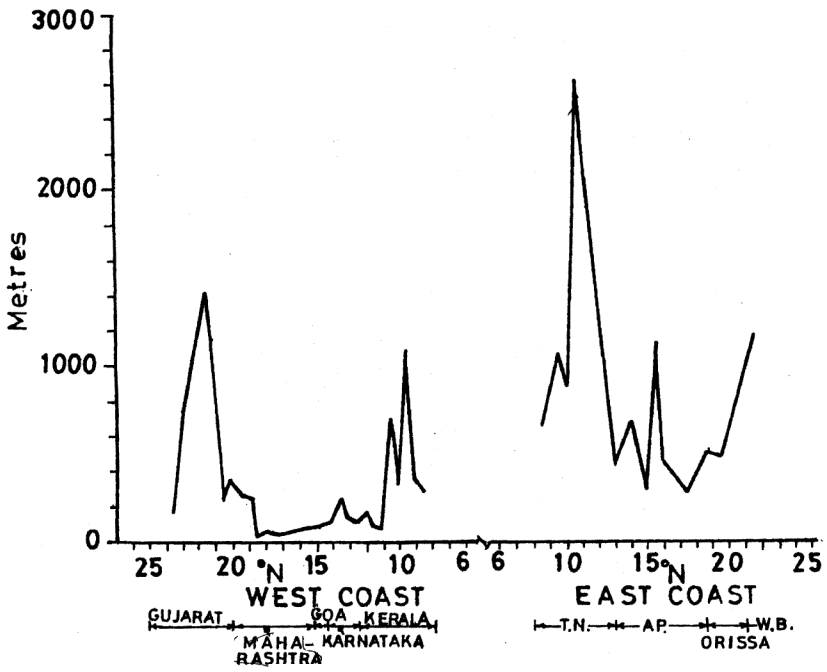

Figure 1. Displacement of shoreline for sea level rise of 1 m (source Shetye *et al.*[1]).

al.[1] pointed out that 12–18°N is the safest on the west coast from the point of view of shoreline retreat. Though the tsunami hit the west coast also (of course with minor intensity), there was no loss of life in Karnataka, Goa and Maharashtra, which are in the above belt. The peak on the west coast is located at 22°N close to Kandla, Gulf of Kachchh, where about 300 people were killed due to an 11.8 m height tsunami that hit this place on 27 November 1945.

Detailed bathymetry and topography digital maps at close intervals along the Indian coast are essential for tsunami and storm surge modelling. These maps will also help to estimate the possible areas of inundation due to the expected sea level rise due to greenhouse effect.

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Are *Bt* toxin engineered plants truly safe?

Transgenic insecticidal plants are gaining attention regarding grants for research from various national and international agencies. About thirty crop species could have been genetically engineered to express *Bacillus thuringiensis* (*Bt*) endotoxins – highly toxic to specific insect pest species[1]. However, development of resistance is also reported to *Bt* toxins, e.g. *Plutella xylostella*[2]. Besides resistance problem in insect species against *Bt* toxin engineered plants, serious safety issues are of great importance to man and environment because of production of toxin proteins and chances of developing human allergies.

A study reported by the US-based union of scientists under the title 'Peril amidst the promise: Ecological risks of transgenic crops in a global market' (1995) reported serious environmental risk due to commercialization of genetically engineered crops that included (i) plants engineered to contain virus particles that might facilitate creation of new viruses, (ii) transgenic crops that may turn as weed, (iii) risks to other organisms that are not intended targets of new chemicals, (iv) risk to existence of beneficial fungi that make available nutrients for plant growth, and (v) threat to population of wild plants and traditional varieties being a source of genetic biodiversity. A US seed company (Pioneer Hi-bred) was forced to drop the development of soybean with Brazil mutagens spliced, because people with Brazil nut allergies adversely reacted to the new product. The genetically engineered food supplement L-tryptophan is believed to have been responsible for several human deaths and injuries in the US. Such fears may have led 'Forum for Biotechnology and Food Security' to urge the Indian Prime Minister to quickly cancel the government decision of importing 1 million tons of soybean from the US.

Insects fed on transgenic plants disrupt cell membrane in their midgut. In the bacterium, δ-endotoxins are synthesized as large protein molecules and crystallized as parasporal inclusions. Further, toxin generates pores in cell membrane, disrupting cellular osmotic balance and causing cells to swell and lyse through a process termed 'colloid–osmotic lysis'[3]. This is one of the important intriguing factors about physiological and biochemical reactions that may also occur in human and other organisms. Moreover, food choice of the insect is associated with a set of phytochemicals available in different families of plant species. Would changing the chemo-typical status of the plant body not invite secondary pest outbreaks

during the growth and development of plant species? To overcome serious environmental risks from transgenic insecticidal plants, more eco-friendly approaches of pest management should also be encouraged to combat both primary and secondary pests by allelopathic plant as intercropping tool, shift in the date of planting/sowing, spacing between rows and plant (solar management) to plant population, screening of superior resistant strains of plant species, change in the seasonal adaptation of the crop suitable to grow in different niches, avoidance of relay cropping and suitably mixed cropping patterns, development of new phyto-molecules as base of new natural insecticides and use of potential insect natural enemies.

Nevertheless, ignoring public apprehensions, some agricultural funding agencies are laying emphasis on developing insecticide transgenic plants in different food, fibre and vegetable species at affordable cost to the government exchequer and have even developed national network system. Major drawback relates to planning and organization of safety data generation for genetically engineered plants that require inputs of multidisciplinary specialists for short- and long-term studies. In my opinion, a sound rational policy for safety data is urgently needed under the approved guide lines of WHO, FAO, etc. to check unknown toxin pollution in man and environment.

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Post-disaster reflections

Parts of India have been devastated by an unexpected tsunami on 26 December 2004. This comes in the wake of the Bhuj earthquake and the supercyclone at Orissa. The smaller and oft forgotten incidents occurring on a day-to-day basis, such as landslides can be mentioned on the side. After every major calamity, we (public, politicians, administrators, scientists) wake up to a grim picture.

Among the four classes of people, except for the most affected group in the public, the rest quickly forget the event. Politicians make the right noises and promises that would be broken soon. Administrators strive their best to help out, unless they are fettered by some obscure rules. But alas! The scientific community who could do the most also wring their hands in despair. The public (including tax-paying ones) expect more in terms of timely signals, forecasts of coming events (even if these are at times conjectural), necessary precautions and other measures. In short, the scientific society is looked upon for advanced warnings of the things to come. But many times there is a failure, in detection and/or communication of a devastation. It is disheartening that after every major catastrophe, scientists behave like 'ambulance chasers' and a project is smelt where none may have existed before nor where anyone was bothered about it. High-level meetings, discussions and brain-stormings occur. Ironically, disaster management groups are formed, although some may already be in place. High-tech instruments are ordered, which may entail a number of trips abroad. Ideas are traded and flung right and left, modellers have a field day, workshops and symposia are held. *Current Science* would be flooded with 'I said so' scientific papers. Of course, the ubiquitous rush of proposals for new projects and big funding are deliberated and sanctioned post-haste. Much of these activities die a natural death. In the event a project is sanctioned and by the time the results are out, the whole incident and purpose of the work is forgotten.

It is time to gird up our loins and be more proactive. Our science need not always be fundamental (nor for self-promotion), but should also be relevant and of societal value. This could be achieved in a simple outreach programme such as by educating school children, people in disaster-prone areas, through public lectures, small booklets and by other means. Unfortunately, in the scenario of publish–promote–perish, these aspirations still appear to be distant dreams. Probably, we are doomed to have a cocooned existence and shut our eyes to the unpleasant situations. This unfortunate behaviour on our part is not only applicable to India, but also worldwide. We have much soul searching to do. Although there are lessons to be learnt by looking back, we need to look into the future and become 'whistle-blowers', prior to onslaught of any major catastrophe, for benefit of the society. Let not the kingdom be lost for want of a horseshoe.

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