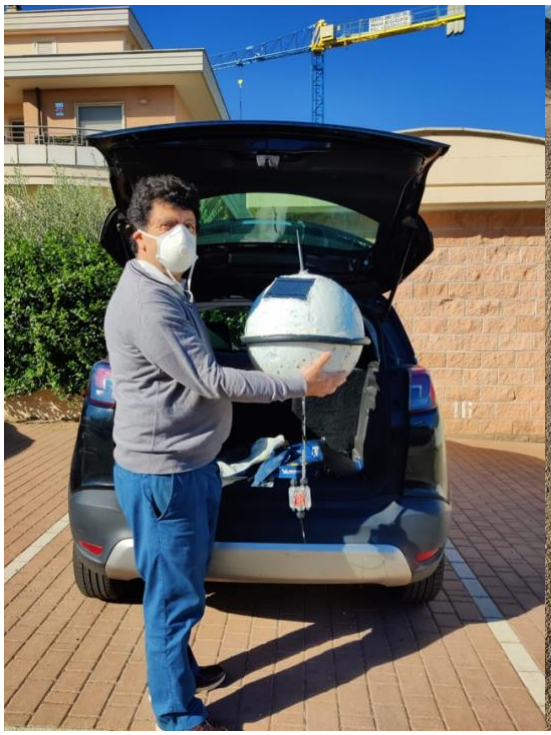
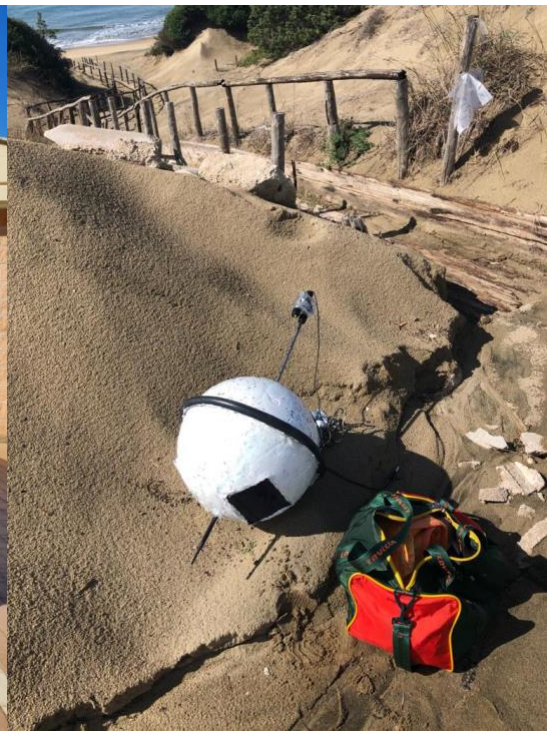
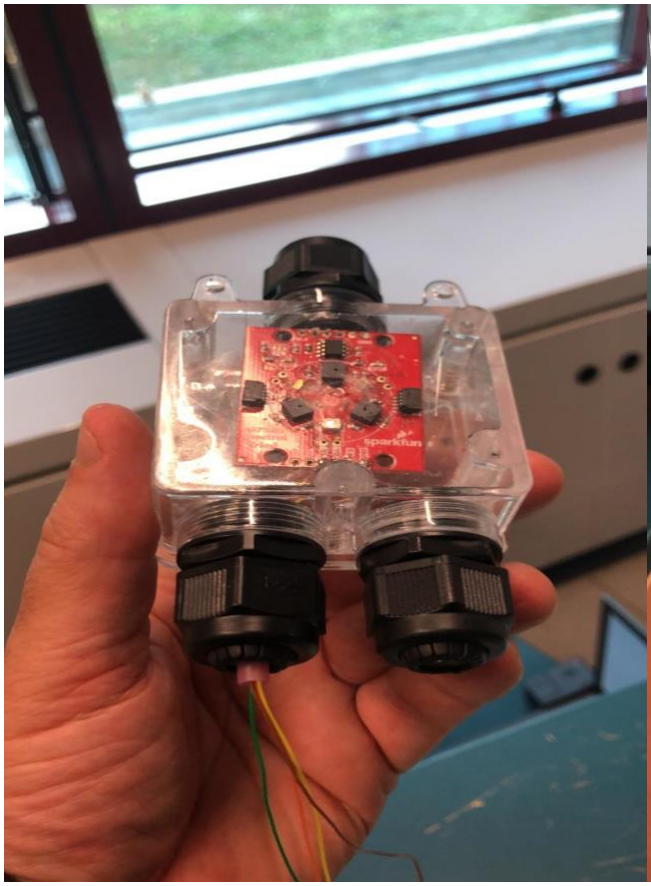
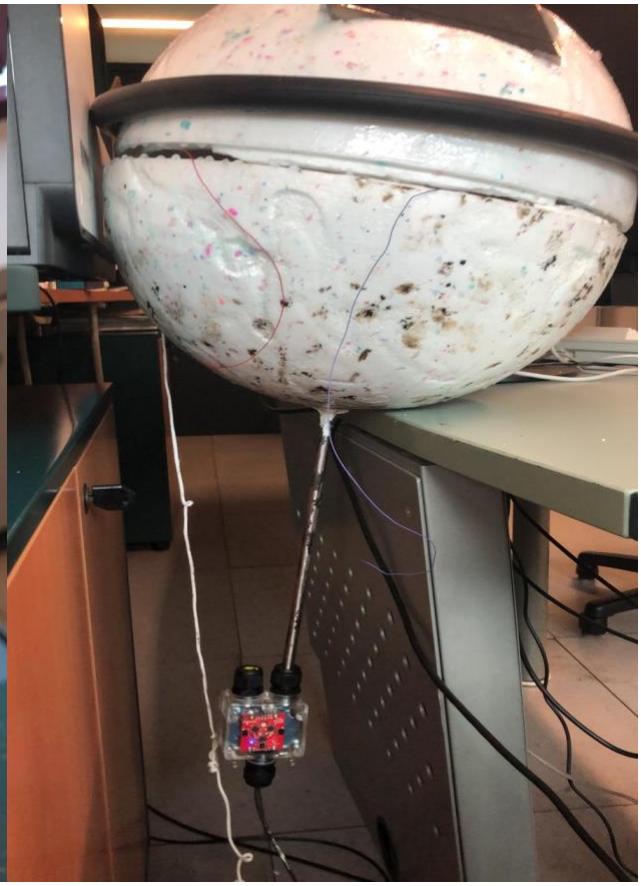
Technology

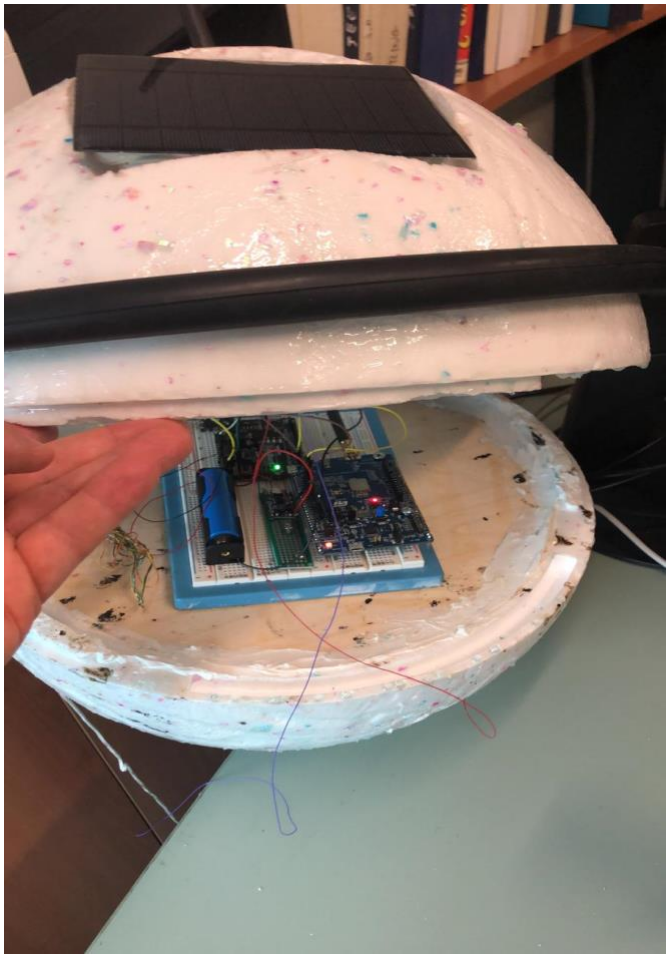
Smart Buoy Technical Specifications

At the heart of this project is the smart buoy. This buoy is designed to monitor water quality in aquaculture. The smart buoy is nothing more than a classic handcrafted buoy equipped with technology to collect data from the marine environment through a spectrophotometer sensor located below sea level (AS7265x).
The initial design involved pumping water from the sea into the buoy using pumps and pipes and conveying the water samples into the buoy for spectroscopic analysis (as envisaged in youtube video (22) 2021 05 25 11 40 15 - YouTube).
Then, in this third delivery, taking on board Professor Vitaletti's observations, the spectrometer was placed directly in the water.

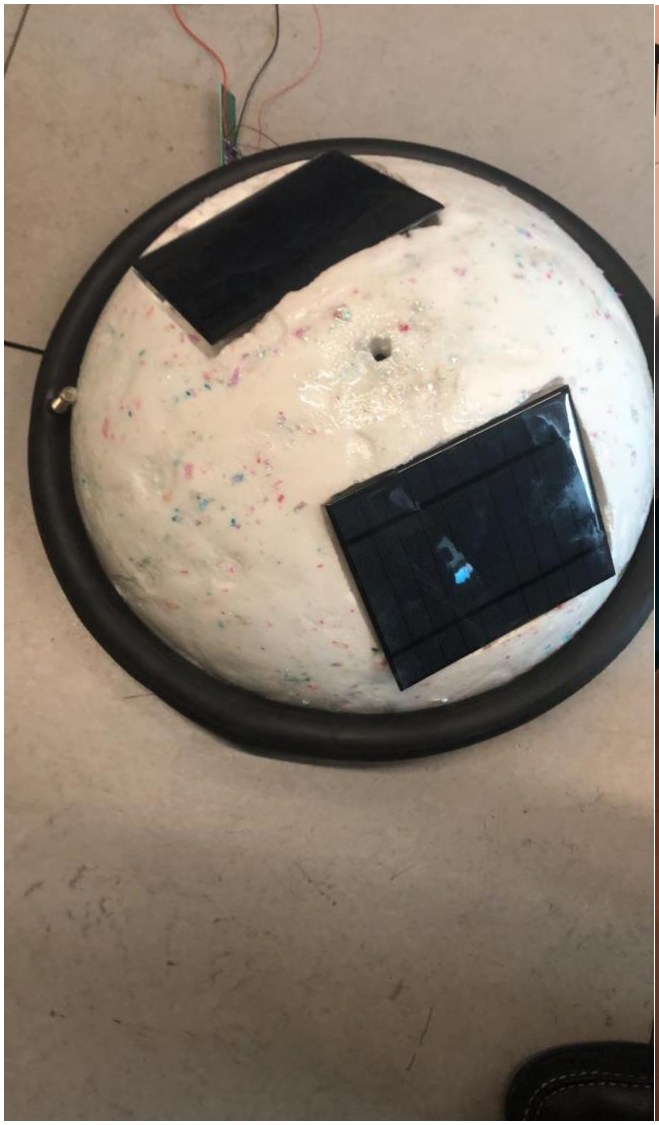



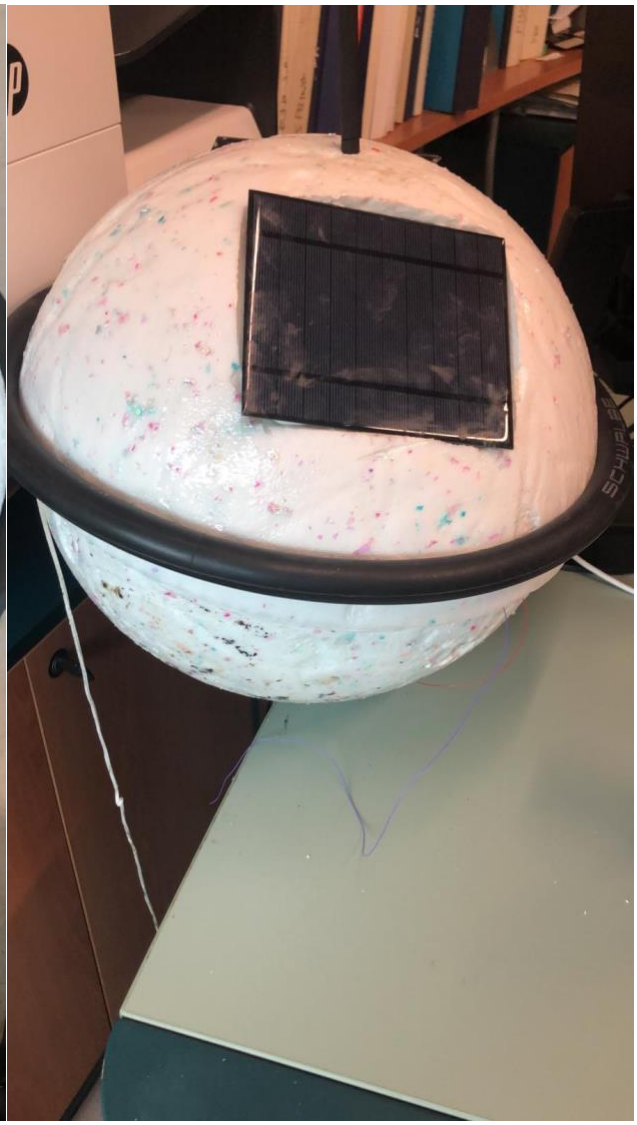
The spectrophotometer is positioned half a meter below sea level and, thanks to a steel capillary tube to which it is attached, samples the surrounding water. Inside the steel capillary tube run electrical wires and a braided nylon rope used to hold the 0.700 gram anchor. The anchor is essential for the buoy not to drift and can also be used to ensure the buoy's stability in the waves.
Both the electrical wires and the braided nylon rope pass through this capillary tube to the inside of the buoy without allowing water to seep in.
The electrical wires are connected to the electronic circuitry in the upper hemisphere of the buoy, while the nylon rope is attached to a transverse wooden base positioned and fixed firmly inside the buoy (see photo).



The spectrophotometer, which is submerged in water, is contained in a perfectly sealed, waterproof IP69 box.
The spectrophotometer is not in contact with the water but inside the IP69 box, which has perfectly transparent walls, allowing the spectroscopic operation of the device.
The structure of the buoy consists of two polystyrene hemispheres coated with a layer of 100% acrylic primer and epoxy resin. It is therefore perfectly resistant to all weather conditions and marine erosion.
The two polystyrene hemispheres that make up the buoy are divided by a sufficiently strong circular wooden shelf whose diameter corresponds exactly to the inside diameter of the buoy. This wooden support not only allows the capillary tube to be fixed in a stable manner, but also allows it to be anchored in a way that is resistant to tearing due to the waves, and also separates the lower part of the buoy in contact with the water, and therefore more subject to infiltration, from the upper hemisphere of the buoy which contains the circuitry. This ensures that each board is impervious to water infiltration, which would inhibit their operation and damage them.
In fact, the circuits rest on the wooden base that separates the two hemispheres of the buoy.
In particular on this base are placed an Arduino board to which are connected the wires coming from the capillary tube, and B-L072Z-LRWAN1 LoRa®/Sigfox™ Discovery kit connected on pins TX and RX to the Arduino board from which it receives data.
In the circuitry part of the buoy there is also a rechargeable battery, a TP4056 battery charger module.

This receives voltage from the two solar panels on the top of the buoy. Also in this part is an antenna for transmitting LORAWAN data to the concentrator located remotely on the shore (see photos).





The Coast Lorawan Concentrator Technical Specifications

The B-L072Z-LRWAN1 board can connect to The Things Network as a device and send data to a maximum distance of a few kilometres. In order to extend the coverage of the TTN network I planned to buy and assemble a Gateway following the instructions in the guide https://github.com/ttn-zh/ic880a-gateway/wiki .