



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
CAMPUS DI FORLÌ



blueMed

28th of May 2020

WEBINAR WITH STAKEHOLDERS

SEDIMENT MANAGEMENT IN HARBOURS AND OTHER WATER BASINS

Italian innovation that can be adopted in Lebanon

Possible applications of the ejector technology in Tripoli harbour: a preliminary assessment

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ECOMEDPORT Start-up Action

AGENDA

SITE DESCRIPTION: RELEVANT INFORMATION FOR EJECTORS PLANT DESIGN

TRIPOLI HARBOUR FRAMEWORK: A LITERATURE ANALYSIS

WHICH APPLICATIONS FOR THE EJECTORS TECHNOLOGY IN TRIPOLI HARBOUR?

CONCLUSIONS



Relevant information for ejectors plant design

General information about port/harbour framework:

- Description of the activities (industry, fisheries, recreative boating, tourism, ...);
- Ownership (public/private);
- Size of the port (square meters of protected water body, number of boats, number/meters of docks, ...);
- Medium navigation depth (also desired);
- Detailed map in DWG or other format, if available.



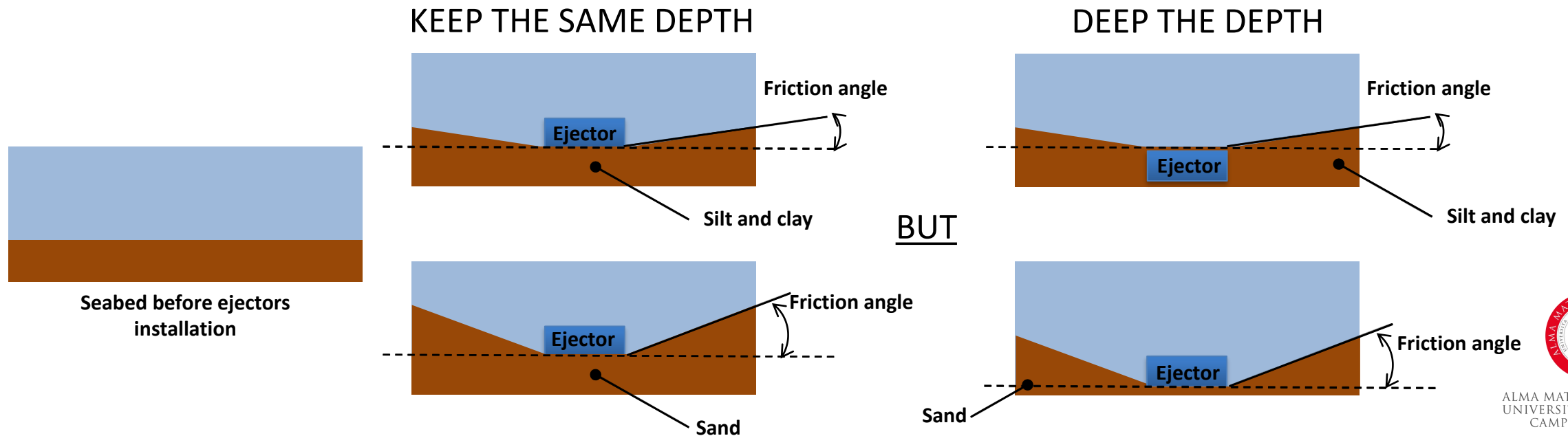
Relevant information for ejectors plant design

Data about chemical-physical characteristics of the sediment to be handled.

The relevant data are:

- **Granulometry** (i.e. % of sand, clay, silt in the sediment),
- Presence of contaminants/pollutants.

Why sediment characterization is so relevant? EXAMPLE:



Relevant information for ejectors plant design

Include data from the last 5-10 years (taken from bathymetries if available or taken from other sources) about **how water depth changes over time**.

Sediment dynamic is crucial because the ejectors aim to put the sediment back on the good route to be transported away from the area affected by accumulation.



Relevant information for ejectors plant design

Include data from the last 5-10 years about **dredging or propeller movement operations** carried out in the area, including quantity of sediment handled, period of dredging, area of operation (i.e. port inlet, specific docks, ...), dredged sediment destination (i.e. landfill, beach nourishment), dredging cost.

Year	Operation: Dredging or propeller movement	Area	Sediment handled (m ³ or tons)	Duration (n° of days)	Cost

What about **permit/authorization**?



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Tripoli harbour framework: a literature analysis

Sediment characteristics: clay matrix (more info needed).



[1] Pb, Cd and Cu distribution and mobility in marine sediments from two ports in Lebanon: Beirut army naval port and Tripoli fishing port, 2016.

[2] Organic pollution in surficial sediments of Tripoli harbour, Lebanon, 2015.

[3] Cooperation development in the Mediterranean fishery sector: the labour context and the producers associations, 2011.

[4] Evaluating sea water quality in the coastal zone of North Lebanon using Telemac-2D, 2009.

[5] Water quality assessment of Lebanese coastal rivers during dry season and pollution load into the Mediterranean Sea, 2007.



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Examples of applications

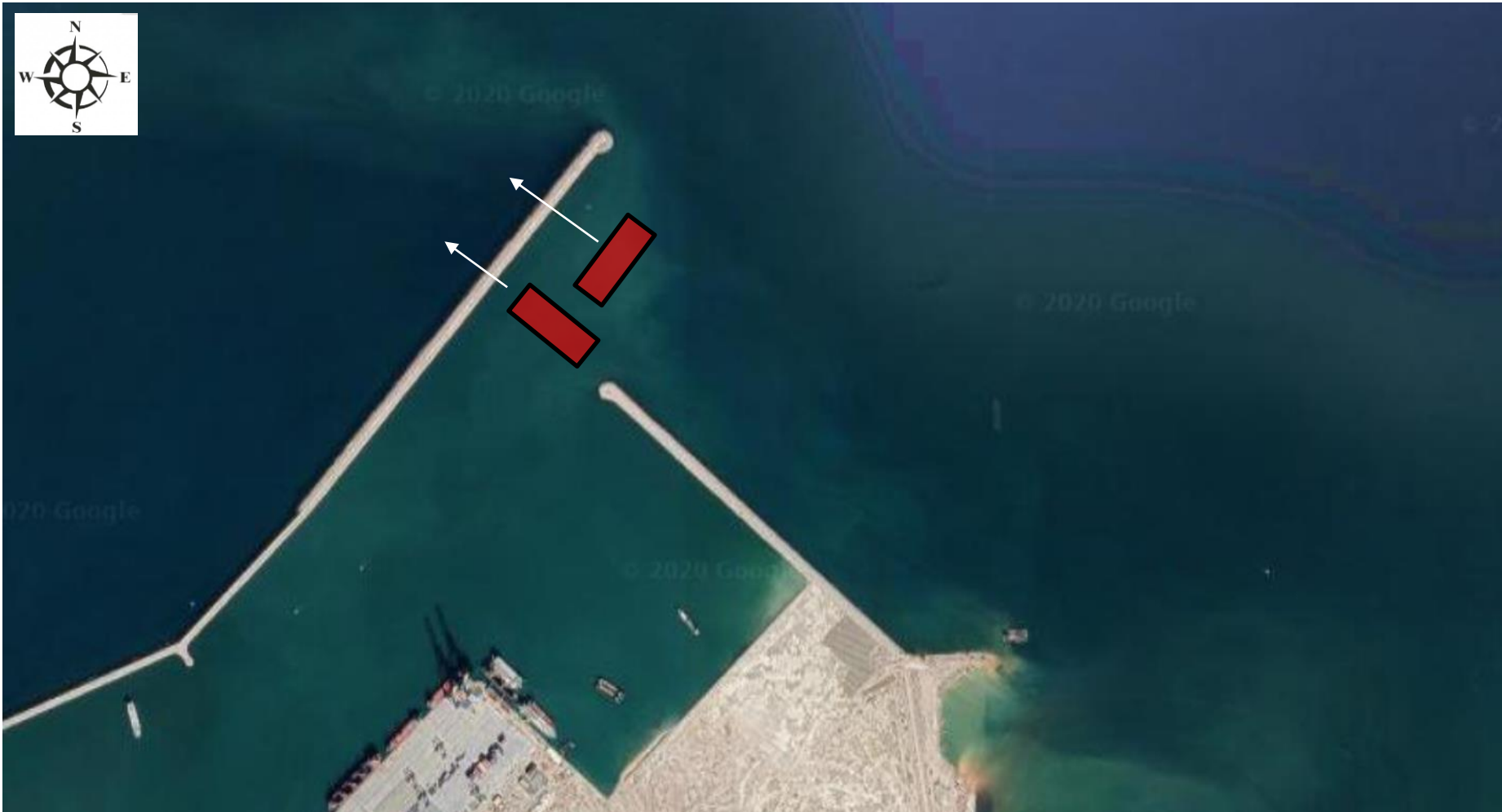


 Areas with sediment accumulation risk (to be confirmed)



Examples of applications

1. Port inlet (about 300 meters width)



Area directly influenced
by 20 ejectors
(About 40 m x 200 m)



Examples of applications

2. Fishery port inlet (about 35 meters width)




Area directly influenced
by 10 ejectors
(About 40 m x 100 m)



Examples of applications

3. Dock protection (about 50 meters length)



 Area directly influenced by 5 ejectors (50 m length)



Examples of applications

2. River mouth protection (variable width, about 100 meters length) – Flood prevention!



Area directly influenced
by 10 ejectors
(about 100 m length)



Examples of applications

Let's talk about MONEY!



Costs difficult to estimate with rough data – many variables can affect ejectors plant cost:

1. Number of ejectors (more pipes, more pumps, everything “bigger”);
2. Discharge distance to be covered (the higher the distance, the higher the power needed at the ejector);
3. Electric supply available? (i.e. one ejector with a 60 m discharge pipeline needs about 3 kW at maximum rate);
4. Find a location for the pumping/filtering cabin;
- ...

A **preliminary feasibility study** is needed to reduce the **uncertainty**...



Examples of applications

Let's talk about MONEY!

... but we can say (more or less):

Bear in mind the renewables option!

#PLANT	EJECTORS	DISCHARGE LENGTH	MEAN POWER	MEAN ENERGY	PLANT COST (**)
1. PORT INLET	20	> 120 m	100 kW	860 MWh/year	1.5 Mil €
2. FISHERY PORT INLET	10	about 90 m	40 kW	340 MWh/year	0.8 Mil €
3. SINGLE DOCK	5	about 120 m	25 kW	215 MWh/year	0.5 Mil €
4. RIVER MOUTH (*)	10	---	---	---	---

(*) really difficult to estimate

(**) order of magnitude, by considering “Italian” costs: $\pm 50\%$ error



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Conclusions

The ejectors plant technology have a **great replication potential** in the area of Tripoli harbour.

More information are needed to better identify size of **critical areas**.

More information about **sediment characteristics** and **accumulation dynamic** are needed to optimize plant design (i.e. number of ejectors).

ECOMEDPORT start-up action aims to complete a **feasibility study** for ejectors plant replication in Lebanon: next steps are i) to select one or more critical areas and ii) to preliminary design one or more systems.





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