Annexure-II

Fixing Setback Area in the islands

The island ecosystems are extremely fragile. As the island communities strive to raise their living standards for growing populations, there is always a tendency to sacrifice the fragile ecosystems that are among their most valuable assets. Further there is always a chance to overexploit their natural resources and to pollute the environment. Another alarming scenario is the predicted Sea Level Rise (SLR) and increased coastal erosion, which could damage the coastal areas and submerge the islands. This will cause irreparable loss or serious damages to the island environment necessitating precaution while initiating the developmental activities in the island. Taking into account all the above a Setback zone in the island becomes highly essential.

Setback line and International Practices

The setback or buffer zone is a planning and operational tool practiced/ implemented in many countries around the world. This was practiced mainly to protect human activities from extreme and chronic physical processes such as coastal erosion and coastal flooding and climate change. Further aim is to preserve ecosystem functions and morphology/landscape along a coast by regulating interference of human settlements and activities with ecosystems. In USA the coastal states can decide their own setback line as per the guidelines of Ocean Coastal Resource Management (OCRM). For example in North Carolina, South Carolina and Florida have setback lines based on annual erosion rate. Usually 30 or 50 times the annual erosion rate is considered but they often update the setback lines and erosion rate data every 10 years. In Minnesota, the Superior coast considers 50 times the annual erosion rate as the setback line. The coast does not have long term erosion details they consider arbitrarily limit of 125 ft as a buffer zone. Washington State follows a setback of 200 m from MHT (Mean High Water Line) for regulation and inland boundary of coastal counties for planning. Australia also has similar setback approach as practiced in India. They consider almost 100 year planning period to accommodate the long term erosion, acute storm erosion and SLR. Maximum water level based on tide, surge, run up of waves on beaches were considered by Spain. Some of the setback lines practiced in other countries are as follows: Sri Lanka - 330m, Spain - 100m, Italy - 300 m, Australia - 100m. In India there are different setback lines for different activities. Hazard line for the country is being demarcated by Survey of India. For this tide, wave setup, sea level rise and shoreline changes parameters are being considered.

Setback Zone for the island

A setback is an area within the islands' coastal zone wherein certain development activities are prohibited or significantly restricted as detailed in the Annexure II. The setbacks are a means of accomplishing a number of objectives including:

- *Providing livelihood security to the local communities including the fisher folk and tribals.*

- *Promote conservation and protection of Island's unique environment and its marine area*

- *To promote development through sustainable integrated management plan based on scientific principles taking into account the vulnerability of the coast to natural hazards*

A setback area is composed of the reservation area or reservation line lying between seaward reference line of High Tide Line (HTL) and the landward reference line of the particular coastal segment to be decided scientifically on a case to case basis along the Island's coast. In the islands' coast the reference line is the HTL which is generally 2 to 2.5 m above the Mean Sea Level (MSL) has been well documented.

Criteria for Setback Line

The IPZ Notification clearly says that the Integrated Island Management Plan *'shall address vulnerability to human life and property based on elevation, geomorphology, sea level trends and horizontal shoreline displacement'*. It further says that the IIMP may indicate suitable areas that are safe for locating dwelling units, infrastructure and also appropriate safeguards measures to protect the life and property of the local communities from natural hazards. A No Development Zone or Setback area is determined so as to achieve the above objectives as required in the IIMP for the island.

The criteria for establishing the setback line for each segment of the islands' coastline has been worked out based on the hazard perception. The segments have been rated based on the hazards experienced by the islands. The major hazards considered are:

- Severe monsoon wave activity and wave set up (due to waves and tides)
- Coastal flooding (geology, geomorphology and land elevation as base parameters)
- Horizontal shoreline displacement (erosion / accretion)
- Sea level trends (Elevation)
- Cyclones, storm surges and tsunami

Though islands face many hazards the most important ones which need to be considered are high monsoonal waves and coastal flooding, shoreline displacement and sea level trends. The cyclones, storm surges and tsunami have not been considered for setback line, as they are rare events and have been accounted in the disaster management plans included in the IIMP by providing cyclone shelters, road communication, etc.

(i) *High monsoon waves*:

Waves are one of the most frequent hazards that are active in the island. It is one among the parameters that significantly contribute to shoreline changes. The impact of waves increases due to wave and wind set up. The impact is more during the high tidal conditions. The changes in the shoreline truly reflect the impact of the waves, tides and wind. Hence it is more practical to examine the long term shoreline changes to account for the above effects.

(ii) *Horizontal shoreline displacemen*t:

The long-term shoreline changes are considered as an important parameter to determine the setback line. The shoreline erosion / accretion phenomenon along the island's coast is not continuous but the coast which has been traditionally eroding may be accreting after a few a years. This can happen due to anthropogenic factors as well like the construction of coastal structures, development of harbour, foreshore based activities, etc. The long-term shoreline changes for a period of 32 years were computed for this purpose

(iii) Sea level trends

It is now well known that the sea levels are increasing in most part of the world due to the global warming phenomenon. Though local studies specific to the islands are not available the Intergovernmental Panel for Climate Change (IPCC) has given a projection of 45 cm of sea level rise globally as a moderate scenario for the period 2000-2100. To be on the conservative side this projection is adopted for the island and a rise of 50 cm is accounted for the purpose of the setback line. This means a coastal zone falling within this rise is vulnerable to the impact of the sea level rise projected. It is to be remembered that the impacts of the day to day waves and tides are also accommodated within this elevation. Hence the area falling within this elevation can be taken as the setback zone. Since the present day impacts are felt up to the HTL and the projections are intented for the future, the elevations are taken above the HTL.

From the above discussion the two measurable criteria for determining the set back line in the islands are horizontal shoreline displacement (erosion and accretion) and elevation. Since the shoreline erosion / accretion is a dynamic process wherein the coast which has been traditionally eroding may turn to an accreting coast and vice versa after a few years of time due to many factors including anthropogenic like construction of coastal structures, development of harbor and port, foreshore based

activities, etc. Hence the shoreline changes independently may not give the correct measurable criteria for identifying the setback line. The other parameter is the elevation of the island with respect to HTL. Considering all the above a distance upto the elevation of 0.5 m above HTL is taken as a general parameter for fixing the setback line.

For fixing the distance to the 0.5m elevation from the HTL the island is divided into several segments and the parameters were determined scientifically for each. Though there is no considerable variation in the segments examined, as a conservative measure the maximum value for the block of segments is taken as the setback distance for that portion of the island.

It has been noted that some part of the island is thickly populated and highly developed. To cater to the greater demands of coastal area in the developed zones it may not always be acceptable if a uniform setback is provided for the entire island. Taking clue from the criteria adopted in categorizing the coastal zone as CRZ-II and CRZ-III and allowing more development in CRZ-II in the original CRZ Notification, the setback in the island is determined based on the criteria whether the portions of the island are developed or undeveloped, availability of free space and differential exposure to natural hazards. Based on the scientific approach as outlined in the Annexure a moderate setback distance is considered for the developed area. For the portion which has sparse settlement or is undeveloped with more open space the maximum observed setback distance is provided as a conservative measure.