Information Services (INCOIS), Hyderabad and ESSO-Integrated Coastal and Marine Area Management (ICMAM), Chennai have carried out mapping and demarcating of multi-hazard coastal vulnerability for the States. The relative vulnerability of different coastal environments is essentially quantified at a regional to national scale using basic information on seven risk variables, *viz.* shoreline change rate, sea-level change rate, coastal slope, mean significant wave height, mean tidal range, coastal regional elevation and coastal geomorphology. Most of the above parameters are dynamic in nature and require a large amount of data from different sources to be acquired, analysed and processed, with an inbuilt updating mechanism.

The general trend in the vulnerability, demarcated in to four classes (very high, high, medium and low), carried out first time on macro-synoptic scales (at 1:1,00,000) covering the entire Indian coastline suggest varied degrees of vulnerability along coastal States of Tamil Nadu, Andhra Pradesh, Odisha, Kerala, Maharastra, Goa, Gujarat and islands of Andaman and Nicobar Islands and Lakshadweep. The Gulfs of Kambhat and Kachchh in Gujarat show very high vulnerability indices, with the inlets of Kachchh showing localized vulnerability. Relatively low vulnerability indices are reported along the zones of mangroves that help in breaking the large amplitude waves, dissipating the energy and hence act as a natural barrier. However, it is to be noted that coastal vulnerability aspects at a much local (micro) level are to be accounted with additional parameters such as cyclone, storm surge and coastal flooding so as to add an additional dimension to the current study.

(b)   Andhra Pradesh coast line falls under the five risk classes. The Coastal Vulnerability Index (CVI) for the state of Andhra Pradesh reveals that the length of 6 km. is under very high vulnerable class. The majority of the coastal stretches belong to low and medium vulnerable class recording a length of 465 km and 379 km, respectively. High vulnerable class was recorded along 224 km of coastline. The coast of Krishna, West Godavari, East Godavari, Visakhapatnam, Vizianagaram and Srikakulam districts were classified as medium to high vulnerable class. In general southern parts of Andhra Pradesh are more vulnerable when compared to northern parts.

NASA aircraft for prediction of cyclones

479. DR. CHANDAN MITRA: Will the Minister of EARTH SCIENCES be pleased to state:

(a)   whether Government proposes to buy a NASA aircraft for prediction of cyclones/calamities;

(b)   if so, the details thereof along with salient features of the aircraft; and

(c)   the steps taken by Government to study wind pattern at high altitudes for better prediction of cyclones/calamities?

THE MINISTER OF EARTH SCIENCE (DR. HARSH VARDHAN): (a) No Sir.

(b)   Does not arise.

(c)   Earth System Science Organization - india Meteorological Department (ESSO-IMD) has installed Doppler Weather Radars network over the coastal areas of the country to identify zones of strong wind and heavy precipitation associated with cyclone as and when cyclone moves in to the 500 km. radial coverage range. ESSO-IMD has established network of Automatic Weather Stations (AWS) and Automatic Rain Gauges (ARG) over the coastal districts to further authenticate the ground level impact associated with the cyclone landfall. High Performance Computing (HPC) systems have been used to enhance the weather forecasting capacities by assimilating all available global satellite data for forecast generation.

A full proof 24×7 operational cyclone detection and movement mechanism exists for the assessment of intensity, track and landfall over the eoastal areas of the country. Details of such monitoring mechanism include genesis of the possible cyclonic circulation over the open seas is generated by the meso-scale short range (72 hrs in advance) prediction models and global scale medium range (120 hrs in advance) prediction models along with monitoring sea surface temperature and moisture convergence, satellite monitoring is pursued for detecting cyclogenesis and monitoring further intensity, movement and landfall of cyclones.

As far as the track and landfall forecasts of the tropical cyclones are concerned, the performance evaluation of the updated forecast systems for the past 5 years, have demonstrated enhanced forecast skill by about 18%.

Diversion of forest lands in Himachal Pradesh

480. SHRIMATI VIPLOVE THAKUR: Will the Minister of ENVIRONMENT, FORESTS AND CLIMATE CHANGE be pleased to state:

(a)   whether State Government of Himachal Pradesh has requested Government to enhance its power to give approval for diversion of forest lands up to five hectares instead of one hectare for non-forestry development purposes for certain specific activities, if so, the details thereof; and