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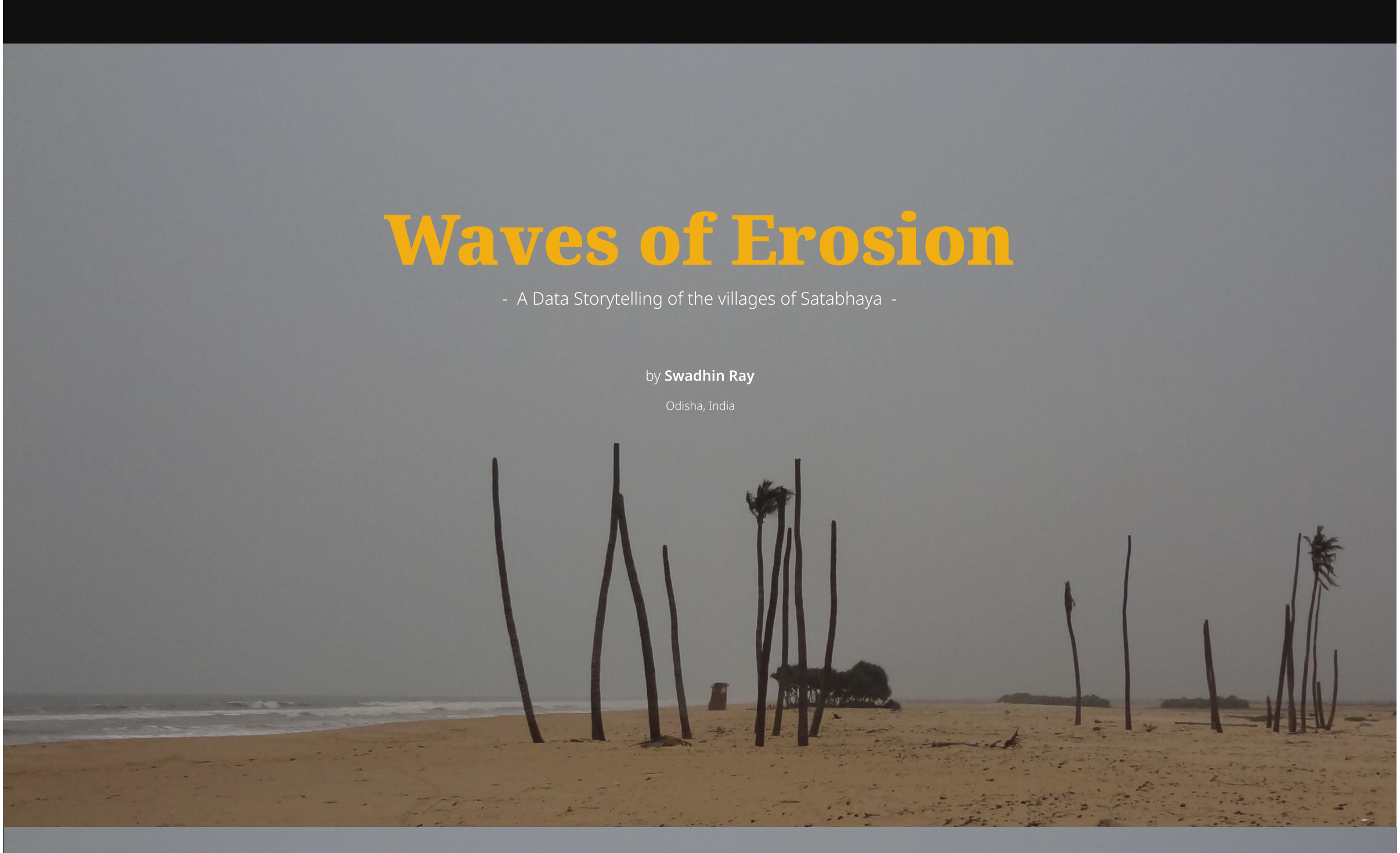


Waves of Erosion

- A Data Storytelling of the villages of Satabhaya -

by **Swadhin Ray**

Odisha, India

"Some were rich there, some were poor, in the new land, we all have become equal"

An elderly villager, age 62, who faced multiple cyclones in his life in 1971, 1982, 1999 until today.

"Sea made us, sea ruined us"

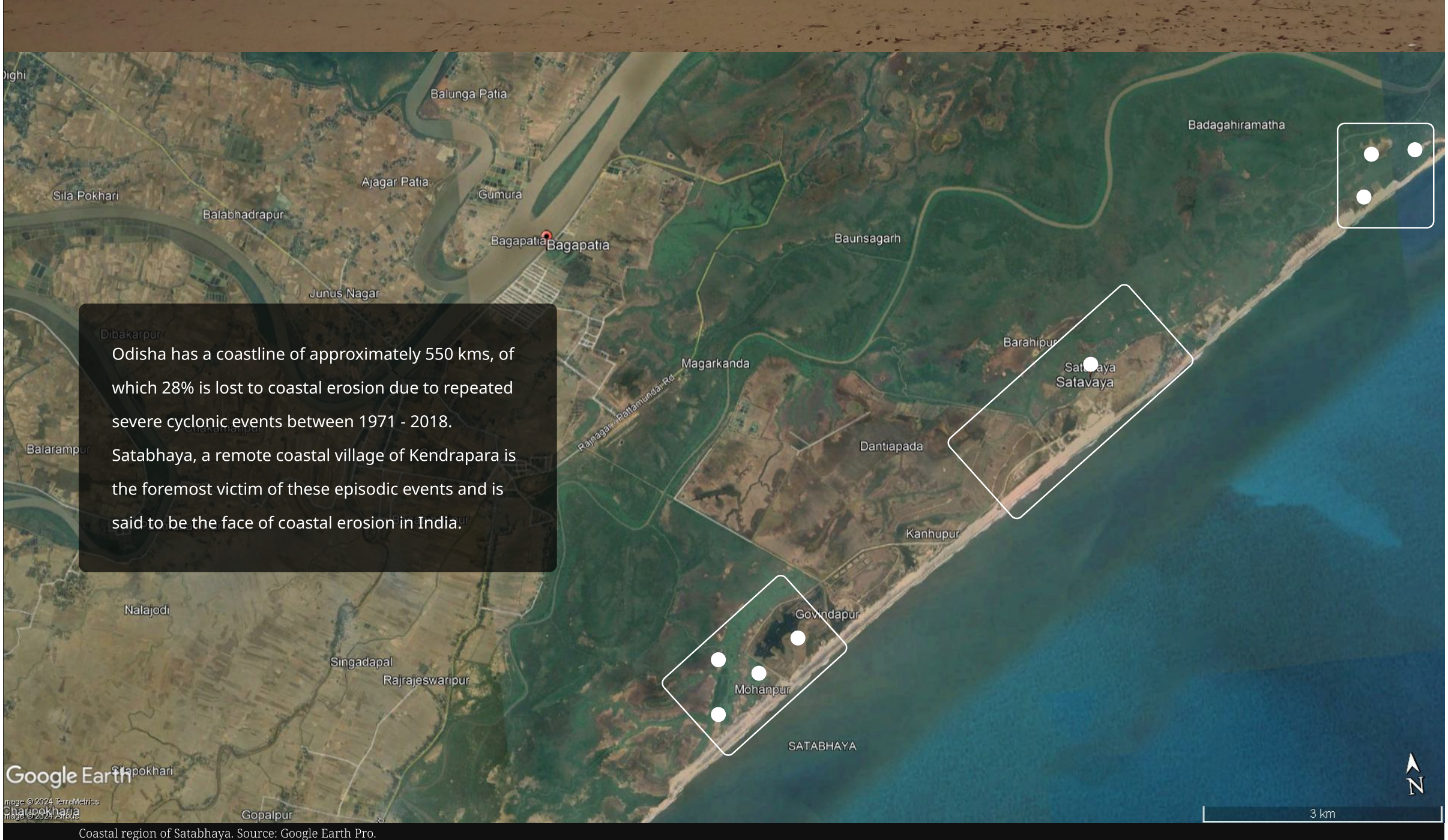
Sudarshan Rout, age - 55, was born in Govindpur, had 4 acres out of appx. 2000 acres village agricultural land. But today it is completely inside the sea now.

"Gods went, the temple remains"

Bhaskar Routray, age - 62, a retired local journalist further added, the story of Goddess Panchubarahi of Satabhaya dates back to the time when Bay of Bengal was called Kalinga Sagar.

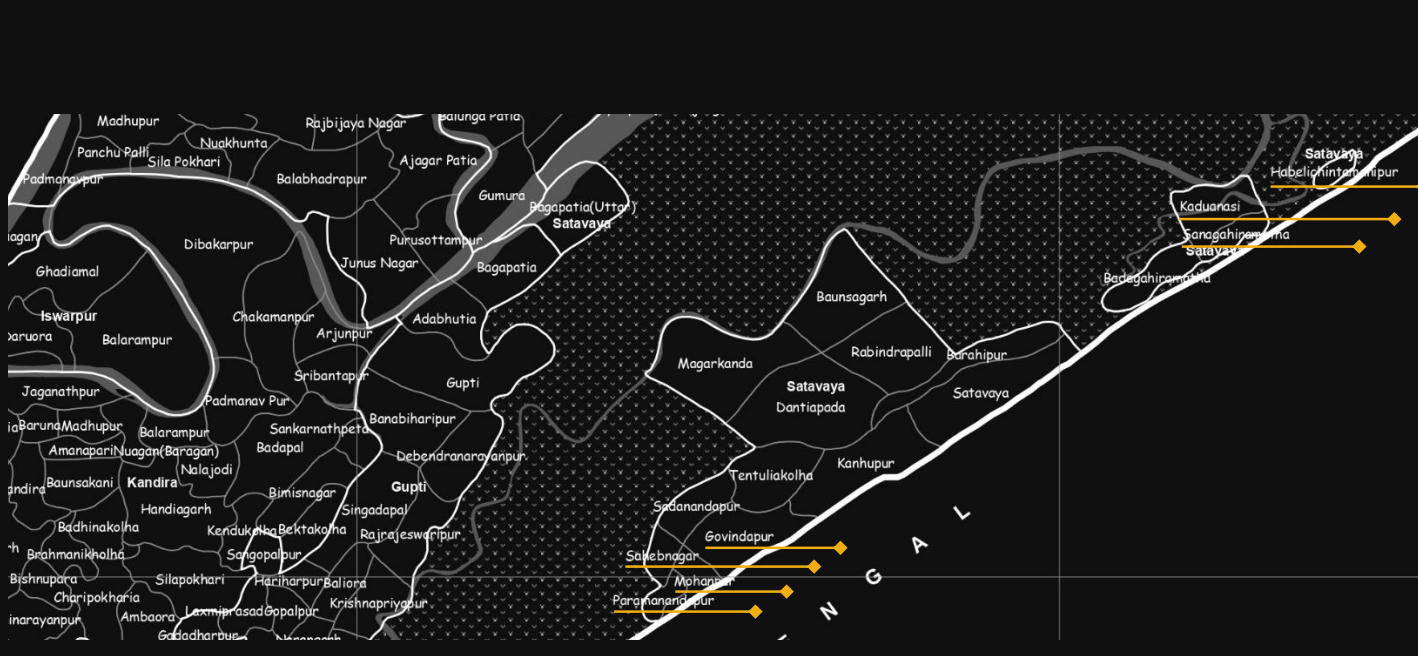
"Roots have weakened, trees have fallen. It is the end of the world, Satabhaya is a no man's land now"

Pabitra Kumar Sahoo, age 37, who used to stay in Satabhaya recalls by saying that around 1982, the shoreline was 1 - 1.5 km away from the temple but today it is just a few seconds away.



Odisha has a coastline of approximately 550 kms, of which 28% is lost to coastal erosion due to repeated severe cyclonic events between 1971 - 2018. Satabhaya, a remote coastal village of Kendrapara is the foremost victim of these episodic events and is said to be the face of coastal erosion in India.

Coastal region of Satabhaya. Source: Google Earth Pro.



7 hamlets of Satabhaya: [from top] HabeliChintamanipur, Kaduanasi, Sanagahiramatha, Govindapur, Sahebnagar, Mohanpur and Paramanandapur.
Source: Odisha Remote Sensing Application Centre, Assembly Constituency Map.

Introduction to Satabhaya

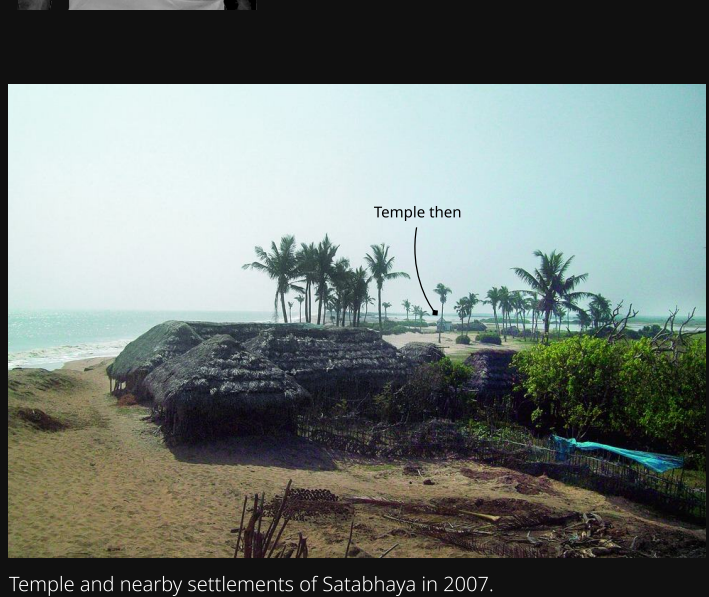
Odisha's coastline is spread across 6 coastal districts namely Ganjam, Puri, Jagatsinghpur, Kendrapara, Bhadrak and Baleshwar. Due to numerous cyclonic episodes starting from 1971 cyclone, approximately 31.02 km of coastline is eroded in Kendrapara district alone making it the worst affected by sea erosion.

In a remote coastal location of Kendrapara, a cluster of seven hamlets, Satabhaya [sata: seven, bhaya: brothers] has the history of being affected by multiple cyclones and rapid erosion by the sea. The cyclone of 1971, the Super cyclone of 1999 and many others until 2018, has affected it's human life and property severely. More than 5000 people have lost their lives, rest have lost their loved ones, washing away more than 600 homes, approximately 2400 acres of cropland got destroyed and salinized due to sea water ingression, temples, high school got destroyed, livestock died and many other incidents occurred parallelly. The frequency and intensity of these storms depend on several climatic factors which have worsened since the 1971 Odisha cyclone and experts link this to coastal erosion with the sea's ingress into the land and the resultant rise in sea levels due to global warming.

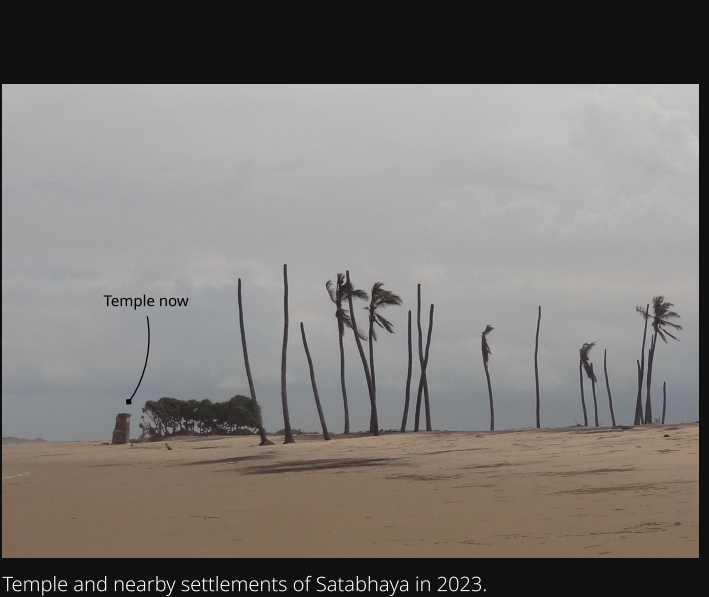
An elderly villager, age 62

Recalled witnessing multiple cyclones in 1971, 1982, 1999, and said,

> *" In 1999, the sea ate my own birthplace in front of my eyes and faded away, after that I left Satabhaya. "*

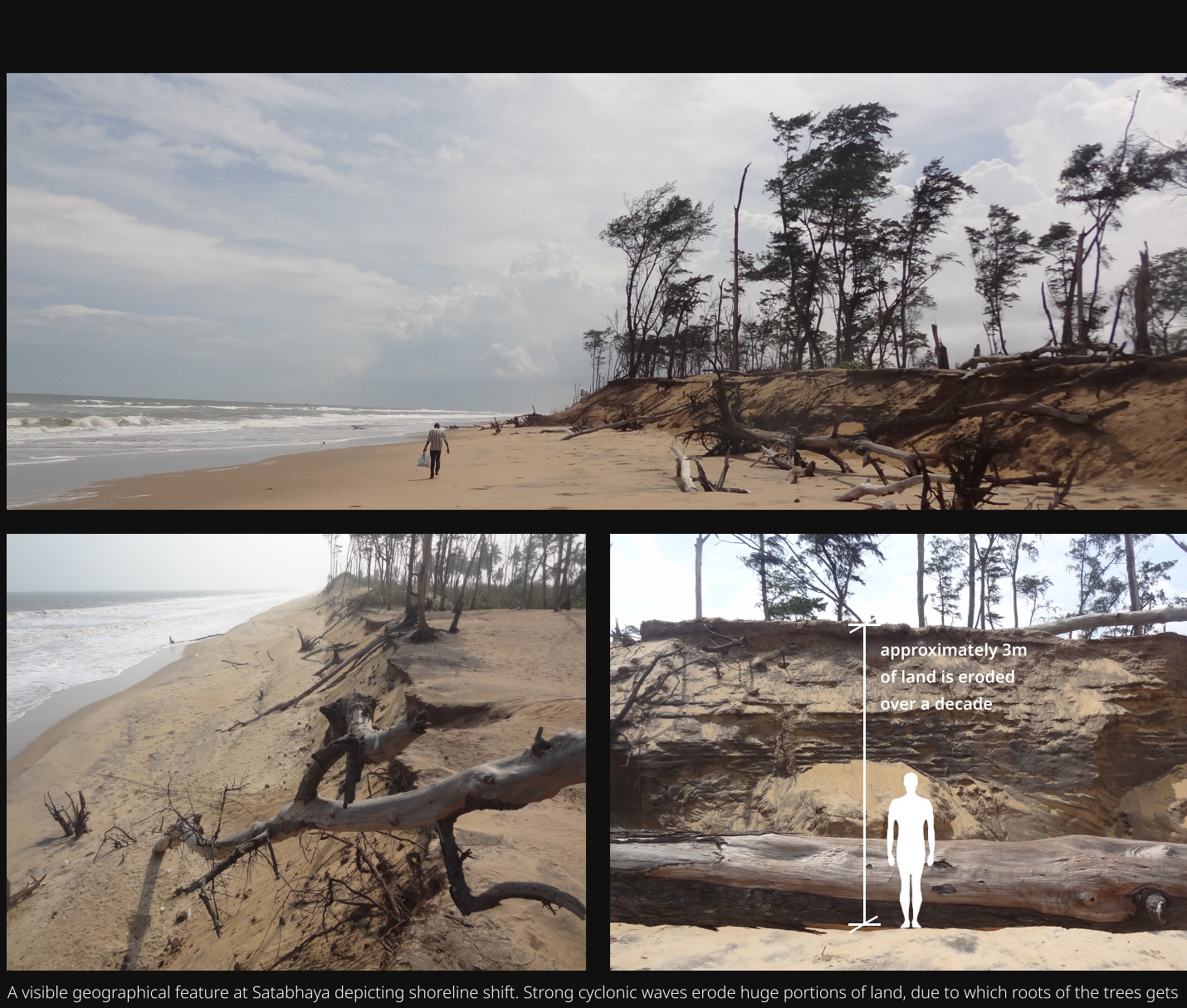


Temple and nearby settlements of Satabhaya in 2007.
Source: Priya Ranjan Sahu



Temple and nearby settlements of Satabhaya in 2023.
Source: Self

* * *

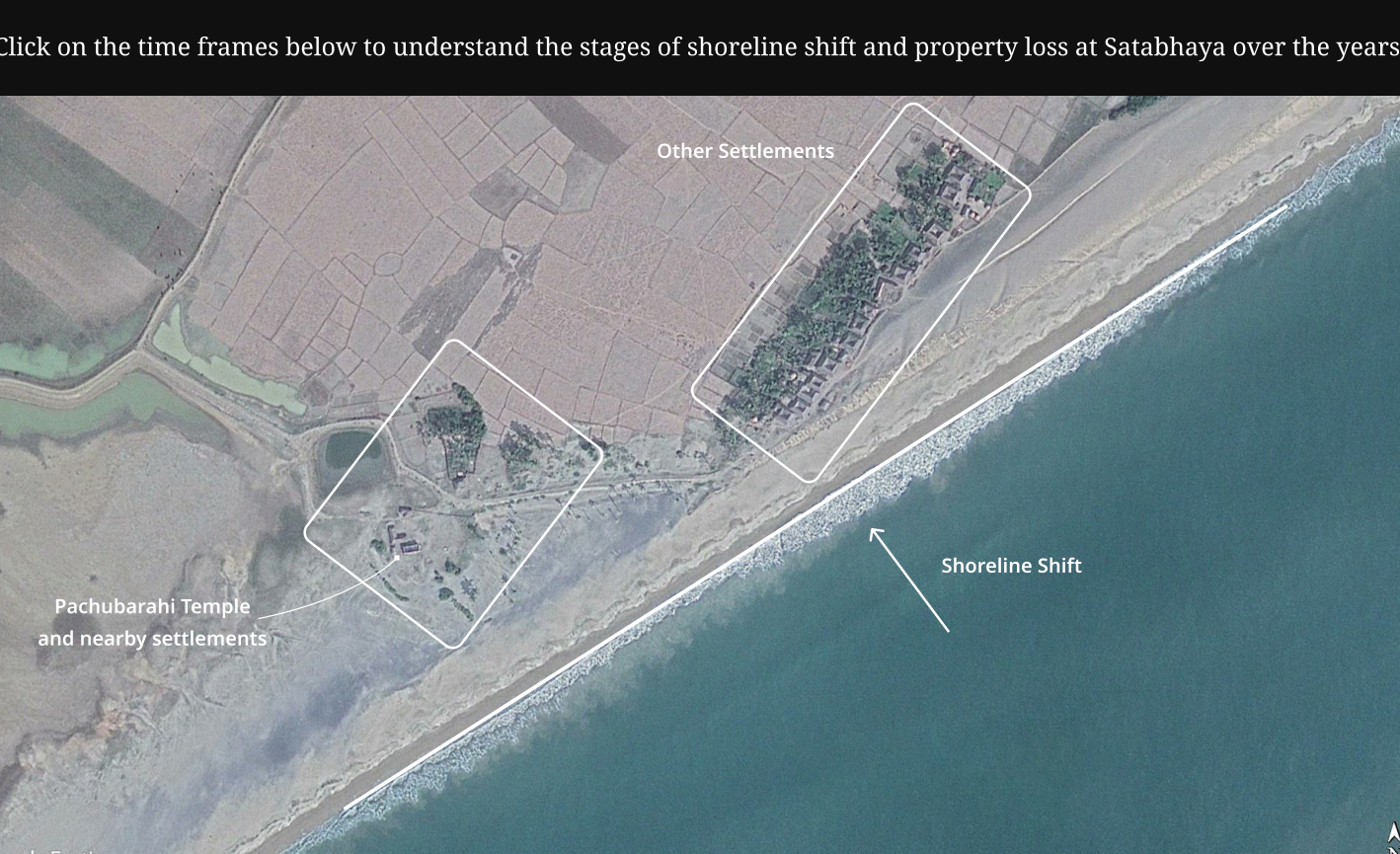


A visible geographical feature at Satabhaya depicting shoreline shift. Strong cyclonic waves erode huge portions of land, due to which roots of the trees gets weak, this results in the land becoming loose and more prone to further erosion. Coastline length of Satabhaya: 17km.
Source: Self 2023.

The Chasing Shoreline

The 17km shoreline of Satabhaya is one of the fastest eroding. During extreme cyclonic episodes waves reach 3-4m in height washing away everything in its way. This has caused the shoreline to ingress by approximately 2km since 1982 as said by locals who witnessed the ingression almost every year.

Click on the time frames below to understand the stages of shoreline shift and property loss at Satabhaya over the years.

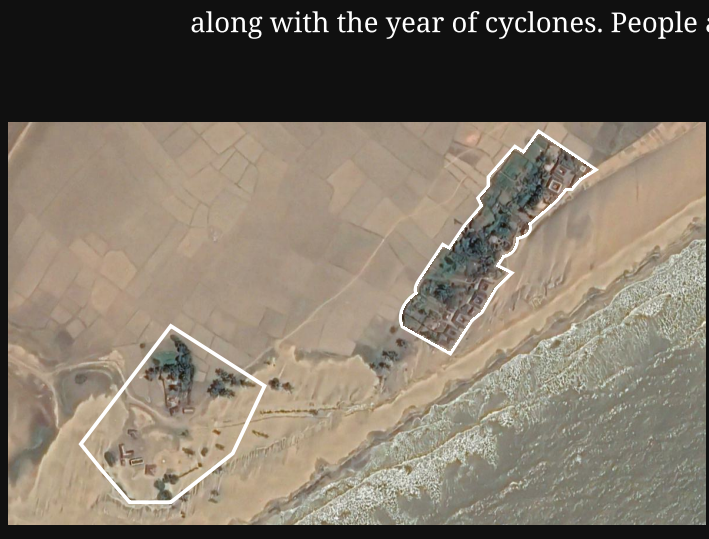


Timelapse of eroded temple and settlements due to shoreline shift over the years. Source: Google Earth Pro

- January 2010
- March 2011
- February 2013
- April 2013
- February 2016
- March 2016
- November 2016
- March 2017
- November 2017
- December 2018
- March 2019
- January 2021
- January 2022
- June 2022
- April 2023
- Play at once

Due to regular [almost yearly] severe cyclones, the shoreline shifted more inward towards the land and eroded away more than 600 households with 5-6 members per household getting displaced and many died as well.

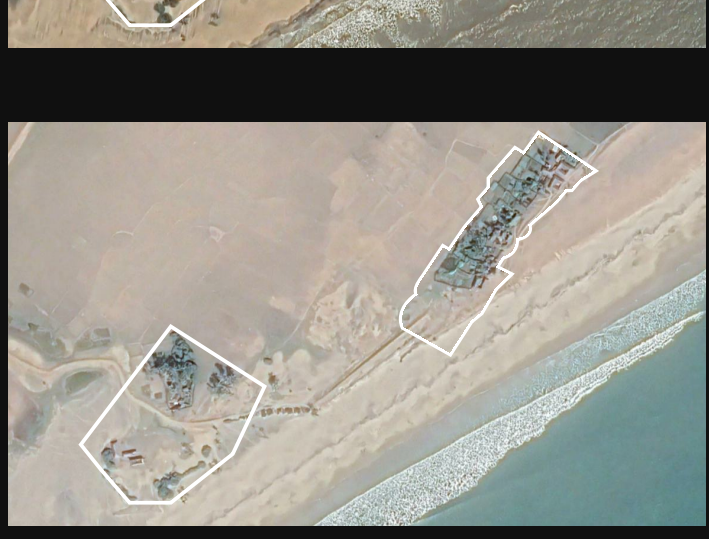
Mark the temple and nearby settlements getting eroded away more severely along with the year of cyclones. People also call them the vanishing villages.



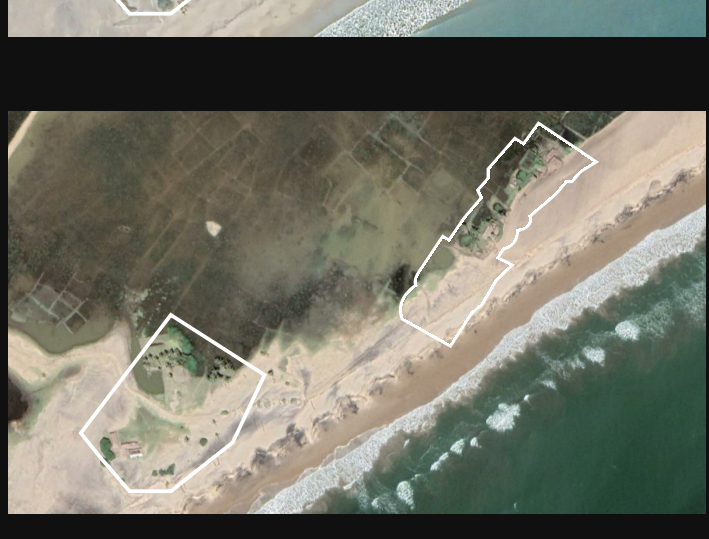
2013 April

2013 October
Cyclone Phailin

2014 October
Cyclone Hudhud

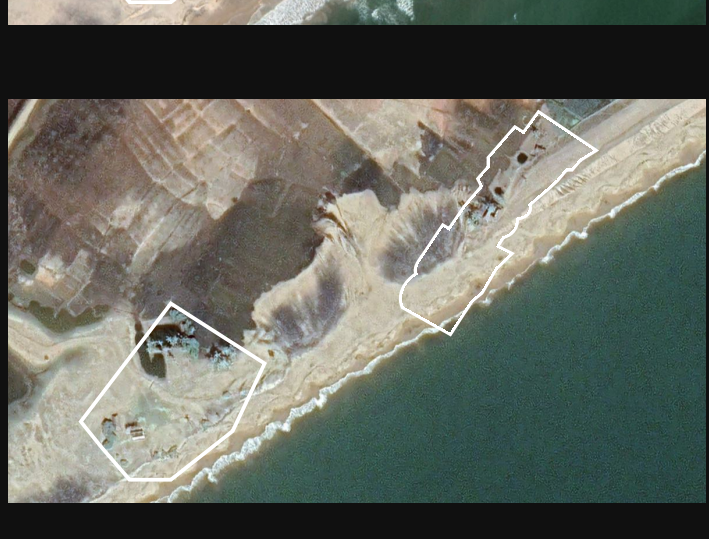


2016 February

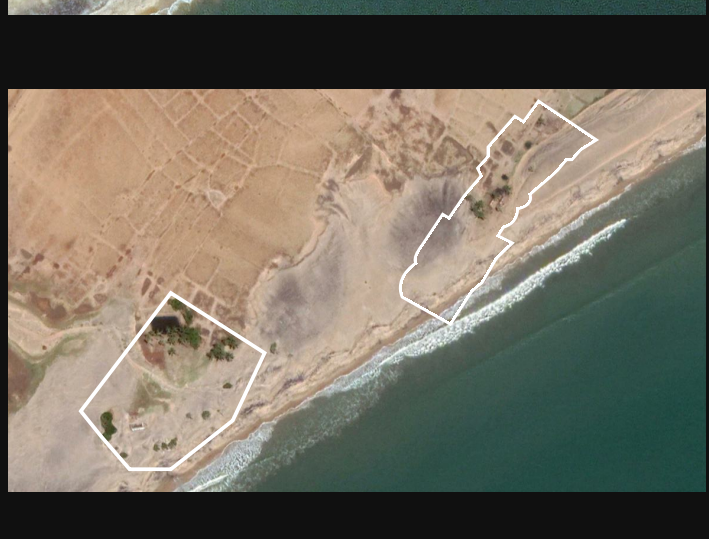


2017 November

2018 October
Cyclone Titli



2018 December



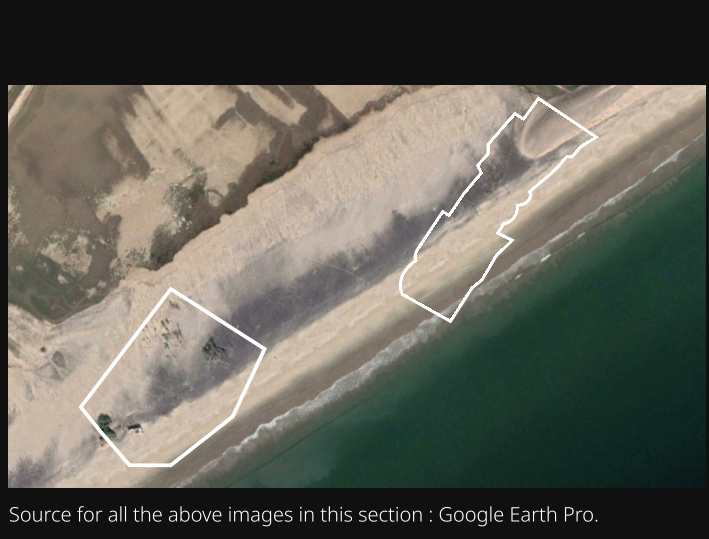
2019 March

2019 April
Cyclone Fani

2019 November
Cyclone Bulbul

2020 May
Cyclone Amphan

2021 May
Cyclone Yaas



2022 January

Source for all the above images in this section : Google Earth Pro.

Mr. Sudarshan Rout, age 55

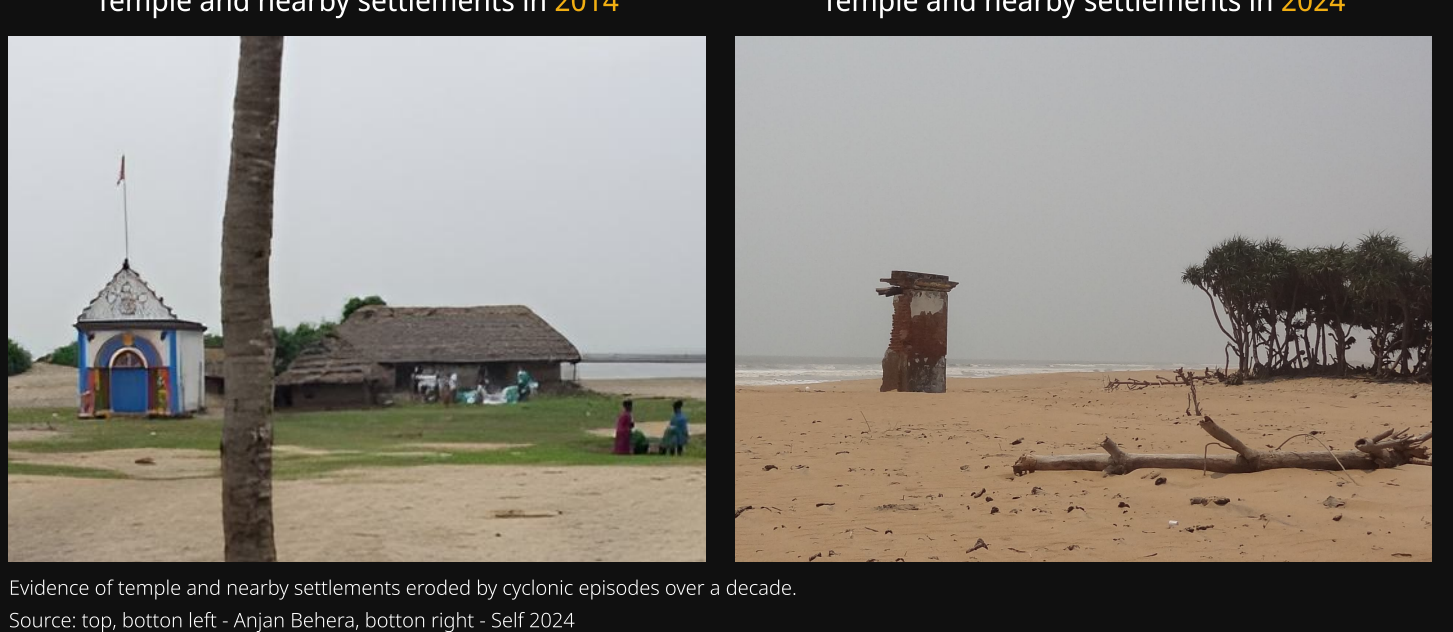
Used to be a resident of Satabhaya, later rehabilitated to Bagapatia, by the Odisha government.

> *" We would be sleeping and in the morning would witness shoreline has come very near to our houses. "*

* * *

Temple and nearby settlements in 2014

Temple and nearby settlements in 2024

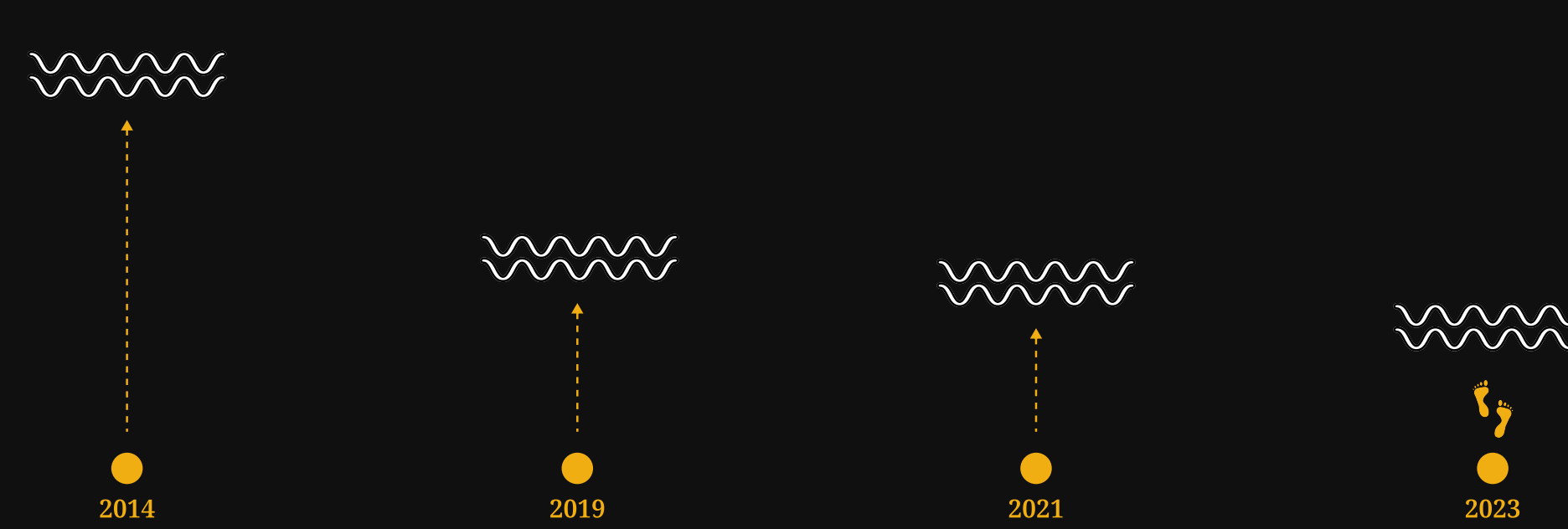


Evidence of temple and nearby settlements eroded by cyclonic episodes over a decade.
Source: top, botton left - Anjan Behera, botton right - Self 2024

The Lost Temple

As evident from the timelapse section, episodic cyclones have caused immense infrastructural damages including a significant cultural symbol of Satabhaya, the 150 year old Maa Panchubarahi Temple. which was once a shared space of belief, but today it has been lost to erosion. It's ruins like the door, bricks, columns etc, are washed way a few meters away from the temple location. Over the course of time, the temple was used as a reference point to keep track of the shoreline ingression by the villagers.

Maa Panchubarahi temple Location in Satabhaya
Source: Google Earth Pro



2014
The sea was
95 - 100 m away.

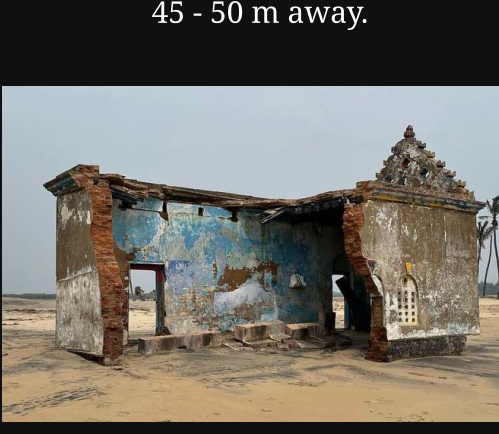
2019
The sea was
55 - 60 m away.

2021
The sea was
45 - 50 m away.

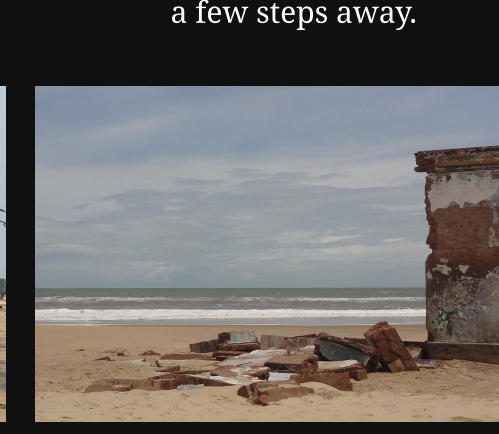
2023
The sea was
a few steps away.

People shared the unaffected temple space.
Source: Anjan Behera

Water reaching the temple and accumulation of sand.
Source: Priya Ranjan Sahu



Part of a temple is damaged.
Source: Aletta André

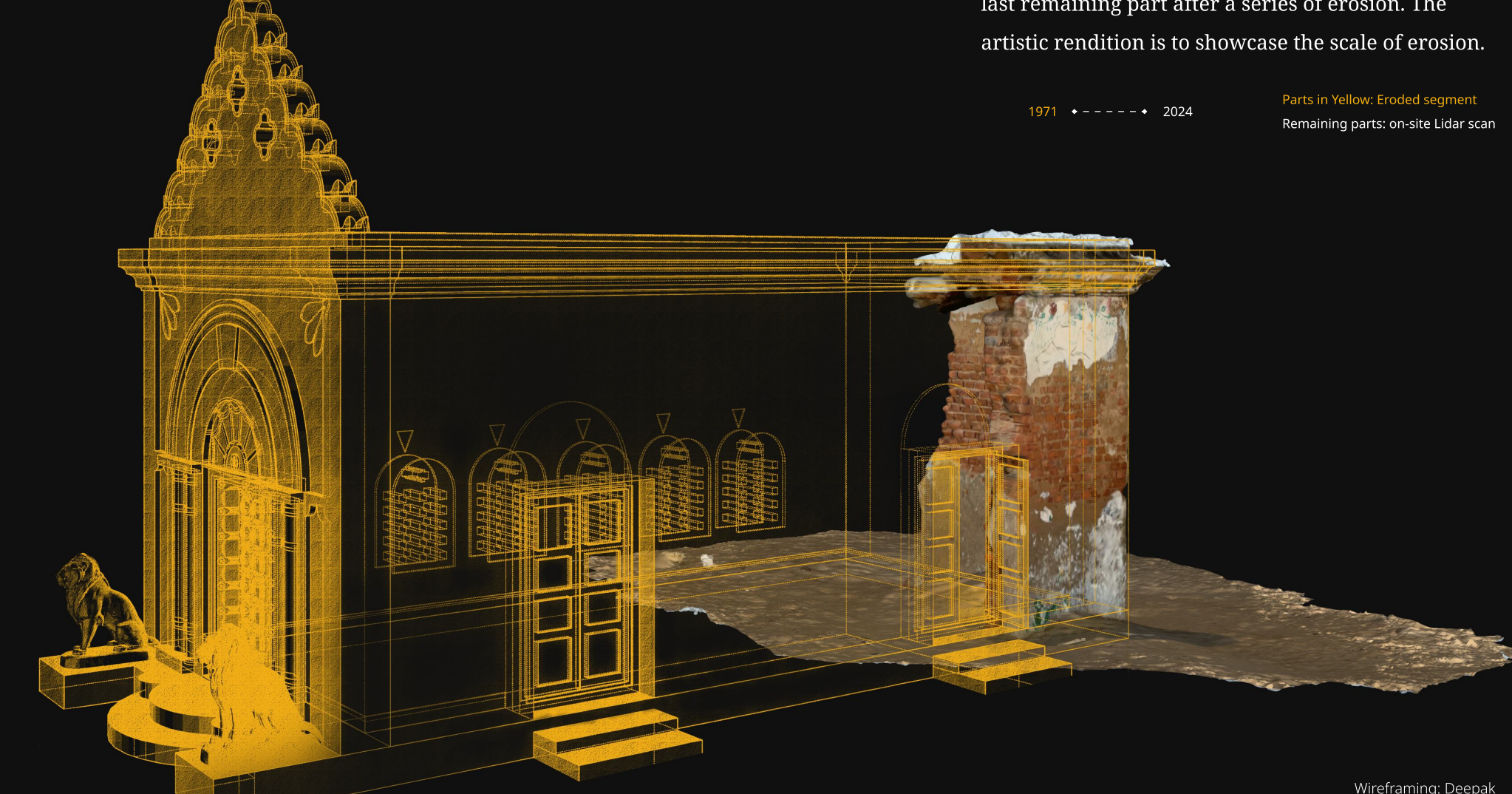


Remains of the damaged temple.
Source: Self

Maa Panchubarahi Temple reconstructed from the last remaining part after a series of erosion. The artistic rendition is to showcase the scale of erosion.

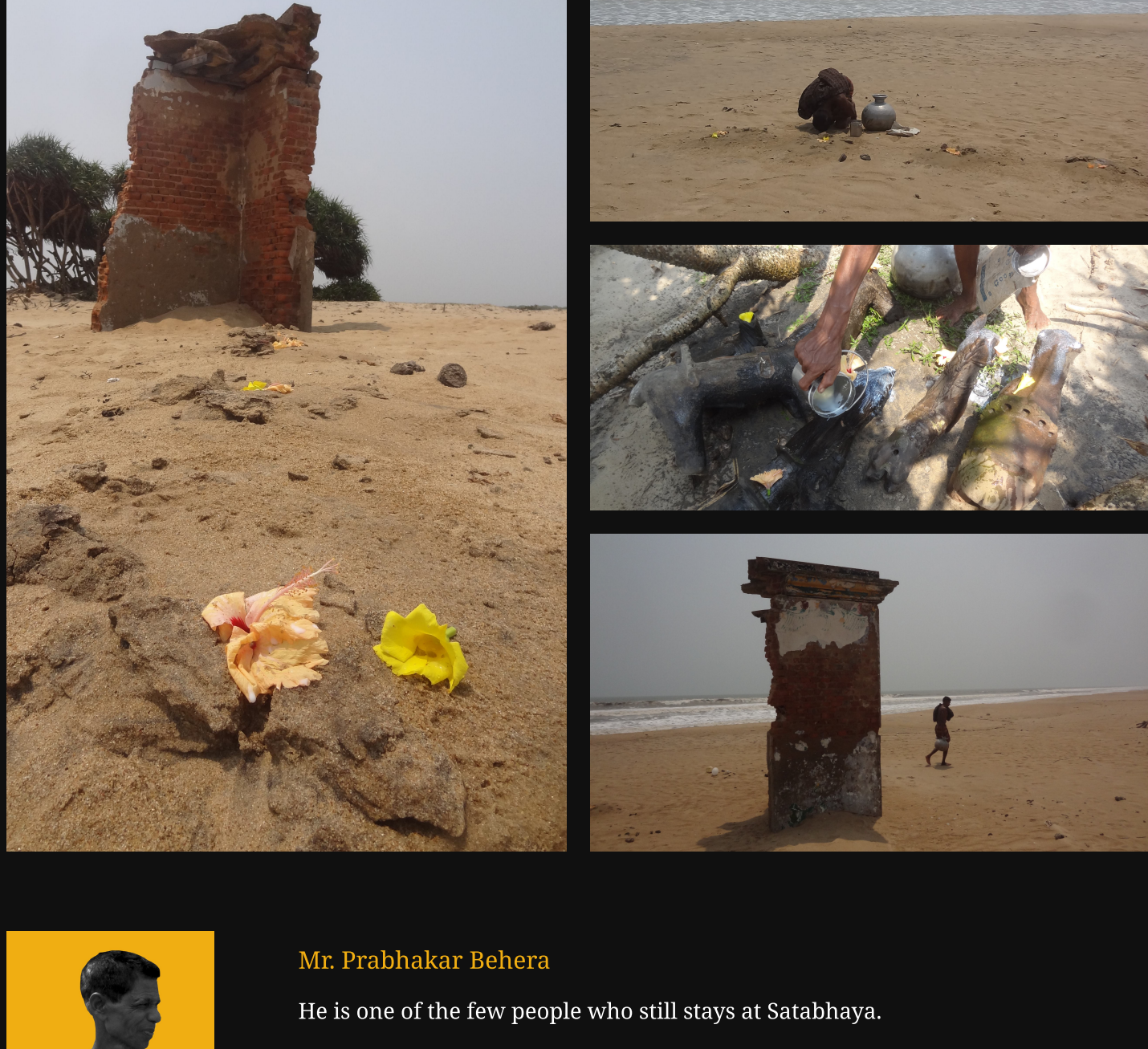
1971 • - - - - - • 2024

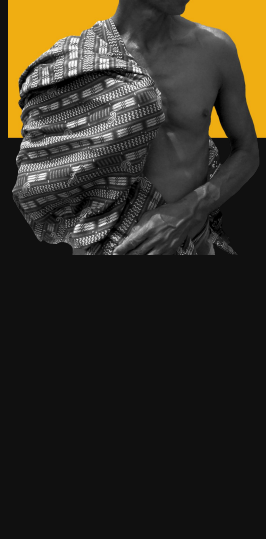
Parts in Yellow: Eroded segment
Remaining parts: on-site Lidar scan



Wireframing: Deepak
Lidar Scan: Self

The people of Satabhaya hold beliefs beyond structures, as seen through a person who still places offering to the gods near the ruins of the temple.





Mr. Prabhakar Behera

He is one of the few people who still stays at Satabhaya.

> *" I do not have enough land for my cattles at Bagapatia so I live here, ample amount of land is available here, I believe goddess will protect me here."*

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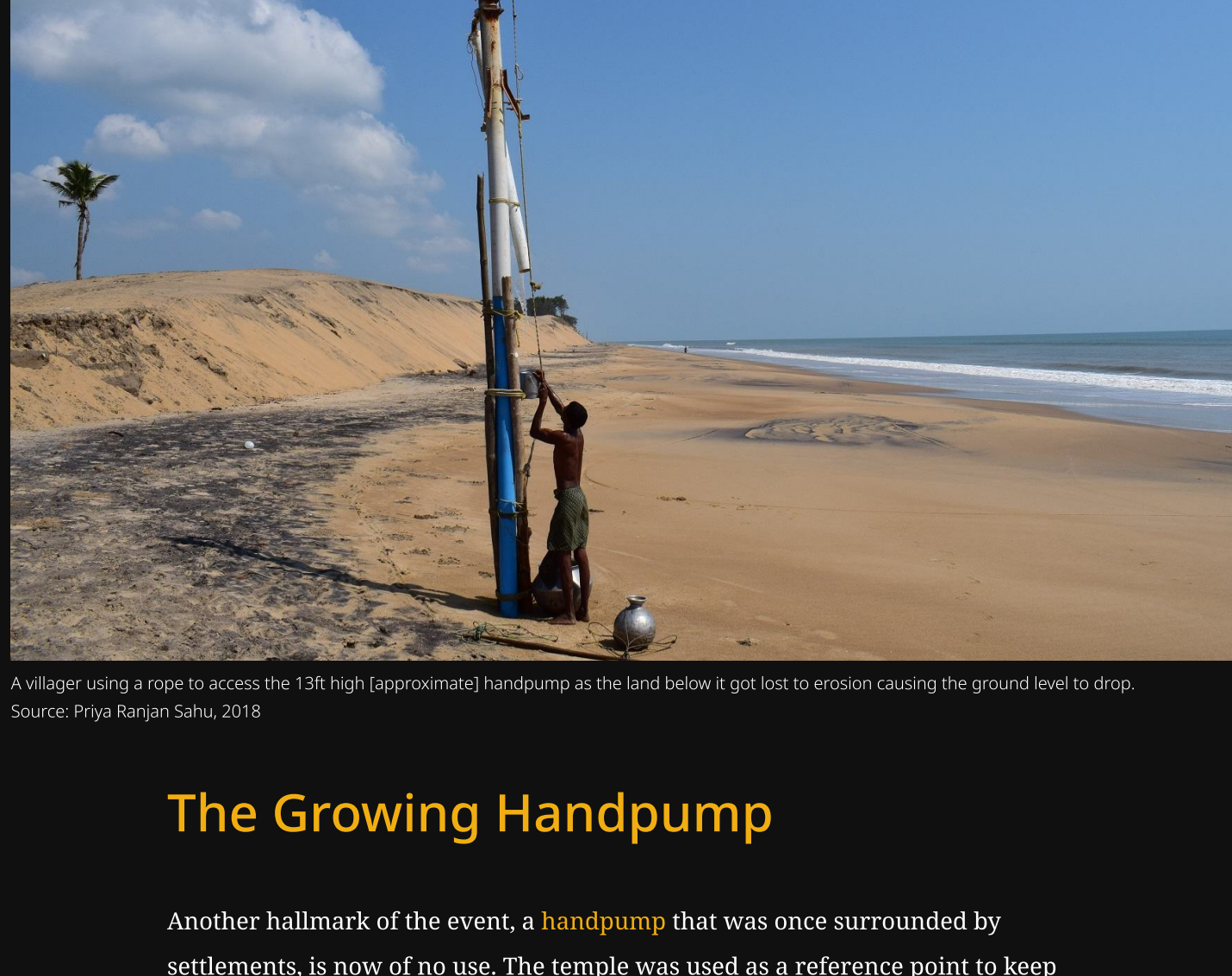
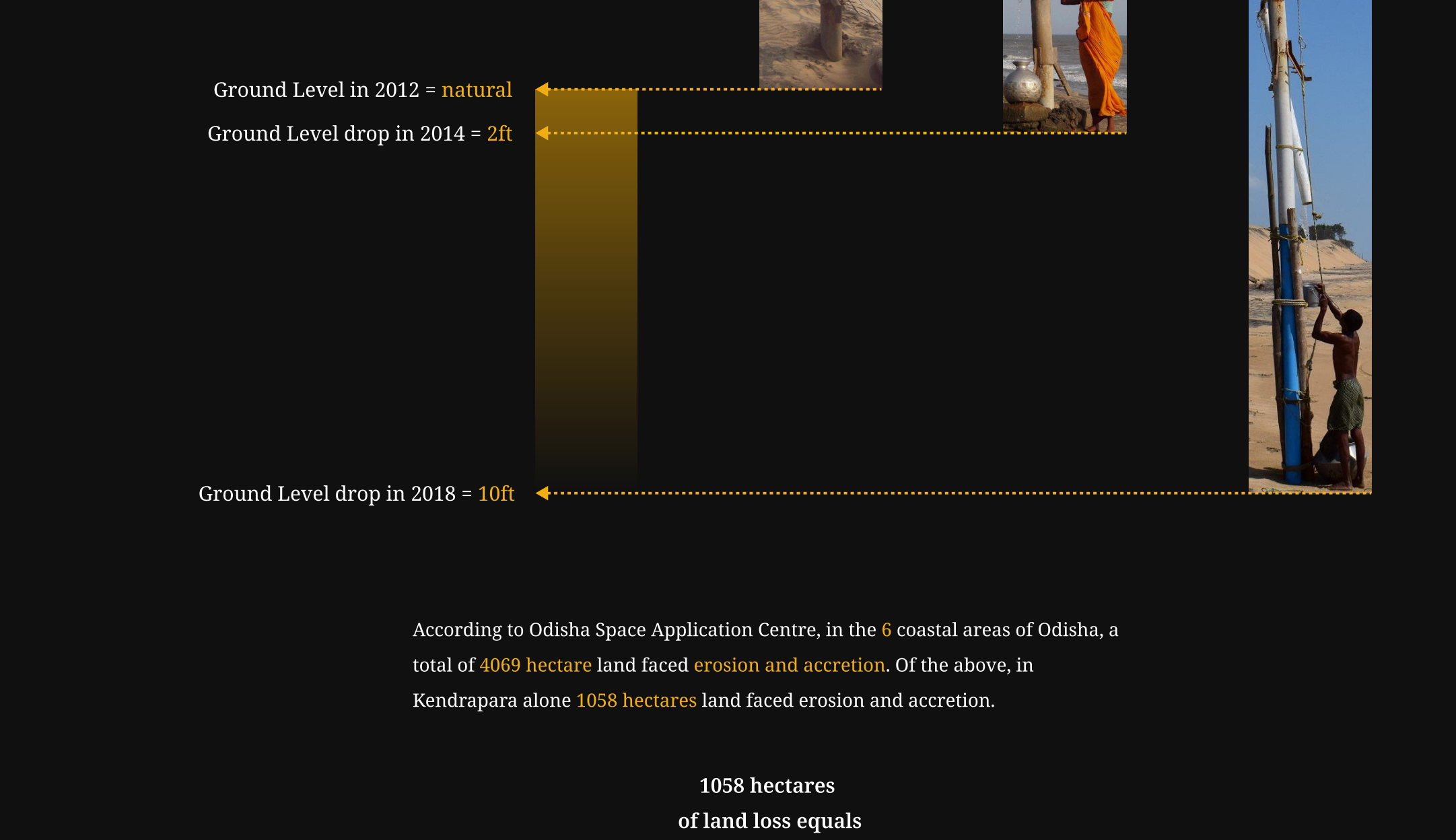


A villager using a rope to access the 13ft high [approximate] handpump as the land below it got lost to erosion causing the ground level to drop.
Source: Priya Ranjan Sahu, 2018

The Growing Handpump

Another hallmark of the event, a handpump that was once surrounded by settlements, is now of no use. The temple was used as a reference point to keep track of the shoreline ingression similarly, villagers used handpumps to keep track of receding land caused due to coastal erosion.



Average handpump height = 3 ft

Ground Level in 2012 = natural

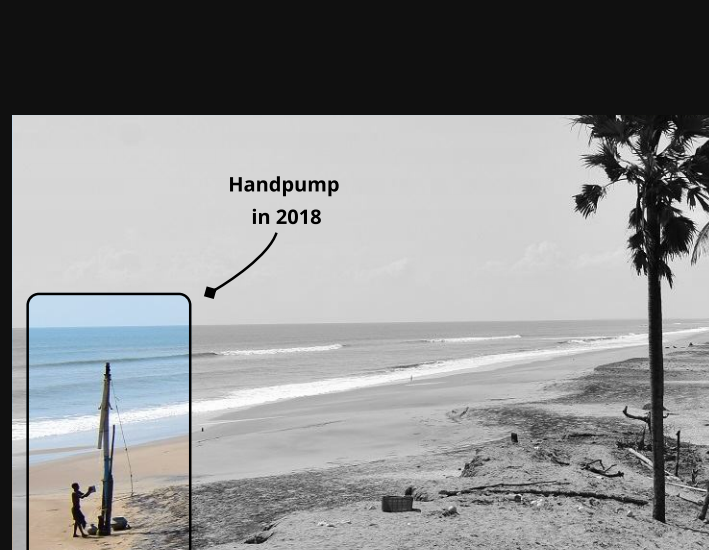
Ground Level drop in 2014 = 2ft

Ground Level drop in 2018 = 10ft

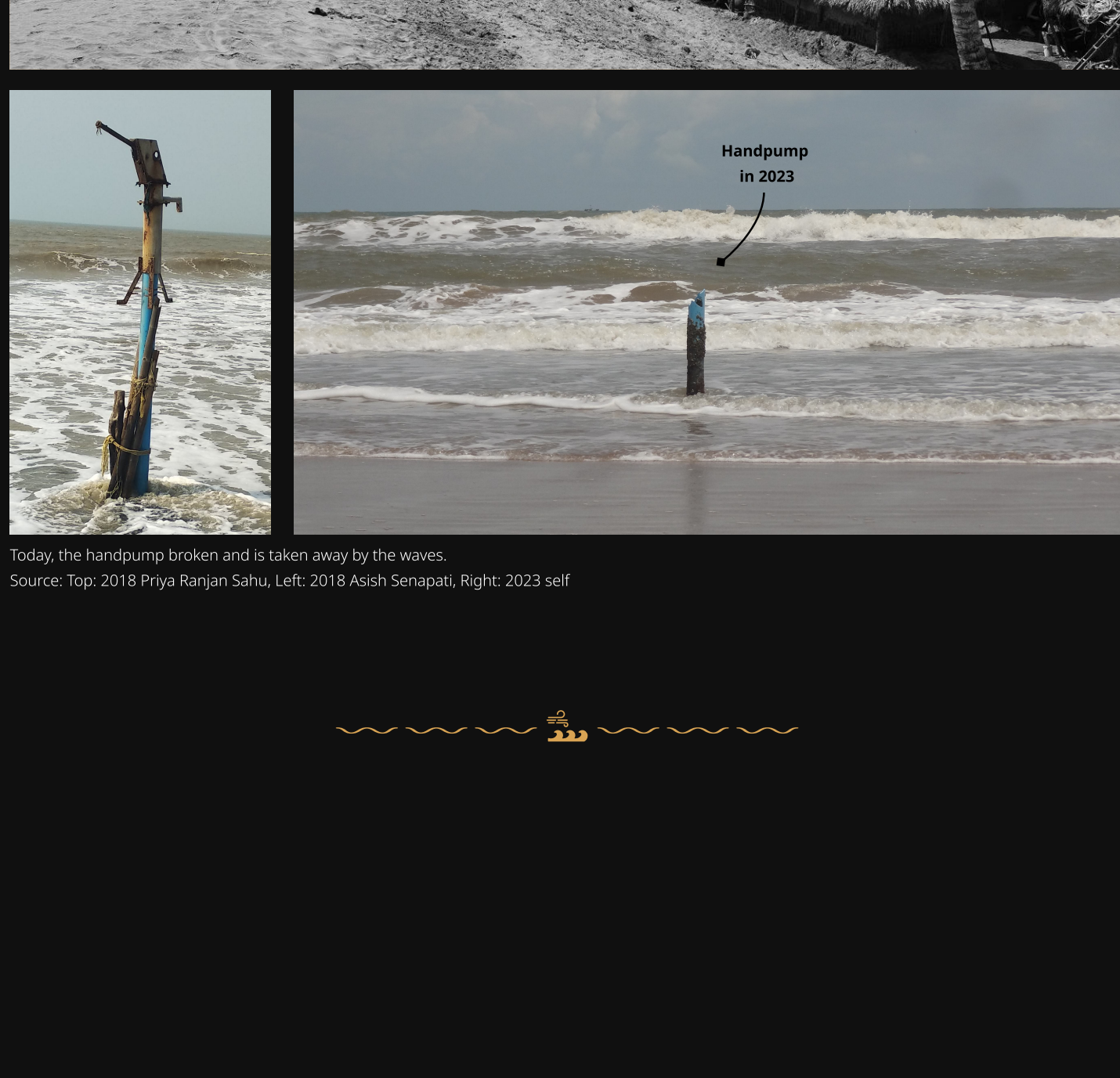
According to Odisha Space Application Centre, in the 6 coastal areas of Odisha, a total of 4069 hectare land faced erosion and accretion. Of the above, in Kendrapara alone 1058 hectares land faced erosion and accretion.

1058 hectares
of land loss equals

286 times
area of Jagannath Puri Temple Complex



1511 times
area of a soccer field



Today, the handpump broken and is taken away by the waves.
Source: Top: 2018 Priya Ranjan Sahu, Left: 2018 Asish Senapati, Right: 2023 self

* * *