



Arab Academy

for Science , Technology and Maritime Transport



The International Maritime Transport
and Logistics Conference

“MARLOG 13”

Towards _____
**Smart Green Blue
Infrastructure**

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Effect of Human Interventions on Hydro-dynamics of Sidi-Abdel Rahman Bay

“North Western Coast of Egypt”



Introduction

The study area located at Sidi Abdel Rahman Bay the northwestern coast of Egypt



Introduction

Natural processes, man-made structures, and coastal development have all contributed to ongoing changes in coastal zones

This erosion led to the loss of beach sand from the northern part of some beaches that are obviously redeposited southward.

Problem statement

Undesirable coastal changes at Stella and Diplomat beaches



Introduction

The aims of the study

To assess the shoreline changes during the interval between (2003-2021) in the study area of Sidi Abdel Rahman Bay

To achieve this aim

Digital Shoreline Analysis System software (DSAS)

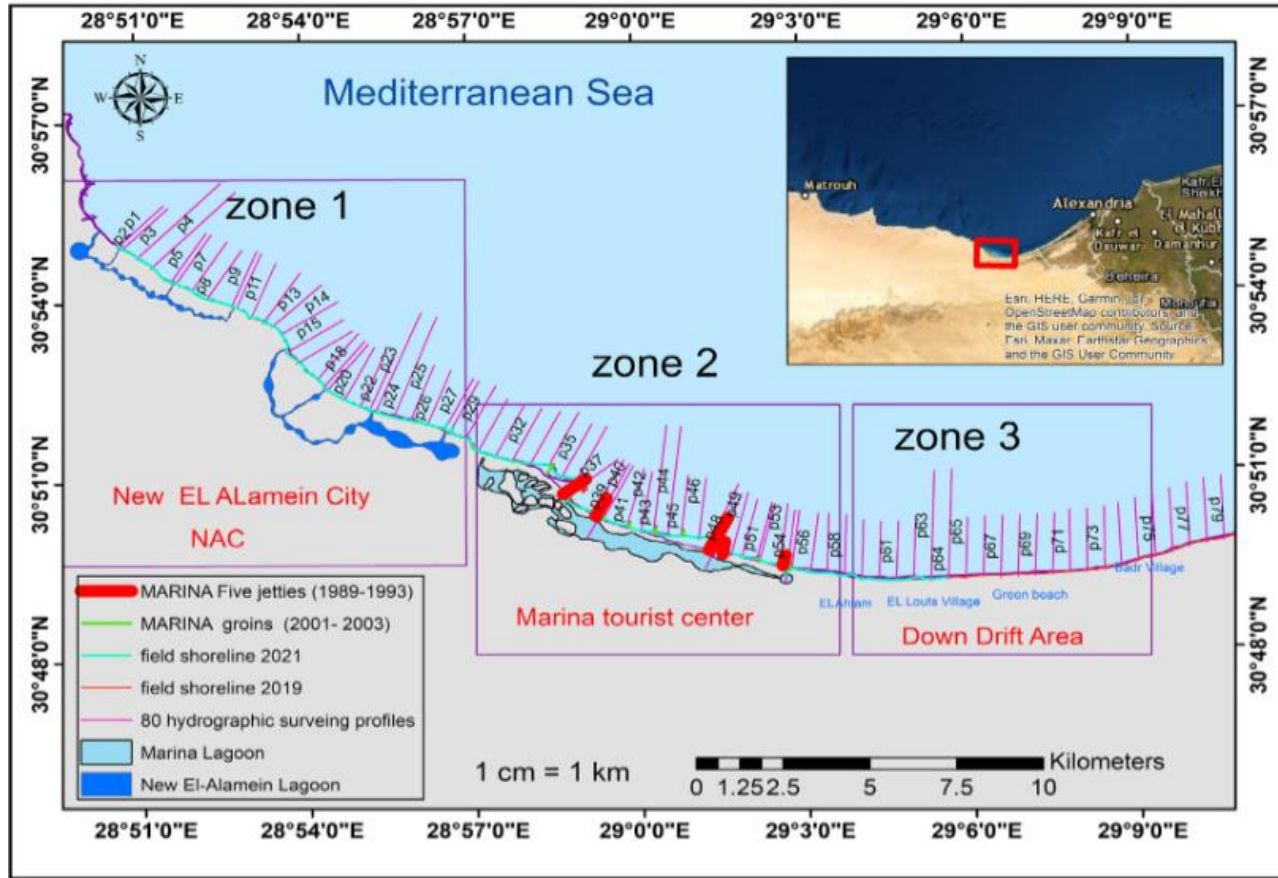
Also to evaluate the impact of the constructions of Marceillia and Hacienda Villages and the prediction of their future position in this area.

To achieve this aim

Littoral Processes (LITPACK)

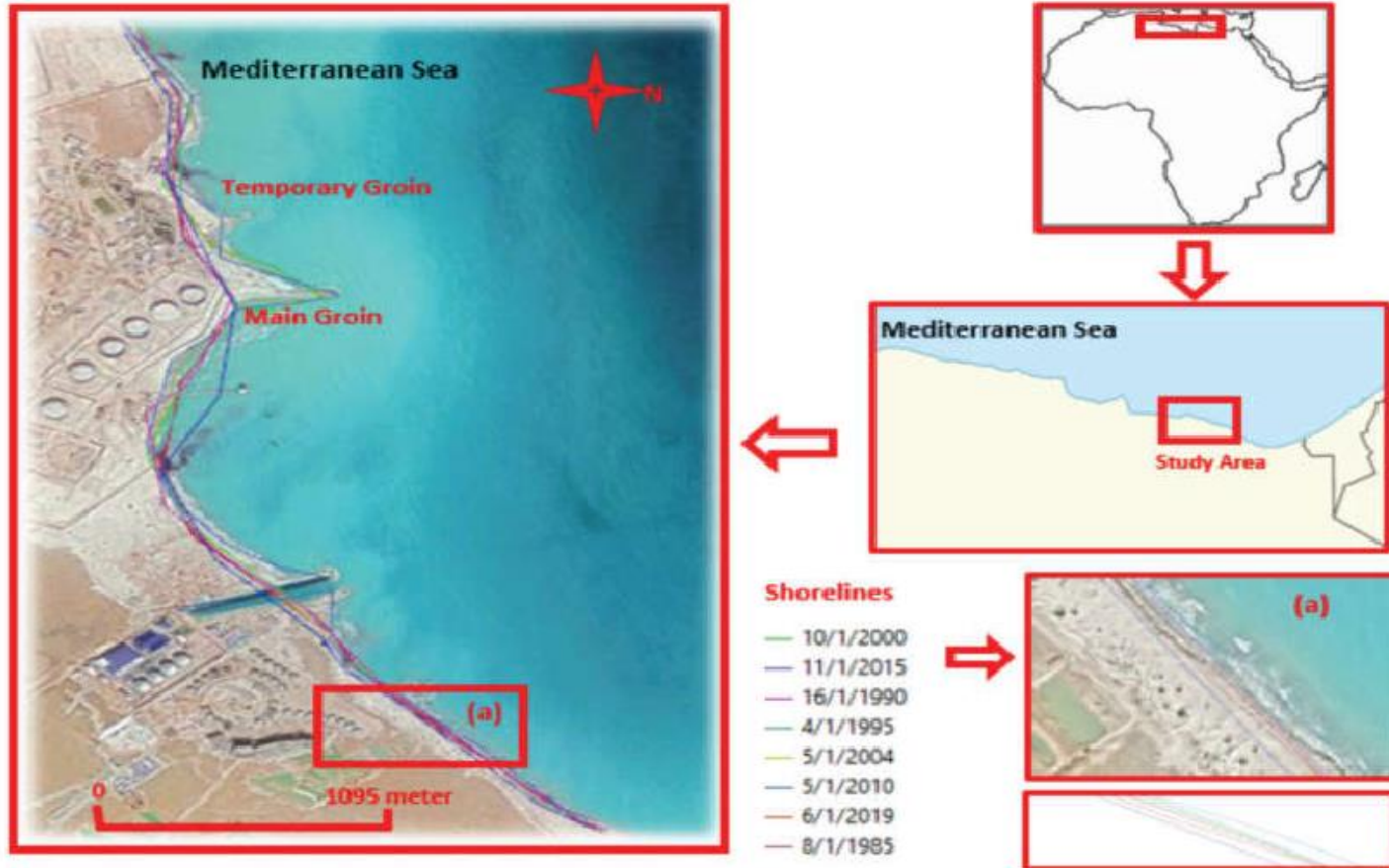
Literature Review

Elstohey et al. (2023)



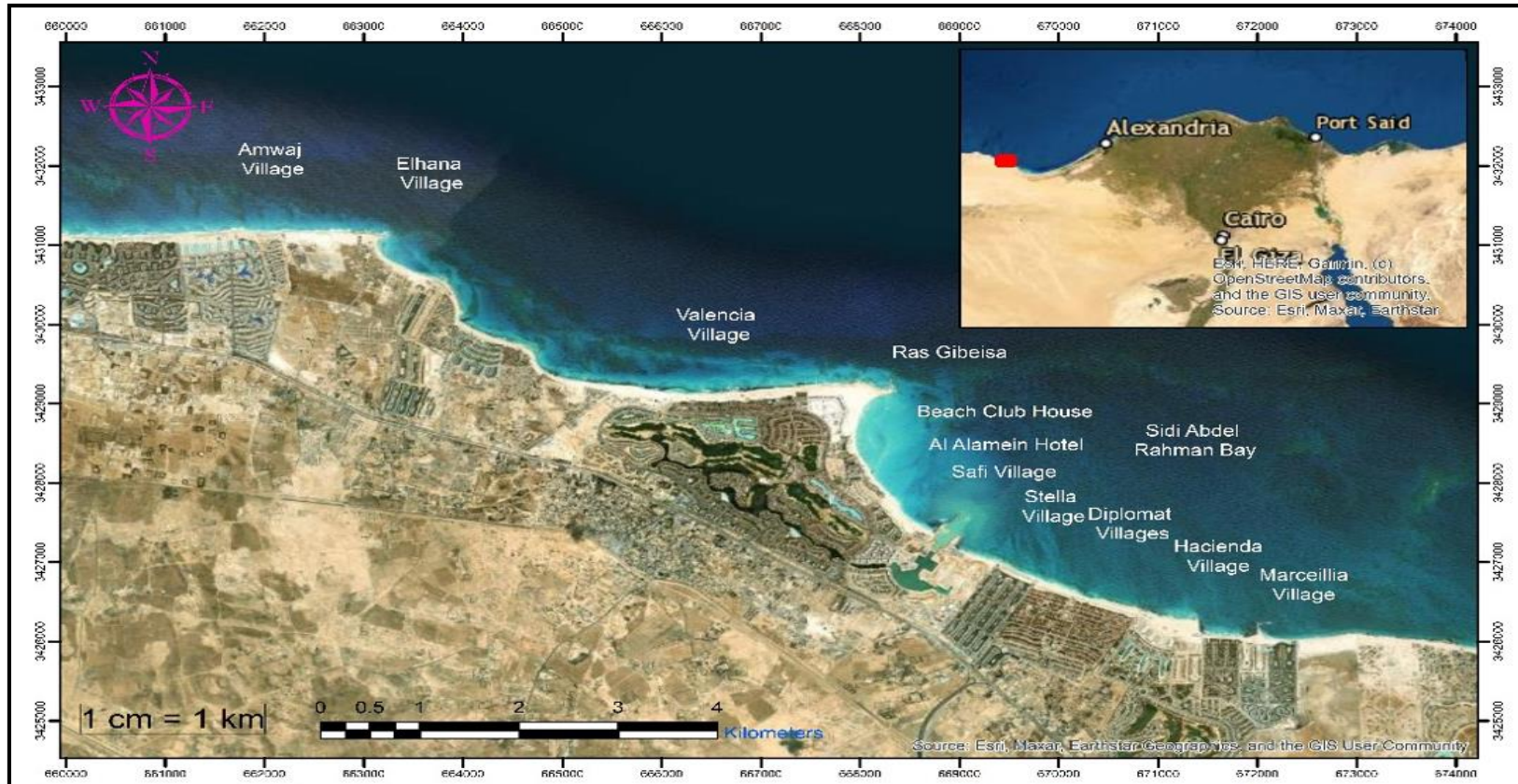
Literature Review

Sarhan et al. (2020)



The study area

The study area located at Sidi Abdel Rahman Bay the northwestern coast of Egypt



Assessment of shoreline change (DSAS)

The zones of the study area



Methodology

Assessment of shoreline change (DSAS)

satellite data

Image processing

Shoreline digitalization (DSAS)

Shoreline(2003-2021)

Baseline

Transects
(10 m interval)

Calculate Shoreline change statistics

EPR

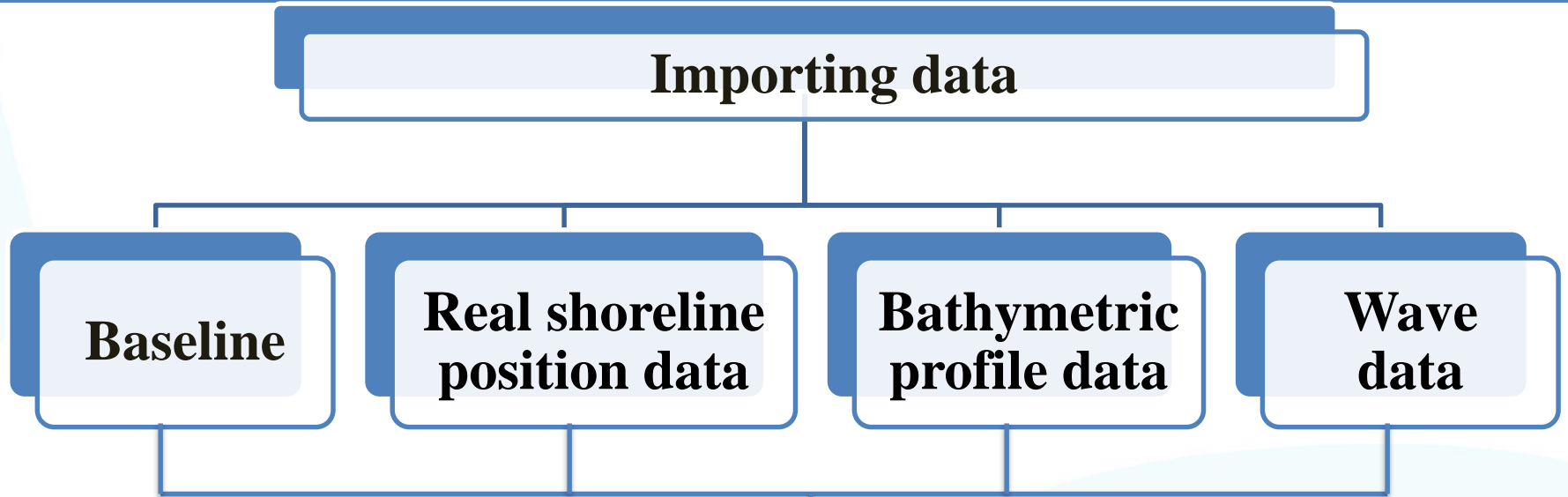
LRR

SCE

NSM

Methodology

Evaluation the impact of the constructions of Marceilla and Hacienda Villages (LITPACK)

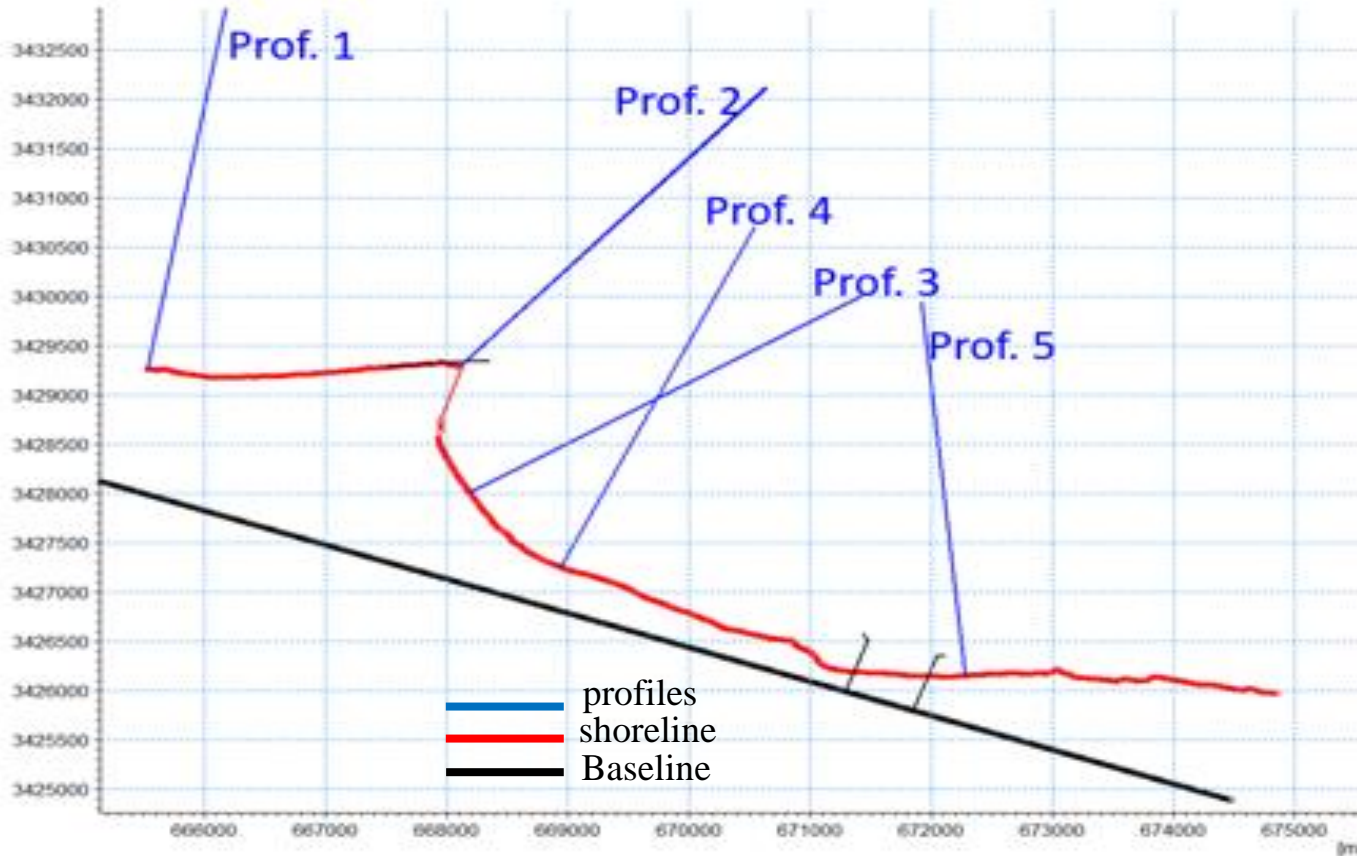


Calibration process (Marciella and Hacienda shoreline changes during the period between October 2016 to January 2021)

Validation process

Methodology

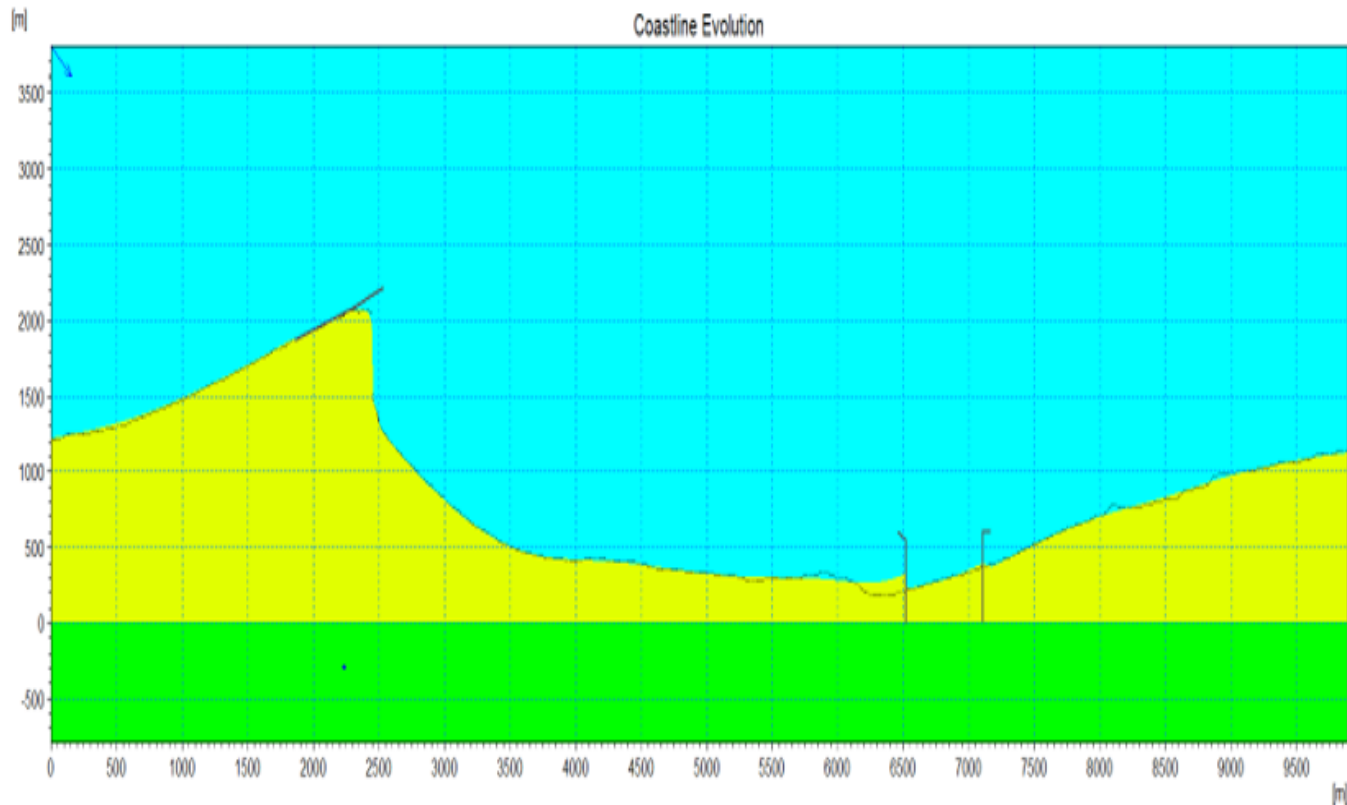
LITPACK



**The Effect of
Marciellia and
Hacienda
Constructions
(October 2016-
January 2021)**

Methodology

LITPACK

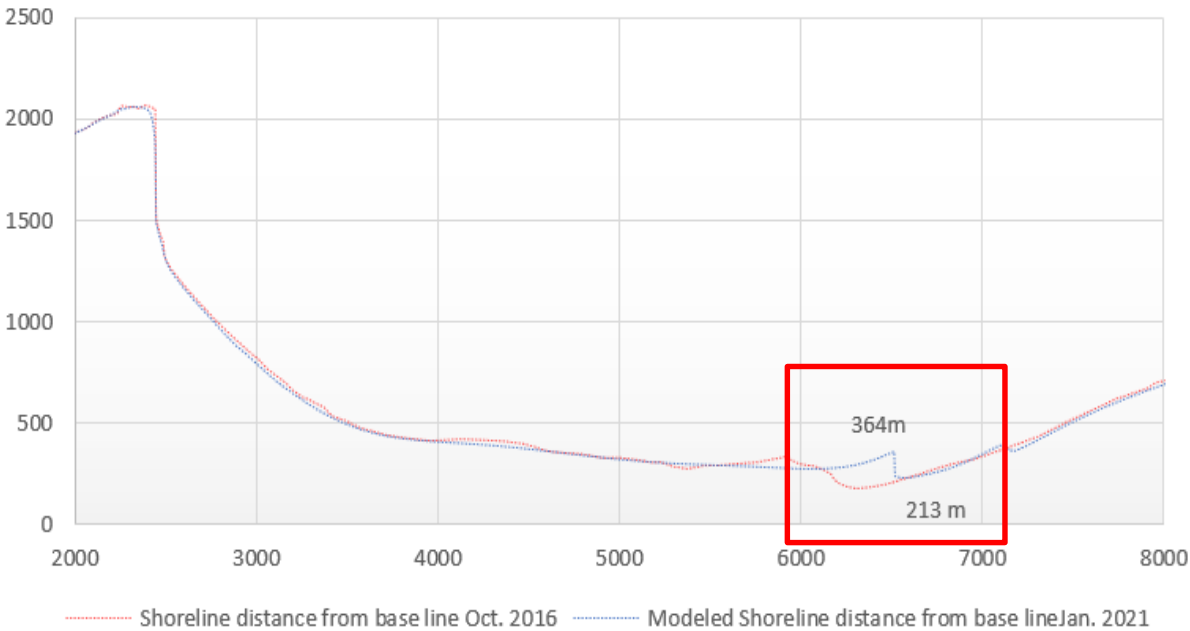


The shoreline changes due to the construction of Hacienda and Marciellia

Methodology

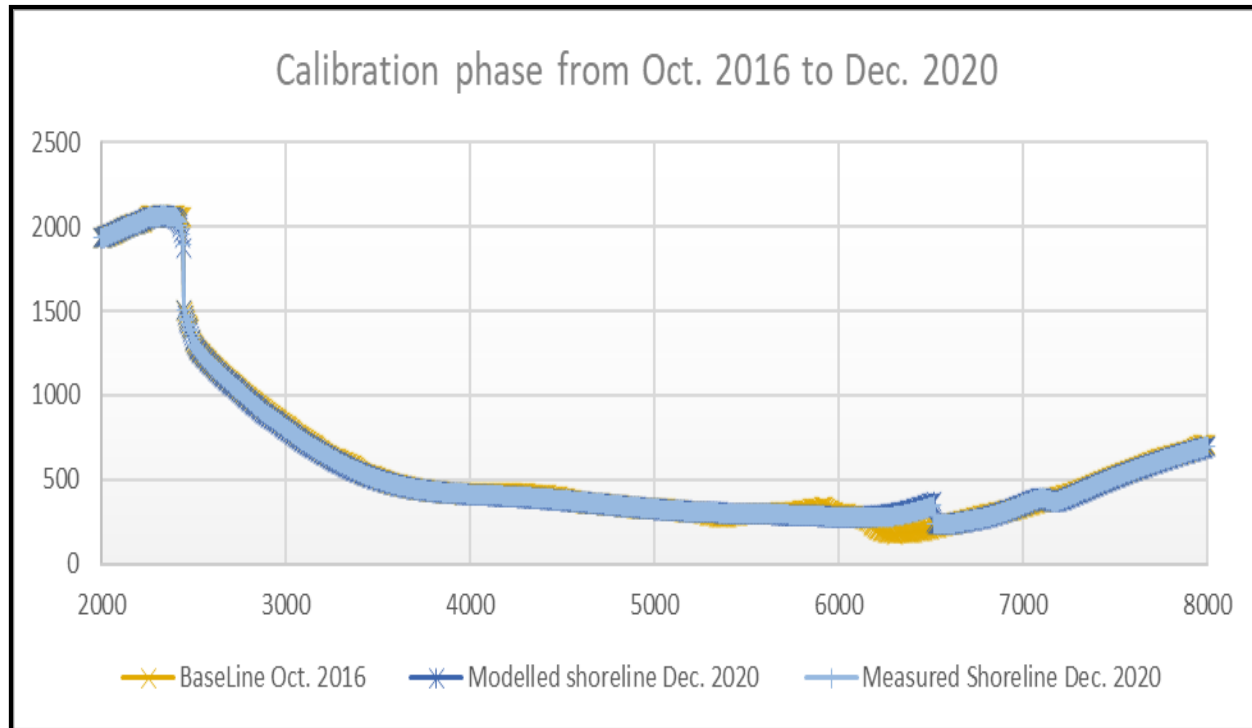
LITPACK

Modeled shoreline change from Oct. 2016 to Jan 2021 at Hacienda beach



Methodology

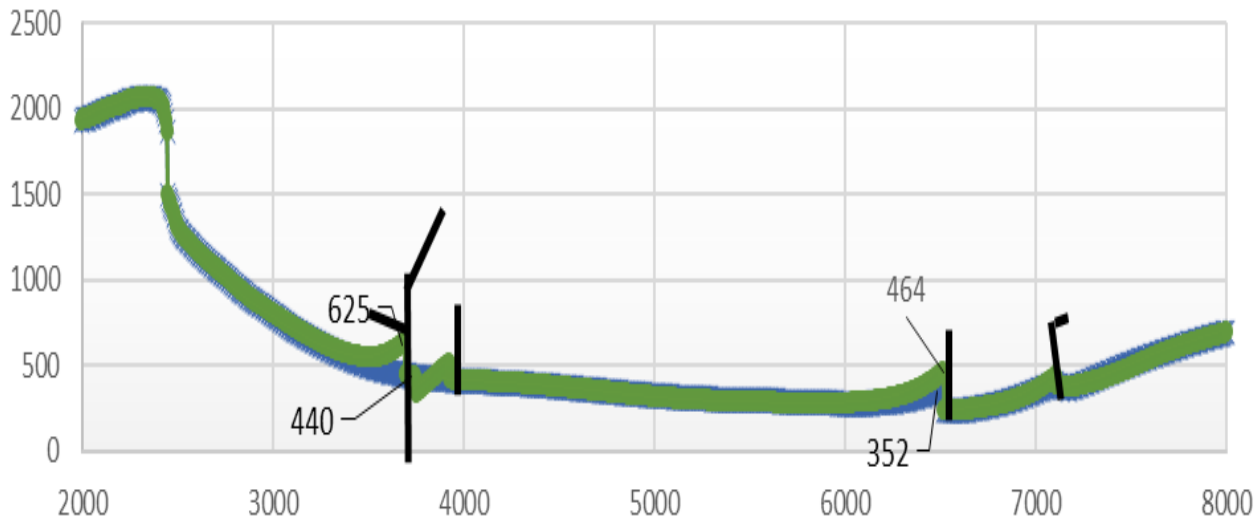
Calibration process



Methodology

The validation process

Validation phase (Jan. 2021 to Aug. 2021)



—*— Modeled Shoreline distance from base line Jan. 2021

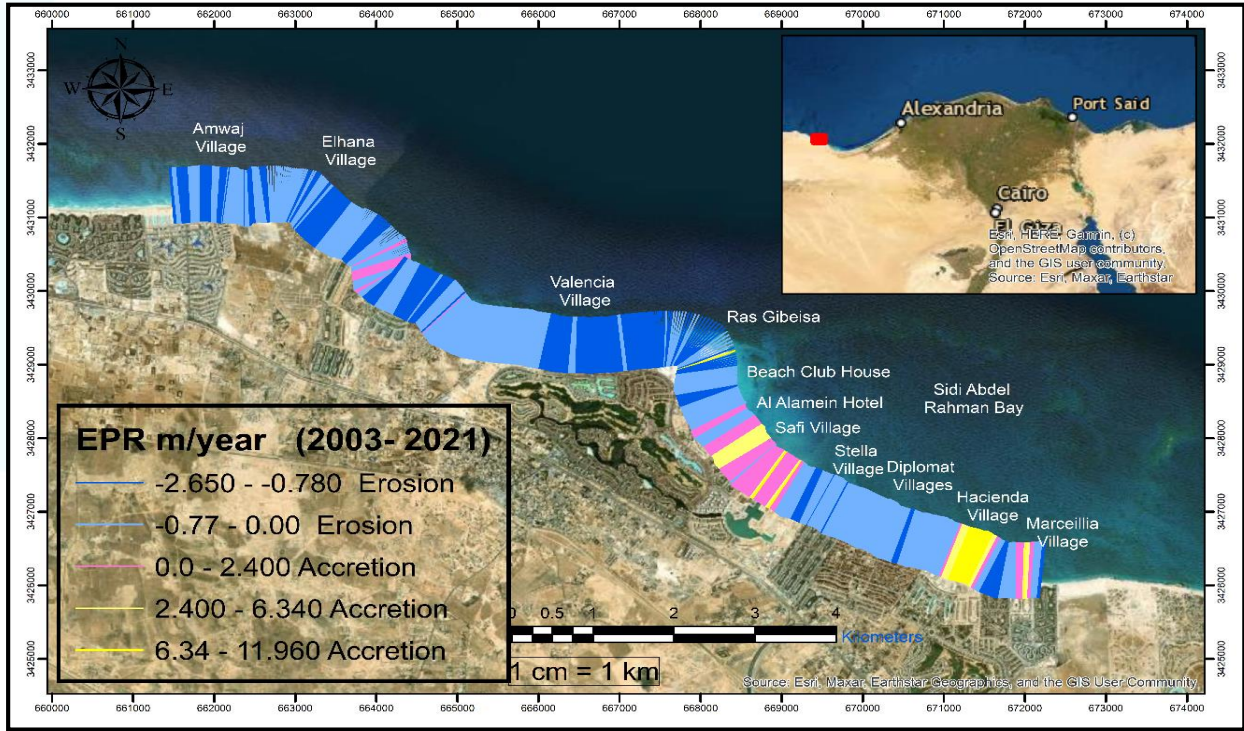
—●— Modeled Shoreline construction phase Jan 2021 to Aug 2021

Marassi breakwaters



Results

Assessment of shoreline change (DSAS)



Zone	Min	Max	Remarks
z1	0	-2.65	Erosion
z2	0	6.340	Accretion
z3	0	-0.77	Erosion
z4			
z5	2.4	11.96	High accretion

Results

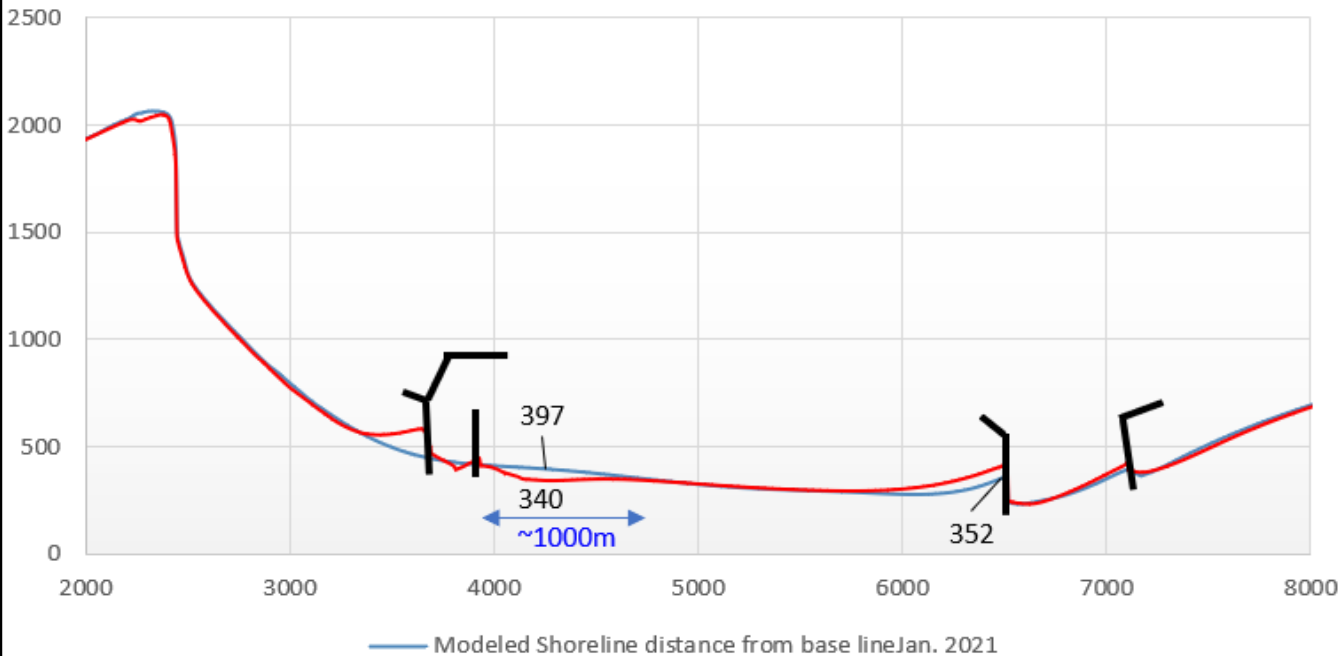
Assessment of shoreline change (DSAS)

Zones	LRR		NSM		SCE		Remarks
	Min	Max	Min	Max	Min	Max	
z1	0	-4.65	6.78	-47.08	-0.77	-2.650	Erosion
z2	0	4.87	6.78	112.42	0	6.340	Accretion
z3 z4	0	-0.63	6.78	-47.08	-0.77	-2.650	Erosion
z5	0	15.02	6.78	212.17	2.4	11.96	High accretion

Results

LITPACK

Effect of 5 years after construction



The numerical model output for shoreline position prediction after the construction of Marassi coastal development for 5 years (2022-2027)

Results

The numerical model has shown that the area will suffer intensive erosion for around 1000 m distance with an average annual rate of 12m/year

Conclusions

A well-considered **comprehensive study** must be performed before any construction of manmade structures to understand the shoreline's response to these structures.

The **shoreline location** is an important indication of study because it represents beach vulnerability tendencies to erosion, which has ramifications for tourist development

Sidi Abdel Rahman Bay is an **unstable location** with a variety of natural and manmade factors that contribute to erosion, thus increasing the need for the construction of several effective types of coastal defense along this coast. During the study period, the beach eroded in several portions.

Conclusions

After using **DSAS** for shoreline assessment the results showed two regions with maximum erosion rates, the first region starting from Amwaj to Ras Gibeisa, and the second region of erosion is the area of Stella and Diplomat villages


While there is **accretion** in the area of Safi village to the beach clubhouse and this is because of Ras Gibeisa headland which acted as a natural protection method

There is clear **accretion** in the Hacienda village coast because of that constructed groyne.


Conclusions

The **LITPACK** model was calibrated and validated by comparing the model results with the actual shoreline position from Google Earth Images. After the calibration and validation, the future prediction simulation was set up to evaluate the shoreline position after the construction of the Marassi coastal development for 5 years, the results showed that the area will suffer intensive erosion for around 1000 m distance with an average annual rate of 12m/year


Recommendations




Regular and continuous analyses of the shoreline, to know, understand and predict shoreline changes



The appropriate choice of the suitable hard protection structure in the area of the eroded beaches whether the usage of a set of groynes or breakwater



The study suggests that a nourishment scheme can be employed with the hard structure protection in the placement of borrowed compatible sand in terms of grain size directly into the eroded beaches.



We recommend for future studies to use the 2D mathematical models to assess the optimum solution to mitigate the significant erosion in front of the study area



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Thank You

