface footprint
- Delivered with instructions for use

OPTIONS

- ✓ Adaptable shape
- ✓ Waterproof seal
- ✓ Possible customization

WE PROTECT YOU AGAINST

- ✓ Coastal flooding
- ✓ Cyclone, hurricane, typhoon

On the right – Hôtel, Saint-Barths

FENCEBLADE

This protection system, made up of composite panels shaped with a patented curve, is inserted into the ground using removable posts. Positioned in front of the area to be protected, this barricade resists submersion waves. The elements are light, easy to handle and store and can be entirely disassembled.

TECHNICAL FEATURES

- Composite material + stainless steel posts
- Custom-built
- Removable
- Inserted in the ground
- Colors
- Weight according to size

CHARACTERISTICS

- Resists ocean-related and cyclone hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Low ground surface footprint
- Delivered with instructions for use

OPTIONS

- ✓ Adaptable shape
- ✓ Possible personalization

WE PROTECT YOU AGAINST

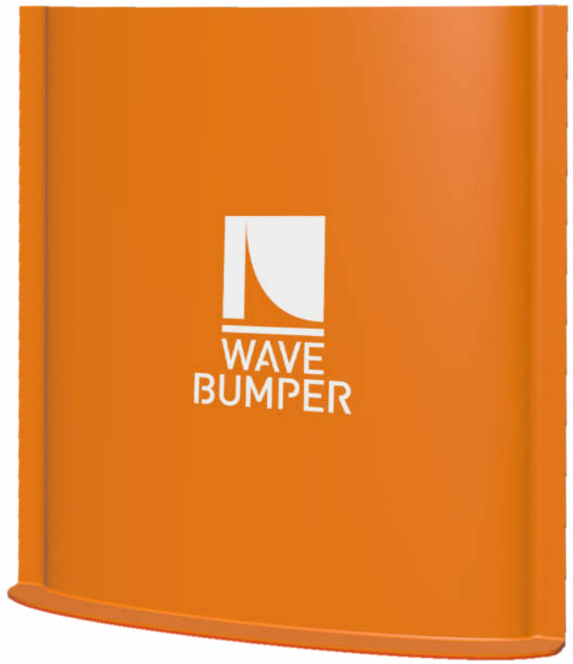
- ✓ Coastal flooding
- ✓ Erosion

On the right – Saint-Barths Island

Non-contractual photo

WATERBLADE

This waterproof device is a true bastion against flooding and can resist rising levels of static and dynamic waters. Its design in composite material is a blend of lightness and resistance and enables the element to regain its initial shape after pressure. These cofferdams do not require any modification to the building. They are easy to install and our expertise in modularity enables our WATERBLADE system to be quickly adapted to any of your windows and doorways, in order to correspond to your specific layout.



TECHNICAL FEATURES

- Composite reinforced material + stainless steel mounts
- Custom-built
- Removable
- Inserted in the ground
- Colors
- Weight according to size

CHARACTERISTICS

- Waterproof seal
- Resists ocean-related and cyclone hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Low ground surface footprint
- Shape memory
- Delivered with instructions for use

OPTIONS

- ✓ Adaptable shape
- ✓ Possible personalization

WE PROTECT YOU AGAINST

- ✓ Flooding

On the right –Restaurant, Corsica

Non-contractual photo

SHUTTERBLADE

Specially designed for cyclone areas, this system resists and protects windows and doors from the wind, rain and any objects projected during a cyclone. Its custom-built design in composite material gives it ultra-resistant properties. A transparent insert can be put into the center of the module to allow daylight to enter during use.

TECHNICAL FEATURES

- Composite reinforced material
- For an opening of:
  900 x 1100 mm
  SHUTTERBLADE module:
  1300 x 1500 mm
  Porthole in polycarbonate:
  320 x 200 mm (optional)
- Removable
- Attached to the building
- Colors
- ± 25 kg

CHARACTERISTICS

- Resists ocean-related and cyclone hazards (wind, floating debris, etc.)
- Resists physical alteration (UV, sand, salt, etc.)
- Delivered with instructions for use

OPTIONS

- ✓ Adaptable shape
- ✓ Transparent porthole in polycarbonate
- ✓ Lateral stainless steel air vents
- ✓ Other colors – extra charge
- ✓ Possible personalization

WE PROTECT YOU AGAINST

- ✓ Cyclone, hurricane, typhoon

On the right – Private property, Saint-Barths

Non-contractual photo

MAXIMUM ADAPTABILITY

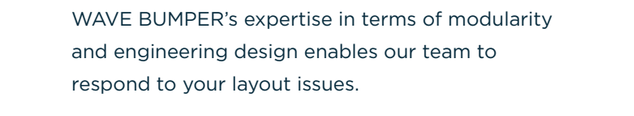
WAVE BUMPER's expertise in terms of modularity and engineering design enables our team to respond to your layout issues.

Our key word is adaptability.

Our engineers are capable of simulating the natural phenomena of oceans and rivers. This is how the WAVE BUMPER team have acquired enough know-how to scale your protective units, while respecting the environment.

Our global vision enables us to start work on studies upstream (description of risks, submersion studies, simulations, etc.), to scale the needs (calculation, scaling and resistance, design, etc.) and to manufacture your protection system. These studies all include shipping, anchoring and storage constraints for each solution.

After this work, our design office defines a personalized defence protocol to efficiently protect the property at risk.



On the right – Town of Canet-en-Roussillon

SOLUTIONS TO SUIT YOUR NEEDS

PROTECTION SOLUTION

Town of Biarritz

DOCK SUBMERSION

Design of an angular BUMPERBLADE to protect the perpendicular angle of the quay.


Town of Canet-en-Roussillon

STRENGTHENING OF A DYKE ENTRANCE

Design of a STAIRBLADE adapted to steps and thus completing the existing dyke.


Non-contractual photo

PROTECTION OF A PRIVATE VILLA

Removable protection against wave penetration which resists cyclone hazards. This retaining wall therefore produces a “sea flush” effect.


Non-contractual photo

PROTECTION AGAINST EROSION

A temporary emergency solution to strengthen areas subjected to occasional erosion.

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Non-contractual photo

PROTECTION OF A COASTAL ROAD

Reversible concrete solution integrating a cycle track to protect the coastal road from submersion waves.


Non-contractual photo

RAILWAY PROTECTION

Reversible solution which considerably prevents the sea water and aerial projections from crossing, including airborne droplets of sea water.


Town of Mauguio-Carnon

ANTI-SCOURING MAT

For both the BIGBUMP and BUMPERBLADE systems, to ensure the best stability of our modules on a soft substrate a geotextile mat with a ballast is used to avoid scouring. As the beach becomes eroded and lowers, a weight at the front of the mat anchors the protection modules and limits scouring below them. The weight is a stainless steel chain inserted into the hem of the geotextile mat.

EQUIPMENT

STORAGE TRAILER

In order to make storage and handling of the units easier, we design our own custom-built layouts. These trailers enable your material to be ready and available as soon as an alert is given.

FILLING HOPPER

This tool is essential for filling BIGBUMP modules. It has a bag offering optimum geometry. Regular pressure on the leverage straps prevents the BIGBUMP modules from premature wear and tear, whilst ensuring safety for those in charge of the filling procedure.

ALERT SIGN POSTS

WAVE BUMPER designs sign posting enable territorial authorities to warn and inform the population of coastal flooding risks in the vicinity of the beaches.

WAVE BUMPER

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