



PReparedness for **O**perational **M**onitoring and **P**rediction of contaminant Transport in the Sea (PROMPT)

2ND TECHNICAL REPORT

CALL: UCPM-2022-PP

Port of Tripoli (OEPT)

31 March 2023



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Introduction:

The main transport mode for global trade is ocean shipping: around 90% of traded goods are carried over the waves.

It is estimated that there are between 25 and 40 million containers currently in use. A very small number of these will go missing, either out of oversight or due to rough seas.

Most containers sink quite rapidly to the ocean floor once they hit the water. But depending on their contents, they may stay afloat for days or even weeks before sliding beneath the surface. It may take even longer for refrigerated containers on account of their buoyant insulation.

Dimensions of a standard shipping container:

Standard ISO dry containers are 7.8ft (2.3m) wide, 7.9ft (2.3m) in height, and come in two lengths: 20ft (5.9m) and 40ft (12.03m). These are the most popular container types for shipping dry cargo including machinery, grains, paper and electronics.

Making the container float:

We can analyze the container as a vessel; A 20' box has a volume of just over 38 cubic meters, and a 40' box has a volume of 77 cubic meters.

The density of sea water is 1.025, which increases the volumes (or displacement values) to just over 39 and 79 cubic meters respectively.

The force required to push the box under the water, or to sink it, would therefore have to exceed the volume of water to be displaced – 39 tons and 79 tons.

It seems that if either size of container is watertight (which is rarely true!), then it will float.

So, for an object to float, the density of the container should be less than the density of seawater (1.025 kg/m³)

A Flexitank to help the container float:

Flexitank (Flexibag) is an ideal container alternative to store and transport all kinds of non-hazardous liquid goods.

It is made by reinforced fabric with PVC/ TPU coated and showing a pillow shape when the water storage bladder tank is full.

If filled with air or a liquid with low density, Flexitanks may help the container float, but this will be verified during the real scale exercise.





OEPT team met with WASDI on Tuesday 7 March 2023, to coordinate the real scale exercise for floating containers in the port of Tripoli.

During the meeting, WASDI team stressed on the importance of having thousands of data images of containers to train the artificial models (= to introduce containers to the system), with different satellites, and it was agreed that this could be done by moving the containers on the land so the satellite takes images in different perspectives, before starting the exercise.

Also, WASDI introduced the different types of satellites:

1- Public satellites with low resolution:

- a. Sentinel1 (15m), with a cycle of 2 weeks, these radar sat can reflect small boats with big lights
- b. Sentinel2 (10m), with a cycle of 1 week, images can be colored
- c. Very high resolution (50 to 30 cm)

Public satellites are always spinning around the world.

2- Commercial satellite:

They are more trusted, and we can decide the location we want to cover.

It was agreed that to make the exercise easier:

- Containers should be floating or slightly submerged (we will have 2 containers with different colors for the optical sensors)
- It is better to have less clouds and calm sea (maybe inside the breakwater of OEPT), because it will be challenging if the sea is rough
- Containers should be placed in a way to keep ships entering the port safe
- The container should stay 2 weeks or more in water
- We can anchor the container so that it has a specific perimeter to move in water
- As a second trial, we can move the container in a way to have a different perspective, or we can remove some air from inside to be less submerged

Finally, WASDI will provide us with the appropriate timing for the experiment, after talking to satellite providers (End of June is a suggested date).