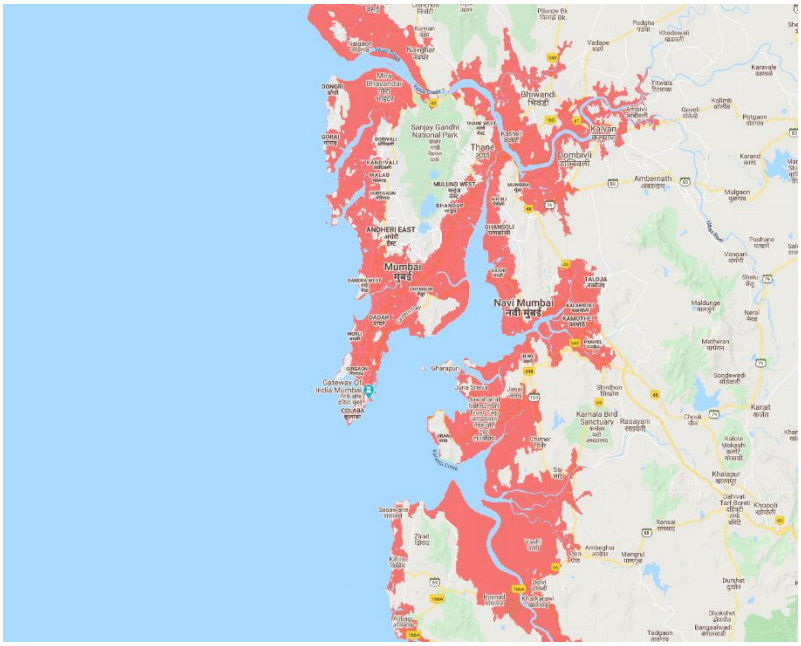
Forget the economy, what if the whole city goes under? ~ Chirag P, 25/03/2021

To the residents of Mumbai, poor and rich alike. To the stakeholders in the Indian economy and to the climate activist who yearns for change.

- Climate change has happened gradually throughout the course of history. However, the current warming trend is of particular worth of mention because it is very likely human induced and proceeding at an alarming rate. The coastal threats to the economy include shoreline erosion and inundation of coastal areas. Various global models are forecasting the loss of critical habitats along the coast. It has been reported that global sea level rose by about 17 cm in the 20th century, and this rate has doubled over the last decade. It is also certain that mean sea level would continue to rise all over the globe in the years to come. It is of utmost importance for the stakeholders of climate change (those who will be potentially affected or those who can drive for change on the policies). Mumbai, India has been arguably one of the most vulnerable regions to sea-level rise because of its high population density, economic and geographic importance and prone-ness to floods.
  Climate Change: Global Sea Level | NOAA Climate.gov



This link: Climate Central | Land projected to be below annual flood level in 2050 provides an illustration of the threats due to sea level rise by the year 2050.

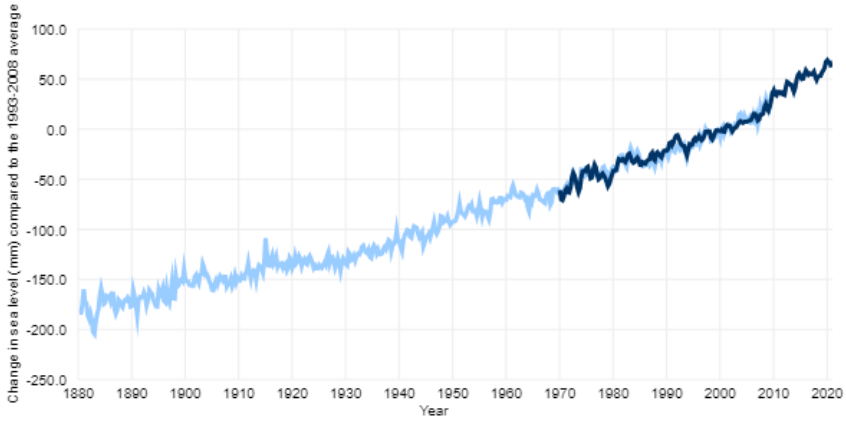
It can be inferred that the whole region in and around Mumbai is at a considerable risk for disasters driven by sea level rise.

This will impact local industries, both industries and the service sector.

Arabian Sea will begin entering, flooding Mumbai by 2050: Study - SCIENCE News (indiatoday.in)

- The topic of Climate change has been a controversial topic among academia and the population alike. But ample data from the past century show that temperatures have been gradually increasing, and the reason maybe or may not be anthropological. Over the last century, average temperatures on Earth have increased by 1 F.
  Climate Change Over the Last 100 Years (archives.gov)
  Nevertheless, anthropological influences only accelerate the process of rising temperatures and this leads to worse and worse projections for vulnerable areas. A key vulnerability is being located in the coast, which makes these regions prone to coastal flooding, which occurs from sea level rise which is an effect of rising temperatures (because of the melting of polar ice caps)
  The regions of South Bombay have forever been tourist attractions and regions of high economic importance with a significant concentration of financial centres. If the Sea levels were to rise and indefinitely and irreversibly flood these densely populated areas, it will be catastrophic to local economies (fisheries, oil companies), the small scale industries that are prevalent in the city and to the national economy.

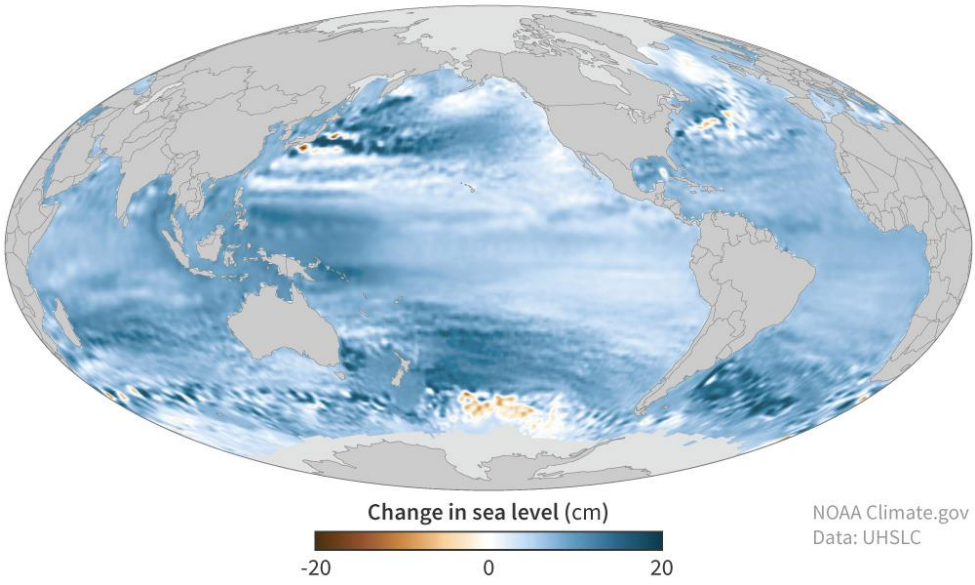
Data from various sources predict the looming imminent hazard of sea-level rise. These data have been taken straight from IPCC reports and have been seconded by the United Nations Organization.



This figure indicates the global sea levels over the last century.

Global mean sea level has risen about 24 *cm* since 1880, with about a third of that coming in just the past two and a half decades!

SEA LEVEL CHANGE (1993-2019)



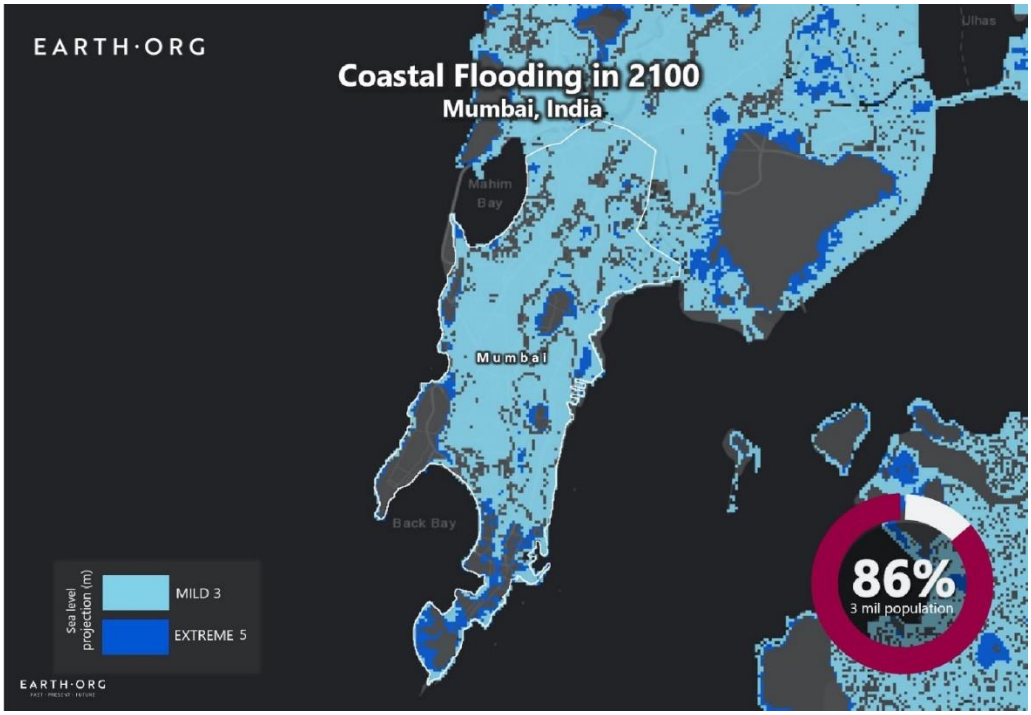
The regions in blue indicate a positive change in sea levels measured since 1993.

It can be inferred that the region around Mumbai has seen an increase in about 5 – 10 *cm*

These figures are only projected to get higher in the coming decades owing to continuously increasing temperatures.

[Climate Change: Global Sea Level | NOAA Climate.gov]

The sea levels are projected to rise by 26 – 55 *cm* in Mumbai, even if demands of the Paris Agreement are met.



Sea level rise in Mumbai by 2100 visualised-

The Local sea level rise has been calculated by taking into account the local coastal floods which could be 2.8 m above mean global sea levels. This brings in a variability of about 1 *m* to 6.5 *m* in the most pessimistic scenario.

Various factors are considered while projecting local sea level rise, namely: Global level projection, Coastal flood level, Pollution scenario and Stochastic effects.

Source: [Sea Level Rise Projection Map - Mumbai | Earth.Org - Past | Present | Future]

- Impacts of Sea Level rise
  Arabian Sea will begin entering, flooding Mumbai by 2050: Study - SCIENCE News (indiatoday.in)
  According to studies, by 2100, the current home to more than 20 crore people will be permanently below the high tide line; a standard high tide would easily overrun areas inhabited by these people.
  This will be detrimental to small scale industries that run the relatively poorer areas of the city, like embroidery, pottery, weaving and so on…
  Mumbai slum-dwellers by the sea live at the mercy of climate change | Reuters

  "Mumbai is going to be under water, we need to plan for that eventuality and what is required is to plan a new city to replace Mumbai as and when it gets submerged. And ideally, to my mind, it should be somewhere inland – at a pretty substantial elevation"

  - **Debi Goenka, environmental activist**

  Furthermore, the financial institutions like banks and large-scale stack exchanges that spot Mumbai's posh South Bombay areas will also be under threat. If they are threatened, they will face severe losses while relocating to other cities which may not be as geographically prominent as Mumbai. The losses will not just be financial but also of livelihood and of lives.

  To prevent this altogether would require global cooperation with respect to Carbon emissions and temperature projections. Other means are to prevent excessive absorption of heat by the sun by engineering reflectors and put it in the atmosphere, which do not look possible for us in the near future. However, stakeholders can prepare for the worst by management and mitigation techniques – build elevated buildings, houses, and make the base of current buildings stronger and for supporting the structure only. Strong walls can be built to reduce or prevent water seepage into the city. Better drainage systems can be installed in the city which reduces the contribution of the "Coastal flood level" factor which is taken into consideration while projecting local sea level rise.

  References: Quoted in the text

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