Coastal Eco-system

More than 600 million people (or 10 percent of the global population) reside in coastal zones of less than 10 metres elevation.

An India country study by the Tata Energy Research Institute and the Ministry of Environment and Forests published in 1995 projected that a 1 metre sea level rise could put as many as 7.1 million people --including all coastal fishing communities whose livelihood is directly linked to the ocean -- at risk of displacement. The Vulnerability of the Coastal Regions to Climate Change sits on top of, and is exacerbated by vulnerabilities created by non-climate change related anthropogenic activity. The irony is that it is the same activity that is responsible for climate change.

Vulnerabilities of Fishing Communities in Coastal Eco-system

(Extract from Vulnerabilities of Fishing Communities to Ecological and Climate Changes: A Pilot Study in Dharavi Bet in Mumbai by Institute for Community Organisation Research[ICOR], 2011)

458 out of the 2643 fishing villages in India are within 100 metres of the high tide line. These villages, which have a population of around a million, are vulnerable to coastal perturbations. Among them are the 27 odd traditional fishing villages in Mumbai and its suburbs.

This is a study of the vulnerability of fishers in three villages situated in the outskirts of Mumbai, Manori, Gorai and Uttan (all in Dharavi Bhet) to ecological and climatic changes

Major issues facing Dharavi Bhet

Overfishing & Dwindling fish catch

In Manori and Gorai together, the average annual fish catch dropped from 18,400 tonnes for the five-year period from 1994-95 to 98-99 to 13,354 tonnes for the period 2004-05 to 2008-09. In Uttan, there was no fall in the average annual catch over these periods (the fall was only marginal, from 20,000 tonnes to 19,300 tonnes).

Ecological degradation

As Mumbai expands frantically, rapid urbanisations and real estate development has started in the hinterland of Dharavi Bhet. Hectic construction has reduced open spaces, green cover and increase pollution, including untreated sewage, chemical effluents, and garbage. Mangroves have become dumping grounds, and sometimes destroyed deliberately for construction.

Climate Change

Rainfall is now erratic and unpredictable, and more often, occurs in short and intense spells. Land temperatures are rising. Sea surface temperatures are also increasing because of which there are more stormy winds particularly in October and November. Coastal waters off Mumbai are rising at 0.3 degrees per decade. The sea level of the Mumbai coast is rising at an average of 1.2 mm a year.

Peoples' Perception of Changes

As a general trend, fishers in the three villages say fish stocks have depleted in the coastal waters because of overfishing and pollution. Many varieties have moved away from the coast or into deeper waters, making it difficult for artisanal and small-scale fishers to access them with their limited boat capacity and fishing gear.

Climate change (of which they have become aware only recently) is adding to the problems, the fishers suggest changes in cloud, rainfall, wind and tidal patterns and also in sea conditions have made it more difficult to locate and catch fish based on these and other traditional "indicators".

It should be noted that they cannot catch fish such as mackerel and sword fish with their dhol nets. These fish have now appeared in these waters, as the warmer waters in which they were found further south, is now moving northwards due to climate change, say CMFRI scientists. If fish continue to move farther or deeper into the sea, small fishers will not be able to catch them with the boats and nets they now have. To adapt to the changes in the long run, fishers in Manori need to have bigger boats and different types of nets, says Dhuming.

Because of the increasing uncertainties in coastal fishing, many artisanal fishers have given up fishing and now work as crew on the big boats which assures them some income.

Some fishing families in Uttan have farming as a secondary occupation, and some households now grow seasonal vegetables which helps cope with income loss to some extent. However, increased temperatures and erratic rainfall are affecting crops, including vegetable crops). New pests are emerging, especially in rice, papaya, shoe flowers, etc. Farmers ascribe this to excess rain and inadequate sun. Studies elsewhere show that "local weather changes can cause disruption in flowering/fruiting cycles and changes in pest profile".

Rising sea surface temperature

The Arabian, Sea, as mentioned earlier, has been warming. A warmer sea can affect fish breeding cycles, and fish production and survival rates. During the decade 1997-2006, around 18 per cent of the mackerel catch in India came from the north-west coast compared to only 7.5 per cent during 1961-76. Also, the share of mackerel caught by bottom-trawling (at about 50-metre depth) boats in the national catch increased from only 2 per cent in 1985 to 10 per cent in the mid-2000s. "This shows that the fish descends down to deeper waters to overcome warmer surface waters", conclude scientists at the Central Marine Fisheries Research Institute

Rising sea level and coastal habitats:

The sea level is rising at an average of 1.2 mm per year along the Mumbai coast. Though several factors contribute to coastal erosion, studies show that a sea level rise of 1 mm per year can in general cause the shoreline to recede by up to 0.5 metre a year.

In Dharavi Bet, has been seeing a gradual shrinkage of its beach space; whereas earlier the beach was wide enough to dock three rows of boats in the off-season, now there is space for only one row. Shrinkage of beach space is also reducing the space available for drying fish, an important economic activity.

Cyclones and storm surges:

As the surface temperature in the Arabian Sea increased, the "occurrence of most intense cyclones" in the region has also increased five-fold since 1995.17. And if this trend continues, it will have serious safety and economic implications for coastal communities, especially for fishing communities.

Socio-Economic Impacts and an 'Uncertain Future':

Women are the "backbone" of fishery-related work once the catch lands – they sort the fish, preserve it, take it to the market, and also dry and process the fish. Women, for example, are required to spend long hours drying fish in open ground and the hot sun. Rising temperature and unpredictable rainfall (which spoils the drying fish) are making their work more difficult and stressful..

Adaptation measures

Immediate measures are needed to improve the coastal environment. Pollution of the coastal waters and the creeks should stop, and the creeks need to be cleaned up to provide a healthy habitat for fish, mangroves and other plant life

In fishery, changes in the marine environment and shifts in fish habitats and fish distribution patterns require adaptation, diversification and the upgrading of fishing gear, craft and capacity to suit the changes. But poor fishers' capacity to do so is limited, and they need help in capacity-building. Traditional fishing practices, suited to the changing local conditions, need to be identified and improved if necessary.

All this will need close collaboration between fisheries scientists and fishing communities.

Further Reading

1. Coastal cities need to clean up their act by Rahul Goswami http://infochangeindia.org/environment/coastal-nightmares/coastal-cities-need-to-clean-up-their-act.html
2. http://www.wamis.org/agm/meetings/rsama08/S512-Vivekanandan-Fisheries-Aquaculture.pdf
3. Climate change and India: A 4x4 assessment. A Sectoral and Regional Analysis for 2030s, November 2010
4. http://moef.nic.in/downloads/public-information/fin-rpt-incca.pdf
5. The Fishing Communities And The Politics Of Climate Change by K P Sasi, 26 October, 2010, g
6. http://www.countercurrents.org/sasi261010.htm.
   The coastal communities complain that the climate change has affected the traditional prediction models of the community. Climate change has disrupted the indicators of these knowledge systems. Once, they knew very well which fish to catch in which season. Today, their calculations of fishing are getting uprooted along with physical displacement due to climate change.