



# **HIDRALERTA: Emergency Response Module for Coastal Wave Overtopping and Flooding at Praia da Vitória bay**

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## **ABSTRACT**

The present work describes the developments done so far to the Praia da Vitoria coastal region under the LIFE-GARACHICO project, namely the implementation of module on HIDRALERTA early warning system for emergency response to coastal waver topping and flooding at Praia da Vitória bay.

### **1. Introduction**

Macaronesia is made up of 5 archipelagos, including the Canary Islands and the Azores archipelago. Macaronesia islands are especially vulnerable to climate change impacts due to their coastal exposure and abrupt orography. Thus, innovative adaptation measures are needed to protect coastal areas from the impacts of climate change.

The LIFE Garachico project - Coastal Flooding Adaptation To Climate Change Through Flexible Strategies In Macaronesia Urban Area, proposes the development of methodologies for the creation of an effective Flexible Adaptation Strategic Framework for the coastal municipalities of Macaronesia, based on the definition of acceptable levels of risk and specific interventions at the local level, in order to increase the resilience of these areas against current and future extreme coastal events due to climate change. The study cases are Garachico and Puerto de la Cruz, at Tenerife at the Canary Islands, and Praia da Vitória at Terceira Island (Archipelago of the Azores).

The tasks of the project include: implementation of an early warning system (EWS), a set of adaptation measures to reduce the risk of overtopping and flooding, in each of the study cases, and the creation of a manual of technical recommendations. In the case of Praia da Vitória, the EWS implemented is the HIDRALERTA system (Poseiro 2019) and the adaptation measures foreseen are associated with the access and the circulation of urban traffic and pedestrians. Those measures and respective protocols (emergency plans) will be established in case of overtopping and flooding alerts and should be activated by the HIDRALERTA system itself (emergency module system). The Garachico test case will also define the basis of a manual of recommendations based on the experience gathered during the application of their own EWS and adaptation measures.

The present paper describes the development of a new HIDRALERTA module that automatically activates a set of emergency plans (emergency preparedness and response activities), to enhance the response of the authorities to the alert events.

### **2. Study case**

Praia da Vitória is in a large bay on the east coast of Terceira Island. It is bordered to the north by Ponta da Má Merenda and to the south by Ponta do Baixio (Fig. 1), which defines a roughly rectangular basin with about 1 km x 2 km. This bay provides excellent conditions for water sports, such as sailing or windsurf. The protection of the bay from severe sea-wave conditions is done by the so-called north and south breakwaters and by the frontal coastal defense at the bay shoreline.

The bay shoreline has a coastal defense 1 km long. Rooted to the coastal defense there is a field of five groynes, which are referred to herein as groins 1 to 5, from south to north. Along the main coastal road there is not an intense occupation. There is a building at the root of groin 3, where currently operates a bar. Along the road, there is a promenade. Halfway, there is an outdoor car parking, training machines and a hotel. Two restaurants are located at the north and the south sides of the bay. In some storm situations, there are severe overtopping and flooding situations along the coastal defense, which put in danger traffic, equipment and specially, pedestrians that uses frequently the site. Adaptation measures that involve the control of access and circulation of urban traffic as well as pedestrian will contribute to reduce the risk.

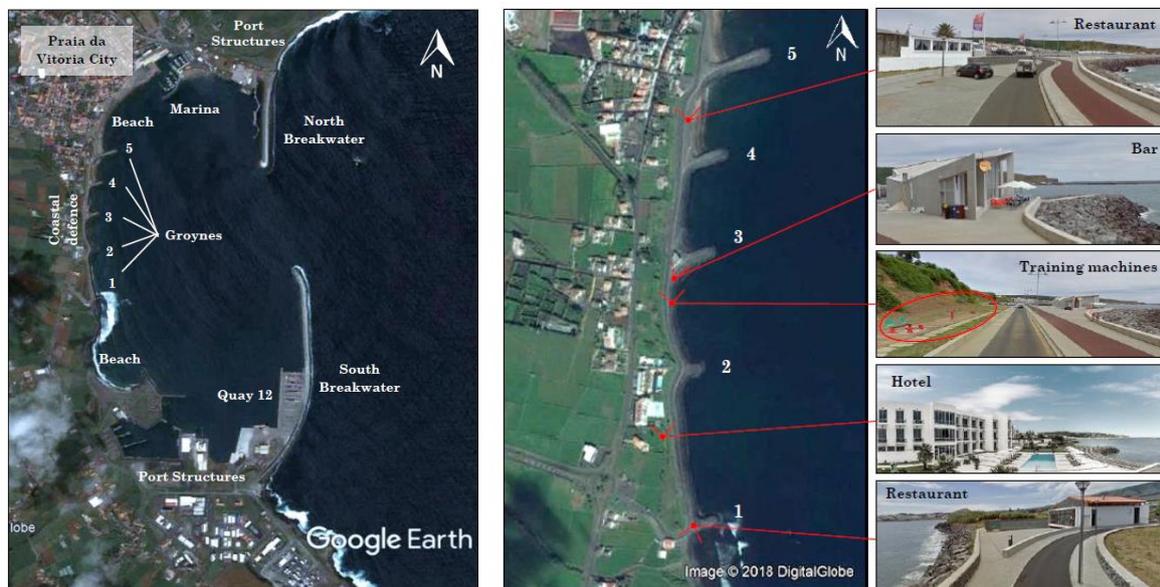


Fig. 1. Praia da Vitória.

### 3. The new module of HIDRALETA system

HIDRALERTA is a forecast and early warning system for coastal and port regions capable of predicting emergency situations, as well as carrying out risk assessment. As a forecast and early warning tool, HIDRALERTA enables the identification, in advance, of the occurrence of emergency situations, prompting the responsible entities to adopt measures to avoid loss of lives and minimize damage. The system provides forecasts, 72 hours in advance and with a 3-hour interval, of wave climate characteristics, its consequences (overtopping and flooding) and risk levels associated. It is a modular system: I – Sea-wave characterization, Module II – Overtopping determination, Module III – Risk assessment; Module IV – Alert System.

A prototype for Praia da Vitoria bay has already been developed. Although HIDRALERTA sends alerts to the responsible authorities, it does not indicate the necessary procedures they should perform to reduce the risks in case of emergency situations related with overtopping and flooding events. In that way and considering the adaptative measures related to traffic and pedestrian access and circulation, specific protocols (emergency plans) will be established in close collaboration with the authorities. Those protocols will be implemented into HIDRALERTA as a part of a new module V – Emergency Response Plans. In this new module a set of previously discussed and prepared documents will be stored in a database and will be activated according to the type and level of alert foreseen. Emergency plans and all the relevant information about the occurrences are then sent to the executive authorities (municipality, civil protection, or others). Information provided will be direct, concise, and easy to understand. Emergency plans to be activated must be well identified, so that operatives can follow those measures and protocols in a timely manner.

#### Acknowledgements

The authors thank the financial support of LIFE Garachico Project (LIFE20 CCA / ES / 001641) and the Portuguese Nat. Distri. Comp. Infrastructure INCD for computing resources.

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