



2023-06-17, Sentinel-2 (overlay: coastline change since 1985)

The coastline at the Nile mouth near Alexandria is defined mainly by the balance of sediment deposition by the Nile River and its removal by the Mediterranean Sea.

The sediment load of the Nile River was significantly reduced by the Aswan High Dam located about 1000 km upstream, which was completed in 1970. Before the construction of the dam, the Nile Delta received an annual sediment load of approximately 130 million tons. Today, this figure has dwindled to around 16-20 million tons, leading to reduced natural replenishment of the coastline.

Over the past century, the Mediterranean Sea has seen an average sea level rise of about 3.4 millimetres per year due to global warming. This leads to an additional substantial increase in coastal erosion and vulnerability to storm surges.



2002-06-17, Landsat 7

Based on satellite data, coastal erosion around Alexandria has been estimated at around 1 meter per year in certain areas. This rapid rate of erosion threatens infrastructure, coastal communities, and agricultural lands. Alexandria is Egypt's second-largest city and home to over 5 million people. Many of the residents rely on agriculture, fisheries, and tourism, all of which are directly or indirectly affected by changes in the coastline. Therefore, Egypt combats coastal erosion around Alexandria and has, for example, spent 21 million Euro in 2018 for this task.



1985-06-10, Landsat 5

Exercises

- Look at the satellite images and try to identify areas with different land cover and landuse.
- Compare the satellite images from 2002, 2016, and 2023 and try to identify changes in the landuse. Focus on settlements, agricultural land, and aquaculture.
- What is happening with the coastline?
- Based on the satellite images, estimate the maximum retreat of the coastline near the river mouth since 1985.
- Can you find structures along the coast, which might have been made to reduce the retreat of the coast down?

Additional Material



View of Damietta (photograph: Mohamed Eissa)

Links and Sources

- https://www.esa.int/ESA_Multimedia/Images/2019/02/Changing_Nile_Delta_seen_by_Proba-V - changes in the Nile Delta on a smaller scale.

Material

Section:	<i>Hydrosphere</i>
Theme:	<i>Flooding</i>
Case study:	Plattsmouth
CS-ID:	HYD15_1
	0.0
Teaser	Plattsmouth – Flash flood at the Missouri River
Background / Intro	<p>The 2019 flooding around Plattsmouth, Nebraska, was a catastrophic event that brought immense devastation to the region. Triggered by a combination of factors, including heavy rainfall and snowmelt, the flooding inundated homes, farms, and infrastructure along the Missouri River.</p> <p>Climate change played a role in this event, as rising global temperatures are leading to more extreme weather patterns, with heavier precipitation and increased risk of flooding. In the case of Plattsmouth, the area experienced record-breaking rainfall, with some areas receiving over 50 cm of rain in a single month. This excessive rainfall, combined with the saturated ground from earlier precipitation, overwhelmed the river's capacity to contain water.</p> <p>The flooding affected over 2,000 homes and forced the evacuation of nearly 1,000 people in the Plattsmouth area. It caused millions of dollars in damages to homes, infrastructure, and agriculture, disrupting the lives of countless residents.</p> <p>Satellite images captured the dramatic expansion of the floodwaters, which swallowed entire communities and vast swaths of farmland. Moreover, the data allow for accurately estimating the affected areas and the damage caused by the flood.</p>
Other material	
Maps	<p>Direct comparison</p> <p>Sentinel-2 with/without activated M.O.S.E.</p> <p>Detail?</p>
OL Realisation	<p>Time Series</p> <p>To be updated – cycle: 5 years</p>

Exercises	1.
Data	Landsat
PDFs	
See also	(internal links to other case studies)
External Links	https://www.esa.int/ESA_Multimedia/Images/2021/11/Las_Vegas_USA https://www.esa.int/ESA_Multimedia/Keywords/Location/Las_Vegas/(result_type)/video https://www.nasa.gov/mission_pages/station/multimedia/gallery/iss026e006255.html (Las Vegas at night, ISS image from 2010; city raster structure) https://svs.gsfc.nasa.gov/10721 (time series 1972-2021)
Link to Book	Page XX
Sources	https://www.bbc.com/news/world-africa-66799518

<https://landsat.visibleearth.nasa.gov/view.php?id=149151>

<https://atlasofthefuture.org/project/mose-project/>