Development of an assesSment tOol for predicting the dynamic riSk of drowning on bEAcheS

- *SOSeas* -

User Interfaces & User Experience

15th November 2020

Index

List of Acronyms

API	Application Programming Interface
ANN	Artificial Neural Networks
C3S	Copernicus Climate Change Service
CMEMS	Copernicus Marine Environment Monitoring Service
DIAS	Data Information Access Service
DSS	Decision Support System
ETL	Extract, Transform & Load
GFS	Global Forecast System
M2M	Machine to machine communication
NOAA	National Oceanic and Atmospheric Administration
OGC	Open Geospatial Consortium
PWA	Progressive Web App
SDGs	Sustainable Development Goals
SOBRASA	The Brazilian Life-Saving Society
TDS	THREDDS Data server
UX	User Experience
UI	User Interface
WEkEO	We knowledge Earth Observation
WCS	Web Coverage Service
WMS	Web Map Service

List of Figures

1 INTRODUCTION

The SOSeas service provides an **open access** to the forecasting risk assessment through the SOSeas App, which has been designed providing a UI that allows answering the needs of targeted users through a high-quality mobile UX. The following url provides access to SOSeas app, and therefore to the SOSeas downstream service applied to Santa Catarina beaches:

https://soseasapp.ihcantabria.com/

2 SOSEAS APP

The SOSeas app is a mobile application that can be installed at any mobile device (android, IOS, etc.). The application includes forecasting metocean information from CMEMS, NOAA and locations of Santa Catarina beaches. The UI is divided in four main sections, see the bottom navigation bar of the Figure 1a: “Beach”, “Conditions”, “Forecast”, ”Risks” and “About”. By default, the SOSeas app makes use of the device geolocation to select the closest beach. However, end users could select any other beach through the “beach selector” functionality, which is based on a list of cities and their related beaches. Once the beach has been selected, the home section shows the current metocean conditions and the calculated electronic bathing flag, see Figure 1a. The beach selection section enables end users to undertake beach selection based on cities, beach names or closest distance between the beach and the mobile device, see Figure 1b. The about section provides information concerning the SOSeas team, funding and the disclaimer of responsibility of the SOSeas Service, see Figure 1c).

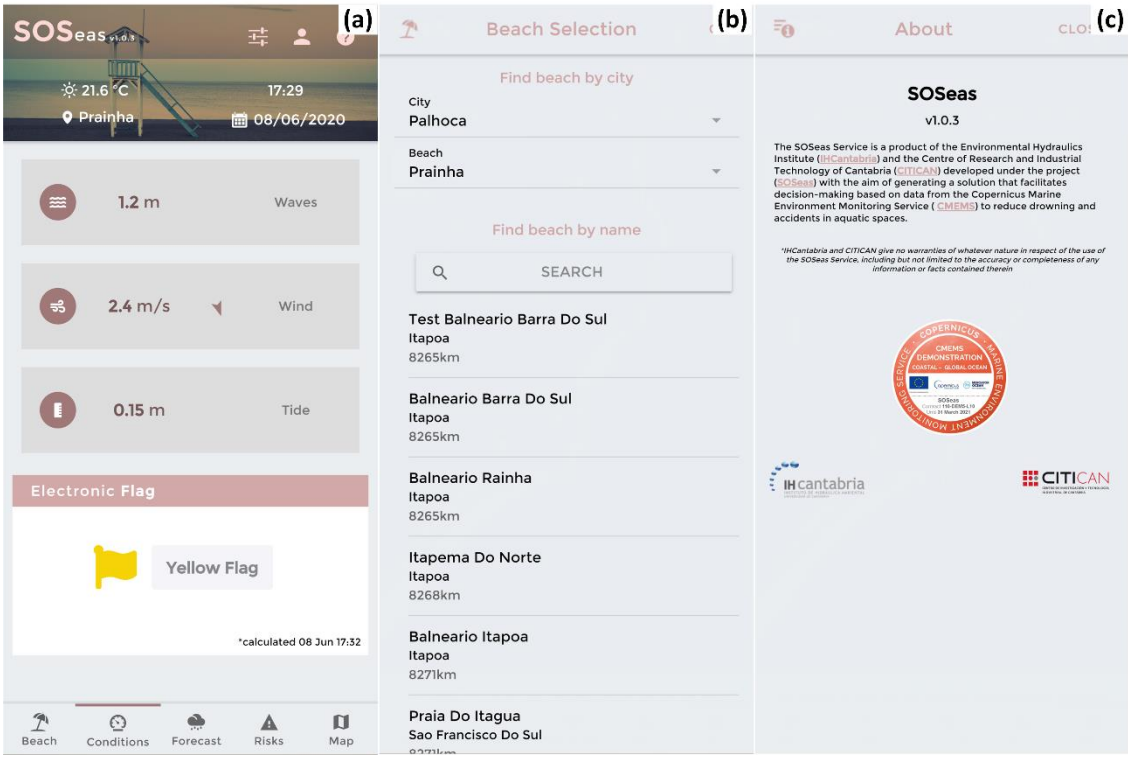

Figure 1. Main tabs of the SOSeas Web App: (a) Web homepage, (b) Beach selection web page, and (c) About SOSeas web page.

The SOSeas Web App also provides information about the forecasting conditions through the forecasting section. This section is divided in two subsections: metocean and flags. Graphical visualizations of the metocean subsection for winds and waves are showed in Figure 2a, and Figure 2c, respectively. Flags subsection makes use of dynamic tables (HTML formatted), which can be visualized in Figure 2b.

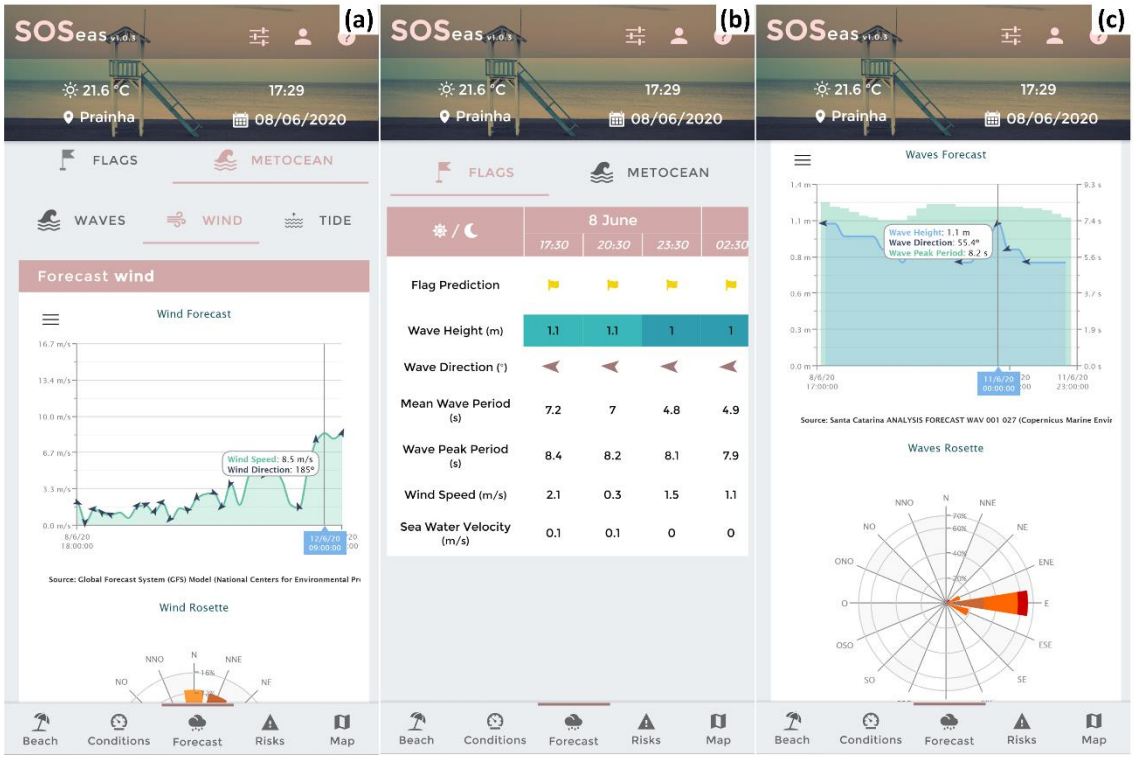

Figure 2. Forecasting section of the SOSeas Web App: (a) Wind conditions, (b) Electronic bathing flags, and (c) Wave conditions.

Waves and Winds subsections provide two charts in which the magnitude and direction of the metocean dynamics are clearly visualized. The Tides subsection provide a chart with the evolution of the tides for the selected beach.

The SOSeas service also provides a specific lifeguard section, where they can manage events and warnings that take place on the beach. The event subsection, see Figure 3a, enables storing and characterizing the events with information such as the type of event, description, consequences, information about the victim, displacement required by lifeguards, etc. Figure 3b shows the map subsection with all the geolocated beaches and risks. The warning subsection, see Figure 10c, enables storing 12 possible preventive actions (e.g. changing flag, detect-marking dangerous places, removing dangerous objects, etc.) and 40 possible preventive warnings (e.g. reporting risks such as currents or solar index, bans, infractions, etc.). Lifeguards with privileges could access the events and warnings subsections.

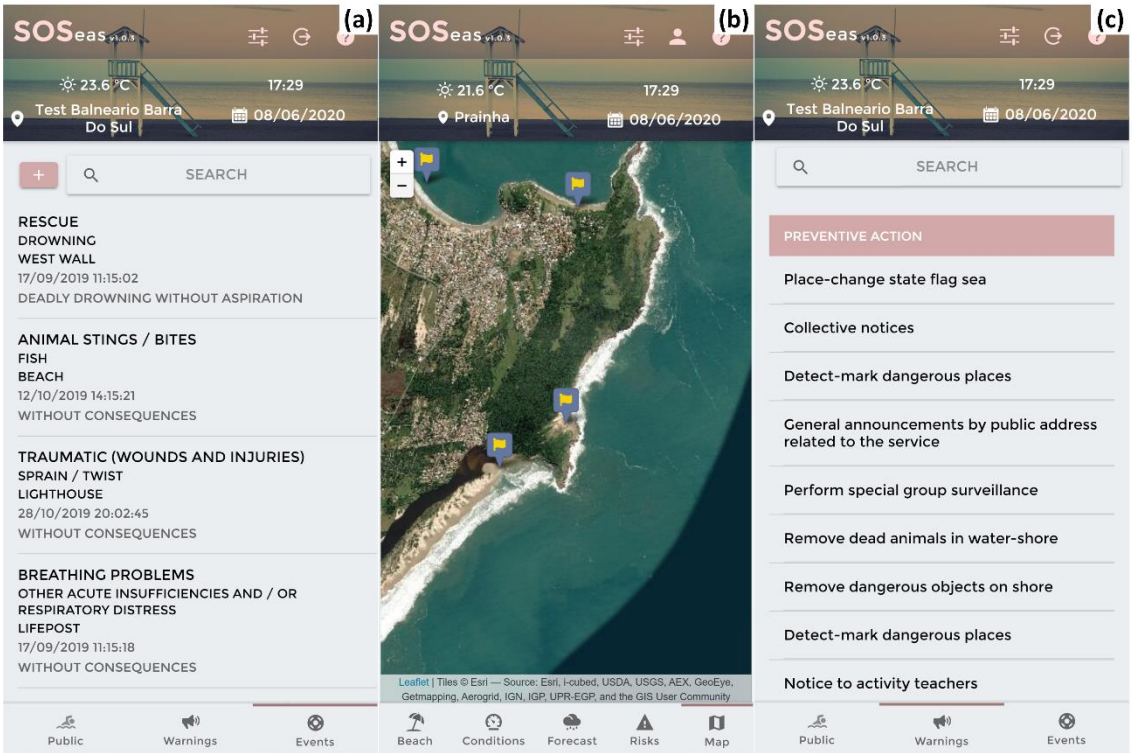

Figure 3. Lifeguard section of the SOSeas Web App: Event subsection (a), Map section (b), and Warning subsection (c).

Access to the SOSeas app through a standard desktop Web browser (Chrome or Firefox) is also enabled.

2.1 SOSEAS VIDEO-TUTORIAL

An example of how to use the SOSeas Web App is illustrated in following video-tutorial: https://vimeo.com/ihcantabria/SOSeas

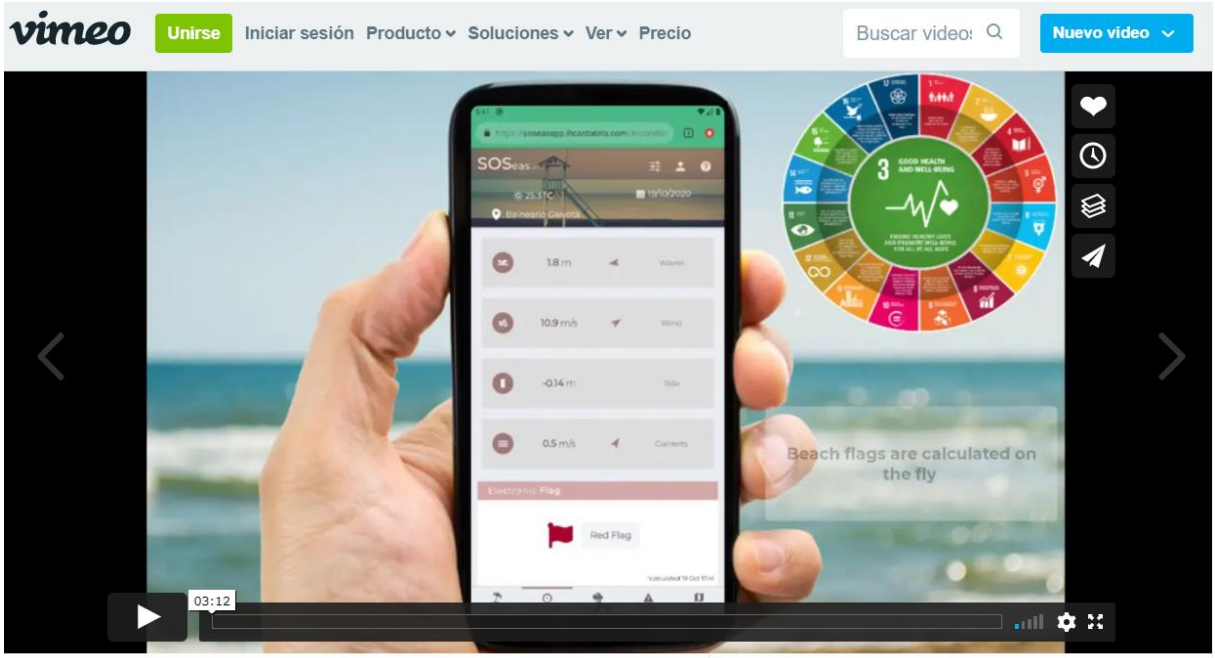

Figure 4. SOSeas video-tutorial.

3 INTEROPERABILITY

The above section provides a guide to access and use the SOSeas app from any standard Web browser (Chrome, Firefox, etc.). However, other software such as those that are currently used by lifeguards might require accessing the Service through interoperability protocols.

The interoperability access allows the integration of the SOSeas Service in any other software or Service. The Interoperability protocols of the SOSeas Service act as a broker between two different applications so that they can communicate with each other, which enable to expose the flag prediction or Metocean operational data and services to any potential user.
In particular, interoperability protocols, following the Open Geospatial Consortium (OGC), have been implemented as a service, for example: Web Map Service (WMS), Web Coverage Service (WCS). Other interoperability protocols such as OpenDap, NetCDF Markup Language (NCML) and NetCDFSubset, ftp or http have also been implemented.

The reception of data from external sources (CMEMS, NOAA, etc) required the implementation of flexible, stand-alone modules that enabled to migrate the required information to the same store in operational mode. The Service collects the information from very different Data Providers with diverse data structures and formats (NetCDF, GRIBs, ASCII). The whole diversity of data sets have been integrated in a common and standardized data format. Once the information is standardized, the SOSeas Service provides communication protocols for data access.

The interoperability services are mainly provided through three APIs:

- Sensors API. It provides an interface to access observations collected by *in situ* sensors, see Figure 5.

Figure 5.Web Interface of the Sensors API

- Data Hub API. It provides an interface to access metocean products from numerical modelling (reanalysis and forecasting products), see Figure 6.

Figure 6. User Interface Data hub API

- Process API. It provides access to the flag prediction analysis under request, see Figure 7.

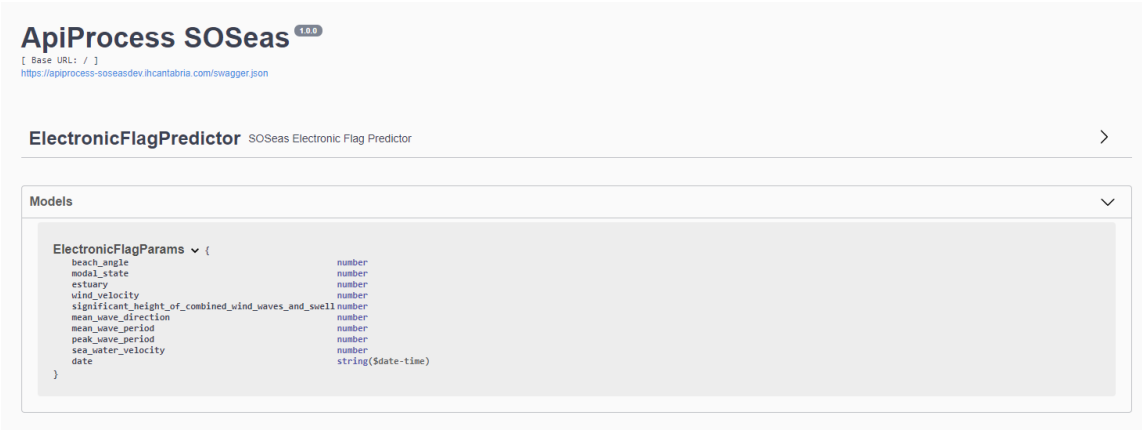

Figure 7. API Process of the SOSeas Service

4 MONITORING SYSTEM

The status of the SOSeas service is constantly monitored to maximise its availability. Administrators of the SOSeas service have access to a specific dashboard that shows the status of the service and all their components. The dashboard of the Monitoring System shows the operational status of data providers, see Figure 8. The System provides information about the lots of metocean data (wind, waves and currents), as well as information on the RAM System, CPU, storage, etc.

Figure 8. Dashboard of the Monitoring Service

In addition, the Monitoring System can be configured to receive alerts via mail or through team communication channels, such as Teams or Slack.