

Cyclone Nisarga

June 3, 2020

Mumbai, and its neighbouring districts prepare for Cyclone Nisarga, a severe cyclonic storm with wind speeds from 100 to 120 kmph. As of this hour, Cyclonic Storm is likely to strengthen into a Severe Cyclonic Storm during next 12 hours (during the afternoon of 03 June) with a maximum sustained wind speed of 100-110 kmph gusting to 120 kmph. It is very likely to recurve north-northeast wards thereafter and cross north Maharashtra coast close to Alibag (Raigad District, Maharashtra) as a Severe Cyclonic Storm.

The damage potential of a severe cyclonic storm includes “*extensive damage to kuccha houses; partial disruption of power and communication lines; minor disruption of rail and road traffic; potential threat from flying debris; and general flooding.*” The Maharashtra State Disaster Management Authority and the National Disaster Response Forces gear up to reduce adverse impacts of Cyclone Nisarga.

What would make Mumbai most vulnerable to this cyclonic storm Nisarga is that it is a densely packed, low lying city completely exposed to the sea. The low-lying areas can easily experience flooding in the event of a 1 to 2m storm surge or very heavy rains. This time, the city is also battling a Covid-19 outbreak - the state of Maharashtra, of which Mumbai is the capital, accounts for more than a third of India's reported infections.

Modelled wind results derived by developing ADCIRC model of the cyclone track (as per IMD’s bulletin no:20 (ARB/02/2020) is provided in the following image:

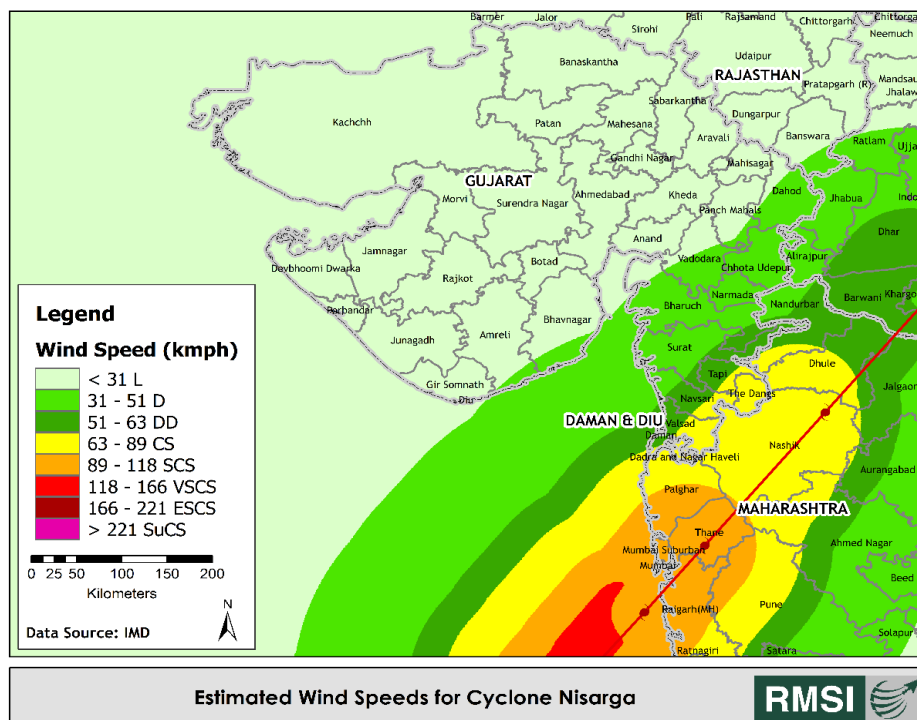


Figure 1: Nisarga wind hazard map

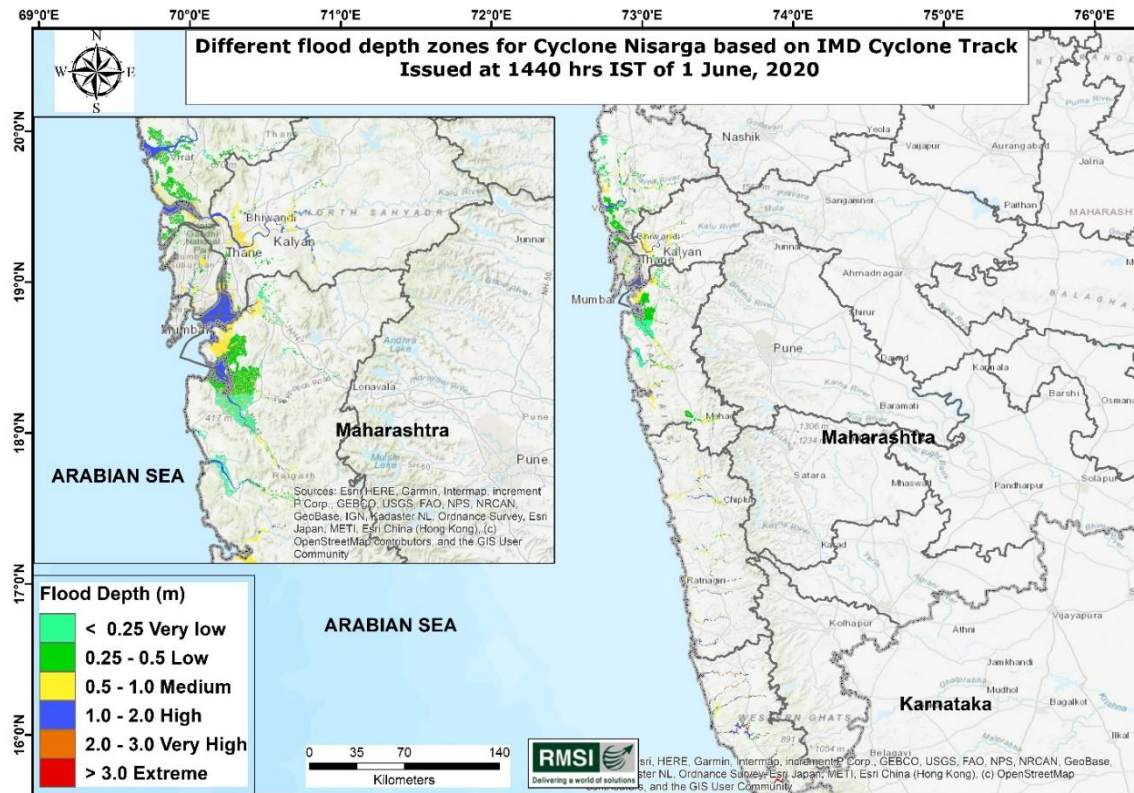


Figure 2: Map of flooding due to Nisarga

Increasing intensity of cyclonic storms in the Arabian Sea

While all the research is indicating a decrease in frequency but increase in intensity of cyclones, the IMD in its [“Statement on Climate of India during 2019”](#) noted the increased contribution of the Arabian Sea to cyclones in the Indian seas for the year 2019 that saw Arabian Sea’s contribution rise to 5 out of the 8 cyclones.

The following figure depicts the historic cyclonic storm tracks in and around Mumbai:

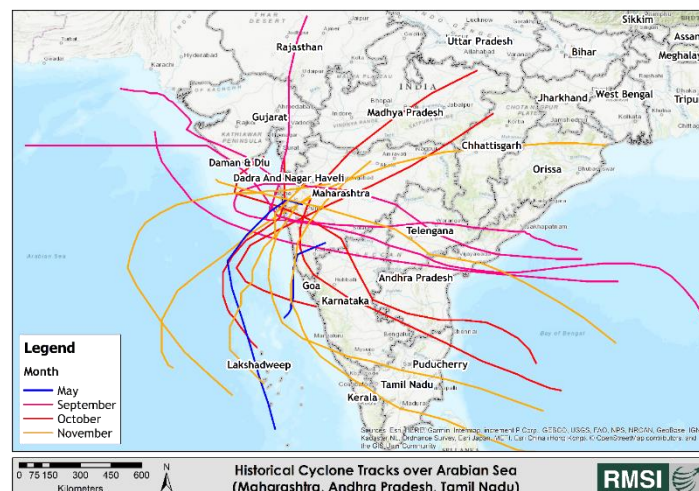


Figure 3: Historical cyclone tracks around Maharashtra

In 2014, Cyclone Nilofar was the first Extremely Severe Cyclonic Storm (ESCS) in the post-monsoon season from October to December which caused flash floods in northeast Oman, killing four people. In the following year, two more storms of the same category — Cyclone Chapala and Cyclone Megh — were observed back-to-back in the same season. With wind speeds approximating those of a hurricane, both made landfall in Yemen, killing 26 people and displacing thousands. It may be noted here that Yemen had no past history of cyclonic storms. Moreover, this was the first instance that more than one ESCS was observed within one year in the Arabian Sea.

The formation of more intense tropical cyclones during the pre-monsoon season in the Arabian Sea in recent decades is because the upper-ocean heat content (OHC) in the Arabian Sea (in and around the genesis location of the onset vortex) has significantly increased from the ocean surface to the depth of the 28 °C isotherm during May–June since early 1990s as a consequence of global warming. This OHC provides thermal energy needed for the development of cyclonic activity and has contributed to an increase in the intensification of tropical cyclones in the 21st Century.

As part of the efforts to reduce the vulnerability and improve cyclone resilience of the nation, the Government of India initiated the National Cyclone Risk Mitigation Project ([NCRMP](#)). Under the NCRMP, the state of Maharashtra has developed designated cyclone shelters in the following locations:

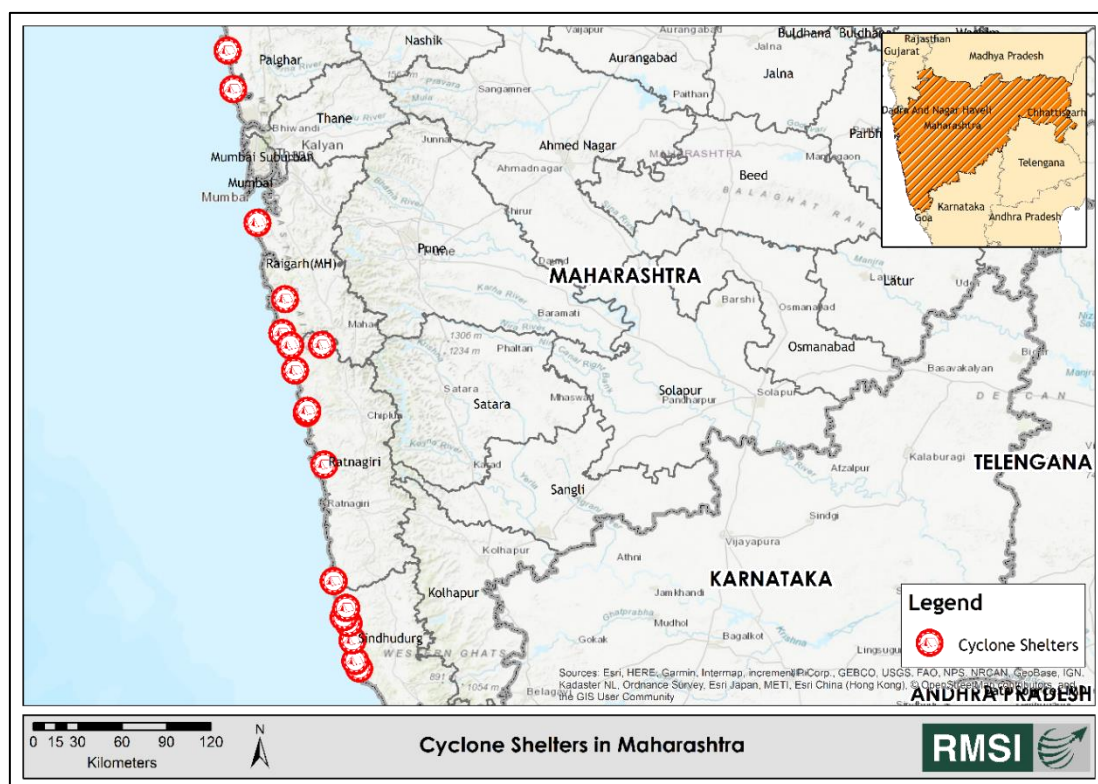


Figure 4: Cyclone shelters in Maharashtra



Way Forward

It can be observed that cyclone shelters have not been designated in Mumbai, Mumbai Suburban and Thane districts. Learning from Nisarga, the Government of Maharashtra could plan for a comprehensive multi-hazard risk assessment study that will help them to ascertain credible risk and develop contextual solutions for disaster risk reduction.

Floods, landslides/rock-falls, earthquake and drought are the primary natural hazards that impact the state. Industrial hazards, road accidents, epidemics and heat wave are other hazards that can also lead to significant losses to the exchequer.

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